Nuytsia

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Department of **Biodiversity, Conservation and Attractions**

The cover photo for Volume 35 features *Stirlingia latifolia* (Proteaceae), a wind-pollinated species with both male and hermaphrodite flowers, which is endemic to south-western Australia. Photographed by Mark Brundrett in 2018 at Lesueur National Park.

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Nutysia

Nuytsia is an open access, peer-reviewed journal that publishes original research on the systematics, taxonomy and nomenclature of Australian (particularly Western Australian) plants, algae and fungi.

Descriptions of taxa, revisions, identification guides, nomenclatural and taxonomic issues, systematic analyses and classifications, censuses, and information on invasive species are all considered.

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CONTENTS

Other content

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Updates to Western Australia's vascular plant census for 2023

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SHORT COMMUNICATION

The census database at the Western Australian Herbarium (PERTH), which provides the nomenclature for the website *Florabase* (Western Australian Herbarium 1998–), lists current names and recent synonymy for Western Australia's native and naturalised vascular plants, as well as algae, bryophytes, lichens, slime moulds and some fungi. The names represented in the census are either sourced from published research or denote as yet unpublished names based on herbarium voucher specimens. We herein summarise the changes made to vascular plant names in this database during 2023.

Sixty four taxa were newly recorded for the State, of which 11 are naturalised and 29 have been added to the Threatened and Priority Flora list for Western Australia (State of Western Australia 2023; Western Australian Herbarium 1998–) (Table 1). A total of 105 name changes were made, including the formal publication of 26 phrase-named taxa (Table 2). Plant groups for which several name changes were made include *Drosera* L. (Krueger *et al.* 2023; Lowrie *et al.* 2017), *Leptospermum* J.R.Forst. & G.Forst. (Wilson & Heslewood 2023), and Rutaceae (Duretto *et al*. 2023). Several new names were added in *Hibbertia* Andrews (Hammer 2023; Thiele 2023; Thiele & Hammer 2023a; 2023b), and the genus *Pigea* Ging., an earlier generic name for *Hybanthus* Jacq., was reinstated (Forster 2021). New genera to Western Australia in 2023 include *Aggreflorum* Peter G.Wilson, *Apectospermum* Peter G.Wilson, *Brownseya* Li Bing Zhang, L.D.Sheph., D.K.Chen, X.M.Zhou & H.He, *Gaudium* Peter G.Wilson, and existing genera newly recognised in Western Australia include *Diplacrum* R.Br. and *Leptospermopsis* S.Moore. Table 2 also includes cases where there has been a change of taxonomic concept, misapplication, exclusion, or rank change.

Table 1. New records added to Western Australia's vascular plant census during 2023. *in litt.* = in correspondence; *in sched.* = on herbarium sheet/label; * = naturalised; T, P1–P4 = Conservation Codes for Western Australian flora (State of Western Australia 2023; Western Australian Herbarium 1998–).

New Name	Status	Comments
Acacia sp. Badgingarra (F. Hort & J. Hort FH 4636)	P2	R. Davis *in. litt.* (16/12/2022).
Acrotriche platycarpa Hislop	P1	See Hislop *et al.* (2023).
Alternanthera denticulata R.Br. var. *denticulata*		New record for WA. See CHAH (2006a).
Bonnaya ciliata (Colsm.) Spreng. subsp. *ciliata*	*	New naturalised record for WA. See CHAH (2016).
Caladenia citrina Hopper & A.P.Br. × *Caladenia rhomboidiformis* (E.Coleman) M.A.Clem. & Hopper		See Brown *et al.* (2008).
Caladenia flava R.Br. × *Caladenia reptans* Lindl.		See Brown *et al.* (2008).

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New Name	Status	Comments
Caladenia hoffmanii Hopper & A.P.Br. × *Caladenia longicauda* Lindl.		See Brown *et al.* (2008).
Carpobrotus edulis (L.) N.E.Br. subsp. *edulis*	*	New naturalised record for WA. G.J. Keighery *in litt.* (21/09/2023).
Cenchrus setosus Sw.	*	New naturalised record for WA. See van der Zon (2023).
Cenchrus setosus Sw. subsp. *setosus*	*	New naturalised record for WA. See van der Zon (2023).
Commersonia sp. Lesmurdie (A.A. Mitchell 11429)	P2	C. Wilkins *in litt.* (23/02/2023).
Diplacrum latzii K.L.Wilson & R.L.Barrett		See Wilson & Barrett (2023).
Drosera atrata T.Krueger, A.Fleischm. & Bourke	P3	See Krueger *et al.* (2023).
Drosera hortiorum T.Krueger & Bourke	P2	See Krueger *et al.* (2023).
Drosera koikyennuruff T.Krueger & A.S.Rob.	P2	See Krueger *et al.* (2023).
Drosera macropetala (Diels) T.Krueger & A.Fleischm.	P1	See Krueger *et al.* (2023).
Enteropogon scabrilemma E.J.Thomps.		See Thompson (2023).
Eremophila improvisa A.P.Br.	P1	See Brown & Davis (2023).
Eremophila sp. Murchison (G.J. Keighery & N. Gibson 1788)		A.P. Brown *in litt.* (16/03/2023).
Erythrophleum arenarium R.L.Barrett & M.D.Barrett		See Barrett & Barrett (2023).
Erythrophleum pubescens R.L.Barrett & M.D.Barrett		See Barrett & Barrett (2023).
Felicia echinata (Thunb.) Nees	*	New naturalised record for WA. R. Davis *in sched.* (17/01/2023).
Freesia leichtlinii subsp. *alba* (G.L.Mey.) J.C.Manning & Goldblatt × *Freesia leichtlinii* Klatt subsp. *leichtlinii*	*	New naturalised record for WA. See CHAH (2014).
Geleznowia calycina (Harv.) Benth.		Name reinstated. See Anderson *et al.* (2023).
Geleznowia eximia K.A.Sheph. & A.D.Crawford	P1	See Anderson *et al.* (2023).
Geleznowia occulta K.A.Sheph. & A.D.Crawford	P2	See Anderson *et al.* (2023).
Geleznowia uberiflora K.A.Sheph. & A.D.Crawford		See Anderson *et al.* (2023).
Glycine sp. Yampi (J.P. Bull & D. Brearley ONS-4790)		J.P. Bull *in litt.* (14/12/2023).
Gompholobium sp. Roy Hill (G. Buller ATF08 AQ14)	P1	S. Dillon & C. Wilkins *in litt.* (13/04/2023).
Goodenia aluta K.A.Sheph. & Lepschi		See Shepherd & Lepschi (2023).
Goodenia crescentiloba K.A.Sheph. & Lepschi		See Shepherd & Lepschi (2023).
Goodenia obscurata K.A.Sheph. & Lepschi	P3	See Shepherd & Lepschi (2023).
Grevillea wickhamii subsp. Prince Regent (R.L. Barrett & M.D. Barrett RLB 3952)	P3	M.D. Barrett *in litt.* (04/06/2023).
Harnieria sp. Gascoyne (J.P. Bull ONS-2721.04)	P1	J.P. Bull *in litt.* (09/03/2023).

New Name	Status	Comments
Hibbertia aplacophylla K.R.Thiele		See Thiele (2023).
Hibbertia ciliolata Toelken	P1	New record for WA. T.A. Hammer *in sched.* (07/10/2022).
Hibbertia hesperia T.Hammer	P1	See Hammer (2023).
Hibbertia remanens K.R.Thiele & T.Hammer	P1	See Thiele & Hammer (2023b).
Hibbertia sp. Forrestania (J.M. Brown 210)	P1	K.R. Thiele *in litt.* (22/09/2023).
Hibiscus sp. Mulga Downs (S. Hitchcock SH 638)	P1	S.J. Dillon *in litt.* (29/06/2023).
Hypocalymma balbakiae Tauss & Rye		See Keighery *et al.* (2023).
Hypocalymma lateriticola Rye & Keighery	P1	See Keighery *et al.* (2023).
Hypocalymma quadrangulare Rye & Keighery	P3	See Keighery *et al.* (2023).
Hypocalymma tenuatum Strid & Keighery × *Hypocalymma xanthopetalum* F.Muell.		See Keighery *et al.* (2023).
Indigofera cordifolia Roth	*	New naturalised record for WA. M. Hislop *in sched.* (07/09/2023).
Ipomoea sp. Karijini (H. Ajduk HAOP305)	P2	S.J. Dillon *in litt.* (30/06/2023).
Lepidium draba L. subsp. *draba*	*	New naturalised record for WA. G.J. Keighery *in litt.* (27/09/2023).
Leucopogon sp. Banovich Rd (M. Hislop 1296)		M. Hislop *in litt.* (06/07/2023).
Melaleuca viminalis (Gaertn.) Byrnes var. *viminalis*	P2	New record for WA. B.J. Lepschi *in sched.* (31/07/2023).
Nicotiana erytheia M.W.Chase & Christenh.		See Chase *et al.* (2023).
Nicotiana karara M.W.Chase & Christenh.		See Chase *et al.* (2023).
Olearia sp. Nyabing (G. Byrne 7139)	P1	R. Davis *in litt.* (13/07/2023).
Pinus palustris Mill.	*	New naturalised record for WA. See Hussey *et al.* (2007).
Pinus ponderosa P.Lawson & C.Lawson	*	New naturalised record for WA. See Hussey *et al.* (2007).
Platysace sp. Tammin (F. Hort & J. Hort FH 4702)	P2	R. Davis & A. Perkins *in litt.* (29/06/2023).
Pterostylis segregata G.Brockman & C.J.French	P1	See Brockman & French (2023).
Sida sp. Turee Creek (P.-L.de Kock PLDK1116)	P1	P.-L. de Kock *in litt.* (01/11/2022).
Thelymitra fasciculata W.Fitzg.		New record for WA. See Brown (2022b).
Triodia sp. De Grey River (M.D. Barrett & B.M. Anderson MDB 4432)		M.D. Barrett *in litt.* (10/04/2023).
Triodia sp. Nanutarra (S. van Leeuwen 5037)		M.D. Barrett *in litt.* (10/04/2023).
Utricularia cowiei R.W.Jobson & Baleeiro	P1	See Jobson & Baleeiro (2022).
Utricularia sp. Mt Brookes (M.D. Barrett et al. MDB 6466)	P2	M.D. Barrett *in litt.* (04/09/2023).

New Name	Status	Comments
Vachellia farnesiana (L.) Wight & Arn. var. *farnesiana*	*	New naturalised record for WA. See CHAH (2006b).

Table 2. Changes to existing entries in Western Australia's vascular plant census during 2023. Excluded taxon = a name used in the botanical literature that refers to a taxon never occurring in WA; misapplied name = a name used in the botanical literature but now considered to refer to one or more different WA taxa; nomenclatural synonym = a superseded name based on the same type specimen as the accepted name; taxonomic synonym = a superseded name based on a different type specimen to the accepted name; orthographic variant = mis-spelling of a name in original publication; *in litt.* = in correspondence; *in sched.* = on herbarium sheet/label; *p.p.* = in part. Status: * = naturalised; T, P1–P4 = Conservation Codes for Western Australian flora (State of Western Australia 2023; Western Australian Herbarium 1998–).

Old Name	New Name	Status	Comments
Acacia olgana Maconochie	n/a		Excluded taxon. This taxon does not occur in WA. B.R. Maslin pers. comm. (11/01/2023).
Acacia sp. Southern Cross (G. Cockerton et al. WB 38518)	*Acacia armigera* R.W.Davis, K.R.Thiele & Cockerton	P1	Taxon formally published. See Thiele *et al.* (2023).
Balaustion grandibracteatum subsp. *juncturum* Rye	*Balaustion grandibracteatum* subsp. *junctura* Rye	P2	Orthographic variant. A.S. George *in litt.* (22/03/2023).
Banksia sphaerocarpa var. *dolichostyla* A.S.George	*Banksia dolichostyla* (A.S.George) K.R.Thiele	T	Nomenclatural synonym. K.R. Thiele *in sched.* (24/11/2022).
Caladenia loreus Hopper & A.P.Br.	*Caladenia lorea* Hopper & A.P.Br.		Orthographic variant. See George & Sharr (2021).
Calandrinia sp. Berry Springs (M.O. Parker 855)	*Calandrinia halophila* Albr. & J.G.West	P1	Taxon formally published. See Albrecht & West (2023).
Calytrix merrelliana (F.Muell. & Tate) Craven	*Calytrix merralliana* (F.Muell. & Tate) Craven		Orthographic variant. See CHAH (2010).
Cenchrus pedicellatus (Trin.) Morrone subsp. *pedicellatus*	*Cenchrus pedicellatus* (Trin.) Morrone	*	Nomenclatural synonym. No subspecies recognised. See van der Zon (2023).
Cenchrus pedicellatus subsp. *unispiculus* (Brunken) Morrone	*Cenchrus pedicellatus* (Trin.) Morrone	*	Taxonomic synonym. See van der Zon (2023).
Corybas abditus D.L.Jones	*Anzybas abditus* (D.L.Jones) D.L.Jones & M.A.Clem.		Nomenclatural synonym. See Jones *et al.* (2002).
Corybas autumnalis A.P.Br. & D.Edmonds	*Corysanthes autumnalis* (A.P.Br. & D.Edmonds) D.L.Jones	P2	Nomenclatural synonym. See Jones (2019).
Corybas despectans D.L.Jones & R.C.Nash	*Corysanthes despectans* (D.L.Jones & R.C.Nash) D.L.Jones & M.A.Clem.		Nomenclatural synonym. See Jones *et al.* (2002).
Corybas limpidus D.L.Jones	*Corysanthes limpida* (D.L.Jones) D.L.Jones & M.A.Clem.		Nomenclatural synonym. See Jones *et al.* (2002).
Corybas recurvus D.L.Jones	*Corysanthes recurva* (D.L.Jones) D.L.Jones & M.A.Clem.		Nomenclatural synonym. See Jones *et al.* (2002).
Darwinia sp. Morawa (C.A. Gardner 2662)	*Darwinia chantiae* K.R.Thiele & R.W.Davis	P3	Taxon formally published. See Thiele & Davis (2023).

Old Name	New Name	Status	Comments
Datura inoxia Mill.	*Datura innoxia* Mill.	*	Orthographic variant. See Applequist (2023).
Drosera brevicornis Lowrie	n/a		Name made current. Taxon reinstated. See Lowrie *et al.* (2017).
Drosera sp. Kentdale (G.J. Bourke 458)	*Drosera reflexa* Bourke & A.S.Rob.	P2	Taxon formally published. See Krueger *et al.* (2023).
Drosera sp. Lesueur National Park (C.A. Gardner 9350)	*Drosera rubricalyx* T.Krueger & A.Fleischm.	P2	Taxon formally published. See Krueger *et al.* (2023).
Drosera sp. Yampi Peninsula (A.J.M. Hopkins BA 0248)	*Drosera maanyaa-gooljoo* A.Fleischm. & T.Krueger	P1	Taxon formally published. See Krueger *et al.* (2023).
Emblica sulcatus (J.T.Hunter & J.J.Bruhl) R.W.Bouman	*Emblica sulcata* (J.T.Hunter & J.J.Bruhl) R.W.Bouman		Nomenclatural synonym. See Bouman *et al.* (2023).
Eremophila sp. Landor (J. Start D7 33)	*Eremophila rubicunda* R.W.Davis	P1	Taxon formally published. See Brown & Davis (2023).
Eremophila sp. Meekatharra (D.J. Edinger 4430)	*Eremophila saxatilis* A.P.Br.	P1	Taxon formally published. See Brown & Davis (2023).
Freesia leichtlinii Klatt	n/a	*	Name made current. Taxon reinstated. See Manning & Goldblatt (2010).
Geleznowia sp. Binnu (K.A. Shepherd & J. Wege KS 1301)	*Geleznowia narcissoides* K.A.Sheph. & A.D.Crawford	P3	Taxon formally published. See Anderson *et al.* (2023).
Geleznowia sp. Marchagee (A. Crawford ADC 1353)	*Geleznowia verrucosa* Turcz.		Name synonymised. See Anderson *et al.* (2023).
Hibbertia rupicola (S.Moore) C.A.Gardner	*Hibbertia glaucophylla* (Steud.) K.R.Thiele & T.Hammer		Taxonomic synonym. See Thiele & Hammer (2023a).
Hibbertia sp. Mt Holland (B. Ellery BE 1437)	*Hibbertia hapalophylla* K.R.Thiele & T.Hammer	P1	Taxon formally published. See Thiele & Hammer (2023b).
Hybanthus calycinus (DC.) F.Muell.	*Pigea calycina* DC.		Nomenclatural synonym. See Forster (2021).
Hybanthus cymulosus C.A.Gardner	*Pigea cymulosa* (C.A.Gardner) P.I.Forst.	T	Nomenclatural synonym. See Forster (2021).
Hybanthus debilissimus F.Muell.	*Pigea debilissima* (F.Muell.) P.I.Forst.		Nomenclatural synonym. See Forster (2021).
Hybanthus epacroides (C.A.Gardner) Melch.	*Pigea epacroides* (C.A.Gardner) P.I.Forst.		Nomenclatural synonym. See Forster (2021).
Hybanthus floribundus (Lindl.) F.Muell.	*Pigea floribunda* Lindl.		Nomenclatural synonym. See Forster (2021).
Hybanthus floribundus subsp. *adpressus* E.M.Benn.	*Pigea adpressa* (E.M.Benn.) P.I.Forst.		Nomenclatural synonym. See Forster (2021).
Hybanthus floribundus subsp. *chloroxanthus* E.M.Benn.	*Pigea* sp. Chloroxantha (E. Bennett & D. Bright EUC 1810)	P3	Nomenclatural synonym. New phrase name raised to recognise *Hybanthus floribundus* subsp. *chloroxanthus* E.M.Benn. under genus *Pigea*, as the combination was not made when the parent taxon was reinstated as *Pigea floribunda* Lindl. See Forster (2021).
Hybanthus floribundus subsp. *curvifolius* E.M.Benn.	*Pigea curvifolia* (E.M.Benn.) P.I.Forst.		Nomenclatural synonym. See Forster (2021).

Old Name	New Name	Status	Comments
Hybanthus floribundus (Lindl.) F.Muell. subsp. *floribundus*	*Pigea floribunda* Lindl.		Nomenclatural synonym. See Forster (2021).
Hybanthus floribundus subsp. Hill River (E.M. Bennett 2252)	*Pigea* sp. Hill River (E.M. Bennett 2252)		Name synonymised. New phrase name to accommodate the informally named *Hybanthus floribundus* subsp. Hill River (E.M. Bennett 2252) within the genus *Pigea*. See Forster (2021).
Hybanthus volubilis E.M.Benn.	*Pigea volubilis* (E.M.Benn.) P.I.Forst.	P2	Nomenclatural synonym. See Forster (2021).
Hypocalymma sp. Cataby (G.J. Keighery 5151)	*Hypocalymma* × *proliferum* Keighery & Rye	P1	Taxon formally published. See Keighery *et al.* (2023).
Isolepis marginata (Thunb.) A.Dietr.	*Ficinia marginata* (Thunb.) Fourc.	*	Nomenclatural synonym. See Barrett & Tay (2016).
Jacquemontia browniana Ooststr.	n/a		Name made current. Taxon reinstated. See CHAH (2006c).
Kunzea affinis S.Moore × *Kunzea preissiana* Schauer	*Kunzea preissiana* Schauer		Misapplied name *p.p.* See Toelken & Craig (2007).
Kunzea affinis S.Moore × *Kunzea preissiana* Schauer	*Kunzea strigosa* Toelken & G.F.Craig		Misapplied name *p.p.* See Toelken & Craig (2007).
Lambertia orbifolia subsp. Bowelling (A. Webb AW 09107)	*Lambertia orbifolia* subsp. *pecuniosa* A.D.Webb, L.T.Monks & Wege	P2	Taxon formally published. See Wege *et al.* (2023).
Lambertia orbifolia subsp. Scott River Plains (L.W. Sage 684)	*Lambertia orbifolia* subsp. *vespera* A.D.Webb, L.T.Monks & Wege	T	Taxon formally published. See Wege *et al.* (2023).
Lepidium muelleri-ferdinandii Thell.	*Lepidium muelleri-ferdinandi* Thell.		Orthographic variant. See CHAH (2006d).
Leptocarpus crassipes Pate & Meney	*Leptocarpus scariosus* R.Br.		Taxonomic synonym. See Briggs *et al.* (2020).
Leptospermum confertum Joy Thomps.	*Gaudium confertum* (Joy Thomps.) Peter G.Wilson	P2	Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum erubescens Schauer	*Leptospermopsis erubescens* (Schauer) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum exsertum Joy Thomps.	*Apectospermum exsertum* (Joy Thomps.) Peter G.Wilson	P3	Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum fastigiatum S.Moore	*Leptospermopsis fastigiata* (S.Moore) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum incanum Turcz.	*Leptospermopsis incana* (Turcz.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum laevigatum (Gaertn.) F.Muell.	*Gaudium laevigatum* (Gaertn.) Peter G.Wilson	*	Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum macgillivrayi Joy Thomps.	*Apectospermum macgillivrayi* (Joy Thomps.) Peter G.Wilson	P3	Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum madidum subsp. *sativum* A.R.Bean	*Aggreflorum longifolium* subsp. *sativum* (A.R.Bean) Peter G.Wilson	P3	Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum maxwellii S.Moore	*Leptospermopsis maxwellii* (S.Moore) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum nitens Turcz.	*Leptospermopsis nitens* (Turcz.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).

Old Name	New Name	Status	Comments
Leptospermum oligandrum Turcz.	*Leptospermopsis oligandra* (Turcz.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum podanthum (F.Muell.) Diels	*Leptospermopsis oligandra* (Turcz.) Peter G.Wilson		Taxonomic synonym. See Wilson & Heslewood (2023).
Leptospermum roei Benth.	*Leptospermopsis roei* (Benth.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum sericeum Labill.	*Leptospermopsis sericea* (Labill.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum spinescens Endl.	*Apectospermum spinescens* (Endl.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum subtenue Joy Thomps.	*Apectospermum subtenue* (Joy Thomps.) Peter G.Wilson		Nomenclatural synonym. See Wilson & Heslewood (2023).
Leptospermum sp. Bandalup Hill (G. Cockerton 11001)	*Apectospermum spinescens* (Endl.) Peter G.Wilson		Name synonymised. See Wilson & Heslewood (2023).
Leptospermum sp. Latham (B.L. Rye 239088 & M.E. Trudgen)	*Apectospermum* sp. Latham (B.L. Rye 239088 & M.E. Trudgen)		Name synonymised. B.L. Rye *in litt.* (28/07/2023).
Leucopogon sp. Forrestania (G.F. Craig 2386)	*Styphelia browniae* Hislop		Taxon formally published. See Hislop (2023b).
Leucopogon sp. Howatharra (D. & N. McFarland 1046)	*Styphelia howatharra* Hislop	P2	Taxon formally published. See Hislop (2023b).
Leucopogon sp. Kalbarri (J.M. Powell 1695)	*Styphelia kalbarriensis* Hislop & E.A.Br.		Taxon formally published. See Hislop (2023b).
Leucopogon sp. Murchison (R.J. Cranfield 9224)	*Styphelia brachygyna* Hislop	P2	Taxon formally published. See Hislop (2023b).
Leucopogon sp. Varley (M. Hislop 3659)	*Styphelia anomala* Hislop	P2	Taxon formally published. See Hislop (2023a).
Leucopogon sp. Wheatbelt (S. Murray 257)	*Styphelia planiconvexa* Hislop		Taxon formally published. See Hislop (2023a).
Microcybe albiflora Turcz.	*Phebalium albiflorum* (Turcz.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe ambigua (C.A.Gardner) Paul G.Wilson	*Phebalium ambiguum* C.A.Gardner		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe multiflora Turcz.	*Phebalium multiflorum* (Turcz.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe multiflora subsp. *baccharoides* (F.Muell.) Paul G.Wilson	*Phebalium multiflorum* subsp. *baccharoides* (F.Muell.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe multiflora Turcz. subsp. *multiflora*	*Phebalium multiflorum* (Turcz.) Duretto & Heslewood subsp. *multiflorum*		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe pauciflora Turcz.	*Phebalium pauciflorum* (Turcz.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe pauciflora subsp. *grandis* Paul G.Wilson	*Phebalium pauciflorum* subsp. *grande* (Paul G.Wilson) Duretto & Heslewood	P1	Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe pauciflora Turcz. subsp. *pauciflora*	*Phebalium pauciflorum* (Turcz.) Duretto & Heslewood subsp. *pauciflorum*		Nomenclatural synonym. See Duretto *et al.* (2023).
Microcybe pauciflora subsp. Grass Patch (A. Strid 21921)	*Phebalium* sp. Grass Patch (A. Strid 21921)		Name synonymised. See Duretto *et al.* (2023).

Old Name	New Name	Status	Comments
Microcybe sp. Windy Hill (G.F. Craig 6583)	*Phebalium* sp. Windy Hill (G.F. Craig 6583)	P3	Name synonymised. See Duretto *et al.* (2023).
Omphacomeria acerba (R.Br.) A.DC.	*Exocarpos acerbus* (R.Br.) Lepschi	P2	Nomenclatural synonym. See Pillon *et al.* (2023).
Pittosporum moluccanum (Lam.) Miq.	*Pittosporum timorense* Blume	P4	Misapplied name. See Cayzer *et al.* (2023).
Pomax sp. Sand dunes (P.G. Wilson 752)	*Pomax ammophila* Ngugi		Taxon formally published. See Ngugi (2022).
Prostanthera serpyllifolia (R.Br.) Briq. subsp. *serpyllifolia*	n/a		Excluded taxon. This taxon does not occur in WA. See Conn (1984).
Pseudolycopodiella serpentina (Kunze) Holub	*Brownseya serpentina* (Kunze) Li Bing Zhang, L.D.Sheph., D.K.Chen, X.M.Zhou & H.He		Nomenclatural synonym. See Chen *et al.* (2022).
Rhadinothamnus anceps (DC.) Paul G.Wilson	*Chorilaena anceps* (DC.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Rhadinothamnus euphemiae (F.Muell.) Paul G.Wilson	*Chorilaena euphemiae* (F.Muell.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Rhadinothamnus rudis (Bartl.) Paul G.Wilson	*Chorilaena rudis* (Bartl.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Rhadinothamnus rudis subsp. *amblycarpus* (F.Muell.) Paul G.Wilson	*Chorilaena rudis* subsp. *amblycarpus* (F.Muell.) Duretto & Heslewood		Nomenclatural synonym. See Duretto *et al.* (2023).
Rhadinothamnus rudis subsp. *linearis* (C.A.Gardner) Paul G.Wilson	*Chorilaena rudis* subsp. *linearis* (C.A.Gardner) Duretto & Heslewood	P4	Nomenclatural synonym. See Duretto *et al.* (2023).
Rhadinothamnus rudis (Bartl.) Paul G.Wilson subsp. *rudis*	*Chorilaena rudis* (Bartl.) Duretto & Heslewood subsp. rudis		Nomenclatural synonym. See Duretto *et al.* (2023).
Scleria pygmaea R.Br.	*Diplacrum pygmaeum* (R.Br.) Boeckeler		Nomenclatural synonym. See Wilson & Barrett (2023).
Scleria sp. C Kimberley Flora (K.F. Kenneally 4873)	*Diplacrum blakei* K.L.Wilson & R.L.Barrett	P1	Taxon formally published. See Wilson & Barrett (2023).
Sida sp. B (C. Dunlop 1739)	*Sida* sp. Limestone (D.E. Albrecht 5748)		Name synonymised. R. Barker *in litt.* (01/12/2023).
Sida sp. tiny glabrous fruit (A.A. Mitchell PRP1152)	*Sida* sp. Kathleen Springs (A.C. Beauglehole 26934)		Name synonymised. See CHAH (2012).
Styphelia sp. South Coast (J.M. Powell 3374)	*Styphelia cylindrica* Hislop		Taxon formally published. See Hislop (2023a).
Thysanotus banksii R.Br.	*Thysanotus elatior* R.Br.	P3	Misapplied name. See Wang *et al.* (2023).
Triglochin turriferum Ewart	*Triglochin turrifera* Ewart		Orthographic variant. See CHAH (2006e).
Triodia sp. De Grey River (M.D. Barrett & B.M. Anderson MDB 4432)	*Triodia degreyensis* M.D.Barrett	P1	Taxon formally published. See Barrett *et al.* (2023).
Triodia sp. Karijini (S. van Leeuwen 4111)	*Triodia karijini* M.D.Barrett & S.J.Dillon	P2	Taxon formally published. See Barrett *et al.* (2023).
Triodia sp. Nanutarra (S. van Leeuwen 5037)	*Triodia avenoides* M.D.Barrett		Taxon formally published. See Barrett *et al.* (2023).

Old Name	New Name	Status	Comments
Triodia sp. Silvergrass (P.-L. de Kock BES 00808)	*Triodia lutiteana* M.D.Barrett & P.-L.de Kock	P1	Taxon formally published. See Barrett *et al.* (2023).
Trymalium spatulatum (Labill.) Ostenf.	*Trymalium spatulatum* (Labill.) G.Don		Nomenclatural synonym. See Kellermann (2021).
Utricularia leptorhyncha O.Schwarz	n/a		Excluded taxon. This taxon does not occur in WA. See Jobson & Baleeiro (2022).

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Three new species of *Styphelia* (Ericaceae: Epacridoideae: Styphelieae) from the central south coast of Western Australia

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SHORT COMMUNICATION

Three new morphologically similar species, *Styphelia halophila* Hislop, *S. lacsalaria* Hislop and *S. microcardia* Hislop, all with short, broad leaves, innocuous leaf tips and recurved sepals, are described and illustrated. *Styphelia lacsalaria* and *S. microcardia* previously known as *Leucopogon* sp. Mount Heywood (M.A. Burgman 1211) and *L.* sp. Bremer Bay (K.R. Newbey 4667) respectively (Western Australian Herbarium 2018–), grouped together as part of a very weakly supported subgroup of Group X in the phylogeny of Puente-Lelièvre *et al.* (2016). Based on morphological similarity, *S. halophila* is regarded as a close relative of *S. lacsalaria*.

Styphelia halophila Hislop, *sp. nov.*

Typus: upper reaches of Lort River, *c.* 7 km west of Belgian Road, along old survey track *c.* 20 km north of Rolland Road [north of Cascade], Western Australia, 14 March 2001, *M. Golding* 3 (*holo*: PERTH 05791049; *iso*: CANB, CNS, NSW).

Leucopogon sp. Lort River (M. Golding 3), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 17 November 2023].

Erect, compact *shrubs*, to *c.* 100 cm high and 150 cm wide, single-stemmed at ground level and most likely with a fire-sensitive rootstock. Young *branchlets* with a sparse to dense indumentum of straight or decurved hairs, to *c.* 0.2 mm long. *Leaves* helically arranged, shallowly to steeply antrorse; apex obtuse to subacute, mucro lacking; base rounded or cuneate; petiole usually 0.1–0.3 mm long, very occasionally to 0.5 mm, usually sparsely hairy on adaxial surface and margins, sometimes ± glabrous throughout; lamina ovate, broadly ovate or depressed-ovate to obovate, broadly obovate or depressed-obovate, 0.8–2.0 mm long, 0.8–2.0 mm wide, slightly discolorous, planoconvex or adaxially concave, longitudinal axis slightly to moderately recurved; adaxial surface shiny, sparsely hairy throughout or sometimes hairs restricted to lower half only, venation not evident; abaxial surface paler, shiny, at least on the veins, glabrous throughout, or sparsely hairy on the veins, with 5–9 primary veins, usually distinctly grooved between the veins; margins usually with short, coarse hairs to 0.05 mm long, or ± glabrous. *Inflorescence* axillary, erect, arising from the axils of regular, mature leaves; axis 1.1–1.5 mm long, 1(2)-flowered, ± terete in the lower part, distinctly compressed above the fertile bract (or uppermost fertile bract if 2-flowered), with a dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* ovate to depressed-ovate, 0.7–1.2 mm long, 0.7–1.1 mm wide, subtended by 4–6 sterile bracts. *Bracteoles* broadly ovate to ± orbicular, 1.5–2.0 mm long, 1.2–1.6 mm wide, obscurely keeled, obtuse, barely striate; abaxial surface usually sparsely hairy, occasionally ± glabrous; margins ciliolate. *Sepals* narrowly ovate, (2.6)2.8–3.5 mm long, 1.2–1.5 mm wide, acute or subacute, distinctly recurved in the upper half; abaxial surface usually sparsely hairy in the upper half, occasionally ± glabrous, straw-coloured (sometimes tinged purple), venation rather indistinct, with only the mid-vein evident; adaxial surface shortly hairy;

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margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white, obovoid, shorter than the sepals, 1.8–2.5 mm long, 1.5–2.0 mm wide, glabrous externally, internal surface glabrous throughout or with a narrow transverse band of hairs at the apex only. *Corolla lobes* white, *c.* equal to or more usually longer than the tube, 2.5–3.0 mm long, 0.7–1.0 mm wide at base, erect in basal 1/2–2/3 and then spreading and recurved, glabrous or sparsely hairy externally, internal surface with a dense indumentum of ± terete, ornamented hairs. *Anthers* partially exserted from the tube by *c.* 7/8 of their length to fully exserted, 1.0–1.2 mm long, apex emarginate. *Filaments* terete, 0.8–1.0 mm long, attached to the anther 3/4–7/8 above anther base, adnate to the tube a little above the sinuses. *Nectary* annular, shallowly lobed, shallowly grooved below the sinuses, 0.3–0.5 mm long, glabrous. *Ovary* broadly obovoid or broadly ellipsoid, 0.8–1.0 mm long, 0.7–0.9 mm wide, glabrous, 2- or 3-locular, straw-coloured or pale green. *Style* straw-coloured, abruptly differentiated from ovary apex, (2.3)2.8–3.8 mm long, slightly scabrous towards the apex, exserted from the corolla tube but not beyond the erect bases of the corolla lobes, inserted in cylindrical depression that tightly envelops, but is free from, the style base; stigma slightly expanded. *Fruit* narrowly ellipsoid to oblongoid, 2.5–2.8 mm long, 1.3–1.6 mm wide, a little shorter than to ± equal to the sepals, circular in transverse section, gynophore very indistinct; surface glabrous, green, smooth and ± dry (mesocarp poorly developed); apex with well-defined subterminal shoulders, the surface then rising gently to a subacute style base; style shed before maturity. (Figure 1)

Diagnostic characters. Within Group X distinguished by the following character combination: habitat preference for surrounds of saline lakes and drainage lines; leaves planoconvex or adaxially concave, slightly to moderately recurved along longitudinal axis, with an obtuse to subacute, non-mucronate apex and a cuneate or rounded base; abaxial leaf surface glabrous or sparsely hairy on the veins, usually distinctly grooved between the veins; inflorescence 1(2)-flowered, terminating in a bud-rudiment; sepals (2.6)2.8–3.5 mm long, distinctly recurved distally, usually sparsely hairy; nectary annular; ovary 2- or 3-locular, glabrous; style base clearly free from ovary apex; fruit narrowly ellipsoid to oblongoid, ± dry (mesocarp poorly developed), a little shorter than to ± equal to the sepals, surface rising gently towards the apex from well-defined subterminal shoulders.

Other specimens examined. WESTERN AUSTRALIA: Lake Tay, 22 Apr. 2013, *W.R. Archer* 22041312 (CNS, PERTH); site 17 Lake Tay, 4 Aug. 2013, *W.R. Archer* 4081314 (CNS, PERTH); 11.5 km due S of Peak Charles, 6.36 km S of Peak Charles Rd on Fields Rd, 26 Sep. 1984, *M.A. Burgman* 3653 (PERTH); 13.6 km S of Peak Charles Rd on Fields Rd, Lort River crossing, 15 Jan. 1994, *A. Cochrane & K. Brown s.n.* (PERTH); 13.6 km S of Peak Charles Rd on Fields Rd (20.4 km N of Rolland Rd), SW of Peak Eleanora, Lort River crossing, 19 Sep. 1993, *G.F. Craig* 2958 A (PERTH); at Lort River crossing on Fields Rd, *c.* 4.8 km N of end of formed road to Peak Eleanora, 6 May 2003, *A. Crawford* ADC 381 (PERTH); upper reaches of Lort River, *c.* 7 km W of Belgian Rd, along old survey track, *c.* 20 km N of Rolland Rd, 29 Oct. 2000, *M. Golding* MRMG 2 (PERTH); Lort River crossing on Griggs Rd (S side), locality of Cascade, 17 May 2002, *M. Hislop & F. Hort* MH 2607 (PERTH); Lort River crossing on Grass Patch Rd, W of Grass Patch, 22 May 2004, *M. Hislop & F. Hort* MH 3223 (CNS, PERTH); Griffiths Rd, SLK 34.81, N section of road reserve [E of Cascade], 17 Apr. 2022, *K. Walkerden* KSW016-p (PERTH); UCL, 1.5 km W of endpoint of Pyramid Rd Reserve [N of Cascade], 28 May 2022, *K. Walkerden* KSW 044-p (CANB, CNS, PERTH); UCL, 1.5 km W of Cups Rd, 22 km NNE of Cups Rd and Rolland Rd intersection [NE of Cascade], 18 Feb. 2023, *K. Walkerden* KSW 240 (MEL, PERTH); UCL, 200 m W of Cups Rd, 28.3 km N of Cups Rd and Rolland Rd intersection [NE of Cascade], 18 Feb. 2023, *K. Walkerden* KSW 242 (PERTH); UCL, 1 km S of Recruit Hill, 5.7 km W of Peak Charles National Park [NE of Salmon Gums], 25 Feb. 2023, *K. Walkerden* KSW 243 (K, PERTH).

Distribution and habitat. Occurs on sandy rises in close proximity to the saline Lort River and around salt lakes to the north and west of the Lort River catchment, in the Mallee bioregion. Grows in halophytic heath, often in association with *Melaleuca thyoides*, *M. halmaturorum*, *Frankenia spp.* and samphires.

Phenology. Flowers over many months of the year, but apparently with a peak between February and May. Mature fruit has been collected in September and January but is most likely present for much of the second half of the year.

Figure 1. *Styphelia halophila*. A – flowering plant *in situ*; B – flowering branchlet *in situ*; C – scanned image of flowering branchlet. Scale bar C = 1 cm. Vouchers *K. Walkerden* 016-p (A, B), *M. Golding* 3 (C). Photographs by Katherine Walkerden.

Etymology. From the Greek *halo-* (salt-) and *philus* (loving), a reference to the preferred habitat of the species.

Conservation status. This species is locally common in the middle and upper reaches of the Lort River and also occurs around salt lakes in areas to the north and west of there. It is known from the south of Peak Charles National Park and is widespread in Unmanaged Reserve 2693. It therefore currently does not appear to be under conservation threat in this remote part of the state.

Affinities. Based on overall morphological similarity the closest relative of *S. halophila* is likely to be *S. lacsalaria*. The two have allopatric distributions with *S. halophila* occurring to the west of the more widespread *S. lacsalaria*, and both favouring similar saline or subsaline habitats. Differences between them are discussed below in the treatment of *S. lacsalaria*.

Styphelia halophila is especially close in general morphology to a widespread inland variant of the variable species *S. hamulosa* (E.Pritz.) Sleumer, as both have very similar-shaped leaves, a non-mucronate leaf tip and usually hairy sepals. At one locality east of Cascade, the two are known to grow in close proximity, i.e. *M. Hislop & F. Hort* MH 2607 (*S. halophila*) and *M. Hislop & F. Hort* MH 2610 (*S. hamulosa*). Critical differences between the two are as follows. Whereas *S. hamulosa* has straight sepals and shortly hairy, more or less closed, abaxial leaf grooves, in *S. halophila* the sepals are longitudinally recurved, the abaxial leaf grooves are open and if any hairs are present, they are scattered on the veins, rather than within the grooves. In addition, the fruit of *S. hamulosa* are always much longer than the sepals (vs. a little shorter than to ± equal to the sepals) and the ovarian locule number is 5 rather than 2 or 3.

Styphelia lacsalaria Hislop, *sp. nov.*

Typus: Uncleared Crown Land, 160 m west of Styles Road, 3.7 km north north-east of Styles Road and Lignite Road intersection, Grass Patch, Western Australia, 10 December 2022, *K.S. Walkerden* KSW 205 (*holo*: PERTH 09554475; *iso*: CANB, CNS, MEL, NSW).

Leucopogon sp. Mount Heywood (M.A. Burgman 1211), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 17 November 2023]

Erect, compact *shrubs*, to *c.* 80 cm high and 90 cm wide, branching from close to the base, most likely with a fire-sensitive rootstock. Young *branchlets* with a sparse to dense indumentum of straight or decurved hairs to *c.* 0.3 mm long. *Leaves* helically arranged, shallowly antrorse to ± patent; apex obtuse to acute, mucro lacking, but sometimes with a barely differentiated callus tip; base cordate, rounded, or cuneate; petiole usually well-defined, although often varying considerably in length on the same plant, 0.2–1.0 mm long, sparsely hairy on adaxial surface and margins, and sometimes also the abaxial surface or occasionally glabrous throughout; lamina rather variable in shape, even on the same plant, narrowly elliptic to transversely elliptic, or ovate to depressed-ovate, sometimes depressed-obovate, 0.8–2.3 mm long, 1.0–2.0 mm wide, usually markedly discolorous, rarely ± concolorous, flat to adaxially convex, or sometimes slightly concave in the lower half, longitudinal axis strongly recurved to circinate; adaxial surface shiny, usually hairy with short, stiff hairs over all or part of the surface, occasionally ± glabrous, often ± rugose, the venation not evident; abaxial surface paler, matt, usually glabrous, sometimes very sparsely hairy, with 5–9 primary veins, flat to very shallowly grooved between the veins; margins usually with very short, coarse hairs to *c.* 0.05 mm long, or ± glabrous. *Inflorescence* axillary, erect, arising from the axils of regular, mature leaves, 0.6–1.2 mm long, 1(2)-flowered, ± terete in the lower part, distinctly compressed above the fertile bract, with a dense indumentum, terminating in a bud-rudiment; flowers erect, sessile. *Fertile bracts* broadly ovate to depressed-ovate, 0.5–0.8 mm long, 0.5–0.8 mm wide, subtended by 3–5 sterile bracts. *Bracteoles* broadly ovate to ± orbicular, 0.9–1.2(1.5) mm long, 1.0–1.2 mm wide, keeled, but often obscurely so, obtuse, ± striate; abaxial surface glabrous; margins ciliolate. *Sepals* narrowly ovate, 2.1–2.9 mm long, (0.8)1.0–1.3 wide, obtuse to acute, usually distinctly recurved in the upper half, occasionally not, or barely recurved in some flowers; abaxial surface glabrous, straw-coloured (sometimes tinged purple), venation usually rather indistinct, with only the mid-vein evident; adaxial surface shortly hairy at least in the upper half and sometimes throughout; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white, obovoid, or broadly obovoid, usually shorter than, or occasionally slightly longer than the sepals, 1.5–2.5 mm long, 1.2–1.7 mm wide, glabrous externally, internal surface

glabrous throughout or occasionally with a few hairs towards the apex only. *Corolla lobes* white, longer than or ± equal to the tube, 1.9–2.6 mm long, 0.5–1.0 mm wide at base, erect in basal 1/2–2.3 and then spreading and recurved, usually glabrous externally, or rarely with sparse, scattered hairs, internal surface with a dense indumentum of ± terete, ornamented hairs. *Anthers* partially exserted from the tube by *c.* 7/8 of their length to fully exserted, 0.7–1.2 mm long, apex emarginate. *Filaments* terete, 0.6–0.9 mm long, attached to the anther 3/4–7/8 above anther base, adnate to the tube a little below the sinuses. *Nectary* annular, variously lobed, shallowly grooved below the sinuses, 0.2–0.4 mm long, glabrous, sometimes with faintly papillose margins. *Ovary* broadly obovoid, broadly ellipsoid to ± globose, 0.5–0.7 mm long, 0.5–0.7 mm wide, glabrous, 2- or 3-locular, straw-coloured or green. *Style* straw-coloured, abruptly differentiated from ovary apex, 1.9–3.4 mm long, scabrous at least in the upper half, exserted from the corolla tube but not beyond the erect bases of the corolla lobes, inserted in a cylindrical depression that tightly envelops, but is free from, the style base; stigma slightly expanded. *Fruit* narrowly ellipsoid to oblongoid, 2.0–2.6 mm long, 1.2–1.4 mm wide, a little shorter than to a little longer than the sepals, circular in transverse section, with a usually rather indistinct gynophore; surface glabrous, shiny, dark green, smooth (mesocarp poorly developed) but sometimes with irregular, longitudinal ridges; apex with well-defined subterminal shoulders, the surface then rising gently to a subacute style base; style shed before maturity. (Figures 2A–D, 3B)

Diagnostic characters. Within Group X distinguished by the following character combination: habitat preference for surrounds of saline lakes and drainage lines; leaves often prominently petiolate (although petiole length often variable on the same plant), flat to adaxially convex, longitudinal axis strongly recurved to circinate, with an obtuse to acute, non-mucronate apex and a cordate, rounded or cuneate base; abaxial leaf surface usually glabrous, sometimes very sparsely hairy, flat to very shallowly grooved between the veins; inflorescence 0.6–1.2 mm long, 1(2)-flowered, terminating in a bud-rudiment; sepals 2.1–2.9 mm long, usually distinctly recurved distally, glabrous; ovary 2- or 3-locular, glabrous; style base clearly free from ovary apex; fruit narrowly ellipsoid to oblongoid, a little shorter than, to a little longer than, the sepals, with strongly defined shoulders and the surface above rising gently to the apex.

Other specimens examined. WESTERN AUSTRALIA: Mt Beaumont land release stage 2 [NE of Condingup], 31 Dec. 1982, *E.M. Bennett* BLR 25 (PERTH); Mount Ney Rd, 2.4 km SW of intersection with Kau Rock Rd [N of Condingup], 21 Oct. 1997, *E.A. Brown* 97/369, *P.G. Wilson & N. Lam* (CHR *n.v.*, MEL *n.v.*, NSW *n.v.*, NY *n.v.*, PERTH, UNSW *n.v.*); 24 km NW of Clyde Hill [NE of Condingup], 4 May 1983, *M.A. Burgman & S. McNee* 1211 (NSW *n.v.*, PERTH); 11.7 km NW of Mt Ney Rd on Clyde Rd [N of Condingup], 20 May 1993, *G.F. Craig & B. Haberley* 2766 (NSW *n.v.*, PERTH); 2.8 km along Gibson Dalyup West Rd from junction with Coolgardie–Esperance Hwy, *c.* 3 km SW of Gibson, 17 May 2005, *R. Davis* 10809 (NSW, PERTH); junction of Boydells Rd and Coolgardie–Esperance Hwy, *c.* 12 km NNW of Gibson, 17 May 2005, *R. Davis* 10815 (PERTH); 22 km NE of Scaddan, 6 km E along Truslove Rd from junction of Coolgardie–Esperance Hwy, Truslove Nature Reserve, 19 June 2006, *R. Davis* 11007 (PERTH); 12 km NW of Gibson, 1 km N along Yates Rd from junction of Fleming Grove Rd, 27 June 2006, *R. Davis* 11071 (PERTH); *c.* 11 miles [*c.* 17.6 km] N of Dalyup, W of Esperance, 25 Feb. 1966, *A.S. George* 7665 (CANB, CNS, MEL, PERTH); [Salmon Gums Nature Reserve] at eastern end of Salmon Gums East Rd, on western edge of salt lake, east of Salmon Gums, 20 May 2002, *M. Hislop & F. Hort* MH 2649 (CANB, CNS, MEL, PERTH); Kumarl–Lake King Rd, 8.4 km from Esperance–Norseman Rd, then 150 m N to shoreline of Lake Exclamation, 21 May 2002, *M. Hislop & F. Hort* MH 2656 (CNS, MEL, PERTH); *c.* 5 m from shore line at S end of salt lake, 16 km E of Grass Patch via Starcevich and Ridley roads, 21 May 2004, *M. Hislop & F. Hort* MH 3212 (NSW, PERTH); E side of Sassella Rd, 900 m S of Salmon Gums East Rd, E of Salmon Gums, 21 May 2004, *M. Hislop & F. Hort* MH 3216 (CANB, CNS, PERTH); Lagoon Rd, 200 m N of Kendall Rd, E of Scaddan, 22 May 2004, *M. Hislop & F. Hort* MH 3219 (K, PERTH); Norwood Rd, 2.4 km E of Dempster Rd, E of Scaddan, 22 May 2004, *M. Hislop & F. Hort* MH 3220 (NSW, PERTH); Bishops Road Nature Reserve (A29012), salt flats in S part of reserve, W of Grass Patch, 27 Apr. 2007, *M. Hislop* 3694 (CANB, CNS, PERTH); 6 km NE of Mt Ridley, *c.* 71 km NE of Esperance, 5 May 1981, *K.R. Newbey* 8283 (CANB, PERTH); Helms Arboretum [W of Esperance airport], 23 Apr. 2010, *C.D. Turley & R.M. Hoggart* 3/4-10 (PERTH);

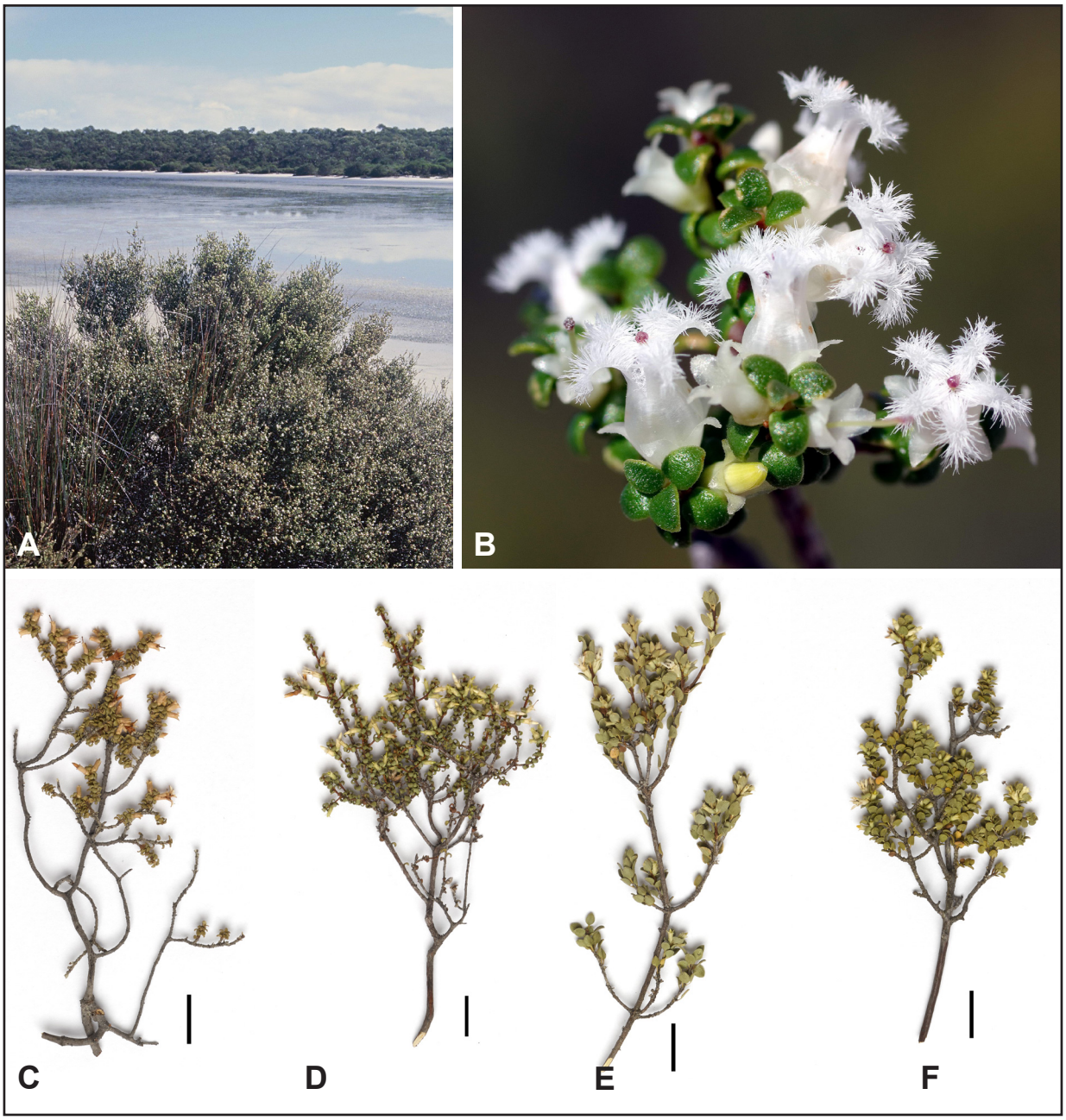

Figure 2. *Styphelia lacsalaria*. A – flowering plant *in situ*; B – flowering branchlet *in situ*; C, D – scanned images of flowering branchlet. *Styphelia aff. lacsalaria*. E, F – scanned images of flowering branchlet highlighting larger leaves with a different curvature. Scale bars C–F = 1 cm. Vouchers *M. Hislop & F. Hort* MH 3222 (A), *M. Hislop & F. Hort* MH 2649 (C), *K.S. Walkerden* KSW 205 (D), *K.S. Walkerden* KSW 22022B (E), *K.S. Walkerden* KSW 218 (F). Photographs by Michael Hislop (A), Rob Davis (B, unvouchered).

Kau Rock Nature Reserve – R 32777, 1.5 km SE of Kau Rock Rd and Mt Ney Rd intersection, Neridup, 14 Jan. 2023, *K. Walkerden* KSW 217 (CNS, PERTH).

Distribution and habitat. Distributed from north of Salmon Gums southwards to about 40 km north-west of Esperance and sporadically eastwards, at least as far as Mount Beaumont, north-east of Condingup; in the Esperance Plains and Mallee bioregions. *Styphelia lacsalaria* is restricted to the close environs of salt lakes and saline drainage lines where it grows in sand or sandy loam soils in halophytic, low, open heath or open woodland.

Phenology. Appears to flower sporadically over many months of the years, at least from December to June. Similarly, mature fruit is likely to be present for an extended period, at least between June and October.

Etymology. From the Latin *lacus* (lake), *salsus* (salty) and -*arius* (pertaining to), a reference to the species' close association with salt lakes.

Conservation status. *Styphelia lacsalaria* is locally common and has a fairly wide distribution, which extends to the north and east of the agricultural districts of south-west Western Australia. No conservation coding is recommended here.

Affinities. As noted above, in the phylogeny of Puente-Lelièvre *et al.* (2016) *S. lacsalaria* (as *Leucopogon* sp. Mount Heywood) grouped with *S. microcardia* in a small, very weakly supported subclade of Group X. Differences between the two species are given below under *S. microcardia*.

Styphelia lacsalaria is morphologically close to *S. halophila* differing most notably in details of leaf curvature, transverse section of the leaf lamina, prominence of abaxial leaf veins and to some extent in the length of the petiole. In *S. lacsalaria* the lamina is flat to adaxially convex, sometimes becoming slightly concave towards the base, and with the abaxial surface flat to very shallowly grooved between the veins. In *S. halophila* by comparison the lamina is noticeably thicker and planoconvex or concave adaxially with the abaxial surface usually distinctly grooved. And whereas *S. lacsalaria* has leaves that are strongly recurved to circinate, in *S. halophila* they are slightly to moderately recurved. *Styphelia lacsalaria* can also mostly be distinguished by the presence of long-petiolate leaves with some or all petioles in the range 0.5–1.0 mm long (*cf.* petioles almost always in the range 0.1–0.3 mm long in *S. halophila*). There are also some useful differences between the two in their bracteole and sepal characters: *S. lacsalaria* has glabrous bracteoles and sepals (0.9–1.2(1.5) mm long and 2.1–2.9 mm long respectively), whereas in *S. halophila* they are usually sparsely hairy, and respectively 1.5–2.0 mm and (2.6)2.8–3.5 mm long. *Styphelia halophila* is also distributed to the west of *S. lacsalaria*.

Notes. Recent collections by Esperance-based botanist Katherine Walkerden of plants from the Mount Burdett–Kau Rock area (e.g. *K.S. Walkerden* KSW 22022B; *K.S. Walkerden* KSW 13122), have raised the question of whether, in addition to *S. halophila* and *S. lacsalaria*, a third member of this halophytic group should be recognised as a distinct taxon. The foliar character of this morphotype is remarkably similar to *Leucopogon bossiaea* (F.Muell.) Benth. and some variants of *L. diversifolius* Hislop and while this plant is closer in gross morphology to *S. lacsalaria*, it differs from that species in having generally larger leaves with consistently long petioles (to 1.8 mm long) and with a significantly different leaf curvature. Rather than having the lamina strongly recurved to circinate from a point immediate above the petiole, as in *S. lacsalaria*, it is either straight or inflexed above the petiole and then gently recurved in the upper half. There is also some tendency for the floral parts to be larger than in typical *S. lacsalaria*. These characters combine to give the plant a significantly different aspect.

This morphotype is currently known from several populations that are well within the distribution of *S. lacsalaria*. However, while it appears to be consistently morphologically distinct from that species in the Burdett Nature Reserve area, in the Kau Rock area the situation is more complicated as both populations of typical *S. lacsalaria* and the anomalous morphotype are present (Figure 2E), along with plants of somewhat intermediate morphology (Figure 2F). It is uncertain therefore, if *S. lacsalaria* is unusually variable in this area or if the intermediate plants represent hybrids between *S. lacsalaria* and an unrecognised species. It is evident that this group would benefit from a molecular study to help explain this pattern of variation. In the meantime, the author has left the status of this plant as an open question, and it is not included in the above description of *S. lacsalaria*. Pending further research, specimens of the anomalous morphotype will be referred to *S. aff. lacsalaria* at the Western Australian Herbarium.

Styphelia microcardia Hislop, *sp. nov.*

Typus: southern edge of Jerramungup townsite, adjacent to South Coast Highway, Western Australia, 1 April 2012, *M. Hislop* 4183 (*holo*: PERTH 08491038; *iso*: CANB, CNS, HO, K, MEL, NSW).

Leucopogon sp. Bremer Bay (K.R. Newbey 4667), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 17 November 2023]

Erect, compact *shrubs*, to *c.* 40 cm high and 40 cm wide, but usually smaller, single-stemmed at ground level and most likely with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of ± straight hairs to *c.* 0.1 mm long. *Leaves* helically arranged, shallowly antrorse to shallowly retrorse; apex obtuse to acute, mucro lacking; base cordate, often with deep basal lobes; petiole well-defined, 0.4–0.8 mm long, glabrous throughout or occasionally with a few hairs, mostly on the distal portion of the adaxial surface; lamina, usually wider than long, depressed-ovate, shallowly triangular or broadly ovate, 1.2–2.1 mm long, 1.4–2.5 mm wide, slightly discolorous, strongly concave adaxially, longitudinal axis recurved, often strongly so; adaxial surface shiny, with a few basal hairs or ± glabrous, sometimes slightly rugose, the venation not evident; abaxial surface paler, shiny, glabrous, with 7–11 primary veins, ± flat or very shallowly and openly grooved between the veins; margins ± glabrous or sometimes with minute coarse hairs, < 0.05 mm long. *Inflorescence* axillary, erect, very reduced, arising from the axils of regular, mature leaves; axis 0.2–0.3 mm long, 1-flowered, ± terete, terminating at the flower, bud-rudiment absent; flowers erect, sessile. *Fertile bracts* broadly ovate, 0.6–0.9 mm long, 0.5–0.9 mm wide, subtended by 2 sterile bracts. *Bracteoles* broadly ovate to ± orbicular, 1.0–1.3 mm long, 0.9–1.2 mm wide, not, or obscurely keeled, obtuse, ± striate; abaxial surface glabrous; margins minutely ciliolate. *Sepals* narrowly ovate, 1.9–2.3 mm long, 0.8–1.1 mm wide, obtuse to acute, usually distinctly recurved in the upper half, occasionally ± straight; abaxial surface glabrous, straw-coloured or sometimes pale green (rarely tinged purple towards the margins), venation variably expressed, from rather obscure to quite well-developed with several raised veins evident; adaxial surface hairy throughout with longer hairs towards the base or occasionally with sparse hairs restricted to the distal half; margins minutely ciliolate, with hairs < 0.05 mm long, or ± glabrous. *Corolla tube* white, obovoid, broadly obovoid or sometimes ellipsoid, usually shorter than (rarely slightly longer than) the sepals, 1.7–2.3(2.6) mm long, 1.0–1.5 mm wide, glabrous externally, internal surface with a transverse band of hairs towards the apex only. *Corolla lobes* white, usually longer than, sometimes ± equal to the tube, 2.2–2.5 mm long, 0.5–0.8 mm wide at base, erect in basal 1/2–2/3 and then spreading and recurved, glabrous externally, internal surface with a dense indumentum of ± terete, distinctly ornamented hairs that are often retrorse, at least in the distal half. *Anthers* either partially exserted from the tube by *c.* 7/8 of their length or ± fully exserted, 0.9–1.1 mm long, apex shallowly emarginate. *Filaments* terete, 0.6–1.0 mm long, attached to the anther *c.* 3/4 above anther base or a little above, adnate to the tube a little below the sinuses. *Nectary* annular, shallowly lobed to ± truncate, 0.2–0.3 mm long, glabrous with the margin papillose. *Ovary* broadly obovoid, depressed-obovoid or broadly ellipsoid, usually distinctly constricted behind the nectary, 0.5–0.6 mm long, 0.5–0.6 mm wide, glabrous, 5-locular, straw-coloured or pale green. *Style* usually pale pink, abruptly differentiated from ovary apex, 2.2–3.1 mm long, faintly scabrous in the upper half, exserted from the corolla tube but usually not beyond the erect bases of the corolla lobes, inserted in a cylindrical depression that envelops, but is free from, the narrow style base; stigma slightly expanded. *Fruit* narrowly ellipsoid, tapering steeply towards the apex above obscurely defined shoulders, 2.0–2.5 mm long, 1.0–1.4 mm wide, a little shorter than, to a little longer than, the sepals, circular in transverse section, with a short gynophore; surface glabrous, shiny, pale green with a cream-coloured apex, smooth and ± dry (mesocarp poorly developed); apex obtuse to subacute; style shed before maturity. (Figure 3A, C)

Diagnostic characters. Within Group X distinguished by the following character combination: leaves prominently petiolate, strongly concave adaxially, usually wider than long, distinctly recurved longitudinally, with an obtuse to acute non-mucronate apex and a cordate base; abaxial leaf surface, glabrous, flat or shallowly and openly grooved between the veins; inflorescence very short, 0.2–0.3 mm long, 1-flowered, terminating at the flower (bud-rudiment lacking); sepals usually distinctly recurved distally; nectary annular; ovary 5-locular, glabrous; style base clearly free from ovary apex; fruit narrowly

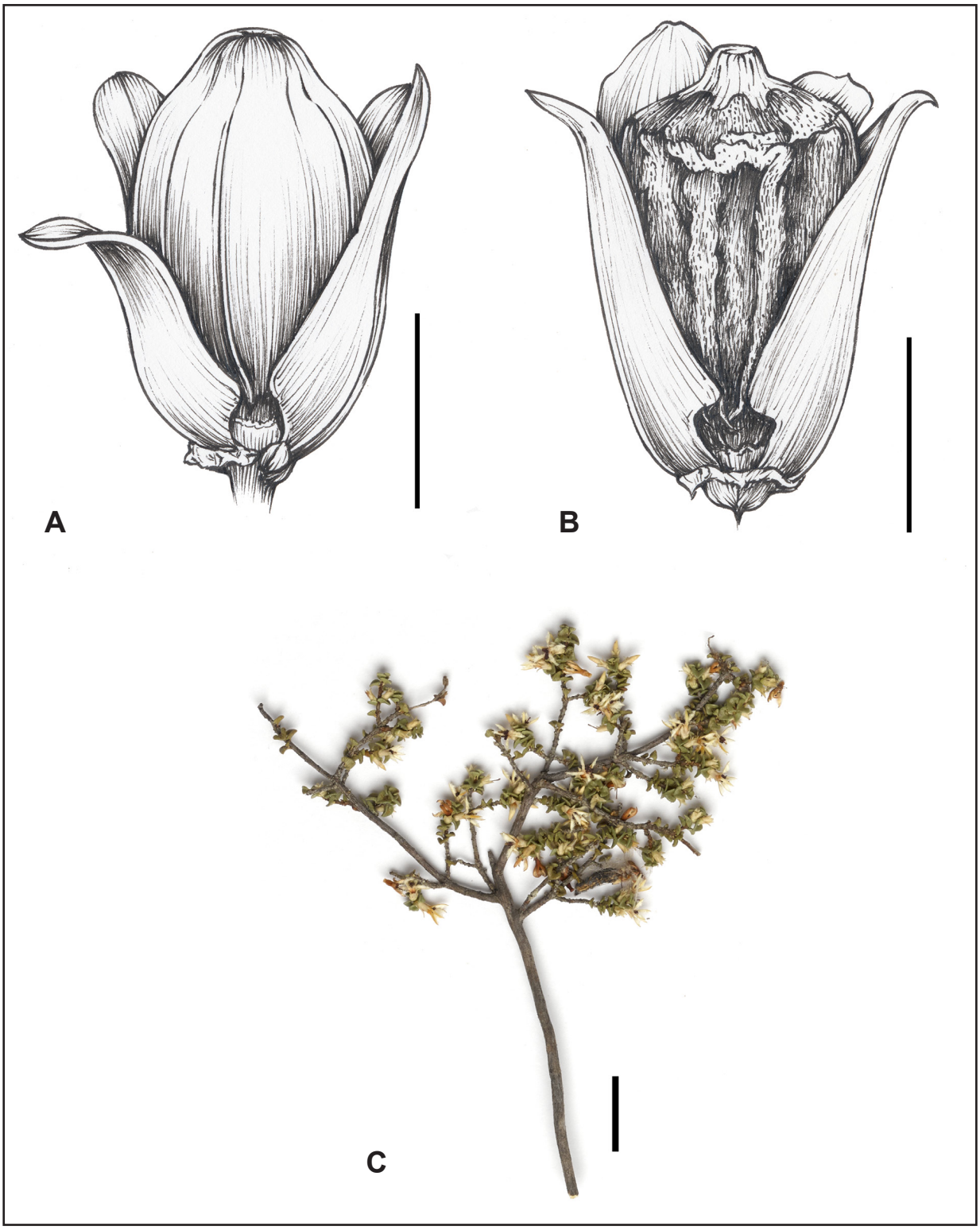

Figure 3. *Styphelia microcardia*. A – fruit, with one sepal removed; C – scanned image of flowering branchlet. *Styphelia lacsalaria*. B – fruit, with one sepal removed. Scale bars A, B = 1 mm; C = 1 cm. Vouchers *M. Hislop* 4219 (A), *R. Davis* 11071 (B), *M. Hislop* 4183 (C).

ellipsoid, ± dry (mesocarp poorly developed), a little shorter than, to a little longer than, the sepals, surface tapering steeply towards the apex from obscurely defined shoulders.

Other specimens examined. WESTERN AUSTRALIA: 6 May 1996, *R. Davis* RD 653 (PERTH); 30 Nov. 1960, *A.S. George* 1862 (PERTH); 23 May 2004, *M. Hislop & F. Hort* MH 3229 (CANB, K, MEL,

PERTH); 27 Apr. 2007, *M. Hislop* 3702 (CANB, CNS, MEL, PERTH); 2 April 2012, *M. Hislop* 4185 (CANB, CNS, MEL, NSW, PERTH); 18 Aug. 2012, *M. Hislop* 4219 (PERTH); 7 Apr. 1976, *K.R. Newbey* 4667 (CANB, CNS, PERTH); 2 Aug. 1986, *J.M. Powell* 2410A (NSW *n.v.*, PERTH); 17 Nov. 1985, *J.M. Powell* 3300 (NSW *n.v.*, PERTH); 26 Mar. 2003, *E.M. Sandiford* EMS 689 (PERTH).

Distribution and habitat. *Styphelia microcardia* has an apparently very disjunct distribution in the Mallee and Esperance Plains bioregions. The western population-cluster has a narrow east-west axis from Ongerup to a little east of Jerramungup. The eastern cluster is known only from a handful of collections made within a few kilometres of each other north-west of Cascade, about 160 kilometres distant from the nearest known occurrence in the western cluster. It is found growing in sand or loam soils over laterite or clay. Associated vegetation is usually open mallee woodland with an often dense understorey dominated by *Melaleuca* species.

Phenology. Peak flowering is apparently between March and May. Mature fruit has been collected in August but is likely to be present until the middle of spring.

Etymology. From the Greek *micro-* (small-) and *cardia* (a heart), a reference to the distinctive leaf shape of the species.

Conservation status. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Bremer Bay (K.R. Newbey 4667). Although often locally common, *S. microcardia* has a restricted and apparently disjunct distribution. The better-known western population-cluster is less than 60 kilometres long and 30 km wide. Within this area it has been recorded from one nature reserve and one unmanaged reserve. On the basis of current knowledge, the eastern cluster appears much smaller. However, because there is more uncleared land in that general area and it is less well-known botanically, there may be greater potential for the discovery of new populations in this eastern part of its range.

Affinities. As discussed in a recent paper (Hislop 2023), *S. microcardia* (as *Leucopogon* sp. Bremer Bay) was strongly supported as sister to *S. lacsalaria*, and together they were placed within a very weakly supported subclade along with *S. corynocarpa* (Sond.) F.Muell., *S. cylindrica* Hislop, and *Leucopogon* sp. 'Koolyanobbing'.

Styphelia microcardia is most likely to be confused with *S. lacsalaria*, both having similar leaves that are relatively short and broad, distinctly recurved longitudinally, and usually prominently petiolate. There is also a strong similarity in their sepal morphology, with both having glabrous, straw-coloured (in the dried condition, cream-coloured when live) and recurved sepals that are a little shorter than, to a little longer than, the mature fruit.

Styphelia microcardia can be distinguished from both *S. lacsalaria* and *S. halophila* in the following ways: leaves glabrous throughout or with a few hairs towards the base on the adaxial surface (*cf.* leaves usually hairy with short, stiff hairs on the adaxial surface); inflorescence axis very short, 0.2–0.3 mm long, terminating at the flower (*cf.* inflorescence axis 0.6–1.5 mm long, terminating in a bud-rudiment); ovary 5-locular (*cf.* 2- or 3-locular). There is also a difference in the fruit. Whereas in *S. microcardia* the fruit surface tapers steeply towards the apex from obscurely defined shoulders, in *S. lacsalaria* and *S. halophila* the shoulders are more strongly defined with the surface then rising more shallowly to the apex (Figure 3A, B). A further foliar difference distinguishes *S. microcardia* from *S. lacsalaria*. In the former the leaves are always strongly concave adaxially but in *S. lacsalaria* they are usually flat or adaxially convex, sometimes slightly concave towards the base. *Styphelia microcardia* has an allopatric distribution relative to those of *S. lacsalaria* and *S. halophila*, which both occur to the east of *S. microcardia*. It also differs from those two species in not being associated with saline or subsaline habitats.

Presumably because *S. microcardia* has somewhat similar, relatively short and longitudinally recurved leaves, it has been confused at times with the widespread and variable *S. hamulosa*. Although *S. hamulosa*

was not included in the phylogeny of Puente-Lelièvre *et al.* (2016), it is morphologically similar to several taxa that were sampled and which grouped with *S. marginata* (W.Fitzg.) Hislop, Crayn & Puente-Lel. in another strongly supported subclade of Group X. Hence the relationship between *S. hamulosa* and the species described in this paper is unlikely to be a particularly close one. In any case, all variants of *S. hamulosa* can be distinguished from *S. microcardia* by their shortly hairy, more or less closed, abaxial leaf grooves (*cf.* glabrous and openly grooved or un-grooved in *S. microcardia*) and sepals that are always straight and never recurved. In addition, the inflorescence axis of *S. hamulosa* is of the common kind that terminates in a bud-rudiment (*cf.* terminating at the flower with the bud-rudiment absent), and the fruit is always much longer than the sepals.

Perhaps surprisingly in view of the large disjunction between the two population-clusters of *S. microcardia*, no significant morphological differences were identified in this study that might indicate taxonomic divergence.

Notes. *Styphelia microcardia* has long been recognised as a probable new species. A collection made in the mid 1960s by the renowned collector, Ken Newbey (*K.R. Newbey* 2407), is annotated in his hand, '*Leucopogon* sp. *nov*. *aff. hamulosus*'. Notable epacrid researcher, Jocelyn Powell, who was active in the 1980s and 1990s, applied the manuscript name '*Leucopogon stemonocryptus*' to one of her own collections of the species housed at the Western Australian Herbarium. Since 2000 it has been known by the phrase name *Leucopogon* sp. Bremer Bay (K.R. Newbey 4667). That choice of place name has turned out to be misleading as the species is not known to grow close to the coast. Although the reference specimen, *K.R. Newbey* 4667, until recently had 'Bremer Bay' as the collection locality, this has turned out to be a probable transcription error. Referral to Newbey's relevant collecting book indicates clearly that it was collected from the 'same locality as [*K.R. Newbey*] 2407', i.e. north of Ongerup.

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I would like to thank Hung Ky Nguyen for the line drawings, Supreema Sinha for the scanned images, Kelly Shepherd for arranging the images to best advantage and Rob Davis and Katherine Walkerden for the photographs. I am also particularly grateful to Katherine for her targeted collections of *S. lacsalaria* and *S. halophila*.

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Two new species in *Pterostylis* (Orchidaceae) in Western Australia

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SHORT COMMUNICATION

Ongoing study of both living material and preserved specimens in the genus *Pterostylis* R.Br. in Western Australia has revealed a number of as yet undescribed species. Two of these, currently recognised by the Western Australian Herbarium under the phrase names *P.* sp. Murchison (C.J. French CJF 12549) and *P.* sp. Paynes Find (G. Brockman GBB 526), are formally described here as new.

Pterostylis argillacea G.Brockman & C.J.French, *sp. nov*.

Type: [East of Kalbarri] Western Australia [precise locality withheld for conservation reasons], 19 September 2018, *C.J. French* CJF 12549 (*holo*: PERTH 09183043).

Pterostylis sp. Murchison (C.J. French CJF 12549), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 6 February 2024].

Illustrations. A.P. Brown, K.W. Dixon, C.J. French & G. Brockman, *Field Guide to the Orchids of Western Australia*, p. 380 (2013), as *P.* sp. Murchison; N. Hoffman, A.P. Brown & J. Brown, *Orchids of South-West Australia*, 4th edn, p. 425 (2019), as *P.* sp. Murchison; A.P. Brown, *The Complete Orchids of Western Australia*, vol. 2, p. 183 (2022), as *P.* sp. Murchison.

Terrestrial tuberous *herb* 120–180 mm tall, solitary. *Leaves* sessile, 7–10 in a basal rosette, prostrate, imbricate, entire, often withered at anthesis, 10–20 mm long × 8–12 mm wide, narrowly obovate, soft green with prominent veining. *Sterile bracts* 2, one basal, second mid scape, tightly clasping, 15–20 mm long × 5–7 mm wide when flattened, lanceolate, soft whitish green. *Scape* erect, 90–130 mm tall × 2–4 mm in diameter, glabrous, greenish brown basally to greenish white distally. *Pedicels* 10–25 mm long, erect then gently curved forward, soft green. *Ovary* straight, 5–8 mm long × 2–2.5 mm diameter, narrowly obovoid, longitudinally ridged, glabrous, soft green. *Flowers* 1–7, erect to semi-nodding, 32–38 mm long × 8–11 mm wide, translucent with red/brown and olive-green striping on the galea and red/brown synsepalum and labellum. *Galea* bulbous, glabrous, curved throughout body and gently decurved in the apical free point; petal margins conjoined throughout, flared laterally mid-length, translucent with longitudinal red/brown lines, sometimes red/green. *Dorsal sepal* cucculate, 25–35 mm long × 8–11 mm wide when flattened including apical free point, narrowly elliptic with a deflexed filiform apical free point 18–24 mm long, translucent with red/brown stipes. *Lateral sepals* mildly deflexed, conjoined part (synsepalum) as wide as the galea, concave laterally and longitudinally, ovate, 7–9 mm long × 3.5–4.5 mm wide when flattened, margins mildly involute, outer surface with sparse cilia, sinus narrow; apical free points filiform, parallel, 16–22 mm long, red/brown sometimes stained with green. *Petals* asymmetrical, ovate-lanceolate, falcate, 15–17 mm long including short apical free point, sparsely hirsute, margins thickened, apex a 2–3 mm acuminate point. *Labellum* nestled within the synsepalum in set position; claw 1–1.5 mm long × 1–1.5 mm wide, green; lamina elliptical-spathulate, completely covered with fine siliceous cells, 5–6 mm long × *c*. 2.5 mm wide, gently concave, with a vague central longitudinal ridge,

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constricted in the proximal one fifth, proximal lobe rudimentary, apex acute. *Labellum marginal setae* spreading obliquely, 8–10, 2–2.5 mm long and the entire margins with numerous short trichomes. *Column* porrect from the ovary, 10–12 mm long × *c*. 2 mm wide, incurved, green/white becoming solid green distally. *Column wings* obscurely rectangular laterally, 3–3.5 mm long × *c*. 2 mm wide; basal lobes ovate, ciliate; barrier trichomes monifiliform. *Anther* 1.5 mm long, obtuse. *Stigma* narrowly ovate, scutelliform, *c*. 5 mm × *c*. 2 mm. *Capsule* not seen. (Figure 1)

Diagnostic features. *Pterostylis argillacea* can be distinguished from all other members of the genus by the following combination of characteristics: basal rosette of leaves on flowering and non-flowering plants; flowers 32–38 mm long × 8–11 mm wide, translucent with red/brown and olive-green striping; cucculate galea with a gently decurved filiform free point to 24 mm long; narrowly spathulate labellum with 8–10 obliquely spreading setae; concave synsepalum with straight parallel filiform free points to 22 mm long.

Other specimen examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 19 Sep. 2018, *C.J. French* CJF 12545 (PERTH 09183051).

Phenology. Flowering occurs throughout September.

Distribution and habitat. Restricted to the lower Murchison River area within the Kalbarri National Park and Murchison House Station, growing under low shrubs and mallee eucalypt woodlands in low depressions in damp clay loam, sometimes seasonally wet.

Conservation status. Recently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *P.* sp. Murchison (C.J. French CJF 12549). Although locally common, the species has a restricted distribution, known from only three locations. However, both collections are from within a National Park. There is a report of this species from Beekeepers Nature Reserve near Eneabba, which is without voucher specimens and requires further research.

Etymology. The specific epithet is from the Latin *argillaceus* (growing on clay), alluding to the preferred habitat of the species in or around low, winter-wet, brown clay pans.

Common name. Murchison Rufous Greenhood.

Affinities. This species has affinities with *Pterostylis spathulata* M.A.Clem., but differs in having smaller red–brown flowers 8–11 mm wide *cf*. *P. spathulata* 12–14 mm wide, with smaller synsepalum 7–9 mm wide *cf*. *P. spathulata* 10–13 mm wide, and straight parallel lateral sepal free points *cf*. markedly upcurved and often crossed in *P. spathulata*. All other species within the *P. spathulata* group have larger flowers with wider synsepalum and are not found growing in wet clay habitat.

Pterostylis argillacea sometimes grows with *P. tryphera* (D.L.Jones & C.J.French) D.L.Jones & C.J.French but has larger flowers 8–11 mm wide *cf*. *P. tryphera* 5–7 mm wide and a spathulate labellum with a rudimentary glabrous proximal lobe *cf*. *P. tryphera* which has a narrowly elliptic to obovate labellum lamina with a densely ciliate proximal lobe equal to the lamina in width.

The distribution of *P. argillacea* overlaps that of *P. macrocalymma* M.A.Clem. & D.L.Jones but they have not been observed growing together. *Pterostylis argillacea* is smaller flowered, 8–11 mm wide *cf*. 10–15 mm wide in *P. macrocalymma* and has straight lateral sepals *cf*. upcurved lateral sepals in *P. macrocalymma*.

Figure 1. *Pterostylis argillacea*. A – plant *in situ* from Kalbarri; B – flower demonstrating labellum features in side view; C – flower demonstrating labellum features, front view. Images unvouchered. Photographs by G. Brockman (A, B) and C.J. French (C).

Pterostylis arida G.Brockman & C.J.French, *sp. nov*.

Type: North of Paynes Find, Western Australia [precise locality withheld for conservation reasons], 8 September 1999, *G. Brockman* GBB 526 (*holo*: PERTH 05534003).

Pterostylis sp. Paynes Find (G. Brockman GBB 526), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 6 February 2024].

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Illustrations. A.P. Brown, K.W. Dixon, C.J. French & G. Brockman, *Field Guide to the Orchids of Western Australia*, p. 381 (2013), as *P.* sp. Paynes Find; A.P. Brown, *The Complete Orchids of Western Australia*, vol. 2, p. 181 (2022), as *P.* sp. Paynes Find.

Terrestrial tuberous *herb* 50–120 mm tall, solitary. *Leaves* sessile, 5–7 in a basal rosette, prostrate, entire, withered at anthesis, 10–20 mm long × 8–12 mm wide, narrowly obovate, margins with short translucent cilia, soft green with prominent veining. *Sterile bracts* 1 or 2, one basal, clasping scape, 15–20 mm long × 6–9 mm wide when flattened, broadly lanceolate, margins with short translucent cilia, soft whitish green. *Scape* erect, 30–80 mm tall × 3–5 mm diameter, glabrous, green/brown basally to greenish white. *Pedicels* 10–55 mm long, curved forward, soft green. *Ovary* straight, 5–8 mm long × 2–2.5 mm diameter, narrowly obovoid, longitudinally ridged, glabrous, soft green. *Floral bracts* erect, clasping the pedicel and base of flower, broadly navicular, margins with short translucent cilia, lamina soft green. *Flowers* 1–4, erect, 25–30 mm long × 7–9 mm wide, translucent with red/brown or soft green striping on the galea and brown/tan synsepalum, dark brown labellum. *Galea* bulbous, covered randomly with short white cilia, curved throughout body and gently decurved to straight in the apical free point; petal margins conjoined throughout, flared laterally mid-length, translucent with longitudinal red/brown or green lines. *Dorsal sepal* cucculate, 20–30 mm long × 8–11 mm wide when flattened including apical free point,

narrowly elliptic with a markedly reflexed filiform apical free point 10–12 mm long, translucent with red/brown or green/tan stipes. *Lateral sepals* mildly deflexed, conjoined part (synsepalum) as wide or slightly wider than the galea, shallowly concave laterally and longitudinally, ovate, 9–11 mm long × 3.5–4.5 mm wide when flattened, margins entire, outer surface covered with untidy translucent cilia to 1.5 mm becoming sparse toward the apical free points, sinus narrow; apical free points filiform, curving forward and together from the conjoined part, 11–14 mm long, red/brown sometimes stained with green. *Petals* asymmetrical, ovate lanceolate, falcate, 14–15 mm long including short apical free point, sparsely hirsute, margins thickened, apex a *c*. 1 mm long acuminate point. *Labellum* proudly exposed in set position; claw 1–1.5 mm long × 1–1.5 mm wide, green; lamina spathulate, completely covered with fine siliceous cells, 6–7 mm long × 2.5–3 mm wide, gently concave, constricted in the proximal one fifth, proximal lobe rudimentary, apex acute and gently curved forward. *Labellum marginal setae* spreading obliquely, 4–5 pairs, 2.5–3 mm long, the entire margins with numerous short trichomes. *Column* porrect from the ovary, 12–14 mm long × *c*. 2 mm wide, incurved, green/white becoming darker distally. *Column wings* obscurely rectangular, 4–5 mm long × 2–2.5 mm wide; basal lobe ciliate; barrier trichomes moniliform. *Anther c*. 1.5 mm long, obtuse. *Stigma* narrowly ovate, scutelliform, *c*. 5 mm × *c*. 2 mm. *Capsule* not seen. (Figure 2)

Diagnostic features. *Pterostylis arida* can be distinguished from all other members of the genus by the following combination of characteristics: plant height to 12 cm tall, basal leaves and bracts with short marginal cilia, synsepalum narrow (8–9 mm wide) with a shallowly concave dorsal surface with untidy translucent cilia becoming sparse toward the apical free points, apical free points filiform (11–14 mm long) curving forward and parallel; dorsal sepal free point filiform 10–12 mm long and markedly reflexed, broadly spathulate labellum with 4–5 pairs of moniliform lateral marginal setae, proximal lobe rounded and free of setae.

Figure 2. *Pterostylis arida*. A – plant from near North Yalgoo; B – flower from near Paynes Find. Images uvouchered. Photographs by G. Brockman.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 19 Aug. 1998, *G. Brockman* GBB 398A (PERTH 05320690); 16 Sep. 1998, *G. Brockman* GBB 384 (PERTH 05320631); 16 Sep. 1998, *G. Brockman* GBB 386 (PERTH 05320550); 16 Sep. 1998, *G. Brockman* GBB 388 (PERTH 05297303); 1 Sep. 1999, *G. Brockman* GBB 488 (PERTH 05533473); 2 Sep. 1999, *G. Brockman* GBB 494 (PERTH 05533929); 7 Sep. 1999, *G. Brockman* GBB 525 (PERTH 05534011); 10 Sep. 2013, *G. Brockman* GBB 3205 (PERTH 09153438); 20 Sep. 2005, *A. Markey & S. Dillon* 3964 (PERTH 07510578).

Phenology. Flowering occurs from mid-August through September.

Distribution and habitat. Currently known from on and around granite rock habitats in the northern goldfields from Bimbijy Station to Mount Magnet, where it grows in damper soil pockets under shrubs and soil-filled faults in the granite.

Conservation status. Recently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *P.* sp. Paynes Find (G. Brockman GBB 526). The species is never common, but populations are scattered over a wide area. Current distribution is restricted to pastoral leases and conservation reserves from reclaimed leases. The species is restricted to low rainfall areas and threatened by overgrazing, changes to rainfall patterns, and mining activity.

Etymology. The specific epithet is from the Latin *aridus* (arid, dry or withered), alluding to the habitat.

Common name. Paynes Find Rufous Greenhood.

Affinities. *Pterostylis arida* has affinities with *Pterostylis spathulata* but differs in having shorter flowering plants 50–120 mm *cf. P. spathulata* 150–350 mm, fewer flowers 1–4 *cf. P. spathulata* 2–12, smaller flowers 25–30 mm long × 7–9 mm wide *cf. P. spathulata* 28–35 mm × 8–11 mm wide and a more northerly distribution.

Pterostylis arida has affinities with *P. tryphera* but has larger flowers 25–30 mm long × 7–9 mm wide *cf. P. tryphera* 20–25 mm long × 5–7 mm wide and a spathulate labellum *cf. P tryphera* with a narrow elongated labellum.

Neither *P. spathulata* nor *P. tryphera* exhibits the short ciliate margins on leaves and bracts present in *P. arida.*

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New combinations of *Hibbertia* (Dilleniaceae) segregated from *H. hibbertioides* and *H. glomerata*

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Abstract

Hammer, T.A. & Thiele, K.R. New combinations of *Hibbertia* (Dilleniaceae) segregated from *H. hibbertioides* and *H. glomerata*. *Nuytsia* 35: 31–45 (2024). Infraspecific taxa within the southwest Australian species *Hibbertia glomerata* Benth. and *H. hibbertioides* (Steud.) J.R.Wheeler are critically re-evaluated. Morphological evidence is presented to recognise *H. glomerata* subsp. *wandoo* J.R.Wheeler and *H. hibbertioides* var. *meridionalis* J.R.Wheeler at species rank, as *H. wandoo* (J.R.Wheeler) T.Hammer & K.R.Thiele and *H. meridionalis* (J.R.Wheeler) T.Hammer & K.R.Thiele respectively. *Hibbertia hibbertioides* var. *pedunculata* J.R.Wheeler is reduced to synonymy under *H. hibbertioides*. The remaining subspecies in *H. glomerata* are provisionally retained but are marginally distinct.

Introduction

Hibbertia Andrews (Dilleniaceae) comprises around 300 accepted species in Australia (Council of Heads of Australasian Herbaria 2006–) with approximately half of these occurring in south-west Western Australia. Judith R. Wheeler contributed substantially to advancing taxonomic knowledge of *Hibbertia* in Western Australia throughout the 1990s and early 2000s (e.g. Wheeler 1994, 2004). Among the species revised by her were *H. glomerata* Benth. and *H. hibbertioides* (Steud.) J.R.Wheeler (Wheeler 2002, 2004).

Wheeler (2002) evaluated specimens of *H. glomerata* and those known under the phrase names *H.* sp. Darling Range (R.D. Royce 5741) and *H.* sp. Wandoo (J. & F. Hort 456), resulting in the recognition of four subspecies: subsp. *darlingensis* J.R.Wheeler, subsp. *ginginensis* J.R.Wheeler, subsp. *glomerata*, and subsp. *wandoo* J.R.Wheeler. The subspecies were delimited mainly on the basis of leaf dimorphism and shape, sepal apex shape, and staminal filament freedom or connation (Wheeler 2002).

In Toelken and Wheeler (2002), Wheeler clarified the identity of *H. hibbertioides*, and subsequently (Wheeler 2004) recognised three varieties: var. *hibbertioides*, var. *pedunculata* J.R.Wheeler, and var. *meridionalis* J.R.Wheeler. *Hibbertia hibbertioides* var. *pedunculata* was discriminated from the typical variety by having distinctly stalked flowers, while var. *meridionalis* was distinguished from both by the combination of ecaudate sepals and having shorter stamens and anthers.

In this paper we critically re-evaluate the infraspecific taxonomy of *H. glomerata* and *H. hibbertioides*. We recognise *H. glomerata* subsp. *wandoo* J.R.Wheeler and *H. hibbertioides* var. *meridionalis* J.R.Wheeler at species rank as *H. wandoo* (J.R.Wheeler) T.Hammer & K.R.Thiele and *H. meridionalis* (J.R.Wheeler) T.Hammer & K.R.Thiele respectively, and reduce *H. hibbertioides* var. *pedunculata* J.R.Wheeler to synonymy under *H. hibbertioides*.

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Methods

All relevant specimens at AD, CANB and PERTH were examined, and images of type specimens viewed through JSTOR *Global Plants* (https://plants.jstor.org). Types examined in person are indicated with '!' while those examined through JSTOR are indicated with 'image!'.

Results and Discussion

Hibbertia glomerata

Wheeler (2002) segregated the subspecies of *H. glomerata* based on the degree of dimorphism of the leaves, the general shape and size of cauline and floral leaves (the former usually narrower and more elongated than the latter), and freedom or fusion of the staminal filaments. *Hibbertia glomerata* subsp. *glomerata*, which occurs in the south of the range, was differentiated from the other subspecies by having dimorphic leaves (the floral leaves ovate to elliptic or rarely obovate and the cauline leaves narrowly oblong, narrowly ovate or oblanceolate) and having all stamens free (Figure 1E, F). *Hibbertia glomerata* subsp. *ginginensis*, which occurs in the north of the range, was differentiated by sometimes having dimorphic leaves (the floral leaves ovate to elliptic and the cauline leaves narrowly ovate to narrowly elliptic) and having nine staminal filaments fused into three bundles, the remaining two being free (Figure 1C, D). *Hibbertia glomerata* subsp. *darlingensis* was distinguished by having all leaves similar (elliptic or oblong-elliptic), with stamens as for subsp. *ginginensis* (Figure 1A, B). *Hibbertia glomerata* subsp. *wandoo* was differentiated by having all leaves similar (narrowly obovate), apiculate sepal apices (the other subspecies having obtuse sepal apices) and all stamens free (Figure 2E, F). Wheeler (2002: 433) additionally noted some specimens that did not fit these concepts (e.g. *R. Davis* 4354, *D. Halford* 80724 and *J.R. Wheeler* 2208) due to their stamens being free or irregularly and basally fused and lacking distinctly dimorphic leaves. She called these specimens 'intermediate variants' of subsp. *darlingensis* (on the specimens as '*Hibbertia glomerata* aff. subsp. *darlingensis*'), presumably meaning intermediate between subsp. *glomerata* and subsp. *darlingensis*.

Our examination of specimens largely confirmed Wheeler's (2002) concepts, including the difficulty differentiating subsp. *darlingensis*, subsp. *ginginensis* and subsp. *glomerata* (Table 1). *Hibbertia glomerata* subsp. *wandoo*, however, is readily distinguished from all other subspecies based on multiple morphological characters (see below). The remaining subspecies of *H. glomerata* are geographically separated, except for those specimens that cannot be determined to infraspecific rank (Figure 3). However, there is much variation in leaf size and shape in these subspecies, leading to some grading of the diagnostic characters between subspecies. It is also difficult to determine in some specimens if the plants have dimorphic leaves or not due to the caducous tendency of the cauline leaves. There is a noticeable geographic split of the specimens with fused or free stamens, with the northern subsp. *darlingensis* and subsp. *ginginensis* having fused bundles of stamens, and the southern subsp. *glomerata* and 'intermediate variants' of subsp. *darlingensis* having free stamens or very shortly and irregularly fused staminal bundles.

Hibbertia glomerata subsp. *wandoo* occurs east of the other subspecies and is both geographically disjunct and morphologically distinct from all other subspecies, in several significant, discrete characters (Table 1). While Wheeler (2002) identified some differences in the leaves of subsp. *wandoo* from the other subspecies of *H. glomerata*, she appears to have overlooked others. As reported by Wheeler (2002), subsp. *wandoo* has leaves that are all similar and narrowly obovate with a more conspicuously rounded apex and gradually tapered base. Whether or not subsp. *darlingensis*, subsp. *ginginensis* and subsp. *glomerata* have distinctly dimorphic leaves, they all have leaves that subtend and cup the flowers (especially noticeable in bud) and are usually longitudinally folded (at least at the apex) so that there is a crease along the adaxial midrib. The leaves of these subspecies do not have a lamina base that tapers narrowly (in fact they often somewhat to distinctly broaden towards the base) and have an apex that is usually recurved (or at least with the minutely excurrent midrib recurved; Figure 1). The leaves of subsp. *wandoo*, by contrast, do not cup the flowers or buds and are not folded or recurved but are often incurved from the base and hence

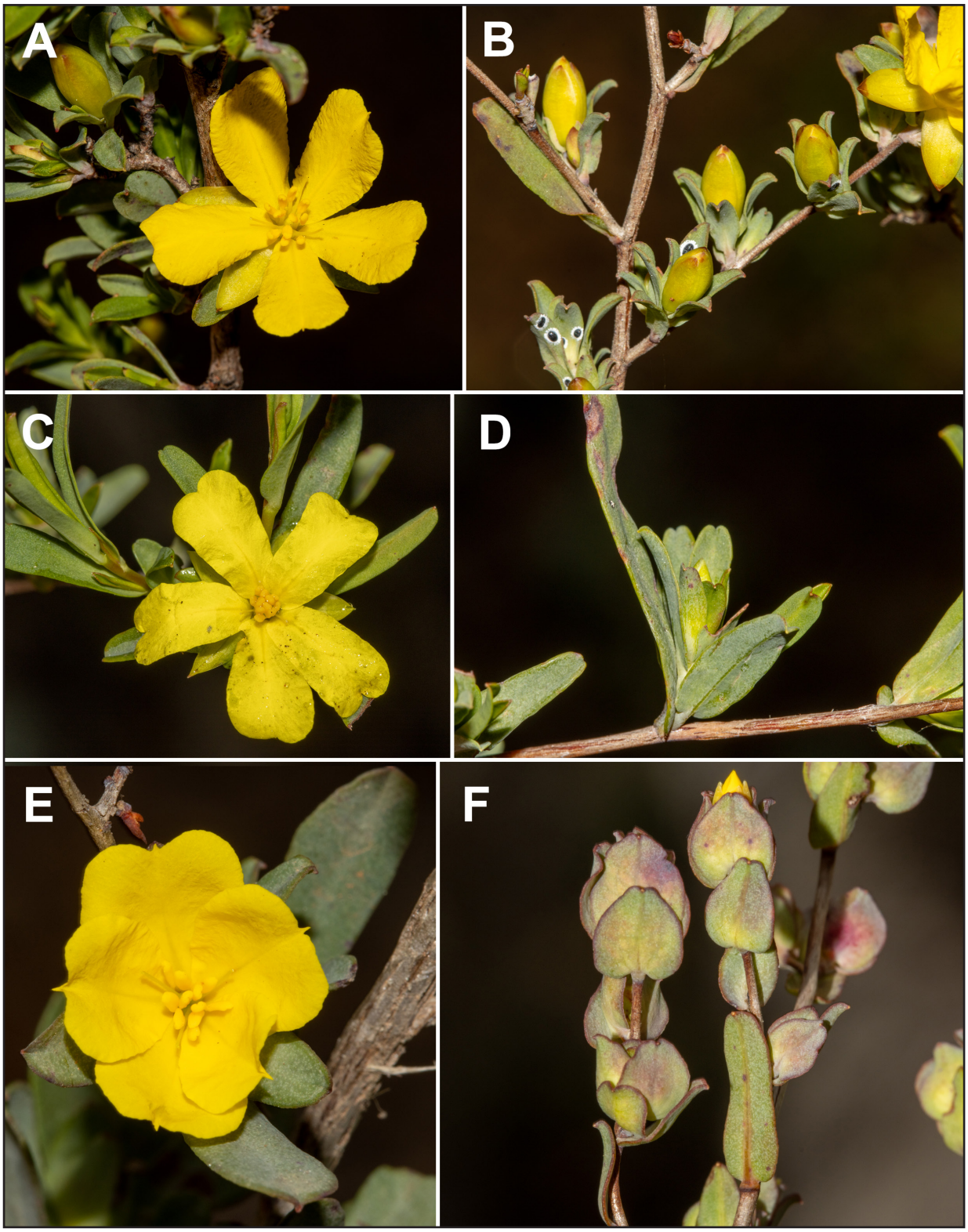

Figure 1. Flowering branches of *Hibbertia glomerata*. A, B – subsp. *darlingensis* (*T.A. Hammer* 237, *L.T. Williamson & R.W. Davis*). C, D – subsp. *ginginensis* (*T.A. Hammer* 262, *L.T. Williamson & R.W. Davis*). E, F – subsp. *glomerata* (*T.A. Hammer* 271, *L.T. Williamson & R.W. Davis*). Photos by T. Hammer.

antrorse (Figure 2F). They are also distinctly thickened so as to appear fleshy, and lack a visible midrib when fresh (sometimes scarcely visible on dried specimens as a raised vein; Figure 2E, F), contrasting with the other subspecies, which have thin-textured leaves with a visible midrib on the abaxial surface (Figure 1).

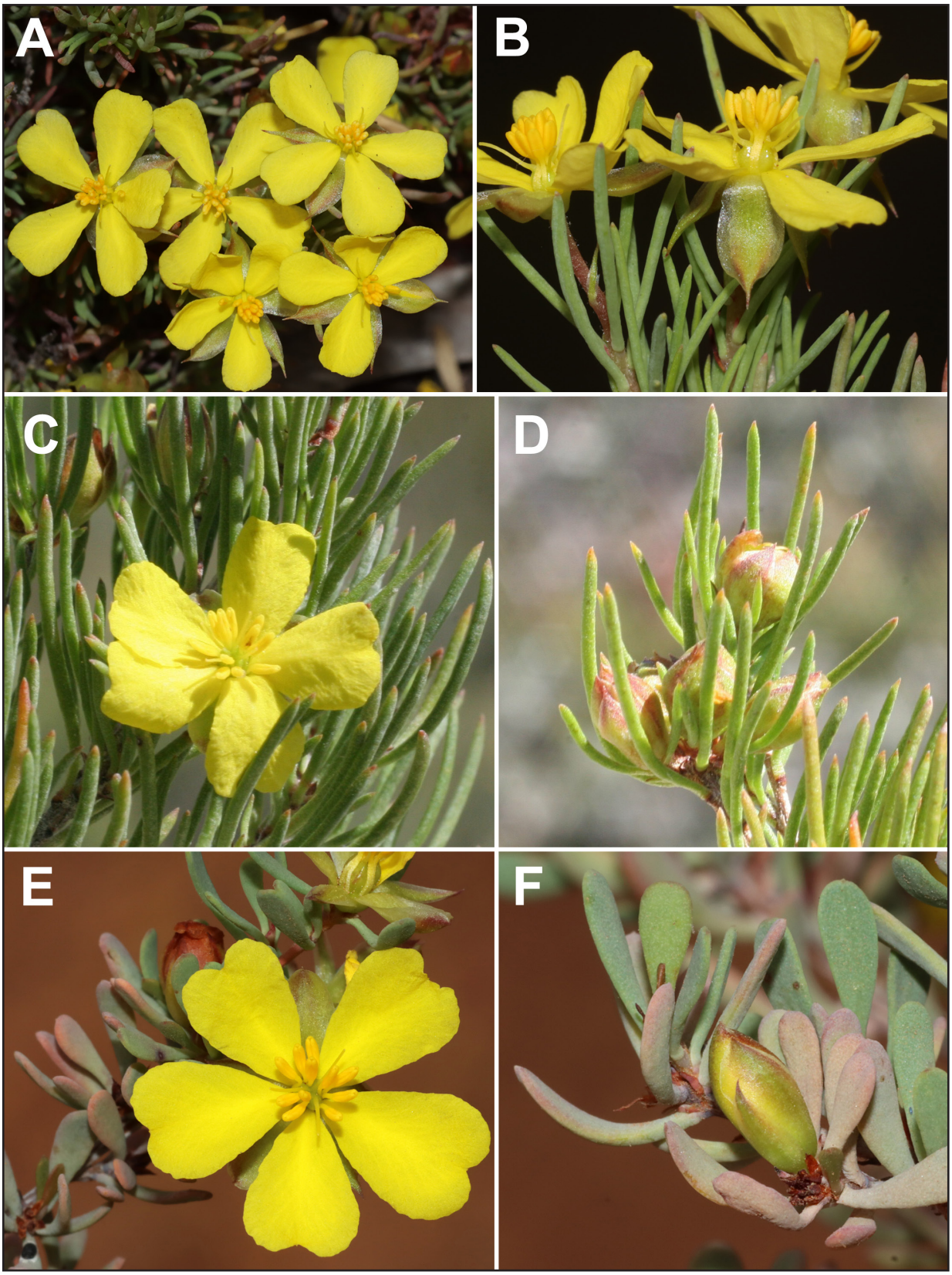

Figure 2. Flowering branches of *Hibbertia hibbertioides*, *H. meridionalis*, *H. wandoo*. A, B – pedicellate form of *H. hibbertioides* (*R. Davis & T. Hammer* RD 13929). C, D – *H. meridionalis* (*G. Byrne* 2558). E, F – *H. wandoo* (*R. Davis & T. Hammer* RD 13930). Photos by T. Hammer (A, B, E & F), and G. Byrne (C, D).

Wheeler (2002) also noted that subsp. *wandoo* had an apiculate sepal apex, while sepals in the other species are obtuse. We found that the outer sepals of subsp. *wandoo* have an acuminate apex that tapers to a tip 0.4–1 mm long (Figure 2F), while the inner sepals are obtuse-apiculate with a shorter point 0.1–0.6 mm long. The other subspecies all have acute to obtuse sepal apices (e.g. Figure 1B), without a tapering tip on the outer sepals or an apiculate point on the inner sepals.

We consider that the differences between subsp. *wandoo* and the other subspecies of *H. glomerata* are significant enough to warrant recognition of this taxon at species rank, and therefore make the new combination *Hibbertia wandoo* (J.R.Wheeler) T.Hammer & K.R.Thiele below.

Hibbertia hibbertioides

As currently circumscribed, *H. hibbertioides* includes two very similar varieties (var. *hibbertioides* and var. *pedunculata*), which overlap in distribution. The third variety (var. *meridionalis*; Figure 4A), is ecologically, geographically and morphologically divergent from the others.

Hibbertia hibbertioides var. *pedunculata* differs from the typical variety mainly in having pedicellate flowers ('pedunculate' in Wheeler 2004; see Figure 2B), the flowers in var. *hibbertioides* being sessile. In addition, var. *hibbertioides* are often more erect plants (e.g. *R. Davis 10108*), while plants of var. *pedunculata* are usually small and cushion-like (e.g. *R. Davis & T. Hammer RD 13929*). However, none of these differences is consistent, especially where the varieties overlap in distribution. Both occur in close proximity near Dryandra Woodland National Park, leading Wheeler (2004: 291) to speculate that the two taxa, and the similar species *H. hemignosta* (Steud.) J.R.Wheeler, may be hybridising in this area. We find no evidence that *H. hibbertioides* and *H. hemignosta* hybridise, specimens being readily separated on the basis of their sepal apices (see below).

Hibbertia hibbertioides var. *meridionalis* is more similar to *H. hemignosta* than it is to *H. hibbertioides* var. *hibbertioides* and var. *pedunculata*. Both *H. hibbertioides* var. *meridionalis* and *H. hemignosta* are distinguished from the other varieties of *H. hibbertioides* by having acute to apiculate sepals (with the acumen to 0.8 mm, but usually much less), rather than caudate sepals (with a tip 1.2–2.5(–3) mm long), especially on the outer sepals (Figure 2A–D; see also Figure 4C–E in Wheeler 2004). *Hibbertia hemignosta* can be distinguished from *H. hibbertioides* var. *meridionalis* by having shorter leaves ((3–)4–10(–12) mm long vs. (5–)10–25(–30) mm long), longer stamens (filaments 1–1.7 mm long vs. 0.8–1.1 mm long) with the filaments of the bundled stamens fused for more of their length (approximately two-thirds vs. approximately half), and longer anthers (1–1.5 mm long vs. 0.8–1 mm long) (Table 2). Although most of these measurements overlap slightly, the combination of features can be used to confidently assign all known specimens.

Hibbertia hemignosta and *H. hibbertioides* var. *meridionalis* are not known to overlap in distribution, with *H. hemignosta* recorded west and north of Fitzgerald River National Park (Figure 4B), while *H. hibbertioides* var. *meridionalis* occurs between Fitzgerald River National Park and Esperance (Figure 4A).

In addition to lacking caudate sepal apices, *H. hibbertioides var. meridionalis* differs from var. *hibbertioides* and var. *pedunculata* by having shorter staminal filaments (0.8–1.1 mm long vs. 1.3–2 mm long) and anthers (0.8–1 mm long vs. 1.3–1.7(–2) mm long) (Table 2).

In order to better clarify the taxonomic differences between *H. hibbertioides* and *H. hemignosta*, we propose raising *H. hibbertioides* var. *meridionalis* to species rank as *Hibbertia meridionalis* (J.R.Wheeler) T.Hammer & K.R.Thiele. *Hibbertia hibbertioides* is then more narrowly circumscribed and readily differentiated from both *H. hemignosta* and *H. meridionalis* based on the presence of caudate sepal apices. We also here reduce *H. hibbertioides* var. *pedunculata* to synonymy under *H. hibbertioides* due to the inconsistency in the presence of the flower stalk, particularly where the taxa overlap in distribution.

Table 1. Selected morphological characters for *Hibbertia wandoo* and the subspecies of *H. glomerata*.

Taxon	***H. glomerata* subsp. *glomerata***	***H. glomerata* subsp. *gingin-ensis***	***H. glomerata* subsp. *darlin-gensis***	***H. wandoo***
Leaf dimorphism	Dimorphic	Sometimes dimorphic	Monomorphic	Monomorphic
Cauline leaf shape	Narrowly oblong, narrowly ovate or oblanceolate	Narrowly ovate to narrowly elliptic	Elliptic or oblong-elliptic	Narrowly oblanceolate to narrowly obovate
Floral leaf shape	Ovate to elliptic or rarely obovate	Ovate to elliptic		
Leaf base	Broadening	Broadening	Broadening or slightly tapered	Distinctly taper-ing
Abaxial leaf midrib	Visible	Visible	Visible	Not or scarcely visible
Leaf orientation	Often longitudinally folded, at least apically	Often longitudinally folded, at least apically	Often longitudinally folded, at least apically	Flat, often in-curved to the base to appear antrorse
Leaf apex	Mucronate, ± recurved	Mucronate, ± recurved	Mucronate, ± recurved	Rounded, not recurved
Outer sepal apex	Obtuse to acute	Obtuse to acute	Obtuse to acute	Acuminate with a tip 0.4–0.6(–1) mm long
Stamen bundle fusion	Free	Fused	Fused	Free

Table 2. Selected morphological characters for *Hibbertia hemignosta*, *H. hibbertioides* and *H. meridionalis*. All measurements in millimetres.

Taxon	***H. hemignosta***	***H. hibbertioides***	***H. meridionalis***
Leaf length	(3–)4–10(–12)	(3–)5–15	(5–)10–25(–30)
Outer sepal tip shape	Mucronate to apiculate	Caudate	Apiculate
Outer sepal tip length	0.1–0.5	1.2–2.5(–3)	(0.3–)0.5–0.8
Staminal filament fusion	*c.* Two-thirds of length	Two-thirds to half of length	*c.* Half of length
Staminal filament length	1–1.7	1.3–2	0.8–1.1
Anther length	1–1.5	1.3–1.7(–2)	0.8–1

Taxonomy

Hibbertia glomerata Benth., *Fl. Austral.* 1: 34–35 (1863). *Type citation*: 'W. Australia. Swan River, Drummond, 1st Coll. n. 8 of 1843.' *Type*: Western Australia, 1843, *J. Drummond* 8 (*lecto* [designated by J.R. Wheeler, *Nuytsia* 14(3): 428 (2002)]: K000700171 image!; *isolecto*: K000700173 image!, LD1096708 image!, MEL 612823 image!).

Erect *shrubs* 0.15–0.5(–1) m high; young stems ± terete, glabrescent with sparse, erect to appressed, minute simple hairs, lacking distinct hair tufts in the leaf axils. *Leaves* dimorphic, with the leaves subtending the flowers (floral leaves) and cauline leaves distinctly different in size and shape, or all leaves similar in shape and/or size, sessile to subsessile; *cauline leaves* narrowly oblong to narrowly oblong-elliptic or rarely narrowly ovate to oblanceolate, (5–)8–25 mm long, 2.5–8 mm wide, glabrous or with very sparse minute simple hairs; base usually wider than the distal lamina, rounded and abruptly constricted on the stem; margins ± entire or very slightly undulate and minutely crenulate and often very slightly raised; midrib visible and slightly raised abaxially, often slightly grooved adaxially; apex obtuse to truncate or emarginate and with the midrib extending as a minute, recurved, blunt point; *floral leaves* broadly ovate to ovate, oblong or elliptic, (3.5–)6–11 mm long, 1.5–7 mm wide, usually folded inward longitudinally and sometimes with the lamina recurved apically, glabrous or with very sparse minute simple hairs, the base abruptly constricted, the midrib visible and slightly raised abaxially; apex acute to obtuse and with the midrib extending as a minute, recurved, blunt point. *Flowers* solitary, terminal or terminating lateral short-shoots, sessile. *Bracts* 2–4, glabrous; primary bract ovate-triangular or broadly ovate-triangular, 1.2–1.8 mm long, 0.7–2 mm wide, the apex acute to obtuse; secondary bracts similar in colour and shape to the primary bract but usually slightly smaller. *Sepals* unequal, glabrous; outer sepals narrowly elliptic, 4–6.5 mm long, 1.8–2.5 mm wide, the apex acute; inner sepals elliptic to broadly elliptic or obovate, 4.5–7 mm long, 2–4 mm wide, the apex obtuse. *Petals* yellow, obovate, (5.5–)6.5–9(–16) mm long, emarginate to truncate and shortly mucronate. *Stamens* (10)11(12), arranged around the gynoecium, in 3 bundles each of 3 stamens with filaments free or mostly fused and with the remaining (1)2(3) stamens solitary; filaments 1–2 mm long; anthers narrowly obloid, 1–2.3 mm long, dehiscing by introrse, longitudinal slits; *staminodes* absent. *Carpels* 3; ovaries globular to ovoid, 0.8–1.3 mm long, glabrous; styles 1.5–3.5 mm long, excentrically attached to the apex and spreading outward to ascending; *ovule* 1 per carpel. *Seeds* not seen. (Figure 1)

Diagnostic features. *Hibbertia glomerata* may be distinguished from all other members of the genus by the following combination of characters: glabrescent stems with minute simple hairs; glabrous (rarely sparsely and minutely hairy) and flattened leaves with a distinct midrib and usually a recurved apex, the leaves all similar or with cauline leaves distinctly longer and narrower than the leaves subtending the flowers; glabrous sepals with an acute to obtuse apex; and 11 stamens around 3 glabrous carpels with all stamens free or with 3 fused bundles of 3 stamens each and with the remaining 2 stamens solitary.

Phenology. Flowers recorded mostly July to November, with a peak in September.

Distribution and habitat. *Hibbertia glomerata* occurs in Western Australia in the Swan Coastal Plain, Jarrah Forest and Warren IBRA regions (DCCEEW 2023), with a main area of distribution from Boonanarring Nature Reserve north of Gingin to Milyeannup National Park south-west of Nannup. In the south of the range, extends as far west as Margaret River and disjunctly as far east as Mount Lindesay National Park north of Denmark (Figure 3). Recorded from jarrah-marri woodlands, often with an open heathy understory, on brown loam or sand with lateritic gravel.

Hibbertia glomerata Benth. subsp. ***glomerata***, *Nuytsia* 14(3): 429–431 (2002).

Leaves usually dimorphic; *cauline leaves* narrowly oblong, narrowly ovate or oblanceolate, 10–25 mm long. *Floral leaves* ovate to elliptic or rarely obovate, (3.5–)4–11 mm long, (2–)3–7 mm wide. *Stamens* 10–12, all free; filaments 1–1.5(–2) mm long; anthers (1–)1.2–1.5 mm long. (Figure 1E, F)

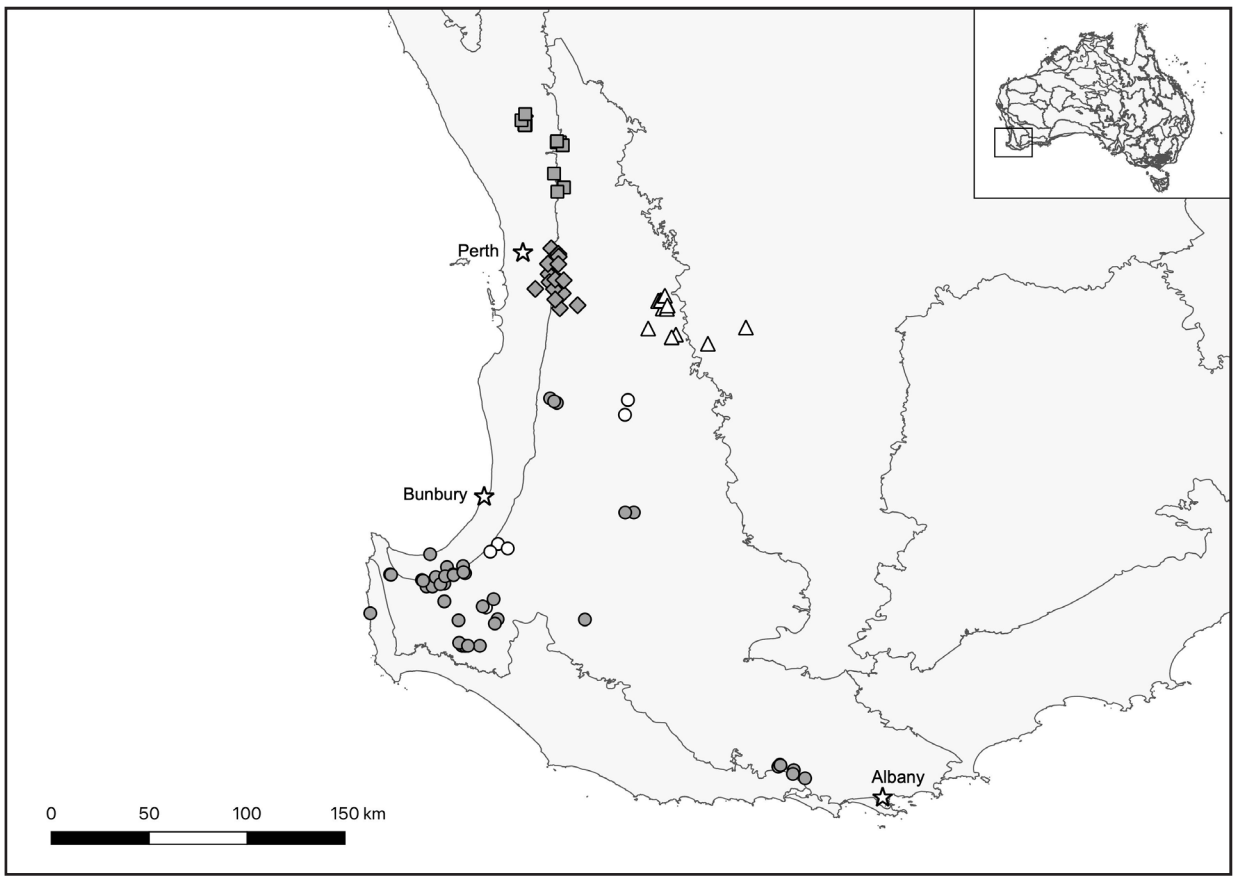

Figure 3. Distribution of *Hibbertia glomerata* and *H. wandoo* based on PERTH specimens: *H. glomerata* subsp. *glomerata* (grey circles), *H. glomerata* subsp. *darlingensis* (diamonds), *H. glomerata* subsp. *ginginensis* (squares), and *H. wandoo* (triangles). White circles are specimens of *H. glomerata* that do not readily fit the subspecies circumscriptions due to intermediate or inconsistent characters. Map boundaries are IBRA v7 regions (DCCEEW 2023).

Selected specimens examined. WESTERN AUSTRALIA: Brockman Hwy, W of Nannup, 8 Oct. 1990, *R. Bates* 23840 (AD); on Crouch Road, 500 m E of junction with Cul de Sac Road, Layman Forest Block, 19 Sep. 2005, *R.J. Cranfield & B.G. Ward* FC 895 (PERTH); 0.7 km off Mowen Road, NW of Nannup, 19 Oct. 1998, *R. Davis* 7324 (PERTH); walk trail between Greenbushes Pool and Schwenkes Dam, off Spring Gully Road, Greenbushes, 6 Nov. 2019, *C. Hamence* 1648 (PERTH); N of Scott Rd, *c.* 130 m NE of corner with Vasse Hwy, *c.* 23 km SE of Busselton, 4 Sep. 2022, *T.A. Hammer* 271 *& L.T. Williamson & R.W. Davis* (AD, PERTH); W side of Nutcracker Rd, *c.* 150 m NW of Denmark-Mount Barker Rd, 10 km N of South Coast Hwy, Mount Lindsay National Park, 5 Sep. 2022, *T.A. Hammer* 273 *& L.T. Williamson & R.W. Davis* (AD, PERTH); along Brockman Hwy, *c.* 1 mile W of Stewart Road turnoff, 18 Oct. 1971, *R.D. Hoogland* 12153 (CANB, K *n.v.*, L *n.v.*, PERTH); all sides of the junction of Jalbarragup Road and Sabina Road, Whicher Range, 12 Sep. 2001, *J.W.Horn* 4062 (CANB (2 sheets) *n.v.*, PERTH); Smith Rd, 20 km NE of Cowaramup, 11 Nov. 1993, *B.J. Keighery & N. Gibson* 631 (PERTH); Whicher National Park, approximately 15 m S of track E off Sues Road, 23 Oct. 2004, *G.J. Keighery & Wildflower Society of WA* SABI 10/8 (PERTH); Whicher Conservation Park, 24 Oct. 2003, *A. Webb* AW 2273 (PERTH); junction of Stewart Road and Brockman Hwy, 4 Sep. 1983, *J.R. Wheeler* 2113 (AD, K *n.v.*, MEL *n.v.*, NSW *n.v.*, PERTH); Whicher Range, Sabina Road, *c.* 1 km E of junction with Canebreak [Cane Brake] Road, 8 Sep. 1983, *J.R. Wheeler* 2169 (AD, K *n.v.*, PERTH); Stewart Road, 1.5 km from Nannup/Augusta Road, Canebreak Picnic Area, 7 Sep. 1985, *J.R. Wheeler* 2399 (AD, K *n.v.*, PERTH).

Phenology. Flowers from July–November, with a peak in September.

Distribution and habitat. Occurs from south of Mandurah to Nannup and with a disjunct population north of Denmark (Figure 3). Recorded from jarrah woodlands on flats or slopes on grey sand or clay over laterite.

Conservation status. Not conservation listed.

Hibbertia glomerata subsp. ***darlingensis*** J.R.Wheeler, *Nuytsia* 14(3): 431–433 (2002). *Type*: Jarrahdale scenic road, 8 km by road from South West Highway, Western Australia, 5 October 1983, *J.R. Wheeler* 2234 (*holo*: PERTH 03072703!; *iso*: K *n.v.*, PERTH 09602232 (spirit) *n.v.*).

Hibbertia sp. Darling Range (R.D. Royce 5741), Western Australian Herbarium, https://florabase.dbca.wa.gov.au [accessed 1 Aug. 2023].

Leaves usually all similar in shape; *cauline leaves* elliptic or oblong-elliptic, 8–17(–21) mm long; *floral leaves* elliptic or oblong-elliptic, 4–10 mm long and 1.5–4 mm wide. *Stamens* 11, in 3 fused bundles each of 3 stamens and with 2 stamens solitary; filaments (1.2–)1.5–2 mm long; anthers usually 1.5–2 mm long. (Figure 1A, B)

Selected specimens examined. WESTERN AUSTRALIA: Kalamunda, 19 km E of Perth, 7 Aug. 1985, *R. & M. Hamilton* 144 (AD, PERTH); reserve on Pomeroy Rd, *c.* 1.2 km E of Canning Rd, Bickley, 1 Sep. 2022, *T.A. Hammer* 237 *& L.T. Williamson & R.W. Davis* (AD); SE side of Brookton Hwy, 0.1–0.3 km SW of junction with Gilmour Rd, 4 Sep. 1999, *J.W. Horn* 2208 (AD, PERTH); Armadale Settlers Common, off Carradine Rd, to E of 4WD track, 14 Oct. 1996, *A. Markey* 359 (PERTH); Gooseberry Hill, Darling Range, 15 Sep. 1900, *A. Morrison s.n.* (AD, CANB); Gooseberry Hill, 8 Sep. 1957, *R.D. Royce* 5741 (PERTH); 5 km NE of Armadale, on Churchman Brook Rd, 1 Sep. 1974, *G.L. Stebbins & A. Weston* A 36 (CANB); corner Mofit and Francis roads, off Welshpool Rd, Carmel, 4 Dec. 2008, *L.S.J. Sweedman* 7621 (PERTH); Albany Hwy, *c.* 8 km from junction with South West Hwy near road train assembly area, 26 Sep. 1983, *J.R. Wheeler* 2195 (AD, DUKE *n.v.*, MEL *n.v.*, PERTH).

Phenology. Flowers mainly August–October, with a peak in October, occasionally also later in summer.

Distribution and habitat. *Hibbertia glomerata* subsp. *darlingensis* occurs east of Perth along the Darling Range from Gooseberry Hill to Karrakup (Figure 3). Recorded from jarrah-marri woodlands on flats or slopes on brown clay or loam over laterite.

Conservation status. Not conservation listed.

Hibbertia glomerata subsp. ***ginginensis*** J.R.Wheeler, *Nuytsia* 14(3): 433–434 (2002). *Type*: [precise locality withheld for conservation reasons] Gingin towards Bindoon, Western Australia, 5 September 1982, *J.R. Wheeler* 2035 (*holo*: PERTH 03072959 image!; *iso*: AD *n.v.*, CANB *n.v.*).

Leaves sometimes dimorphic; *cauline leaves* narrowly ovate to narrowly elliptic, 10–25 mm long; *floral leaves* ovate to elliptic, 3.5–10 mm long, 2.5–6.5 mm wide. *Stamens* 11, in 3 fused bundles each of 3 stamens and with 2 stamens solitary; filaments 1.5–2 mm long, the bundle filaments fused; anthers usually 1.5–2.3 mm long. (Figure 1C, D)

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 28 Sep. 1968, *E.M. Canning* WA/68 3575 (CANB, PERTH); 5 Jun. 2007, *D. Coultas & G. Woodman* Opp 2 (PERTH); 28 Jul. 1983, *J.R. Wheeler* 2047 (PERTH); 14 Sep. 1995, *R. Davis* 90 (PERTH); 3 Sep. 2022, *T.A. Hammer* 262 *& L.T. Williamson & K.R. Thiele* (AD); 3 Sep. 2022, *T.A. Hammer* 263 *& L.T. Williamson & K.R. Thiele* (AD); 25 Sep. 2006, *F. Hort & G. Thornett* 2889 (AD, PERTH); 11 Oct. 2012, *F. & J. Hort* 3747 (AD, MEL, PERTH); 14 Sep. 2001, *F. Hort* 1449 (AD, PERTH); 25 Aug. 1996, *S.J. Patrick* 2763 (PERTH).

Phenology. Flowers June–December, with a peak in September.

Distribution and habitat. *Hibbertia glomerata* subsp. *ginginensis* occurs from Boonanarring to Lower Chittering (Figure 3). Recorded from jarrah-marri woodlands on brown clay or loam over laterite.

Conservation status. Listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–).

Hibbertia hibbertioides (Steud.) J.R.Wheeler in H.R. Toelken & J.R. Wheeler, *J. Adelaide Bot. Gard.* 20: 1–4 (2002); *Pleurandra hibbertioides* Steud. in J.G.C. Lehman, *Pl. Preiss.* 1: 265 (1845). *Type*: Mt Bakewell, Western Australia, 8 September 1839, *L. Preiss* 2164 (*syn*: LD 1081540 image!, MEL 0666836 image!, MEL 0666837 image!, MO-279482 image!, S08-20128 image!).

Candollea teretifolia Turcz., *Bull. Soc. Natural. Moscou* 22(2): 6 (1849); *Hibbertia teretifolia* (Turcz.) F.Muell., *Fragm. Phyt. Austral.* 4: 117 (1864). *Type*: Western Australia, *J. Drummond* coll. IV. n. 124 (collection 4) (*holo*: KW 001000416 image!; *iso*: K000700336 image!, K000700337 image!, MEL 666838 image!, P 00682363 image!, PERTH 04430506 image!).

Hibbertia hibbertioides var. *pedunculata* J.R.Wheeler, *Nuytsia* 15(2): 290–291 (2004). *Type*: Catchment Rd, Talbot State Forest, York, 200 metres S of Deefor Rd T junction, Western Australia, 6 October 1999, *F. & J. Hort* 647 (*holo*: PERTH 05440300 image!; *iso*: AD 180931!, CANB 599358 image!, K 000700376 image!).

Compact cushion-like to erect *shrubs* 0.1–0.5(–0.7) m high; young stems terete, glabrescent with sparse to moderately dense, appressed, crisped to straight simple hairs, lacking distinct hair tufts in the leaf axils. *Leaves* monomorphic, sessile, erect to spreading, scattered or clustered on short-shoots, linear to very narrowly oblanceolate, (3–)5–15 mm long, 0.2–0.6(–0.9) mm wide, terete to slightly compressed, lacking a distinct midrib, green or glaucous, glabrous; base slightly broadened and flattened; apex acute to slightly acuminate. *Flowers* solitary, terminal or terminating lateral short-shoots, sessile to pedicellate; pedicels (if present) (0.5–)3–10(–18) mm long, glabrous or with crisped simple hairs. *Bracts* 2–4, glabrous; primary bract subtending the calyx (when flowers sessile) or at the base of the pedicel (when pedicellate), narrowly ovate or ovate to oblong, 0.9–2.3 mm long, (0.3–)0.5–0.6 mm wide, the apex acute to obtuse and mucronate with the tip to 0.3–0.5 mm long; secondary bracts similar to the primary bract in colour, indumentum and shape. *Sepals* unequal, glabrous; outer sepals narrowly ovate to ovate, (4.5–)5.2–6.4 mm long, (0.9–)1.8–2.4 mm wide, the margins ± membranous, the apex caudate with the tip 1.2–2.5 (–3) mm long; inner sepals oblong-elliptic to oblong-obovate, 4.5–6.8 mm long, (2–)2.6–3.5 mm wide, the apex apiculate to caudate with a tip 0.4–1.4 mm long. *Petals* yellow, obovate, (4–)5–9 mm long, entire to emarginate. *Stamens* (10)11(12), arranged around the gynoecium, in 3 bundles each of 3 stamens fused by their filaments and with (1)2(3) stamens solitary; filaments 1.3–2 mm long, those in bundles with the fused portion (0.3–)0.8–1.5 mm long and the free portion 0.3–0.8(–1) mm long; anthers narrowly obloid, 1.3–1.7(–2) mm long, dehiscing by introrse, longitudinal slits; *staminodes* absent. *Carpels* 3; ovaries obovoid, (0.8–)1–1.5 mm long, glabrous; styles 1.4–2.6 mm long, ascending and spreading outward; *ovule* 1 per carpel. *Seeds* glossy, orange-brown, compressed-globular, *c.* 2 mm long; aril membranous, irregularly lobed, restricted to the very base of the seed. (Figure 2A, B)

Diagnostic features. *Hibbertia hibbertioides* may be distinguished from all other members of the genus by the following combination of characters: linear to very narrowly oblanceolate and terete to slightly compressed glabrous leaves without a distinct midrib; outer sepals (4.5–)5.2–6.4 mm long and with a caudate tip 1.2–2.5(–3) mm long; (10)11(12) stamens around 3 glabrous carpels with 3 stamens fused by their filaments between each carpel and with the remaining (1)2(3) stamens solitary; and anthers 1.3–1.7(–2) mm long.

Selected specimens examined. WESTERN AUSTRALIA: site 1, Bindoon Army Camp, near gravel pit just N of Campsite 2, 5 km SW of Cachionalgo Hill, 14 Nov. 1996, *M.G. Allen* 1023 (PERTH); Marangup Reserve off Toodyay Rd, 8 Oct. 2006, *A. Blundell* MOR 3 (PERTH); 11 km SW of Hay Flat road along Head Rd, Wannamal, 20 Sep. 1983, *R.J. Cranfield* 4195 (PERTH); 35 km S of Arthur River, 20 Oct.

1983, *R.J. Cranfield* 4687 (PERTH); 7.1 km E along Julimar Rd from junction of Chittering Rd, 9 Oct. 2001, *R. Davis* 10108 (AD, PERTH); 5 km W along Brookton Hwy from junction of Beraking Pool Rd, 29 Nov. 2020, *R. Davis & T. Hammer* RD 13929 (PERTH); firebreak on Kawana Rd, Lol Gray, Dryandra, 6Oct. 2002, *J. Foss & P. Gurry* 210 (PERTH); on track to Mount Byroomanning, NE of Bindoon, 18 Oct. 1998, *M. Hislop* 1162 (PERTH); 71.5 miles [115 km] from Perth along Great Northern Hwy between Bindoon and New Norcia, *c.* 1 mile W of the hwy, 11 Nov. 1974, *R.D. Hoogland & G.L. Stebbins* 12491 (CANB, L *n.v.*, PERTH, UC *n.v.*); S terminus of Head Rd, Head Rd is located on the S side of Hay Flat Rd *c.* 5.9 km W of its junction with the Great Northern Hwy, Shire of Chittering, 5 Sep. 1999, *J.W. Horn* 2252 (DUKE *n.v.*, PERTH); Poison Paddock, New Norcia, 7 Oct. 2004, *K. Macey* 699 (PERTH); Coalara Road, 6.4 km S of Marchagee–Coomallo Road, 5 Sep. 1997, *W. O'Sullivan* 278 (PERTH); Mercer Rd, SW of York, 19 Nov. 1998, *H. Seeds* 120 (PERTH); Brookton Hwy 5.0 km W of Beraking Pool Rd, 5 Dec. 2020, *K.R. Thiele* 5669a (PERTH); Mercer Rd, 1.1 km W from Talbot Rd, SW of York, 9 Oct. 2001, *J.R. Wheeler* 4130 (MEL *n.v.*, PERTH).

Phenology. Flowers mostly September to December, with a peak in October.

Distribution and habitat. *Hibbertia hibbertioides* occurs east and north of the Darling Scarp in the Avon Wheatbelt, Geraldton Sandplains, Jarrah Forest and Swan Coastal Plain IBRA regions (DCCEEW 2023), with the main area of distribution from Lesueur National Park and Watheroo National Park (in the north) to around Dryandra and east of Pingelly (in the south), and with several sporadic records further south to around Nannup and Mobrup (Figure 4A). It commonly occurs in jarrah-marri or wandoo woodlands and *Allocasuarina*- or *Banksia*-dominated shrublands on grey or brown sand or loam, often with lateritic gravel.

Conservation status. Not of conservation concern.

Typification. Wheeler (2004) cited the holotype of *Pleurandra hibbertioides* Steud. as being a specimen from LD, but Steudel (1845) did not designate a holotype in the protologue or cite material at a specific herbarium, and therefore all specimens available to him at the time should be treated as syntypes (McNeill 2014). The citation of the specimen by Wheeler (2004) as holotype did not inadvertently lectotypify the name, because on or after 1 January 2001 the use of the terms 'lectotype' and 'here designated' is required for lectotypification (see Art. 7.11, 9.23 in Turland 2018).

Hibbertia meridionalis (J.R.Wheeler) T.Hammer & K.R.Thiele, *comb. et stat. nov.*

Hibbertia hibbertioides var. *meridionalis* J.R.Wheeler, *Nuytsia* 15(2): 289–290 (2004). *Type*: Springdale Rd, 3.7 km E of Fence Rd, Western Australia, 19 March 2002, *J.R. Wheeler* 4153 (*holo*: PERTH 06331092 image!; *iso*: AD 180929!, CANB 599365 image!, K *n.v.*, MEL 2283112 image!, NSW 536972 image!).

Compact low *shrubs* 0.1–0.3(–0.4) m high; young stems terete, glabrescent with appressed, crisped to straight simple hairs, lacking distinct hair tufts in the leaf axils. *Leaves* monomorphic, sessile, erect to spreading, scattered or clustered on short-shoots, linear to very narrowly oblanceolate, (5–)10–25(–30) mm long, 0.3–0.5 mm wide, terete, lacking a distinct midrib, usually green, glabrous; base slightly broadened and flattened; apex acuminate to acute. *Flowers* solitary, terminal or terminating lateral short-shoots, sessile. *Bracts* 2–4, glabrous; primary bract ovate to ovate-triangular, 0.5–1.2 mm long, 0.2–0.5 mm wide, the apex acute to obtuse and mucronate with the tip 0.2–0.4 mm long; secondary bracts similar to the primary bract in colour, indumentum and shape. *Sepals* unequal, glabrous; outer sepals ovate, (2.9–)3.3–4 mm long, 1.3–1.8 mm wide, the margins ± membranous, the apex acute to obtuse and apiculate with a tip (0.3–)0.5–0.8 mm long; inner sepals oblong-elliptic to oblong-obovate, 3.4–3.6 mm long, 2–2.5 mm wide, the apex obtuse and ± mucronate with the tip 0.1–0.4 mm long. *Petals* yellow, obovate, (3–)4–5 mm long, emarginate. *Stamens* 11, arranged around the gynoecium, in 3 bundles each of 3 stamens fused by their filaments and with 2 stamens solitary; filaments 0.8–1.1 mm long, the fused bundles with the fused portion 0.5–0.6 mm long and the free portion 0.4–0.6 mm long; anthers narrowly obloid, 0.8–1 mm long, dehiscing by introrse, longitudinal slits; *staminodes* absent. *Carpels* 3; ovaries

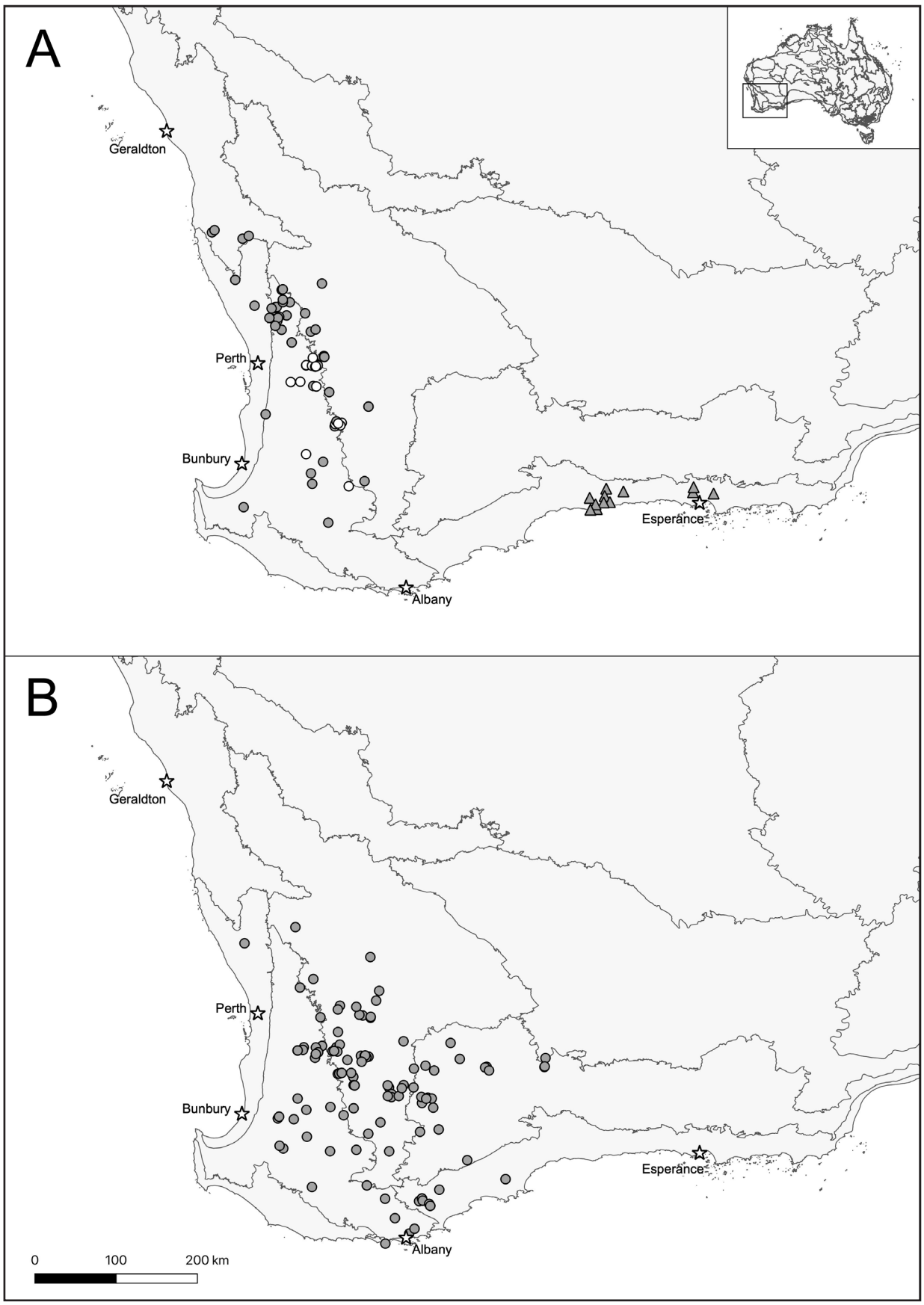

Figure 4. Distribution of *Hibbertia hibbertioides*, *H. meridionalis* and *H. hemignosta* based on PERTH specimens. A – *H. hibbertioides* with sessile flowers (grey circles), *H. hibbertioides* with pedicellate flowers (white circles) and *H. meridionalis* (triangles). B – *Hibbertia hemignosta*. Map boundaries are IBRA v7 regions (DCCEEW 2023).

obovoid, 0.8–1.1 mm long, glabrous; styles 1.4–1.8 mm long, ascending and spreading outward; *ovule* 1 per carpel. *Seeds* glossy, orange-brown, compressed-globular, *c.* 1–1.2 mm long; aril membranous, irregularly lobed, restricted to the very base of the seed. (Figure 2C, D)

Diagnostic features. *Hibbertia meridionalis* may be distinguished from all other members of the genus by the following combination of characters: linear to very narrowly oblanceolate and ± terete leaves without a distinct midrib; outer sepals (2.9–)3.3–4 mm long and with an apiculum (0.3–)0.5–0.8 mm long; 11 stamens around 3 glabrous carpels with 3 stamens fused by their filaments between each carpel and with the remaining 2 stamens solitary; and anthers 0.8–1 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 26.1 km from Hopetoun on South Coast Rd, *c.* 1 km to the S along unnamed track, 19 Apr. 1998, *M. Bennett* 113 (PERTH); Southern Ocean Rd 2.1 km E of the Mason Bay campsite turnoff, 14 Mar. 2007, *G. Byrne* 2558 (PERTH); 1.3 km N along Mason Bay Rd from junction of Middle Rd, 21 Feb. 2002, *R. Davis* 10291 (PERTH); 30.5 km SW of Munglinup, 15 May 1996, *R. Davis* RD 764 (PERTH); Oxall Rd (Munglinup), 8 Feb. 1987, *H. Demarz* 11703 (AD, PERTH); power line right of way on the W side of Coolgardie–Esperance Hwy at the SW corner of its junction with Jenkins Street in Gibson, 26 Sep. 2001, *J.W. Horn* 4135 (CANB *n.v.*, DUKE *n.v.*, PERTH); Helms Forestry Reserve 23527, Gibson, 2 Nov. 2011, *C.D. Turley & R.M. Hoggart* 13/11-11 (PERTH); Southern Ocean Rd, *c.* 27 km along from junction with Hopetoun–Ravensthorpe Rd, 19 Mar. 2002, *J.R. Wheeler* 4151 (AD, PERTH); Jerdacuttup Rd, 6 miles [*c.* 9.7 km] from Hopetoun, 28 Oct. 1968, *J.W. Wrigley s.n.* (CANB).

Phenology. Flowers recorded throughout the year, with most records in March.

Distribution and habitat. *Hibbertia meridionalis* is restricted to the Esperance Plains IBRA region of Western Australia (DCCEEW 2023), occurring mainly from Jerdacuttup to Munglinup and north of Esperance (Figure 4A). It is recorded from heathlands, shrublands and mallee woodlands on grey sand.

Conservation status. Not of conservation concern.

Typification. In the protologue, Wheeler (2004) reported the location of the type as 'Springdale Rd, 4.7 km E of Fence Rd, 33°51'S, 120°34'E, Western Australia'. However, the distance reported on the label of the type specimen is '3.7 km E of Fence Road'. The coordinates included in the protologue indicate the true location was closer to 3.7 km from Fence Road, therefore we have chosen here to treat the distance reported in the protologue as an error.

Notes. *Hibbertia meridionalis* slightly overlaps in distribution with the somewhat similar *H. glaucophylla* (Steud.) K.R.Thiele & T.Hammer (previously *H. rupicola* (S.Moore) C.A.Gardner; see Thiele & Hammer 2023) and *H. hamata* (F.Muell.) F.Muell., which were also included in the *H. hemignosta* group by Wheeler (2004). *Hibbertia meridionalis* can be readily differentiated from these species by having ± terete leaves (the others having leaves with two distinct narrow grooves on the abaxial surface either side of a distinct midrib; see Figure 4A, B & G in Wheeler 2004). Leaves in *H. hamata* are also sigmoid in shape and usually narrowly clavate with a distinctly recurved apex.

Hibbertia wandoo (J.R.Wheeler) T.Hammer & K.R.Thiele, *comb. et stat. nov.*

Hibbertia glomerata subsp. *wandoo* J.R.Wheeler, *Nuytsia* 14(3): 434–435 (2002). *Type*: [precise locality withheld for conservation reasons] Beverley, Western Australia, 22 February 2000, *F. Hort* 944 (*holo*: PERTH 05604591 image!; *iso*: AD 156485!, CANB 577640 image!, K 000700169 image!, L *n.v.*, MEL 2282388 image!, NSW 537551 image!, PERTH 09352023 *n.v.*, US *n.v.*).

Hibbertia sp. Wandoo (J. & F. Hort 456), Western Australian Herbarium, https://florabase.dbca.wa.gov.au [accessed 1 Aug. 2023].

Erect *shrubs* 0.25–0.6 m high; young stems ± terete, glabrescent with sparse appressed, crisped, simple hairs, lacking distinct hair tufts in the leaf axils. *Leaves* monomorphic, sessile, spreading, ± scattered or crowded near the stem apex, narrowly oblanceolate to narrowly obovate, (4–)7–13 mm long, 1–2.5(–3.3) mm wide, ± flat, usually glaucous, glabrous; base gradually and narrowly tapering to a flattened insertion on the stem; midrib indistinct, sometimes darkened and very slightly raised abaxially; apex obtuse, minutely mucronate, rarely truncate or emarginate. *Flowers* solitary, terminal or terminating lateral short-shoots, sessile. *Bracts* 2–4, glabrous; primary bract ovate-triangular, 1.2–1.4 mm long, 0.8–1 mm wide, the apex acute to obtuse and apiculate with the tip 0.2–0.3 mm long; secondary bracts similar to the primary bract in colour and shape. *Sepals* unequal, glabrous; outer sepals narrowly ovate-elliptic to ovate, (4.2–)5–6 mm long, 0.9–2.6 mm wide, the apex acuminate and with a distinct tip 0.4–0.6(–1) mm long; inner sepals broadly oblong-elliptic to oblong-obovate, 5–6.6 mm long, 2.8–3.8 mm wide, the apex obtuse and apiculate with a tip 0.1–0.6 mm long. *Petals* yellow, obovate, 6.2–8.8 mm long, ± entire to emarginate. *Stamens* (10)11(12), arranged around the gynoecium, in 3 bundles each of 3(4) ± free stamens with (1)2(3) stamens solitary; filaments 1.4–2.2 mm long, ± free or shortly and irregularly fused; anthers narrowly obloid, 1.2–2.2 mm long, dehiscing by introrse, longitudinal slits; *staminodes* absent. *Carpels* 3; ovaries globular to obovoid, 1.2–1.4 mm long, glabrous; styles 2–3.3 mm long, ascending and spreading outward; *ovule* 1 per carpel. *Seeds* not seen. (Figure 2E, F)

Diagnostic features. *Hibbertia wandoo* may be distinguished from all other members of the genus by the following combination of characters: glabrous leaves that are all similar and narrowly oblanceolate to narrowly obovate and lack a distinct midrib; primary bract ovate-triangular, 1.2–1.4 mm long, 0.8–1 mm wide; outer sepals (4.2–)5–6 mm long with the apex acute to acuminate and the tip 0.4–0.6(–1) mm long; and (10)11(12) free stamens around 3 glabrous carpels.

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 8 Oct. 1997, *R. Davis* 4245 (PERTH); 29 Nov. 2020, *R. Davis & T. Hammer* RD 13930 (PERTH); 6 Feb. 2008, *T. Erickson* TEE 361 (PERTH); 11 Aug. 2005, *F. Hort* 2569 (PERTH); 26 Aug. 2005, *F. Hort & J. Hort* 2598 (PERTH); 5 Jun. 2006, *F. Hort & J. Hort* 2799 (PERTH); 4 Oct. 2016, *F. Hort & J. Hort* FH 4077 (PERTH); 28 Apr. 1999, *J. & F. Hort* 456 (AD, CANB *n.v.*, NSW *n.v.*, PERTH); 9 Oct. 2001, *J.R. Wheeler* 4126 (PERTH); 9 Oct. 2001, *J.R. Wheeler* 4127 (AD, PERTH); 9 Oct. 2001, *J.R. Wheeler* 4128 (PERTH).

Phenology. Flowering recorded throughout the year but mostly from August to November, with a peak in October.

Distribution and habitat. *Hibbertia wandoo* occurs in the Jarrah Forest and Avon Wheatbelt IBRA regions (DCCEEW 2023), mostly southwest of Beverley and west and southwest of Brookton (one record east of Brookton), Western Australia (Figure 3). Recorded from wandoo woodlands and jarrah-marri woodlands, often with an open heathy understory, on brown loam or sand with lateritic gravel.

Conservation status. Listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Hibbertia glomerata* subsp. *wandoo*. Conserved in Wandoo National Park and a few smaller conservation parks and nature reserves.

Notes. *Hibbertia wandoo* may be potentially confused with *H. inclusa* Benth., which has a scattered distribution across southwest W.A. *Hibbertia inclusa* is most similar to *H. crispula* J.M.Black and other species in the *H. virgata* R.Br. ex DC. group from south-eastern Australia, which share with *H. wandoo* free stamens and leaves without a distinct midrib. The leaves of *H. inclusa* are similar in shape to *H. wandoo*, which can be narrowly oblanceolate with a rounded apex. However, *H. inclusa* can be readily differentiated by the leaves being covered in minute, crisped, simple hairs, while the leaves of *H. wandoo* are glabrous (often also glaucous).

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Corrigendum to: Revision of the connate bract group allied to *Goodenia panduriformis* (Goodeniaceae), including recognition of three new species

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SHORT COMMUNICATION

See *Nuytsia* 34: 227–254 (2023), https://doi.org/10.58828/nuy01061.

p. 231. In the Key, the following lead:

6: Corolla cream, white, whitish green to pale violet, pinkish mauve or yellowish pink, 16–25 mm long; sepals glabrous or with scattered to moderately dense hairs 0.1–0.5 mm long, entire to dentate, fused at the base 4.5–5.3 mm, posterior sepal broadly ovate, free portion 7.5–8.5 mm long, 8.4–10.5 mm wide; ovules (20–)28–40 (WA, SA, Qld, NSW, Vic) ..... **G. connata**

Should be corrected to:

6: Corolla cream, white, whitish green to pale violet, pinkish mauve or yellowish pink, 14–25 mm long; sepals glabrous or with scattered to moderately dense hairs 0.1–0.5 mm long, entire to dentate, fused at the base 2.5–5.5 mm, posterior sepal broadly ovate, free portion 6–15 mm long, (5–)6.2–12.3 mm wide; ovules (20–)28–40 (WA, SA, Qld, NSW, Vic)..... **G. connata**

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Calandrinia sp. Edel Land (F. Obbens FO 01/17) is a synonym of *C. sphaerophylla* (Montiaceae)

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SHORT COMMUNICATION

Calandrinia sphaerophylla J.M.Black was first collected in 1925 from a locality near Port Lincoln on the Eyre Peninsula (the exact location is unknown) and was described by Black (1927). This species is a small, semi-erect to erect succulent annual with very small, creamy white flowers (3–5 mm diam.) with 5 petals, 6 stamens and 3 stigmas (i.e. 3-valved in fruit). Many of the basal and other leaves are spheroidal, but it can also have obovoid leaves. It has seeds roughly 0.5 mm long that are dark red-brown, shiny and sub-reniform to ovoid in shape. The seed surface has numerous minute papillae or tubercules, and in this respect, looks very similar to *C. papillata* Syeda, a species that is very different in habit, size, and habitat to *C. sphaerophylla* and is also 8-petalled with 4-valved fruits. One might suspect that *C. sphaerophylla* could be related to *C. eremaea* Ewart because both species are small plants with somewhat similar papillate seeds, however, there are several subtle differences. For example, *C. eremaea* seeds are reniform and black or metallic in colour, whereas *C. sphaerophylla* seeds are sub-reniform to ovoid and dark red-brown. Also, seed of *C. eremaea* has strong rows of papillae predominantly on the dorsal surface and less distinct elsewhere and is also distinctly colliculate, whereas the papillae or tubercules on seeds of *C. sphaerophylla* generally occur over most of the surface and the colliculi are less distinct. In his protologue, Black (1927) states, in reference to *C. sphaerophylla*, '[r]esembles *C. pygmaea* F.Muell. [i.e. *C. granulifera* Benth.] in size, but differs in the reflexed pedicels, thinner not deciduous sepals, obtuse petals, filaments united about the middle, broad not slender styles and pale capsule splitting almost to base.' In fact, Black was correct in comparing *C. sphaerophylla* and *C. granulifera* as allied species because molecular analyses showed both species to belong in the same clade (Clade 5), but neither is placed with *C. eremaea* nor *C. papillata* (Hancock *et al*. 2018).

The original Eyre Peninsula specimen of *C. sphaerophylla* was almost certainly collected from shallow soils in rocky limestone habitat, like the few collections made since. Those later collections were made in 2019 from the north-west Eyre Peninsula, *D.E. Murfet* 9451 (MEL 2477195A) and Nullarbor National Park, *D.E. Murfet* 9429 (MEL 2477175A), the latter very near the border with Western Australia. The type (AD 97826032) and yet another Murfet collection in 2015, *D.E. Murfet* 8095 (AD 281087) from the Nullarbor (possibly the same location as above) are the only other South Australian collections.

In the late 2000s I examined the specimen *M.E. Trudgen* 7453 (PERTH 01228544) that had been incorrectly determined as *C. calyptrata* Hook.f. and which I recognised was probably a new species for Western Australia. It had the same morphological characteristics as *C. sphaerophylla* although I was unaware of this at that time. Over the years more specimens matching *Trudgen* 7453 were discovered within the PERTH collection or collected from the Shark Bay area, including several from targeted field surveys in 2017 and 2018. All these collections came from limestone habitats, mostly rocky, from the outer-most peninsula of Shark Bay (locally known as Edel Land) and on several islands north of this peninsula. The name *C.* sp. Edel Land (F. Obbens FO 01/17) was subsequently established in early 2018 (Western Australian Herbarium 1998–). Sometime later a further collection, *J.J. Alford & G.J. Keighery*

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s.n. (PERTH 06507239) from Eucla National Park near the border with South Australia, was recognised as morphologically identical to the Shark Bay collections. This collection, however, was question-marked as *C.* sp. Edel Land (F. Obbens FO 01/17) because there was no spirit material available at that time to provide a proper comparison of floral features with the Shark Bay specimens and also partly due to the substantial geographical separation.

Eventually, I realised that the description of *C. sphaerophylla* seemed very similar to *C.* sp. Edel Land (F. Obbens FO 01/17) and I also became aware of Murfet's collection of *C. sphaerophylla* near the border. This sparked a wider investigation which included viewing all the known interstate collections of *C. sphaerophylla* and their seeds. For the MEL collections of *C. sphaerophylla* I have seen high resolution scans of the sheets and SEMs of the seed. I have personally examined the AD collections including the type and their seeds. There appears to be very little difference between the collections of *C. sphaerophylla* from South Australia and those collections of *C.* sp. Edel Land (F. Obbens FO 01/17) from Western Australia. All the Western Australian specimens follow Black's original description for the species and the seed SEMs and macro images are all very similar (see Figure 1). At this stage, I consider *C.* sp. Edel Land (F. Obbens FO 01/17) to be a synonym of *C. sphaerophylla*. If a genetic study of the disjunct populations were undertaken then it might provide some evidence in the future for a subspecies ranking, but currently the morphological evidence does not support this (see Figure 2).

Calandrinia sphaerophylla J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 51: 378 (1927); *Parakeelya sphaerophylla* (J.M.Black) Hershk., *Phytologia* 84: 103 (1999); *Rumicastrum sphaerophyllum* (J.M.Black) Carolin ex Hershk., *Phytologia* 102: 121 (2020). *Type citation*: 'Near Port Lincoln' and 'collected in 1925 without indication of exact locality'. *Type specimen*: Port Lincoln district, Eyre Peninsula, South Australia [precise locality and collector unknown], October 1925, specimen forwarded to Black per Edquist (*holo*: AD 97826032!; *iso*: K).

Calandrinia sp. Edel Land (F. Obbens FO 01/17), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 22 January2024].

Diagnostic features. *Calandrinia sphaerophylla* can be distinguished from other members of the genus by its diminutive erect habit with spheroid to obovoid succulent leaves, very small creamy white, 5-petalled flowers with 6 stamens and 3 stigmas and occurring in calcareous, coastal habitats.

Other specimens examined [localities withheld for conservation reasons]. WESTERN AUSTRALIA: without date, *J.J. Alford & G.J. Keighery* s.n. (PERTH 06507239); 29 Aug. 1998, *S.J. Claymore & A.S. Weston* 200 (PERTH 05269695); 27 Aug. 1998, *S.J. Claymore & A.S. Weston* 207 (PERTH 05266858); 12 Nov. 2017, *S. Fox & S. Thomson* SBULU01-11 (PERTH 09441638); 4 Sep. 1972, *A.S. George* 11520 (PERTH 09312218); 25 Sep. 1997, *A. Markey* 1457 (PERTH 05241278); 18 Sep. 2017, *F. Obbens* FO 01/17 (PERTH 08934142); 3 Sep. 2018, *F. Obbens* FO 15/18 (PERTH 09044280); 3 Sep. 2018, *F. Obbens* FO 16/18 (PERTH 09044272); 23 Sep. 1989, *M.E. Trudgen* 7453 (PERTH 01228544).

SOUTH AUSTRALIA: 29 Sep. 2015, *D.E. Murfet* 8095 (AD 281087); 6 Sep. 2019, *D.E. Murfet* 9429 (MEL 2477175A image!); 8 Sep. 2019, *D.E. Murfet* 9451 (MEL 2477195A image!).

Phenology. This species appears to flower and fruit from early to late spring and possibly longer.

Distribution and habitat. The distribution for *C. sphaerophylla* now occurs from the Eyre Peninsula in South Australia to just across the Western Australian border at Eucla and then a wide disjunction to the Shark Bay region. This represents a substantial range extension for *C. sphaerophylla*, but there are a number of examples in Western Australia where species known from the Kalbarri-Shark Bay coastal region also occur along the far south-east coast of Western Australia. All *C. sphaerophylla* collections to date are from coastal limestone habitats including from cliff tops, smaller rocky rises or flatter areas behind the shoreline. It is generally collected on rocky limestone in soil pockets or cracks or on more substantial limestone sediments behind bays. Usually found in shrubland, shrub-heath or areas of

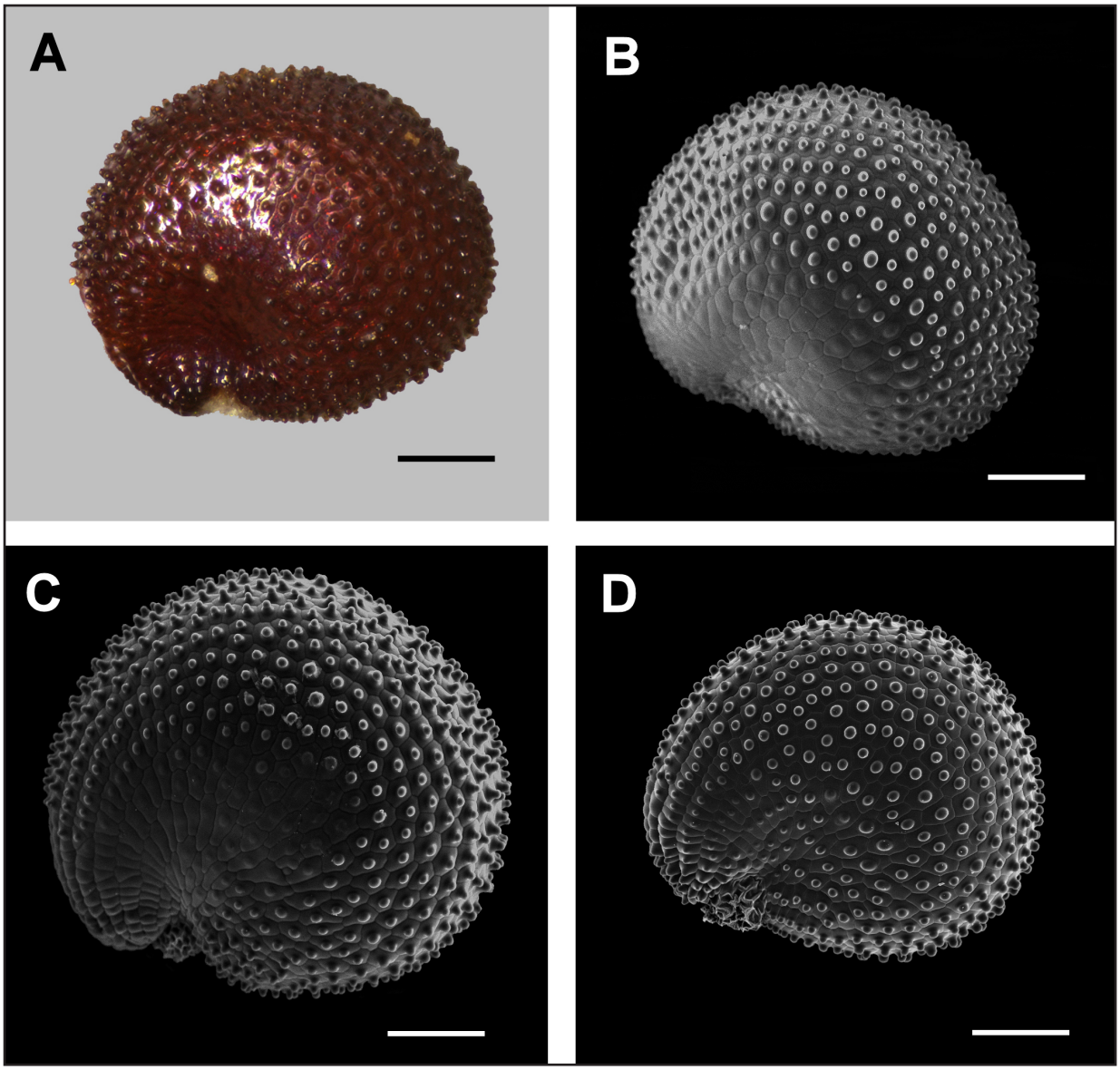

Figure 1. *Calandrinia sphaerophylla* seeds. A – Type from Port Lincoln district, Eyre Peninsula, South Australia (AD 97826032). B – NW Eyre Peninsula, South Australia, *Murfet* 9451 (MEL 2477195A). C – Nullarbor National Park, South Australia, *Murfet* 9429 (MEL 2477175A). D – Edel Land Peninsula, Shark Bay, Western Australia, *Obbens* FO 01/17 (PERTH 08934142). Scale bars = 0.1 mm (A–D).

herbfields within these vegetation associations including being in or adjacent to samphire communities. In Western Australia common associated species include *Acacia andrewsii*, *Atriplex paludosa* subsp. *moquiniana*, *A. bunburyana*, *Alyogyne* sp., *Capparis spinosa*, *Exocarpos aphyllus*, *Frankenia pauciflora, Rhagodia latifolia* and *Senecio pinnatifidus*, while in South Australia *Correa backhousiana*, *Goodenia varia*, *Gnaphalium indutum*, *Melaleuca acuminata*, *Pittosporum angustifolium* and *Senecio euclaensis* are listed.

Conservation status. *Calandrinia sphaerophylla* is listed as rare under the South Australian *Environment Protection and Biodiversity Conservation Act 1999*. Note *C.* sp. Edel Land (F. Obbens FO 01/17) is currently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). Targeted surveys for *C. sphaerophylla* might find more populations on the limestone habitats of the Baxter Cliffs and Wylie Scarp that extends for many kilometres westward from south of Cocklebiddy almost to Cape Arid, Western Australia. There is also potential for it to be discovered further south of Shark Bay along the Zuytdorp Cliffs towards Kalbarri where there is also significant limestone habitat. It is certainly under-collected in current areas of its distribution including within South Australia.

Figure 2. *Calandrinia sphaerophylla* plant habit and some images with opened flowers. A, B – NW Eyre Peninsula, South Australia, *Murfet* 9451 (MEL 2477195A). C – Nullarbor National Park, South Australia, *Murfet* 9429 (MEL 2477175A). D – Edel Land Peninsula, Shark Bay, Western Australia, *Obbens* FO 01/17 (PERTH 08934142). Photographs D. Murfet (A–C) and F. Obbens(D).

Affinities. *Calandrinia sphaerophylla* appears to belong within clade 5 (Hancock *et al*. 2018). Members of this group are all small, annual plants with some of the smallest sized flowers in the genus (3–5 mm diam.). Most species within this clade are 5-petalled with 3 stigmas and generally have 10 stamens or fewer. Many species in this group also have spheroid to obovoid leaves.

Acknowledgements

Thanks to Brendan Lepschi and Kirsten Cowley at CANB for supplying me with the initial image of the type and ensuring its quick return to AD for me to examine. Thanks also to Juergen Kellermann and Helen Vonow at AD for their help in organising the examination of the type and D. Murfet's other Nullarbor collection. They also provided macro images of the type's seeds. I am grateful to Helen Barnes and Angharad Johnson at MEL who supplied high quality images of the two D. Murfet collections held there and also SEM images of their seeds. My grateful appreciation to Steven Dillon at PERTH who edited and improved many of the above images into plates for Figures 1 and 2. My gratitude also to Denzel Murfet who provided three of the images for Figure 2. Finally, thanks to Terry Macfarlane and Greg Keighery who reviewed the draft manuscript and made useful suggestions. Thanks to the Western Australian Herbarium for their continued support and access and the ongoing help from all the curation staff.

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Revision of the multi-ovulate species of *Thysanotus* (Asparagaceae), with three new species

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Abstract

Macfarlane, T.D. & French, C.J. Revision of the multi-ovulate species of *Thysanotus* (Asparagaceae), with three new species. *Nuytsia* 35: 55–76 (2024). The group of *Thysanotus* species having more than two ovules per ovary locule (the multi-ovulate species) is taxonomically revised. The three previously described species, *T. brachyantherus* Brittan, *T. lavanduliflorus* Brittan and *T. nudicaulis* Brittan, are maintained and redescribed, with *T. nudicaulis* being redefined following removal of two new species previously included in its concept. Three new species are described: *T. argillaceus* T.Macfarlane & C.J.French, *T. ellipsoideus* T.Macfarlane & C.J.French and *T. prospectus* C.J.French & T.Macfarlane. The South Australian records of *T. nudicaulis* are recognised as belonging to *T. ellipsoideus*. A key to the group and illustrations of some characters are provided and all species are mapped and illustrated photographically.

Introduction

Thysanotus R.Br. (Asparagaceae subfamily Lomandroideae, Gunn *et al.* 2020) currently has 56 accepted, described species (Brittan 1981, 1987; Council of Heads of Australasian Herbaria 2006–; Macfarlane *et al*. 2020; Wang & Silcock 2022; Wang *et al.* 2023), all occurring in Australia with two of them extending outside of Australia. Most occur in Western Australia, especially in the south-west. New species have been recently described (Sirisena *et al.* 2009, 2013, 2016; Macfarlane *et al.* 2020; Wang & Silcock 2022) but more undescribed species are known. The work reported in this paper commenced with investigation of a presumed new species that came to our attention, followed by our observation of another suspected new species within the current concept of *T. nudicaulis* Brittan. The subsequent comparison of those species revealed a further species within *T. nudicaulis* and resulted in this revision of all multi-ovulate species of *Thysanotus*.

Thysanotus had been considered to have two ovules in each of the three ovary locules in all species (Baker 1876; Bentham 1878) until Brittan (1972) reported the occurrence of the multi-ovulate condition, with up to 17 ovules per locule in two of the species he described (*T. brachyantherus* Brittan and *T. nudicaulis*). A third species, *T. lavanduliflorus* Brittan, was later reported as having 4–6 ovules per locule (Brittan 1981). These three species are all tuberous and resemble each other morphologically, being relatively short plants with little-branched panicles or occasionally with a single umbel and leaves usually withered at flowering time. They occur in Western Australia's southern and south-eastern wheatbelt and the woodlands and shrublands to the east, with *T. nudicaulis* also on the Eyre Peninsula of South Australia (Western Australian Herbarium 1998–; State Herbarium of South Australia 2022). Three further multi-ovulate species are newly described here, and the three previously named species are redescribed. The biggest change concerns *T. nudicaulis* from which two of the new species are segregated. A key is provided to all six species and illustrations are provided for all species to assist with identification.

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The multi-ovulate condition appears on morphological grounds to define a group of related species and to be an apomorphic condition that has evolved within the genus. Although there has been no adequately representative molecular phylogenetic study that includes multi-ovulate species, a study by Sirisena (2010) indicated that tuberous species form a clade that is embedded within the genus. Additionally, the following related genera in the *Arthropodium* group of Asparagaceae subfamily Lomandroideae (Gunn *et al.* 2020) are multi-ovulate: *Arthropodium* R.Br. (Brittan 1987), *Dichopogon* Kunth (Brittan 1987), *Eustrephus* R.Br. (Conran & Clifford 1986) and *Trichopetalum* Lindl. (Conran 1998). An appropriately representative molecular phylogenetic study of *Thysanotus* would help to resolve the questions of whether the multi-ovulate state is derived within *Thysanotus*, whether it is a synapomorphy of a clade, and whether the multi-ovulate species are part of a larger tuber-bearing clade.

Before N.H. Brittan's collections from 1950 onwards and relevant publications (Brittan 1972, 1981), none of the multi-ovulate species had been named and had scarcely been collected. This is due to a combination of factors: their occurrence remote from Perth, the annual above-ground phase that is dependent on adequate rainfall, the rather inconspicuousness of the plants even when in flower, the short life of the flowers (each flower opens for only a few hours in the middle of the day, for a single day) and their late flowering seasons. The earliest collections of this group were not from the main distribution of the group in Western Australia but from the limited distribution of *T. ellipsoideus* T.Macfarlane & C.J.French in South Australia, by J.S. Browne in 1874–75 (cited in Brittan 1981, MEL 2215472A, MEL 2215473A, MEL 2215474A). The next collection was by A.D. Black in 1935 (AD 96021022, apparently the Port Lincoln specimens referred to under *T. tuberosus* R.Br. by J.M. Black (1943, p. 191)).

Methods

This study was based on specimens at the Western Australian Herbarium (PERTH), including the relevant type specimens, as well as field observations, photographs and new collections. The field studies have proven to be invaluable for understanding the taxa, especially for investigating the important taxonomic characters provided by root system morphology. So important is the root system morphology that certain species, e.g. *T. nudicaulis*, *T. ellipsoideus* and to some extent *T. prospectus* C.J.French & T.Macfarlane cannot be morphologically differentiated with confidence in specimens lacking underground parts. Consequently, there are a few specimens, formerly identified as *T. nudicaulis*, that are unallocated following this study and are mapped in Figure 1A.

In collecting specimens for this study, plants were excavated so as to obtain the rootstock, roots and entire tubers where possible, then photographed for the purposes of data gathering and establishing a reference collection. A more sustainable technique we recommend for future work consists of the careful removal of soil in layers from around the plant base (or part of it) until the tubers are just exposed (Figure 2), recording or photographing the morphology and attachment of tubers, and replacement of the soil. A single tuber could also be collected as part of a specimen. The regenerative buds for roots, leaves and annual inflorescences are located on the rootstock, the perennating organ. To avoid damaging the rootstock, inflorescences taken as a specimen should be cut rather than pulled up.

Thysanotus flowers soon close after the plant is collected and they cannot be adequately revived for examination using the usual herbarium technique. We photographed flowers before collection, pressed the plant immediately after collection, and separately dried individual open flowers in a notebook, subsequently placing them in packets with the main specimen. Such preparations, used extensively for *Thysanotus* by N.H. Brittan (e.g. illustrated in Brittan 1972), were used for our floral measurements, including of the delicate fimbriae, while the photographs recorded colours, three dimensional shapes and relationships between floral parts.

Several measurements require explanation. (1) *Roots and tubers*. All of the multi-ovulate species of *Thysanotus* exhibit root storage of varying morphology, from uniformly thickened roots, to roots with extensive thickening that in part becomes swollen, often gradually, to elongated non-thickened roots with an abruptly swollen and relatively short to long terminal tuber (see included Figures for each species).

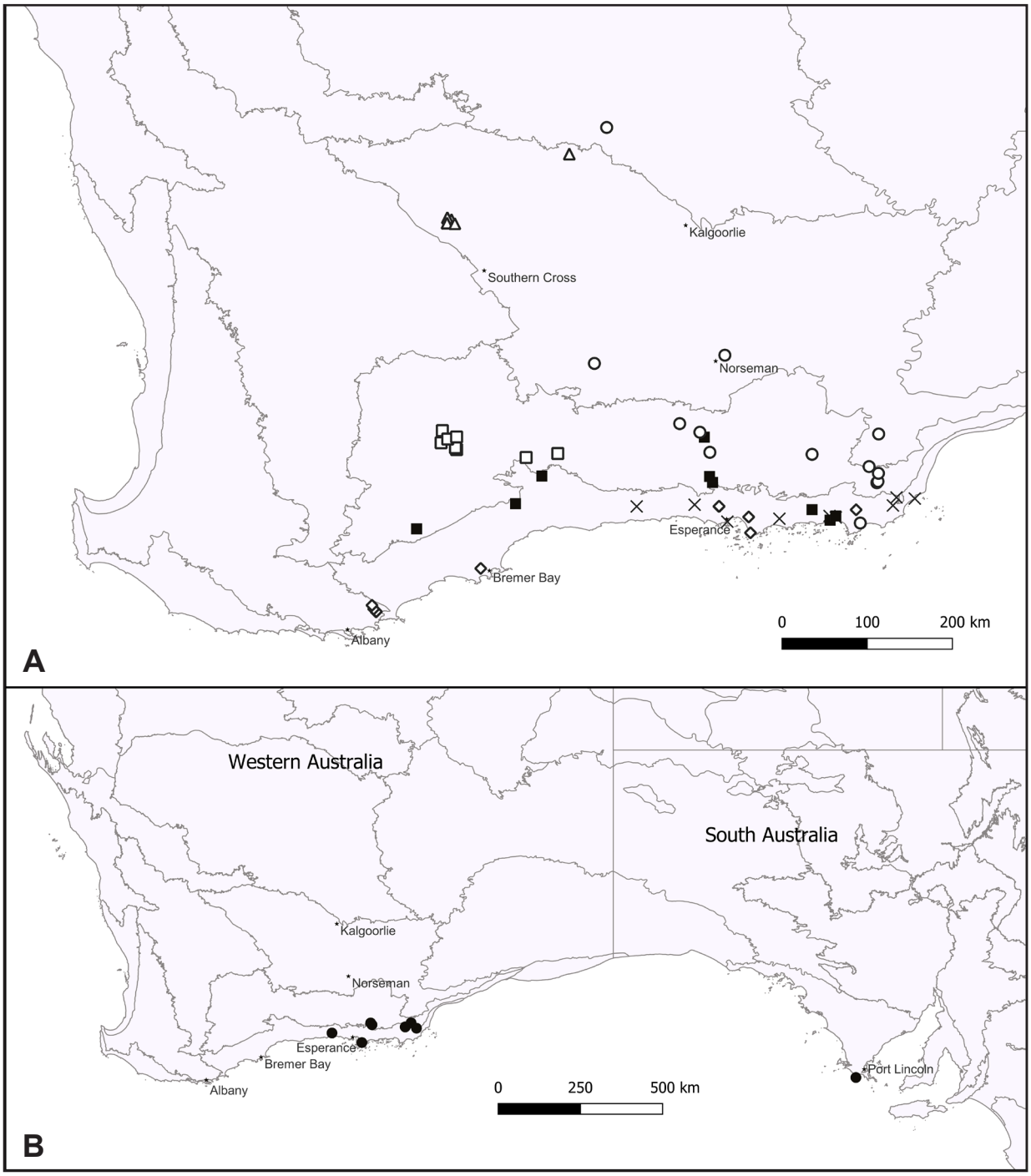

Figure 1. Distribution of the multi-ovulate species of *Thysanotus* based on specimens at PERTH. A – *T. argillaceus* (△), *T. brachyantherus* (○), *T. lavanduliflorus* (□), *T. nudicaulis* (■), *T. prospectus* (◇), unallocated specimens formerly identified as *T. nudicaulis s. lat.* (X); B – *T. ellipsoideus*.

Pate and Dixon (1982) classified the latter tuber type in particular as root tubers produced by a special adventitious root. The distance of any swelling of the root or distinct tuber from the rootstock is indicated for each species, using the term root rather than alternative terms such as pedicel, stalk or stele. The tip of the tubers may bear one to several fine roots or a single thick root like the proximal root. (2) *Perianth length*. Flower size is represented as the length of the perianth which, for practical purposes, is taken as the length of the sepals in mature flowers (Figure 3A). The sepals and petals are essentially equal (the petals are very slightly shorter, allowing the minute apical group of papillae to adhere to their slightly sub-apical counterparts on the sepals, i.e. the 'tepal apex trichomes' (TAT) of Macfarlane and Conran (2017)) but the sepals are more readily visible and measurable because of their firmer texture than the delicate

Figure 2. Excavation exposing tubers *in situ*. *T. nudicaulis*, *T.D. Macfarlane & C.J. French* TDM 7469. Photograph by C.J. French.

petals, which are usually less accessible on specimens and collapse as flowers close. Mature flowers are taken to be open flowers or, if none are present, full-sized buds whose opening is imminent, or very recently closed flowers. (3) *Anther length*. The anthers of 6-stamened *Thysanotus* species consist of two whorls, the so-called outer and inner anthers, corresponding with whether they are attached at the base of the outer tepals (sepals) or inner tepals (petals) respectively. In the open flower, however, the anthers often appear to be in two groups, corresponding to the two whorls, as a result of bending of the filaments. When the anthers of the two whorls are unequal (and often also dimorphic) as in the multi-ovulate species, the inner whorl anthers are longer than the outer, providing a practical way of identifying the whorls which may therefore be referred to as inner (long) anthers vs outer (short) anthers. Inner (long) anther length is taken as the straight distance from anther base to tip, i.e. across the curve (Figure 3B), chosen because the anthers hold their shape consistently, no treatment such as soaking is required, and the feature is readily visible in open flowers. The outer (short) anthers are usually straight or nearly so, making length measurement straightforward. (4) *Petal measurements*. The petals when viewed externally (abaxially) have a central greenish, thickened band that contains the veins, a wing area on either side composed of delicate coloured tissue, and the fringes (fimbriae) consisting of spreading coloured hairs. The central, solid part of the petal, i.e. the part excluding the fimbriae, is the body and its width was measured at the widest point. The length of the fimbriae similarly were measured at their greatest length.

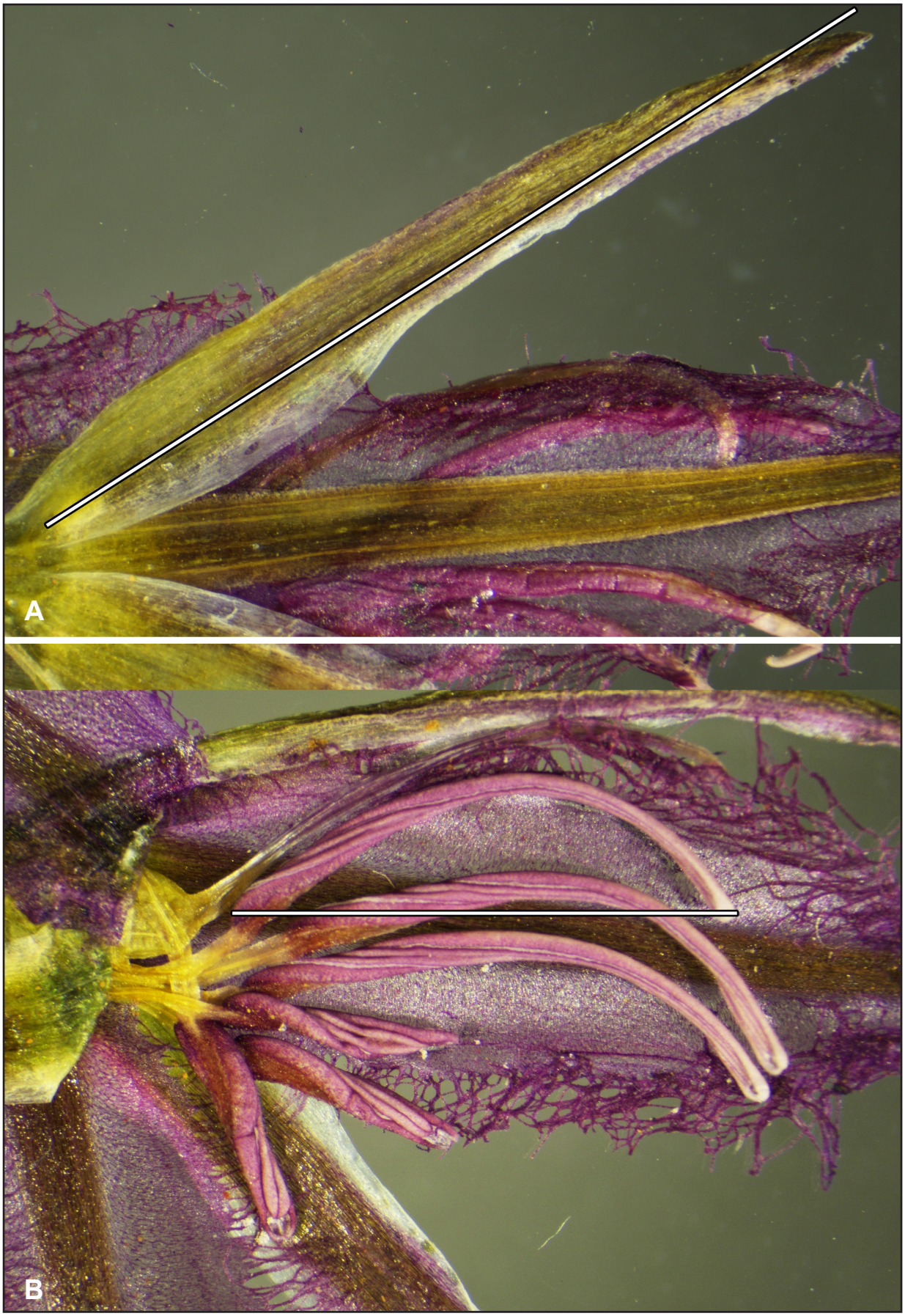

Figure 3. Explanation of floral measurement characters. A – length of the perianth is measured on sepals of fully-developed flowers, from the base of the free margin to the apex; B – length of the inner (long) anthers, from the base of the anther across the curve to the outer edge of the anther tip. Images from *T. nudicaulis*, *T.D. Macfarlane & C.J. French* TDM 7375. Photographs by C.J. French.

Taxonomy

Thysanotus argillaceus T.Macfarlane & C.J.French, *sp. nov.*

Type: Ennuin former pastoral lease, NNW of Bullfinch, Western Australia [precise locality withheld for conservation reasons], 13 October 2021, *T.D. Macfarlane & C.J. French* TDM 7329 (*holo*: PERTH 09504710; *iso*: CANB, MEL, PERTH 09504818).

Thysanotus sp. Ennuin (N. Gibson & M. Lyons 2665), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 14 Dec. 2023].

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescences. *Roots* forming defined tubers; *tubers* ellipsoid to fusiform, up to 17 per plant, 24–48 mm long, 5–11 mm diam., borne on long, thin, wiry roots up to 35–90 mm long, current and previous years' tubers present. *Leaves* several, basal, not seen when green but apparently not conspicuously equitant, narrowly sheathing to just above ground level, withered at flowering time. *Inflorescence* 1 or occasionally 2 per plant, 40–200 mm tall (above ground), a relatively short panicle comprising the upper part, branching from about 1/2–2/3(–4/5) of the height; *scape* erect, terete to angled, glabrous, usually lacking sterile bracts, occasionally 1 present; *panicle* small to well-developed, rachis 14–73 mm long, with 1–4 fertile (branch- or umbel-bearing) nodes, including a terminal umbel, *branches* 1–3 per node, diverging at an acute angle (by up to 70°), maximum length 10–50 mm, simple, with a terminal umbel of flowers and occasionally a sessile one shortly below the terminal one, or sometimes secondarily once-branched. *Umbels* (1–)3–5(–6)-flowered, the flowers at different developmental stages. *Pedicels* (5–)7.5–9 mm long, erect in flower and fruit, articulate at about 1/4 to 1/2 (0.25–0.55 of the length from the base) and usually slightly below the apices of the outer umbel bracts. *Perianth* 13–17.5 mm long; sepals 2.1–3 mm wide; petals purple, body 4–5.5 mm wide, fringe well-developed, slightly irregular, the longest fimbriae 2.5–4 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel down-curved group. *Outer anthers* straight to slightly curved, twisted, 3.5–5 mm long, reddish purple, the dorsal surface (connective) thickened, drying with a rough surface, with terminal pore *c*. 0.4 mm long on the ventral face of the apex. *Inner anthers* strongly curved, twisted, 6–8.5 mm long (measured across the curve), reddish purple, the dorsal surface (connective) thickened for only a very short distance at the base, dehiscent by a pore *c*. 0.4–0.5 mm long on the ventral face of the apex. *Ovary* spherical, whitish, with 6–9 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned about level with the apices of the long anthers. *Fruit* globular, enclosed in the withered perianth, not seen mature. Seeds not seen. (Figure 4)

Diagnostic features. *Thysanotus argillaceus* may be distinguished from all other members of the genus by the following combination of characters: ellipsoid tubers on long, thin, wiry roots; leaves withered at flowering time; inflorescence an annual erect panicle; pedicels articulate at 1/4–1/2 of the length from the base; anther whorls unequal and held in two groups; anthers reddish purple, outer anthers straight, inner (long) anthers curved, 6–8.5 mm long (measured across the curve); ovules multiple, 6–9 per locule.

Other specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 17 Oct. 1996, *N. Gibson & M. Lyons* 2665 (PERTH 05271053); 19 Oct. 1996, *N. Gibson & M. Lyons* 2696 (PERTH 05273471); 13 Oct. 2021, *T.D. Macfarlane & C.J. French* TDM 7317 (PERTH 09504702); 13 Oct. 2021, *T.D. Macfarlane & C.J. French* TDM 7325 (PERTH 09504753); 24 Oct. 2016, *P. Waddell* 675 (PERTH 08897212).

Phenology. Flowering in spring (all collections to date have been made in October). This species responds to rainfall for growth and flowering. In dry years no plants appear above ground, remaining dormant as rootstock and tubers below ground. Green leaves have so far not been observed, the leaves being withered at flowering time.

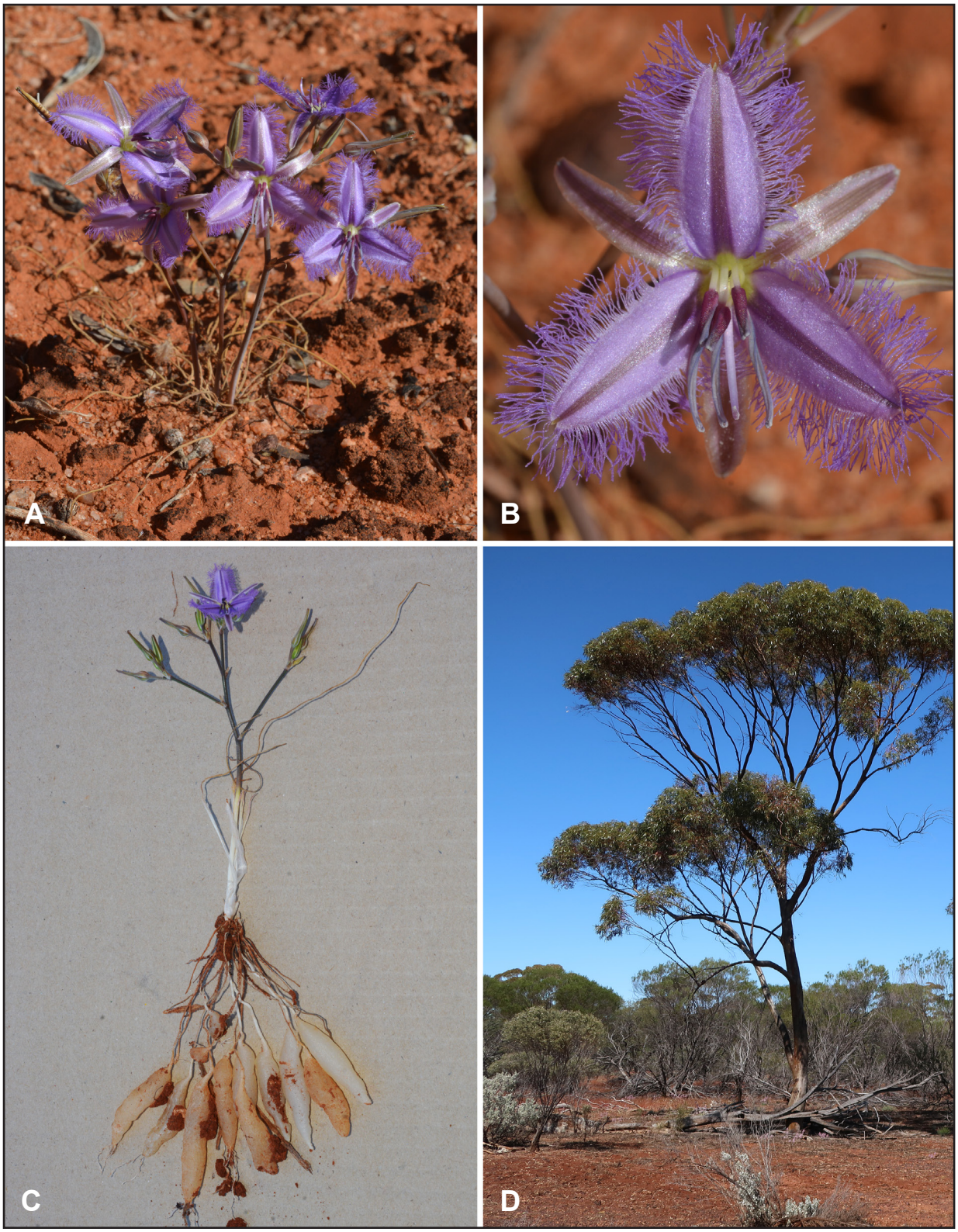

Figure 4. *Thysanotus argillaceus*. A – clump of flowering plants *in situ* showing the withered leaves; B – flower; C – whole plant showing the short stature, tubers and the panicle comprising most of the inflorescence height; D – a habitat. Images from *T.D. Macfarlane & C.J. French* TDM 7329. Photographs by C.J. French.

Distribution and habitat. Known to occur in two areas of the Eastern Goldfields in Western Australia, at several sites on the former pastoral station Ennuin, north-north-west of Bullfinch and 120 km east near former Jaurdi Station homestead, north of Boorabbin (Figure 1A). Grows in red or orange clay soil that feels crunchy underfoot (sometimes referred to as self-mulching clay) on flats or lower slopes of slight rises, in open eucalypt woodland with sparse to absent shrub understorey.

Conservation status. *Thysanotus argillaceus* is currently listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), under the name *T.* sp. Ennuin (N. Gibson & M. Lyons 2665).

Etymology. The epithet is from the Latin *argillaceus* (clayey), in reference to the soil type on which it grows.

Notes. *Thysanotus argillaceus* is very similar to *T. lavanduliflorus*, differing in its larger flowers and larger floral organs such as anthers, mostly simple primary panicle branches, flowering time (*T. argillaceus* in October, *T. lavanduliflorus* in late November to December), geographical distribution and habitat type.

Thysanotus brachyantherus Brittan, *J. Roy. Soc. Western Australia* 54: 79–81, Figure 3 (1972). *Type*: near Russell Range, *c*. 100 miles [160 km] E of Esperance, Western Australia, 8 December 1960, *N.H. Brittan* 60/95-1 (*holo*: PERTH 00998710! (*Brittan* 60/95-1); *iso*: K 000794786 image! (*Brittan* 60/95-2), MEL 2295094 image! (*Brittan* 60/95-3)).

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescence. *Roots* forming defined tubers; *tubers* ovoid or occasionally broadly fusiform, 5–18 per plant, (12–)18–60 mm long, 4.5–12 mm diam., borne on thin, wiry roots 40–115 mm long, current and previous years' tubers present. *Leaves* poorly known, 1–8 per plant, basal, not conspicuously equitant, sheathing at base with narrow translucent membranous margins, withered at flowering time; lamina erect, up to 150 mm long (above ground), more or less terete, glabrous. *Inflorescence* 1, occasionally 2 per plant, height relative to leaves inadequately known, 100–350 mm tall (above ground), a pyramidal panicle comprising the upper part; *scape* erect, terete, glabrous, with 0 or 1 sterile bracts, borne at 1/3–1/2 the inflorescence height when present; *panicle* few- to several-branched and few- to many-flowered, *rachis* 21–195 mm long with 2–3(–10) fertile (branch- or umbel-bearing) nodes, including terminal umbel, nodes with 1 branch, sometimes also bearing a sessile umbel instead of a branch or an umbel in the axil of a branch, *branches* 10–100 mm long, slightly to moderately spreading, simple with a terminal umbel or occasionally once-divided, in luxuriant plants 1 or 2 sessile umbels may occur along branches. *Umbels* 2–8-flowered, the flowers at different developmental stages. *Pedicels* 4.8–10 mm long, erect in flower and fruit, articulate at 1/5 to a little less than 1/2 (0.2–0.45 of the length from the base), usually slightly below the apex of the outer umbel bract, occasionally to slightly above all umbel bracts. *Perianth* 8.3–9 mm long; sepals 1.6–2.2 mm wide; petals purple, body 3–3.9 mm wide excluding the fringe, fringe well-developed, the longest fimbriae 2–3.3 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel slightly down-curved group. *Outer anthers* straight to slightly curved, twisted, 1.8–2.9 mm long; the dorsal surface (connective) reddish purple, somewhat thickened for most of the length, the surface drying rough, ventral surface pale purple; dehiscent by a pore 0.2–0.25 mm long on the ventral face of the apex. *Inner anthers* curved, twisted, 3–3.8 mm long (measured across the curve), dorsal surface (connective) thickened for a short distance at the base, pale reddish purple in the proximal half, transitioning to whitish on the distal half, ventral surface pale purple, whitish distally, dehiscent by a 0.2–0.25 mm long pore on the ventral face of the apex. *Ovary* spherical, pale green, with 4–8 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned near the apices of the long anthers. *Fruit* spherical, enclosed in the withered perianth that splits upon fruit enlargement, the distal part of the perianth empty and forming a tail. *Seeds* with distal face rounded and the proximal face flat to angled, 1.5–2 mm diam., black, aril colour unknown, forming two thin, spreading, appressed, flabellate lobes. (Figure 5)

Diagnostic characters. *Thysanotus brachyantherus* may be distinguished from all other members of the genus by the following combination of characters: forming discrete ovoid (occasionally broadly fusiform) tubers on long, thin, wiry roots; leaves withered at flowering time; flowers small (perianth 8.3–9 mm long), inner (long) anthers 3–3.8 mm long (measured across the curve), pale reddish; ovules several (4–8) per locule.

Figure 5. *Thysanotus brachyantherus*. A – part of panicle; B – flower, front view showing positions of the two anther whorls; C – flower enlargement, showing side view of anthers; D – roots, showing defined ovoid or fusiform tubers; E – a habitat. Images from *C.J. French* 14718 (A, C–D; A, C photographed in cultivation), *T.D. Macfarlane & C.J. French* CJF 9820, TDM 7458 (B, E). Photographs by C.J. French (A–D), T.D. Macfarlane (E).

Other specimens examined. WESTERN AUSTRALIA: Ponier Rock, 11 Dec. 2009, *E. Adams & M. Hoggart* EA 618 (PERTH 08204381); 380 m SW of Emily Ann Mine, adjacent to access track in front of offices, 1.77 km N of the Hyden – Norseman Rd, 29 Nov. 2011, *P.G. Armstrong* PA 11/701 (PERTH 08800820); junction of Balladonia, Israelite Bay and Esperance tracks, near Mount Ragged, Russell

Range, *c*. 110 miles [177 km] E of Esperance, 8 Dec. 1960, *N.H. Brittan* 60/93 (PERTH 01121863, 01121871, 01121898, 01121901); 6 km NW of Salmon Gums, 9.2 km SW of Hobby Rd on Upper Salmon Gums Rd, 10 Dec. 1983, *M.A. Burgman & C. Layman* MAB 2849 (PERTH 01158953); 2.5 km S of Sampsons Well, Riverina Stn, 21 Sep. 1988, *R.J. Cranfield* 7572 (PERTH 02638037); 1 mile [1.6 km] S of Mount Ragged, 8 Dec. 1960, *A.S. George* 2117 (PERTH 01041444); Cape Arid National Park on Balladonia Rd, just N of Pine Hill, 17 Nov. 2000, *N. Gibson, K. Brown & B. Moyle* NG 5792 A (PERTH 08676771); 12 km NE of Mount Arid, Cape Arid National Park, 29 Oct. 1989, *G.J. Keighery* 11312 (PERTH 05101387); Red Lake Townsite Nature Reserve, N of Grasspatch, 7 Dec. 2022, *T.D. Macfarlane & C.J. French* TDM 7459 (PERTH 09630414); 18 km W of Coolgardie Esperance Hwy, approximately 122 km N of Esperance town site, 7 Feb. 2002, *M. Maier* BES MM 978 (PERTH 08350221); 30 km NE of Mt Heywood, *c*. 105 km NE of Esperance, 9 Oct. 1980, *K.R. Newbey* 8002 (PERTH 01041843); 12 km NE of Norseman (Norseman 1:250,000 sheet), 31 Oct. 1980, *K.R. Newbey* 8098 (PERTH 02005921).

Phenology. Flowering recorded from October to December, apparently varying between seasons, with one record in September at the most northerly locality. Fruits have been collected in November and December.

Distribution and habitat. The recorded range is from west of Lake Johnston to near Mt Ragged and Mt Arid in southern Western Australia, with an outlying collection from Riverina Station in the Goldfields, 280 km north of the next nearest location (Figure 1A). Specimens have recently come to our attention from surveys on the Nullarbor Plain, representing a substantial eastward extension in the known range. These specimens are not yet available for citation. The species grows in various vegetation types including open heath, mallee eucalypt low woodland, eucalypt woodland (sometimes with chenopod understories), open herbfields next to exposed granite, and in self-mulching clay depressions. The soils usually feature clay or are sandy overlying clay.

Conservation status. This species was previously listed as Priority Two under Western Australian conservation ratings but, with its wide geographic distribution and relatively recent increase in collections, it has been de-listed following a review (T. Llorens, pers. comm.). It is not regarded as of conservation concern.

Etymology. The epithet *brachyantherus*, Latin for short anthers, is apt for this species, which has the smallest flowers and shortest anthers of any species in the multi-ovulate group.

Notes. *Thysanotus brachyantherus* is the most distinctive species in the multi-ovulate group and is readily identified by its small anthers, with the longer ones, although curved, not long enough to have the long sweeping curvature of the other species; both whorls are particularly noticeably twisted. There is a range of plant sizes, from small plants with small inflorescences to tall, well-branched plants evidently grown in luxuriant conditions in good seasons.

Thysanotus ellipsoideus T.Macfarlane & C.J.French, *sp. nov.*

Type: intersection of Kau Rock Road and Mount Ney Road, south corner. Kau Rock Nature Reserve, NE of Esperance, Western Australia, 8 December 2022, *T.D. Macfarlane & C.J. French* TDM 7464 (*holo*: PERTH 09630473; *iso*: CANB).

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescence. *Roots* forming defined tubers; *tubers* ellipsoid, sometimes fusiform, 5–18(–40) per plant, 11–30(–40) mm long, 3–11 mm diam., borne on long, thin, wiry roots (25–)40–110 mm long (sometimes appearing thicker when fresh), current and previous years' tubers usually present. *Leaves* apparently few, 1–4 per plant, basal, not conspicuously equitant, sheathing at base with narrow translucent membranous margins, withered at flowering time; lamina erect, straight, rather stiff, 80–250 mm long, glabrous, otherwise inadequately known. *Inflorescence* 1 per plant, a little shorter than to exceeding the leaves, 60–230 mm

tall (above ground), a panicle comprising the upper part or occasionally unbranched with a terminal umbel; *scape* erect, terete to compressed, glabrous, with (0)1 or 2 sterile bracts, the lowest borne at 1/3–3/4 the inflorescence height when present; *panicle* relatively small, few-branched and few-flowered, rachis 12–68(–96) mm long with 1–4(–5) fertile (branch- or umbel-bearing) nodes, including terminal umbel, *branches* 1 (rarely 2) per node, erect to widely spreading (by up to 60°), the longest branch 7–35 mm long, simple, each with a terminal umbel of flowers. *Umbels* 1–4-flowered, the flowers at different developmental stages. *Pedicels* (8–)9.5–12.5 mm long, erect in flower and fruit, articulate at *c.* 1/4–2/3 (0.27–0.61 of the length from the base), slightly (1–2 mm) above the apex of the outer umbel bract. *Perianth* (10–)12–15.5 mm long; sepals 2–2.8 mm wide; petals purple, body 3.8–7 mm wide excluding the fringe, fringe well-developed, the longest fimbriae 3–4.5 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel down-curved group. *Outer anthers* straight, twisted, 3.1–3.7 mm long, reddish purple; the dorsal surface (connective) somewhat thickened for most of the length, the surface drying rough; dehiscent by a pore 0.2–0.5 mm long on the ventral face of the apex. *Inner anthers* strongly curved, twisted, 6–8 mm long (measured across the curve), reddish purple, usually with a whitish longitudinal stripe; dorsal surface (connective) thickened for a short distance at the base; pore length unrecorded. *Ovary* shortly cylindrical, pale green or yellowish, with 9–11 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned about level with the apices of the long anthers. *Fruit* cylindrical, enclosed in the withered perianth which splits upon fruit enlargement. *Seeds* not seen. (Figure 6)

Diagnostic characters. *Thysanotus ellipsoideus* may be distinguished from all other members of the genus by the following combination of characters: discrete ellipsoid tubers formed on long, thin, wiry roots; leaves present but withered at flowering time; pedicels (8–)9.5–12.5 mm long, articulate below to above the middle (1/4–2/3 from the base); perianth (10–)12–15.5 mm long; inner (long) anthers 6–8 mm long (measured across the curve), reddish purple with a white stripe; ovules multiple (9–11 per locule).

Other specimens examined. WESTERN AUSTRALIA: 100 miles [161 km] E of Esperance, Esperance–Israelite Bay Rd, 6 Dec. 1960, *N.H. Brittan* 60/91 (PERTH 02972050, 02972069); Mount Ragged–Israelite Bay Rd, 14.15 and 14.65 miles [22.77 and 23.57 km] S of Mount Ragged, 8 Dec. 1960, *N.H. Brittan* 60/96 (PERTH 02972166, 02972158, 02971887); 3 miles [4.8 km] E of Lort River, Esperance–Ravensthorpe Rd, 13 Dec. 1960, *N.H. Brittan* 60/120 (PERTH 02971941); SW slopes of Mount Ragged, Jan. 1953, *N.H. Brittan s.n.* (PERTH 02971895); 1/3-1/2 way to summit of Mount Le Grand, 12 Dec. 1960, *A.S. George* 60/113 (PERTH 02971933, 02971925); *c*. 12 miles [19.3 km] SW of Mount Ragged, 6 Dec. 1960, *A.S. George* 2041 (PERTH 03016226). SOUTH AUSTRALIA: near Cape Carnot, 10 Dec. 1972, *E.C. Nelson* ANU 16865 (PERTH 03027775).

Phenology. Flowering recorded from December to January. Flowers do not open until the middle of the day.

Distribution and habitat. *Thysanotus ellipsoideus* occurs in south coastal Western Australia, from Lort River to Mt Ragged, east of Esperance, and has a limited distribution in the Port Lincoln area, Eyre Peninsula, South Australia (previously treated as *T. nudicaulis*) (Figure 1B). There are several Western Australian specimens formerly identified as *T. nudicaulis* which may be *T. ellipsoideus* but, lacking tubers, cannot at present be allocated to either of these two species (Figure 1A). None of them would significantly extend the known range of *T. ellipsoideus* if they proved to belong to this species. We have seen only one South Australian specimen but are assuming that all records from this state belong to *T. ellipsoideus* given the tuber description as ellipsoid in Brittan (1986). The species grows in mallee eucalypt low woodland and low heathland in sand to sandy clay surface soil over clay, laterite or gravel.

Conservation status. With occurrence over a wide geographical range including in conservation reserves, this species is not regarded as of conservation concern in Western Australia. This taxon is listed as Endangered under South Australian legislation (Government of South Australia 2023), as *T. nudicaulis*.

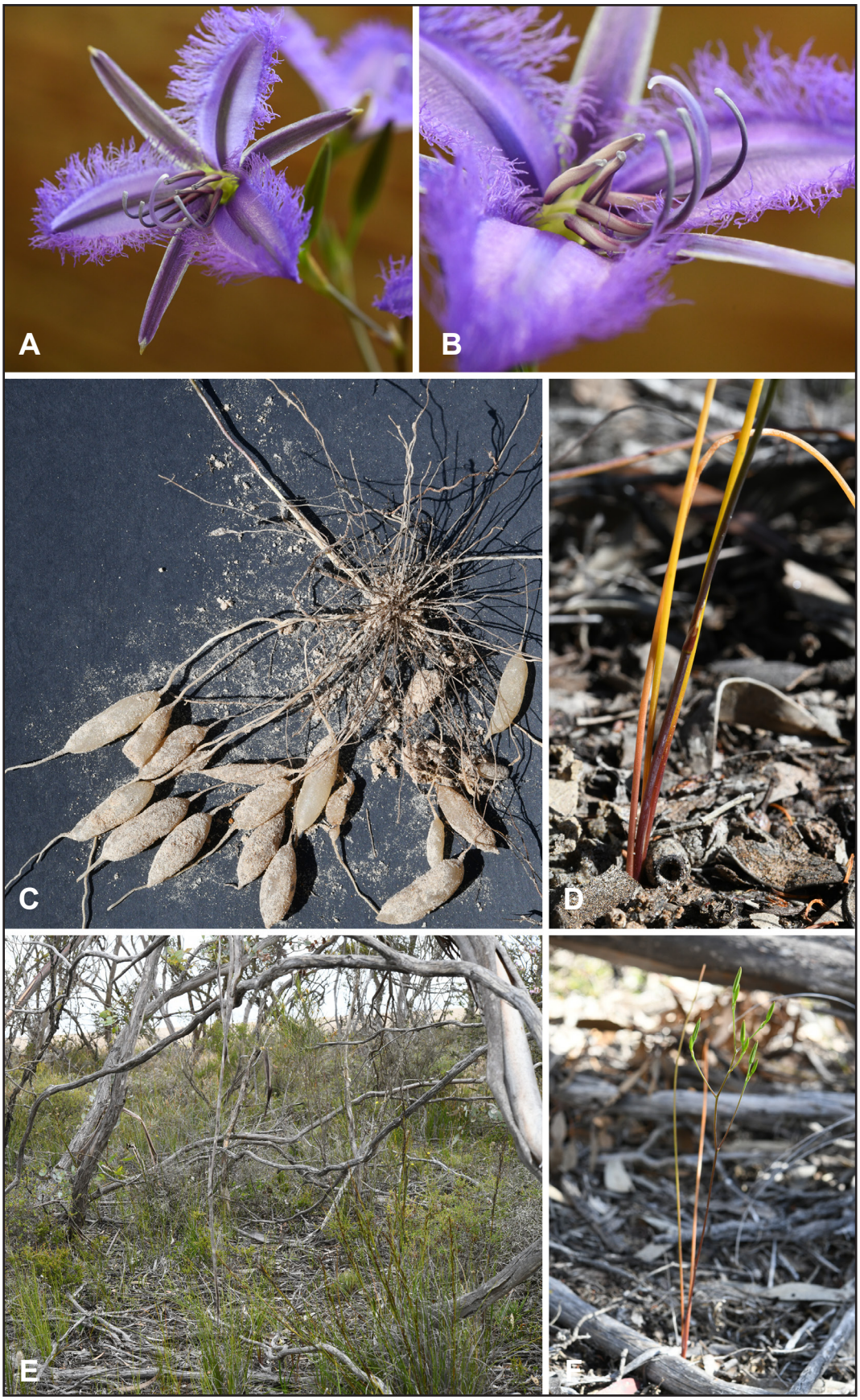

Figure 6. *Thysanotus ellipsoideus*. A – flower, oblique top view; B – flower enlargement, oblique side view showing positions of the two anther whorls and the style; C – roots, showing ellipsoidal tubers and thin, wiry roots; D – plant base showing three leaves, senescing at beginning of flowering time; E – a habitat; F – whole plant *in situ*, panicle with advanced buds, occupying upper part of inflorescence. Images from *T.D. Macfarlane & C.J. French* TDM 7464. Photographs by C.J. French.

Etymology. The epithet *ellipsoideus* is from Latin, referring to the ellipsoid shape of the tubers, characteristic of the species.

Notes. *Thysanotus ellipsoideus* (like *T. prospectus*) has until now been included in *T. nudicaulis.* It differs from both of those species by the form of the tubers and roots: the roots connecting the tubers are thin and, especially with age or drying, are wiry rather than thick and abruptly expand into a discrete tuber, rather than the roots being relatively thick and gradually expanding into the discrete tuber as in *T. nudicaulis*, or the whole root being uniformly thickened and lacking a discrete tuber as in *T. prospectus* (compare Figure 6C with Figures 8E & 9E). Some other features show differences or partial differences between these three species, with *T. ellipsoideus* tending to have smaller or fewer parts and *T. prospectus* having larger or more, while *T. nudicaulis* tends to span the ranges of the other two. *Thysanotus ellipsoideus* has few leaves, 1–4, that are not usually conspicuously equitant (in a fan-like arrangement) and are withered at flowering time whereas *T. prospectus* has more leaves, 3–8 arranged equitantly (the bases tightly packed on either side of the inflorescence axis in one plane) and green at flowering time. Inflorescence height and thus the overall size of the plant can be helpful for differentiation, with *T. ellipsoideus* the smallest at 60–230 mm compared with 180–410 mm but usually less than 300 mm in *T. nudicaulis* and 210–520 mm and usually more than 300 mm in *T. prospectus*. Pedicel length shows a trend of different lengths, with (8–)9.5–12.5 mm of *T. ellipsoideus* comparing to the usually longer 11–20 mm pedicels in *T. prospectus*, although in *T. nudicaulis* the 10.5–15 mm length spans the gap between the ranges of the other two species. Similarly, ovules per ovary locule appear, on the present limited data, to differ between the 9–11 of *T. ellipsoideus* and 13–17 in *T. prospectus* but *T. nudicaulis* having an overlapping 10–15 ovules. The flowers are similar in all three species in overall form, colour and the arrangement of stamens.

Thysanotus lavanduliflorus Brittan, *Brunonia* 4: 125–127 (1981). *Type*: 'Hyden–Newdegate road, 33.6 miles [54 km] S of Hyden', Western Australia, 27 November 1973, *N.H. Brittan* 73/62 (*holo*: PERTH 01011383!; *iso*: K 000794782 image!).

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescence. *Roots* forming defined tubers; *tubers* fusiform, 6–8 or more per plant, 16–38 mm long, 4–7 mm diam., borne on thin, wiry roots 25–78 mm long (sometimes appearing thicker when fresh), current and previous years' tubers usually present. *Leaves* up to 8 per plant, basal, not conspicuously equitant, sheathing at base with narrow translucent membranous margins, withered at flowering time; lamina not seen when green. *Inflorescence* 1 per plant, height relative to leaves not known, 40–180 mm tall (above ground), an open more or less pyramidal panicle comprising the upper 1/2–2/3; *scape* erect, terete to compressed, glabrous, with 0 or 1 sterile bracts, borne at slightly below the middle when present; *panicle* relatively small, few-branched and few-flowered, rachis 38–92 mm long with 2–5 fertile (branch- or umbel-bearing) nodes, including terminal umbel, *branches* 1 or 2 per node, slightly to widely spreading (by up to 60°), the longest branch 12–55 mm long, simple or once divided, each with a terminal umbel of flowers. *Umbels* 1–5-flowered, the flowers at different developmental stages. *Pedicels* 6.5–10 mm long, erect in flower and fruit, articulate at *c.* 1/4–2/5 (0.23–0.39 of the length from the base), below the tips of the umbel bracts. *Perianth* 10–12 mm long; sepals 1.5–2.2 mm wide; petals bluish purple, 3.7–5 mm wide excluding the fringe, fringe well-developed, the longest fimbriae 2.3–3.1 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel down-curved group. *Outer anthers* straight, twisted, 2.7–3.4 mm long; the dorsal surface (connective) somewhat thickened for most of the length, the surface drying rough, reddish purple on back; dehiscent by a pore 0.2–0.25 mm long on the ventral face of the apex. *Inner anthers* strongly curved, twisted, 5–6 mm long (measured across the curve), dorsal surface (connective) thickened for a short distance at the base, reddish purple, ventral surface whitish to pale purple; dehiscent by a pore 0.3 mm long on the ventral face of the apex. *Ovary* spherical, white, with 4–6 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned about level with the apices of the long anthers. *Fruit* more or less spherical, enclosed in the withered perianth which splits upon fruit enlargement. *Seeds* not seen. (Figure 7)

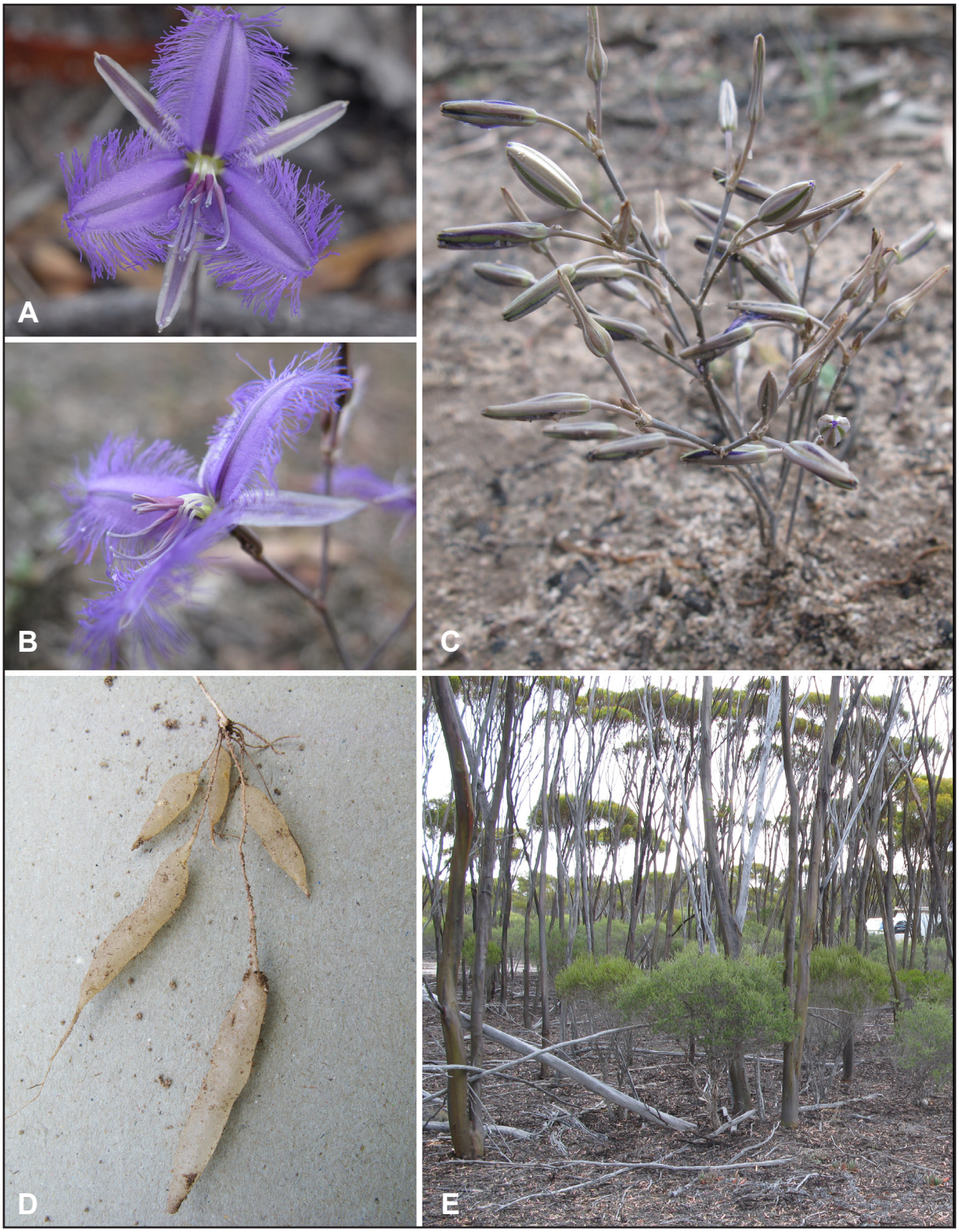

Figure 7. *Thysanotus lavanduliflorus*. A – flower, oblique view from above; B – flower, side view, showing positions of the two anther whorls; C – inflorescences, with typical dull, inconspicuous colouring and panicle occupying a large proportion of the whole inflorescence; D – roots, showing defined tubers; E – a habitat. Images from *C.J. French* 8546 (A, B, D, E), *C.J. French* 8544 (E). Photographs by C.J. French (A, C, E), T.D. Macfarlane (B, D).

Diagnostic characters. *Thysanotus lavanduliflorus* may be distinguished from all other members of the genus by the following combination of characters: discrete fusiform tubers formed on long, thin, wiry roots; leaves withered at flowering time; inner (long) anthers 5–6 mm long (measured across the curve), reddish; pedicels 6.5–10 mm long, articulate lower than the middle (1/4–2/5 from the base); perianth 10–12 mm long; ovules multiple (4–6) per locule.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 27 Nov. 1973, *N.H. Brittan* 73/63 (PERTH 01068881); 27 Nov. 1973, *N.H. Brittan* 73/64 (PERTH 01068903); 1 Dec. 1981, *N.H. Brittan* 81/43 (PERTH 01068946); 1 Dec. 1981, *N.H. Brittan* 81/44 (PERTH 01068938); 2 Dec. 1981, *N.H. Brittan* 81/45 (PERTH 01068954); 2 Nov. 1981, *N.H. Brittan* 81/46 (PERTH 01068911); 19 Nov. 2009, *C.J. French* CJF 8544 (PERTH 09663983, 09663975); 19 Nov. 2009, *C.J. French* CJF 8546 (PERTH 09602275, 09602313, 09602364); 7 Nov. 1990, *M. Graham* MSG 297 (PERTH 01487051).

Phenology. Flowering recorded from late November to December. Flowers do not open until the middle of the day.

Distribution and habitat. Most records of *T. lavanduliflorus* are from the Newdegate area in Western Australia, with additional collections from near Lake Pallarup and further south-south-east to the Vermin Fence, a range of 110 km (Figure 1A). The species grows in eucalypt low woodland and low mallee shrubland with a sparse understorey, in sand to sandy clay surface soil over clay, usually in the vicinity of salt lakes.

Conservation status. Currently listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). Under-explored, with a possibility that it may occur more widely outside the agricultural zone.

Etymology. The epithet *lavanduliflorus*, from the Latin for lavender-flowered, apparently refers to the description of the flowers as 'more bluish than other members of the genus with the possible exception of *T. baueri*' (Brittan 1981). The flowers do look more bluish purple than the pinkish purple seen in most species.

Notes. *Thysanotus lavanduliflorus* has smaller flowers than other members of the multi-ovulate group (except *T. brachyantherus*), with consequent smaller measurements for anthers. The species most similar to *T. lavanduliflorus* is *T. argillaceus*, which differs by its larger flowers and generally shorter inflorescence whose branches are seldom secondarily branched versus frequently so in *T. lavanduliflorus*.

The flowers of *T. lavanduliflorus*, with their bluish purple coloration, are rather dull and can be difficult to see from a distance. With the greyish colour of the inflorescence axes and flower exterior that merge with the background, and the leaves being withered at flowering time, the plants are difficult to see against the leaf litter and bare soil of their habitat. The flowers open in the middle of the day and close mid-afternoon. These factors all help to make this species difficult to find and contribute to its elusiveness in flora surveys and to the fact that most collections are still those made by the original collector, N.H. Brittan, during just a couple of field trips.

Thysanotus nudicaulis Brittan, *J. Roy. Soc. Western Australia* 54: 81, Figures 4, 5 (1972). *Type*: 65 miles [104 km] E of Esperance on Israelite Bay track, Western Australia, 11 December 1960, *N.H. Brittan* 60/106-1 (*holo*: PERTH 01221019! (*Brittan* 60/106-1); *iso*: K 000794780 image! (*Brittan* 60/106-2), MEL 2295104 image! (*Brittan* 60/106-3), PERTH 01221027! (*Brittan* 60/106-4)).

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescence. *Roots* forming defined tubers; *tubers* fusiform, 5–15 per plant, 30–185 mm long, 2.5–5.5 mm diam., borne on thick, rather fleshy roots (the thickness persisting to maturity) 11–40 mm long, current and previous years' tubers present. *Leaves* 1–4 per plant, basal, not conspicuously equitant, sheathing at base with narrow translucent membranous margins, withered at flowering time; lamina erect, straight, rather stiff, 80–250 mm long (above ground), 0.4–1.4 mm diam., terete, tapering to an acute apex, glabrous. *Inflorescence* 1 per plant, a little shorter than to exceeding the leaves, 180–320 mm tall (above ground), a pyramidal to corymbose panicle comprising the upper part; *scape* erect, terete to compressed, glabrous, with 0–2 sterile bracts, borne at slightly below the middle to about 3/4 when present; *panicle* relatively small, few-branched and few-flowered, rachis 9–42(–60) mm long with 2–3(–6) fertile (branch- or

umbel-bearing) nodes, including terminal umbel, *branches* 1 (rarely 2) per node, slightly to moderately spreading (by up to 15°), the longest branch (4–)15–85 mm long, simple or rarely once divided, each with a terminal umbel of flowers. *Umbels* 1–6-flowered, the flowers at different developmental stages. *Pedicels* 10.5–15 mm long, erect in flower and fruit, articulate at *c.* 1/3–1/2 (0.31–0.56 of the length from the base), slightly above the apex of the outer umbel bract. *Perianth* 11.5–15 mm long; sepals 1.75–2.6 mm wide; petals purple, body 2.1–5.8 mm wide excluding the fringe, fringe well-developed, the longest fimbriae 1.8–4 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel down-curved group. *Outer anthers* straight, twisted, 3.5–4.2 mm long, reddish purple; the dorsal surface (connective) somewhat thickened for most of the length, the surface drying rough; dehiscent by a pore 0.2–0.3 mm long on the ventral face of the apex. *Inner anthers* strongly curved, twisted, 6–9 mm long (measured across the curve), reddish purple, usually with a whitish longitudinal stripe; dorsal surface (connective) thickened for a short distance at the base; dehiscent by a 0.2–0.25 mm long pore on the ventral face of the apex. *Ovary* shortly cylindrical, pale green or yellowish, with 10–15 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned about level with the apices of the long anthers. *Fruit* cylindrical, enclosed in the withered perianth which splits upon fruit enlargement. *Seeds* black, with whitish aril. (Figure 8)

Diagnostic characters. *Thysanotus nudicaulis* may be distinguished from all other members of the genus by the following combination of characters: fusiform tubers gradually expanding from thick roots; leaves withered at flowering time; inner (long) anthers 6–9 mm long (measured across the curve), reddish purple, usually with a whitish longitudinal stripe; pedicels 10.5–15 mm long, articulate at the middle or below (1/3–1/2); ovules multiple (10–15) per locule.

Other specimens examined. WESTERN AUSTRALIA: 28 miles [45 km] W of Esperance, Esperance – Ravensthorpe Rd, 13 Dec. 1960, *N.H. Brittan* 60/117 (PERTH 02971968, 02972042, 02972034); S side of salt lake, Israelite Bay Rd, 55.5 miles [89.3 km] E of Norseman – Esperance Rd, 11 Dec. 1960, *A.S. George* 2189 (CANB 336778.1 *n.v.*, K *n.v.*, PERTH 01978624); *c*. 2.5 km S of Scaddan, Coolgardie – Esperance Hwy, 7 Dec. 2022, *T.D. Macfarlane & C.J. French* TDM 7456 (AD, PERTH 09630392); 5 km N of Scaddan, Coolgardie – Esperance Hwy, just S of Phillips Rd, 7 Dec. 2022, *T.D. Macfarlane & C.J. French* TDM 7457 (PERTH 09630384); 2.8 km W of West River bridge, South Coast Hwy, W of Ravensthorpe, 9 Dec. 2022, *T.D. Macfarlane & C.J. French* TDM 7467 (AD, PERTH 09630430); Jerramungup – Gnowangerup Rd, opposite Gleeson Rd, *c*. 27 km W of Jerramungup, 9 Dec. 2022, *T.D. Macfarlane & C.J. French* TDM 7469 (CANB, PERTH 09630457).

Phenology. Flowering recorded from mid-November to mid-December, with one record in January.

Distribution and habitat. The recorded range is from west of Jerramungup to 90 km east of Esperance, on the south coastal region of Western Australia (Figure 1A). The species grows in mallee eucalypt low woodland with sedge or low to tall shrubland understorey, in sand or sand over clay.

Conservation status. With a wide geographical range, apparently growing in extensive populations and represented in at least one conservation reserve, this species is not regarded as of conservation concern.

Etymology. The epithet *nudicaulis*, from the Latin for naked stem, was not explained in the original publication (Brittan 1972). We assume that, given that the stem or scape usually bears bracts, the name probably did not refer to the stems themselves but to the fact that the leaves have usually dried out at flowering time, leaving a leafless flowering stem.

Notes. This revised concept of *T. nudicaulis* represents usually small plants with little inflorescence branching and rather few umbels, bearing roots that are relatively thick at the base and gradually expanding into an obvious tuber. The ovule number range 10–17 per locule given by Brittan (1972, 1981, 1987) is presumed by us to include observations of *T. ellipsoideus* and *T. prospectus*, so we have used our own observations here. Further comparisons between the three species that formerly comprised *T. nudicaulis* are given under *T. ellipsoideus*.

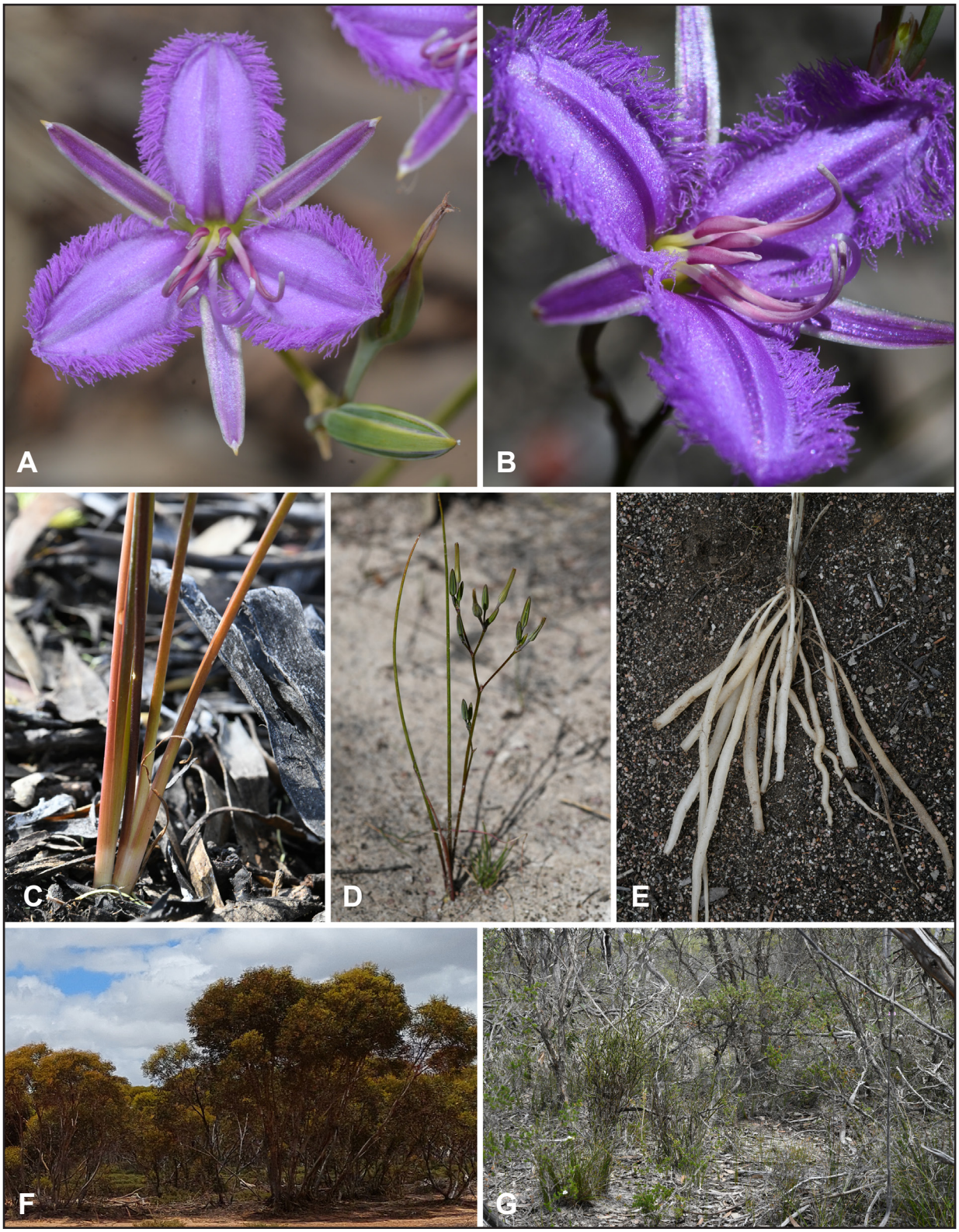

Figure 8. *Thysanotus nudicaulis*. A – flower, front view showing positions of the two anther whorls; B – flower, oblique view from above anthers showing the different forms of the two anther whorls; C – plant base with *c*. 4 leaves becoming senescent, showing a tendency toward being equitant, and a scape (darker in colour); D – a plant *in situ*, no flowers open; E – roots, showing relatively thick roots (not wiry) that gradually expand into long slender tubers that lack a well-defined beginning; E – a habitat, mallee eucalypts with red loamy soil; F – a habitat, mallee eucalypts with a fairly dense understory on grey sand over clay. Images from *T.D. Macfarlane & C.J. French* TDM 7375 (A), *T.D. Macfarlane & C.J. French* TDM 7456 (B, G), *T.D. Macfarlane & C.J. French* TDM 7461 (C), *T.D. Macfarlane & C.J. French* TDM 7469 (D), *T.D. Macfarlane & C.J. French* TDM 7467 (E), *T.D. Macfarlane & C.J. French* TDM 7375 (F). Photographs by C.J. French.

Thysanotus prospectus C.J.French & T.Macfarlane, *sp. nov.*

Type: Lake Pleasant View, near Manypeaks township, E side of the lake, Western Australia, 30 November 2021, *T.D. Macfarlane, C.J. French, E.M. Sandiford & S. Barrett* TDM 7356 (*holo*: PERTH 09504699; *iso*: AD, CANB, PERTH 09504745).

Herbs with a small subterranean perennating rootstock, storage roots, and annual leaves and inflorescence. *Roots* thickened and fleshy along their whole length, not forming defined tubers, thickened from the base, often slightly broader in the mid–region, 6–22 per plant, up to 180 mm long, 1.5–3 mm diam., current and previous years' roots present. *Leaves* 3–8 per plant, basal, often equitant (forming a fan-like arrangement), sheathing at base with narrow translucent membranous margins, green at flowering time (sheath and lower part of the lamina usually reddish); lamina erect, straight, rather stiff, 100–390 mm long (above ground), 0.8–2.2 mm diam., terete or adaxially concave in the proximal part, tapering to an acute apex, glabrous. *Inflorescence* 1 per plant, slightly to well exceeding the leaves, 155–520 mm tall (above ground), a more or less corymbose panicle comprising the upper part; *scape* erect, terete to compressed, glabrous, with 0–2 sterile bracts, borne at slightly below to slightly above the middle when present; *panicle* usually relatively large and well-branched, the rachis 20–330 mm long (lowest branch to base of terminal umbel) with 2–7 fertile (branch- or umbel-bearing) nodes including terminal umbel, *branches* 1 or 2 per node, narrowly to fairly widely spreading (by up to 30°), the longest branch 20–170 mm, simple with a terminal umbel of flowers or more often compound with a terminal umbel-like group of secondary branches each bearing a terminal umbel of flowers, the lower 1 or 2 branches often well-developed and comprising secondary panicles. *Umbels* (2–)3–4(–8)-flowered, the flowers at different developmental stages. *Pedicels* 11–20 mm long, erect in flower and fruit, articulate at *c.* 1/3–3/5 (0.3–0.61 of the length from the base), slightly to well above the apex of the outer umbel bract. *Perianth* 13–18 mm long; sepals 2–3.9 mm wide; petals purple; body 3.5–7.6 mm wide, the fringe well-developed, the longest fimbriae 2–5 mm long. *Stamens* 6, the anthers of the two whorls held in two separate groups, dissimilar and unequal, the shorter outer anthers in a parallel group projecting forward above the longer inner anthers which form a parallel down-curved group. *Outer anthers* straight, twisted, 3.1–5.6 mm long, reddish purple at the base and along the sides, the dorsal and ventral surfaces whitish; the dorsal surface (connective) somewhat thickened for most of the length, drying with a rough surface; dehiscent by a pore 0.3–0.4 mm long on the ventral face of the apex. *Inner anthers* strongly curved, twisted, 6.5–8 mm long (measured across the curve), reddish purple at the base and along the sides, the dorsal and ventral surfaces whitish; the dorsal surface (connective) thickened for only a short distance at the base; dehiscent by a pore 0.2–0.3 mm long on the ventral face of the apex. *Ovary* shortly cylindrical or somewhat conical, yellowish, with 13–17 ovules per locule; style curved, positioned alongside the long anthers; stigma short, simple, positioned about level with the apices of the long anthers. *Fruit* cylindrical, 7–7.5 mm long, enclosed in the withered persistent perianth which splits upon fruit enlargement. *Seeds* black, with whitish aril. (Figure 9)

Diagnostic characters. *Thysanotus prospectus* may be distinguished from all other members of the genus by the following combination of characters: roots thickened and fleshy for their whole length but not forming discrete tubers; leaves green at flowering time, several (3–8), often equitantly arranged; inner (long) anthers 6.5–8 mm long (measured across the curve), reddish purple at the base and on the sides, whitish dorsally and ventrally; pedicels 11–20 mm long, articulate at or below the middle (1/3–3/5); ovules multiple (13–17) per locule.

Other specimens examined. WESTERN AUSTRALIA: S of Mount Merivale, 12 Dec. 1960, *N.H. Brittan* 60/109 (PERTH 02971828); Lake Pleasant View, near Manypeaks, 10 Dec. 2020, *C.J. French* CJF 13704 (MEL, PERTH 09504729); at base of Mount Le Grand, 12 Dec. 1960, *A.S. George* 60/111 (PERTH 02971836, PERTH 02971844); *c*. 1 mile [1.61 km] S of Mount Merivale on track to Mount Le Grand, 12 Dec. 1960, *A.S. George* 2205 (PERTH 03016242); site SPS 134A, Western shore of White Lake, within Helms Arboretum, *c*. 18 km NNW of Esperance, 24 Oct. 2000, *M.N. Lyons* 2863 (PERTH 06834345); North Sister Nature Reserve, N of Manypeaks township, the western lake at W end of the reserve, SE corner of the lake, adjacent to Mount Pleasant Rd, 30 Nov. 2021, *T.D. Macfarlane, C.J. French &*

Figure 9. *Thysanotus prospectus*. A – flower, front view; B – flower, oblique front view showing positions of the two anther whorls; C – plant base showing an equitant fan of leaves, green at flowering time; D – inflorescence; E – roots thickened from the base, constituting evenly thickened tubers; E – a habitat, showing a lake in the background. Images from *T.D. Macfarlane & C.J. French* TDM 7356 (A, C, F), *T.D. Macfarlane & C.J. French* TDM 7359 (B) and *C.J. French* 13704 (E). Photographs by C.J. French.

E.M. Sandiford TDM 7358 (PERTH 09504737); Lake Corimup, eastern edge of the north easterly lake (or lake part), Lake Corimup Nature Reserve, N of Manypeaks township, 30 Nov. 2021, *T.D. Macfarlane, C.J. French & E.M. Sandiford* TDM 7359 (PERTH 09504680); Cape Arid National Park, E of Esperance, 29 Nov. 1971, *R.D. Royce* 9826 (PERTH 01978616); NW fringe of Lake Velleia, Helms Forestry Reserve 23527, Gibson, 15 Dec. 2011, *C.D. Turley & R.M. Hoggart* 25/12-11 (PERTH 08438056).

Phenology. Flowering late November to December.

Distribution and habitat. Known from several populations from Manypeaks to near Cape Arid, a range of approximately 500 km (Figure 1A). Grows in damp to wet sandy soil near the shores of more or less permanent fresh to brackish lakes or in the adjacent gypsum dunes, in association with paperbark trees (*Melaleuca cuticularis*).

Conservation status. *Thysanotus prospectus* is not considered to be of conservation concern, given its extensive range and occurrence in conservation reserves, although because of the limited extent of its specialised habitat, populations are scattered and of relatively limited numbers of plants.

Etymology. The epithet *prospectus* (an outlook, view) is a Latin noun used in apposition, a reference to the occurrence of the plant on sites overlooking lakes, particularly the lake where we first saw it, Lake Pleasant View.

Notes. *Thysanotus prospectus* has formerly been included in *T. nudicaulis*. Clearly Brittan was aware of an unusual degree of variation in *T. nudicaulis*, judging from his mention of well-developed panicles on luxuriant specimens, which he, unusually, used a second photographic plate to illustrate (his Figure 5 of *A.S. George* 60/111-1, accompanying his Figure 4 depicting the holotype of *T. nudicaulis*) in the original description (Brittan 1972), and in a later discussion (Brittan 1981, p. 131). He reports his one-time belief that there were two taxa within *T. nudicaulis*, which he ultimately decided against, referring to differences in the degree of thickening of the tuberous roots, and in the thickness of the non-tuberous parts of the roots near the rhizome (rootstock), as well as unspecified correlated differences in stamens and ovary, in addition to geographical distribution. A subsequent collection, *Lyons* 2863, was identified as *T.* aff. *nudicaulis*, emphasising the poor fit of some plants with that species. We went through a similar process to Brittan, with a similar outcome, based on the same root features plus the inflorescence size, until we saw the plants here described as *T. prospectus* in the field and carried out a detailed herbarium study. That study along with further field work resulted in the recognition of a third root and tuber form (representing *T. ellipsoideus* as described above) within *T. nudicaulis*. The root tuber forms and differences in their connecting roots are too divergent to accept within a single species and, taking into account plant size trends, leaf number, structure and greenness at flowering time (also mentioned by Brittan) together with habitat differences, have led us to recognise three species in place of Brittan's (1972, 1981, 1987) concept of *T. nudicaulis*. The flowers of the three species are very similar: the most reliable distinguishing features are in the roots and tubers, with additional differences involving plant height, leaf number, leaf greenness at flowering time and habitat (see under *T. ellipsoideus*).

Key to multi-ovulate *Thysanotus* species (more than 2 ovules per ovary locule)

The length of the main axis (inflorescence length) is measured from ground level to the base of the bracts of the terminal umbel. The panicle (or rachis) length is measured from the base of the lowest bract that subtends a branch, umbel or flower to the base of the bracts of the terminal umbel.

1. Perianth 8.3–9 mm long; inner (long) anthers 3–3.8 mm long ..... **T. brachyantherus**

1: Perianth 10–18 mm long; inner (long) anthers 5–8.5 mm long

2. Perianth 10–12 mm long; flowers bluish purple; ovules 4–6 per ovary locule..... **T. lavanduliflorus**

2: Perianth 11.5–20 mm long; flowers purple to pinkish purple; ovules 8–17 per ovary locule

3. Tubers well-defined, ellipsoid to fusiform, swelling abruptly from the roots, attached by long, fine, wiry roots

4. Inflorescence axis lacking sterile nodes (marked by a bract) below the inflorescence (rarely a sterile node present); pedicels (5–)7.5–9 mm long [growing on brown self-mulching clay]..... **T. argillaceus**

4: Inflorescence axis with 1 or 2 sterile nodes (marked by a bract) below the inflorescence (rarely none present); pedicels (8–)9.5–12.5 mm long [growing on sand to sandy clay soil] ..... **T. ellipsoideus**

3: Tubers less well-defined or undefined, consisting either of thick roots that gradually swell into a tuber or of thick roots that are more or less the same diameter throughout

5. Tubers swelling gradually from thick attaching roots, becoming fusiform; leaves usually withered at flowering time, the group of leaves not conspicuously equitant (fan-like) at base [plants not associated with lakes or swamps]..... **T. nudicaulis**

5. Tubers undefined, consisting of thick roots of even diameter throughout or slightly thicker in the middle; leaves green (fresh) at flowering time, the group of leaves usually conspicuously equitant (fan-like) at base [growing near lakes or swamps, associated with paperbark trees (*Melaleuca cuticularis*)] ..... **T. prospectus**

Acknowledgements

We thank Libby Sandiford and Sarah Barrett, Albany, for participation in fieldwork and exchange of information about *Thysanotus*, with the former successfully guiding our search for new populations of *T. prospectus* and voluntarily checking for further locations. Alex George shared his memories of his 1960 trip to Israelite Bay with N.H. Brittan, which assisted with interpreting localities on herbarium specimens, and he also assisted with the choice of new species epithets. Michael Hislop, W.A. Herbarium, originally drew attention to an unidentifiable collection that led to our recognition of *T. argillaceus* and P.J. Waddell clarified the location details of his collection of that species. P-L. de Kock and Biota are acknowledged for discovering the range extension of *T. brachyantherus*. The W.A. Herbarium curation staff gave efficient help with processing collections. Field work was supported by Terrestrial Biodiversity Conservation Research funding from Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions and private travel by C.J.F. We thank the reviewer for helpful comments.

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Typifications in *Malleostemon*, *Micromyrtus*, *Scholtzia* and *Thryptomene* (Myrtaceae) and a hybrid designation

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Abstract

Wege, J.A. & Rye, B.L. Typifications in *Malleostemon*, *Micromyrtus*, *Scholtzia* and *Thryptomene* (Myrtaceae) and a hybrid designation. *Nuytsia* 35: 77–81 (2024). As part of revisionary work in Myrtaceae tribe Chamelaucieae, lectotypes are selected for *Malleostemon decipiens* (W.Fitzg.) Trudgen, *M. tuberculatus* (E.Pritz.) J.W.Green, *Micromyrtus imbricata* Benth., *M. sulphurea* W.V.Fitzg., *Scholtzia ciliata* F.Muell., *S. teretifolia* Benth., *S. uberiflora* F.Muell. and *Thryptomene kochii* E.Pritz., and the type of *Micromyrtus erichsenii* Hemsl. is clarified. *Micromyrtus chrysodema* Rye is hypothesised to be a hybrid between *M. flaviflora* (F.Muell.) J.M.Black and a 2-ovulate, white-flowered species of *Micromyrtus* Benth.

Introduction

Treatments of *Malleostemon* J.W.Green, *Micromyrtus* Benth., *Thryptomene* Endl. and *Scholtzia* Schauer are currently in preparation for the *Flora of Australia* as part of a broader project synthesising current knowledge on Myrtaceae tribe Chamelaucieae. The following updates are published in advance of these treatments.

Typifications

Malleostemon decipiens (W.Fitzg.) Trudgen in B.L. Rye & M.E. Trudgen, *Nuytsia* 22(6): 396 (2012); *Baeckea decipiens* W.Fitzg., *J. Western Austral. Nat. Hist. Soc.* 2(1): 20 (1904). *Type*: 'Minginew [Mingenew], sand plains', Western Australia, September 1903, *W.V. Fitzgerald s.n.* (*lecto*, here designated: PERTH 08245932! [ex Herb. C.A. Gardner]; *isolecto*: K 000821699 image! [comm. W.E. Blackall], NSW 498038!, PERTH 08245657! [ex Herb. C.A. Gardner]).

Typification. Four syntypes have been located, of which PERTH 08245932 and NSW 498038 have a pink Herb. W.V. Fitzgerald label and are annotated in Fitzgerald's hand. The former is likely to have been part of the set donated to the Western Australian Department of Agriculture, while the latter was sent to NSW prior to Fitzgerald's publication, as evidenced by the letter sent by Fitzgerald in April 1904 to update the manuscript name '*Baeckea ericoides*' with the published name (see Maslin & Cowan 1994). PERTH 08245932, along with the fragment on PERTH 08245657, were subsequently procured by Charles Gardner for his personal herbarium. It is unclear which collection the fragment was taken from, although the descriptive annotation 'Similar in habit to B. camphorosmae. Flowers white' ties it to either PERTH 08245932 or K 000821699, the latter having been sent to Kew by W.E. Blackall. The designated lectotype is the only specimen that bears the published species name in Fitzgerald's hand.

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Malleostemon tuberculatus (E.Pritz.) J.W.Green, *Nuytsia* 4(3): 308–310 (1983); *Thryptomene tuberculata* E.Pritz. in F.L.E. Diels & E.G. Pritzel, *Bot. Jahrb. Syst.* 35(2–3): 411–412 (1904). *Type*: 'in distr. Coolgardie pr. Coolgardie in fruticetis arenosis [Western Australia], flor. m. Nov.', *L. Diels* 5231 (*lecto*, here designated: PERTH 01622498! [ex B; collection date given as 31 Oct. 1901]; *isolecto*: PERTH 01622501! [ex B, ex Herb. C.A. Gardner; collection date given as Nov. 1901]).

Typification. The holotype at B was destroyed in WWII, although not before Charles Gardner had obtained fragments (isotypes) for PERTH during his term as Australian Botanical Liaison Officer (see Green 1990). The designated lectotype is the best quality material; the isolectotype comprises smaller fragments retained in Gardner's personal herbarium. There is a date discrepancy on their labels; however, we believe they are from the same gathering.

Micromyrtus imbricata Benth., *Fl. Austral.* 3: 64 (1867); *Thryptomeme imbricata* (Benth.) F.Muell., *Fragm.* 8(59): 13 (1873). *Type*: 'Sandy places, Termination Granite' [*c.* 53 km NE of Israelite Bay], Western Australia, *G. Maxwell s.n.* (*lecto*, here designated: MEL 71347 image!; *isolecto*: K 000821751 image!, PERTH 06491928! [ex K]).

Typification. Bentham viewed and annotated specimens at both K and MEL. The PERTH material, which is mounted on the same sheet as a collection by H. Steedman, is a fragment taken from the K duplicate by Gardner. The MEL specimen, which we have selected as the lectotype, bears an annotation that reads 'quite different in structure and leaves from T. saxicola. M. imbricata', which was written by Bentham in response to Mueller's original identification.

Micromyrtus erichsenii Hemsl., *Hooker's Icon. Pl.* 28, t. 2780 (1905). *Type*: Dedari, 24 miles [39 km] west of Coolgardie, Western Australia, September 1903, *G.H. Thistleton-Dyer* 43 (*holo*: K 000821776 image!; *iso*: PERTH 01630784! [ex K, ex Herb. C.A. Gardner]).

Typification. The type fragment at PERTH, which was once part of Gardner's personal herbarium, bears an 'ex Museo botanico Berolinensi' label, with the collection details provided in Gardner's hand. This in itself is unsurprising since Gardner was permitted to take fragments of many key Western Australian collections at B during his term as Australian Botanical Liaison Officer, notably those of Ludwig Diels and Ernst Pritzel (e.g. see *Malleostemon tuberculatus* above). As a result, Rye (2002) interpreted the holotype of *M. erichsenii* as being at B and potentially destroyed in WWII; however, it appears that Gardner procured the PERTH fragment from a specimen at K. William Hemsley was Keeper of the Herbarium and Library at K when he described *M. erichsenii* (Stafleu & Cowan 1979) and K 000821776, which we regard as the holotype, is annotated with the species name and publication details in addition to bearing floral sketches comparable to those in the protologue. Gardner is known to have taken other type fragments from K for his personal herbarium (e.g. see under *Micromyrtus imbricata*). There also appear to be instances where he has written annotations on 'ex Museo botanico Berolinensi' labels for fragments that are unlikely to have been acquired from B (e.g. see under *Micromyrtus sulphurea* W.V.Fitzg.).

Micromyrtus sulphurea W.V.Fitzg., *J. Western Austral. Nat. Hist. Soc.* 2(1): 19 (1904). *Type*: 'On rocky hillside, 1/2 mile [0.8 km] west of Mount Magnet', Western Australia, September 1903, *W.V. Fitzgerald s.n.* (*lecto*, here designated: NSW 136239 image!; *isolecto*: NSW 7063 image!, PERTH 01631357! [comm. W.E. Blackall], PERTH 01631365! [ex Herb. C.A. Gardner]).

Typification. Four syntypes of *M. sulphurea* are known, of which PERTH 01631357 and NSW 136239 bear a pink Herb. W.V. Fitzgerald label with annotations in Fitzgerald's hand, including descriptive information on the former. As per *Malleostemon decipiens*, the former is likely to have been part of the set donated to the Western Australian Department of Agriculture, while the latter was sent to NSW prior to Fitzgerald's publication; however, in this instance the PERTH sheet is annotated 'comm. W.E. Blackall 10/X/1939' and bears illustrations, presumably those of Blackall who worked on an illustrated key to the Western Australian flora in the 1930s. Although a flower has been drawn on PERTH 01631357, there are no open flowers on the specimen, suggesting some material has been removed. PERTH 01631365 is

a poor-quality fragment Gardner took for his personal herbarium, presumably from PERTH 01631357, although curiously he made annotations on an 'ex Museo botanico Berolinensi' label.

NSW 7063 has a National Herbarium of New South Wales label with an annotation by a herbarium technician that indicates the material is from Fitzgerald's herbarium; a small label above this, written by Barbara Briggs, indicates it is a 'duplicate of sheet marked "Type"' (presumably NSW 136239). There is another plain slip of paper with Fitzgerald's annotations in pencil (including the species' name, location and date) that possibly represents his original field notes (with later change of the generic name). It is unclear if this material was part of Fitzgerald's personal collection, purchased by NSW in 1909 (see Maslin & Cowan 1994).

We have designated NSW 136239 as the lectotype since it is the most intact material, with open flowers as well as buds.

Scholtzia ciliata F.Muell., *Fragm.* 4(26): 76 (1864); *Baeckea ciliata* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 54 (1882). *Type*: 'In vicinia rivi Murchison River. Oldfield' [White Peak, Western Australia] (*lecto*, here designated: MEL 2192077!; *isolecto*: K 000357126 image!, K 000357127 image!, MEL 2192078!).

Typification. We designate MEL 2192077 as the lectotype since it was retained at MEL, is annotated by Mueller with the species name, and bears Oldfield's field slip, which provides the additional locality information of White Peak. Malcolm Trudgen annotated this sheet as the lectotype in 2006 but failed to publish this choice.

Scholtzia teretifolia Benth., *Fl. Austral.* 3: 70 (1867); *Baeckea teretifolia* (Benth.) F.Muell., *Syst. Census Austral. Pl.*: 54 (1882). *Type*: 'W. Australia, Drummond, n. 136' (*lecto*, here designated: K 000357116 image!; *isolecto*: G 00227678 image!, K 000357117 image!, K 000357118 image!, MEL 2194015 image!).

Typification. Five syntypes have been located, of which K 000357116 (from Herbarium Hookerianum) and K 000357117 (from Herbarium Benthamianum) were available to Bentham. We have designated the former as the lectotype since it is the best quality material and is annotated with both the species name and publication details.

Scholtzia uberiflora F.Muell. *Baeckea uberiflora* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 53 (1882). *Type*: 'In planitiebus ad flumen Murchison. Oldfield' [Western Australia] (*lecto*, here designated: MEL 2194018!; *isolecto*: K 000357129 image!, K 000357130 image!, MEL 2194016!, MEL 2194017!, MEL 2194019!, MEL 2194020!, W 0009011 image!).

Typification. We select MEL 2194018 as the lectotype from amongst the numerous syntypes available to Mueller, since it is the best quality specimen retained by him at MEL. Although Malcolm Trudgen annotated this sheet as the lectotype in 2010, he never formalised this choice.

Thryptomene kochii E.Pritz., *Repert. Spec. Nov. Regni. Veg.* 10: 133 (1911). *Type*: 'In districtu Coolgardie prope Cowcowing', Western Australia, September 1904, *M. Koch 1230a* (*lecto*, here designated: NSW 532163 image!; *isolecto*: PERTH 01621505!, PERTH 01621912!, PERTH 01621920!, PERTH 01621939!; ?*isolecto*: NSW 532164 image!).

Typification. NSW 532163 is selected as the lectotype since, unlike the remaining specimens, it is annotated by Pritzel with the species' name. It also bears a separate label by Koch that reads 'when I can lay my hand on I will send you a better specimen'. This material is likely to have been sent to NSW from B by Pritzel, who is known to have distributed specimens widely. It is unclear whether there was additional material at B that was subsequently destroyed in WWII (we consider this a likely scenario), or whether Koch did indeed send Pritzel a better specimen.

Koch is known to have applied the same number to specimens of the same species collected on different occasions (e.g. Short 1992; Maslin & Cowan 1994). The material cited above is dated September 1904 so we assume that is part of the same gathering; the exception is NSW 532164, which bears only the year of collection and is therefore treated as a possible duplicate. MEL 0070702, a specimen of *T. kochii* with the same collecting number as the type but dated August 1923, is not considered type material.

On the likely hybrid status of *Micromyrtus chrysodema* Rye

Micromyrtus chrysodema was described from a single gathering collected south-east of Leinster (*P.G. Armstrong* POA 33: NSW, PERTH), apparently from a population of *c.* 30 plants spread sparsely within a 1 km radius (Rye 2006). It is one of six Western Australian taxa with five stamens, with molecular data indicating it has close affinities with one of the other 5-staminate species, the widespread *M. flaviflora* (F.Muell.) J.M.Black (Peter G. Wilson pers. comm.). *Micromyrtus chrysodema* differs from *M. flaviflora* in having two (rather than 7–10) ovules, slightly rather than prominently rugose patterning on the hypanthium, and smaller leaves, sepals and petals (Table 1).

Table 1. Morphological comparison of the putative hybrid *Micromyrtus chrysodema* with its likely parent species, *M. flaviflora* and *M. clavata*, and other 2-ovulate species known from the eastern Murchison bioregion.

Feature (L = length, W = width)	**M. chrysodema**	**M. flaviflora**	**M. clavata**	**M. serrulata**	**M. stenocalyx**	**M. sulphurea**
Leaf blade L (mm)	*c.* 1.6	2–3.5	1.3–2	1.8–3.3	1.3–3	2–4
Leaf blade W (mm)	0.6–0.7	0.8–1.5	0.6–1	0.7–1.5	0.8–1.3	0.5–0.8
Leaf blade thickness (mm)	0.3–0.35	0.2–0.5	0.35–0.5	0.1–0.3	0.4–0.9	0.3–0.5
Leaf blade margin	entire or with minute teeth around apex	entire to laciniate	entire	minutely serrulate to ciliolate	entire	entire
Peduncle L (mm)	1.2–1.6	1.5–2.5	0.5–1.1	0.2–0.5	0.6–1.4	(0.6–)0.8–1.5(–2)
Bracteole L (mm)	*c.* 1.3	1.2–2.2	0.6–1.5	2–3	1–1.5	1–1.8
Hypanthium	slightly rugose, 5-ribbed basally, 10-ribbed at summit	prominently rugose, 5-angled to partly 10-ribbed	not rugose, usually 10-ribbed	not rugose, 10-ribbed	not rugose, 5- or 10-ribbed or with ribs absent	not rugose, markedly 10-ribbed
Hypanthium L (mm)	*c.* 2.5	2.3–3.6	1.4–2.2	1.7–2.2	2.5–3.5	(1.5–)2–3
Sepal L (mm)	*c.* 0.35	0.7–1.3	0.25–0.5	0.7–1.3	0.1–0.2	0.2–0.6
Petal L (mm)	*c.* 1.5	2–3	1.3–1.5	1.5–2.4	0.9–1.3	1.2–2
Petal colour	white	yellow, white or blushed pink	white	white	white	sulphur-yellow
Stamen number	5	5	10	10	10	10
Filament L (mm)	*c.* 0.4	0.4–0.8	0.4–0.5	0.6–0.9	0.4–0.6	0.6–0.9
Ovule number	2	7–10	2	2	2	2

Following its publication, *M. chrysodema* was listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), indicating that further survey was needed to better understand its conservation status; however, attempts to relocate this species have failed, with only *M. flaviflora* found. Based on this information, we think it likely that the population of 30 plants originally recorded at the type location of *M. chrysodema* was comprised primarily of *M. flaviflora*, and that the collection of *M. chrysodema* represents a hybrid between *M. flaviflora* and a 2-ovulate species of *Micromyrtus*. Potential 2-ovulate candidates are *M. clavata* Rye, *M. serrulata* J.W.Green, and *M. sulphurea*, all of which occur in the Murchison bioregion and have been recorded within 125 km of the type location of *M. chrysodema*, although none has been recorded at this specific locality. *Micromyrtus stenocalyx* (F.Muell.) J.W.Green is another potential candidate although this species is known from further away, with its distribution centred on the Great Victoria Desert bioregion.

On morphological grounds, *M. clavata* appears to be the most likely second parent (Table 1), with all characters of *T. chrysodema* being intermediate between it and *T. flaviflora* or matching one or the other putative parent. Each of the other 2-ovulate species listed seems to conflict in some characters, such as the combination of *M. flaviflora* and *M. serrulata* both having longer sepals than the putative hybrid. They also each have some features more noticeably different from the putative hybrid: sulphur-yellow petals and a markedly 10-ribbed hypanthium in *M. sulphurea,* distinctly serrulate/ciliolate leaves, long bracteoles and short peduncles in *M. serrulata*, and very reduced, rim-like sepals in *M. stenocalyx*.

On the basis of the available evidence, we infer *M. chrysodema* to be an uncommon hybrid without the ability to self-perpetuate, and as such recommend that it be removed from Western Australia's vascular plant census and Priority Flora list.

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Leucopogon longipes (Ericaceae: Epacridoideae: Styphelieae), a remarkable, new, short-range endemic from the Great Southern district of Western Australia

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SHORT COMMUNICATION

Among the epacrids of Western Australia a high percentage of taxa have narrow and/or very sporadic distributions and are hence of conservation concern. Illustrative of this is the fact that of 48 new Western Australian epacrids published in the last five years, 36 or 3/4 of them, have been assessed as Priority or Threatened Flora. A significant number of such species have very restricted distributions indeed with new examples of this phenomenon still coming to light with some regularity. The latest to be discovered was found by the second author during a brief assessment of the conservation values of a remnant on private property in the Great Southern district.

Leucopogon longipes Hislop, *sp. nov.*

Typus: east of Mount Barker, Western Australia [precise locality withheld for conservation reasons], 19 September 2023, *S. Barrett* SB 2380 (*holo*: PERTH 09626271; *iso*: CANB, CNS, MEL, NSW)

Erect, slender *shrubs* to *c.* 80 cm high and 60 cm wide, single-stemmed at ground level with a fire-sensitive rootstock. Young *branchlets* with a sparse indumentum of very short hairs, to 0.05 mm long, or glabrous. *Leaves* helically arranged, most steeply antrorse; apex acuminate with a very fine, brittle tip; base cuneate to rounded; petiole 0.4–0.7 mm long, well-defined, red or purple, glabrous or with a few hairs on the margins; lamina very narrowly ovate to very narrowly elliptic, 5.0–18 mm long, 0.7–2.0 mm wide, ± concolorous, strongly concave adaxially to involute, longitudinal axis ± straight but usually becoming incurved towards the apex; adaxial surface glabrous with the mid-vein and sometimes the pair of veins on either side evident at least in the lower half; abaxial surface glabrous, with 5–7 rather conspicuous, pale, primary veins, the mid-vein no wider than the others, the surface flat between the veins; margins long-ciliate with hairs to *c.* 1 mm long, sometimes becoming glabrescent on older leaves. *Inflorescence* terminal and axillary, erect, unit inflorescences often grouped together to form dense head-like conflorescences; axis 3.0–8.0 mm long, 3–10-flowered, with a dense indumentum of patent hairs, terminating in a bud-rudiment; flowers erect, pedicellate above and below the bracteoles, the pedicels below the bracteoles, 0.2–0.6 mm long, those above often longer, 0.4–1.0 mm long. *Fertile bracts* ovate to narrowly ovate, always well-differentiated from the leaves, 0.8–1.7 mm long, 0.5–0.9 mm wide, with 2–5 sterile bracts on the axis below. *Bracteoles* narrowly ovate, 1.0–1.8 mm long, 0.4–0.6 mm wide, acute to acuminate, keeled; abaxial surface glabrous; margins irregularly ciliolate. *Sepals* narrowly ovate, 2.0–3.0 mm long, 0.5–0.8 mm wide, acuminate; abaxial surface glabrous, green, usually flushed red-purple in the upper half or throughout, with the mid-vein and one or sometimes two pairs of veins on

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either side strongly demarcated; margins irregularly ciliate with hairs to 0.2 mm long. *Corolla tube* white or occasionally flushed pink in the upper half, ± cylindrical, or sometimes narrowly ovoid, shorter than the sepals, 1.2–2.0 mm long, 0.8–1.2 mm wide, glabrous externally, internal surface glabrous except for an apical zone of retrorse hairs just below the lobes. *Corolla lobes* white, variably flushed pink, longer than the tube, 2.0–2.5 mm long, 0.4–0.6 mm wide at base, spreading from close to the base and recurved, glabrous externally, internal surface with a dense indumentum of ± straight, terete, white hairs. *Anthers* partially exserted from the tube, by *c.* 1/3 of their length, 1.2–1.6 mm long, including elongate sterile tips, slightly recurved towards the apex. *Filaments* terete, 0.3–0.5 mm long, attached to the anther about 3/4 above base, adnate to the tube just below the sinuses. *Nectary* partite, the scales, 0.2–0.3 mm long, 0.2–0.3 mm wide, rather thick, glabrous. *Ovary* globose, 0.4–0.5 mm long, 0.4–0.5 mm wide, glabrous, 5-locular. *Style* 0.20–0.35 mm long, abruptly differentiated from ovary apex, included within the corolla tube; stigma enlarged and 5-lobed. *Fruit* much shorter than the calyx, depressed-obovoid, 0.7–0.8 mm long, 1.3–1.4 mm wide, with 5 sharply defined, broad, flat ridges alternating with sunken areas of similar width; apex truncate with rounded shoulders, the surface glabrous, ± dry (mesocarp not developed), descending steeply to the base of the style which is wholly included within a central depression. (Figure 1)

Diagnostic characters. Easily recognised by the following character combination: leaves long-ciliate, very narrowly ovate to very narrowly elliptic, 5.0–18 mm long, 0.7–2.0 mm wide, strongly concave adaxially to involute; flowers pedicellate above and below the bracteoles, the pedicels above the bracteoles, 0.4–1.0 mm long; nectary partite; fruit 5-locular, depressed obovoid, with 5 sharply defined, broad, flat ridges alternating with sunken areas of similar width, the apical surface descending steeply to the base of the wholly included style.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 19 Sep. 2021, *S. Barrett* SB 2368 (PERTH); 19 Sep. 2023, *S. Barrett* SB 2381 (PERTH); 27 Nov. 2023, *S. Barrett* SB 2382 (PERTH).

Distribution and habitat. Known only from an area east of Mount Barker in the far south of the Jarrah Forest bioregion, where it grows in low woodland in shallow, sandy loam over laterite on the lower slopes of a granite hill. Associated species include *Eucalyptus marginata*, *Banksia grandis*, *Xanthorrhoea platyphylla*, *Agonis theiformis*, *Tetratheca affinis*, *Sphaerolobium alatum*, *Bossiaea ornata*, *Daviesia preissii*, *Leucopogon obovatus* subsp. *revolutus*, *Conostylis setigera*, *Desmocladus fasciculatus* and *Drosera lasiantha*.

Phenology. To judge from the very few specimens available, peak flowering is likely to be in September and October. Mature fruit has been collected in late November.

Etymology. From the Latin *longus* (long) and *pes* (foot), a reference to the long pedicels that are characteristic of the species.

Conservation status. Currently known only from a single population on private property of some 500 plants in two sub-populations. To be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens, pers. comm.).

Affinities. *Leucopogon longipes* is a very distinctive species which seems likely to occupy a relatively isolated position within the Western Australian members of the genus. It has a particularly gracile habit which it shares with a number of species belonging to the following small species groups, mostly from the wettest parts of the south-west of the state: the *L. gracilis* group, or Group E (refer Hislop 2009); *L. extremus* Hislop & Puente-Lel. and *L. incisus* Hislop (refer Hislop *et al.* 2012 & Hislop 2015); *L. alternifolius* R.Br. and *L. wheelerae* Hislop (refer Hislop 2008) and *L. gilbertii* Stschegl. Phylogenetic relationships within *Leucopogon* are still poorly understood but their respective morphologies do not suggest that any of these groups are closely related to each other. Similarly, it seems unlikely that *L. longipes* has close affinities with any of the above, despite a superficial similarity to some member species.

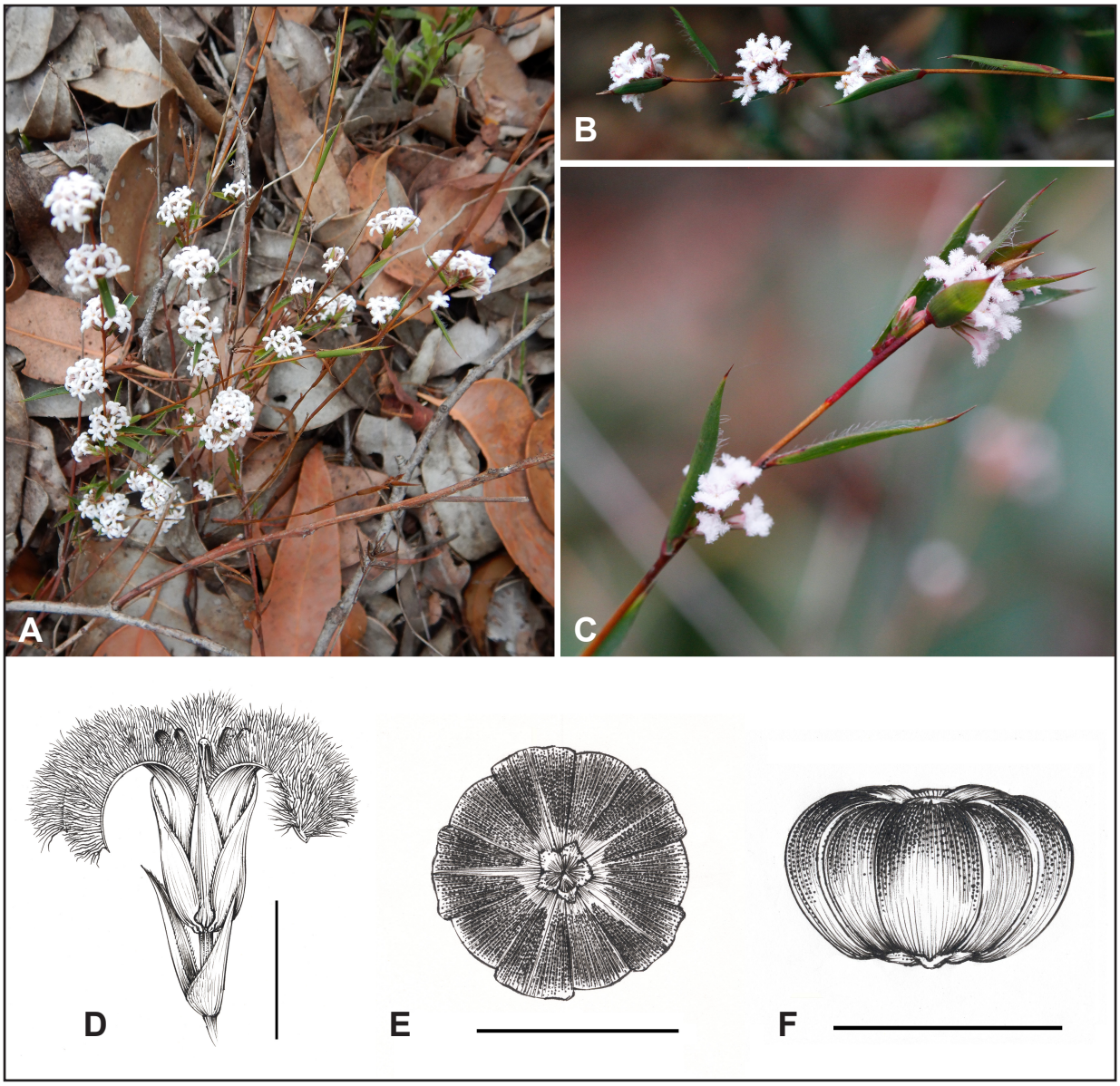

Figure 1. *Leucopogon longipes*. A – flowering plant *in situ*; B – flowering branchlet *in situ*; C – flowering branchlet showing long-ciliate leaf margins; D – flower, external view; E – fruit, top view; F – fruit, lateral view. Scale bars C = 2 mm; D, E = 1 mm. Vouchers *S. Barrett* SB 2381 (A, B), *S. Barrett* SB 2380 (C), *S. Barrett* SB 2382 (D, E). Photographs by Sarah Barrett (A), Bayley Castlehow (B). Drawings by Hung Ky Nguyen.

Perhaps the species most similar to *L. longipes* in gross morphology is *L. tenuicaulis* Hislop from the *L. gracilis* group. It shares with *L. longipes* relatively long branchlet internodes, leaves that are comparable in size and shape (although usually wider in *L. tenuicaulis*), inflorescences that extend down the flowering branchlets for many nodes, as well as pedicellate flowers, an unusual feature in the genus. However, *L. tenuicaulis* differs in having a 2-locular, hairy and slightly compressed ovary (*cf.* 5-locular, glabrous and circular in cross section in *L. longipes*), an annular rather than partite nectary, and sepals that are shorter than, rather than longer than the corolla tubes. *Leucopogon longipes* also has some similarities with *L. paradoxus* Hislop, an anomalous species currently placed tentatively in the *L. gracilis* group. Like *L. longipes* the latter has narrow, often involute leaves and unit inflorescences that are frequently grouped closely together to form dense, head-like conflorescences. But again, closer examination reveals obvious differences, with *L. paradoxus* having the 2-locular, hairy ovaries typical of the *L. gracilis* group, sessile rather than pedicellate flowers, sepals and corolla lobes that are much shorter than (*cf.* longer than) the corolla tubes and a narrow, deciduous style 0.3–0.5 (*cf.* thick, persistent and 2.5–3.5 mm long).

Of the other gracile species listed above that might conceivably be confused with *L. longipes* all can be distinguished by their 2- or 3-locular rather than 5-locular ovaries. Other easily interpreted differences are as follows: *L. alternifolius* and *L. wheelerae* can be further differentiated by their ovate or broadly ovate leaves with cordate bases, *L. extremus* by its glabrous corolla lobes, *L. incisus* by its recurved leaf margins and compressed, narrowly ellipsoid ovaries and *L. gilbertii* by its pale brown elliptic or obovate sepals, annular nectaries and hairy compressed ovaries.

A particularly remarkable feature of the new species is the fruiting character (Fig. 1E, 1F) which is quite unlike that of any other Western Australian species, being more or less dry, strongly depressed-obovoid with the upper surface descending steeply to the style base. The lateral surfaces comprise 5 sharply defined broad ridges that alternate with sunken areas of a similar width. This fruit type is unique within the genus.

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A new combination in *Cynodon* for *Brachyachne anisocarpa* (Poaceae)

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SHORT COMMUNICATION

Albrecht and McLay (2022) recently described a new species *Brachyachne anisocarpa* Albr. (Poaceae) from Western Australia and the Northern Territory, Australia. The authors make a case for including the species in *Brachyachne* (Benth.) Stapf even though that genus had been incorporated into *Cynodon* Rich. by Peterson *et al.* (2015). Part of the Albrecht and McLay (2022) case was that the inclusion of *Brachyachne* into *Cynodon* had not received universal acceptance within Australia. Currently this remains the case, as *Brachyachne* is still maintained as distinct in Queensland (Thompson *et al.* 2022; Council of Heads of Australasian Herbaria 2006–).

Other elements of the case for maintaining *Brachyachne* as separate from *Cynodon* were that the two genera are readily separated morphologically, their native ranges are geographically separate and the relationship between them was poorly resolved with available molecular data. The molecular assessment was based on the molecular phylogenetic analyses, using nuclear and chloroplast data, of Peterson *et al.* (2010, 2015) and Albrecht and McLay's (2022) own analysis, for which they added sequence data for two additional *Brachyachne* species including *B. anisocarpa*. In the more comprehensively sampled later two studies, *Cynodon* and *Brachyachne* formed separate groups but both formed a polytomy with *C. maritimus* Kunth, whose position thus left *Brachyachne* embedded in *Cynodon*. Albrecht and McLay (2022) considered that there was sufficient uncertainty about the position and current state of knowledge of *C. maritimus* that, along with the other grounds of their case, they felt that the formal inclusion of *Brachyachne* in *Cynodon* was premature. Thus, the new species was described in *Brachyachne*.

Cynodon maritimus was described from Peru, South America (Kunth 1816) but it is unclear whether the samples used by Peterson *et al.* (2015), from populations in the United States and the Caribbean that are at least sometimes currently placed under that name (including *C. maritimus* var. *vaginiflorus* Caro), match the type. Although the taxonomy of *C. maritimus* is unclear, the molecular vouchers are considered to conform morphologically to the traditional concept of *Cynodon* (P.M. Peterson, pers. comm.). *Cynodon* has often been considered an Old World genus (e.g. Clayton & Renvoize 1986; Harlan *et al.* 1970; Barkworth 2003) while others treat it as occurring in both eastern and western hemispheres without necessarily addressing its native status (Watson & Dallwitz 1992). Several species have been described as native to South America (Caro & Sanchez 1969, 1972; Caro 1983) and are currently accepted as such in that region (Salariato & Zanotti 2012; Peterson & Giraldo-Cañas 2022) but by others are treated as synonyms (mostly of *C. dactylon* (L.) Pers.), e.g. World Flora Online. The discrepancy between authors has meant that molecular phylogenetic studies of Chloridoideae or *Cynodon* (e.g. Peterson *et al.* 2010, 2015; Jewell *et al.* 2012) do not appear to be comprehensively representative of the genus world-wide, especially lacking adequate coverage of South America plants. The molecular results of Peterson *et al.* (2015) indicate that *C. maritimus* is distinct from *C. dactylon* and suggest that there are native South American *Cynodon*. Consequently, there may be justification in the view of Albrecht and McClay

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(2022) that the position of *C. maritimus* remains unclear and requires further investigation. Despite this, *Brachyachne* species appear on current evidence to be embedded in *Cynodon* and there is therefore a need for a valid name for *B. anisocarpa* in *Cynodon* until further studies of relationships can be carried out.

For a species to be officially listed for Western Australia, it needs to be placed in an accepted genus. Since acceptance of the inclusion of *Brachyachne* in *Cynodon*, the former is no longer accepted in Western Australia, so the describing of *B. anisocarpa* in *Brachyachne* meant that it could not be included in the Western Australian plant census and hence appear in Florabase (Western Australian Herbarium 1998–). As the species is considered to warrant a conservation priority status in Western Australia (see below), a census listing is a necessary step for any conservation action or protection measure. Consequently, a new combination in *Cynodon* is provided here for *B. anisocarpa*.

Cynodon anisocarpus (Albr.) T.Macfarlane, *comb. nov.*

Brachyachne anisocarpa Albr., *Nuytsia* 33: 265–271 (2022). *Type*: Cultivated Australian National Botanic Gardens nursery, 28 February 2018, *D.E. Albrecht* 15234 (*holo*: CANB 905223 *n.v.*; *iso*: AD, BRI, DNA, K, MEL, NSW, NT, all *n.v.*, PERTH).

Other specimens. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 18 Apr. 2024, *N. Dakin* WB41135 (PERTH); 25 Jun. 2023, *J. Paterson* WB41009 (PERTH); 26 Jun. 2023, *J. Paterson* WB41010 (PERTH); 20 Mar. 2024, *J. Paterson* WB41134 (PERTH); 24 Mar. 2024, *J. Paterson* WB41133 (PERTH); 1 Feb. 1980, *R.J. Petheram* 573B (NT *n.v.*).

Distribution. This species is currently known from the Northern Territory (Albrecht & McLay 2022) and six locations in Western Australia, one from the southeastern Kimberley region and five close together about 700 km south east in the Telfer area of the Great Sandy Desert.

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens, pers. comm.). The few currently known locations, all outside of conservation reserves, and the uncommon habitat (Albrecht & McLay 2022) mean that *Cynodon anisocarpus* is poorly known and potentially at risk.

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Goodenia austrina and *G. vanleeuweniana* (Goodeniaceae), two new blue-flowered species from Western Australia

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SHORT COMMUNICATION

Two new blue-flowered species of *Goodenia* R.Br. are described and illustrated. *Goodenia austrina* L.W.Sage & K.A.Sheph. (subg. *Monochila* sect. *Caerulea* (Benth.) Carolin), previously phrase-named as *G.* sp. South Coast (A.R. Annels ARA 1846), is a new conservation listed species confined to a few scattered populations in southern Western Australia. *Goodenia vanleeuweniana* L.W.Sage & K.A.Sheph. (subg. *Monochila* sect. *Scaevolina* (Carolin) K.A.Sheph.), a new species centred around the Little Sandy Desert region previously phrase named as *G.* sp. Sandy Creek (R.D. Royce 1653), is named for Professor Stephen van Leeuwen, the BHP Curtin Indigenous Professor in Biodiversity & Environmental Science at Curtin University. Both species were supported as distinct based on nrDNA and cpDNA sequence data (Shepherd *et al.* 2020), with *G. vanleeuweniana* (as *G.* sp. 'Sandy Creek') placed sister to *G. hartiana* L.W.Sage in the 'Scaevolina' clade, and *G. austrina* (as *G.* sp. 'South Coast') with an unresolved position without clear affinities within the *Caerulea* clade ('*Coerulea*' in Shepherd *et al.* 2020, Figure 8; see *Notes* below).

Taxonomy

Goodenia austrina L.W.Sage & K.A.Sheph., *sp. nov.*

Type: South Coast Highway, west of Denmark, Western Australia [precise locality withheld for conservation reasons], 25 October 2016, *K.A. Shepherd & C.F. Wilkins* KS 1644 (*holo*: PERTH 09101926; *iso*: AD, BRI, CANB, K, MEL, NSW).

Goodenia sp. South Coast (A.R. Annels ARA 1846), Western Australian Herbarium, in Florabase, https://florabase.dbca.wa.gov.au/ [accessed 7 March 2024].

Erect to spreading, multi-stemmed, perennial *subshrub* 0.2–0.4 m high. *Stems* straight to slightly zig-zag, glandular, without a strong odour. *Leaves* in a basal rosette and some leaves extending up the stems, linear, entire, with scattered small lobes, or lyrate, flat, lamina (including petiole) 21–44 mm long, 0.5–2.2 mm wide, with dense, short glandular hairs on both surfaces and a dense tuft of white hairs in the axil, apex acute, base attenuate. *Inflorescence* a terminal raceme; peduncles 14–69 mm long, with glandular hairs; bracts linear, leaf-like but smaller, entire, 3–40 mm long, 0.5–2 mm wide, densely glandular hairy on both surfaces, apex rounded to acute; bracteoles very narrowly ovate to linear, 1.9–16 mm long, 0.2–0.9 mm

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wide, densely glandular hairy, apex rounded to acute; pedicels 2.9–16.6 mm long, articulate below the ovary. *Sepals* ± equal, narrowly elliptic to elliptic, 3.5–6.3 mm long, 0.3–0.8 mm wide, usually appressed to corolla tube, densely, glandular hairy on both surfaces and margin, sometimes with occasional simple hairs, apex acute. *Corolla* 10.5–16 mm long, blue with white at base of lobes and in throat, pouch absent, outer surface with scattered glandular hairs, sometimes with scattered simple hairs on wings, inner surface mostly glabrous but with hairs 0.2–0.6 mm long lower down in throat. *Abaxial corolla lobes* 4.9–8.6 mm long, 1.3–2.4 mm wide, apex acute, basally fused for a further 3.2–5.2 mm; wings 4.9–8.7 mm long, 1.7–2.8 mm wide, entire, slightly undulate, slightly exceeding the lobe. *Adaxial corolla lobes* 7.3–9.8 mm long, 1.6–2.1 mm wide, apex acute, basally fused for a further 1.4–2.3 mm; auricle 2.7–4.3 mm long, 1.5–2.7 mm wide, with dense hairs 0.6–0.9 mm long on the inner margin; wing above auricle 5.3–6.7 mm long, 2–2.7 mm wide; wing opposite auricle 4–6 mm long, 1.8–2.5 mm wide. *Stamen* filaments linear, 2.9–3.7 mm long, 0.3–0.5 mm wide; anthers linear to narrowly oblong, 0.9–1.8 mm long. *Style* 4.3–5 mm long, 0.2–0.5 mm wide, upper half with scattered white hairs 0.3–0.7 mm long, indusium obovoid, 1.2–2 mm long, 1.8–3 mm wide, abaxial surface glabrous, adaxial surface with scattered hairs 0.3–0.7 mm long, upper lip with dense, white or purple-tinged bristles 0.3–0.5 mm long, lower lip glabrous or with bristles to 0.1 mm long near each outer margin. *Ovary* cylindrical, with sepal bases fused to outer surface and dark in appearance, tapering towards base, (3)4–8.2 mm long, 1.6–2.9 mm wide, with scattered to moderately dense glandular hairs, septum 2/3 to almost as long as locules, with 14–24 ovules in 2 rows. *Fruit* a cylindrical capsule, 8–9 mm long, with glandular hairs, valves opening. *Seeds* ovate, flat, cream, 1.1–1.8 mm long, 0.8–1.4 mm wide, faintly areolate; wing 0.1–0.2 mm wide, slightly overlapping seed margin. (Figure 1)

Diagnostic features. Unique within *G.* subg. *Monochila* sect. *Caerulea* in being a multi-stemmed perennial with the following features: a basal rosette of linear to lyrate leaves covered in glandular hairs; leaf-like bracts; very narrowly ovate to linear bracteoles 1.9–16 mm long; narrowly elliptic to elliptic, acute sepals 3.5–6.3 mm long and 0.3–0.8 mm wide; a blue corolla 10.5–16 mm long, with scattered glandular hairs on the outer surface and a white throat with hairs 0.2–0.6 mm long deep inside; a cylindrical and smooth ovary (3)4–8.2 mm long and 1.7–2.9 mm wide, tapering towards the base with 14–24 ovules; and cream, faintly areolate seeds 1.1–1.8 mm long and 0.8–1.4 mm wide with a wing 0.1–0.2 mm wide.

Other specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 1 Dec. 2010, *D. Angus* DA 068 (PERTH 08391890); 29 Oct. 1991, *A.R. Annels* ARA 1846 (PERTH 03176738; PERTH 04297628); 5 Oct. 2000, *A. Burchell* 409 (PERTH 05831644); 27 Nov. 2001, *R.J. Cranfield* 17578 (PERTH 06749852); 19 Nov. 1983, *E.J. Croxford* 5714B (PERTH 04420128); 19 Nov. 1983, *E.J. Croxford* 5724 (PERTH 02837609); 28 Jan. 1985, *E.J. Croxford* 4500 (PERTH 03230252); 11 Jan. 1987, *G.J. Keighery* 9359 (PERTH 02647885).

Phenology. Flowering material has been observed from September to November (spring to early summer). Fruits are present on specimens collected in November.

Distribution and habitat. Currently known from several populations near the southern coast of Western Australia from east of Walpole to Waychinicup National Park, east of Manypeaks, in the Esperance Plains, Jarrah Forest and Warren bioregions (Figure 2). It grows in brown loamy sand near exposed granite in fringing vegetation including *Eucalyptus preissiana*, *E. marginata*, *Banksia coccinea*, *Melaleuca* sp., *Adenanthos* sp., *Leucopogon* sp., *Commersonia corniculata* and sedges.

Conservation status. Listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), under the phrase name *G.* sp. South Coast (A.R. Annels ARA 1846). This species is currently only known from a few populations found on shallow soils near exposed granite outcrops. These populations may be susceptible to significant threats such as weed invasion, too frequent fires, population disturbance (through off-road vehicle activity and feral animals), and severe drought conditions, exemplified by those that occurred in the south-west of Western Australia during early 2024.

Figure 1. *Goodenia austrina*. A – habitat at the type locality; B – habit; C – basal leaves; D – flower; E – inflorescence showing the long bracteoles; F – flower from above; G – flower from below; H – flower, side view showing the absence of a pouch and small, elliptic sepals. Voucher: *K.A. Shepherd & C.F. Wilkins* KS 1644. Images by K.A. Shepherd.

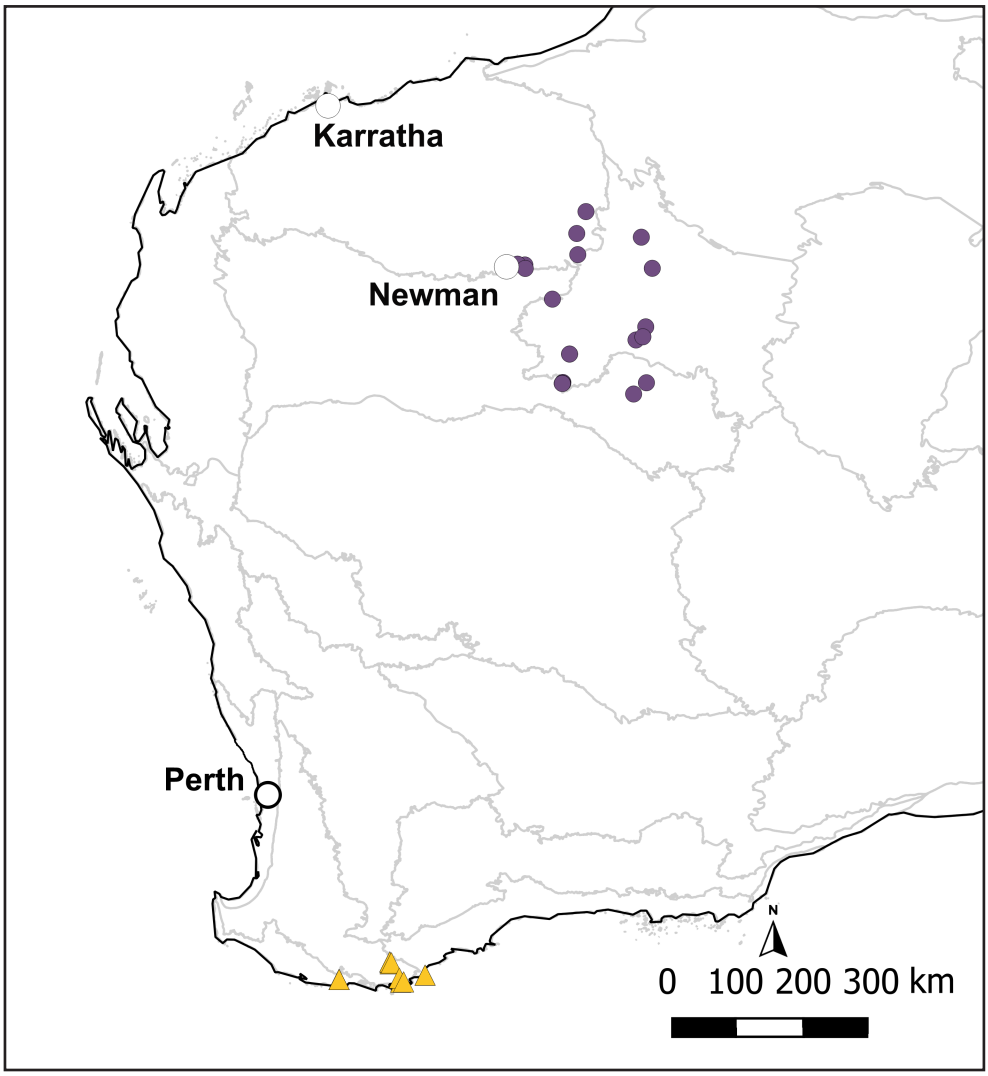

Figure 2. Distribution of *Goodenia austrina* (▲) and *G. vanleeuweniana* (●) in Western Australia based on PERTH specimen data, with IBRA subregions (Australian Government Department of Agriculture, Water and the Environment 2012) in pale grey.

Etymology. Named from the Latin *austrinus* (southern), in reference to its distribution in southern Western Australia.

Common name. Southern blue-flowered Goodenia.

Affinities. Based on analyses of nuclear and chloroplast DNA sequence data, *G. austrina* is placed within the subg. *Monochila* sect. *Caeruleae* clade *sensu* Shepherd *et al.* (2020), which includes the blue-flowered species of *Goodenia* from southern Western Australia that have seeds with a wing more than 0.1 mm wide. It should be noted that *G. austrina* did not align closely with any other species in this clade. Morphologically it is similar to the widespread *G. caerulea* R.Br. but is readily distinguished by its ovary, which is cylindrical with a tapered base and (3)4–8.2 × 1.7–2.9 mm (*cf.* ovary shape with a rounded base and 2.5–4(5) × 1.4–2.2 mm in *G. caerulea*), and blue corolla with a white throat (*cf.* blue corolla with a yellow throat).

Notes. Shepherd *et al.* (2020) referred to sect. *Caeruleae* as sect. '*Coeruleae*'. It has now come to light that the original name '*caerulea*' has been misinterpreted as '*coerulea*' more than once, for example in Carolin (1990), and in recent citations on the *Australian Plant Name Index* (Council of Heads of Australasian Herbaria 2006–) and *Florabase* (Western Australian Herbarium 1998–), most likely due to a misreading of the 'ae' dipthong in the original protologue (Brown 1810) (A. Monro pers. comm.).

Goodenia vanleeuweniana L.W.Sage & K.A.Sheph., *sp. nov.*

Type: Dolerite ridge, 37 km north-east of Mt Essendon, 22 km south-east of Lake Sunshine, Little Sandy Desert, Western Australia, 6 September 2002, *L.W. Sage, S. van Leeuwen, R.J. Cranfield, C. Wilkins, P. Nikulinsky, B. Bromilow, J. Tucker & M. Tutt* LWS 2506 (*holo*: PERTH 06962890 [Sheet 1 of 2], PERTH 06962882 [Sheet 2 of 2]; *iso*: BRI, CANB, DNA).

Goodenia sp. Sandy Creek (R.D. Royce 1653), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 7 March 2024].

Erect to spreading, multi-stemmed, perennial *subshrub* to *c*. 0.6 m high. *Stems* straight, glandular viscid with a strong unpleasant odour. *Leaves* cauline (basal leaves apparently always absent), very narrowly obovate, entire or unevenly denticulate to serrate, conduplicate, lamina (including petiole) 14–40 mm long, 2.5–7 mm wide, with dense, short, glandular hairs on both surfaces and margins but lacking hairs in the axil, apex obtuse to acute and usually recurved, base usually tapering. *Inflorescence* a terminal raceme or thyrse; peduncles 7–25 mm long, glandular hairy; bracts very narrowly obovate to linear, leaf-like but smaller, mostly entire, 12–38 mm long, 1.9–5 mm wide, densely, glandular hairy on both surfaces and the margins, apex obtuse to acute; bracteoles mostly linear to very narrowly obovate, 2.5–18 mm long, 0.7–1.5 mm wide, densely, glandular hairy, apex obtuse to acute; pedicels 1–8.1 mm long, articulate below the ovary. *Sepals* ± equal, very narrowly ovate to lanceolate, 6–11 mm long, *c*. 1 mm wide, spreading, densely, glandular hairy on the adaxial surface and margins, apex acute. *Corolla* 15–20 mm long, blue or purple with a lighter blue, purple or white throat and blue or purple striations on lobes, with a distinct pouch *c.* equal to length of ovary, outer surface with sparse glandular hairs and occasional long, simple hairs, inner surface with simple hairs and enations lower in throat, lobe margins with villous simple hairs. *Abaxial corolla lobes* 7.5–10.4 mm long, 2–2.6 mm wide, apex rounded; wings 6.1–8 mm long, 1.7–2.5 mm wide, rounded, entire, slightly exceeding the lobe. *Adaxial corolla lobes* 9.7–14.5 mm long, 1.9–2.6 mm wide, apex rounded, basally fused for a further *c*. 9 mm; auricle not obvious; wing above auricle 3.4–6 mm long, 1.8–2.2 mm wide; wing opposite auricle 4.3–7.8 mm long, 1.7–2.7 mm wide. *Stamen* filaments linear, 5–6.5 mm long, 0.3–0.6 mm wide; anthers narrowly oblong, 2.5–3.2 mm long. *Style* 9.7–11 mm long, 0.6–0.8 mm wide, villous, with simple hairs 0.4–1.8 mm long; indusium obovoid, 2–2.9 mm long, 2–2.8 mm wide, with simple, antrorse hairs 1.4–1.8 mm long on both surfaces, upper lip with prominent purplish-tipped white bristles 0.3–0.5 mm long, lower lip bristles to 0.1 mm long. *Ovary* ± cylindrical, tapering towards base, 6.7–9.5 mm long, with dense, glandular hairs to 0.5 mm long; septum two thirds to almost as long as locules, with 24–44 ovules in two rows, articulation below the ovary. *Fruit* a cylindrical capsule, *c.* 11 mm long, glabrous, valves opening. *Seeds* poorly known, only immature seen, ± ovate, flat, *c*. 1.7 mm long, *c.* 1.3 mm wide, reticulate to reticulate-foveate, with a narrow, brown rim; wing almost obsolete to *c*. 0.1 mm wide, possibly mucilaginous. (Figure 3)

Diagnostic features. *Goodenia vanleeuweniana* is a viscid, multi-stemmed perennial that has a distinctive foetid odour and a preference for rocky habitats and is further distinguished as unique within *G.* subgen. *Monochila* sect. *Scaevolina* by virtue of the following characters: leaves very narrowly obovate, conduplicate, 14–40 mm long; bracts very narrowly obovate to linear, leaf-like; bracteoles densely glandular hairy; sepals very narrowly ovate to lanceolate, 6–11 mm long and *c*. 1 mm wide; corolla 15–20 mm long, blue or purple with a lighter blue, purple or white throat and blue or purple striations on lobes, with sparse, glandular or simple hairs on the outer surface, villous hairs on the margins, and simple hairs and enations in the throat; ovary cylindrical with a tapering base and 24–44 ovules; and seeds ovate, with a narrow rim and almost obsolete wing *c*. 0.1 mm wide.

Other specimens examined. WESTERN AUSTRALIA: between Earaheedy and Glen Ayle Stations (ENE of Meekatharra), 20 July 1967, *J.S. Beard* 4795 (PERTH 02600781); Mine tenement, near Newman, 17 May 2007, *E. Carroll* WJ 18/11 (PERTH 08367701); 0.5 km S of Mobile Equipment Workshop, Ore Body 18 *c.* 30 km NE of Newman, 3 Sep. 2011, *R.J. Chinnock* 10303 (AD *n.v.*, PERTH 09191798); locality not given, 7 June 1979, *G. Davis* 90 (PERTH 01873997); 3 km NW of Glen Ayle Station, 18 Aug. 2000, *D.J. Edinger* 2209 (PERTH 05727235); *c*. 19 km NE of Newman, 24 Apr. 2009, *T. Edwards* 53

Figure 3. *Goodenia vanleeuweniana*. A – habit; B – flowers; C – bud, showing spreading sepals; D – open flower, side view showing the obvious pouch and hairy style. *Goodenia hartiana*; E – habit; F – flowers. Vouchers: *L.W. Sage* LWS 2888 (A–B), *M. Goods* DD 551 (C), *G. Goods* DD 507 (D); unvouchered plant near Telfer (E, F). Images by L.W. Sage (A, B, E, F) and M. Goods (C–D).

(PERTH 08678278); near camp, *c.* 4.1 km on a bearing of 297 degrees from Trig Point M6, Carnarvon Range, Birriliburu Indigenous Protected Area [plot C013], 10 Aug. 2012, *N. Gibson, S. van Leeuwen, M.A. Langley & K. Brown* NG 6968 (PERTH 08819718); western end of Carnarvon Range, *c.* 3.5 km on a bearing of 303 degrees from Trig Point M6, Carnarvon Range, Birriliburu Indigenous Protected Area [plot C012c], 9 Aug. 2012, *N. Gibson, S. van Leeuwen, M.A. Langley,& K. Brown* NG 6969 (PERTH 08819696); Canning Stock Route, 13.3 km N of Well 12 – E of CSR, 24 May 2013, *G. Goods* DD 507 (PERTH 08749221); Canning Stock Route, 4.8 km N of Well 12, 25 May 2013, *M. Goods* DD 551 (PERTH 08749248); Serpents Glen, Carnarvon Range, Little Sandy Desert, 4 Aug. 2001, *K.F. Kenneally & D.J. Edinger* K 12183 E 2647 (PERTH 05848598); 2 km N of Serpents Glen, Carnarvon Range, Little Sandy Desert, 5 Aug. 2001, *K.F. Kenneally & D.J. Edinger* K 12195 E 2660 (PERTH 05848709); *c*. 2 km S of Balfour Downs Homestead on homestead access road to Talawanna Track, 8 Apr. 1995, *A.A. Mitchell* PRP 58 (NSW *n.v.*, PERTH 04272528); Little Sandy Desert, 23 Apr. 1979, *A.S. Mitchell* 554 (NT *n.v.*, PERTH 02598841); between Lake Disappointment and Robertson Range, Aug. 1973, *G.N. Royce s.n.* (PERTH 02640848); 10 miles N of Sandy Creek on Rabbit Proof Fence, 14 May 1947, *R.D. Royce* 1653 (PERTH 02603926); 10 km N of Well 13, Canning Stock Route, 17 Aug. 2007, *W.A. Thompson* WAT CSR 16 (PERTH 09153950); Little Sandy Desert, 28 km N of Cooma Well along the No. 1 Vermin Proof Fence, 14 Aug. 2001, *S. van Leeuwen* 4881 (PERTH 06473059); BDRN03, 13.9 km WNW of Christie Crossing on Oakover River, 9.7 km WNW of Mt Hodgson, 114.8 km ESE of Nullagine, Mt Divide Station, Pilbara IBRA, 6 May 2006, *S. van Leeuwen et al*. PBS 5778 (PERTH 08899886); BDRN03, 13.9 km WNW of Christie Crossing on Oakover River, 9.7 km WNW of Mt Hodgson, 114.8 km ESE of Nullagine, Mt Divide Station, Pilbara IBRA, 12 Aug. 2006, *S. van Leeuwen et al*. PBS 5798 (PERTH 08899894).

Phenology. Observed flowering from April to September. Flowering is most likely dependent upon adequate rains. Fruiting from early summer.

Distribution and habitat. Endemic to Western Australia, occurring north and eastwards of Newman, predominantly in the Little Sandy Desert bioregion but extending into the adjacent areas of the Pilbara and Gascoyne bioregions (Figure 2). It occurs primarily on rocky soils including on rocky ridges tops, buckshot plains or low stony hills, and is associated with *Eucalyptus* spp., *Acacia* spp., *Triodia* spp. and other Goodeniaceae species.

Conservation status. A relatively widespread species currently known from 19 populations, so it is not considered to be a species of conservation concern, though no populations are currently known from the conservation estate.

Etymology. Named for Professor Stephen J. van Leeuwen (SVL) in recognition of his substantial contribution to the conservation of Western Australia's flora, especially his passionate work in the Pilbara. This has included leading the Pilbara biological surveys (in which we participated), tireless work in support of conservation research, mentoring others, and providing inspiring Indigenous leadership, particularly through his recent appointment as the BHP Curtin Indigenous Chair of Biodiversity and Environmental Science. Stephen has provided ongoing support and encouragement to both of us, particularly during his tenure at the Department of Biodiversity, Conservation and Attractions (and its predecessors), for which we are very grateful.

Common name. van Leeuwen's Goodenia.

Affinities. Phylogenetic analyses of chloroplast and nuclear molecular data placed *G. vanleeuweniana* within the subg. *Monochila* sect. *Scaevolina* clade, sister to *G. hartiana* (Shepherd *et al.* 2020). It can be distinguished from this species by its attenuate ovary base (*cf.* rounded in *G. hartiana*), conduplicate, very narrowly oblanceolate leaves with an obtuse to acute apex (*cf.* flat, oblanceolate leaves with a rounded apex), slightly larger flowers (corolla 15–20 mm long *cf.* 10–17 mm), and longer bracteoles (2.5–18 mm long *cf.* 2.5–3 mm). *Goodenia vanleeuweniana* is found primarily in rocky habitats whereas *G. hartiana* is situated in sandy habitats including dune swales and sand hills (Sage & Albrecht 2006). *Goodenia*

vanleeuweniana could be confused with the arid zone taxon *G. azurea* subsp. *hesperia* L.W.Sage & Albr. but differs by the absence of basal leaves and its longer sepals (6–11 mm long *cf.* to 4.5 mm).

Notes. Field observations and collection details from herbarium material suggest that *G. vanleeuweniana* resprouts from a basal stock following fire or mechanical disturbance such as road or track grading. Plants of *G. vanleeuweniana* are viscid to touch and have a distinctive and lingering unpleasant odour.

Amendments to the *Flora of Australia* key for *Goodenia*

Goodenia austrina may be inserted into the *Flora of Australia* key to *Goodenia* (Carolin 1992: 150) by altering couplets 9, 13 and 14 of Group 1, as follows:

9 At least the lower leaves lyrate or pinnately lobed

10 Leaf lobes broader than linear; Vic ..... **57. G. macmillanii**

10: Leaf lobes linear; northern Australia ..... **17. G. gloeophylla**

9: None of the leaves lyrate or pinnately lobed

11. Corolla lobes almost equal in length (adaxial lobes *c.* 3/4 as long as abaxial lobes) ..... **27. G. scaevolina**

11: Corolla lobes very unequal in length (adaxial lobes 1/2 to 3/5 as long as abaxial lobes)

12 Herb with basal leaves

13 Corolla to 7 mm long; leaves obovate to lanceolate; northern Australia ..... **20. G. viscidula**

13: Corolla more than 11 mm long

14 Leaves linear; south-western W.A.

14b Ovary with a rounded base; corolla prominently pouched; abscission line below ovary; fruit ovoid ..... **34. G. caerulea**

14b: Ovary tapering towards base; corolla not pouched or inconspicuous; no abscission line below ovary; fruit cylindrical ..... **G. austrina**

14: Leaves broader than linear; north-western Australia ..... **28. G. stobbsiana**

Goodenia vanleeuweniana and *G. hartiana* (as per Sage & Albrecht 2006), can be included in the *Flora of Australia* key to *Goodenia* (Carolin 1992: 151) by altering couplets 16 and 17 of Group 1, as follows:

16: Leaves linear to oblanceolate, narrowly elliptic or narrowly obovate, mostly to 7 mm wide

17 Sepals to 2 mm long; corolla lacking enations; bracteoles linear; ovules numerous; monsoonal northern Australia ..... **17. G. gloeophylla**

17: Sepals >3 mm long; corolla with enations; bracteoles broader than linear; ovules to *c.* 24; south-western and arid W.A.

17a Ovules to 15; seeds with aculeate cellular projections; south-western W.A. ..... **52. G. xanthotricha**

17a: Ovules 24–44; seeds reticulate to reticulate-foveate; north-western W.A.

17b Ovary rounded at base; ovules *c.* 24; leaves flat, apex round; occurs on sandy soils ..... **G. hartiana**

17b: Ovary tapering at base; ovules 24–44; leaves conduplicate, apex obtuse to acute; occurs on rocky habitats ..... **G. vanleeuweniana**

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at PERTH; Malcom Trudgen for recognising *Goodenia vanleeuweniana* as a distinct species and bringing it to our attention; and the editorial team at *Nuytsia* including Tanya Llorens (DBCA) for providing an up-to-date conservation assessment, Juliet Wege for editorial assistance, and Brendan Lepschi for providing a helpful review.

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New taxa and a key for *Thryptomene* (Myrtaceae: Chamelaucieae: Thryptomeninae)

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Abstract

Rye, B.L. New taxa and a key for *Thryptomene* (Myrtaceae: Chamelaucieae: Thryptomeninae). *Nuytsia* 35: 101–135 (2024). A description is given for *Thryptomene* Endl. together with a key to all species and subspecies. Nine new Western Australian taxa are described as *T. butleri* Rye, *T. caduca* subsp. *incurva* Rye, *T. conica* Rye, *T. dampieri* subsp. *capensis* Rye, *T. interzonensis* Rye, *T. jilbadji* Rye, *T. maritima* Rye, *T. maritima* subsp. *freycinetensis* Rye and *T. pieroniae* Rye. Updated descriptions are given for *T. caduca* Rye & Trudgen, *T. dampieri* Rye and *T. salina* Rye & Trudgen and brief descriptions are given for three phrase-named taxa to inform future research. *Thryptomene* sp. Leinster (B.J. Lepschi & L.A. Craven 4362) is synonymised under *T. decussata* (W.Fitzg.) J.W.Green. Most of the new taxa are conservation-listed.

Introduction

Thryptomene Endl. is an endemic Australian genus of the Myrtaceae tribe Chamelaucieae DC. and is now the sole genus in subtribe Thryptomeninae Benth. (Rye *et al.* 2020). About 60 species and subspecies are now recognised, with representatives in all Australian States and Territories but with a large majority restricted to Western Australia, where ten phrase-named taxa were current prior to this study (Western Australian Herbarium 1998–). One additional undescribed species, *T.* sp. Missionary Plain (A. Schubert 267), is known from central Australia (Northern Territory Herbarium 2013).

Three issues have delayed the publication of new names for the species and subspecies treated herein: i) insufficient material for some taxa to be adequately described; ii) uncertainty as to the status of taxa belonging to difficult species complexes; and iii) uncertainty regarding the circumscription of *Thryptomene*, as Stapf (1924) had suggested that *Paryphantha* Schauer might need to be reinstated. Although species of *Paryphantha s. str.* are distinguished by having a curved-urceolate connective gland on their anthers, this genus is nested within *Thryptomene s. lat.* in unpublished molecular data (Peter Wilson pers. comm.). Recent collections of the rare taxa have assisted in the resolution of the other issues.

The aims of this paper are to describe a number of unnamed members of the genus so that they can be included in a treatment for *Flora of Australia*, to present an up-to-date, Australia-wide key to the species and subspecies, and to provide information on the remaining phrase-named taxa. George and Sharr (2021) was consulted for the etymology of plant names. Methods used in obtaining descriptions are as given in Rye (2013).

Generic description

Thryptomene Endl., *Stirp. Herb. Hügel.* 192 (1838); *Thryptomene* Endl. sect. *Thryptomene*; *Tryptomene* F.Muell., *Fragm.* 1(1): 11 (1858), *orth. var. Type*: *Thryptomene australis* Endl., *nom. cons.*

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Gomphotis Raf., *Sylva Tellur.* 103 (1838), *nom. rej. Type*: *Gomphotis saxicola* (A.Cunn. ex Hook.) Raf. [= *Thryptomene saxicola* (A.Cunn. ex Hook.) Schauer].

Paryphantha Schauer, *Linnaea* 17: 235–236 (1843); *Thryptomene* sect. *Paryphantha* (Schauer) Kuntze in T. Post & O. Kuntze, *Lex. Gen. Phan.* 559 (1903). *Type*: *Paryphantha mitchelliana* Schauer, *nom. illeg.* [= *Thryptomene calycina* (Lindl.) Stapf].

Astraea Schauer, *Linnaea* 17: 238–239 (1843), *nom. illeg.*, *nom. superfl.*; *Thryptomene* sect. *Astraea* Stapf, *Bot. Mag.* 149: t. 8995 (1924). *Type*: *Astraea saxicola* (A.Cunn. ex Hook.) Schauer [= *Thryptomene saxicola* (A.Cunn. ex Hook.) Schauer].

Bucheria Heynh., *Alph. Aufz. Gew.* 80 (1846), *nom. illeg.*, *nom. superfl. Type*: *Bucheria saxicola* (Hook.) Heynh., *nom. illeg.* [= *Thryptomene saxicola* (A.Cunn. ex Hook.) Schauer].

Thryptomene sect. *Euthryptomene* Kuntze in T. Post & O. Kuntze, *Lex. Gen. Phan.* 559 (1903), *nom. inval.*

Thryptomene sect. *Oligandron* Stapf, *Bot. Mag.* 149: t. 8995 (1924). *Type*: *Thryptomene oligandra* F.Muell.

Thryptomene sect. *Thryptocalpe* Stapf, *Bot. Mag.* 149: t. 8995 (1924). *Lectotype*, designated by B.L. Rye, *Nuytsia* 24: 273 (2014): *Thryptomene urceolaris* F.Muell.

Prostrate to tall shrubs, rarely trees, glabrous. *Young stems* smooth (not tuberculate), usually white or pale grey and dotted with oil glands, sometimes reddish at first. *Leaves* opposite, decussate, small, shortly petiolate or (in *T. naviculata*) sessile. *Peduncles* 1–3 per axil, 1–3-flowered, but with most species having just a single 1-flowered peduncle per axil. *Bracteoles* keeled. *Pedicels* ± absent in most species. *Flowers* primarily 5-merous or (in 2 species) 6- or 7-merous, actinomorphic. *Hypanthium* with a greater diameter than length in most species, longer than wide and/or dorsiventrally compressed in some species, longitudinally ribbed in about half the species, with varied other kinds of ornamentation less common; free part usually much shorter than the adnate part (but up to *c.* half as long in *T. decussata*). *Sepals* much shorter than to slightly longer than the petals, persistent in fruit. *Petals* 5(–7), broad, usually widely spreading in flower, white or pink to purplish or (in 1 species) yellow, in most species closing inwards in fruit to a somewhat erect position or to a more horizontal position over top of fruit, in a few species widely spreading in fruit or shed well before fruit matures; antipetalous colleters absent or minute. *Staminodes* rare or absent. *Stamens* inflexed in bud, 5–40, variously arranged but when 5 then all antisepalous and when numerous then in 2 series with outer series longer, much shorter than the petals. *Filaments* free. *Anthers* dorsifixed, versatile, commonly becoming mid to dark brown; thecae divergent at base, compact; connective gland free, dorsal-subterminal, broad-truncate or curved-urceolate, large. *Ovary* inferior, 1-locular; placenta near-basal or lateral; ovules erect (not pendulous), 2 and collateral or 4–10 in 2 rows. *Style* central and terminal (base not inset); stigma small, capitate. *Fertile fruits* indehiscent, inferior (but often with a convex summit protruding upwards), all or mostly 1-seeded. *Seeds* transversely reniform or of other depressed shapes in most species, erect and longer than wide in a few species, 1.2–2.1 mm long or across; testa membranous. *Sterile fruits* similar in shape to or more spherical than the fertile fruits, very hard.

Diagnostic characters. Distinctive in its anther morphology, which includes two basally divergent, compact thecae and a large, free connective gland. Other important characters: ovary inferior, 1-locular, with ovules on a near-basal or lateral placenta; style terminal; fruits indehiscent.

Size and distribution. *Thryptomene* is an endemic Australian genus with 54 formally named species, several subspecies and three phrase-named taxa currently recognised. More than 80% of the species are restricted to Western Australia, with most of those occurring in the south-west, but the genus also extends to north-east Queensland and to Tasmania.

Chromosome numbers. *n* = 9–11, with tetraploid numbers of *n* =18 and *n* = 22 also recorded (Rye 1979).

Notes. Some floral and fruiting characters in *Thryptomene* are shown in Figure 1, including the typical shape and colour of the anthers (Figure 1A). One character of importance in identifying Western Australian species groups or individual species is the shape of their flower buds, with a summit that ranges from concave to conic (Figure 1B, C, E). The ornamentation of the hypanthium in both fruit (Figure 1D) and flower is also diagnostic.

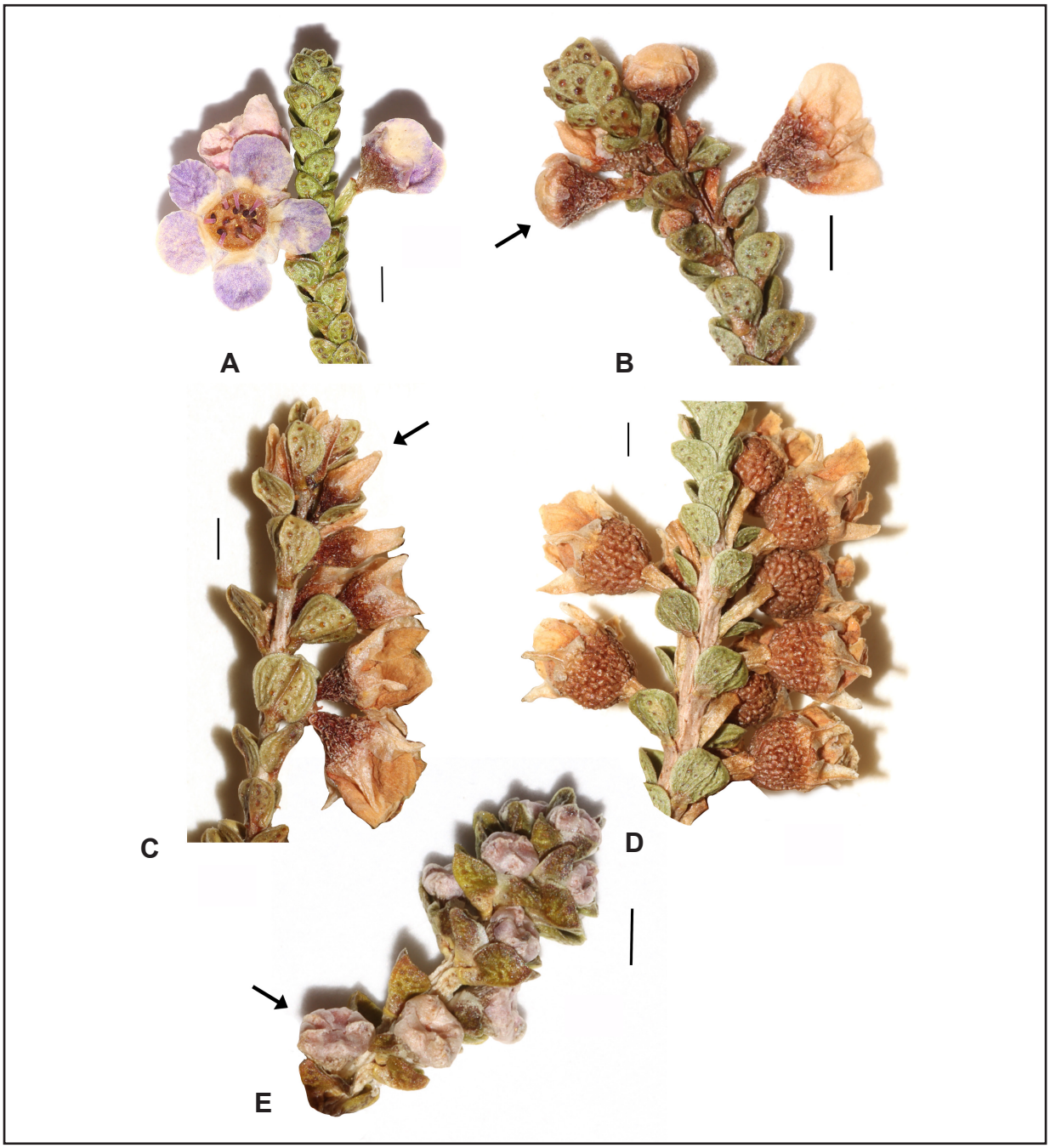

Figure 1. Flowering and fruiting branchlets in the *Thryptomene caduca* (A–D) and *T. dampieri* (E) complexes. A – *T. caduca* subsp. *caduca* top view of flower and side view of bud just starting to open, showing the blistered appearance of the hypanthium and almost triangular sepals; B – *T. caduca* subsp. *incurva* obtuse buds (one arrowed) with depressed ovate sepals; C – *T. conica* acute buds (one arrowed); D – *T. conica* fruits with sepal sides closed together distally and a rugose-tuberculate hypanthium; E – *T. butleri* flower buds with concave apex (one arrowed). Images by Juliet Wege from *L.S.J. Sweedman* 9549 (A), *H. Demarz* 11302 (B), *B. Dell s.n.*, PERTH 04499131 (C), *A.G. Gunness* AG 2360 (D), *M.E. Trudgen, B. Moyle & C. Wilkins* MET 21853 (E). Scale bars = 1 mm.

Stapf (1924) published an infrageneric classification for *Thryptomene*, dividing the genus into five sections. Prior to his paper, only the typical section and sect. *Paryphantha* (Schauer) Kuntze had been recognised. A molecular framework and re-assessment of morphological characters are needed to determine how many of the previously named sections of *Thryptomene* should be recognised and whether any additional sections are needed.

Key to species and subspecies

1. Ovules 4–10, in 2 rows. Hypanthium with 8–16 closely packed ribs extending for its full length

2. Stamens 15–40 in 2 series

3. Mature peduncles 0–0.3 mm long. Sepals 2–3.3 mm long. Ovules 5–10. Mature style 2.5–3.5 mm long (Yaringa Stn–near Congo Creek–Lee Steere Range–Leonora area, W.A.) ..... **T. decussata**

3: Mature peduncles 0.7–1.4 mm long. Sepals *c.* 1.4 mm long. Ovules 4. Mature style *c.* 0.7 mm long (Binnu area, W.A.) ..... **T. duplicata**

2: Stamens 5–13 in 1 series

4. Stamens 10 in most flowers, with one ± opposite each sepal and each petal, sometimes up to 12 in a few flowers

5. Leaf apical point (0.7–)1–2 mm long (where best developed). Ovules 6–9. Mature style 0.3–0.6 mm long. Occurs on granite outcrops and in other rocky habitats (N of Cue–Wongan Hills area–Tallering Peak–near Menzies, W.A.) ..... **T. costata**

5: Leaf apical point absent or to 0.5 mm long. Ovules 4–6. Mature style 0.6–0.8 mm long. Occurs around low-lying winter-wet sites (2 species), the habitat of *T.* sp. Coolgardie not recorded

6. Rapidly growing young stems not winged. Hypanthium ribs flattened and closely pressed together giving a striate appearance. Occurring north of Geraldton (Kalbarri NP–W of Binnu, W.A.) ..... **T. striata**

6: Rapidly growing young stems narrowly 4-winged. Hypanthium ribs rounded to almost acute and separated by v-shaped sinuses. Occurring south of Geraldton

7. Leaf blades narrowly to broadly obovate, 2–7 × 0.9–2.1 mm; apical point absent or to 0.3(–0.5) mm long. Occurring less than 200 km from the coast (Wilroy–Gingin–Ejanding, W.A.) ..... **T. mucronulata**

7: Leaf blades very broadly obovate, 2–3 × 1.8–2.3 mm; apical point 0.4–0.5 mm long. Occurring more than 500 km inland (Coolgardie area, W.A.) ..... **T.** sp. **Coolgardie**

4: Stamens 5–13, all opposite sepals or irregularly arranged (never regularly 10 opposite the sepals and petals)

8. Leaf apical point absent or rarely to 0.1 mm long. Stamens 5–7, not consistently 7 (Mt Holland area–Emu Rock area, W.A.) ..... **T. salina**

8: Leaf apical (or subapical) point 0.2–1.5 mm long. Stamens 7–13, not consistently 7

9. Leaves fairly flat, obovate to almost circular; apical point 0.2–0.5 mm long. Bracteoles persistent in fruit. Ovules 4 (Kalbarri NP, W.A.) ..... **T. johnsonii**

9: Leaves thick, linear to obovate in outline; apical point 0.5–1.5 mm long. Bracteoles shed in bud or flower. Ovules 5–8

10. Leaves almost terete with an adaxial groove, 2.5–4 mm long, with a subterminal point 0.8–1.5 mm long (Menzies–Pinjin Stn, W.A.) ..... **T. eremaea**

10: Leaves triangular or indented-triangular in TS towards the apex and tending to be more flattened below, 3–9 mm long, tapered at apex to a terminal point 0.5–1 mm long

11. Stamens almost reaching style when pressed inwards; filament 0.7–1.1 mm long. Mature style 0.6–0.8 mm long (Near Kalannie–Darling Range–Frank Hann NP–Lort River, W.A.) ..... **T. australis** subsp. **australis**

11: Stamens well separated from style when pressed inwards; filament 0.4–0.6 mm long. Mature style 0.35–0.6 mm long (SE Coolgardie–Cape Arid NP, W.A.) ..... **T. australis** subsp. **brachyandra**

1: Ovules 2, collateral. Hypanthium with a rugose to almost smooth surface or with 5 or 10 more widely spaced, full-length ribs or (when 6-merous) sometimes 12-ribbed

12. Flowers all or mostly 6- or 7-merous, with 6–8 stamens

13. Leaves with a petiole 0.6–0.8 mm long. Sepals 1–1.3 mm long, ± entire. Occurring in central and eastern Australia (Palm Valley, N.T. & N of Charleville, Qld–near Dubbo, N.S.W.) ..... **T. hexandra**

13: Leaves sessile. Sepals 1.8–2.5 mm long, deeply denticulate-laciniate. Occurring in W.A. (near Jigalong–Karlamilyi NP–near Gibson Desert NR, W.A.)..... **T. naviculata**

12: Flowers all or mostly 5-merous, with 5–16 stamens, but most species primarily with either 5 or 10 stamens

14. Stamens 5 in all or most flowers. Sepals slightly shorter than to distinctly longer than the petals. Mature style 0.25–0.5(–0.6) mm long

15. Sepals and petals yellow. Leaf blades as broad as or broader than long (1.5–2.2 mm long, 1.5–2.5 mm wide); apical point recurved, to 0.2 mm long. Occurring in N.T. (Missionary Plain, N.T.)..... **T.** sp. **Missionary Plain**

15: Sepals and petals white or pink. Leaf blades narrower than long in most species, always differing in some respects from above choice. Occurring in W.A., S.A. or eastern Australia

16. Hypanthium broad at the base and usually becoming saccate (pouched on each side of the peduncle). Outermost sepal strongly ridged, sometimes shortly horned (Great Victoria Desert, W.A.–Wynbring, S.A.)..... **T. elliottii**

16: Hypanthium narrow where the peduncle is attached, not saccate. Outermost sepal not strongly ridged

17. Sepals somewhat longer than the petals

18. Leaves narrowly obovate-elliptic to linear in outline, 0.7–1.2 mm wide, 0.3–0.5 mm thick, i.e. more than 1/3 as thick as wide (Kangaroo Island & Eyre Peninsula, S.A.)..... **T. ericaea**

18: Leaves narrowly elliptic or narrowly obovate to broadly obcordate, 1–4 mm wide, not noticeably thickened

19. Petals 0.5–0.8 mm long

20. Petioles 0.8–1.7 mm long. Leaf blades 1–1.3 mm wide. Hypanthium 1.7–2.5 mm long (Eyre Peninsula, S.A.–eastern Tas.)..... **T. micrantha**

20: Petioles 0.4–0.7 mm long. Leaf blades 1.8–2.6 mm wide. Hypanthium 0.7–1 mm long (Suttor River, Qld–near N.S.W. border) ..... **T. parviflora**

19: Petals 0.9–1.4 mm long

21. Leaf blades 5–12 mm long. Peduncles 1–3 per axil, 1.3–2.5 mm long, 1–3-flowered. Occurring in Victoria (Grampians area, Vic.)..... **T. calycina**

21: Leaf blades 1.7–4.5 mm long. Peduncles 1 per axil, 0.4–0.8 mm long, 1-flowered. Occurring in W.A.

22. Leaves broadly or very broadly obovate, 1.7–3 mm long; apical point absent or fairly erect. Sepals and petals erect in fruit (Eurardy Stn–Yuna area & Mt Singleton, W.A.)..... **T. pieroniae**

22: Leaves narrowly obovate, 3.5–4.5 mm long; apical point strongly recurved. Sepals widely spreading and petals closed inwards in fruit (Jaurdi Stn–Parker Range, W.A.) ..... **T. interzonensis**

17: Sepals somewhat shorter than, or rarely as long as, the petals

23. Shrub or tree to 10 m high. Hypanthium 1–1.5 mm long. Fruits broader than long (Cape York Peninsula & Lizard Island, Qld)..... **T. oligandra**

23: Shrubs with maximum heights of 1–2.6 m. Hypanthium 1.5–2.6 mm long. Fruits longer than broad

24. Leaves very thick, almost terete, with a prominent apical point 0.2–1.5 mm long. Occurring in south-eastern W.A. and western S.A.

25. Leaves almost globular, 1.5–2.3 mm long. Flowers solitary, with a pedicel 0.5–3 mm long as well as a peduncle (Queen Victoria Spring NR, W.A.–near Wyola Lake & Maralinga, S.A.) ..... **T. biseriata**

25: Leaves almost narrowly oblong in outline, 3–4 mm long. Flowers 1–3 per peduncle, if solitary then sessile but secondary axes bearing lateral flowers sometimes present (Talleringa area, S.A.) ..... **T. longifolia**

24: Leaves flat to very thick but not terete, apical point absent or not more than 0.2 mm long. Occurring from central inland W.A. to the Pilbara and south-west

26. Peduncles 1–3 per axil, very dorsiventrally compressed. Anthers dehiscent by pores or short slits that are much shorter than thecae; connective gland curved-urceolate

27. Leaf blades obovate, 2–3.5 mm wide (E of Warburton, W.A.)..... **T.** sp. **Warburton**

27: Leaf blades narrowly obovate to linear in outline, 0.6–1.3 mm wide

28. Leaves not clustered, 3–5 mm long, 0.4–0.5 mm thick (Leinster–Neale Junction, W.A.)..... **T. nealensis**

28: Leaves tending to be densely clustered near the ends of branchlets, 6–16 mm long, not more than 0.3 mm thick (Karijini NP–Carnarvon Range–Mt Augustus, W.A.) ..... **T. wittweri**

26: Peduncles 1 per axil, somewhat compressed. Anthers dehiscent by slits that are about as long as the thecae; connective gland broad-truncate

29. Leaves broadly or very broadly obovate, wider than thick; apical point minute or absent. Hypanthium tending to develop a whitish bloom (Queen Victoria Rocks–Kambalda area, W.A.)..... **T. planiflora**

29: Leaves obovate to linear in outline or clavate, about as thick as wide or thicker than wide; apical point usually 0.2–1.4 mm long but often ± absent in *T. urceolaris*. Hypanthium lacking a bloom

30. Leaves 4–11 mm long. Hypanthium distally free for 0.2–0.35 mm

31. Leaves with an apical point 0.7–1.4 mm long. Petals 1–1.3 mm long. Flowers 3–4.5 mm diam. (Mullewa–Beacon–Merredin–Kondinin, W.A.)..... **T. cuspidata**

31: Leaves with an apical point 0.4–0.6 mm long. Petals 1.5–2.3 mm long. Flowers 5–7 mm diam. (N of Hyden–near Jilbadji NP, W.A.)..... **T. jilbadji**

30: Leaves 1.4–3.5(–4) mm long. Hypanthium distally free for 0.5–0.8 mm

32. Mature leaves with abaxial and adaxial surfaces distinctly delimited, 2–4 mm long; apical point recurved, 0.3–1 mm long. Peduncles 0.5–1.5 mm long. Flowers 2.5–4 mm diam. (Cadoux–Coolgardie–Frank Hann NP, W.A.)..... **T. kochii**

32: Mature leaves clavate, without a clear separation of the abaxial and adaxial surfaces, 1.4–2.5 mm long; apical point erect or absent, to 0.2 mm long. Peduncles 0.3–0.5 mm long. Flowers 4–5.5 mm diam. (Diemals Stn–Yindi Stn, W.A.) ..... **T. urceolaris**

14: Stamens 7–14(–16) in all or most flowers, except sometimes 5 or 6 in *T. denticulata* (which has sepals much shorter than the petals). Sepals much shorter than the petals in most species, but similar in size to the petals in *T. orbiculata* and *T. racemulosa*. Mature style (0.4–)0.5–1.7 mm long

33. Stamens 10, with one opposite each sepal and petal. Sepals with a thick herbaceous midrib and a conspicuous white petaloid margin, the outer ones with a horn to 0.3 mm long (Arnhem Land, N.T.) ..... **T. remota**

33: Stamens 5–16, when 10 then in pairs opposite the sepals or alternating with the sepals and petals. Sepals varied, sometimes with a less distinctively coloured petaloid margin than above choice, not horned except sometimes in *T. hubbardii*

34. Leaves long-linear in outline, *c.* as thick as wide; apical point *c.* 1 mm long. Stamens 7 or 8, almost equidistant, irregularly arranged in relation to the sepals and petals (Kalbarri NP, W.A.) ..... **T. pinifolia**

34: Leaves depressed ovate or circular to linear, much wider than thick; apical point absent or to 0.2 mm long. Stamens 5–16, usually 10 in most species, often paired opposite the sepals or regularly alternating with the sepals and petals

35. Sepals widely spreading or with distal half widely spreading in fruit, more than half as long as to slightly exceeding the petals

36. Young leaves denticulate to ciliolate on margins; apical point to 0.2 mm long. Sepals with a herbaceous, oil-dotted keel and scarious margins. Stamens *c.* 1/3 as long as the petals (East Yuna NR–Indarra Springs NR, W.A.) ..... **T. hubbardii**

36: Young leaves entire to denticulate on margins; apical point ± absent. Sepals without an obvious keel, rather petaloid. Stamens 1/2–2/3 as long as the petals

37. Mature peduncles 4–8 mm long. Hypanthium minutely papillose (East Yuna NR–Bindoo Hill NR, W.A.) ..... **T. velutina**

37: Mature peduncles 1–3 mm long. Hypanthium not papillose

38. Leaves very narrowly to broadly obovate, rarely almost circular, the broadest ones 1–2.5 mm wide. Flowers 3.5–6 mm diam. Stamen filaments 0.7–1.3 mm long (N of Geraldton–Kulin, W.A.) ..... **T. racemulosa**

38: Leaves broadly ovate to depressed-obovate, often ± circular, the broadest ones 2.3–3.3 mm wide. Flowers 5–8 mm diam. Stamen filaments 1.2–1.6 mm long (East Yuna NR–E of Walkaway, W.A.) ..... **T. orbiculata**

35: Sepals fairly erect to tightly closed inwards in fruit, much shorter than to somewhat more than half as long as the petals

39. Flower buds with apex concave to almost flat. Bracteoles mostly persistent in mature fruit and sepals closed in almost horizontally in fruit

40. Leaves 5–12 times longer than wide, not keeled. Hypanthium pitted in fruit

41. Leaves with 2 or 3 main rows of oil glands on each side of the midvein; glands 20–40 per row. Sepals glossy (Kalbarri NP, W.A.) ..... **T. calcicola**

41: Leaves with 1 or 2 rows of oil glands on each side of the midvein; glands 8–15 per row. Sepals dull (Chapman River area, W.A.) ..... **T. stenophylla**

40: Leaves ranging from slightly wider than long to 4 times longer than wide, often strongly keeled. Hypanthium smooth in fruit or rugose with irregular wrinkles and bumps, sometimes also with some pits

42. Hypanthium smooth in fruit (Near Irwin River–Mingenew–Arrino, W.A.) ..... **T. nitida**

42: Hypanthium rugose in fruit

43. Hypanthium with numerous low rounded bumps at least distally. Occurring in hilly terrain on various rock types including laterite (Hutt River–Chapman River area, W.A.) ..... **T. baeckeacea**

43: Hypanthium with longitudinal wrinkles. Occurring on limestone and coastal dunes

44. Mature leaves keeled only near the apex on abaxial surface (Baudin Island–Tamala Stn, W.A.) ..... **T. maritima** subsp. **freycinetensis**

44: Mature leaves mostly keeled for more than a quarter to the whole of their full length on abaxial surface

45. Leaves with a petiole 0.5–1.2 mm long; blade usually 3–6.5 mm long, with 6–12 oil glands in the two central rows, i.e. closest to the midvein on each side, on the abaxial surface. Petals 2–3 mm long

46. Peduncles borne at 1–8 consecutive nodes, 0.6–2 mm long. Recorded in crevices in sandstone or limestone and on sand dunes, usually in low coastal shrubland (N of Kalbarri–Yardanango NR, W.A.)..... **T. maritima** subsp. **maritima**

46: Peduncles borne at 5–14 consecutive nodes, 0.1–0.7(–1) mm long. Recorded in gullies and gorges, usually with *Acacia* and spinifex (Cape Range, W.A.) ..... **T. dampieri** subsp. **capensis**

45: Leaves with a petiole 0.2–0.7 mm long; blade usually 1.5–3 mm long (rarely to 4.5 mm long in *T. dampieri* but still with a short petiole), usually with 2–6 oil glands in the two central rows, i.e. closest to the midvein on each side, on the abaxial surface. Petals 1.3–2(–2.3) mm long

47. Peduncles borne at 7–22 consecutive nodes. Petals 1.3–1.7 mm long (near Leeman–Lancelin, W.A.)..... **T. butleri**

47: Peduncles borne at 2–8 consecutive nodes. Petals 1.5–2(–2.3) mm long (Exmouth area–Dirk Hartog Island–Hamelin Pool, W.A.)..... **T. dampieri** subsp. **dampieri**

39: Flower buds with apex usually shallowly convex to conic in most species, but flat to concave in *T. podantha*. Bracteoles caducous to persistent, if persistent then sepals fairly erect or only loosely closed inwards in fruit

48. Hypanthium ribbed in flower, becoming smooth or almost smooth in mature fruit, if not fully smooth then with a distinct pedicel, 1–1.4 mm long, as well as a peduncle

49. Bracteoles persistent after fruits fall. Petals 3–3.5 mm long. Stamen filaments *c.* 1.7 mm long. Fruits with a peduncle less than 0.3 mm long and no pedicel (S of Eneabba, W.A.) ..... **T. spicata**

49: Bracteoles deciduous. Petals 2–2.5 mm long. Stamen filaments 0.6–1 mm long. Fruits with a peduncle 0.5–1.5 mm long and a pedicel 1–1.4 mm long (Meadow Stn–near Yuna, W.A.) ..... **T. podantha**

48: Hypanthium variously ornamented in flower, not becoming smooth in fruit, the pedicel ± absent or less than 0.3 mm long

50. Bracteoles caducous or shed in flower. Sepals folded and with an acute apex

51. Sprawling coastal dune plant, rooting at nodes of prostrate stems. Mature style *c.* 1.3 mm long, almost as long as the petals (Dirk Hartog Island & Steep Point, W.A.) ..... **T. repens**

51: Erect to widely spreading shrub, without adventitious roots, occurring inland or near the coast but not on dunes. Mature style 0.4–0.8 mm long, much shorter than the petals

52. Hypanthium somewhat ribbed at first, becoming smoother in fruit or the ribs more rounded (Cooloomia NR–Meadow Stn–Pindar, W.A.)..... **T. strongylophylla**

52: Hypanthium densely blistered in bud, densely tuberculate in fruit

53. Longest sepals 1–1.5 mm long. Flowers with a conic apex in late bud, mostly with 10 stamens; hypanthium 1.1–1.6 mm long (Cooloomia NR–Meadow Stn–Pindar, W.A.)..... **T. conica**

53: Longest sepals 0.4–0.8 mm long. Flowers with a convex apex in late bud, mostly with 7–9 stamens; hypanthium 0.6–1.1(–1.3) mm long

54. Flowers deeply convex in late bud, 5–6 mm diam. when fully open. Sepals (0.5–)0.6–0.8 mm long, fairly erect (near Hamelin Pool, W.A.)..... **T. caduca** subsp. **caduca**

54: Flowers shallowly convex in late bud, 3.5–4 mm diam. when fully open. Sepals 0.4–0.6 mm long, strongly incurved (Tamala Stn–Coburn Stn area–Murchison House Stn, W.A.)..... **T. caduca** subsp. **incurva**

50: Bracteoles mostly persistent in fruit, if caducous then sepals with a rounded apex

55. Hypanthium (in flower) rugose with wrinkles or ridges as well as pits. Outer sepals distinctly auriculate

56. Mature peduncles 0.5–2.5 mm long. Sepals keeled, distinctly denticulate to laciniate; margins often recurved or flat, not markedly incurved (Cooloomia NR–Wongan Hills, W.A.)..... **T. denticulata**

56: Mature peduncles ± absent or to 0.3 mm long. Sepals not keeled, ± entire; margins incurved

57. Leaves mostly with the apex (including dorsal ridge) recurved. Bracteoles with the midrib not very prominent (near Wannoo, W.A.) ..... **T. wannooensis**

57: Leaves with the apex (of the dorsal ridge) incurved. Bracteoles with the keel forming a prominent compressed ridge (near Eurardy Stn–Mullewa, W.A.)..... **T. globifera**

55: Hypanthium pitted, lacking wrinkles or ridges. Outer sepals not or scarcely auriculate

58. Peduncles solitary or 2 superposed in the axils, 1–3-flowered. Occurring near the south coast, mainly on granite (Augusta–Bremer Bay; Esperance area–Cape Arid NP–Middle Island, W.A.) ..... **T. saxicola**

58: Peduncles solitary in the axils, all 1-flowered or rarely a few of them 2-flowered. Occurring north of Perth, mainly on sand or laterite

59. Leaf blades 1.2–2.2 mm long. Mature peduncles 0.8–3 mm long, shorter than to about twice as long as the bracteoles. Bracteoles persistent (Carnamah–Wubin area, W.A.)..... **T. shirleyae**

59: Leaf blades 3–12 mm long. Mature peduncles 3–11 mm long, much longer than the bracteoles. Bracteoles usually caducous or shed in flower

60. Hypanthium (in mature fruit) with large deep pits, not papillose. Occurring south of Geraldton (Arrowsmith River–Mullering Brook, W.A.)..... **T. hyporhytis**

60: Hypanthium (in mature fruit) with numerous small shallow pits, sometimes also papillose. Occurring north and east of Geraldton (Moresby Range, W.A.)..... **T. stapfii**

Species and subspecies descriptions

A. The *Thryptomene caduca* Rye & Trudgen complex

The *T. caduca* species complex belongs to the *T. denticulata* (F.Muell.) Benth. group, which is unusual in having the ovary summit pink in young flowers but fading when the flowers age; other species groups in the sect. *Astraea* have the ovary summit green or yellow at first but turning pink or red as the flowers age. *Thryptomene caduca* was formally named in 2014 but the closely related taxon known as *T.* sp. Eagle Gorge (A.G. Gunness 2360) was left undescribed pending further study (Rye 2014: 279). Examination of some additional collections and the previously available specimens in both taxa has enabled *T.* sp. Eagle Gorge to be resolved as a distinct species, described below as *T. conica* Rye, and a novel subspecies to

be recognised within *T. caduca*. Sepal length in the complex is particularly variable, ranging from just 0.4 mm to 1.5 mm.

Thryptomene strongylophylla Benth. is similar to *T. caduca* and *T. conica* in most respects but differs in having its hypanthium longitudinally ribbed in bud and smoother or with the ribs more rounded in fruit, rather than with a densely tuberculate or irregularly bumpy surface (see Rye 2014: Figure 1 for both kinds of patterning). It tends to have a shorter style than *T. conica* and more numerous stamens than *T. caduca*.

Thryptomene caduca Rye & Trudgen in B.L. Rye, *Nuytsia* 24: 277–279 (2014). *Type*: Useless Loop Rd, Western Australia [precise locality withheld for conservation reasons], 1 August 1996, *G.J. Keighery & N. Gibson* 1992 (*holo*: PERTH 05045878; *iso*: CANB 826813, K, MEL 2389014).

Shrubs 0.7–1.5 m high, one record of 1.5 m wide. *Leaves* crowded and antrorse on branchlets, sometimes almost appressed when less densely arranged on older stems. *Petioles* almost absent to 0.3 mm long. *Leaf blades* obovate to broadly ovate or ± circular, 1.5–2.5 mm long, 1–1.5 mm wide, entire or sometimes minutely denticulate; abaxial surface convex and acutely keeled, with the keel distally incurved, with 1 or 2 main rows of oil glands on each side of the midvein and 3–7 glands per row; adaxial surface concave; apical point ± absent. *Peduncles* solitary in each axil, borne at 2–9 consecutive nodes, compressed or very compressed, 1–3 mm long, 1-flowered. *Bracteoles* ovate or broadly ovate, 1–1.3 mm long, caducous. *Pedicels* ± absent or rarely to 0.2 mm long. *Flowers* 5-merous, with a deeply to shallowly convex (or flat with curved margin) apex in bud, 3.5–6 mm diam. when fully open. *Hypanthium* very broadly obconic or expanded distally, 0.6–1.3 mm long, 1.2–1.8 mm diam., with a blistered surface at first; free part *c.* 0.3 mm long. *Sepals* very broadly or depressed ovate, 0.4–0.8 mm long, 0.7–1.3 mm wide, ± entire, ± erect to strongly incurved in bud; auricles (when present) less than 0.2 mm long. *Petals* 1.3–2.3 mm long, pink, ± entire, loosely closed inwards in fruit. *Stamens* 7–9, with 1 or 2 opposite each sepal, occasionally with the filaments of one pair connate. *Filaments* 0.35–0.6 mm long. *Anthers c.* 0.25 mm long, 0.3–0.4 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovary* summit pink at first; ovules 2. *Style* 0.5–0.7 mm long; stigma to 0.1 mm diam. *Fruits* very broadly or depressed obovoid, 1.2–1.4 mm long, 1.4–1.7 mm diam., 1-seeded; hypanthium cup-shaped, with numerous low, rounded, irregular ridges and bumps. *Seeds* transversely reniform, *c.* 1.1 mm high, *c.* 1.5 mm across. (Figures 1A, B; 2A)

Diagnostic characters. Distinguished by the following combination of characters: bracteoles caducous; flowers with a deeply convex or more flattened apex in late bud; hypanthium with a blistered surface at first, becoming irregularly rugose-tuberculate in fruit (with numerous low, rounded, irregular ridges and bumps); sepals very broadly or depressed ovate, 0.4–0.8 mm long; petals 1.3–2.3 mm long; stamens 7–9; style 0.5–0.7 mm long; ovules 2.

Distribution and habitat. Occurs in the Yalgoo and Geraldton Sandplain bioregions, extending from Tamala Station east to near the Coburn Station area, and from near Hamelin Pool south to Murchison House Station, Western Australia (Figure 3). Recorded in sandy habitats, the sand of varied colours including yellow to red, with vegetation usually dominated by *Banksia* or *Eucalyptus* species.

Phenology. Flowers mainly in July and August, also recorded in April. Mature fruits recorded in August and September.

Etymology. From the Latin *caducus* (caducous, shed early), referring to the bracteoles.

Affinities. This species is closest to *T. conica* (see notes under that species). It is also closely related to *T. strongylophylla* (see comments provided above under the species complex).

Notes. Two geographically separated subspecies are recognised that differ in sepal length, flower size and bud shape.

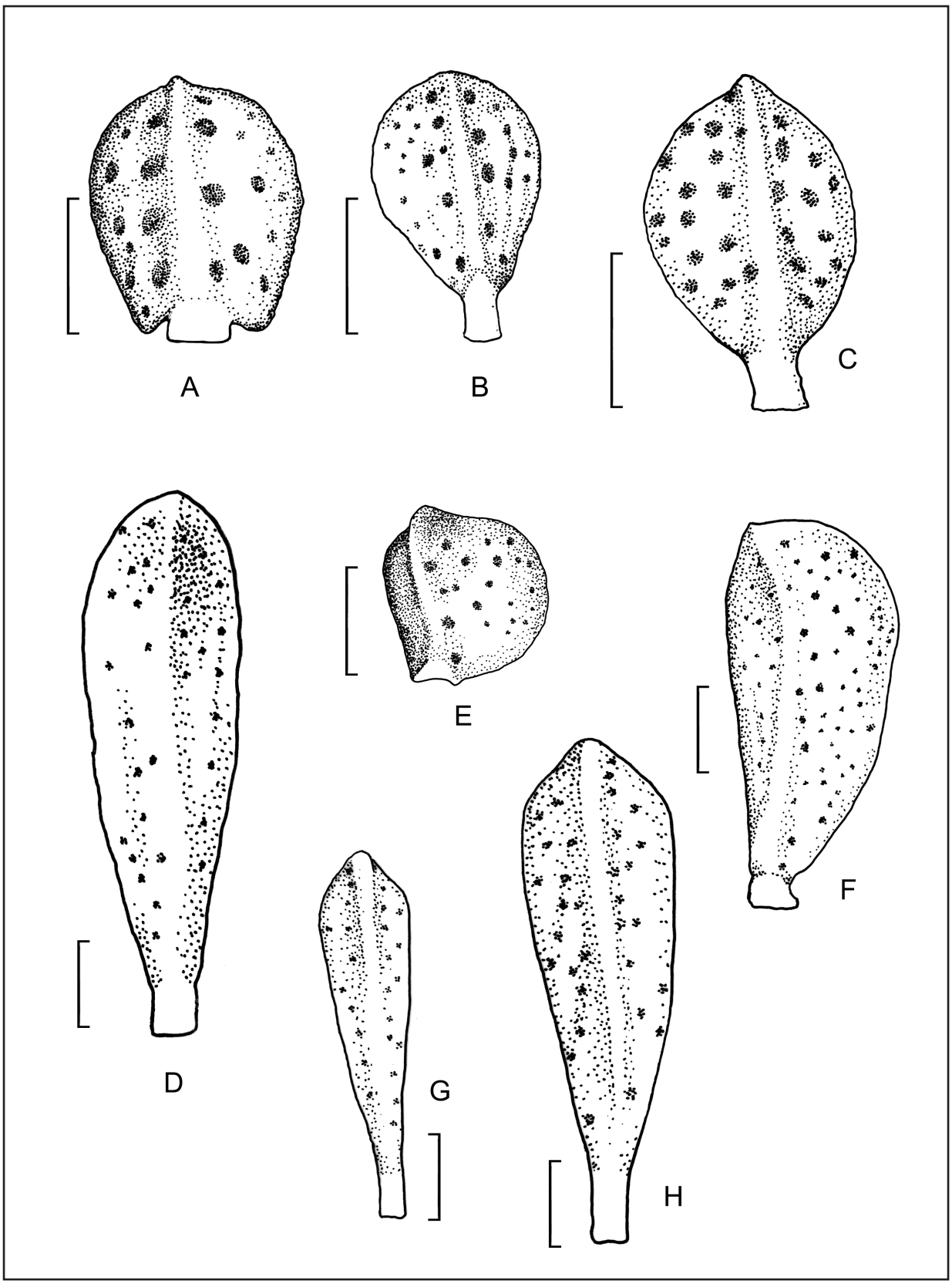

Figure 2. Leaf abaxial surface in the *Thryptomene caduca* (A, B) and *T. dampieri* (C–H) complexes. A – *T. caduca* subsp. *caduca*; B – *T. conica*; C – *T. butleri*; D – *T. dampieri* subsp. *capensis*; E, F – *T. dampieri* subsp. *dampieri*; G – *T. maritima* subsp. *freycinetensis*, showing the distal ridge by a line of dots; H – *T. maritima* subsp. *maritima*, showing a ridge extending along full length of blade. Drawn by Skye Coffey from *L.S.J. Sweedman* 9549 (A), *B. Dell s.n.*, PERTH 04499131 (B), *M.E. Trudgen, B. Moyle & C. Wilkins* MET 21853 (C), *Y. Chadwick* 2296 (D), *M.E. Trudgen* MET 21927 (E, F), *J.J. Alford* 1350 (G), and *A.G. Gunness* 2358 (H). Scale bars = 1 mm.

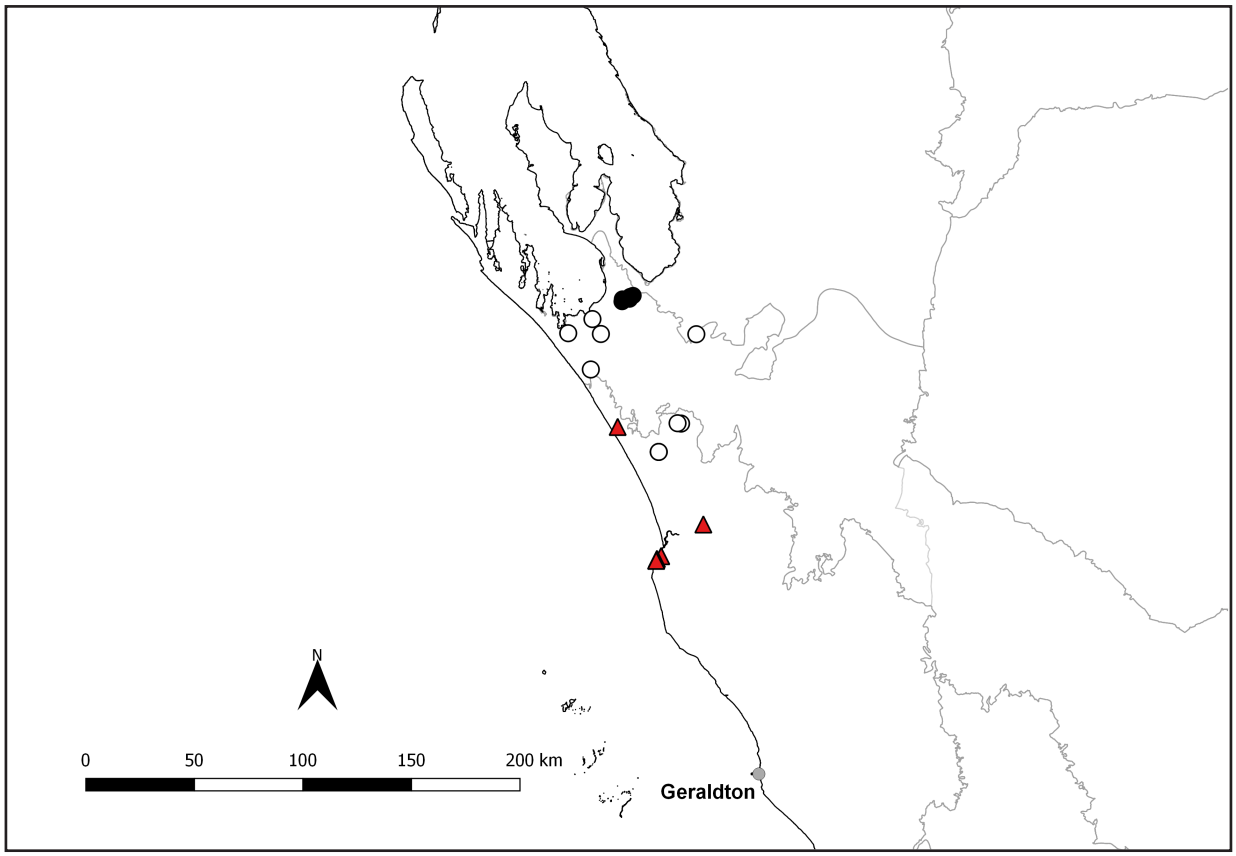

Figure 3. Distribution of the *Thryptomene caduca* complex: *T. caduca* subsp. *caduca* (●), *T. caduca* subsp. *incurva* (○) and *T. conica* (▲).

Thryptomene caduca Rye & Trudgen subsp. **caduca**

Flowers with a convex apex in bud, 5–6 mm diam. when fully open. *Hypanthium* 1–1.3 mm long. *Sepals* (0.5–)0.6–0.8 mm long, erect or loosely closed inwards in fruit. *Petals* 1.5–2.3 mm long. (Figures 1A, 2A)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 6 Aug. 1986, *S.D. Hopper* 5114 (PERTH); 19 Aug. 1995, *G.J. Keighery & N. Gibson* 937 (PERTH); 3 Aug. 1994, *M. Lewis* 26/94 (PERTH); 28 Aug. 2020, *L.S.J. Sweedman* 9549 (PERTH).

Distribution. Occurs in the Yalgoo bioregion where it is restricted to a small area not far south of Hamelin Pool, Western Australia (Figure 3).

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.).

Notes. Distinguished from subsp. *incurva* by its longer, more erect sepals and larger flowers, which are more convex at the summit in bud.

Mature fruits and seeds have not been collected for this subspecies.

Thryptomene caduca subsp. **incurva** Rye, *subsp. nov.*

Type: State Barrier Fence track, west from North West Coastal Highway, Western Australia [precise locality withheld for conservation reasons], 30 July 1996, *G.J. Keighery & N. Gibson* 2054 (*holo*: PERTH 05278686; *iso*: CANB 826809).

Thryptomene strongylophylla subsp. Tamala (M.E. Trudgen 7384), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Thryptomene sp. Tamala (M.E. Trudgen 7384) in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 404 (2000); Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Illustrations. B.L. Rye, *Nuytsia* 24: 278, Figure 1A (2014), as *T. caduca*.

Flowers with a shallowly convex (or flat with curved margin) apex in late bud, 3.5–4 mm diam. when fully open. *Hypanthium* 0.8–1.1 mm long. *Sepals* 0.4–0.6 mm long, strongly incurved. *Petals* 1.3–1.6 mm long. (Figure 1B)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 8 Apr. 1975, *J.S. Beard* 7392 (CANB, NSW, PERTH); 28 Aug. 1991, *A.H. Burbidge* 4370 (PERTH); 27 Aug. 1969, *A.S. George* 9590 (PERTH); 3 Aug. 1996, *G.J. Keighery & N. Gibson* 1984 (NSW *n.v.*, PERTH).

Distribution. Occurs in the Yalgoo and Geraldton Sandplain bioregions, extending from Tamala Station east to the Coburn Station area and south to Murchison House Station, Western Australia (Figure 3).

Etymology. From the Latin *incurvus* (bowed, curved inwards), referring to the sepals being strongly curved inwards in bud and in early fruit.

Conservation status. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). This subspecies has a range *c.* 80 km long and is known from at least one conservation reserve.

Notes. Distinguished from subsp. *caduca* by its shorter, more strongly incurved sepals and smaller flowers, which are shallowly convex to almost flat at the summit in bud. While the sepals are strongly incurved in bud and young fruit, they become more erect when the fruit swells to its full size.

Southern specimens tend to have more elongate leaves than northern specimens.

Thryptomene conica Rye, *sp. nov.*

Type: near Red Bluff, Kalbarri, Western Australia [precise locality withheld for conservation reasons], 18 August 1977, *R.J. Chinnock* 3736 (*holo*: PERTH 02188953; *iso*: AD 97744132 *n.v.*, PERTH 02188872).

Thryptomene sp. Eagle Gorge (A.G. Gunness 2360) in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 404 (2000); Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs 0.3–1(–1.5) m high, commonly *c.* 1 m wide, spreading or rounded, often broader than high. *Leaves* antrorse or almost appressed, overlapping except on very fast-growing shoots. *Petioles* 0.2–0.4 mm long. *Leaf blades* mostly broadly obovate, 1.2–2.5 mm long, 1.3–1.7 mm wide, broadly obtuse at apex, entire; abaxial surface convex and prominently keeled, with the keel distally incurved, with usually 2 or 3 main rows of oil glands on each side of midvein, the central rows with 3–6 prominent glands; adaxial surface concave, less prominently gland-dotted; apical point absent. *Peduncles* solitary in each axil, borne at 1–6(–12) consecutive nodes, compressed, 1–2 mm long, 1-flowered. *Bracteoles* ± oblong-ovate, 1.3–1.5 mm long, caducous. *Flowers* 5-merous, with a conic apex in bud, 5–6.5 mm diam. when fully open. *Hypanthium* very broadly obconic at first, 1.1–1.6 mm long, 1.6–2 mm diam., densely blistered; free part 0.3–0.4 mm long. *Sepals* spreading in flower, closed inwards in fruit and with the distal half having the

sides closed together, triangular to broadly ovate, 1–1.5 mm long, 0.5–1.1 mm wide, purple, ± entire; auricles (when present) less than 0.2 mm long. *Petals* 2–2.5 mm long, mauve-pink, broadly obtuse, entire, loosely closed inwards in fruit. *Stamens* 9 or usually 10, mostly in widely separated pairs opposite the sepals. *Filaments* 0.6–0.8 mm long, deep pink. *Anthers* 0.25–0.3 mm long, *c.* 0.4 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovules* 2. *Style* 0.6–0.8 mm long; stigma <0.1 mm diam. *Fruits* very broadly obovoid, 1.6–2.3 mm long, 1.8–2.3 mm diam., 1-seeded; hypanthium broadly cup-shaped, densely tuberculate. *Seeds* not seen at maturity. (Figures 1C, D; 2B)

Diagnostic characters. Distinguished primarily by the conic apex of the flower buds. Other important characters: bracteoles caducous; hypanthium with a blistered surface at first, becoming irregularly rugose-tuberculate in fruit; sepals 1–1.5 mm long; stamens usually 10; ovules 2.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 22 June 1982, *D. & B. Bellairs* 1650A (PERTH); 16 May 1971, *B. Dell s.n.* (PERTH); 19 Sep. 1994, *A.G. Gunness* 2359 (CANB, MEL, PERTH); 19 Sep. 1994, *A.G. Gunness* 2360 (AD, NSW, PERTH); 18 Aug. 1995, *G.J. Keighery & N. Gibson* 971 (BRI, NSW, PERTH); 22 Sep. 2002, *M.E. Trudgen* 21655 (PERTH).

Distribution and habitat. Occurs in the Yalgoo and Geraldton Sandplain bioregions, extending along the west coast from near the mid-point of the Zuytdorp Cliffs south to near Eagle Gorge in Kalbarri National Park, Western Australia (Figure 3). Recorded in gullies on sandstone or coastal limestone cliffs, in shallow sandy soil over rock, usually in low shrubland.

Phenology. Flowers from May to August. Fruits have been recorded in August and September.

Etymology. From the Latin *conicus* (cone-shaped), referring to the conic shape of the upper part of the flower buds, formed by the arrangement of the almost erect sepals.

Conservation status. Listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Eagle Gorge. All of the specimens come from Kalbarri National Park except for an isolated collection made *c.* 80 km further north. Within the park, almost all of the collections are from a coastal belt less than 10 km long.

Affinities and co-occurrence. *Thryptomene caduca* is closely related to *T. conica*, the two species being very similar in their hypanthium patterning, which changes from blistered in bud and young flower (Figure 1A–C) to irregularly rugose-tuberculate in fruit (Figure 1D); however, *T. caduca* has a less pronounced bud apex resulting from its discretely shorter sepals (0.4–0.8 mm *vs* 1–1.5 mm) and tends to have fewer stamens (6–9 *vs* 9 or usually 10) and smaller flowers (3.5–6 mm *vs* 5–6.5 mm diam.). *Thryptomene conica* has a more obvious petiole that extends 0.2–0.4 mm below the base of the blade of its larger leaves (Figure 2B). The petiole is usually difficult to measure in *T. caduca* because it overlaps the base of the blade, with the margins of the blade reaching almost to the stem on each side; its maximum extension below the base of the blade is 0.2 mm (Figure 2A).

Thryptomene conica and *T. strongylophylla* both occur close to Kalbarri and an atypical specimen (*P. Armstrong s.n.*: PERTH 06364845), which looks somewhat intermediate in its hypanthium patterning although it clearly does not match *T. conica*, might be a hybrid between the two.

Notes. The rather long, erect sepals of *T. conica* are distinctive in having the sides closed together distally (Figure 1D) and in forming a high, conic summit to the flower bud (Figure 1C), but with the tips of the sepals often somewhat separated in late bud. *Thryptomene* has no other species with such a tall conic apex to the buds.

B. The *Thryptomene dampieri* Rye complex

The taxonomically difficult *T. dampieri* complex extends along the west coast for more than 1,000 km, from Cape Range south to Lancelin, and has five main variants. De Candolle (1828) gave one of the variants the name *Baeckea micrantha* DC. but by the time Gardner (1931) transferred that species to *Thryptomene* as *T. micrantha* (DC.) C.A.Gardner, the epithet had already been used for an eastern Australian species, *T. micrantha* J.D.Hook., so the new combination was illegitimate. The species was renamed as *T. dampieri* (Rye 2014), with three other members of the complex listed under phrase names (Western Australian Herbarium 1998–); the fourth unnamed taxon was not recognised as distinct at this time, with associated specimens housed at PERTH under *Thryptomene* sp.

The five variants cannot be accounted for by simple clinal variation in the complex from its northern extreme to its southernmost location. For example, the two taxa with the longest leaves and largest flowers are widely separated geographically from one another. All five variants are recognised here, either as species or subspecies, but there is no easy taxonomic solution for such a complex based just on morphology; molecular data may be needed to test the validity of the four new entities.

The *T. dampieri* complex belongs to the *T. baeckeacea* species group, which is characterised by prominently keeled, persistent bracteoles, flower buds that are concave at the top (Figure 1E), and sepals that are incurved in bud and fruit. Leaf morphology is important in distinguishing members of the complex (see Figure 2 and the key) but variation within each taxon, including on individual specimens, may partially obscure these differences. Different leaf types on a single branchlet include a tendency for the smaller leaves to have an incurved apex (Figure 2E) and larger ones to have a recurved apex (Figure 2F). Inflorescence length varies considerably; in some taxa the flowers are mostly borne at few consecutive nodes and therefore appear densely clustered on each branchlet, whereas in taxa with numerous fertile nodes the inflorescence is elongate.

Thryptomene butleri Rye, *sp. nov.*

Type: south-east of Lancelin, Western Australia [precise locality withheld for conservation reasons], 2 July 2013, *N. Cadd & L. Vaughan* NC 03 (*holo*: PERTH 08699186; *iso*: K, MEL).

Thryptomene sp. Lancelin (M.E. Trudgen 14000), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs low and spreading in exposed sites, more erect in sheltered sites, 0.15–1.1(–1.6) m high, 0.7–1.5 m wide, when prostrate then sometimes with adventitious roots. *Leaves* mostly crowded and widely antrorse. *Petioles* 0.3–0.7 mm long. *Leaf blades* often somewhat recurved towards apex (but with keel apex incurved), obovate to very broadly obovate, 1.5–2.5(–3.5) mm long, 1.2–2.2 mm wide, usually entire; abaxial surface convex, keeled for all or most of its length, mostly with 3 or 4 main rows of oil glands on each side of the midvein and 4–6 glands in the central rows; adaxial surface concave; apical point absent. *Peduncles* solitary in each axil, borne at 7–17 consecutive nodes, compressed, 0.3–0.65 mm long, 1-flowered. *Bracteoles* ovate or broadly ovate, 0.9–1.3 mm long, largely herbaceous and green but with petaloid denticulate margins, persistent. *Pedicels* ± absent. *Flowers* 5-merous, with a concave to almost flat apex in late bud, 3–4 mm diam. when fully open. *Hypanthium* broadly obconic, 1–1.1 mm long, 1.5–2 mm wide, with many fine irregular longitudinal wrinkles or similar irregular patterning; free part *c.* 0.3 mm long. *Sepals* strongly incurved, depressed ovate, the outermost ones auriculate, 0.5–0.7 mm long, 1.1–1.3 mm wide, minutely denticulate, tightly closed inwards in fruit. *Petals* 1.3–1.7 mm long, pale to fairly deep pink or pink-purple, ± entire, loosely closed inwards in fruit. *Stamens* usually 10, occurring close to the junctions of the sepals and petals and tending to occur in pairs opposite the sepals but still widely spaced. *Filaments* 0.45–0.5 mm long, pink. *Anthers* 0.25–0.35 mm long, 0.35–0.45 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovules* 2. *Style* usually 0.6–0.7 mm long; stigma *c.* 0.15 mm diam. *Fruits* very broadly or depressed obovoid, 1.2–1.5 mm long, 1.6–2 mm diam.,

1-seeded; hypanthium with irregular longitudinal furrows. *Seeds* ± transversely reniform, 0.8–1 mm high, 1.3–1.4 mm across. (Figures 1E; 2C)

Diagnostic features. Distinguished by the following combination of characters: petioles 0.3–0.7 mm long; leaf blades 1.5–2.5(–3.5) mm long, keeled for all or most of their length, usually with 4–6 oil glands in the two central rows on the abaxial surface; flower buds with a concave to almost flat apex; peduncles borne at 7–17 consecutive nodes; hypanthium rugose with many fine irregular longitudinal wrinkles or similar irregular patterning; sepals 0.5–0.7 mm long; petals 1.3–1.7 mm long; stamens usually 10; ovules 2.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] July 1963, *W.H. Butler* 17 (PERTH); 4 Aug. 2004, *F. Obbens & C. Godden* 64.1 (CANB, PERTH); 9 Sep. 2016, *B.L. Rye* 290167 (PERTH); 20 Sep. 1996, *M.E. Trudgen* 14000 (AD, BRI, CANB, HO, MEL, NSW, PERTH).

Distribution and habitat. Occurs in the Geraldton Sandplains and Swan Coastal Plain bioregions from near Leeman south to Lancelin, Western Australia (Figure 4). Grows on sand dunes and limestone in low, exposed coastal heath, and with taller shrubs in more sheltered sites.

Phenology. Flowers recorded over most of the year, especially from June to September, with mature fruits mostly recorded in September and October.

Conservation status. Listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Lancelin.

Etymology. The epithet honours William Henry (Harry) Butler (1930–2015), who made the first known collection of this taxon in 1963. Harry promoted membership of the Gould League and popularised natural history through his television series and book. He was most interested in reptiles but also collected close to 1,000 plant specimens throughout Western Australia and in the far south-west of the Northern Territory.

Co-occurring species. Not known to co-occur with any other species of *Thryptomene*.

Affinities. This species is the southernmost member of the *T. dampieri* complex. It is geographically widely separated from other members of this complex except for some overlap with *T. maritima*, which is distinguished by having larger flowers (4.5–8 mm diam. *vs* 3–4 mm in *T. butleri*) and leaves (2.5–6.5 mm long *vs* 1.5–2.5(–3.5) mm), and usually fewer consecutive flowering nodes (1–8(–12) *vs* 7–17). *Thryptomene butleri* has the smallest flowers in the complex and the highest maximum number of consecutive flowering nodes, with flowers borne at close or widely spaced nodes in a spike-like arrangement.

Notes. The sepals of *T. butleri* are strongly incurved onto the concave summit of the flower bud (see Figure 1E) and tend to remain so throughout the flowering and fruiting stages, making it difficult to measure their length.

Thryptomene dampieri Rye, *Nuytsia* 24: 281–284 (2014). *Type*: 2 miles [3 km] S of Denham, Western Australia, 21 July 1957, *J.W. Green* 1422 (*holo*: PERTH 02188368; *iso*: CANB 826767, K, MEL 2389007, NSW 937814, PERTH 02188600).

Shrub usually low and spreading, often described as prostrate or sprawling, 0.2–1.2 m high, commonly 0.5–2 m wide. *Leaves* mostly antrorse or crowded and widely antrorse. *Petioles* 0.2–1.5 mm long. *Leaf blades* often incurved or recurved towards apex, mostly narrowly to very broadly obovate, 1.3–5(–7) mm long, 1.5–2.2(–2.5) mm wide, usually entire; abaxial surface convex and keeled for its full length, with the keel often broad and flattened in the basal half, dotted with oil glands or with 2–5 main rows of oil glands

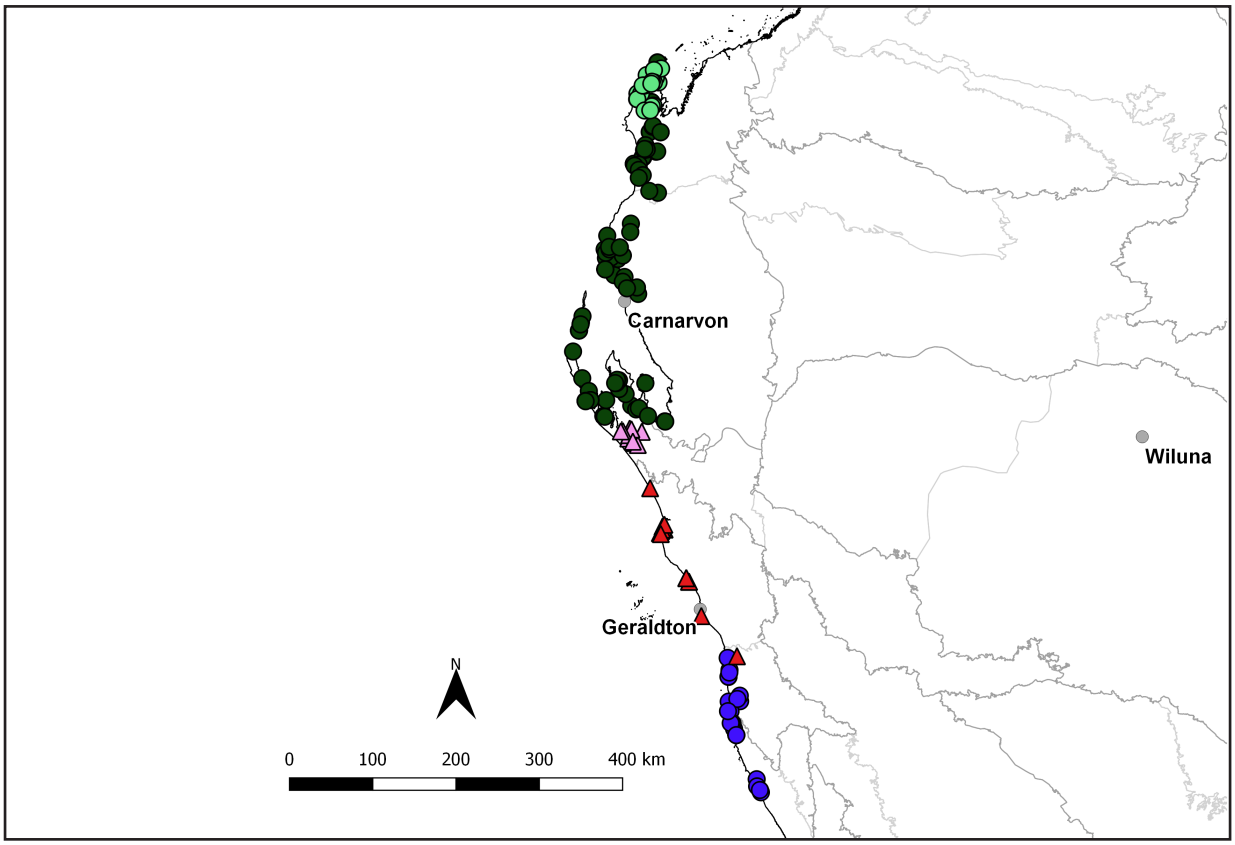

Figure 4. Distribution of the *Thryptomene dampieri* complex: *T. butleri* (●), *T. dampieri* subsp. *dampieri* (●) and subsp. *capensis* (●), *T. maritima* subsp. *maritima* (▲) and subsp. *freycinetensis* (▲).

on each side of the midvein and 3–10 glands in the central rows; adaxial surface concave; apical point absent. *Peduncles* solitary in each axil, borne at 2–14 consecutive nodes, compressed, 0.1–0.8(–1) mm long, 1-flowered. *Bracteoles* 0.6–2 mm long, denticulate or entire, persistent. *Pedicels* ± absent. *Flowers* 5-merous, with a concave to almost flat apex in late bud, 4–7 mm diam. when fully open. *Hypanthium* very broadly or depressed obconic, 1–1.6 mm long, 2–2.5 mm diam., with many fine irregular longitudinal wrinkles or similar irregular patterning; free part 0.3–0.5 mm long. *Sepals* broadly to depressed ovate, the outermost ones sometimes with obvious auricles, 0.5–1.3 mm long, 0.9–1.8 mm wide, denticulate or entire, tightly closed inwards in fruit. *Petals* 1.5–2.3(–2.5) mm long, pink or pink-purple, ± entire, loosely closed inwards in fruit. *Stamens* usually 10, in pairs opposite the sepals or ± equidistant and alternating with the sepals and petals. *Filaments* 0.4–0.8 mm long. *Anthers* 0.3–0.35 mm long, 0.35–0.5 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovules* 2. *Style* 0.5–0.8 mm long; stigma 0.15–0.2 mm diam. *Fruits* very broadly or depressed obovoid, *c.* 1.4 mm long, *c.* 1.8 mm diam., 1-seeded; hypanthium with irregular longitudinal furrows. *Seeds* transversely reniform, 1.1–1.2 mm high, 1.4–1.5 mm across. *Sterile fruits* common.

Diagnostic features. Distinguished by the following combination of characters: leaf blades less than 3 times longer than wide, keeled for full length, the keel often broad and flattened in the basal half; flower buds with a concave to almost flat apex; hypanthium rugose with many fine irregular longitudinal wrinkles or similar irregular patterning; sepals 0.5–1.3 mm long; petals 1.5–2.3(–2.5) mm long; stamens usually 10; ovules 2.

Distribution. Occurs in the Carnarvon and Yalgoo bioregions, extending from near Exmouth south to the Hamelin Bay area including Dirk Hartog Island, Western Australia (Figure 4).

Phenology. Flowers from April to September. Fruits recorded from June to October.

Etymology. Named after William Dampier (1651–1715), an English privateer, navigator and naturalist, who was the first European to bring back a collection of Australian plant specimens; this species collected in the Shark Bay area in 1699 was part of this first Australian collection.

Co-occurrence. Although this species is the most widespread member of the *T. dampieri* complex, it is not known to co-occur with any other species of *Thryptomene*.

Notes. *Thryptomene dampieri* shows some regional variation in leaf morphology. For example, specimens from Steep Point and Dirk Hartog Island have leaves with fewer rows of oil glands on average than most other specimens. Two subspecies are recognised based primarily on habitat differences and leaf measurements.

Thryptomene dampieri subsp. **capensis** Rye, *subsp. nov.*

Type: Cape Range National Park, Western Australia [precise locality withheld for conservation reasons], August 1978, *G. Perry* 846 (*holo*: PERTH 07789831; *iso*: MEL).

Shrub 0.5–1.2 m high, 1.1–2 m wide. *Petioles* 0.5–1.2 mm long. *Leaf blades* narrowly obovate, 3.5–6(–7) mm long, 1.5–2.1(–2.5) mm wide; abaxial surface dotted with oil glands or with at least 2 main rows of them on each side of the midvein and 6–10 glands in the central rows. *Peduncles* borne at 5–14 consecutive nodes, 0.1–0.7(–1) mm long. *Bracteoles* ovate, 1.3–2 mm long. *Pedicels* ± absent. *Flowers* 5–7 mm diam. *Sepals* 0.6–1.2 mm long, 0.9–1.8 mm wide. *Petals* 2–2.3(–2.5) mm long, the outermost ones with auricles. (Figure 2D)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 6 Sep. 1970, *K.M. Allan* 464 (AD, BRI, PERTH); 21 July 2006, *J. English* JE 0093 (CANB, NSW, PERTH); 30 Aug. 1960, *A.S. George* 1309 (PERTH); 7 Aug. 1992, *E. Leyland* EL 11 A (PERTH); 27 July 2003, *M.E. Trudgen* 21934 (HO, PERTH).

Distribution and habitat. Occurs in the Carnarvon bioregion on the large peninsula on the west side of Exmouth Gulf, extending from the Milyering area south to Yardie Creek in Cape Range National Park, Western Australia (Figure 4). Recorded on sand dunes and in limestone areas, in gullies or gorges or other less exposed locations, commonly with *Acacia* and spinifex.

Etymology. From the English ‘cape’ and the Latin -*ensis* (native of), as this taxon is known only from the Cape Range National Park area.

Conservation status. To be listed as Priority Three under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). All or most of the distribution of this taxon is protected within a large national park.

Affinities and co-occurrence. This subspecies occurs within the northernmost part of the range of subsp. *dampieri* in the far north of the range of the whole complex. Specimens of subsp. *dampieri* occur in more exposed sites along the coast of the peninsula and usually have shorter petioles (0.2–0.5 mm long *vs* 0.5–1.2 mm in subsp. *capensis*), leaf blades that are shorter (1.3–3(–5) mm long *vs* 3.5–6(–7) mm) and have 3–5 (*vs* 6–10) oil glands in the central rows of the abaxial surface, and flowers that tend to be smaller (4–6 mm diam. *vs* 5–7 mm) and borne at fewer consecutive nodes (2–8 *vs* 5–14). Subsp. *dampieri* is very widespread and variable and may sometimes have leaves up to about 5 mm long, but these longer leaves still have a short petiole up to 0.5 mm long whereas subsp. *capensis* normally has a longer petiole on leaves of that length. Whether or not the two subspecies ever co-occur in mixed stands needs to be investigated but some cross-pollination seems likely. These two taxa might intergrade in intermediate habitats.

Notes. Floral characters have been based on relatively few specimens as most specimens lack mature flowers. No mature fertile fruits were found although there were plenty of very hard, infertile ones.

Thryptomene dampieri Rye subsp. **dampieri**

Baeckea micrantha DC., *Prodr.* 3: 230 (1828); *Thryptomene micrantha* (DC.) C.A.Gardner, *Enum. Pl. Austral. Occ.* 97 (1931), *nom. illeg. non* J.D.Hook. (1853). *Type*: 'Nouvelle Hollande, côte orient' [from Western Australia not the east coast], collector unknown (*holo*: G 00486600 ex P; possible *iso*: P 0029032, P 0029033).

Illustrations. A.P. de Candolle, *Mém. Soc. Phys. Genève* Pl. 14 (1841–1842), as *Baeckea micrantha*; W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.* 3A: 48 (1980), as *T. baeckeacea*.

Shrub 0.2–0.7(–1) m high, usually 0.5–1 m wide. *Petioles* 0.2–0.5 mm long. *Leaf blades* mostly broadly or very broadly obovate and 1.3–3(–5) mm long, 1.5–2.2 mm wide; abaxial surface with 2–5, usually 3 or 4 main rows of oil glands on each side of the midvein and 3–5 glands in the central rows. *Peduncles* borne at 2–8 consecutive nodes, 0.2–0.8 mm long. *Bracteoles* ovate or broadly ovate, 0.6–1.6 mm long. *Flowers* 4–6 mm diam. *Sepals* 0.5–1.3 mm long, 1.2–1.8 mm wide. *Petals* 1.5–2(–2.3) mm long. (Figure 2E, F)

Other specimens examined. WESTERN AUSTRALIA: inland of Herald Bay, Dirk Hartog Island, 18 Oct. 1974, *J.S. Beard* 7089 (PERTH); Shark Bay, 1699, *W. Dampier s.n.* (OXF image!); Edel Land National Park, 45 km SW of Denham, 28 July 2019, *E. Leitch & M. Starkey* WAA019156 (PERTH); Red Bluff, N of Cape Cuvier, 20 June 1976, *M.E. Murray* 21 (CANB *n.v.*, K *n.v.*, PERTH); Quoin Bluff area, Dorre Island, 21 Aug. 1977, *A.S. Weston* 10588 (CANB *n.v.*, PERTH); Point Quobba, 28 July 1969, *Paul G. Wilson* 8372 (PERTH).

Distribution and habitat. Occurs in the Carnarvon and Yalgoo bioregions, extending from near Exmouth south to the Hamelin Bay area including Dirk Hartog Island, Western Australia (Figure 4). Occurs in crevices in limestone and on white or coloured sand dunes, including red sand overlying limestone, or otherwise in salty brownish sand. Often in low heath including spinifex or in taller *Acacia* shrubland.

Conservation status. A widespread subspecies.

Co-occurrence. In the far north of its range, this subspecies may co-occur with subsp. *capensis* (see notes under that taxon).

Notes. See notes under subsp. *capensis* for differences between the two subspecies of *T. dampieri*.

Thryptomene maritima Rye, *sp. nov.*

Type: Kalbarri National Park, Western Australia [precise locality withheld for conservation reasons], 6 September 2016, *B.L. Rye* 290157 (*holo*: PERTH 08837295; *iso:* CANB).

Shrubs erect or low and spreading, 0.3–1.8 m high, 0.6–3 m wide. *Leaves* crowded and widely antrorse to not very crowded and antrorse or appressed. *Petioles* 0.4–0.7 mm long. *Leaf blades* often somewhat recurved towards apex (but with keel apex incurved), narrowly keeled for full length or keeled distally, mostly narrowly obovate or obovate, 2.5–6.5 mm long, 1–2 mm wide, usually entire; abaxial surface keeled throughout or distally keeled and somewhat flattened below, with 2–4 (rarely 1 in subsp. *freycinetensis*) main rows of oil glands on each side of the midvein and 6–12 glands in the central rows; adaxial surface concave; apical point absent. *Peduncles* solitary in each axil, borne at 1–8(–12) consecutive nodes, compressed, 0.5–2 mm long, 1-flowered. *Bracteoles* ± ovate, 1.5–2.5 mm long, entire or denticulate, persistent. *Pedicels* ± absent. *Flowers* 5-merous, with a concave to almost flat apex in late bud, 4.5–8 mm diam. when fully open. *Hypanthium* very broadly or depressed obconic, 1.2–1.5 mm long, 2–2.5 mm

diam., with many fine irregular longitudinal wrinkles or similar irregular patterning; free part *c.* 0.6 mm long. *Sepals* very broadly or depressed ovate, the outermost ones not or only shortly auriculate, 0.8–1.3 mm long, 0.9–2.1 mm wide, pink, minutely denticulate or entire, tightly closed inwards in bud and fruit, somewhat looser but still incurved between the petals or more erect in flower. *Petals* (1.8–)2–3 mm long, pink or pink-purple, ± entire, loosely closed inwards in fruit. *Stamens* usually 10, alternating with the sepals and petals, ± equidistant. *Filaments* 0.7–0.9 mm long. *Anthers* 0.3–0.35 mm long, 0.35–0.5 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovules* 2. *Style* 0.8–0.9 mm long; stigma *c.* 0.15 mm diam. *Fertile fruits* depressed obovoid, 1.35–1.5 mm long, 1.8–2.2 mm diam., 1-seeded; hypanthium with irregular longitudinal furrows. *Seeds* ± transversely reniform, 1.1–1.2 mm high, 1.6–1.65 mm across. *Sterile fruits* common.

Diagnostic features. Distinguished by the following combination of characters: leaves less than 4 times as long as wide; peduncles 0.5–2 mm long, borne at 1–8(–12) consecutive nodes; bracteoles persistent; flower buds with a concave to almost flat apex; hypanthium rugose with many fine irregular longitudinal wrinkles or similar irregular patterning; sepals tightly closed inwards in fruit; petals 1.8–3 mm long; stamens usually 10; ovules 2.

Distribution. Occurs in the Yalgoo and Geraldton Sandplains bioregions, extending from Freycinet Estuary south to Yardanogo Nature Reserve, Western Australia, with the southernmost specimen separated from the remaining specimens by *c.* 70 km (Figure 4).

Phenology. Flowers recorded from May to September, with mature fruits recorded from September to November.

Etymology. From the Latin *maritimus* (growing by the sea) as this species, like other members of the *T. dampieri* complex, is restricted to habitats close to, and often overlooking, the sea.

Affinities and co-occurrence. Full separation of this species from other members of the complex requires a combination of characters, as indicated under the subspecies below and in the key above. Although there are many other *Thryptomene* species known from the region where *T. maritima* occurs, there are no records of co-occurrence with those species.

Thryptomene maritima subsp. **freycinetensis** Rye, *subsp. nov*.

Type: Shark Bay area, Useless Loop Rd, Western Australia [precise locality withheld for conservation reasons], 29 July 2003, *M. Trudgen, B. Moyle & C. Wilkins* MET 21965 (*holo*: PERTH 08212759; *iso*: AD, CANB, K, MEL, NSW).

Thryptomene sp. Carrarang (M.E. Trudgen 7420), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs usually low and spreading, 0.3–1(–1.4) m high, 0.9–3 m wide. *Petioles* 0.4–0.65 mm long. *Leaf blades* often somewhat recurved towards apex (but with keel apex incurved), narrowly obovate or obovate, 2.5–4 mm long, 1–1.3 mm wide, usually entire; abaxial surface convex, with a keel evident only near the apex, the surface below smoothly convex, with 1–3 main rows of oil glands on each side of the midvein and 6–9 glands in the central rows; adaxial surface concave; apical point absent. *Peduncles* borne at 1–12 consecutive nodes. *Flowers* 4.5–5.5 mm diam. *Sepals* broadly or very broadly ovate, not auriculate, 0.8–0.9 mm long, 0.9–1.3 mm wide. *Petals* 1.8–2.2 mm long, pink or pink-purple, ± entire. (Figure 2G)

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 12 Sep. 1989, *J.J. Alford s.n.* (PERTH); 29 July 2003, *M. Trudgen, B. Moyle & C. Wilkins* MET 21966 (AD, BRI, PERTH).

Distribution and habitat. Occurs in the Yalgoo bioregion in the vicinity of Freycinet Estuary, extending from Baudin Island south to Tamala Station (Figure 4). The habitat is recorded as white or brown sand, on dunes or in crevices in limestone, in a low coastal heath. The new subspecies is often one of the main taxa present, others often including *Melaleuca cardiophylla* or *Acacia rostellifera*.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Carrarang.

Etymology. Named for its distribution, which is on islands in the Freycinet Estuary and on the mainland close to the western and southern margins of the estuary.

Affinities and co-occurrence. Distinguished from *T. maritima* subsp. *maritima* and other members of the *T. dampieri* complex by its mature leaves, which have a more consistently curved abaxial surface below the distal keel; it also usually has smaller flowers than subsp. *maritima*. It occurs south of the distribution of *T. dampieri* and north of that of *T. maritima* subsp. *maritima*. It is usually found closer to the coast than other *Thryptomene* species from the general area and is not known to co-occur with any of them.

Notes. This taxon has the smallest distribution of all the members of the *T. dampieri* complex and is probably the least variable.

Thryptomene maritima Rye subsp. **maritima**

Thryptomene sp. Red Bluff (A.G. Gunness 2358), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs low to moderately erect, 0.5–1.8 m high, 0.6–2 m wide. *Petioles* 0.5–0.7 mm long. *Leaf blades* often somewhat recurved towards apex (but with keel apex incurved), mostly narrowly obovate or obovate, 3–6.5 mm long, 1.2–2 mm wide, usually entire; abaxial surface keeled throughout or distally keeled for at least 1/4 the length of the blade and somewhat flattened below, commonly with 3 or 4 main rows of oil glands on each side of the midvein and 7–12 glands in the central rows. *Peduncles* borne at 1–8 consecutive nodes. *Flowers* 5.5–8 mm diam. *Sepals* very broadly or depressed ovate, 0.8–1.3 mm long, 1.4–2.1 mm wide. *Petals* 2–3 mm long. (Figure 2H)

Selected specimens examined. WESTERN AUSTRALIA: Goats Gulch, Kalbarri National Park, 8 July 2004, *D. & B. Bellairs* 6383 (PERTH); Yardanogo Nature Reserve, 6 Sep. 2004, *C. Godden* Opp 100 (PERTH); Horrocks, N of Geraldton, 31 July 2003, *M.E. Trudgen* MET 21991 (AD, BRI, CANB, PERTH); Red Bluff, S of Kalbarri, 6 May 1968, *Paul G. Wilson* 6539 (PERTH).

Distribution and habitat. Occurs in the Geraldton Sandplains bioregion, extending from north of Kalbarri south to Yardanogo Nature Reserve, Western Australia, with the southernmost specimen separated from the remaining specimens by about 75 km (Figure 4). Occurs in crevices in sandstone or limestone and in white or brownish sand on dunes, often in low coastal heath with herbs and a variety of shrub species, such as *Olearia*, *Scaevola* and *Scholtzia*.

Conservation status. Not currently considered to be at risk.

Notes. This subspecies is the only member of the *T. dampieri* complex to have petals up to 3 mm long. It is closest in location and morphology to *T. maritima* subsp. *freycinetensis* but has more prominently keeled leaves and usually has larger flowers. It is similar to *T. dampieri* subsp. *capensis* in having long leaves and large flowers but has fewer consecutive flowering nodes (1–8 *vs* 5–14).

C. Miscellaneous species

This section deals with seven phrase-named taxa from varied species groups and updates the descriptions given previously for *T. decussata* and *T. salina*. When the publication of new *Thryptomene* species began (Rye & Trudgen 2001) as part of a broader taxonomic study of tribe Chamelaucieae, two of the taxa described below had never been collected and four of them were known from just one collection. Now only one species, *T.* sp. Warburton, remains this poorly known.

Thryptomene decussata (W.Fitzg.) J.W.Green, *Census Vasc. Pl. W. Australia* edn 2, 6 (1985); *Scholtzia decussata* W.Fitzg., *J. W. Australian Nat. Hist. Soc.* 2(1): 19–20 (1904). *Type*: Mount Magnet, Western Australia, September 1903, *W.V. Fitzgerald s.n.* (*lecto*: PERTH 01631918, inadvertently designated by J.W. Green, *op. cit.*; *isolecto*: NSW 463200, NSW 463281, PERTH 01605143).

Thryptomene sp. Leinster (B.J. Lepschi & L.A. Craven 4362), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs 0.3–3(–4) high, 0.5–3 m wide. *Leaves* antrorse to almost patent, mostly widely antrorse. *Petioles* 0.1–0.3 mm long. *Leaf blades* broadly obovate to depressed obovate-cordate, 1.3–2.5 mm long, 1.3–2.7 mm wide, thin apart from the keel or to 1 mm thick, entire; abaxial surface convex or shallowly convex, distally strongly keeled and incurved, also keeled below or more flattened, with scattered or numerous crowded oil glands; adaxial surface shallowly concave, dotted with oil glands; apical point absent or <0.1 mm long. *Peduncles* (when present) solitary in each axil, borne at 1–3 consecutive nodes, 0–0.4 mm long, 1-flowered. *Bracteoles* broadly to depressed ovate, 2–3.3 mm long, rather scarious except for the narrow keel, persistent in flower and probably often in fruit; apical point absent or to 0.4 mm long. *Flowers* 5-merous, with a convex apex in late bud, 6–11 mm diam. when fully open. *Hypanthium* very broadly or depressed obconic, 2–2.2 mm long, 2.3–3 mm wide, with close, irregular ribs; free part 0.8–1.3 mm long. *Sepals* very broadly or depressed ovate, 2–3.3 mm long, 3–4 mm wide, petaloid, without auricles, white, ± denticulate, widely spreading in fruit. *Petals* 2.2–4 mm long, pale pink or white, entire, loosely closed inwards in fruit. *Stamens* 16–40, in 2 whorls. *Longest filaments* 2.3–3.3 mm long. *Anthers* 0.3–0.4 mm long, 0.5–0.6 mm wide, dehiscent by 2 pores; connective gland broad-truncate. *Ovules* (5)6–10. *Style* 2.5–3.5 mm long; stigma 0.25–0.6 mm diam. *Fruits* very broadly obovoid, 2.2–2.7 mm long, 2.2–3 mm diam.; hypanthium with 12–16 full-length and 1–6 shorter, close-packed ribs. *Seeds* not seen at maturity, the largest seen *c.* 1.3 mm across. (Figure 5A–C)

Diagnostic features. Unique in having up to *c.* 40 stamens and up to 10 ovules. Other important characters: hypanthium with 12–16 full-length and a few shorter ribs; style 2.5–3.5 mm long.

Selected specimens examined of variants with sparsely to densely glandular leaves. WESTERN AUSTRALIA: Butchers Track, E of Meadow Station, 13 Oct. 1973, *J.S. Beard* 6828 (PERTH); Melka [Meka] Station, 24 Sep. 1987, *R.J. Cranfield* 6316 (CANB, PERTH); Blue Hills Range, 18 Oct. 2005, *A. Markey & S. Dillon* 3605 (PERTH); 30 km E of Hillview Homestead, 26 Sep. 1982, *A.A. Mitchell* 1049 (PERTH); Mount Narryer, 1898, *I. Tyson* 36 (PERTH); Mt Barloweerie, *c.* 20 km S of Wooleen Homestead, 13 Oct. 1975, *J.Z. Weber* 5080 (AD *n.v.*, PERTH); Hamelin Station, 5 Oct. 2015, *V. Westcott & B. Parkhurst* 3 (PERTH).

Selected specimens examined of far inland variant with very densely glandular leaves. WESTERN AUSTRALIA: SE of Leinster, 13 Oct. 2004, *P.G. Armstrong* PA 22 (MEL, NSW, PERTH); W of Ashburton Downs Rd, 175 km N of Meekatharra, 30 Sep. 2016, *S. Hitchcock & R. Haycock* M 198 (PERTH); 15 km NE of Leinster, within LNO Minesite tenements, 28 Sep. 2006, *S. Kern & A. Rea* 12053 (NSW, PERTH); 1.3 km NE of Goldfields Hwy on access road to Leinster, 27 Oct. 2000, *B.J. Lepschi & L.A. Craven* 4362 (CANB *n.v.*, PERTH); Lee Steere survey site LSTR23, NE of Wiluna, 16 Sep. 2008, *W.A. Thompson & N.B. Sheehy* 735 (MEL, PERTH); Yakabindie Station, 65 km N from Leinster, 6 Nov. 2016, *J. Warden & S. Smith* WB 38686 (PERTH).

Distribution and habitat. Occurs in the Carnarvon, Gascoyne, Yalgoo and Murchison bioregions, extending *c.* 900 km from near the coast in Yaringa Station inland to Lee Steere Range, and from near Congo Creek south to the Leonora area, Western Australia (Figure 6). Recorded on lateritic breakaways and other rocky sites, usually in *Acacia* shrublands. It is sometimes one of the tallest species present. The variants with sparsely to densely glandular leaves occur in all four bioregions from Yaringa Station south-east to the Leonora area, whereas the inland variant with very densely glandular leaves is restricted to the Murchison and Gascoyne bioregions, extending from near the upper Gascoyne River south to the Leinster area and east to Lee Steere Range (see Figure 6).

Phenology. Flowers mainly recorded from July to November, with fruits recorded from September to November.

Conservation status. A very widespread species that is not considered to be at risk.

Etymology. From the Latin *decussatus* (decussate), referring to the arrangement of the leaves in opposite pairs with those at each node orientated at right angles to those at adjacent nodes.

Co-occurring species. The distribution of this widespread species overlaps that of *T. costata* Rye & Trudgen, with both species occurring on rocky outcrops. There are two records of their co-occurrence in the Yalgoo area: a sparse shrubland of *T. decussata*, *Acacia aneura* and *A. umbraculiformis* over open shrubland of *T. costata* (*A. Markey & S. Dillon* 5368), *T. decussata* and *Philotheca sericea*; and a sparse shrubland of *Acacia aneura*, *A. umbraculiformis*, *A. aulacophylla* and *A. ramulosa* over open shrubland of *T. costata* (*A. Markey & S. Dillon* 5021), *T. decussata* and *Philotheca brucei*.

Affinities. The closest relative appears to be *T. duplicata* Rye & Trudgen, which also has stamens arranged in two rows but differs from *T. decussata* in its longer peduncles (0.7–1.4 mm long *vs* 0–0.3 mm), shorter sepals (*c.* 1.4 mm long *vs* 2–3.3 mm), shorter style (*c.* 0.7 mm long *vs* 2.5–3.5 mm) and fewer ovules (4 *vs* 5–10).

Notes. *Thryptomene decussata* is broadly circumscribed herein to include the 'broad-leaved' (or western) and 'typical' variants of Rye and Trudgen (2001: 520), which have sparsely to densely glandular leaves, and *T.* sp. Leinster (B.J. Lepschi & L.A. Craven 4362), a more recently recognised, far inland variant with very densely glandular leaves. Although it is now known from numerous collections, the far inland variant was only collected for the first time in October 2000, too late to be included in the Rye and Trudgen (2001) treatment.

The typical variant, which extends from north of Mount Magnet to Leonora, has broadly obovate leaves with dense oil glands (Figure 5B). Specimens to the west are more likely to have some broader (depressed ovate-cordate) leaves with widely spaced oil glands (Figure 5A); however, leaf shape is variable across the distribution of these two variants, including within populations (e.g. *S. Patrick, D. Edinger & G. Marsh* 3236 B: PERTH), suggesting it is of little taxonomic utility.

The far inland variant (*T.* sp. Leinster) has very broadly to depressed obovate leaves with a higher density of oil glands relative to most other populations of *T. decussata* (Figure 5C); however, there is material with comparably dense oil glands (albeit with narrower leaves) from Mt Dugel (e.g. *R. Meissner & G. Owen* 1660: PERTH), which is well within the distribution of the variants with less crowded glands (see Figure 6). The density of oil glands can also vary within a population as evidenced by a second collection from Mt Dugel (*R. Meissner & G. Owen* 1661: PERTH), which has fragments with either moderately dense or very dense oil glands. The Mt Dugel collections bridge the gap in oil gland density between the far inland variant and the remainder of *T. decussata*, suggesting that formal taxonomic recognition of the former is not warranted. The far inland variant, for which there are few specimens with well-pressed, open flowers, tends to have smaller flowers (6–8 mm diam. *vs* (7–)8–11 mm), although this difference is not discrete. Some specimens of the far inland variant have that the highest stamen numbers recorded for *Thryptomene*

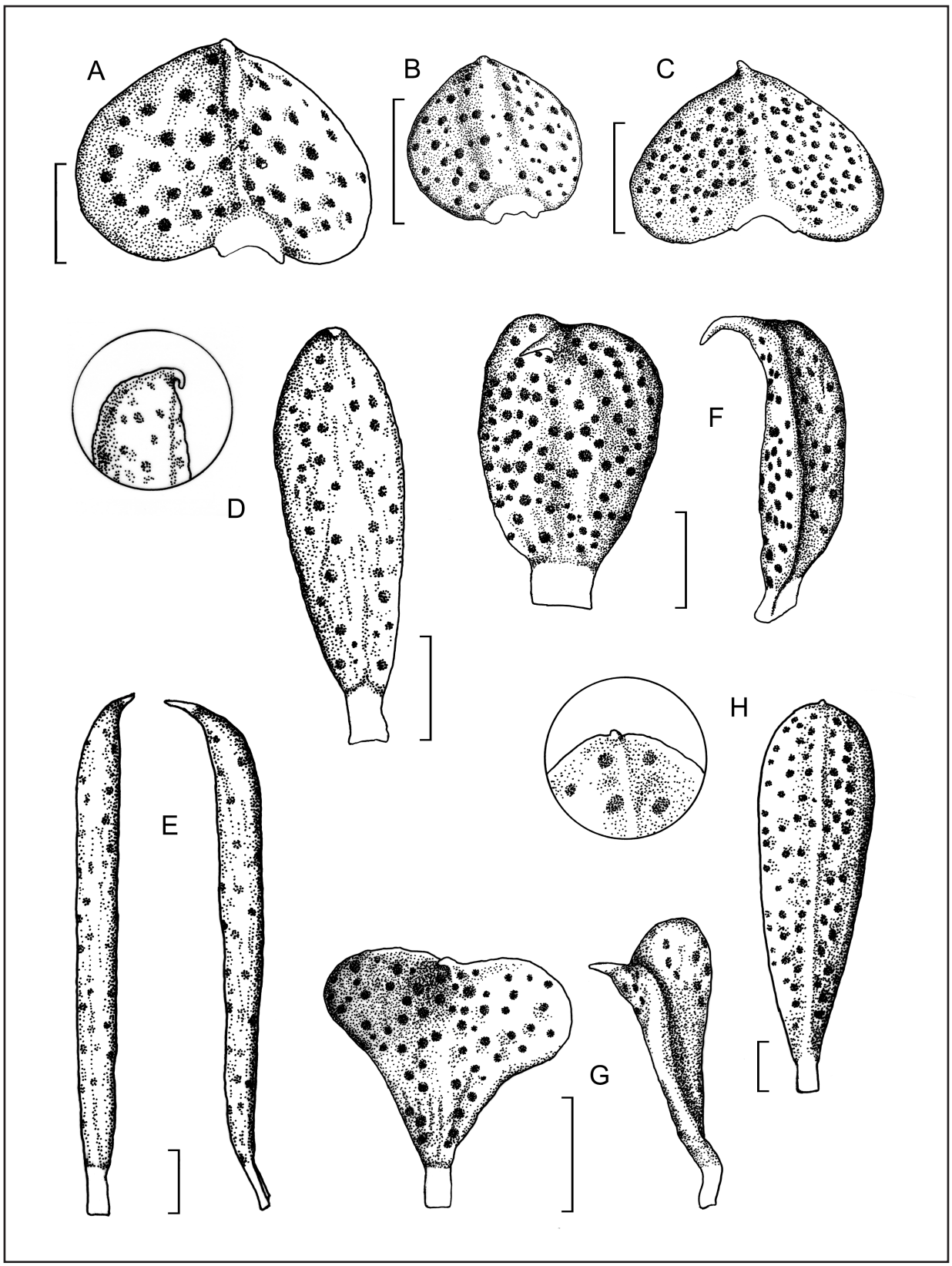

Figure 5. Leaf abaxial surface in miscellaneous species of *Thryptomene*. A – *T. decussata* variant with oil glands widely spaced; B – *T. decussata* typical variant; C – *T. decussata* inland variant with crowded oil glands; D – *T. interzonensis*, with close-up of recurved apical point; E – *T. jilbadji*, also with side view; F – *T.* sp. Coolgardie, also with side view; G – *T.* sp. Missionary Plain, also with side view; H – *T.* sp. Warburton, with close-up of minute point. Drawn by Skye Coffey from *S. Patrick, D. Edinger & G. Marsh* 3236 B (A), *W.A. Thompson & N.B. Sheehy* 553 (B), *P. Armstrong* 06/46 (C), *C. Adams & H. Hughes* WB 24456 (D), *L. Ducki* 739 (E), *C.A. Gardner s.n.*, PERTH 02193736 (F), *D.E. Albrecht & A. Schubert* 12728 (G) and *M. Henson & M. Hannart* 32433 (H). Scale bars = 1 mm.

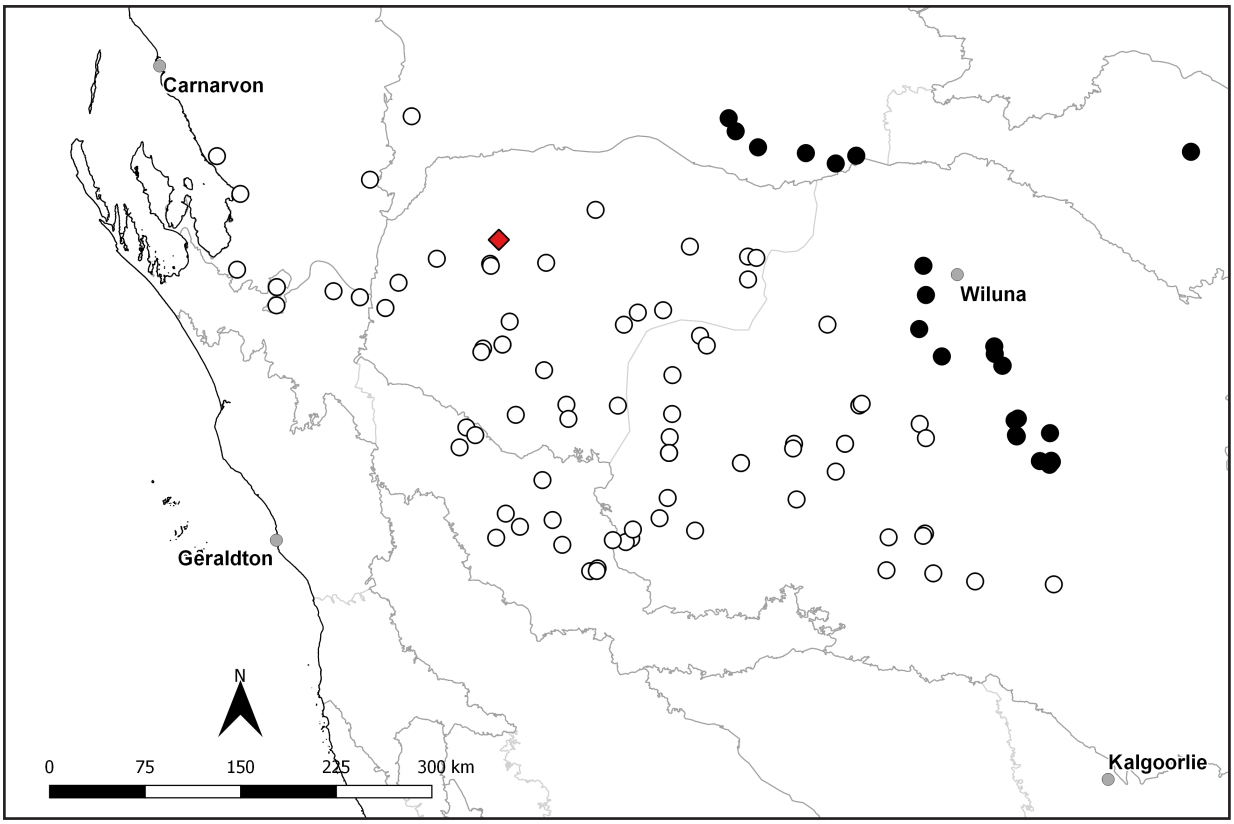

Figure 6. Distribution of *Thryptomene decussata*: variants with sparsely to densely glandular leaves (○), far inland variant with very densely glandular leaves (●) and narrow-leaved specimens from Mt Dugel with very densely glandular leaves (◆).

(*c.* 40 per flower), although low stamen numbers (*c.* 16 per flower) have also been recorded for this and other variants.

Thryptomene decussata was originally described as *Scholtzia decussata* because its ovary was misinterpreted as being '2-celled with 2 or 3 superposed ovules in each cell' (Fitzgerald 1904: 20) and perhaps also because of its high stamen numbers in comparison with all previously described *Thryptomene* species. The protologue implies there can be as few as four ovules per ovary but the lowest number, only found on one specimen in this study, was five and even six was rather unusual, most flowers examined having 7–10 ovules.

Despite the large number of specimens of *T. decussata* at PERTH, no mature seeds have been observed. Most specimens are vegetative or in bud, and when flowers are present they are often galled (e.g. see *P. Armstrong* 853). Other insect associations, identified by L. Cook, include psyllids in the form of white hairy scales (see *A.A. Mitchell* 4147) and flattened scales of white flies (see *F. Lullfitz* 2831).

Thryptomene interzonensis Rye, *sp. nov.*

Type: north-north-east of Mount Clara [east of Southern Cross], Western Australia [precise locality withheld for conservation reasons], 2 December 1997, *R.J. Cranfield* 11702 (*holo*: PERTH 0523104; *iso*: CANB).

Thryptomene sp. Mt Clara (R.J. Cranfield 11702), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs 0.3–0.8 high, 0.3–1 m wide. *Leaves* patent to almost appressed, mostly antrorse. *Petioles* 0.5–0.6 mm long. *Leaf blades* narrowly obovate, 3.5–4.5 mm long, 1–1.3 mm wide, obtuse, entire, often with narrow, scarious margins; abaxial surface shallowly convex, not or scarcely keeled, with 2 or more longitudinal rows of oil glands, the rows closest to the midvein on each side with 8–12 main glands; adaxial surface flat or shallowly concave, dotted with oil glands; apical point recurved, 0.15–0.2 mm long, white. *Peduncles* borne at 2–6 consecutive nodes, 1 per axil, not or scarcely compressed, 0.4–0.8 mm long, 1-flowered. *Bracteoles* ovate to elliptic, 0.4–1 mm long, entire, rather scarious, persistent in flower; apex often recurved. *Pedicels* absent. *Flowers* 5-merous, with a convex apex in late bud, 3.5–4 mm diam. when fully open. *Hypanthium* becoming somewhat urceolate and wider than thick, 1.3–1.4 mm long, *c.* 1.2 mm wide, prominently 10-ribbed; free part 0.2–0.25 mm long. *Sepals* broadly or very broadly obovate, with a distinct claw, 1.3–1.5 mm long, 1.4–1.6 mm wide, petaloid, without auricles, white, entire, widely spreading in fruit. *Petals* broad-based, *c.* 1.3 mm long, white, entire, apparently erect in flower, closed inwards and overlapping across the summit of the fruit. *Stamens* 5, antisepalous, widely spaced. *Filaments* 0.3–0.6 mm long. *Anthers c.* 0.2 mm long, *c.* 0.3 mm wide, dehiscent by 2 pores; connective gland broad-truncate. *Ovules* 2. *Style* 0.3–0.4 mm long; stigma ≤0.1 mm diam. *Fertile fruits* very broadly or depressed obovoid, *c.* 1.2 mm long, *c.* 1.35 mm diam.; hypanthium with 10 full-length ribs, the ribs rounded and mostly separated by broad sinuses, 1-seeded. *Seeds c.* 0.8 mm long, *c.* 1.2 mm wide. *Sterile fruits* globular, commonly with two equal-sized, hard pieces of chaff. (Figure 5D)

Diagnostic features. Distinguished by the following combination of characters: leaves narrowly obovate, with a strongly recurved apical point 0.15–0.2 mm long; hypanthium not compressed in flower, 10-ribbed; sepals similar in length to, or slightly longer than, the petals; anthers dehiscent by 2 pores; fruit ribs 10, widely spaced, rounded.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 12 Nov. 2008, *C. Adams & H. Hughes* WB 24456 (PERTH); 1 Feb. 2010, *J. Jackson* 87 (CANB, NSW, MEL, PERTH); 6 Nov. 2022, *Z. Sims* 3737 (PERTH).

Distribution and habitat. Occurs in the Coolgardie and Avon Wheatbelt bioregions, extending from Jaurdi Station south to Parker Range, Western Australia (Figure 7). Variously recorded from open scrub on a yellow clayey sandplain, the edge of a salt pan over exposed granite, and sandplain.

Phenology. Flowers recorded from November to January and mature fruits in January and February.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Mt Clara. Known from three localities spread over a distance of *c.* 110 km.

Etymology. Named for its occurrence in the South-western Interzone of Beard (1980).

Co-occurring species. Not known to co-occur with any other species of *Thryptomene*.

Affinities. This distinctive species has not been sampled in molecular studies but its morphology indicates that it would fall into a group that includes sections *Oligandron* and *Paryphantha*. There are no obvious close relatives to *T. interzonensis* but it keys out above (couplet 22) with *T. pieroniae* (see affinities section under that species).

Notes. *Thryptomene interzonensis* is a fairly recently discovered species, the first collection of it having been made in 1997. Its sepals are more narrowly clawed than usual in the genus. Its hypanthium is obviously 10-ribbed in late flower and fruit, but only the five prominent antisepalous ribs may be obvious in late bud. In fruit the 10 ribs are broad and rounded, with gaps between them.

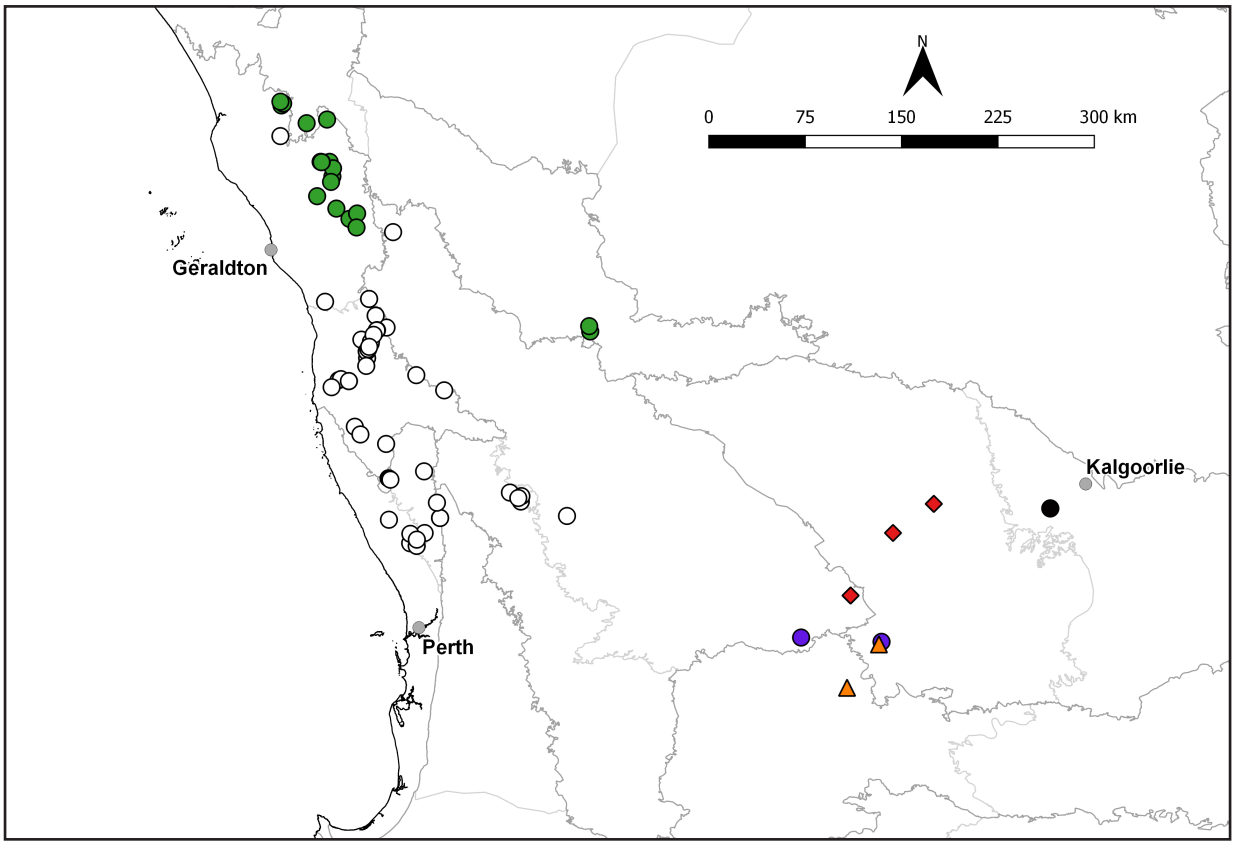

Figure 7. Distribution of *Thryptomene interzonensis* (◆), *T. jilbadji* (●), *T. pieroniae* (●), *T. salina* (▲), *T. mucronulata* (○) and *T.* sp. Coolgardie (●).

Thryptomene jilbadji Rye, *sp. nov.*

Type: *c.* 50 km NNE of Hyden, Western Australia [precise locality withheld for conservation reasons], 1 November 2000, *B.J. Lepschi & L.A. Craven* 4477 (*holo*: PERTH 06466532; *iso*: AD 156024, CANB 638632, K, MEL 2225948, NSW 586448).

Thryptomene sp. Hyden (B.J. Lepschi & L.A. Craven 4477), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs 0.3–0.45 m high, one record of 0.15 m wide. *Leaves* antrorse or appressed. *Petioles* 0.8–1.3 mm long. *Leaf blades* long-linear in outline, 7–11 mm long, 0.4–0.5 mm wide, 0.5–0.6 mm thick, acute, entire, almost terete but slightly thicker than wide distally; abaxial surface deeply convex, not keeled, usually with 2 main longitudinal rows of oil glands on each side of midvein, with numerous oil glands in the central rows; adaxial surface flat or shallowly convex, often grooved along the centre; apical point recurved, 0.4–0.6 mm long. *Peduncles* 1 per axil, borne at 1–3 consecutive nodes, somewhat compressed, 0.7–0.8 mm long, 1-flowered. *Bracteoles* obovate, 1.2–1.7 mm long, somewhat scarious, with an apical point to 0.3 mm long, entire, persistent in flower, not seen in fruit. *Pedicels* absent. *Flowers* 5-merous, with a convex apex in late bud, 5–7 mm diam. when fully open. *Hypanthium* cup-shaped, 1–1.2 mm long, 1.6–1.8 mm wide, 10-ribbed or with fewer ribs visible; free part 0.2–0.3 mm long. *Sepals* very similar to the petals but broader, almost circular, 1.7–2.3 mm long, 1.8–2.2 mm wide, white, without auricles, entire, widely spreading in flower and fruit. *Petals* 1.7–2.3 mm long, white, entire, widely spreading in flower, possibly closed in fruit. *Stamens* 5, antisepalous, widely spaced. *Filaments* 0.3–0.4 mm long. *Anthers* *c.* 0.25 mm long, 0.3–0.35 mm wide, dehiscent by 2 slits ± as long as the thecae; connective gland broad-truncate. *Ovules* 2. *Style* not seen at maturity but apparently small. *Fruits* not seen at maturity. (Figure 5E)

Diagnostic features. Distinguished by the following combination of characters: leaves long-linear in outline, 7–11 mm long, with an apical point 0.4–0.6 mm long; hypanthium not compressed in flower; sepals similar to the petals but broader; anthers dehiscent by slits ± as long as the thecae; ovules 2.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 15 Nov. 2022, *L. Ducki* 739 (PERTH); 30 June 2022, *D. Rubick* 556 (PERTH).

Distribution and habitat. Occurs in the Avon Wheatbelt and Coolgardie bioregions, Western Australia (Figure 7), recorded from the type population that is east of Narembeen and north of Hyden and from two later collections from near Jilbadji Nature Reserve. The type collection was made from yellowish brown sand in a regrowth of *Acacia*, Proteaceae and Myrtaceae species, while one of the later collections was from flat, red-orange, heavier soil in *Eucalyptus* low open mallee woodland over *Melaleuca*, *Persoonia* and *Santalum*.

Phenology. Flowers recorded in October and November.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Hyden. Described at the type locality as being uncommon and in two collections from the area near Jilbadji Nature Reserve as having 6–10 or up to 25 plants, the overall range less than 70 km long.

Etymology. Named for its occurrence near Jilbadji Nature Reserve.

Affinities. This species belongs to *T.* sect. *Thryptocalype*. It is similar to *T. cuspidata* (Turcz.) J.W.Green in having long leaves with an obvious apical point but with the point shorter (0.4–0.6 mm long *vs* 0.7–1.4 mm) and also differing in its larger flowers (5–7 mm diam. *vs* 3–4.5 mm).

Notes. Good fruiting material is needed to complete the description of this species but a non-flowering collection made in June had a single infertile, probably immature, fruit. The young stems are often reddish at first but soon become white.

Thryptomene pieroniae Rye, *sp. nov.*

Type: east of Bulla–Whelarra Road, Western Australia [precise locality withheld for conservation reasons], 21 August 2003, *B.L. Rye & M.E. Trudgen* BLR 238086 (*holo*: PERTH 06744648; *iso*: CANB, K, MEL, NSW).

Thryptomene ninghanensis J.W.Green ms in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 404 (2000); Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Thryptomene sp. Wandana (M.E. Trudgen MET 22016), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au [accessed 13 October 2023].

Shrubs usually 0.4–0.8 m high, possibly to 1.5 m high, 0.5–1 m wide, single-stemmed at base. *Leaves* antrorse or ± appressed, mostly closely antrorse. *Petioles* 0.4–0.8 mm long. *Leaf blades* broadly or very broadly obovate, 1.7–3 mm long, 1.2–1.8 mm wide, obtuse, entire; abaxial surface shallowly convex but flattened along midvein, distally keeled, flattened or indented below along the midvein, with 1–3 main rows of oil glands on each side of midvein, with 3–5(6) oil glands in the central rows; adaxial surface shallowly concave; apical point absent or to 0.2 mm long. *Peduncles* 1 per axil, borne at 1–6(–13) consecutive nodes, not or scarcely compressed, 0.5–1 mm long, 1-flowered. *Bracteoles* ovate or narrowly ovate, 0.7–0.8 mm long, somewhat scarious, acute, entire, persistent in flower, shed in fruit. *Pedicels* absent. *Flowers* 5-merous, with a convex apex in bud, 3–4 mm diam. when fully open. *Hypanthium* dorsiventrally

compressed in adnate part and ± circular in TS in the short free part, becoming ± obconic as the fruit begins to form, 1.3–2.3 mm long, 1.2–1.5 mm wide, with 5 or 10 narrow ribs; free part *c.* 0.2 mm long. *Sepals* ovate, 1.2–1.4 mm long, 0.6–1 mm wide, petaloid and pink except for a short, broad green claw, without auricles, entire, widely spreading in flower, erect in fruit. *Petals* more narrowly clawed than the sepals, 1.1–1.3 mm long, pink or white, entire, widely spreading in flower, closed inwards to an erect position in fruit. *Stamens* 5, antisepalous, widely spaced. *Filaments c.* 0.3 mm long. *Anthers* 0.2–0.25 mm long, 0.3–0.35 mm wide, dehiscent by 2 slits; connective gland broad-truncate. *Ovules* 2. *Style* 0.3–0.5 mm long; stigma to *c.* 0.1 mm diam. *Fertile fruits* almost obconic, *c.* 1.8 mm long, *c.* 1.35 mm diam., 1-seeded; hypanthium incurved over summit of fruit, not compressed, smooth, darkened. *Seeds* erect, truncate, almost obconic, *c.* 1.2 mm long, *c.* 1 mm diam. *Sterile fruits* numerous, similar in shape but very hard. (Figures 8 & 9)

Diagnostic features. Distinguished by the following combination of characters: leaves broadly or very broadly obovate, with apical point absent or to 0.2 mm long; sepals slightly to distinctly longer than the petals, erect in fruit.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 1934, *H.K. Barker s.n.* (PERTH); 31 Aug. 1990, *A.H. Burbidge* 4351 (PERTH); 9 July 1963, *F.G. Smith* 1673 (PERTH); 27 Sep. 2002, *M.E. Trudgen* MET 21730 (AD, BRI, NSW, PERTH); 19 Oct. 2011, *V. Yeomans* VY 52 (PERTH).

Distribution and habitat. Occurs in the Geraldton Sandplains and Yalgoo bioregions mainly extending from Eurardy Station south to the Yuna area, Western Australia, with two old records from near Ninghan, some 250 km to the south-east (Figure 7). Recorded in sandy soils, commonly in *Acacia* high shrubland, or sometimes in vegetation dominated by scattered emergent *Eucalyptus* species.

Phenology. Flowers recorded from late July to September, with mature fruits recorded in September and October.

Conservation status. Listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *T.* sp. Wandana.

Etymology. Named after Margaret Pieroni (1936–), a superb botanical illustrator who prepared a plate for this species more than twenty years ago. Margaret has produced artwork for many books, scientific papers and other works, one of her most outstanding contributions being the line illustrations and exquisite paintings for all the named species and variants of Featherflowers in *Verticordia: the Turner of Hearts*. Her many other contributions to botany include being the leader of the Dryandra Study Group from 1987 to 2023, and she was awarded an Order of Australia Medal in 2024.

Co-occurring species. The distribution of this species overlaps that of a few other *Thryptomene* species but the only record of co-occurrence (*M.E. Trudgen* MET 22016) is with *T. strongylophylla* in the McGauren Nature Reserve.

Affinities. This species has no obvious close relatives. It came out closest to *T. biseriata* J.W.Green and *T. longifolia* J.W.Green in unpublished molecular data (Peter Wilson pers. comm.) but with very weak support. Rather than with those two species, *T. pieroniae* keys out above (couplet 22) with *T. interzonensis*, which differs in having narrowly obovate (*vs* broadly or very broadly obovate) leaves and very broadly or depressed obovoid (*vs* almost obconic) fruits.

Notes. The manuscript name of *T. ninghanensis* J.W.Green refers to the Ningham district where *T. pieroniae* was collected for the first time in 1934 (*H.K. Barker s.n.*), but the species is far more common in the disjunct area to the north-west.

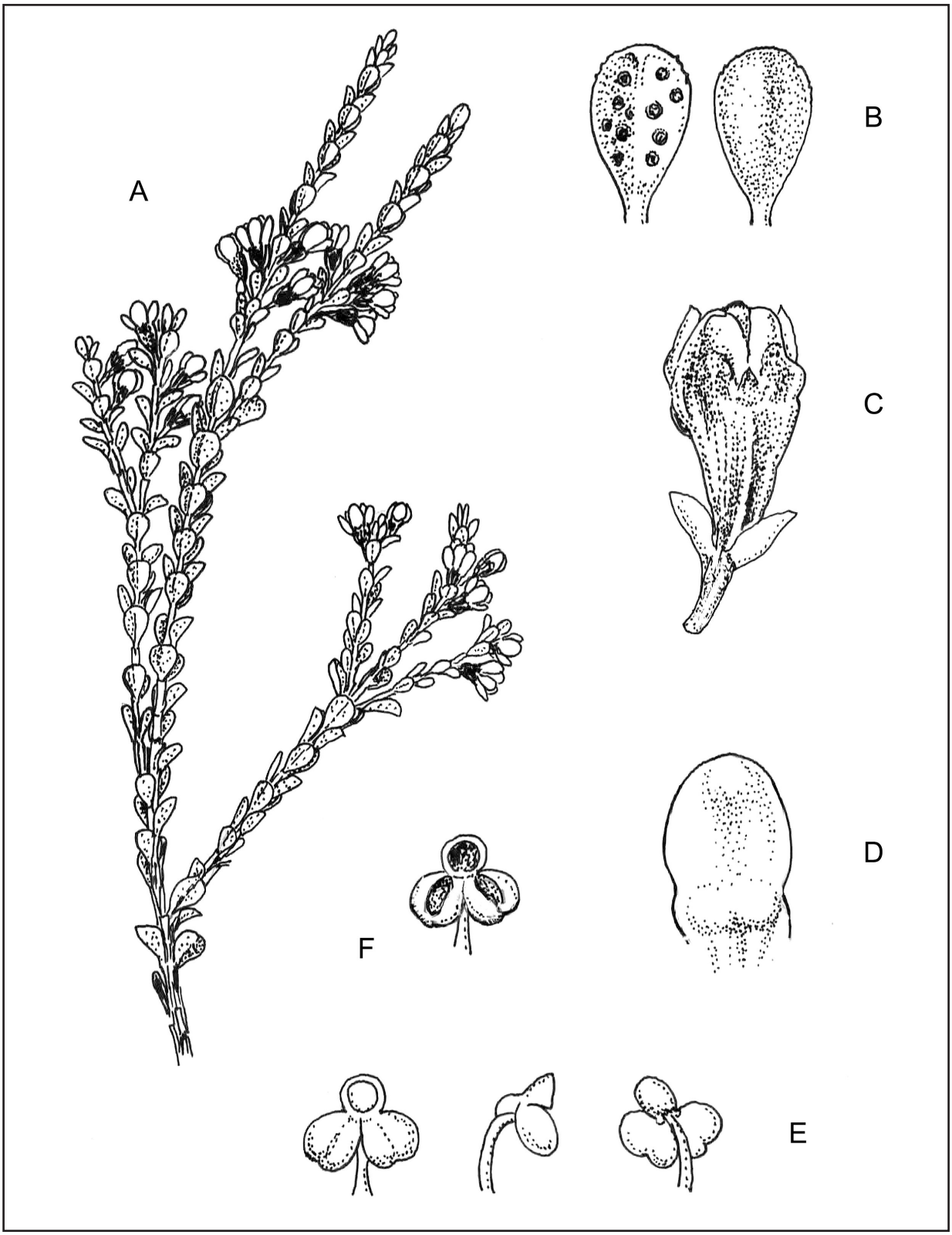

Figure 8. *Thryptomene pieroniae.* A – flowering branch; B – abaxial and adaxial views of leaf; C – flower bud with two bracteoles and the peduncle; D – sepal; E – three views of anther prior to dehiscence; F – anther after dehiscence. Drawn by Margaret Pieroni from *A.H. Burbidge* 4350 (A, C–F) and *M.E. Trudgen* 2221 (B).

Figure 9. *Thryptomene pieroniae.* A – habitat and single-stemmed habit; B – flowering stems with buds to fully open flowers. Images by Juliet Wege from *J.A. Wege* 2207.

Normally the species is an erect shrub but one plant that had been knocked over by roadworks or some other disturbance was observed to have produced adventitious roots from horizontal stems (*B.L. Rye & M.E. Trudgen* 238086).

Thryptomene salina Rye & Trudgen, *Nuytsia* 13(3): 525–526 (2001). *Type*: east of Hyden, Western Australia [precise locality withheld for conservation reasons], 9 October 1981, *K.R. Newbey* 9171 (*holo*: PERTH 02159481; *iso*: CANB 558563, MEL 2137181).

Shrubs 0.5–1.1 m high, one record as 1.2–1.5 m wide. *Leaves* antrorse, overlapping. *Petioles* 0.5–0.6 mm long. *Leaf blades* narrowly to very broadly obovate, 2.3–2.6 mm long, 2–2.6 mm wide, entire or denticulate; abaxial surface convex, flattened along middle for most of length, distally keeled, dotted with numerous oil glands; adaxial surface concave; apical point absent or rarely *c.* 0.1 mm long, more commonly with a dorsal-subterminal point *c.* 0.1 mm long. *Peduncles* solitary in each axil, borne at 3–6 consecutive nodes, compressed, 0.8–1.2 mm long, 1-flowered. *Bracteoles* very broadly ovate, 1.5–2 mm long, scarious, persistent. *Pedicels* ± absent. *Flowers* 5-merous, with a convex apex in late bud, 5–6 mm diam. when fully open. *Hypanthium* obconic with a flared top, 2.5–3 mm long, 2.5–3.5 mm diam., with close, irregular ribs; free part 0.5–1 mm long. *Sepals* depressed ovate, 1.2–1.7 mm long, 2–2.5 mm wide, ± entire, widely spreading in fruit. *Petals* 1.8–2.1 mm long, entire, closed inwards and overlapping across the summit of the fruit. *Stamens* 5–7, with 1 or 2 opposite each sepal. *Filaments* 0.3–0.4 mm long. *Anthers c.* 0.35 mm long, *c.* 0.6 mm wide, dehiscent by pores; connective gland broad-truncate. *Style* 0.35–0.4 mm long; stigma *c.* 0.15 mm diam. *Ovules* 5 or 6. *Fruits* very broadly obovoid, *c.* 2.2 mm long, *c.* 2.2 mm diam., 1-seeded, the seed only occupying the top of the fruit; hypanthium with 8–10 full-sized ribs and 3–6 shorter ones. *Seeds* transversely reniform, *c.* 0.8 mm high, *c.* 1.5 mm across.

Diagnostic features. Distinguished by the following combination of characters: hypanthium with 8–10 full-sized ribs and 3–6 shorter ones; stamens 5–7, with 1 or 2 opposite each sepal; ovules 5 or 6.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 2 Aug. 2023, *G. Cockerton* WB41136 (PERTH); 15 Aug. 2023, *N. Dakin* WB41137 (PERTH).

Distribution and habitat. Known from two populations east and north-east of Hyden in the Coolgardie and Mallee bioregions, Western Australia (Figure 7). Both populations were recorded from a drainage line or creek, the surrounding vegetation dominated by *Eucalyptus* and *Allocasuarina* and at one location with a myrtaceous understory that included *Euryomyrtus maidenii*. Only one of the locations was described as saline.

Phenology. Flowers recorded in October and November and mature fruits in August.

Conservation status. Listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). The two known localities are less than 50 km apart, and about 100 plants were recorded at the more recently discovered site.

Etymology. From the Latin *salinus* (salty, saline), referring to the habitat of the original collection. Note that the location of the more recently discovered population is not saline, just low-lying.

Affinities. This species belongs to *T.* sect. *Thryptomene sensu* Rye and Trudgen (2001), differing from other members of that group in having fewer stamens. However, molecular data suggest the typical section may need a broader circumscription (Peter Wilson pers. comm.).

Notes. When it was described by Rye and Trudgen (2001), *T. salina* was only known from a single specimen in bud. Recent collections include open flowers and mature fruits, allowing a much fuller description of the species. The petals fold inwards to form a flat cover over the top of the fruit.

Thryptomene sp. **Coolgardie (E. Kelso s.n. 1902)**

Illustrations. Line drawings on *E. Kelso s.n.* 1902; PERTH 02193647).

Shrub size unknown. *Leaves* antrorse. *Petioles* 0.3–0.5 mm long. *Leaf blades* very broadly obovate, 2–3 mm long, 1.8–2.3 mm wide, entire; abaxial surface shallowly convex or convex, flattened or grooved along the centre, not or scarcely keeled, dotted with numerous oil glands; adaxial surface concave to almost flat, usually shallowly concave; apical mucro thick, white, recurved, 0.4–0.5 mm long. *Peduncles* solitary in each axil, borne at 1–5 consecutive nodes, compressed, 0.5–0.8 mm long, 1-flowered. *Bracteoles c.* 2 mm long, scarious, apparently caducous or shed in flower. *Pedicels* ± absent. *Flowers* 5-merous, *c.* 6.5 mm diam. *Hypanthium* broadly to depressed obconic, 1.5–2 mm long, 1.5–3 mm diam., with close, irregular ribs; free part 0.5–0.8 mm long. *Sepals* depressed ovate, 1.5–1.7 mm long, 2–2.5 mm wide, ± entire. *Petals c.* 2.5 mm long, colour not recorded, entire. *Stamens* 10, with 1 opposite each sepal and petal. *Antipetalous filaments c.* 0.6 mm long. *Anthers c.* 0.25 mm long, *c.* 0.4 mm wide, dehiscent by pores; connective gland broad-truncate. *Ovules* 6. *Style c.* 0.7 mm long; stigma small. *Fruits* not seen at maturity, with *c.* 11 full-length and several shorter ribs. (Figure 5F)

Specimens examined. WESTERN AUSTRALIA: Coolgardie, Oct. 1920, *C.A. Gardner s.n.* (PERTH); Coolgardie district, 1902, *E. Kelso s.n.* (PERTH).

Distribution and habitat. Occurs in the Coolgardie bioregion, Western Australia (Figure 7). The habitat is not known, although given *T.* sp. Coolgardie is most similar in morphology to *T. mucronulata*, it might similarly favour low-lying, winter-wet sites.

Phenology. Flowers recorded in October.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). As more than a hundred years have passed since its last collection, this taxon may now be extinct. Its two collections give the locality just as Coolgardie, and if they were made close to the town centre, the population was probably cleared long ago.

Affinities. Although well separated from *T. mucronulata s. lat.* geographically (Figure 7), *T.* sp. Coolgardie shows only minor morphological differences. It differs from *T. mucronulata* in its broader leaves (very broadly obovate *vs* narrowly to broadly obovate in *T. mucronulata*) having an apical point up to 0.5 mm long (*vs* usually absent or less than 0.3 mm long) and it appears to have less persistent bracteoles. The most similar specimen of *T. mucronulata* in leaf morphology is probably *S.B. Rosier* 196 [3216] from the Wongan Hills area. The *T. mucronulata* complex is very variable and needs further study to determine whether any of its variants warrant formal recognition.

Thryptomene sp. **Missionary Plain (A. Schubert 267)**

Shrubs recorded up to 1 m high, width not recorded. *Young stems* smooth, white, dotted with oil glands. *Leaves* antrorse or appressed. *Petioles* 0.4–0.6 mm long. *Leaf blades* obcordate to very broadly obcordate, 1.5–2.2 mm long, 1.5–2.5 mm wide, entire or with a few minute crenulations or teeth on the margins where the leaf is broadest, with margins level or incurved; abaxial surface shallowly convex or flat in basal half, convex with apex recurved distally, not or scarcely keeled, dotted with numerous oil glands; adaxial surface shallowly concave or flat in basal half, distally concave; apical point recurved, to 0.2 mm long. *Peduncles* 1 per axil, borne at a solitary or 2 consecutive nodes, *c.* 0.3 mm long, 1-flowered. *Bracteoles* broadly ovate, 0.8–1.3 mm long, somewhat scarious, denticulate, with an apical point to 0.3 mm long, persistent in flower, not seen in fruit. *Pedicels* absent. *Flowers* with a convex apex in late bud, *c.* 5 mm diam. when fully open, 5-merous. *Hypanthium* very broadly or depressed cup-shaped, 1.3–2 mm long, *c.* 2 mm wide, with irregular ribs that are largely hidden by the auricles; free part ± absent. *Sepals* attached below the petals in the space between their wide lateral auricles, almost circular in outline overall but depressed cordate excluding the auricles, 1.5–2.3 mm long (including auricles), 2–2.5 mm wide, denticulate, yellow, spreading in fruit; auricles 0.6–1 mm long. *Petals* moderately broadly attached at base, 1.7–2.3 mm long, denticulate, yellow. *Stamens* 5, antisepalous, widely spaced. *Filaments* 0.6–0.8 mm long. *Anthers c.* 0.4 mm long, *c.* 0.6 mm wide, dehiscent by 2 pores or short slits; connective gland broad-truncate. *Ovules* 2. *Style c.* 0.6 mm long; stigma *c.* 0.15 mm diam. *Fruits* depressed ovoid, *c.* 1.5 mm long, *c.* 1.8 mm diam. *Seeds* unknown. (Figure 5G)

Specimens examined. NORTHERN TERRITORY: [localities withheld for conservation reasons] 29 Apr. 2010, *D. Albrecht* 13246 (NSW *n.v.*, NT *n.v.*, PERTH); 10 Nov. 2008, *D.E. Albrecht & A. Schubert* 12728 (NSW *n.v.*, NT *n.v.*, PERTH).

Distribution and habitat. Occurs between Gosses Bluff and Haasts Bluff, Northern Territory. Recorded on undulating sandy country with *Acacia* and *Triodia*.

Phenology. Flowers recorded in April and May. Fruits recorded in November.

Conservation status. Listed as Near Threatened in the Northern Territory based on IUCN criteria (Northern Territory Herbarium 2013).

Affinities. This highly distinctive species is unique in having yellow sepals and petals and can also be distinguished from all other species by its sepals being inserted below the petals and having large auricles. Molecular data (Peter Wilson pers. comm.) indicate that its closest relative is the Queensland species *T. parviflora* (F.Muell. ex Benth.) Domin, which differs also in having narrower leaves and smaller flowers.

Notes. Galls are very common on the flowering stems in the two specimens examined, and this may have restricted the number of flowers produced. Presumably there is some better material available among the specimens housed at NT, which are currently on loan to Peter Jobson at NSW.

The overall shape of the sepals including their large auricles is almost circular, with the auricles adding up to 1 mm to their full length. Excluding the auricles, the sepals are somewhat shorter than the petals and arise at a lower level, so that the petal apex is distinctly above the sepal apex.

Thryptomene sp. **Warburton (M. Henson & M. Hannart 32433)**

Shrub size not recorded but with branches more than 0.3 m long. *Leaves* antrorse, not clustered. *Petioles* 0.6–1 mm long. *Leaf blades* narrowly obovate, 5–9.5 mm long, 2–3.5 mm wide, entire; abaxial surface shallowly convex or flat, not or scarcely keeled, dotted with oil glands; adaxial surface shallowly concave or flat; apical point absent or *c.* 0.1 mm long. *Peduncles* 1 or 2 per axil, borne at 1 or 2 consecutive nodes, very compressed, 0.7–1.3 mm long, 1-flowered. *Bracteoles* apparently caducous or shed in flower. *Pedicels* ± absent. *Flowers* 5-merous, *c.* 4 mm diam. *Hypanthium* campanulate, 1.5–1.7 mm long, 1.5–2 mm diam., prominently 10-ribbed; free part 0.4–0.5 mm long. *Sepals* very broadly obovate, 1–1.2 mm long, *c.* 1.5 mm wide, petaloid, white, ± entire. *Petals c.* 1.4 mm long, white, entire. *Stamens* 5. *Filaments* 0.3–0.35 mm long. *Anthers c.* 0.4 mm long, *c.* 0.6 mm wide, dehiscent by pores or short slits; connective gland curved-urceolate. *Ovules* 2. *Style c.* 0.5 mm long; stigma *c.* 0.15 mm diam. *Fruits* not seen at maturity; hypanthium with 10 full-length ribs. (Figure 5H)

Specimen examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 24 Dec. 2011, *M. Henson & M. Hannart* 32433 (PERTH).

Distribution and habitat. Occurs in the Central Ranges bioregion near Warburton, Western Australia. Habitat unknown.

Phenology. Flowers and immature fruits recorded in October.

Conservation status. Listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). This taxon occurs in a remote area that is difficult to access and needs to be specifically targeted by collectors to gain a reliable assessment of its conservation status.

Affinities and co-occurrence. This taxon belongs to the *T. wittweri* complex, which also includes *T. nealensis*. It is distinguished from *T. nealensis* and *T. wittweri* by its broader leaves that are obovate and 2–3.5 mm wide (*vs* narrowly obovate to linear in outline and 0.6–1.3 mm wide in *T. nealensis* and *T. wittweri*). *Thryptomene nealensis* also differs from *T.* sp. Warburton in having thickened leaves and *T. wittweri* differs in having clustered leaves. Recorded only from a far-inland locality, *T.* sp. Warburton is highly unlikely to co-occur with any other species of *Thryptomene*. It occurs north of the known range of *T. nealensis* and east of the known range of *T. wittweri*.

Notes. Very few flowers and fruits are present on the sole specimen of *T.* sp. Warburton. One immature seed was examined; it was erect to oblique and *c.* 1 mm long. More collections are needed to provide a full description but the taxon certainly appears to be distinct.

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A new weed for Western Australia from Torndirrup National Park: *Plecostachys serpyllifolia* (Asteraceae)

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SHORT COMMUNICATION

A good start on listing the flora of Torndirrup National Park was undertaken by G.J. Keighery who produced an unpublished list of 514 species in 1988, including 454 native and 60 naturalised weed species (copy in the Library, Department of Biodiversity, Conservation & Attractions (DBCA)). In April 2020, the DBCA's NatureMap database listed 610 species of plants for the National Park, of which 47 were naturalised weeds. By July 2024, Florabase listed herbarium specimens of 41 naturalised weeds for the National Park (Asteraceae marked with an asterisk): *Aeonium haworthii* Webb & Berthel., *Aira cupaniana* Guss., **Arctotheca calendula* (L.) K.Lewin, **A. populifolia* (P.J.Bergius) Norl., *Bellardia trixago* (L.) All., *B. viscosa* (L.) Fisch. & C.A.Mey., *Briza maxima* L., *B. minor* L., *Carpobrotus edulis* (L.) N.E.Br. subsp. *edulis*, *Centaurium erythraea* Rafn, **Carduus pycnocephalus* L., *Cotoneaster pannosus* Franch., *Crassula natans* var. *minor* (Eckl. & Zeyh.) G.D.Rowley, **Dittrichia graveolens* (L.) Greuter, **D. viscosa* (L.) Greuter, **Erigeron sumatrensis* Retz., **E. canadensis* L., *Erodium botrys* (Cav.) Bertol., *Euphorbia paralias* L., *Freesia leichtlinii* subsp. *alba* x *leichtlinii* subsp. *leichtlinii*, *Gaudium laevigatum* (Gaertn.) Peter G.Wilson, *Heliophila pusilla* L.f., *Hordeum leporinum* Link, **Hypochaeris glabra* L., *Lagurus ovatus* L., **Leontodon saxatilis* Lam., *Lepidium africanum* (Burm.f.) DC., *Lolium* sp., *Lysimachia arvensis* (L.) U.Manns & Anderb., *Pelargonium capitatum* (L.) L'Hér., *Psoralea pinnata* L., *Romulea rosea* (L.) Eckl., *Rumex crispus* L., *Sagina apetala* Ard., **Senecio elegans* L., *Sporobolus africanus* (Poir.) Robyns & Tournay, **Sonchus oleraceus* L., *Trifolium angustifolium* L. var. *angustifolium*, *T. fragiferum* L. var. *fragiferum*, **Ursinia anthemoides* (L.) Poir. subsp. *anthemoides*, *Vulpia fasciculata* (Forssk.) Fritsch. This list includes 12 species of alien Asteraceae.

My own work over three decades surveying granite outcrop flora in Torndirrup National Park has added the following 28 species of unvouchered weeds to the introduced flora list: *Anthoxanthum odoratum* L., *Avena barbata* Link, *Bromus hordeaceus* L., *B. rubens* L., *Centaurium erythraea* Rafn, *Cerastium glomeratum* Thuill., *Cyperus tenellus* L.f., *Disa bracteata* Sw., *Ficinia marginata* (Thunb.) Fourc., *Galium murale* (L.) All., *Gladiolus undulatus* L., *Juncus bufonius* L., *Juncus capitatus* Weigel, *Lampranthus glaucus* (L.) N.E.Br., *Lotus subbiflorus* Lag., *Lysimachia arvensis* (L.) U.Manns & Anderb., *Orobanche minor* Sm., *Petrorhagia dubia* (Raf.) G.López & Romo, *Plantago lanceolata* L., **Pseudognaphalium luteoalbum* (L.) Hilliard & B.L.Burtt, **Sonchus asper* (L.) Hill, *Stenotaphrum secundatum* (Walter) Kuntze, *Trianoptiles solitaria* (C.B.Clarke) Levyns (a new record for Western Australia), *Trifolium dubium* Sibth., *T. glomeratum* L., **Vellereophyton dealbatum* (Thunb.) Hilliard & B.L.Burtt, *Vulpia bromoides* (L.) Gray, *V. myuros* (L.) C.C.Gmel. The additional three species of Asteraceae makes up a total of 15 alien taxa in that family recorded for the National Park.

Additions to the native flora of Torndirrup National Park continue to rise as well. Of special note are completely new species not collected before, such as *Hydrocotyle serendipita* A.J.Perkins, now known

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also from Two Peoples Bay Nature Reserve (Perkins & Dilly 2017), and *Calandrinia* sp. Torndirrup (S.D. Hopper et al. SDH 8712), still known from just a single population in the National Park.

In July 2024, I came across a small stand of softly tomentose intricately branched shrublets lining a powerline service track through Torndirrup which clearly had asteraceous flowers and fruits (Figure 1). On consultation with Neville Walsh, recently retired from the National Herbarium Victoria and shrubby Asteraceae expert, this plant proved to be *Plecostachys serpyllifolia* (P.J.Bergius) Hilliard & B.L.Burtt. The species is well described elsewhere (Hilliard 1983; Viljoen 2012; Walsh 2021).

The genus *Plecostachys* Hilliard & B.L.Burtt comprises two species native to the Cape Floristic Region of South Africa and adjacent Kwazulu-Natal and Mozambique. Both species were originally described in *Gnaphalium* L. as *G. serpyllifolia* P.J.Bergius and *G. polifolium* Thunb. However, the two differ from *Gnaphalium* species in habit and leaf form. They are intricately branched and interwoven twiggy shrubs with numerous small more or less elliptic leaves (Hilliard & Burtt 1981). They also share white-tipped bracts, undivided stereome, achenes with common duplex hairs and scabrid pappus bristles whose bases cohere by patent cilia or are sometimes partly fused (Hilliard & Burtt 1981). Other synonyms of *P. serpyllifolia* include *Helichrysum serpyllifolium* (P.J.Bergius) Less., *Syn. Gen. Compos.*: 277 (1832) [non *Helichrysum serpyllifolium* (Lam.) Pers. (1807)]; and *Gnaphalium orbiculare* Thunb., *Prodr. Pl. Cap.*: 152 (1800) ≡*Helichrysum orbiculare* (Thunb.) Druce, *Rep. Bot. Soc. Exch. Club Brit. Isles* 4: 626 (1917). For example, *H. obiculare* is cited rather than *P. serpyllifolia* in some older articles that document wetland habitat associations for South Africa (e.g. Taylor 1972).

Figure 1. *Plecostachys serpyllifolia*. A – plants *in situ* lining the edge of the powerline track in Torndirrup National Park on 15 July 2024, adjacent dense low heath and sedgeland with *Callistemon glaucus* Sweet (red inflorescence); B – inflorescences in flower and early fruit, with leaves; C – inflorescence in full flower; D – mature fruits, flowers and leaves. Images from *S.D. Hopper* 8718. Photographs by S.D. Hopper.

Plecostachys serpyllifolia (cobweb bush, petite liquorice (Eng.); vaaltee, kooigoed (Afr.)) favours seasonally damp sandy coastal flats in well-drained moist soil and flowers March–May in its native range (Hilliard 1983). As its Afrikaans common name, kooigoed, meaning cow stuff or bedding material, suggests, it was traditionally used by indigenous people to sleep on due to its soft woolly foliage (Viljoen 2012). Vaaltee means bland tea, suggesting that the species was also used for that purpose as well. *Plecostachys serpyllifolia* differs from *Plecostachys polifolia* (Thunb.) Hilliard & B.L.Burtt in having milky white (not yellowish cream) bracts and suborbicular leaves with undulate margins, not ovate leaves (Hilliard 1983; Manning & Goldblatt 2012).

Voucher specimen for *Plecostachys serpyllifolia*: Torndirrup National Park, 350–500 m west of the intersection of Austin Road and MacBride Rd west along powerline service track, 35° 05' 26" S, 117° 55' 29" E, 15 July 2024, *S.D. Hopper* 8718 (PERTH).

Discussion

The confinement of *P. serpyllifolia* to the edges of a regularly maintained track beneath powerlines (Figure 1) through dense heath on seasonally waterlogged soils seems to reflect the regular disturbance of track use. The surrounding habitat is clearly OCBIL in nature – on an old, climatically-buffered and rarely disturbed, infertile landscape (Hopper 2023; Hopper *et al.* 2021). Such landscapes are resilient to weed invasion if disturbance levels are minimal.

The use of *P. serpyllifolia* as a popular foliage ornamental has seen it grown elsewhere in Mediterranean climate regions. It has naturalised in California, Victoria, New South Wales, the Azores, Scilly Islands, Chile, Portugal and Spain (GBIF 2024). Its naturalisation in Torndirrup National Park likely occurred as a garden escape. Other plants that have recently become naturalised at nearby Goode Beach are good indicators of this behaviour such as *Felicia echinata* (Thunb.) Nees on the primary coastal dunes and *Kennedia lateritia* F.Muell. on the granitic slopes of Karrakatta Road (Hopper, unpublished). As *P. serpyllifolia* is quite confined within Torndirrup National Park to 150 m of powerline track, with *c.* 200 adult plants, its early eradication should be attempted. Also, future surveys of coastal vegetation along the south coast of Western Australia should be vigilant and aware that *P. serpylliflora* is a significant potential invasive.

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Stylidium miscellany IV: novel species, recircumscriptions and range extensions for northern Australia

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Abstract

Wege, J.A., Brennan, K.G., Bean, A.R., Barrett, R.L., Dillon, S.J. & Barrett, M.D. *Stylidium* miscellany IV: novel species, recircumscriptions and range extensions for northern Australia. *Nuytsia* 35: 141–198 (2024). This paper advances knowledge of triggerplant diversity in monsoonal and arid Australia. The following 14 species are newly described: *Stylidium aliforme* Wege & Brennan (N.T.), *S. anomalum* Wege (W.A.), *S. brachyotis* Wege & Brennan (N.T.), *S. brennanianum* Wege, M.D.Barrett & A.R.Bean (W.A., N.T., Qld), *S. contrarium* Wege (N.T.), *S. eludens* Wege & A.R.Bean (Qld), *S. incognitum* Wege (W.A., N.T.), *S. modicum* M.D.Barrett, R.L.Barrett & Wege (W.A.), *S. pezidium* Wege, Brennan & S.J.Dillon (W.A., N.T., Qld), *S. synaptum* Wege, Brennan & A.R.Bean (W.A., N.T., Qld), *S. tantillum* Wege & Brennan (N.T.), *S. torquatum* Wege & Brennan (N.T.), *S. tremendum* Wege, M.D.Barrett & R.L.Barrett (W.A.) and *S. youwanjela* M.D.Barrett, R.L.Barrett & Wege (W.A.). *Stylidium tenerrimum* F.Muell. (W.A., N.T.) is recircumscribed and *S. evolutum* Carlquist (N.T.) reinstated to its original circumscription. Narrower circumscriptions of *S. fissilobum* F.Muell. (W.A., N.T.) and *S. multiscapum* O.Schwarz (W.A., N.T.) are presented and a lectotype designated for the latter. *Stylidium tenerum* Spreng. (N.T., Qld, P.N.G.) is placed into synonymy under *S. uliginosum* Sw. ex Willd. (south-east Asia), and *S. symonii* Carlquist (N.T.) synonymised under *S. floodii* F.Muell. (N.T., Qld). *Stylidium elachophyllum* A.R.Bean & M.T.Mathieson (Qld) and *S. irriguum* W.Fitzg. (W.A.) are recorded for the Northern Territory, while *S. aquaticum* A.R.Bean (N.T.) and *S. capillare* R.Br. (N.T., Qld) are recorded for Western Australia. A record of *S. longibracteatum* (W.A.) from Kata Tjuta in the Northern Territory is highlighted as having potentially unreliable locality information. Lectotypes are selected for *S. claytonioides* W.Fitzg., *S. cordifolium* W.Fitzg., *S. irriguum* W.Fitzg., *S. rubriscapum* W.Fitzg. and *S. trichopodum* F.Muell. Both *S. pseudotenellum* O.Schwartz and *S. mitrasacmoides* F.Muell. are treated as names of uncertain application. The existence of appropriated type fragments in Herbarium Lowrieanum, recently bequeathed to the Western Australian Herbarium, is noted.

Introduction

Our understanding of *Stylidium* Sw. ex Willd. (Stylidiaceae) diversity across northern Australia has increased substantially over the past 30 years, with the description of 36 novel species and one new

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combination (Kenneally & Lowrie 1994; Lowrie & Kenneally 1996, 1997, 1998, 1999; Bean 1999a, 1999b, 2000, 2010; Bean & Mathieson 2012; Barrett *et al.* 2015); however, despite this collective effort, gaps in our taxonomic knowledge remain. Triggerplants from this region, which are for the most part annual herbs, are among the most difficult to study when pressed and dried, with accurate interpretation of taxonomically informative floral features (most notably the morphology of the corolla, throat appendages, column and seed coat) challenging for even the most experienced botanist. Taxonomic research is greatly aided by field observations, photographic records and the study of flowers preserved in spirit; however, field work is hampered by the remote and rugged terrain and narrow collection windows. Furthermore, while some species are geographically restricted or poorly known, others span jurisdictional boundaries, with associated herbarium collections held across institutions, impeding comparative research.

Documenting *Stylidium* diversity in the Kimberley region remains a particular challenge. Wheeler (1992) provided the first meaningful review of species from this region but, without access to type material and with relatively few specimens at her disposal, was unable to adequately circumscribe a number of species, noting that many variants required further taxonomic assessment. There has since been a significant collection effort; however, a substantial number of these specimens remain in the backlog at the Western Australian Herbarium (PERTH) and as such are unavailable for study. Furthermore, many associated spirit collections contain few flowers or are otherwise poorly preserved, dissolving on dissection. It has become increasingly apparent that, in order to prevent unacceptable publication delays, an account of *Stylidium* for *Flora of Australia* will need to be presented without a complete assessment of existing collections from the Kimberley region, and without resolution of some putative new taxa in widespread and variable species complexes.

Despite the inherent difficulties in documenting *Stylidium* across northern Australia, substantial taxonomic progress has recently been made, aided by several extended research visits to the Northern Territory Herbarium (DNA), Queensland Herbarium (BRI) and Australian National Herbarium (CANB) by one of us [JW], and an influx of recent collections, including associated photographs and spirit material. These new insights are presented herein and include novel species, recircumscriptions, significant range extensions, and resolution or discussion of nomenclatural and typification issues.

Methods

This study is based primarily on examination of specimens and associated spirit materials at BRI, CANB, DNA and PERTH, with select material also examined at additional cited herbaria. Photographic records were also examined where available, and a subset of taxa targeted for field observations and additional collections. Seeds were sampled from herbarium specimens, gold-coated, and imaged using a JCM-5000 NeoScope following standard protocols.

Revised descriptions of previously named species that have undergone a changed circumscription will be published in the *Flora of Australia* in due course; however, key diagnostic features and photographs are provided herein to aid their identification and to enable ready comparison with the newly recognised species. These diagnostic statements are based on data extracted from specimens and associated photographs by the first author. The term ‘throat appendages’ refers to the protuberances or ridge of tissue that can be present at the base of the corolla lobes while the term ‘callosity’ refers to the hardened yellow, orange or red tissue that may be present in the corolla lobe sinuses; these terms are equivalent to the ‘paracorolla’ and ‘paracorolla gland’ of Bean (1999b, 2000, 2010), Bean and Mathieson (2012) and Barrett *et al.* (2015). An interactive key to Australia’s triggerplant flora is undergoing development and will be the most effective identification tool for end-users of the taxonomy. In the interim, a dichotomous key to the species in the Northern Territory has been made available (Wege & Brennan 2024) in light of the number of taxonomic changes proposed for this jurisdiction.

Taxonomy

Stylidium aliforme Wege & Brennan, *sp. nov.*

Type: Bullo River Station *c.* 16 km from homestead and 1 km W of Bullo River, Northern Territory, 12 May 2008, *D. Lewis* 815 (*holo*: DNA D0191671!; *iso*: MEL 2330600 *n.v.*).

Rosulate *annual herb* 7.5–24 cm high. *Glandular hairs* 0.1–0.2 mm long, with a pale red or red-black (or sometimes translucent), globose or discoid head. *Stem* contracted. *Leaves* basal, narrowly oblanceolate, narrowly spathulate or ± linear, 2.5–14 mm long including the slender petiole, 0.4–1.8 mm wide, glabrous, apex obtuse or rounded; margins entire. *Scapes* 1–3 per plant, 7.5–24 cm long including inflorescence, 0.2–0.5 mm wide, glandular-hairy including inflorescence, usually with a few scattered bracts 0.5–0.9 mm long. *Inflorescence* determinate, monochasially cymose, 2–27-flowered, flowers rotated 180°; branches glandular-hairy; bracts 0.4–1.5 mm long, glandular-hairy; pedicels 0.5–1 mm long or indistinct. *Hypanthium* linear in outline, 3.5–11 mm long, 0.4–0.5 mm wide, glandular-hairy. *Calyx lobes* with 3 free and 2 connate for most of their length, 1.7–2.7 mm long, glandular-hairy including inner surface, apex obtuse to rounded. *Corolla* mauve-pink (or pink?) with white towards base of lobes and in throat, pale abaxially; lobes paired vertically, glandular-hairy abaxially and on margins; anterior (upper) lobes ± obovate with a bilobed apex (the outer segment broader than the inner one), smaller than the posterior pair, 1–1.7 mm long, 1.4–1.7 mm wide; posterior (lower) lobes basally connate for 1–1.8 mm, strongly bilobed forming a 4-lobed lower lip (segments divergent, with the outer ones spreading and smaller than the inner ones), 3–5 mm long, *c.* 2.5–4 mm wide; tube 1.7–2 mm long, just shorter than the calyx lobes, glandular-hairy externally and internally below the throat appendages. *Labellum* on tube just below sinus, elliptic or narrowly ovate, sparsely glandular-hairy including the tip, *c.* 0.5 mm long with a terminal appendage 0.1–0.2 mm long. *Throat appendages* basally connate and somewhat irregularly lobed, mauve pink with an orange to red (or yellow?) callosity near sinus of each upper and lower corolla lobe, 0.2–0.5 mm high, glabrous; anterior (upper) appendage with a truncate or broadly emarginate apex; lower (posterior) appendages asymmetric, more prominently lobed near callosity. *Column* 6.8–8 mm long, straight when extended, glabrous, ± slender above main bend, scarcely dilated below the anthers above a strong distal hinge (lacking an apiculus or a hyaline appendage above the anthers); anther locules 0.6–0.7 mm long, corona absent; stigma sessile, entire. *Capsules* linear in outline, 8–14 mm long excluding calyx lobes, longitudinally ribbed; halves detaching distally, recurved, often twisting on drying. *Seeds* brown, ± ellipsoid to ovoid, *c.* 0.15–0.2 mm long, ± smooth (areolate), with concave depressions. (Figure 1A)

Diagnostic features. A rosulate annual herb with the following key features: narrow (less than 2 mm wide) and spreading basal leaves; glandular hairs on the scape, inflorescence and corolla, including the margins of the corolla lobes and inside the throat of the flower below the appendages; a ± linear hypanthium; 3 free and 2 part-connate calyx lobes; a predominantly mauve-pink (or pink?) corolla with unequal lobes, the upper (anterior) pair much smaller than the lower ones and bilobed with unequal segments (the outer segment broader than the inner one), the lower pair bilobed and basally connate forming a 4-lobed lip (the outer segments spreading); mauve-pink, basally connate throat appendages and a prominent orange or red (or yellow?) callosity in the sinus of each upper and lower corolla lobe; a 6.8–8 mm column that is dilated below the anthers above a strong distal hinge and lacks an apiculus or a hyaline appendage above the anthers; and ± smooth (areolate) seeds.

Specimens examined. NORTHERN TERRITORY: Macadam Range, 13 June 2007, *K. Brennan* 7268 (DNA); Bullo River Station *c.* 20 km along access track from homestead, 16 June 2006, *D. Lewis* 556 (DNA); Bradshaw Field Training Area, Fitzmaurice River, 14 May 2017, *B. Wirf* 1458 (DNA).

Spirit material examined. *K. Brennan* 7268 (DNA). Flower reconstituted from *D. Lewis* 815 (DNA) to confirm presence of glandular hairs in the throat.

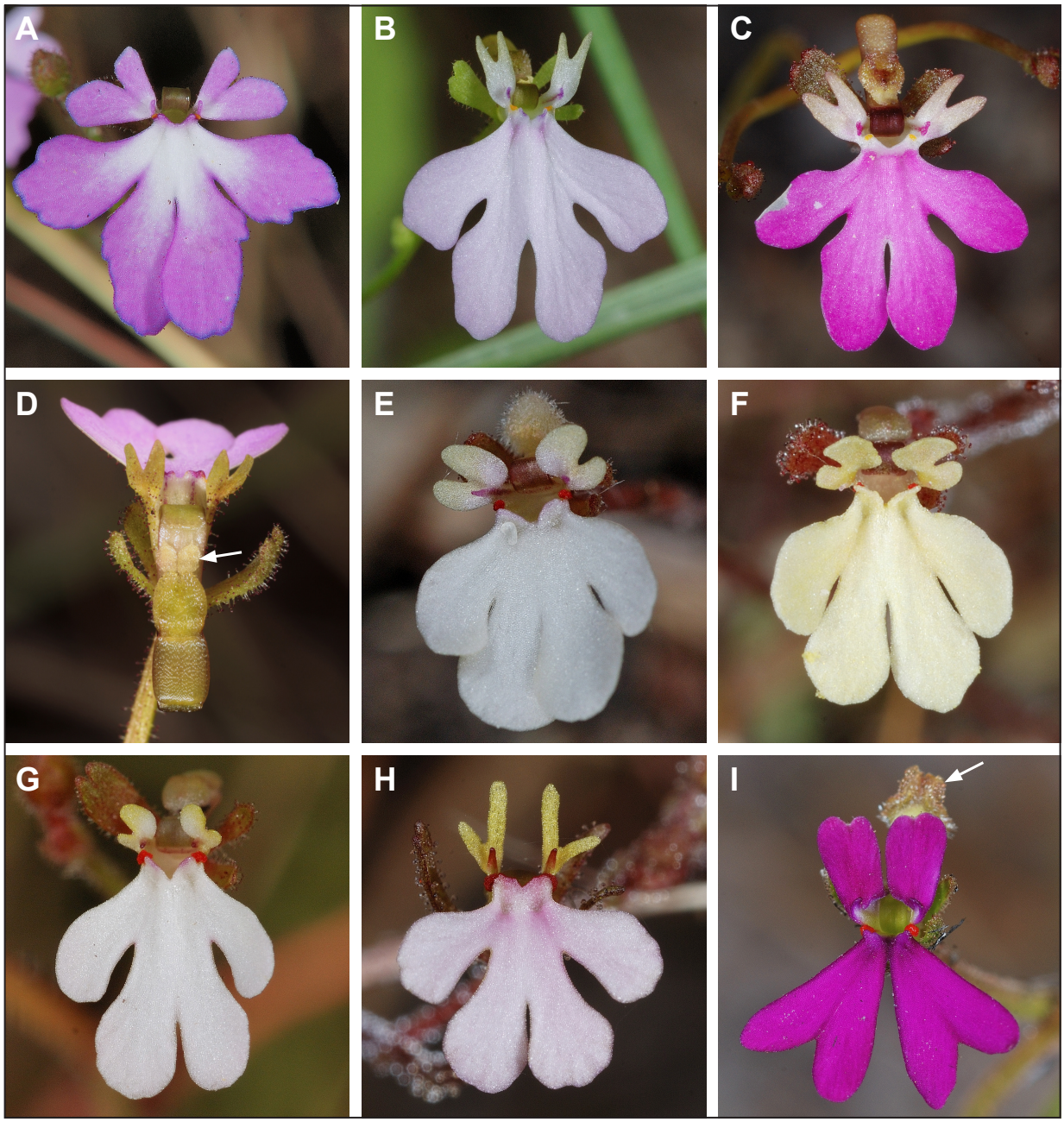

Figure 1. A – *Stylidium aliforme* flower with bilobed corolla lobes, the upper pair with unequal segments (the outer segment broader than the inner one), the lower pair 4-lipped with divergent segments; B, C – *S. pachyrrhizum* flowers with bilobed corolla lobes, the upper pair with ± equal segments, the lower pair 4-lipped; D – *S. pachyrrhizum* flower with poised column, showing the pair of hyaline appendages at the tip (arrow); E–H – *S. schizanthum* flowers with bilobed corolla lobes, the upper pair unequal (the inner segment broader than the outer one), the lower pair 4-lipped (the outer segment incurved); I – *S. lobuliflorum* flower with emarginate upper corolla lobes that are held close together, bilobed lower lobes that are scarcely connate basally, and column tissue that extends above the anthers and stigma (arrow). Photographs by K. Brennan (A–C & E–I) and R.L. Barrett (D) from *K. Brennan* 7268 (A), *K. Brennan* 7617 (B), *K. Brennan* 7858 (C), *R.L. Barrett* RLB 5683 (D), *K. Brennan* 7336 (E), *K. Brennan* 7344 (F), *K. Brennan* 7543 (G), *K. Brennan* 7764 (H), and *K. Brennan* 7760 (I).

Flowering period. April–June.

Distribution and habitat. Known from the Victoria Bonaparte bioregion in the Northern Territory at sites on Bullo Station, in the Macadam Range, and near the Fitzmaurice River to the west of Bradshaw. Grows amongst dense grass on seasonally flooded plains, in open woodland with *Corymbia polycarpa* and *Melaleuca viridiflora*, or *Eucalyptus bigalerita*, *Pandanus spiralis* and *Planchonia careya*.

Conservation status. Data Deficient according to IUCN criteria (IUCN 2012) based on insufficient survey (N. Cuff pers. comm.). An apparently localised distribution.

Etymology. From the Latin *aliformis* (wing-shaped), a reference to the corolla lobes, which fancifully resemble fairy wings.

Vernacular name. Hairy-fairy Triggerplant.

Affinities. Akin to the widespread, morphologically variable *S. schizanthum* F.Muell. and *S. pachyrrihizum* F.Muell., differing from both species in having a corolla with glandular hairs on the margins of the lobes as well as in the throat below the throat appendages. All three species have divided corolla lobes, with the degree of division and shape of the lobes, as well as the degree to which the lower pair are joined at the base, being highly variable in *S. schizanthum s. lat.* and to a lesser extent *S. pachyrrhizum*. Nonetheless, *S. aliforme* appears to have a distinct corolla shape, particularly the outer segments of the upper (anterior) lobes, which are broader than the inner segment (the segments are *c.* equal in *S. pachyrrhizum* and the outer segment is usually narrower than the inner one in *S. schizanthum* or the lobe otherwise emarginate) (Figure 1A–H). Unlike *S. schizanthum*, the lower corolla lobes of *S. aliforme* have divergent segments, with the outer ones widely spreading (*cf.* somewhat incurved in *S. schizanthum*). *Stylidium pachyrrhizum* also differs from *S. aliforme* (and indeed *S. schizanthum*; see Wege & Brennan 2024) in possessing hyaline appendages above the anthers (Figure 1D). There appears to be a small apiculus above each anther locule in *S. schizanthum* (absent in *S. aliforme*), although this feature is difficult to observe on pressed material, so it is unknown whether it is consistently found in *S. schizanthum*.

Stylidium aliforme has previously been confused with *S. lobuliflorum* F.Muell., a species with a dense scape and inflorescence indumentum of sticky and pale-headed glandular hairs, broader leaves (2–11 mm wide), and a column that is slender rather than dilated below the anthers and has tissue that extends above the anthers (Figure 1I). *Stylidium lobuliflorum* also has a distinct corolla shape: the upper lobes are emarginate and usually abut one another, while the lower pair are bilobed and free to the top of the tube or basally connate.

Stylidium anomalum Wege, *sp. nov.*

Type: Yampi Training area, Western Australia [precise locality withheld for conservation reasons], 22 July 2018, *R. Jensen* RJ 4010 *& J.E. Kemp* (*holo*: PERTH 09136592!; *iso*: BRI!).

Weak-stemmed *annual herb c.* 9–20 cm high. *Glandular hairs* to *c.* 0.1 mm long, with a red or reddish black, globose or discoid head. *Stem* decumbent to erect, *c.* 19–40 cm long including inflorescence, 0.3–1 mm wide, straw-brown or pale green, sometimes pale reddish or flecked red, much-branched, glabrous. *Leaves* scattered on stem, narrowly to broadly ovate, 1.5–8 mm long, 1.5–6.5 mm wide, glabrous, apex subacute to acute or acuminate with a blunt tip; base rounded or ± truncate (rarely cordate); margins entire. *Scape* absent. *Inflorescence* determinate, monochasially cymose, 3–19-flowered, flowers rotated *c.* 90°; bracts opposite, ovate, linear-lanceolate or subulate, 1.5–5 mm long, glabrous; branches mostly glabrous, sometimes sparsely glandular-hairy; pedicels 0.5–3 mm long, sparsely glandular-hairy or glabrous. *Hypanthium* oblong to linear in outline, 3.5–10 mm long, 0.3–0.7 mm wide, sparsely glandular-hairy. *Calyx lobes* with 3 free and 2 connate for more than half their length, 1.5–3.6 mm long, sparsely glandular hairy (mostly on margins in lower half), apex ± acute (blunt). *Corolla* white or pale pink with a prominent

dark pink or purplish colour band on the lobes and a golden yellow throat; lobes paired laterally with each pair connate for more than half their length, sparsely glandular-hairy abaxially, unequal, with the upper pair smaller than the lower pair (sometimes markedly so); upper lobes ± ovate with a subacute to obtuse apex, 1.5–2.5 mm long, 0.7–1.5 mm wide; lower lobes ± elliptic to oblong with a subacute to obtuse apex, 2.2–5.5 mm long, 1–2.3 mm wide; tube 0.7–1.1 mm long, shorter than the calyx lobes, sometimes with a few glandular hairs distally, sinus ± absent. *Labellum* ± at top of corolla tube, glabrous or with the odd glandular hair, ovate or elliptic, 0.3–0.5 mm long with a terminal appendage 0.05–0.1 mm long. *Throat appendages* absent. *Column* with a slight lateral curve when extended, 3.5–5 mm long, glabrous; anther locules 0.4–0.6 mm long, corona absent; stigma sessile, entire. *Capsules* ± oblong-linear in outline, 6–12 mm long excluding calyx lobes, without ribs, halves coherent distally. *Seeds* brown with a pale nipple, ellipsoid, 0.2–0.3 mm long, papillose with sinuate ridges. (Figure 2A; also see https://inaturalist.ala.org.au/observations/208878488 [accessed 13 August 2024; from *J. Teuber* BES 01735])

Diagnostic features. A weak-stemmed, annual herb with the following key features: a decumbent to erect and often much-branched stem 0.3–1 mm wide; scattered, ovate leaves 1.5–6.5 mm wide, with a rounded or ± truncate (rarely cordate) base; opposite bracts (leaf-like or narrower); short pedicels (0.5–3 mm long); a sparsely glandular-hairy hypanthium; a white or pale pink corolla with a prominent dark pink or purplish colour band on each lobe and a yellow throat, the lobes paired laterally with each pair joined for more than half their length and the upper pair smaller than the lower ones; ± oblong-linear capsules with distally coherent halves; and papillose seeds 0.2–0.3 mm long.

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: May 1967, *Y. Power s.n.* (PERTH); 9 Aug. 2023, *Z. Sims* 4297 (specimen seen prior to submission to PERTH); 23 Apr. 2024, *J. Teuber* BES 01735 (PERTH).

Spirit material examined. *K.F. Kenneally s.n.* (PERTH 07983395, spirit only: single flower dissolved on dissection). Flower reconstituted from *R. Jensen* RJ 4010 *& J.E. Kemp* (PERTH).

Flowering period. May–August.

Distribution and habitat. Currently confirmed from five sites in Western Australia, extending from west of the Robinson River in the Northern Kimberley bioregion to near Kundat Djaru in the Tanami bioregion, including Charnley River – Artesian Range Wildlife Sanctuary. Recorded from mound springs, perched damplands and flats where it grows in dark humus, sandy clay or clay. Associated vegetation is open woodland with assorted dominant species including *Eucalyptus brevifolia*, *Atalaya hemiglauca* and *Lysiphyllum cunninghamii*, *Melaleuca nervosa*, or *Banksia dentata*. Grows amongst tussock grasses and sedges or *Triodia* hummocks, sometimes with *Utricularia*.

Conservation status. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Noted as common at the type locality but with the substrate damaged by cattle.

Etymology. From the Greek *anomalos* (uneven, irregular, unusual), a reference to the corolla lobes.

Vernacular name. Anomalous Triggerplant.

Affinities. *Stylidium anomalum* belongs to *S.* sect. *Alsinoidea* (*sensu* Bean 2000), a small group of leafy-stemmed annuals with laterally paired corolla lobes, distally coherent capsules and papillose seeds with a pale nipple. Its flowers are most similar to *S. evolutum* Carlquist, a species endemic to the Darwin Coastal bioregion with markedly unequal corolla lobes (see information provided below under that species). *Stylidium anomalum* can be differentiated by its 1.5–6.5 mm wide, ovate (rarely cordate) leaves (*cf.* 0.5–1 mm wide in *S. evolutum* and mostly linear-subulate or linear-lanceolate, although sometimes ± elliptic or narrowly ovate towards the base) and smaller seeds (0.2–0.3 mm long *cf.* 0.4–0.5 mm).

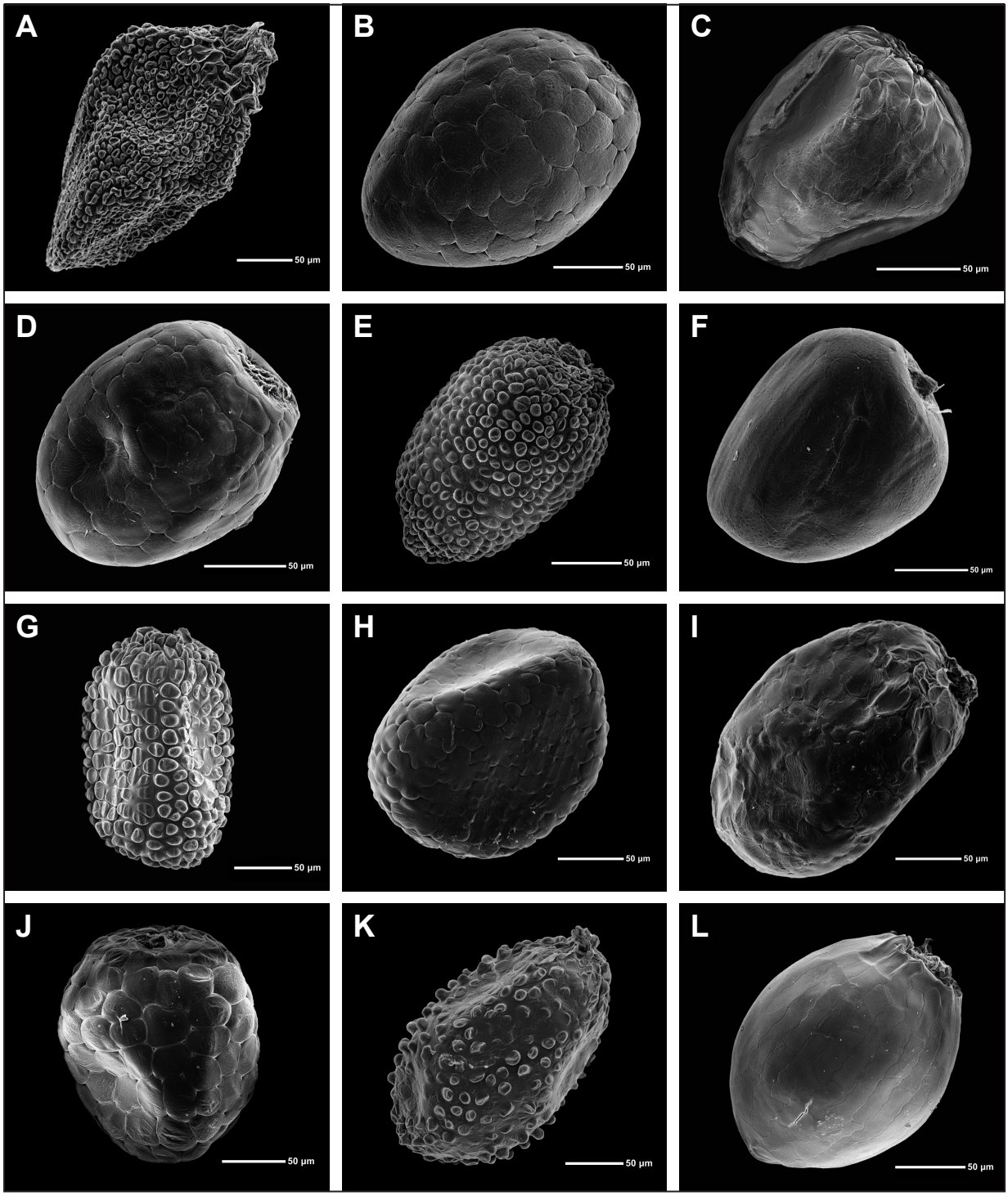

Figure 2. Seeds of select annual triggerplants from northern Australia. A – *Stylidium anomalum* (*R. Jensen* RJ 4010 *& J.E. Kemp*: PERTH); B – *S. aquaticum* (*K.F. Kenneally* 4031: PERTH); C – *S. simulans* (*S. Carlquist* 15435: PERTH); D – *S. lobuliflorum* (*D.J. Edinger* 2585: PERTH); E – *S. divergens* (*K. Brennan* 7557: DNA); F – *S. schizanthum* (*A.A. Mitchell* 3671: PERTH); G – *S. diffusum* (*A.R. Bean* 30826 *& D. Halford*: BRI); H – *S. oviflorum* (*R.J. Cumming* RJC188689: BRI); I – *S. confertum* (*P.I. Forster* PIF22800 *et al.*: BRI); J – *S. capillare* (*M.T. Mathieson* MTM 811: BRI); K – *S. elachophyllum* (*K.R. McDonald* KRM 2044 & *J.A. Covacevich*: BRI); L – *S. eludens* (*K.R. McDonald* KRM9783B: BRI). Photographs by S.J. Dillon.

Stylidium anomalum has previously been confused with the widespread *S. cordifolium* W.Fitzg., which has mostly cordate (but sometimes ovate) leaves. Unlike *S. anomalum*, *S. cordifolium* has a dark red, medial stripe on the undersurface of the corolla lobes (visible in pressed material including the lectotype), and each lateral corolla lobe pair is connate for less than (or rarely up to) half their length and roughly equal in length (*cf.* connate for more than half their length and with the upper pair smaller than the lower ones in *S. anomalum*). It also has larger seeds (0.4–0.5 mm long *cf.* 0.2–0.3 mm in *S. anomalum*).

Stylidium fluminense F.L.Erickson & J.H.Willis could also cause confusion but has a mostly longer column (5–7.5 mm long *cf.* 3.5–5 mm in *S. anomalum*) with larger anther locules (0.7–1 mm *cf.* 0.4–0.6 mm), and its leaves are usually narrowly lanceolate to lanceolate (sometimes tending oblanceolate) with an attenuate to cuneate base (rarely with elliptic or ovate leaves towards the base of the plant; *cf.* ovate in *S. anomalum* with a rounded or truncate (rarely cordate) base). The corolla lobes of *S. fluminense* are usually ± equal in length or with the upper pair a fraction shorter than the lower ones and its pedicels indistinct or rarely to 1 mm long (*cf.* 0.5–3 mm in *S. anomalum*).

Notes. Material from Doongan Station (*R.L. Barrett* RLB 7111, RLB 7410 and RLB 7444: PERTH) with ovate leaves remains unplaced; it does not appear to match *S. anomalum* on account of its indistinct pedicels and corolla morphology (the latter more akin to *S. fluminense*), although it has seeds of comparable size. There are also unplaced specimens from northern Queensland (*A.R. Bean* 16599: BRI, DNA; *R.W. Jobson* 1261: NSW; *S.L. Thompson & M.R. Newton* 2369A: BRI) that may match the material from Doongan Station. Material from Papua New Guinea currently assigned to *S. javanicum* Slooten (*R. Pullen* 6631: BRI, CANB) is also very similar. Further research is required.

Stylidium aquaticum A.R.Bean, *Austrobaileya* 5(4): 622–623 (2000). *Type*: Headwaters Cui-Eci Creek, Northern Territory, 12 May 1994, *I.D. Cowie* 4906 *& D. Albrecht* (*holo*: DNA D0120670!).

Diagnostic features (typical form). A weak-stemmed annual herb with the following key features: a somewhat fleshy stem base with densely arranged, filiform leaves 0.1–0.5 mm wide; a ± linear hypanthium with glandular hairs restricted to the distal end; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; white or pale mauve-pink, vertically paired corolla lobes with a strongly bilobed apex, the lower (posterior) pair much larger than the upper ones and with spreading, unequal to subequal segments; a prominent orange-yellow callosity near the sinus of each upper and lower corolla lobe, and an inconspicuous throat appendage on each lower lobe with a faint ridge-like extension into the corolla tube; a 4.5–6 mm long column with small, lateral lobes above the main bend and hairs around the anthers (i.e. a corona); and ± smooth (areolate) seeds. (Figures 2B, 3A)

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 7 May 2011, *M.D. Barrett* MDB 3550 (PERTH); 16 June 1987, *G.J. Keighery & J.J. Alford* 1679 (PERTH); 7 Aug. 1975, *K.F. Kenneally* 4031 (PERTH); 12 June 1976, *K.F. Kenneally* 4754 (PERTH); 23 June 1993, *A. Lowrie* 749 (PERTH); 9 May 1995, *A.A. Mitchell* 3943 (PERTH); 25 May 1991, *T. Willing & R. Shivas* 414 (PERTH, spirit only).

Conservation status. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Data Deficient in the Northern Territory according to IUCN criteria (Northern Territory Herbarium 2013) although likely to be reclassified as Least Concern under the Common Assessment Method (CAM) in light of the Western Australian records (N. Cuff pers. comm.).

Notes. *Stylidium aquaticum* was described from a single locality in the north-west portion of the Northern Territory. Several specimens from Western Australia's Kimberley region have recently been matched to the type population. The following collections from the Northern Territory are currently assigned to *S. aquaticum* but may represent a distinct taxon; they have a column with thickened margins above the main bend (rather than the small but distinct lateral lobes characteristic of *S. aquaticum s. str.*) and there are red-tipped throat appendages either side of the orange callosities (Figure 3B): Nitmiluk, Marrewel Plateau, 14 Apr. 2005, *K. Brennan* 6523 (DNA); Nitmiluk National Park, headwaters of Fergusson River, 28 Mar. 2002, *I.D. Cowie* 11443 *& A. Gibbons* (DNA, spirit only); Nitmiluk National Park, 20 Apr. 2001,

Figure 3. *Stylidium aquaticum*. A – flower from a population in the Northern Kimberley region that appears to match the type population from the N.T.; B – flowers from the atypical Nitmulik population. Photographs by M.D. Barrett from *M.D. Barrett* 3550 (A) and K. Brennan from *K. Brennan* 6523 (B).

C.R. Michell 3150 (DNA); Nitmiluk National Park, Marrawal Plateau, 16 Apr. 2002, *C.R. Michell* 3835 (DNA); Nitmiluk National Park, Site 557, 20 Apr. 2001, *J.A. Risler* 1645 *& M. Waetke* (DNA). Additional collections (including photographs and spirit material) from across the range of this species are required to support additional taxonomic research.

Stylidium brachyotis Wege & Brennan, *sp. nov.*

Type: Maguk (Barramundie) falls, Northern Territory, 8 July 2007, *K. Brennan* 7370 (*holo*: DNA D0182620; *iso*: BRI, CANB, PERTH, MEL).

Rosulate *annual herb* (8–)12–32 cm high. *Glandular hairs* sticky, 0.1–0.2 mm long, with a translucent to yellowish or pale red, discoid or globose head. *Stem* usually contracted or 0.5–3 cm long, 0.5–0.8 mm wide, straw-brown with a reddish tinge, simple or branched, glabrous. *Leaves* usually basal, sometimes terminal and scattered on stem below, with an elliptic, ovate, lanceolate or orbicular lamina, 4–30 mm long including petiole, 2–10 mm wide, glabrous, apex obtuse or rounded; margins entire, sometimes finely hyaline. *Scape* 1–3(–*c.* 10) per plant, (8–)12–32 cm long including inflorescence, 0.2–0.8 mm wide, glandular-hairy throughout, sometimes with scattered sterile bracts 0.8–4 mm long. *Inflorescence* determinate, monochasially or dichasially cymose, (1–)5–*c.* 75-flowered, flowers rotated 180°; branches glandular-hairy; bracts 0.5–2.3 mm long, glandular-hairy; pedicels indistinct or more often *c.* 0.5–1.5 mm long, glandular-hairy. *Hypanthium* linear in outline, 4–13 mm long, 0.3–0.6 mm wide, glandular-hairy. *Calyx lobes* with 3 free and 2 connate for more than half their length, 1.5–2.8 mm long, glandular-hairy, apex subacute or obtuse. *Corolla* mauve-pink or pale mauve with white near base of lobes (rarely all white?) and a greenish yellow throat, pale yellow abaxially; lobes paired vertically, sparsely glandular-hairy towards base; anterior (upper) lobes narrowly obovate to obovate with a bilobed or emarginate apex, shorter but more than 1/2 the length of the posterior pair, 1–2.4 mm long, 0.8–1.4 mm wide; posterior (lower) lobes basally connate for 1–2 mm, ± obovate with a deeply bilobed apex (forming a 4-lobed lip with ± evenly spaced and equal segments), 2.2–4.4 mm long, 2–3 mm wide; tube 1.8–2.2 mm long, a little shorter to a little longer than the calyx lobes, sparsely glandular-hairy (mostly near anterior sinus). *Labellum* on outside of corolla tube, narrowly ovate to elliptic, *c.* 0.4 mm long with a terminal appendage to *c.* 0.1 mm long, glabrous. *Throat appendages* 8 (2 on each corolla lobe), whitish, glabrous, partially or completely decurrent with corolla and forming ridges in the throat, the free portion (when present) *c.* 0.1–0.3 mm high and ± obtuse. *Column* 4–5.2 mm long, straight when extended, slender above main bend but slightly dilated below the anthers and above a strong second bend, glabrous; anther locules 0.3–0.5 mm long, corona absent; stigma sessile, emarginate. *Capsules* linear in outline, 7–15 mm long excluding calyx lobes, without ribs; halves detaching distally, often recurved. *Seeds* brown, ellipsoid, *c.* 0.2 mm long, colliculate, usually with concave depressions. (Figure 4)

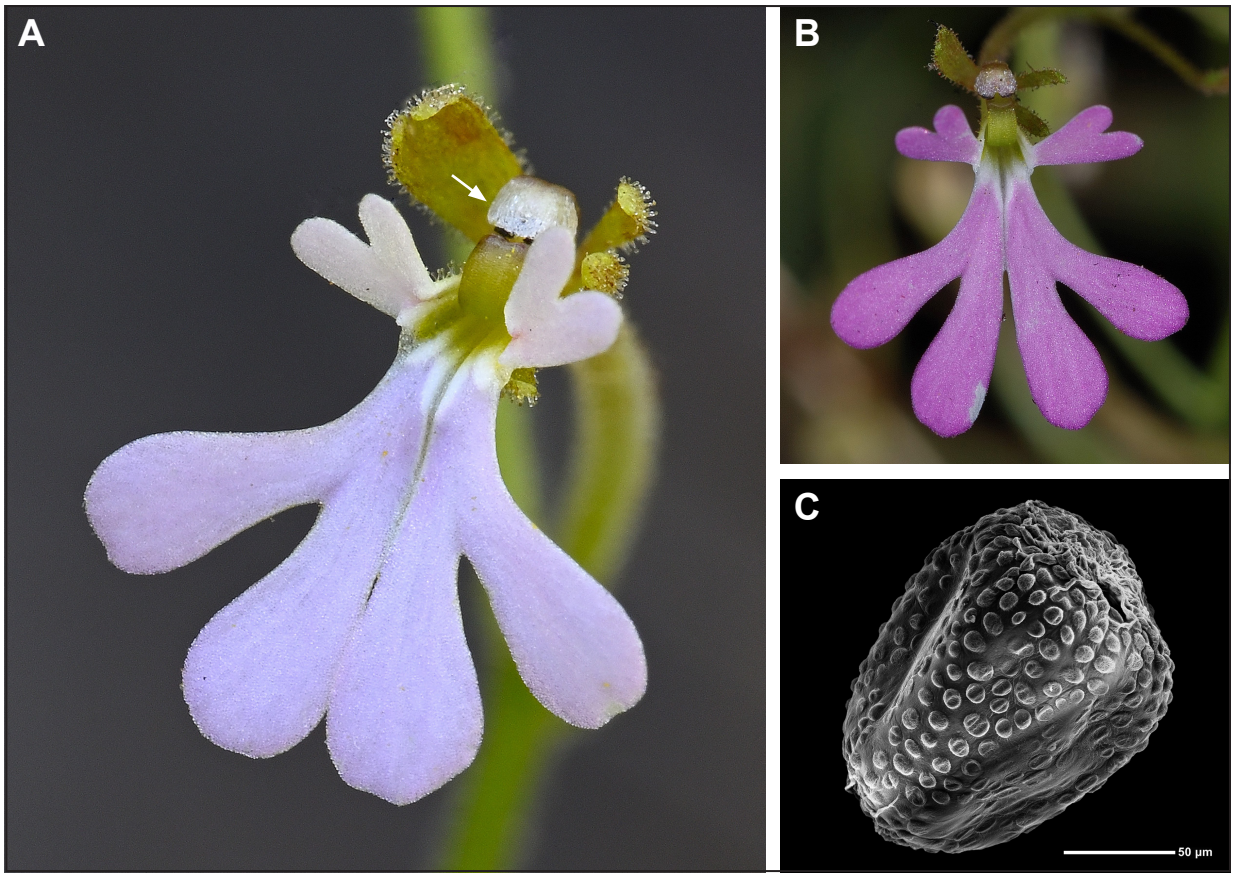

Figure 4. *Stylidium brachyotis*. A – flower showing the unequal, pale mauve corolla lobes, the lower pair much larger than the upper ones and forming a 4-lobed lip with ± even segments. The throat appendages extend ridge-like into the throat and there are no hairs around the anthers (arrow); B – flower with mauve-pink corolla lobes; C – colliculate seed. Photographs by K. Brennan (A, B) and S.J. Dillon (C) from *K. Brennan* 7370 (A) and *K. Brennan* 7759 (B; C: DNA).

Diagnostic features. A rosulate annual herb with the following key features: pale-headed, sticky glandular hairs on the scape, inflorescence branches and calyces; a ± linear hypanthium; 3 free and 2 part-connate calyx lobes; a mauve-pink or pale mauve corolla with a white throat and very unequal lobes, the smaller, upper (anterior) pair emarginate, the lower pair 2.2–4.4 mm long, strongly bilobed and basally connate (forming a 4-lobed lower lip with ± even segments); a short (4–5.2 mm long) column that is slightly broadened just below the anthers above a strong second bend; and colliculate seeds.

Specimens examined. NORTHERN TERRITORY: Stag Creek, above falls, 14 Aug. 1990, *K. Brennan* 717 (DNA); Deaf Adder Gorge, Djuwarr, 17 July 2008, *K. Brennan* 7759 (DNA); Jim Jim Creek, 3.5 km ESE of Jim Jim Falls, 23 May 1980, *L.A. Craven* 5831 (CANB); 12 km SW of Twin Falls, 25 May 1980, *L. Craven* 5911 (CANB, DNA); Tributary of Barramundie Creek, 33 km WSW Twin Falls, 5 June 1980, *L. Craven* 6419 (CANB, DNA); Kakadu National Park, 22 Apr. 1990, *C.R. Dunlop* 8628 *& P.F. Munns* (DNA); above UDP falls, July 1973, *C.H. Gittins* 2637 (BRI, CANB, NSW); 10 km N of Twin Falls, 28 May 1980, *M. Lazarides* 9045 (CANB, DNA); 23.5 km WSW of Twin Falls, 31 May 1980, *M. Lazarides* 9117 (CANB, DNA); Katherine River catchment, 14 Sep. 2000, *K.R. McDonald* KRM627 (BRI); Waterfall Creek about 100 km NE of Pine Creek, 13 May 2012, *D.E. Murfet* 7493 *& A. Lowrie* (AD, DNA); above UDP falls, 8 July 1977, *K. Paijmans* LAC 4666 (CANB); Kakadu National Park, Upper Koolpin Creek, 8 June 1988, *J. Russell-Smith* 5482 *& D. Lucas* (DNA); Deaf Adder Basin, 11 June 1972, *R. Schodde* 97 (BRI, CANB, DNA, NT); El Sharana – Pine Creek road, Crocodile Dreaming, 2 June 1983, *H.S. Thompson* 484 (CANB).

Spirit material examined. *K. Brennan* 7370 (DNA); *K. Brennan* 7759 (DNA); Upper Koolpin Creek, 2 Aug. 2008, *K. Brennan* 7767 (DNA, spirit only).

Flowering period. May–August.

Distribution and habitat. Endemic to the Northern Territory, where it has been recorded in Kakadu National Park between Gunlom Falls and Deaf Adder Gorge. Favours damp sand in rocky seepage and washout areas near perennial creeks on sandstone escarpments, often growing in proximity to waterfalls. Grows amongst herbs, grasses and sedges, in tall shrubland of *Asteromyrtus arnhemica* and *Pandanus* or *Grevillea* and *Verticordia* with fringing *Allosyncarpia ternata* forest, or in shrubby, low *Eucalyptus* woodland.

Conservation status. Data Deficient according to IUCN criteria based on incomplete population data but unlikely to be classified under a Threatened category due to an absence of threat (N. Cuff pers. comm.).

Etymology. From the Greek *brachys* (short) and *otos* (an ear), a reference to the short upper corolla lobes (relative to the lower pair).

Vernacular name. Short-eared Triggerplant.

Affinities. Specimens of *S. brachyotis* have been variously misidentified as *S. simulans* Carlquist, *S. accedens* A.R.Bean, *S. lobuliflorum*, *S. divergens* A.R.Bean and *S. schizanthum*, all of which occur in Kakadu National Park. It is most similar to *S. simulans*, differing in its markedly unequal corolla lobes: the upper pair are less than half the length of the lower pair (Figure 4A, B) whereas they are more than half the length in *S. simulans* (see Carlquist 1979: Figures 30–34; Wege & Brennan 2024: Figure 5I). It also has colliculate rather than ± smooth (areolate) seeds (compare Figure 2C with Figure 4C) and lacks hairs around the anthers (*cf.* hairs present near the apex of the column in *S. simulans*). *Stylidium brachyotis* also tends to have a taller stature (8–30 cm high *cf.* 5–13 cm in *S. simulans*) and larger leaves (4–30 mm long *cf.* 1.8–10 mm), although these differences are not discrete. *Stylidium simulans* is represented by few collections from Kakadu National Park where it appears to favour shallow, white sand pockets on sandstone pavements.

Pressed material of *S. brachyotis* is readily confused with *S. lobuliflorum*, although the latter has a longer column (6.5–10 mm long *cf.* 4–5.2 mm in *S. brachyotis*) that is slightly broadened and concave above the main bend (rather than broadened immediately below the anthers) and has tissue that extends above the anthers (Figure 1I). *Stylidium lobuliforum* also has lower (posterior) corolla lobes that are free to the top of the tube or shortly connate (rather than forming a fairly evenly 4-lobed lip), an orange or orange-red callosity in the sinus of each upper and lower corolla lobe, and ± smooth (areolate) seeds (Figures 1I, 2D). Pressed material of *S. accedens* may similarly cause confusion although this species has a shorter column (2.5–3 mm long) and white corolla lobes (*cf.* mauve-pink or mauve with a white base) that are smaller and have a distinct shape (see Wege & Brennan 2024: Figure 5K). Specifically, the lower (largest) pair of corolla lobes are 0.7–1.5 mm long (*cf.* 2.2–4.4 mm in *S. brachyotis*) and free to the top of the tube or scarcely connate basally. *Stylidium accedens* also tends to have a shorter hypanthium (2–5 mm long *cf.* 4–13 mm long in *S. brachyotis*).

Stylidium divergens, which has colliculate seeds like *S. brachyotis* (Figure 2E), can be separated by its darker and sparser glandular indumentum (including a scape that is glabrous rather than glandular-hairy towards the base), longer column (5.5–8 mm) that is slender immediately below the anthers and has hairs around the anthers (i.e. a corona), longitudinally-ribbed capsules, and more prominent throat appendages. *Stylidium schizanthum* similarly has glandular hairs with darker heads than those of *S. brachyotis*, differing further by its morphologically distinct throat appendages (including an orange or red callosity near the sinus of each upper and lower corolla lobe) and bilobed lower corolla lobes with unequal rather than ± equal segments (Figure 1E–H); the typical form of *S. schizanthum* also has ± smooth (areolate) rather than colliculate seeds (Figure 2F).

Stylidium brennanianum Wege, M.D.Barrett & A.R.Bean, *sp. nov.*

Type: *c.* 62 km from Lajamanu on track to Tanami Road, Northern Territory, 16 April 2021, *K. Brennan* 12100 (*holo*: DNA D0287261; *iso*: NT D0287261 [ex DNA], PERTH 09636552).

Weak-stemmed *annual herb* 7–38 cm high. *Glandular hairs* 0.1–0.15 mm long, with a red or red-black, discoid or globose head. *Stem* scapiform, sometimes a little fleshy towards base, 7–38 cm long including inflorescence, 0.5–2 mm wide, green or pale reddish brown, glabrous. *Leaves* bract-like, ± evenly scattered, adpressed or porrect, narrowly ovate to linear-lanceolate, 1–4(–8) mm long, 0.3–0.6 mm wide, glabrous, apex obtuse to somewhat truncate; margins entire. *Scape* absent. *Inflorescence* determinate, monochasially or dichasially cymose, (1–)5–*c.* 120-flowered, flowers rotated 180°; branches mostly glabrous, sometimes with a few glandular hairs near bract insertion; bracts 1.5–3 mm long, sparsely glandular-hairy or glabrous; pedicels ± indistinct. *Hypanthium* ± linear in outline, 6–18 mm long, 0.3–0.9 mm wide, sparsely glandular-hairy in upper half or throughout but especially distally. *Calyx lobes* with 3 free and 2 connate for more than half their length, 1.5–2.5 mm long, glandular-hairy on margins and towards base (but sometimes elsewhere on surface), apex subacute to obtuse. *Corolla* white, yellowish cream abaxially; lobes paired vertically, sparsely glandular-hairy abaxially on anterior lobes; anterior (upper) lobes ± obovate with a strongly bilobed apex (segments more than half the length of the lobe and divergent), smaller than the posterior pair, 1–2.8 mm long, 1–1.5 mm wide; posterior (lower) lobes basally connate for 0.3–1.5 mm, ± obovate with a flared and bilobed apex (segments ± equal and somewhat divergent), 2–5 mm long, 2.4–4.2 mm wide; tube 1.5–2.2 mm long, *c.* equal to or a little longer than the calyx lobes, sparsely glandular-hairy near anterior sinus. *Labellum* on outside of corolla tube, elliptic or narrowly ovate, 0.4–0.8 mm long with a terminal appendage 0.1–0.4 mm long, sparsely glandular-hairy or more rarely glabrous. *Throat appendages c.* 8 (2 on each corolla lobe), sometimes with additional minor lobing, basally connate or in 2 basally connate groups, golden yellow, orange or dull red, 0.2–0.5 mm high, glabrous. *Column* 4.8–7 mm long, straight when extended, slender above main bend or with raised margins, with a second bend well below the anthers, glabrous; anther locules 0.5–0.9 mm long, corona present; stigma sessile, ± entire. *Capsules* ± linear in outline, *c.* 9–20 mm long excluding calyx lobes, halves coherent distally. *Seeds* brown, ± globose, ellipsoid or ovoid, 0.15–0.2 mm long, colliculate, usually with concave depressions. (Figure 5A–D)

Diagnostic features. A weak-stemmed annual herb with the following key features: bract-like leaves 1–3 mm long, ± evenly scattered along a scape-like stem; a ± linear hypanthium with glandular hairs in upper half or throughout; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; white, vertically paired corolla lobes with a strongly bilobed apex, the upper pair dissected for more than half their length) the lower (posterior) pair much larger than the upper ones and apically flared; 8 golden yellow, orange or dull red throat appendages with an obtuse to rounded tip (sometimes with additional minor lobes); a 4.8–7 mm long column that is slender or with raised margins above the main bend and has hairs around the anthers (i.e. a corona); and colliculate seeds.

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 8 Apr. 2018, *M.D. Barrett* MDB 5469 (BRI, CANB, DNA, NT, PERTH); 4 July 1995, *K. Coate* 366 (DNA, PERTH); 4 July 1995, *K. Coate* 370 B (BRI, PERTH); 3 May 1969, *F. Lullfitz s.n.* (PERTH); 9 Aug. 2023, *Z. Sims* 4323 (specimen seen prior to submission to PERTH).

NORTHERN TERRITORY: Along track from Lajamanu to Tanami Rd, 5 Aug. 2023, *K. Brennan* 13232 (BRI, DNA, PERTH); Access track to Pungalina, off Savannah Way, 19 Aug. 2024, *K. Brennan* 13621 (DNA).

QUEENSLAND: Abingdon Downs station, 7 km SW of Rosie Lagoon, 20 km NE of the homestead, 91 km NNW of Georgetown, 3 Aug. 2006, *C. Appelman & G. Wilson* R295 (BRI); One Hundred Mile Swamp, Undara Resort, E of Mt Surprise, 30 July 1998, *A.R. Bean* 13757 *& I. Fox* (BRI, CNS, DNA, MEL, NSW); Messmate Spring, Whitewater, E of Mt Surprise, 2 June 2001, *R.J. Fensham* 4516 (BRI); 29 km NW of 'Corinda', 8 May 1974, *S. Jacobs* 1517 (NSW); 15.7 km by road N of Coen Road bridge,

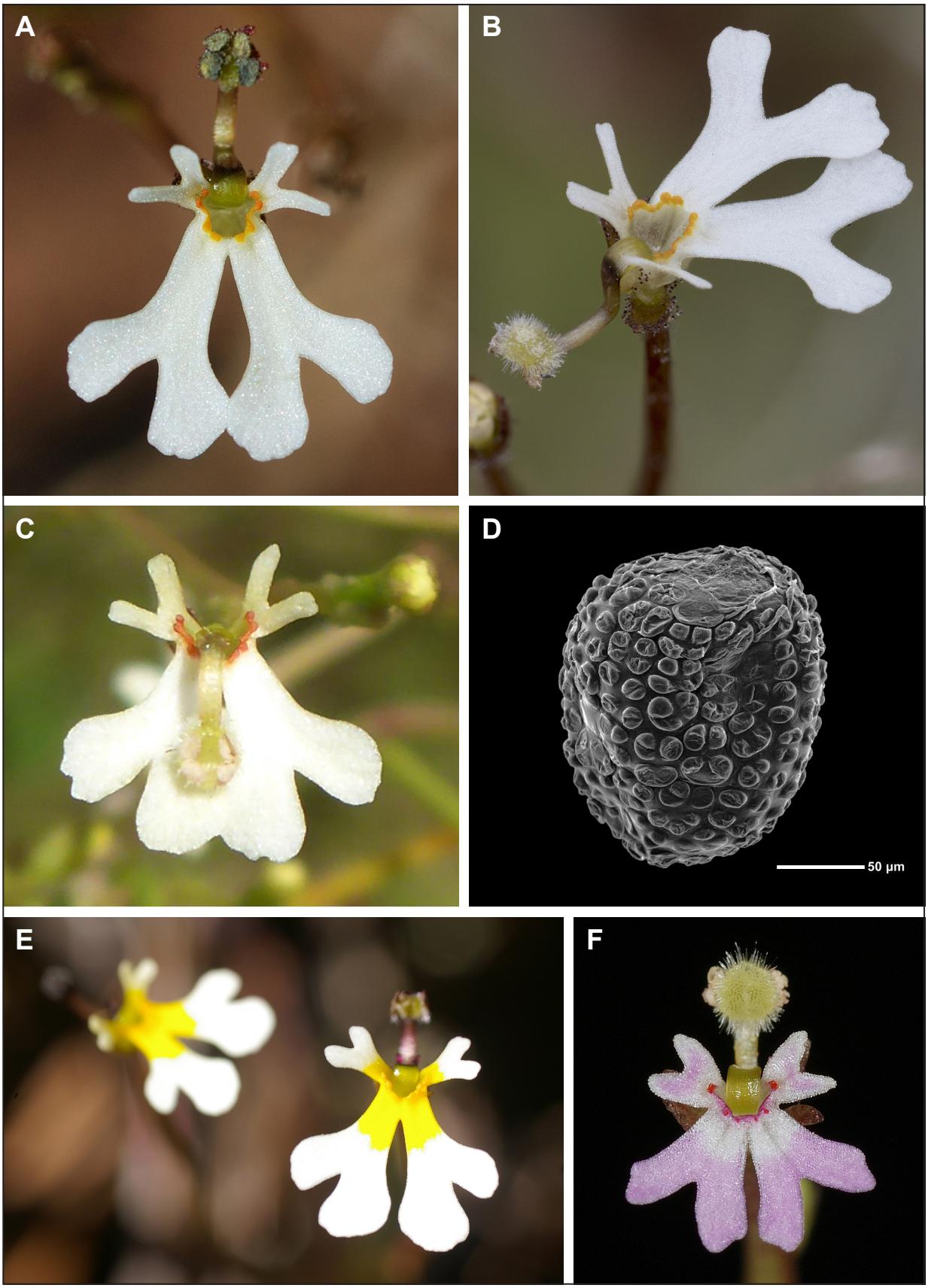

Figure 5. A–C – *Stylidium brennanianum* flowers showing the strongly dissected upper corolla lobes, bilobed lower lobes with flared apex, and prominent orange-yellow or dull reddish throat appendages; D – *S. brennanianum* colliculate seed; E – *S. oviflorum* flowers, showing the yellow throat and throat appendages, and bilobed lower corolla lobes with unequal segments; F – *S. diffusum* flower. Photographs by K. Brennan (A, B, F), M.D. Barrett (C), S.J. Dillon (D) and R.J. Cumming (E) from *K. Brennan* 12100 (A; D: DNA), *K. Brennan* 13223 (B), *M.D. Barrett* 5469 (C), Mt Zero, WNW of Townsville (E) and *K. Brennan* 8174 (F).

2 Sep. 2006, *K.R. McDonald* KRM5632 *& R. Jensen* (BRI); 1.4 km by road W of Lake Emma turnoff, Lakefield National Park, 27 June 2010, *K.R. McDonald* KRM9484 (BRI); Bull Swamp, Lama Lama National Park, 24 June 2013, *K.R. McDonald* KRM14525 *& Lama Lama Rangers* (BRI); Lama Lama National Park, Bull Swamp, 4 Aug. 2013, *K.R. McDonald* KRM14686 *& P.I. Forster* (BRI); Brooklyn Nature Refuge, Mitchell River, 8 July 2019, *K.R. McDonald* KRM21362 (BRI); *c.* 29 km NW of old 'Corinda' on the road from Doomadgee Aboriginal Station to Wollogorang, 8 May 1974, *R. Pullen* 9149 (BRI, CANB, DNA); 65 km SE of Coen in Balclutha Creek Nature Refuge, 29 June 2011, *S. Thomspon et al.* SLT 1141 (BRI); N of Coen, 18 Sep. 2007, *B.S. Wannan* 4830 *& P. Graham* (BRI); Gamboola, 11 Aug. 2011, *B.S. Wannan* 6284 *& M. Trenerry* (BRI, MEL *n.v.*, NSW); 48 km ESE of Aurukun, Yuukingga Nature Refuge, 4 May 2016, *B.S. Wannan* 6783*, N. Kepple, T. Mitchell, S.L. Thompson & W. Lawrence* (BRI).

Spirit material examined. *A.R. Bean* 13757 *& I. Fox* (BRI); *K. Brennan* 12100 (DNA); Winneke Hills on track from Lajamanu to Tanami Rd, 4 Aug. 2023, *K. Brennan* 13223 (DNA, spirit only); *K. Coate* 366 (PERTH); *K.R. McDonald* KRM9484 (BRI); *B.S. Wannan* 6783 *et al.* (BRI). Flower reconstituted from *M.D. Barrett* MDB 5469 (PERTH).

Flowering period. April–September.

Distribution and habitat. Widespread in northern Australia, occurring from east of Derby in Western Australia's Kimberley region to south-east of Mount Carbine in northern Queensland including the Tanami Desert and near Pungalina in the Northern Territory. Grows in damp or waterlogged, sandy soils (sometimes in shallow water), beside seasonal streams, at the margins of swamps, or in drainage depressions and perched wetlands. Found amongst grasses, sedges and herbs, usually in low, open woodland with *Melaleuca viridiflora*, *M. nervosa*, *Corymbia polycarpa*, *Eucalyptus camaldulensis*, *E. brassiana* or *Asteromyrtus symphyocarpa*.

Conservation status. A widespread species that is more commonly recorded in Queensland, where its conservation status has not yet been assessed. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Data Deficient in the Northern Territory according to IUCN criteria but likely to be classified as Least Concern under the CAM (N. Cuff pers. comm.).

Etymology. Named for Kym G. Brennan (1954–) in recognition of his generous assistance in documenting the Northern Territory's triggerplants, most notably through an exceptional collection effort that has included flowers preserved in spirit, high quality photographs, and targeted collections of poorly known or undescribed taxa.

Vernacular name. Brennan's Triggerplant.

Affinities. *Stylidium brennanianum* has previously been confounded with *S. fissilobum* F.Muell. (W.A., N.T.), especially in Queensland, but can be differentiated by its pure white corolla with prominent yellow, orange or dull red throat appendages and strongly dissected upper (anterior) lobes (*cf.* corolla lobes usually pink or mauve-pink (rarely with the upper pair white) with orange or yellow callosities in the sinuses and emarginate upper lobes; Figure 6A–E). It also has a mostly shorter column (4.8–7 mm long *cf.* 7–9.5 mm in *S. fissilobum*) that is slender or with raised margins above the main bend (*cf.* with lateral lobes; Figure 6F), and colliculate rather than ± smooth (areolate) seeds (compare Figure 5D with Figure 6G).

Stylidium brennanianum is morphologically more similar to *S. oviflorum* A.R.Bean (Qld), a species with a distinct corolla shape and colour, specifically the yellow markings on the basal portion of the lobes and the unequal, lower lobe segments (Figure 5E). *Stylidium oviflorum* also has small but distinct lateral lobes above the main bend of the column, less prominent throat appendages and scarcely colliculate seeds (Figure 2H). With the exception of corolla colour, these features can also be used to separate *S. confertum* A.R.Bean (Qld: Figure 2I) from *S. brennanianum*. Indeed, *S. confertum*, which has a white

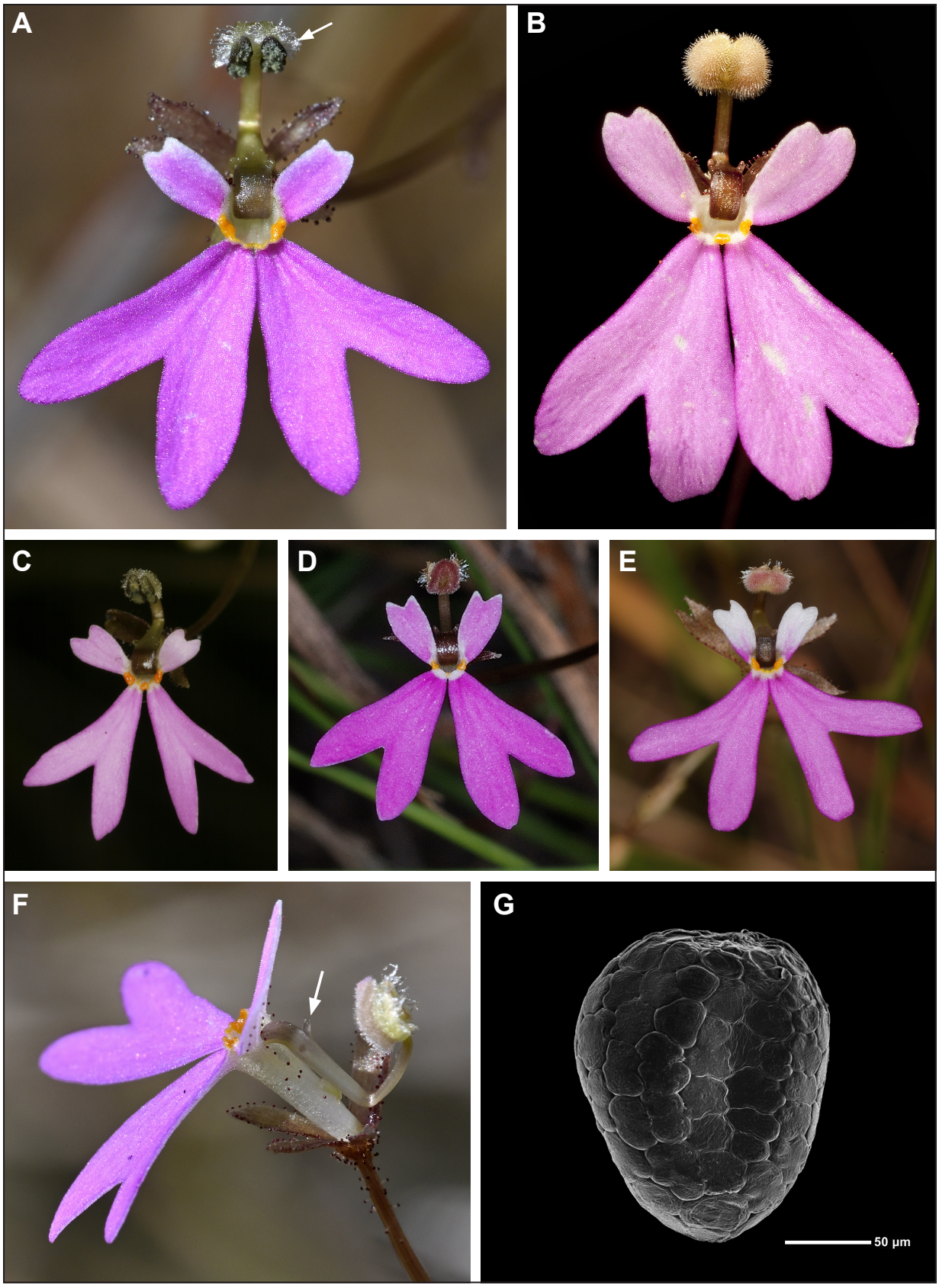

Figure 6. *Stylidium fissilobum*. A – flower, showing the emarginate upper corolla lobes and bilobed lower lobes (the latter free to the top of the corolla tube), and hairs near the anthers (arrow); B – flower, with stigma developed; C–E – subtle variation in corolla shape and colour, and in the prominence of the orange throat callosities; F – side view of flower showing the small lateral lobes on the column (arrow); G – ± smooth (areolate) seed. Photographs by K. Brennan (A, D–F), K.R. Thiele (B), M.D. Barrett (C) and S.J. Dillon (G) from *K. Brennan* 13102 (A, F), *K.R. Thiele* 4850 (B), *M.D. Barrett* MDB 2059, *K. Brennan* 7267 (D), *K. Brennan* 7596 (E) and *M.J. Clark* 1737 (G: DNA).

corolla, yellow throat appendages and leaves that are densely arranged near the base of the plant, may prove to be conspecific with *S. oviflorum* upon further study.

Stylidium diffusum R.Br. (N.T., Qld) has colliculate seeds like *S. brennanianum* (Figure 2G) but tends to have longer and broader leaves (2–12 × 0.4–2.5 mm *cf.* 1–4(–8) × 0.3–0.6 mm) that are densely clustered towards the base of the stem. It also has a distinct corolla and throat appendage morphology (Figure 5F), and a column that it is often shorter (3.5–5.5 mm long) and lacks hairs around the anthers.

Stylidium aquaticum (N.T., W.A.) has a swollen stem base with densely clustered, linear leaves that are usually longer than those of *S. brennanianum* (2–12 mm long *cf.* 1–4(–8) mm), ± smooth (areolate) rather than colliculate seeds (see Figure 2B), and upper corolla lobes that are less deeply dissected (Figure 3); the typical form of *S. aquaticum* differs further from *S. brennanianum* in possessing lateral lobes above the main bend of the column.

A comparison with *S. torquatum* Wege & Brennan (N.T.), a species with a more northerly distribution and a distinct corolla and throat appendage morphology, is provided in the affinities section under that species.

Note. A specimen from south-east of Coen (*S. Thompson et al.* SLT1141: BRI) with linear leaves to 8 mm long is questionably recorded as having a yellow corolla but appears referable to *S. brennanianum*. A collection from north of Coen (*J. Wrigley & I. Telford* NQ 1768: CBG) with a cream corolla and hypanthium *c.* 25–30 mm long remains unplaced, with field observations and additional collections required to resolve its taxonomic status.

Stylidium capillare R.Br., *Prodr. Fl. Nov. Holland.* 570 (1810); *Candollea capillaris* (R.Br.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Type*: Endeavour River, Queensland, 1770, *J. Banks & D. Solander s.n.* (*holo*: BM 000563895!).

Stylidium quadrifurcatum F.L.Erickson & J.H.Willis, *Vict. Naturalist* 73: 5–6 (1956). *Type*: Pine Creek, Northern Territory, April 1904, *J.H. Niemann s.n.* (*holo*: MEL 1061651!; *iso*: MEL 2386964!).

Diagnostic features. A diminutive annual herb with the following key features: a basal rosette of leaves 1.8–7 mm long; a slender scape with scattered sterile bracts 0.7–1.6 mm long; a ± linear hypanthium with glandular hairs restricted to the distal end; 3 free and 2 part-connate calyx lobes with glandular-hairy margins and an acute apex; cream to white or pale mauve-pink, vertically paired corolla lobes with an evenly bilobed apex, the upper (anterior) pair less than half the length of the lower pair, the lower pair free to the top of the corolla tube; 4 basally connate throat appendages (1 on each corolla lobe), white with a yellow, subacute to acute or obtuse tip; labellum positioned at the base of the anterior corolla sinus or on the tube just below the sinus; and ± smooth (areolate) seeds. (Figure 2J, 7)

Selected specimens. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 22 Apr. 2008, *M.D. Barrett* MDB 1918 *& R.L. Barrett* (PERTH); 25 Mar. 2010, *M.D. Barrett* MDB 2779 *& R.L. Barrett* (PERTH); 7 May 2011, *M.D. Barrett* MDB 3551 (PERTH); 16 Apr. 1993, *R.L. Barrett* 570 (PERTH); 18 Apr. 1993, *R.L. Barrett* 579 (PERTH); 4 June 2014, *K.R. Thiele* 4982 (PERTH).

NORTHERN TERRITORY: Darwin Rural Area, between Palmerston and Berry Springs, 17 Apr. 2006, *K. Brennan* 6961 (DNA); Litchfield National Park, catchment of Aida Creek, 2 Mar. 1995, *I.D. Cowie* 5200 *& S. Taylor* (DNA); Kakadu National Park, 27 Mar. 1982, *C.R. Dunlop* 6232 (DNA); Nitmiluk National Park, near site 385, 3 Apr. 2001, *J.A. Risler* 1520 (DNA); Near creekline on Finn Rd, *c.* 3.75 km N of Cox Peninsula Rd, N of Berry Springs, 8 Apr. 2016, *J.A. Wege* JAW 2005 *& B.P. Miller* (PERTH).

QUEENSLAND: Brooklyn, *c.* 1 km W of road c. 13.7 km N of Mt Molloy along Peninsula Developmental Rd, 4 Mar. 2011, *R. Jensen* 2274 *& T. Roberts* (BRI, CNS *n.v.*); Hann Tableland National Park, NW of Mareeba, 11 May 2010, *M.T. Mathieson* MTM811 (BRI); *c.* 1.0 km by road W of Petford, 13 Mar. 2008,

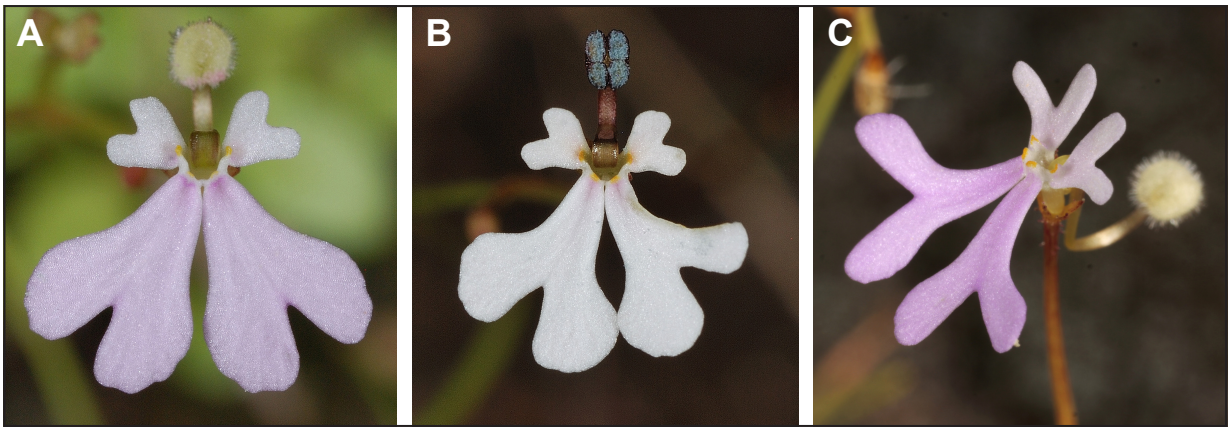

Figure 7. Flowers of *Stylidium capillare s. lat*. showing subtle variation in corolla morphology and yellow-tipped throat appendages. Photographs by K. Brennan (A, B) and R.L. Barrett (C) from *K. Brennan* 7501 (A), *K. Brennan* 8626 (B) and *M.D. Barrett* MDB 2852 *& R.L. Barrett* (C).

K.R. McDonald KRM7283 (BRI); Downstream from Hey Point, Franjum Point, on Embley River, S of Weipa, 22 Mar. 1981, *A. Morton* 1164 (BRI, CNS *n.v.*, MEL *n.v.*); Bridge Creek Holding (proposed National Park), upper Bridge Creek catchment, NW of Cooktown, 1 May 2010, *P.I. Forster* PIF36629 *& M.B. Thomas* (BRI); Quinkan Reserve 1 (West Quinkan), S of Laura, 7 Mar. 2017, *P.I. Forster* PIF44567*, K.R. McDonald* & Western Yalanji traditional owners (BRI); Escott Station, 47 km NW of Burketown, 28 Apr. 2007, *E.J. Thompson & G.W. Wilson* WES1229 (BRI).

Conservation status. A widespread species that is poorly known in Western Australia but otherwise assessed as Least Concern (Northern Territory Herbarium 2013) or Special Least Concern (Bean 2024). To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.).

Notes. This widespread species was recorded between Litchfield National Park in the Northern Territory and Cooktown and Mareeba in northern Queensland by Bean (2000) but extends into Western Australia's Kimberley region. Some of the Western Australian collections have capsules that separate distally (rather than being coherent distally like material from Queensland and the Northern Territory).

The following two Western Australian collections from the Prince Regent River area have been annotated as *S. aff. capillare* on account of the widely divergent lower corolla lobe segments (Figure 7C) and apparently longer column (*c.* 8–8.5 mm long *cf.* 4.8–7 mm in typical *S. capillare*): 19 Jan. 2003, *R.L. Barrett* RLB 2600 *& M.D. Barrett* (PERTH); 27 Mar. 2010, *M.D. Barrett* MDB 2852 *& R.L. Barrett* (PERTH). Additional collections, including flowers preserved in spirit, are needed to enable further taxonomic assessment. More photographic records from across the range of *S. capillare* would also be of assistance in assessing variation in corolla shape.

A population in Prince Regent National Park with affinity to *S. capillare* but with longer, asymmetric upper corolla lobes and unique throat appendages is segregated below as *S. youwanjela* M.D.Barrett, R.L.Barrett & Wege.

Stylidium claytonioides W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 3: 219–220 (1918). *Type*: Between Isdell Range and Mt Bartlett, Western Australia, [20] July 1905, *W.V. Fitzgerald* 1242 (*lecto*, here designated: PERTH 01640526!; *isolecto*: NSW 923306 image!, PERTH 01640518! [excluding fragments of *S. cordifolium*]).

Typification. The collections made by Fitzgerald during Charles Crossland's expedition to the Kimberley in 1905 are variously dispersed, with no complete set held at any one institution (Maslin & Cowan 1994: 396). Specific collection dates are usually not noted on specimen labels (these usually only having the

month and year), but many of his collections can be matched to a single day with reference to Fitzgerald's unpublished expedition diary. Three syntypes of *S. claytonioides* are known, of which PERTH 01640526 has been selected as the lectotype since it is the best quality material and has been annotated by Fitzgerald with the published name. The other PERTH sheet includes fragments of *S. cordifolium* (a species that Fitzgerald also collected at a site between Isdell Range and Mt Bartlett) and has a typed label in which Fitzgerald's collecting number has been mistakenly given as 2242.

Stylidium contrarium Wege, *sp. nov.*

Type: 15 km north-north-east of Jabiru East, Northern Territory, 22 March 1981, *L.A. Craven* 6555 (*holo*: CANB 338101!; *iso*: DNA D0021014!, MEL 0653766!).

Annual herb 8–18 cm high. *Glandular hairs* to *c.* 0.1 mm long, with a red, globose or discoid head. *Stem* erect, 1.7–7 cm long, 0.5–1.6 mm wide, straw-brown, greenish brown or pale reddish brown, simple, with sparse to dense stellate hairs. *Leaves* in a basal and terminal rosette (with the basal ones sometimes rotting off), occasionally also scattered on stem, glabrous adaxially, usually stellate-hairy abaxially especially towards base or sometimes glabrous, apex with a branched or simple acumen 0.3–1.3 mm long or with basal leaves sometimes subacute to acute or obtuse; margins hyaline- or white-crenulate or with simple, somewhat flattened hairs 0.2–0.4 mm long (rarely ± entire); basal leaves narrowly oblanceolate to oblanceolate or spathulate, lamina 2–10 mm long, 0.5–2.7 mm wide; terminal leaves narrowly lanceolate or linear-subulate, lamina 3.5–8 mm long, 0.4–1.5 mm wide. *Scapes* 1–32 per plant, 5–12 cm long including flower, 0.2–0.3 mm wide, constricted (pulvinate?) and sparsely glandular-hairy near bracts otherwise glabrous. *Inflorescence* determinate, 1-flowered, flower rotated 180°; pedicels indistinct or *c.* 0.5 mm long above bracts, sparsely glandular-hairy; bracts paired, 0.4–1.2 mm long, glabrous or sparsely glandular-hairy. *Hypanthium* oblong to linear in outline, 5.5–11.5 mm long, 0.3–0.9 mm wide, glabrous or with a few glandular hairs distally. *Calyx lobes* with 3 connate for at least half their length and 2 connate for most of their length (the latter held at right angles to the hypanthium), 0.7–1.3 mm long, with glandular-hairy margins, apex subacute, obtuse or scarcely emarginate. *Corolla* pink or mauve-pink with white markings towards base of lobes and a yellow-green throat; lobes in a somewhat fan-like arrangement (the upper pair spreading, the lower ones paired vertically), glabrous or with a few glandular hairs abaxially towards base; anterior (upper) lobes elliptic to obovate with a rounded or emarginate apex, much smaller than the posterior pair, 0.6–2.5 mm long, 0.5–1.4 mm wide; posterior (lower) lobes basally connate for 1.5–2 mm, ± obovate with a deeply bilobed apex (forming a 4-lobed lip, the segments subequal or unequal and bilobed, emarginate or obtuse), 3–4.5 mm long, 1.7–3 mm wide; tube 2–3.3 mm long, longer than calyx lobes, sparsely glandular-hairy mostly near anterior sinus. *Labellum* on outside of corolla tube, ovate, 0.4–0.6 mm long, glabrous, without appendages. *Throat appendages* absent or possibly rudimentary at base of posterior corolla lobes. *Column* 11–14 mm long, straight when extended, dilated distally with raised edges and a strong bend below anthers, sparsely glandular-hairy distally; anther locules 0.7–1 mm long, corona absent; stigma sessile, prominent, entire to shallowly bilobed. *Capsules* linear in outline, *c.* 7–12 mm long excluding calyx lobes, longitudinally ribbed, with a slight longitudinal twist; halves detaching distally, not or becoming recurved or sinuate on drying. *Seeds* brown, ellipsoid or ± globose, *c.* 0.15 mm long, ± smooth (areolate), with concave depressions. (Figure 8)

Diagnostic features. An erect, annual herb with the following key features: a stellate-hairy stem with a basal and terminal leaf rosette (sometimes with leaves scattered between); terminal leaves with a branched or simple acumen 0.3–1.3 mm long, a glabrous upper surface, a stellate-hairy lower surface (especially towards the base), and simple hairs 0.2–0.4 mm long on the margins or with the margins white-crenulate; slender scapes with a solitary flower borne above a pair of bracts; a 2-lipped calyx (with 3 lobes connate for *c.* half their length and 2 connate to near the apex); pink or mauve-pink corolla lobes with white markings towards the base, the upper (anterior) pair spreading, the lower pair basally connate and deeply bilobed; a long column (11–14 mm), with a prominent distal dilation and strong bend below the anthers; and linear capsules with longitudinal ribs.

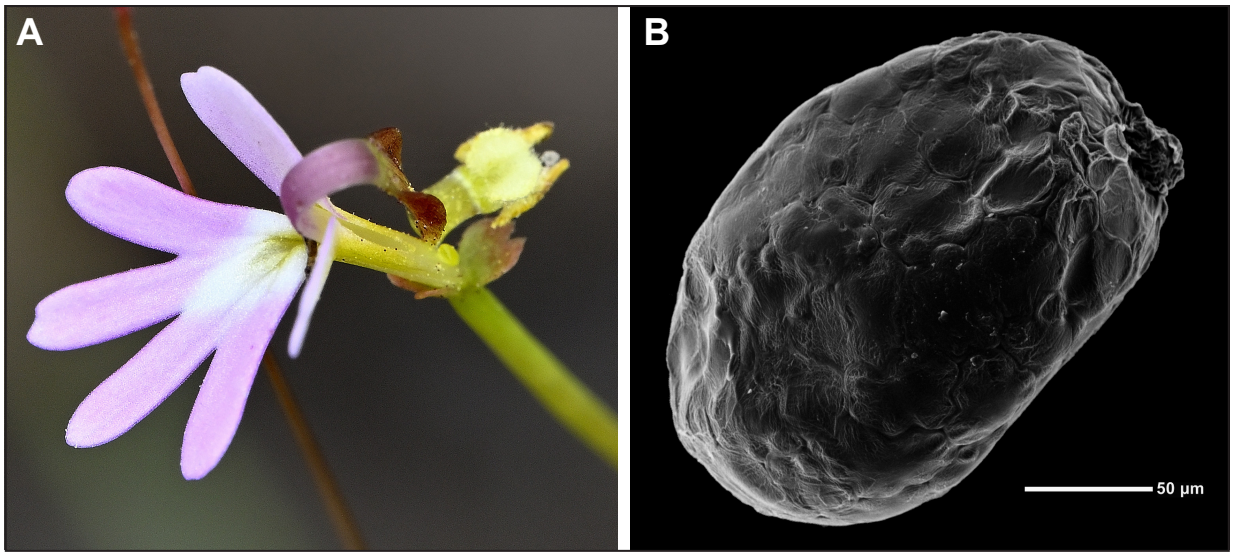

Figure 8. *Stylidium contrarium*. A – flower, showing the long column; B – ± smooth (areolate) seed. Photographs by K. Brennan (A) and S.J. Dillon (B) from *K. Brennan* 13470.

Specimens examined. NORTHERN TERRITORY: near Kakadu Fire Plot 132, Leichhardt Springs, 12 Apr. 2024, *K. Brennan* 13470 (BRI, CANB, DNA, PERTH); Radon Gorge, Mount Brockman, 19 Mar. 1982, *C.R. Dunlop* 6341 *& J.A. Taylor* (DNA); Mount Brockman, near fire plot 132, Kakadu, 4 Apr. 2017, *B. Wirf* 1309 (DNA).

Spirit material examined. *K. Brennan* 13470 (DNA); *L. Craven* 6555 (MEL); *C.R. Dunlop* 6341 *& J.A. Taylor* (DNA).

Flowering period. March–April.

Distribution and habitat. Endemic to Kakadu National Park in the Northern Territory where it is known from north-east of Jabiru and Mt Brockman. Grows in damp sand on sandstone pavements atop a plateau or amongst rocks near a creekline. Recorded in mixed shrubland and localised *Allosyncarpia* forest with *Micraira*, or *Eucalyptus phoenicea* open woodland.

Conservation status. Data Deficient according to IUCN criteria but may qualify for listing under a Threatened category due to its small extent of occurrence and area of occupancy (N. Cuff pers. comm.).

Etymology. From the Latin *contrarius* (against, counter, contrary), alluding to its long column but small stature.

Vernacular name. Contrary Triggerplant.

Affinities. *Stylidium contrarium* has been segregated from *S. ericksoniae* J.H.Willis on account of its longer column. Column length is usually a reliable taxonomic signal in *Stylidium*, with a fairly consistent length within species facilitating precise pollen placement on insect visitors. Indeed, *S. contrarium*, *S. ericksoniae* and the allied *S. pedunculatum* R.Br., which all occur in Kakadu National Park, have discretely different column lengths (11–14 mm, 5.2–8 mm and 2.2–4 mm, respectively).

Stylidium pedunculatum differs further in having very small corolla lobes (the larger, posterior pair < 1 mm long) and a corolla tube that is ± equal to or scarcely longer than the calyx lobes rather than distinctly longer. *Stylidium contrarium* and *S. ericksoniae* are more similar in corolla morphology: both species have bilobed posterior (lower) lobes, although the segments are themselves often bilobed or strongly emarginate in *S. contrarium* (but they can also be obtuse like those of *S. ericksoniae*).

Notes. Stellate hairs have not previously been reported in Stylidiaceae. They are present on the stem and leaves of *S. contrarium*, *S. ericksoniae* and *S. pedunculatum*.

Stylidium cordifolium W.Fitzg., *The Western Mail* 21(1068): 9, 25 (1906), with an expanded description provided in *J. & Proc. Roy. Soc. Western Australia* 3: 217–218 (1918); *Stylidium alsinoides* var. *cordifolium* (W.Fitzg.) Ewart, Jean White & B.Wood, *Proc. Roy. Soc. Victoria* (New Series) 23(2): 299–300, t. VI. (1911). *Type citation*: 'north-east of the King Leopold Ranges'. *Type specimens*: Isdell River near Grace's Knob, Western Australia, May 1905, *W.V. Fitzgerald* 940 (*lecto*, here designated: PERTH 01640941!; *isolecto*: NSW 923305 image!, PERTH 03120783!); Isdell River, W Kimberley [Western Australia], June 1905, *W.V. Fitzgerald s.n.* (*syn*: BM 000603727!); Isdell Range [Western Australia], July 1905, *W.V. Fitzgerald* 1246 (*syn*: PERTH 03120791!).

Typification. Fitzgerald (1906a, 1906b, 1906c) published three articles in *The Western Mail* to illustrate some of the species he encountered as a naturalist on the 1905 trigonometrical survey expedition to the Kimberley, led by Charles Crossland. *Stylidium cordifolium* is included in the third article and is described as follows: 'Among the additions to the Stylidieae is the straggling Stylidium Cordifolium, W.V.F., with heart-shaped stem-leaves, and small, pinkish, dark-blotched flowers'. This description, which is accompanied by a photograph of pressed material showing detail that aids identification, constitutes valid publication under *ICN* Article 38.1 (Turland *et al.* 2018). An expanded description was later provided in the *Journal and Proceedings of the Royal Society of Western Australia* (Fitzgerald 1918), which has hitherto been considered the original publication of this name. Several syntypes have been located: the designated lectotype is the best quality material and has been annotated by Fitzgerald with the published name.

Upon naming *Stylidium alsinoides* var. *cordifolium*, Ewart *et al.* (1911) did not provide a direct reference to *S. cordifolium*; however, they indirectly refer to this species, stating 'This plant has been considered by certain West Australian botanists as a distinct species…' before arguing that it should instead be recognised as a variety. Accordingly, their name is herein regarded as a valid new combination under *ICN* Article 41.3 (Turland *et al.* 2018).

Stylidium elachophyllum A.R.Bean & M.T.Mathieson, *Austrobaileya* 8(4): 608–612, Figures 1–3 (2012). *Type*: Hann Tableland National Park, north-west of Mareeba, Queensland, 27 March 2012, *M.T. Mathieson* MTM1292 (*holo*: BRI AQ0852029!; *iso*: CNS 141337!).

Diagnostic features. A diminutive, weak-stemmed annual with the following key features: a glabrous, scape-like stem bearing small, bract-like leaves 0.5–1.7 mm long; an oblong to linear hypanthium 3.5–7.5 mm long; 3 free or scarcely connate calyx lobes and 2 connate for more than half their length; pale mauve-pink corolla lobes with an obtuse or rounded apex, somewhat fan-like (the upper (anterior) pair smaller than the lower ones and widely spreading, the lower ones paired vertically; see Wege & Brennan 2024: Figure 2D); labellum positioned at the base of the anterior corolla sinus; a short (3–4.8 mm long), glabrous column; and colliculate seeds (Figure 2K).

Selected specimens. NORTHERN TERRITORY: Wickham Point Rd, *c.* 1 km from Channel Island Rd, Wickham, 6 Mar. 2007, *A. Lowrie* 3381 *& D. Murfet* (PERTH); Wickham Point Rd, *c.* 2 km from Channel Island Rd, 7 Mar. 2008, *A. Lowrie* 3815 *& D. Murfet* (PERTH); Channel Island area, Wickham Point Rd, 6 Mar. 2007, *D.E. Murfet* 5612 *& A. Lowrie* (AD, DNA).

Conservation status. Data Deficient in the Northern Territory according to IUCN criteria based on insufficient survey (N. Cuff pers. comm.). Listed as Endangered in Queensland (Bean 2024).

Notes. This species was described from a single locality in the Hann Tableland west of Mareeba (Bean & Mathieson 2012). Two additional populations were subsequently unearthed at BRI, extending the species' distribution to just north of Cooktown. The cited collections from the Northern Territory, which

are all from the same area, are a close match to those from Queensland and represent a significant range extension.

Stylidium eludens Wege & A.R.Bean, *sp. nov.*

Type: *c.* 500 m east of Emu Lagoon, Errk Oykangand National Park, Queensland, 2 September 2010, *K.R. McDonald* KRM9783b (*holo*: BRI AQ1005575!).

Stylidium sp. (Aurukun C.Dalliston CC429), A.R. Bean (ed.), *Census of Queensland Vascular Plants 2023 (Print),* Queensland Department of Environment, Science and Innovation, Queensland Government.

Annual herb c. 7–11 cm high. *Glandular hairs c.* 0.1–0.2 mm long, with a red or yellowish, ellipsoid head. *Stem* contracted or more often to *c.* 3 cm long, 0.25–0.4 mm wide, straw-brown to reddish brown, simple, glabrous. *Leaves* in a terminal rosette and sometimes scattered below or appearing ± basal through contraction of stem, linear, 5–20 mm long, 0.3–0.6 mm wide, glabrous, apex attenuate with a blunt acumen to *c.* 0.5 mm long; margins entire. *Scapes* 1–*c.* 15 per plant, 4.5–9 cm long including the inflorescence, 0.2–0.3 mm wide, glabrous. *Inflorescence* determinate, monochasially or dichasially cymose, (1–)3–7-flowered, flowers rotated 180°; branches glabrous; bracts 1–7 mm long, sparsely glandular-hairy on inner surface and margins; pedicels 3–7 mm long, usually with a few glandular hairs towards base. *Hypanthium* narrowly obovoid to obconical, 1.3–3 mm long, 0.7–0.8 mm wide, glabrous. *Calyx lobes* with 3 free and 2 connate for more than half their length (rarely scarcely connate basally), 1.5–2.5 mm long, glabrous externally but glandular-hairy on inner surface and margins, apex obtuse or subacute. *Corolla* pink; lobes paired vertically, glandular-hairy abaxially; anterior (upper) lobes elliptic with an obtuse apex, smaller than the posterior pair, *c.* 1–2.8 mm long, *c.* 0.9–1 mm wide; posterior (lower) narrowly obovate with an obtuse apex, *c.* 1.5–3.5 mm long, *c.* 1.4 mm wide; tube *c.* 2–3 mm long, longer than the calyx lobes, sparsely glandular-hairy, with an anterior sinus. *Labellum* at sinus base, *c.* 0.4–0.5 mm long with a terminal appendage to *c.* 0.2 mm, glandular-hairy. *Throat appendages* basally connate, forming a ± semi-circular ridge with obtuse lobes, *c.* 0.1–0.3 mm high, minutely papillose and glandular-hairy. *Column c.* 8–9.5 mm long, slender above main bend, glandular hairy distally including the connective; anther locules *c.* 0.7–0.8 mm long, corona present; stigma sessile, entire. *Capsules* narrowly obovoid to obconical, 4–6 mm long excluding calyx lobes, without ribs; halves detaching distally, not recurved. *Seeds* brown, ellipsoid, *c.* 0.15–0.2 mm long, ± smooth (areolate). (Figure 2L)

Diagnostic features. A diminutive annual herb with the following key features: linear, glabrous leaves mostly arranged in a dense rosette at the tip of the stem (sometimes scattered on the stem below or appearing ± basal through contraction of the stem); a glabrous scape and inflorescence branches; a glabrous, narrowly obovoid to obconical hypanthium; glandular hairs on the inner surface and margins of the calyx lobes and bracts; pink, vertically paired corolla lobes, the upper (anterior) pair smaller than the lower ones; throat appendages forming a ± semi-circular ridge with obtuse lobes and glandular hairs; a glandular-hairy column with a corona (i.e. hairs around the anthers); and ± smooth (areolate) seeds.

Other specimen examined. QUEENSLAND: S of Aurukun, 32 km N of Peret Outstation, 21 July 1988, *C. Dalliston* CC429 (BRI).

Spirit material examined. None available. Flower reconstituted from *K.R. McDonald* KRM9783b; bud reconstituted from *C. Dalliston* CC429 to confirm the presence of glandular hairs on throat appendages.

Flowering period. July–September.

Distribution and habitat. Currently known from two sites on the western side of Cape York Peninsula in Queensland, one to the south of Aurukun, the other near the Alice River in Errk Oykangand National Park. Grows on floodplains in *Asteromyrtus* or *Melaleuca* woodland.

Conservation status. A poorly known species in need of survey and a formal conservation assessment.

Etymology. From the Latin *eludo* with the present participle ending *-ens* (evading, eluding, baffling), a reference to its poorly known status and dearth of herbarium collections.

Vernacular name. Elusive Triggerplant.

Affinities. *Stylidium eludens* is morphologically akin to the Cape York endemic *S. delicatum* A.R.Bean and the more widespread *S. floodii* F.Muell., the latter of which grows with *S. eludens* at the type locality (*K.R.McDonald* KRM9783 was originally a mixed collection of the two species that has been subsequently separated). It can be differentiated from both species by its glabrous scape, inflorescence branches and hypanthium (*cf.* glandular-hairy) and the presence of glandular hairs on the throat appendages. It also has distinct calyx lobes and bracts in which the glandular hairs are restricted to the inner surface and margins (*cf.* glandular-hairy on both surfaces in *S. delicatum* and usually only on the outer surface in *S. floodii*) and its capsules are narrowly obovoid to obconical (*cf.* ellipsoid to obovoid).

Notes. Further collections (including photographs and flowers preserved in spirit) are required to better document the precise colour and form of the corolla.

Stylidium evolutum Carlquist, *Aliso* 9(2): 309–313, Figures 1–8 (1978). *Type*: beside road heading to Shoal Bay, north-west of Darwin, Northern Territory, 25 June 1977, *S. Carlquist* 15190 (*holo*: RSA 283657!; *iso*: CANB 297677!, DNA D0017891!).

Diagnostic features. A weak-stemmed, annual herb with the following key features: a decumbent to erect and often much-branched stem 0.5–1 mm wide; scattered, linear-subulate or linear-lanceolate leaves 0.5–1 mm wide (sometimes ± elliptic or narrowly ovate towards stem base); opposite, leaf-like bracts; indistinct or very short pedicels to 1 (rarely 2) mm long; a sparsely glandular-hairy hypanthium (rarely apparently glabrous); a white or dusty pink corolla with prominent red or pink markings towards the base of the lobes and a yellow throat (usually with red speckles), the lobes laterally paired, with each pair usually fused for half to more than half their length and the upper pair much smaller than the lower ones; ± linear capsules with distally coherent halves; and papillose seeds 0.4–0.5 mm long. (Figure 9)

Selected specimens. NORTHERN TERRITORY: Amy Johnson Drive, near Boulter Rd intersection, 22 May 2010, *K. Brennan* 8635 (DNA); 23 miles [37.01 km] S of Darwin, 19 June 1978, *S. Carlquist* 15455 (DNA, RSA); Litchfield National Park, Florence Falls road, near turn off to Buley Rock Holes, 12 June 1999, *I.D. Cowie* 8337 (BRI, DNA, MEL); near Amys Creek, Weddell area, 14 Apr. 2014, *I.D. Cowie* 13680 (BRI, DNA); Howard Springs, 31 May 1995, *J. Egan* 4984 (DNA); Shoal Bay Conservation Reserve, Hope Inlet, 25 May 2000, *R.A. Kerrigan* 141 *& I.D. Cowie* (DNA); Gunn Point, 1 Aug. 2018, *D.L. Lewis* 3199 (DNA, PERTH); Point Stuart, Swim Creek, 11 June 1987, *J. Russell-Smith* 5568 (DNA).

Conservation status. Data Deficient according to IUCN criteria but may qualify as Near Threatened with further survey (N. Cuff pers. comm.).

Notes. Following the recent discovery of populations matching the type of *S. tenerrimum* F.Muell. (refer to the notes under that species), *S. evolutum* is herein reinstated to accommodate specimens assigned to that species by Bean (2000: 636). *Stylidium evolutum* is endemic to seasonal swamps and seepage zones in the Darwin Coastal bioregion in the Northern Territory and can be readily separated from *S. tenerrimum* by its corolla, which has markedly unequal lateral pairs (the upper much smaller than the lower) that are connate for *c.* half to more than half their length and have a prominent red colour band toward the base (*cf.* with ± equal pairs that are connate for less than half their length and with discrete red-pink or purplish markings; compare Figure 9B with Figure 10B). *Stylidium evolutum* also has a more robust habit with stems 0.5–1.3 mm wide (*cf.* 0.2–0.5 mm in *S. tenerrimum*), and short or indistinct pedicels (usually 0–1 (rarely 2) mm long *cf.* 1–6 mm).

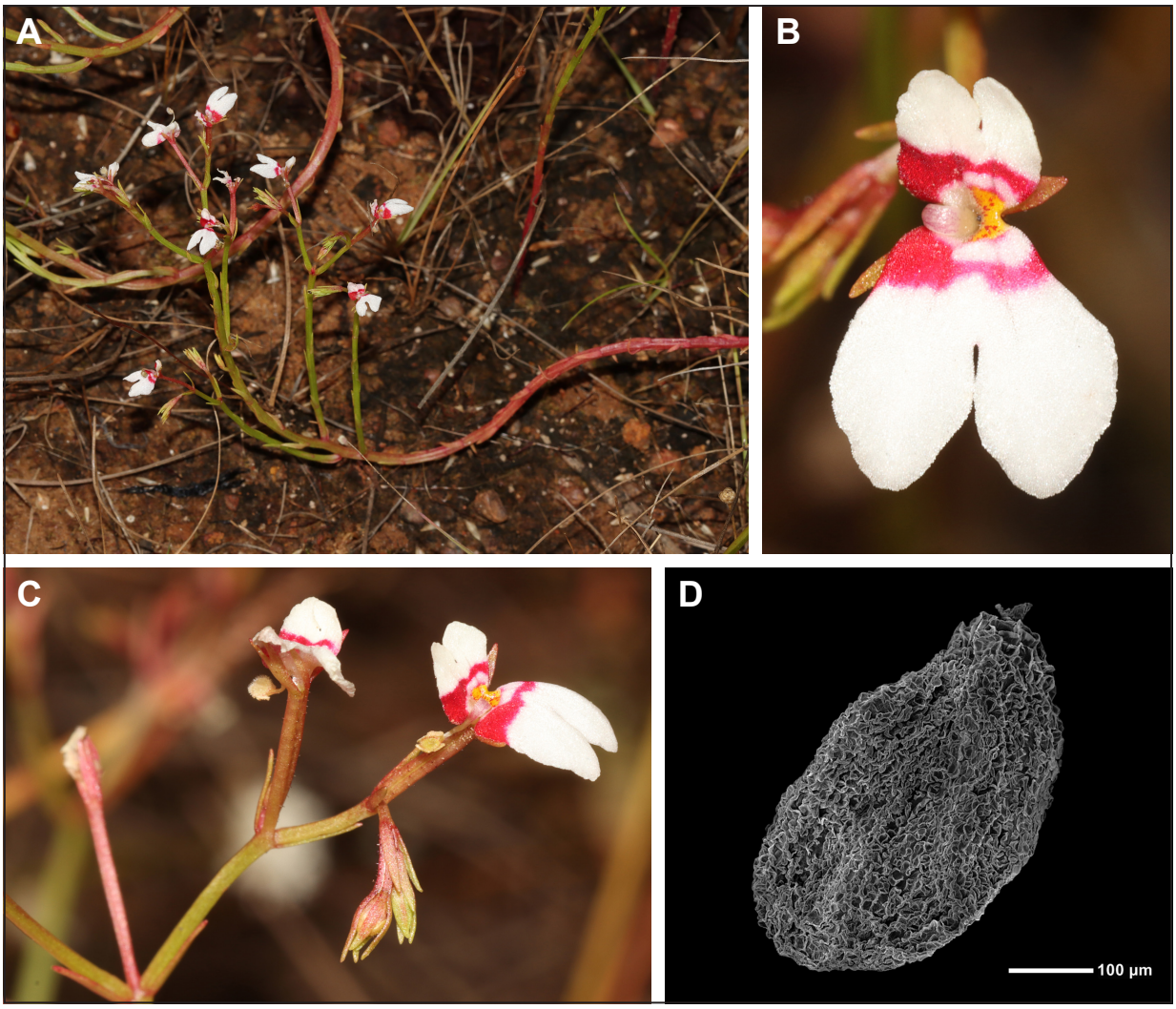

Figure 9. *Stylidium evolutum*. A – weak-stemmed habit; B – flower showing the asymmetrical, laterally paired corolla lobes with a broad colour band near the base; C – inflorescence portion showing the indistinct pedicels; D – papillose seed. Photographs by J.A. Wege (A–C) from Yarrawonga swamp (population DNA D0192632) and S.J. Dillon (D) from *I.D. Cowie* 14436 (DNA).

Stylidium anomalum, which is currently known from Western Australia but may extend into the Northern Territory in the Tanami bioregion, has markedly unequal corolla lobes like *S. evolutum*. Refer to the comparative notes provided under the treatment of that species.

Stylidium fissilobum F.Muell., *Fragm.* 1(6): 154 (1859); *Candollea fissiloba* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Type*: Victoria River, Northern Territory, May 1856, *F. Mueller s.n.* (*lecto*, designated by A.R. Bean, *Austrobaileya* 5(4): 623 (2000): MEL 1061830!; *isolecto*: BM 000645730!, GH 00033486 image!, K 000060549!, K 000741780!).

Diagnostic features. A weak-stemmed annual herb with the following key features: bract-like leaves 1–4 mm long, ± evenly scattered along a scapiform stem or more densely arranged towards the base; a ± linear hypanthium with glandular hairs restricted to the distal end; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; pink or mauve-pink, vertically paired corolla lobes (rarely partially white), the upper (anterior) pair smaller than the lower ones and with an emarginate apex, the lower pair bilobed and ± free to the top of the tube; orange or yellow callosities in corolla lobe sinuses (these are especially prominent between each upper and lower lobe but can also be present between the lower lobes); a 7–9.5 mm long column with small, obtuse lobes immediately above the main bend; and ± smooth (areolate) seeds. (Figure 6)

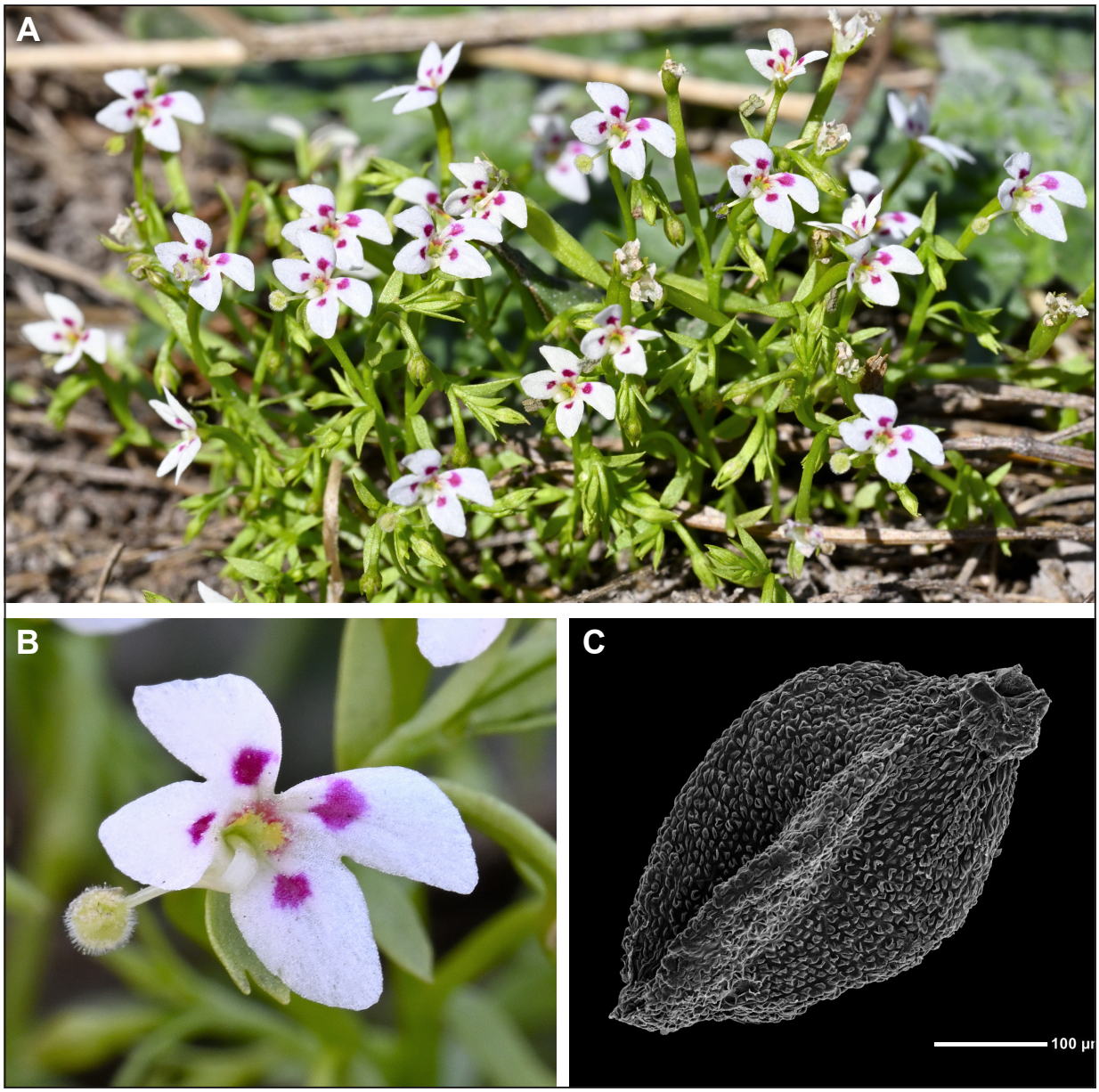

Figure 10. *Stylidium tenerrimum*. A – diminutive, weak-stemmed habit with a delicate, much-branched stem; B – flower, showing the laterally paired lobes with discrete purple-pink markings; C – densely papillose seed. Photographs by K. Brennan (A, B) from *K. Brennan* 13191 and S.J. Dillon (C) from *H.I. Aston* 2553 (PERTH).

Selected specimens. WESTERN AUSTRALIA: Beverley Springs Station, *c.* 35 km NW of Homestead, 27 June 1993, *M. Barrett* MDB 210 (PERTH); Durack River Station, 61.5 km at 224.5 degrees from Home Valley Station homestead, 3 June 2014, *R. Butcher* RB 1877 *& A.N. Start* (DNA, PERTH); Karunjie Station, 112 km at 217.6 degrees from Home Valley Station homestead, 4 June 2014, *R. Butcher* RB 1926 *& A.N. Start* (PERTH); Chilli's Garden, 2.5 km SW from El Questro Township, 28 June 2008, *G. Byrne* 3456 (PERTH); Bindoola Creek, Jack's Waterhole, NE Kimberley, 12 April 2002, *K. Coate* 660 A (PERTH); Pseudomys Hills, Drysdale River National Park, N Kimberley, 7 Aug. 1975, *K.F. Kenneally* 4034 (PERTH); Gibb River Rd, 9.1 km W of Home Valley Homestead turnoff, 30 May 2014, *K.R. Thiele* 4850 (PERTH); Karunjie Station, *c.* 3.2 km direct line W of confluence of Nugget Creek and Chapman River, 4 June 2014, *K.R. Thiele* 4980 (PERTH).

NORTHERN TERRITORY: 40.5 km NW of Pine Creek, 28 May 2005, *A.R. Bean* 23932 (BRI); Macadam Range, 13 June 2007, *K. Brennan* 7267 (DNA); Litchfield National Park, Reynolds track, 12 May 2016, *K. Brennan* 10604 (DNA); Mary River, 1 May 1989, *M.J. Clark* 1737 (DNA); Litchfield National Park,

16 Apr. 1999, *I.D. Cowie* 8300 *& K. Brennan* (BRI, DNA, MEL *n.v.*); Fish River Station, headwaters of Snape Creek, 25 Apr. 2012, *I.D. Cowie* 13196 (DNA, MEL *n.v.*); Bradshaw Field Training Area, *c.* 48 km NW of Bradshaw Homestead, 11 May 2017, *I.D. Cowie* 14191 *& N.J. Cuff* (B *n.v.*, DNA, MEL *n.v.*, NY *n.v.*); 18 km SSW Cooinda on Pine Creek road, 19 May 1980, *L. Craven* 5624 (CANB, DNA, MEL, RSA); Douglas Station *c.* 3.5 km SW of Hayes Creek, 12 June 2014, *N.J. Cuff* 52 *& I.D. Cowie* (DNA); Bullo River Station *c.* 25 km NW of homestead, 22 Mar. 2009, *D.L. Lewis* 944 (DNA); Keep River National Park, *c.* 68 km NE of Ranger Station, 12 May 2011, *D.L. Lewis* 1684 (DNA, MEL *n.v.*).

Notes. We have adopted a narrower circumscription of *S. fissilobum* relative to that of Bean (2000), aided by recent collections and photographs of the typical form and two taxonomic segregates (refer to the comparative notes provided under *S. brennanianum* and *S. torquatum*). *Stylidium fissilobum* is widespread in the Kimberley region and across the Top End, occurring as far east as Kakadu National Park. Specimens from Queensland previously assigned to *S. fissilobum* are mostly referable to *S. brennanianum*.

Stylidium floodii F.Muell., *Fragm.* 1(6): 149 (1859). *Candollea floodii* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Type citation*: 'Ad ripas glareoso-arenosas prope originem fluminis Victoriae et rivi Roper River.' *Type specimens*: Dry lagoons on the Roper River, Gulf of Carpentaria, Northern Territory, 8 July 1856, *F. Mueller s.n.* (*lecto*, designated by K.F. Kenneally & A. Lowrie, *Nuytsia* 9(3): 347 (1994): MEL 233150!; *isolecto*: GH 00033487 image!, K 000741765!, MEL 233151A! [individual on left hand side], MEL 233152B! [individual on upper portion of sheet, and individuals on the lower left and third from the left]); Depot Creek [Victoria River], Northern Territory, March 1856, *F. Mueller s.n.* (*syn*: MEL 233151B! [individual on right hand side], MEL 233152A! [individuals on lower portion of sheet and second from the left and on right hand side]), = *S. adenophorum* Lowrie & Kenneally.

Stylidium symonii Carlquist, *Aliso* 9(3): 439, 441–443, Figures 78–83 (1979), *syn. nov. Type*: At old B.H.P. (Broken Hill Pty.) flying field, Arnhem Land, Northern Territory, 17 June 1972, *D.E. Symon* 7731 (*holo*: DNA A0041348! [NT 41348]; *iso*: AD 98599542 *n.v.*, RSA 283547! [ex NT 41348]).

Diagnostic features. A tufted annual herb with the following key features: a pale stem that is usually shortly elongated and multi-branched; linear, glabrous leaves with an acumen to 0.6 mm long, arranged in a terminal rosette and scattered on the stem below (sometimes appearing ± basal through contraction of the stem), occasionally also forming rosettes along stem length or at base; glandular-hairy scape and inflorescence (including the hypanthium and calyx lobes); subacute to obtuse calyx lobes; pink or mauve-pink, vertically paired corolla lobes, the upper (anterior) pair smaller than the lower ones; throat appendages forming a ± semi-circular ridge with obtuse, scarcely papillose lobes; ellipsoid to obovoid capsules without raised ribs; a glandular-hairy column with a corona (i.e. hairs around the anthers); and ± smooth (areolate) seeds. (Figure 11)

Selected specimens. NORTHERN TERRITORY: Arnhem Land, Koolatong River Crossing, Numbulwar Rd, 8 Oct. 1987, *M.J. Clark* 1622 (DNA); Amungee Mungee Waterhole, 3 May 1991, *I.D. Cowie* 1819 *& B.A. Wilson* (DNA); Koolatong River, 18 Oct. 1996, *I.D. Cowie* 7360 (DNA, MEL); Groote Eylandt, 21 June 2021, *D.L. Lewis* 3567 *& K. Brennan* (DNA, PERTH); Nitmiluk National Park, E boundary, 2 May 2002, *C.R. Michell* 3842 (DNA); Manbulloo Station, 12 Aug. 2021, *J. Patykowski* 124 (DNA).

QUEENSLAND: Richmond – Croydon road, 76.8 km S of 'Esmeralda', 2 July 1998, *A.R. Bean* 13443 (BRI); One Hundred Mile Swamp, Undara Resort, E of Mt Surprise, 30 July 1998, *A.R. Bean* 13760 *& I. Fox* (BRI); Thorntonia Station, 40 km NW of Gunpowder, 23 May 2006, *R. Booth & D. Kelman* CAM14-1 (BRI, DNA); Rock Hole at Emu Lagoon, Errk Oykangand National Park, 8 June 2010, *K.R. McDonald* KRM9294 *& T. Cockburn* (BRI); Mimosa Creek, Errk Oykangand National Park, 10 June 2010, *K.R. McDonald* KRM9407 *& L. Little* (BRI); 118 km W of Burketown, 17 Apr. 2004, *E.J. Thompson & M. Newton* WES859 (BRI).

Typification. *Stylidium symonii* was described by Carlquist (1979) from a gathering by David Symon from north-eastern Arnhem Land, although this name has not been applied to any additional collections.

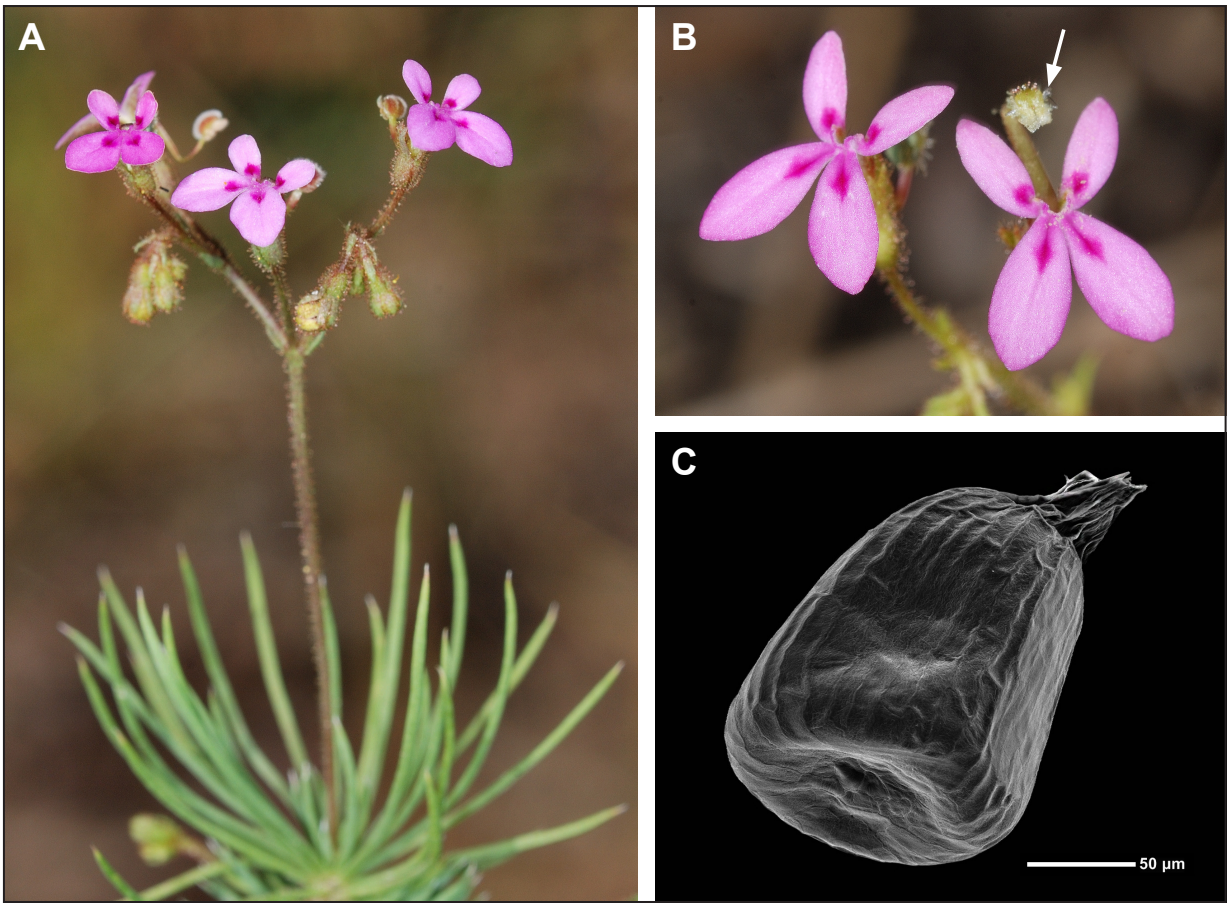

Figure 11. *Stylidium floodii*. A – linear leaves and glandular-hairy inflorescence; B – flowers, with hairs around the anthers (arrow) and adjacent glandular hairs; C – ± smooth (areolate) seed. Photographs by K. Brennan (A, B) and S.J. Dillon (C) from *K. Brennan* 9909 (A), *K. Brennan* 8672 (B) and *K.R. McDonald* KRM 9407 (C: BRI).

Two duplicates of Symon's collection have been examined and found to be identical to *S. floodii*. It is of note that Carlquist applied the name *S. floodii* to collections of *S. turbinatum* Lowrie & Kenneally (e.g. *S. Carlquist* 15178 and 15461: DNA, RSA; *S. Carlquist* 15389 and 15420: RSA), and *S. adenophorum* Lowrie & Kenneally (e.g. *J.R. Clarkson* 3713 and 3747: RSA; *L.A. Craven* 4090: RSA; *T.S. Henshall* 250: DNA; *A. Kanis* 1720: DNA; *P.K. Latz* 3520: DNA).

Carlquist (1979) cites the holotype of *S. symonii* as 'N.T.: sheet no. 41348', noting that he examined this sheet when he visited and annotated the NT specimens in June 1978. Fragments from this sheet were acquired by him during this visit: RSA 283547 is annotated by Carlquist as 'from NT 41348', and photographs of the fragments were published alongside his description. Curiously there is no mention of this in the protologue. DNA A0041348 is not annotated by Carlquist, although he annotated the specimen at RSA as an isotype. The AD isotype could not be found on a recent visit to that institution.

Stylidium incognitum Wege, *sp. nov.*

Type: south-east of Wyndham, Western Australia [precise locality withheld for conservation reasons], 25 July 2023, *J.A. Wege* JAW 2284 *& B.P. Miller* (*holo*: PERTH 09608184; *iso*: BRI, CANB, DNA, MEL).

Rosulate *annual herb* 8–34 cm high, with a slender tap root. *Glandular hairs* 0.15–1.2 mm long, with a red, ellipsoid head. *Stem* contracted. *Leaves* basal, spreading, lanceolate or oblanceolate (sometimes narrowly so), (6–)10–90 mm long, (1.8–)3–15 mm wide, glabrous, apex subacute, acute or acuminate with a slender acumen (0.3–)0.8–1.8 mm long; margins hyaline, irregularly serrate or crenulate to ± entire. *Scapes* 1–*c.* 15 per plant, 8–34 cm long including inflorescence, 0.3–1.3 mm wide, glandular-hairy.

Inflorescence determinate, monochasially or dichasially cymose, 5–*c.* 75-flowered, flowers rotated *c.* 90°; branches glandular-hairy; bracts 1–7.5 mm long, glandular-hairy; pedicels 1.5–5 mm long, glandular-hairy. *Hypanthium* ellipsoid to obovoid or ± globose, 1–2 mm long, 0.8–1.6 mm wide, glandular-hairy. *Calyx lobes* free, 1.3–2.3 mm long, glandular-hairy, apex obtuse or rounded. *Corolla* medium pink to magenta (rarely white) with dark purplish-pink to red markings towards base of lobes and a golden yellow throat, cream or yellowish abaxially with a dark red stripe or mottled markings on each lobe; lobes paired laterally, sparsely glandular-hairy abaxially; anterior lobes obovate or elliptic with an obtuse apex, shorter than the posterior pair, 2–3 mm long, 1.3–2.1 mm wide; posterior lobes obovate with an obtuse apex, 2.5–4 mm long, 1.6–2.1 mm wide; tube 1.8–2.5 mm long, *c.* equal to or more often a little longer than the calyx lobes, sparsely glandular-hairy distally, with an anterior sinus. *Labellum* on outside of corolla tube just below sinus (rarely at base of sinus), broadly ovate, orbicular or elliptic, 0.5–0.8 mm long, usually sparsely glandular-hairy abaxially, without appendages. *Throat appendages* absent. *Column* 7–8.7 mm long, with a slight lateral curve when extended and a strong bend below the anthers, slightly broadened and scarcely concave above main bend, glabrous; anther locules 0.6–0.9 mm long, corona absent; stigma sessile, entire. *Capsules* ellipsoid to subglobose, 1.7–2.8 mm long excluding calyx lobes, without ribs; halves detaching distally or irregularly dehiscent towards base, not recurved. *Seeds* brown with a pale nipple, ellipsoid or ovoid, 0.2–0.3 mm long, colliculate, with concave depressions. (Figure 12)

Diagnostic features. A basally-rosetted annual with the following key features: a spreading rosette of lanceolate or oblanceolate leaves with a hyaline margin and a subacute, acute or acuminate apex with a slender acumen; glandular-hairy scapes and inflorescences; an ellipsoid to obovoid hypanthium; obtuse to rounded calyx lobes that are *c.* equal to or longer than the hypanthium; medium pink to magenta (rarely white), laterally paired corolla lobes with a golden yellow throat that lacks appendages; a column that is glabrous and slightly broadened above the main bend and lacks a corona (i.e. hairs around the anthers); and colliculate seeds.

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 17 Aug. 1999, *E. Bennett* EB 9909 (PERTH); 11 July 2001, *D.J. Edinger* 2569 (PERTH); 13 July 2001, *D.J. Edinger* 2580 (PERTH); 15 July 2001, *D.J. Edinger* 2582 B (PERTH); 3 Aug. 1974, *K.F. Kenneally* 1899 (PERTH); 17 June 1993, *A. Lowrie* 719 (DNA, PERTH); 30 May 2014, *K.R. Thiele* 4920 (PERTH); 30 July 2023, *J.A. Wege* JAW 2287 *& B.P. Miller* (BRI, DNA, PERTH).

NORTHERN TERRITORY: Keep River National Park, 14 Aug. 2008, *K. Brennan* 7799 (DNA); Spirit Hills Station, 21 Aug. 1987, *P.L. Wilson* 736 (DNA).

Spirit material examined. *D.J. Edinger* 2569 (PERTH); *J.A. Wege* JAW 2284 *& B.P. Miller* (PERTH); *J.A. Wege* JAW 2287 *& B.P. Miller* (PERTH).

Flowering period. Late May–August (and potentially into September), with peak flowering in July.

Distribution and habitat. Known from the Victoria Bonaparte bioregion and adjacent Central Kimberley, from Durack Station in Western Australia to Keep River National Park in the Northern Territory. Grows in sand on flood plains, in drainage lines and near watercourses and billabongs. Favours open savanna woodland, growing amongst grasses in association with *Adansonia*, *Melaleuca*, *Grevillea*, *Pandanus*, *Eucalyptus* or *Syzygium*.

Conservation status. To be listed as Priority Two under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Data Deficient in the Northern Territory under IUCN criteria due to inadequate survey (N. Cuff pers. comm.).

Etymology. From the Latin *incognitus* (unknown, unidentified), a reference to its lack of recognition as a distinct species despite herbarium collections dating back to 1974.

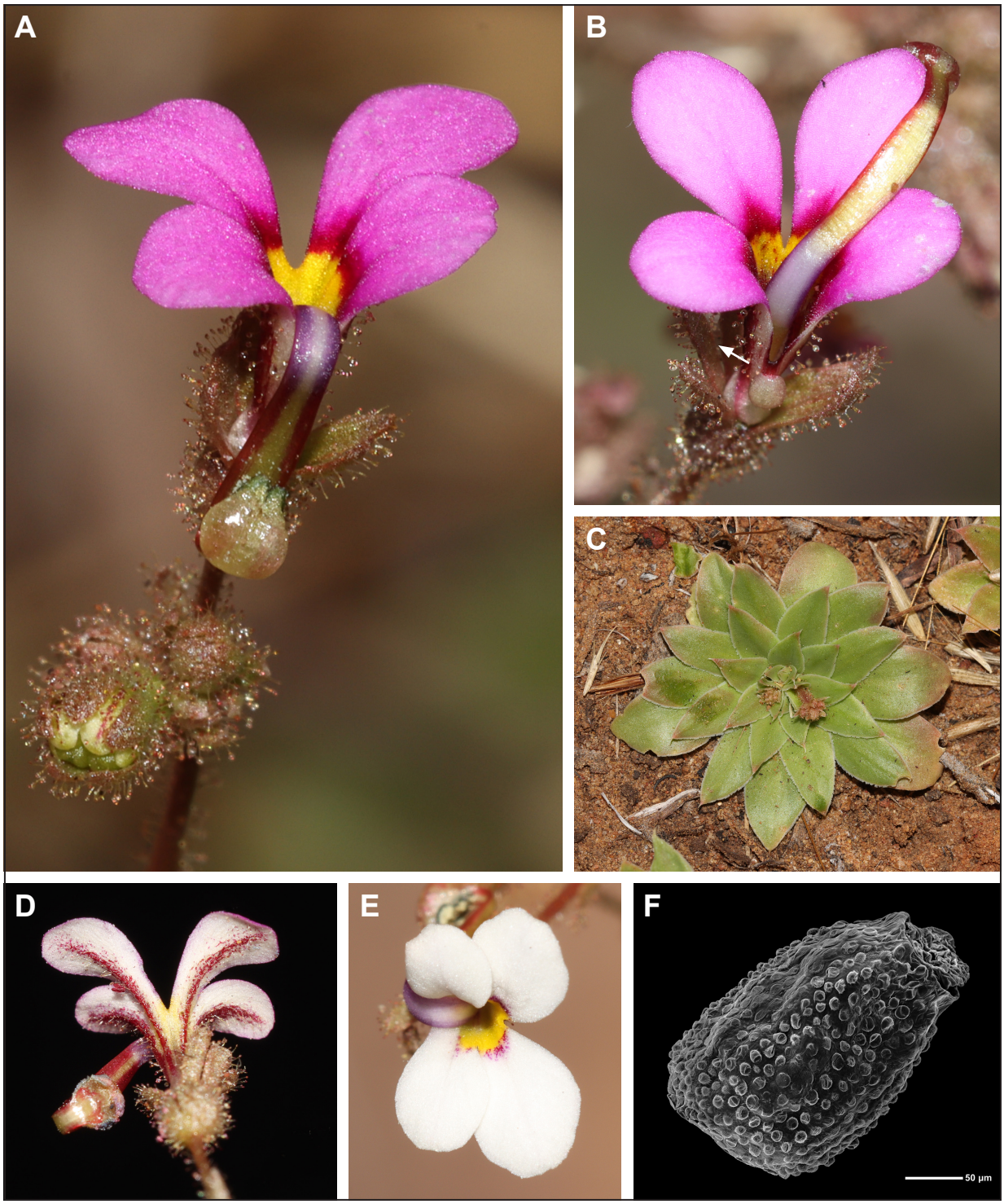

Figure 12. *Stylidium incognitum*. A – flower with laterally paired corolla lobes, a golden yellow throat without appendages, and a glabrous column that is slightly broadened above the main bend; B – triggered flower, revealing the simple labellum positioned just below the anterior corolla sinus (arrow); C – basal leaves; D – flower, showing the pale corolla undersurface with red markings; E – rare, white-flowered form; F – colliculate seed. Photographs by J.A. Wege (A–E) and S.J. Dillon (F) from *J.A. Wege* 2287 *& B.P. Miller* (A–D), *J.A. Wege* 2284 *& B.P. Miller* (E) and *K. Brennan* 7799 (F: DNA).

Vernacular name. Clandestine Triggerplant.

Affinities. Akin to the Cape York endemic *S. austrocapense* A.R.Bean, a species with a similar habit, floral morphology and seed coat. It can be differentiated by its column, which is slightly broadened above the main bend and lacks hairs (a corona) around the anthers (*cf.* slender in *S. austrocapense* with a corona). *Stylidium incognitum* also has a more uneven indumentum of glandular hairs on the scape and inflorescence (0.15–1.2 mm long *cf.* 0.15–0.5 mm long in *S. austrocapense*), obtuse to rounded calyx lobes that are roughly equal to or longer than the hypanthium (*cf.* acute to obtuse and usually shorter than the hypanthium), and flowers with a golden yellow throat (*cf.* pale greenish yellow or white). Its leaves also tend to have a more pronounced acumen.

Stylidium incognitum has previously been confused with *S. multiscapum* O.Schwarz (Figure 13A–D), a pink-flowered, rosulate species that differs in having white (*cf.* yellow) markings at the base of the corolla lobes, eight throat appendages (*cf.* none), and a slender column with hairs around the anthers. The distribution of these two species overlaps in the Kununurra and Keep River National Park areas.

Stylidium leptorrhizum F.Muell. (Figure 13E–G) is another pink-flowered, rosulate species that overlaps in distribution and flowering time with *S. incognitum*. It can be differentiated by its long corolla tube (4–5 mm long and exserted well beyond the calyx lobes *cf.* 1.8–2.5 mm long and equal to or a little longer than the calyx lobes), prominent throat appendages, and dorsally operating, hairy column (*cf.* laterally operating, glabrous column).

Stylidium irriguum W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 3: 219 (1918). *Type citation*: 'Messmate Creek, in the Packhorse Range; Isdell and Charnley Rivers (W.V.F.).' *Type specimens*: Charnley River near F.B. 33, Western Australia, August 1905, *W.V. Fitzgerald* 1396 (*lecto*, here designated: PERTH 01641484!); Messmate Creek, Packhorse Range, Western Australia, May 1905, *W.V. Fitzgerald* 996 (*syn*: NSW 923304 image!, PERTH 01641492! [packet contents, i.e. excluding fragment of *S. semipartitum* F.Muell. attached to sheet]).

Diagnostic features. A diminutive annual herb with the following key features: leaves arranged in a somewhat erect rosette (sometimes also scattered on stem below), 6–30 mm long, the lamina narrowly oblanceolate or elliptic with a slender petiole; a ± linear hypanthium a 2-lipped calyx with glandular-hairy margins; a white or pale mauve-pink corolla with a yellow throat bearing ridges and glandular hairs, lobes ± vertically paired (the upper lobes somewhat spreading) with an emarginate apex; the labellum positioned at the base of the anterior sinus; and ± smooth (areolate) seeds (Figure 14A).

Selected specimens. WESTERN AUSTRALIA: *c.* 35 km NW of Beverley Springs Station Homestead, 8 July 1993, *M. Barrett* MDB 252 (PERTH); campsite on Bachsten Creek (S arm) on Walcott Inlet Track, W Kimberley, *M.D. Barrett* MDB 2962 *& R.L. Barrett* (BRI, DNA, PERTH); Cascade Creek of Prince Regent River, N Kimberley, 4 Aug. 2005, *K. Coate* 729 (DNA, PERTH); Blyxa Creek, Prince Regent River Reserve, 21 Aug. 1974, *A.S. George* 12501 (CANB, PERTH); King Cascade, Prince Regent River, Kimberley, 31 May 1992, *K.F. Kenneally* 11175 (PERTH).

NORTHERN TERRITORY: East Alligator Rd, Narridj Creek, 23 Apr. 1995, *K. Brennan* 3170 (DNA); Arnhem Land Plateau, 15 June 1978, *S. Carlquist* 15440 (RSA); Buckingham River swampland, 9 km E of Wamalana radio site, 20 Sep. 2009, *D.E. Murfet* 6588 (AD, DNA); South Bay, Bickerton Island, 6 June 1948, *R.L. Specht* 465 (AD, BRI, CANB, MEL *n.v.*, RSA); 10 km from East Alligator River crossing on Oenpelli road towards Arnhem Hwy, 19 Apr. 1980, *I.R. Telford* 7681 *& J.W. Wrigley* (CBG).

Conservation status. Not currently considered to be at risk in Western Australia (Western Australian Herbarium 1998–). Least Concern in the Northern Territory according to IUCN criteria (N. Cuff pers. comm.).

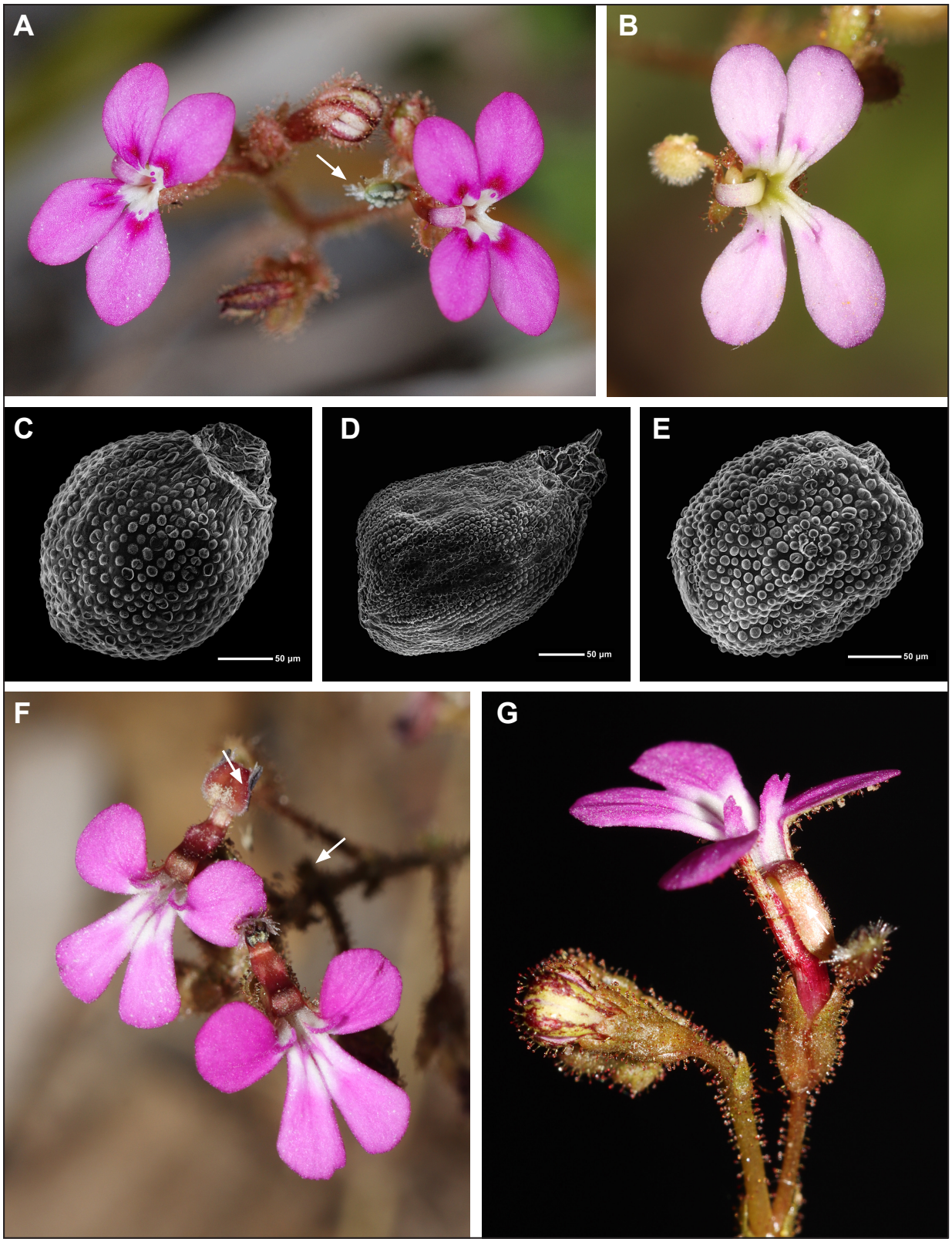

Figure 13. A, B – *Stylidium multiscapum* flowers, showing the laterally paired corolla lobes and hairs around the anthers (arrow), and slender appendages at the base of each corolla lobe; C, D – *S. multiscapum* colliculate seed; E – *S. leptorrhizum* colliculate seed; F – *S. leptorrhizum* flowers, showing the distinctive corolla lobe arrangement, simple hairs on the column above the main bend (L arrow), and hairs around the anthers (R arrow); G – *S. leptorrhizum* flower, showing the long corolla tube with red markings, prominent throat appendages and glandular hairs at the column tip (arrow). Photographs by K. Brennan (A), J.A. Wege (B, F, G) and S.J. Dillon (C–E) from *K. Brennan* 7310 (A), *J.A. Wege* 2283 *& B.P. Miller* (B), *J. Westaway* 2716 (C: DNA), *D.E. Murfet* 6036 (D: PERTH), *G. & N. Sankowsky* 2221 (E: PERTH), and *J.A. Wege* 2286 *& B.P. Miller* (F, G).

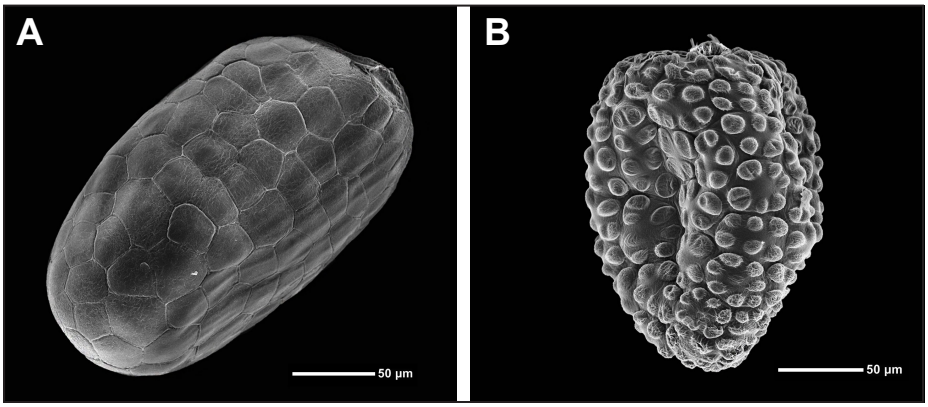

Figure 14. A – *Stylidium irriguum* ± smooth (areolate) seed; B – *S. rotundifolium* colliculate seed. Photographs by S.J. Dillon from *K. Coate* 372 (A: PERTH) and *P.I. Forster* PIF32887 *& K.R. McDonald* (B: BRI).

Typification. Fitzgerald collected specimens of *S. irriguum* from Messmate Creek and Charnley River, the latter of which is known from a single sheet at PERTH. This sheet is designated as the lectotype since it is the best quality material, bearing flowers, capsules and seed, and has been annotated by Fitzgerald with the published name. The PERTH sheet of Fitzgerald's Messmate Creek gathering is mixed material, comprising three individuals of *S. irriguum* in an envelope and a fragment *S. semipartitum* affixed to the sheet. Fitzgerald's description of *S. irriguum* does not contain elements of *S. semipartitum*, which he collected on the same expedition (Fitzgerald 1918: 218, as *S. leptorrhizum* F.Muell.: PERTH 03121526).

Notes. *Stylidium irriguum* was treated as a synonym of *S. rotundifolium* R.Br. by Bean (2000) before being reinstated on Western Australia's Vascular Plant census in 2014 (Parker 2015). These two species have a similar floral morphology; however, *S. irriguum* can be reliably separated from *S. rotundifolium* by its seeds, which are ± smooth (areolate) rather than colliculate (Figure 14). It also tends to have narrower leaves that are held more upright to form a habit somewhat reminiscent of *S. osculum* A.R.Bean, which similarly grows in shallow water and sodden ground.

Stylidium irriguum and *S. rotundifolium* are part of a taxonomically challenging species complex that includes *S. osculum* A.R.Bean, *S. dunlopianum* Carlquist, *S.* sp. King Cascade (K.F. Kenneally 11173) and additional undescribed taxa. There is considerable variation across the Kimberley region that remains the subject of ongoing research.

Stylidium longibracteatum Carlquist, *Aliso* 7(1): 37–38, Figures 77–80 (1969). *Type*: *c.* 5 miles north of Yalgoo, Western Australia, 6 September 1967, *S. Carlquist* 3006 (*holo*: RSA 0005435!; *iso*: RSA 0005436!).

Notes. *Stylidium longibracteatum* is a hardy, perennial stilt plant that inhabits rocky outcrops in Western Australia's Yalgoo and Murchison bioregions (Western Australian Herbarium 1998–). A collection of this species by Western Australian naturalist William (Harry) Butler from Kata Tjuta in the Northern Territory, some 360 km south-west of Alice Springs, was recently unearthed at PERTH (Mount Olga, Mar. 1967, *W.H. Butler s.n.*: Figure 15). If the location information is correct, this collection represents a significant range extension and may indicate a much broader distribution in Australia's arid zone; however, the accuracy of this record must be questioned given that Butler specimens are somewhat notorious for their locality errors (Michael Hislop pers. comm.). Indeed, it is perhaps more likely that the specimen was collected by Butler in Western Australia en route to Kata Tjuta. The March flowering time is noteworthy since *S. longibracteatum* is otherwise known to flower from August to October; however, this may have been a response to seasonal conditions. Examination of rainfall records indicates above average rainfall in the three months leading up to March 1967 at Kata Tjuta and across much of Western Australia's arid zone (Bureau of Meteorology 2023).

Figure 15. *Stylidium longibracteatum* (PERTH 03172236), ostensibly collected from the N.T. by William Butler but perhaps more likely originating from a locality in W.A. Photograph by Supreema Sinha.

Stylidium mitrasacmoides F.Muell., *Fragm.* 1(6): 150 (1859). *Type citation*: 'Ad ripas fluvii Victoriae prope Palm Island. Flood'. *Type specimen*: Victoria River [Northern Territory], October 1855, *J.A. Flood s.n.* (*holo*: K 000741781!).

Notes. *Stylidium mitrasacmoides* was tentatively placed under *S. tenerrimum* by Bean (2000: 636) who was unable to locate the holotype, which was at that time on loan to Kevin Kenneally and Allen Lowrie at PERTH. This specimen, which was returned to K some years ago, is highly fragmentary and extremely difficult to interpret. The habit is not discernible, although the presence of a broad, lanceolate, cauline leaf suggests a placement in sect. *Alsinoidea* (Mildbr.) A.R.Bean (*sensu* Bean 2000). The linear, more or less sessile hypanthium, partly connate calyx lobes (with three free and two fused for more than half their length), and sparse indumentum on the hypanthium, calyx lobes and undersurface of the corolla lobes support this interpretation. Indeed, Bentham (1868: 24) suggested the material was a depauperate individual of *S. alsinoides* R.Br., noting the bracts are mostly opposite (a feature that characterises most members of this group and is not found elsewhere in *Stylidium*); however, *S. alsinoides* is not currently recorded for the Northern Territory, occurring from northern Queensland to the Philippines (Bean 2000).

Four species from sect. *Alsinoidea* occur in the Northern Territory: *S. cordifolium, S. evolutum*, *S. tenerrimum* and *S. fluminense*. Of these, *S. evolutum* is the only species whose distribution does not occur near the type locality of *S. mitrasacmoides*; it is endemic to the Darwin Coastal bioregion and, unlike the type of *S. mitrasacmoides*, is characterised by markedly unequal corolla lobes and mostly linear-subulate or linear-lanceolate leaves. The type of *S. mitrasacmoides* is similarly not referable to *S. tenerrimum*, a species with smaller leaves, finer stems, distinctly pedicellate flowers, and a glabrous hypanthium and calyx lobes (refer to the information provided below under this species), nor does it appear to match *S. cordifolium*, which has distinctive cordate or ovate leaves with a cordate or rounded base (*cf.* lanceolate with a cuneate base). It is potentially referable to the later named *S. fluminense* (Erickson & Willis 1966), which has a comparable leaf morphology; however, Mueller's description of the corolla as white and minute, and his likening of the flowers and stature to that of the southern Australian annual *S. despectum* R.Br. (rather than the allied *S. tenerrimum*, which he named at the same time), adds a degree of doubt to this interpretation. *Stylidium fluminense* usually has a bright pink to mauve-pink corolla with striking markings, although white-flowered individuals have been recorded (e.g. *J.E. Wajon 382*: PERTH; *R. Kerrigan* 181 *& J. Risler*: DNA). Its corolla lobes are 3–6.5 mm long (not especially small relative to other species in the genus) and, like other members of the section, each lateral pair is basally connate (the lobes in *S. despectum* are free to the top of the tube and 1–2.2 mm long). The type of *S. mitrasacmoides* has corolla lobes *c.* 2.5 mm long and the hypanthium is shorter than or at the lower end of the range currently documented for *S. fluminense* (*c.* 4–5.5 mm long *cf.* 5–20 mm).

In view of the poor-quality type specimen (including the limited floral material upon which to draw any firm taxonomic conclusions) and the information in the protologue, we currently regard *S. mitrasacmoides* as a name of uncertain application. A direct comparison of the type fragments against modern day collections of *S. fluminense*, including additional collections from the Victoria River area, may help to resolve whether *S. mitrasacmoides* is an earlier name for this taxon.

Stylidium modicum M.D.Barrett, R.L.Barrett & Wege, *sp. nov.*

Type: Northern Prince Regent National Park, 14.9 km west of Mt Brookes, Kimberley region, Western Australia, 26 April 2023, *M.D. Barrett* MDB 6439*, A. Spiridis & D. Chemello* (*holo*: PERTH 09597018; *iso*: BRI, CANB, DNA, MEL).

Erect *annual herb* (5–)10–28 cm high. *Glandular hairs* 0.1–0.6 mm long, with a red or red-black, discoid or globose head. *Stem* 0.5–12 cm long, 0.5–2 mm wide, red to red-brown, straw-brown or greenish, simple or sometimes branched distally, glabrous. *Leaves* in a loose terminal rosette and scattered on stem below, with an elliptic, orbicular to suborbicular, ovate or obovate lamina, (6–)12–75 mm long including a slender petiole, (4–)8–30 mm wide, glabrous, apex rounded or obtuse; margins entire, sometimes finely hyaline-erose. *Scapes* 1–12 per plant, 7–22 cm long including inflorescence, 0.4–1.3 mm wide, glandular-

hairy. *Inflorescence* determinate, monochasially or dichasially cymose, 7–*c.* 60-flowered, flowers rotated 180°; branches glandular-hairy; bracts 0.8–4.5 mm long, sparsely glandular-hairy; pedicels indistinct. *Hypanthium* linear in outline, 10–22 mm long, 0.4–0.6 mm wide, glandular-hairy. *Calyx lobes* with 3 free and 2 connate for more than half their length, 2.2–3.2 mm long, glandular-hairy, apex obtuse. *Corolla* mauve-pink or pink to dark pink, with small, red-pink markings near base of upper (anterior) lobes, yellowish abaxially; lobes paired vertically, sparsely glandular-hairy abaxially; anterior (upper) lobes obovate with an emarginate or ± rounded apex, smaller than the posterior pair, 2.5–3.7 mm long, 2–3 mm wide; posterior (lower) lobes obovate with a bilobed apex (segments usually divergent, very rarely not so or tending emarginate), 4–6.2 mm long, 3–5 mm wide; tube 2.8–3.5 mm long, longer than the calyx lobes, sparsely glandular-hairy, with a sinus on the anterior side. *Labellum* on outside of corolla tube (sometimes appearing ± at edge of sinus), elliptic to narrowly ovate, glabrous, 0.6–0.8 mm long with a terminal appendage 0.1–0.2 mm long. *Throat appendages* 6 (1 on each anterior corolla lobe, 2 on each posterior lobe), apparently basally connate or with the posterior ones in basally connate pairs, yellow, sometimes creamy white basally, 0.2–0.5 mm high, obtuse or rounded, papillose. *Column* 9–12 mm long, straight when extended, slightly broadened above main bend with a second bend well below the anthers, glabrous; anther locules 0.8–1 mm long, corona absent; stigma sessile, entire. *Capsules* linear in outline, 16–38 mm long excluding calyx lobes, without ribs or faintly ribbed; halves detaching distally, somewhat recurved. *Seeds* brown, ellipsoid, *c*. 0.2 mm long, ± smooth (areolate), with concave depressions. (Figure 16A, B)

Diagnostic features. An erect annual herb with the following key features: broad, petiolate leaves in a loose terminal rosette and scattered on the stem below; glandular hairs on the scape and inflorescence including the calyces; calyx with 3 free lobes and 2 connate for more than half their length; mauve-pink or pink, vertically paired corolla lobes with a yellowish undersurface, the smaller, upper pair with an emarginate or rounded apex, the lower pair usually bilobed with divergent segments and free to the top of the corolla tube; labellum positioned on the corolla tube below the anterior sinus; 6 yellow or yellowish throat appendages; a 9–12 mm long column that is broadened above the main bend and has a second bend well below the anthers; linear capsules bearing seeds with rounded or somewhat angular partitions on the surface.

Specimens examined. WESTERN AUSTRALIA: 5.6 km ESE of (new) Theda Station Homestead, N Kimberley, 1 May 2008, *M.D. Barrett* MDB 2235 (PERTH); E bank of Lawley River near tidal/freshwater confluence, Lawley River National Park, N Kimberley region, 29 Mar. 2010, *M.D. Barrett* MDB 2895 *& R.L. Barrett* (PERTH); edge of sandstone massif overlooking King Edward River, N boundary of Theda Station, 30.5 km NNW of (new) homestead, N Kimberley region, 4 May 2011, *M.D. Barrett* MDB 3441 (BRI, DNA, PERTH); northern Prince Regent National Park, 16.7 km WNW of Mt Brookes, Kimberley region, 26 Apr. 2023, *M.D. Barrett* MDB 6380*, A. Spiridis & D. Chemello* (PERTH); northern Prince Regent National Park, 4 km ESE of Mt Brookes, Kimberley region, 27 Apr. 2023, *M.D. Barrett* MDB 6523*, A. Spiridis & D. Chemello* (PERTH); Roe River 'pavement 1' on mainland, 3 km ESE of Gertrude Cove, Kiska Island, 23 Apr. 2008, *R.L. Barrett* RLB 4611 *& M.D. Barrett* (PERTH); Camp Creek Gauging Station, Mitchell Plateau, 27 Apr. 1982, *G.J. Keighery* 4758 (PERTH); Mitchell River Falls, Mitchell Plateau, NW Kimberley, 17 June 1976, *K.F. Kenneally* 4993 (PERTH); Mitchell Falls, Mitchell River, N Kimberley, 21 July 1976, *J. Lewis* 43 (PERTH); Lenae on SW side of Vansittart Bay, 24 Mar. 1993, *A.A. Mitchell* 2908 (PERTH); *c.* 2 km E of Mitchell Falls, 15 Mar. 1994, *A.A. Mitchell* 3363 (PERTH); small tributary of Garimbu Creek, Prince Regent National Park, 22 June 2014, *B.S. Wannan* 6680*, M. Wardrop, P. Lane & H. Hofman* (BRI, CNS *n.v.*, PERTH).

Spirit material examined. *M.D. Barrett* MDB 2895 *& R.L. Barrett* (PERTH). Flowers reconstituted from *M.D. Barrett* MDB 2895 *& R.L. Barrett* (PERTH); *M.D. Barrett* MDB 3441 (PERTH); *M.D. Barrett* MDB 6439*, A. Spiridis & D. Chemello* (PERTH); *M.D. Barrett* MDB 6523*, A. Spiridis & D. Chemello* (PERTH); *R.L. Barrett* RLB 4611 *& M.D. Barrett* (PERTH); *J. Lewis* 43 (PERTH).

Flowering period. March–July.

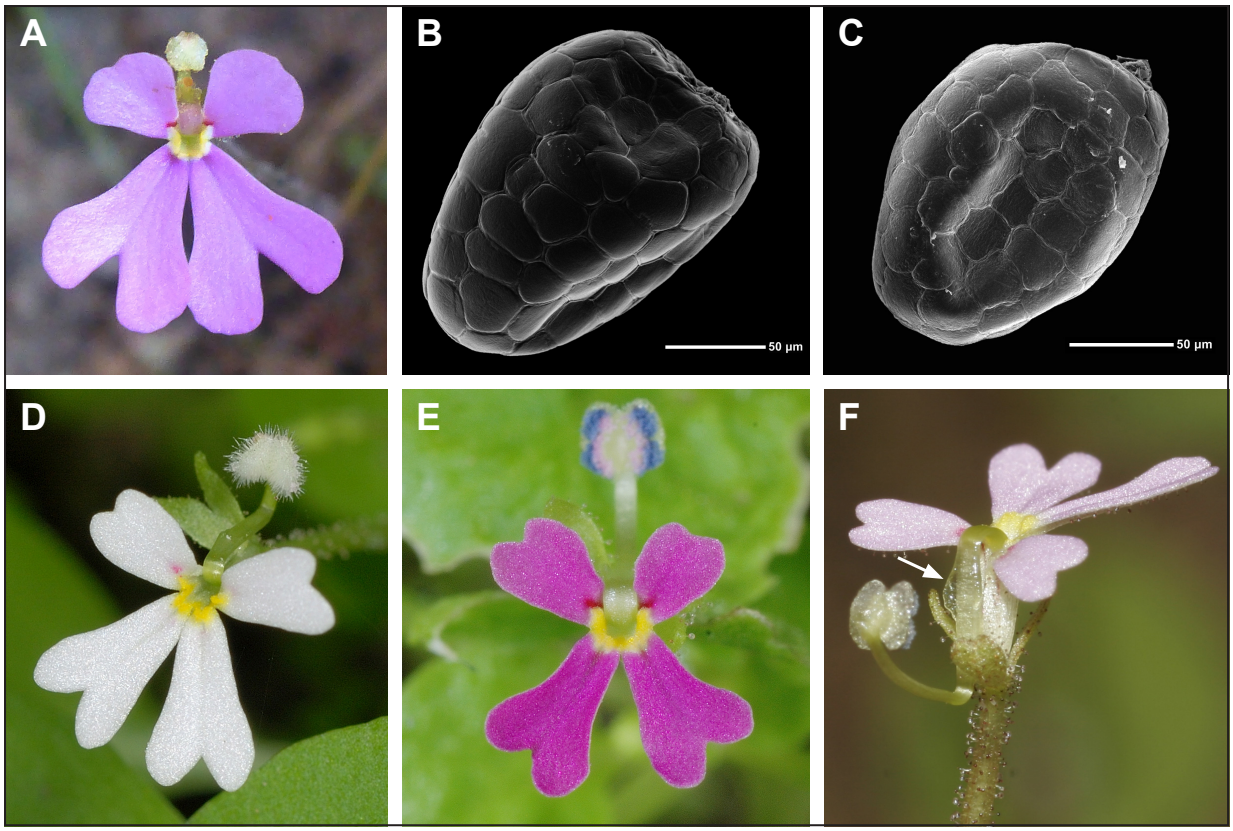

Figure 16. A – *Stylidium modicum* flower, showing the bilobed lower corolla lobes with divergent segments; B – *S. modicum* ± smooth (areolate) seed; C – *S. muscicola* ± smooth (areolate) seed; D–F – *S. muscicola* flowers, showing the emarginate to shallowly bilobed corolla lobes. Note the broadened column above the main bend (arrow). Photographs by M.D. Barrett (A), S.J. Dillon (B, C), K. Brennan (D, E) and R.L. Barrett (F) from *M.D. Barrett* 6523, *A. Spiridis & D. Chemello* (A), *M.D. Barrett* 6439, *A. Spiridis & D. Chemello* (B: PERTH), *I.D. Cowie* 13344 (C: PERTH), *K. Brennan* 10088 (D), *K. Brennan* 7605 (E) and Pangoor, Theda Station (F).

Distribution and habitat. Endemic to the North Kimberley bioregion in Western Australia, including occurrences in Prince Regent, Mitchell River and Lawley River National Parks. Grows in rugged sandstone country under rock overhangs and in small caves, or on shaded sandstone walls and ledges, often near creeks, small pools and waterfalls. Recorded from open woodland over mixed shrubland and grassland, shrubland with *Triodia*, and herbfields. Commonly growing in shaded microhabitat with *Thedachloa annua*, *Lindernia barkeri*, *Cheilanthes* spp., *Doryopteris concolor* and *Coleus scutellarioides*, and also with either *Stylidium muscicola* F.Muell. or *S. tremendum* Wege, M.D.Barrett & R.L.Barrett (but never with both species at any given location).

Conservation status. Occurs in dense colonies albeit over a small area due to its habitat specificity. Not considered to be at risk.

Etymology. From the Latin *modicus* (medium, middling), a reference to its intermediate column length with respect to the allied *S. muscicola* and *S. tremendum*.

Vernacular name. In-between Triggerplant.

Affinities. *Stylidium modicum* is morphologically allied to *S. muscicola* (Figure 16C–F) and *S. tremendum* (Figure 17) and usually has a column of intermediate length, i.e. 9–12 mm long *cf.* 5.5–8.5 mm in *S. muscicola* and usually 12–18 mm in *S. tremendum* (although sometimes as short as 9 mm when co-occurring with *S. muscicola*). It can be further differentiated from both species by its lower (posterior) corolla lobes, which are usually prominently bilobed with divergent segments rather than emarginate or shallowly bilobed and without divergent segments. Additional differences to *S. muscicola* include its labellum position (on the outer wall of the corolla tube *cf.* at the base of the anterior sinus in *S. muscicola*),

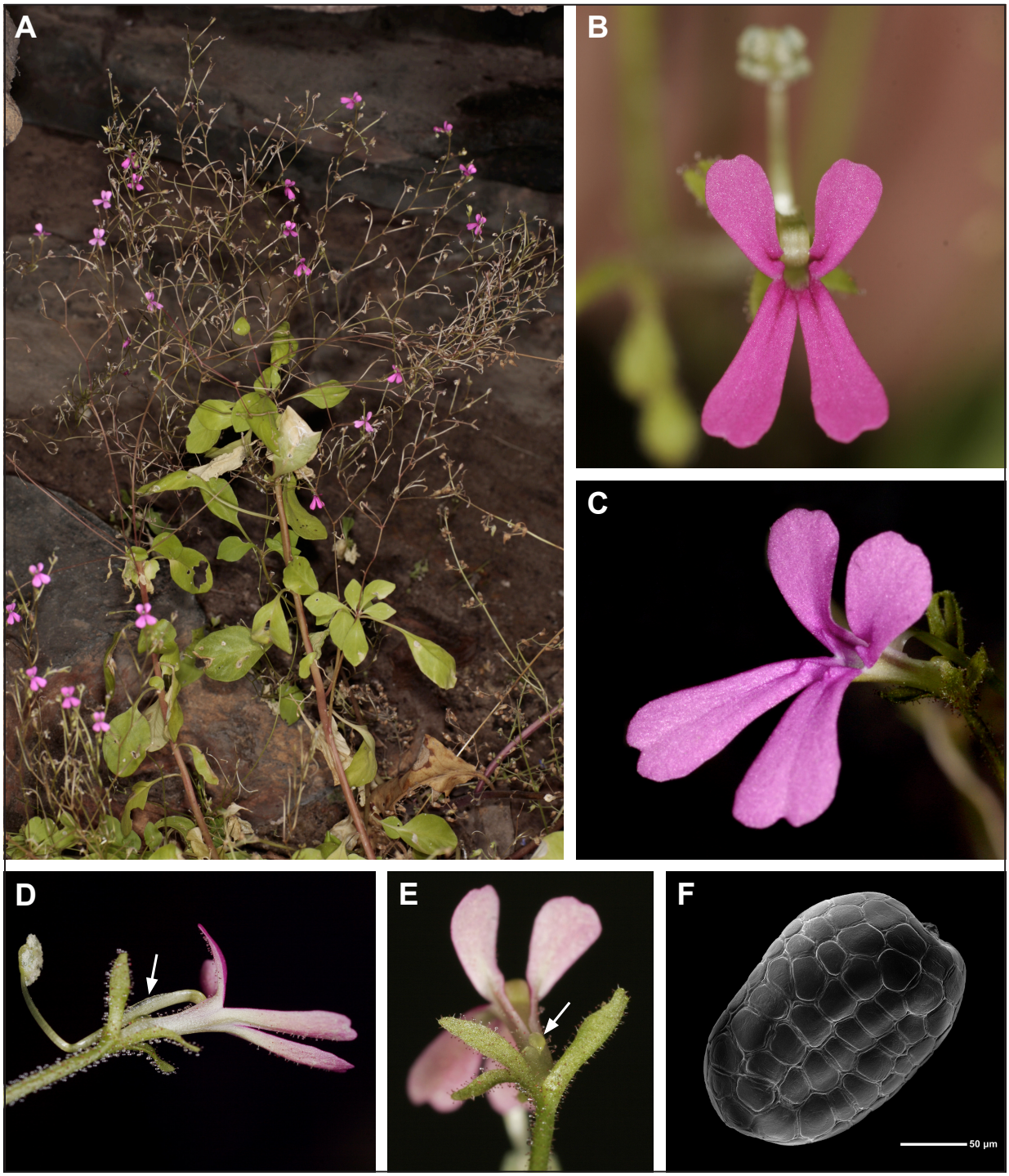

Figure 17. *Stylidium tremendum*. A – habit; B – flower with emarginate to rounded corolla lobes and long column; C – flower showing the magenta throat appendages at the base of each corolla lobe and the distinct lower corolla lobes (i.e. free to the top of the corolla tube); D – side view of flower showing the long corolla tube and broadened column above the main bend (arrow); E – flower showing the labellum at the base of the anterior sinus (arrow); F – ± smooth (areolate) seed. Photographs by R.L. Barrett (A, C), M.D. Barrett (B, D, E) and S.J. Dillon (F) from Old Mitchell River Rd, Theda Station (A, C), *M.D. Barrett* 1978 *& R.L. Barrett* (B, D, E) and *A. Lowrie* 758 (F: PERTH).

larger lower corolla lobes (4–6.2 × 3–5 mm *cf.* 2.2–4 × 1–2.7 mm) and larger anther locules (0.8–1 mm long *cf.* 0.4–0.7 mm). *Stylidium modicum* is also reliably differentiated from *S. tremendum* by the undersurface of the corolla lobes (yellowish *cf.* white) and its yellow throat appendages (*cf.* magenta or mauve-pink).

Stylidium modicum is potentially confused with *S. willingii* R.L.Barrett, Kenneally & Lowrie, a species that has a shorter column (5–7 mm long) with small, lateral lobes above the main bend, and emarginate, truncate or shallowly bilobed posterior corolla lobes (i.e. lower lobes without divergent segments). *Stylidium willingii* tends to have a basally-rosetted habit (although more rarely has a terminal rosette and additional leaves scattered below on a stem to 5 cm long).

Notes. Additional photographs and collections of *S. modicum*, including flowers preserved in spirit, are required to improve the above description, especially the throat appendage detail.

Stylidium multiscapum O.Schwarz, *Repert. Spec. Nov. Regni Veg.* 24(4–13): 105–106 (1927). *Type*: Darwin, Northern Territory, April 1927, *F.A.K. Bleeser* 360 (*holo*: B, destroyed in WWII; *lecto*, here designated: NSW 470185 image!).

Diagnostic features. A basally-rosetted annual with the following key features: a slender tap root; oblanceolate or ± lanceolate leaves (sometimes narrowly so), often with a fine hyaline border and usually with a slender acumen 0.2–1 mm long; glandular-hairy scapes and inflorescences; an ellipsoid or obovoid hypanthium; laterally paired corolla lobes that are pink with a white base and bear 8 throat appendages (2 on each lobe); a slender, glabrous column with a corona (i.e. hairs around the anthers); and colliculate seeds (note the protuberances are sometimes difficult to detect under a stereo microscope). (Figure 13A–D)

Selected specimens. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 6 July 1974, *G.W. Carr* 3078 *& A.C. Beauglehole* 46837 (DNA); 18 June 1980, *U. Roberts* 5 (AD); 24 July 2023, *J.A. Wege* JAW 2283 *& B.P. Miller* (BRI, PERTH).

NORTHERN TERRITORY: 3.4 km along Edith Falls road, NW of Katherine, 28 May 2005, *A.R. Bean* 23905 (BRI, CANB, DNA, MEL, NY *n.v.*); Napier Peninsula, 28 June 2007, *K. Brennan* 7310 (DNA); Arafura Swamp, near Glyde river crossing, 23 Sep. 1998, *I.D. Cowie* 7987 *& C.P. Mangion* (DNA); Melville Island, S of Milikarpiti, 23 Aug. 2000, *I.D. Cowie* 8968 (BRI, DNA); Arnhem Land *c.* 18 km ESE of Ramingining, 23 June 2001, *I.D. Cowie* 9436 (DNA); Keep River National Park, Flying Fox Creek, 13 June 1995, *J. Egan* 5073 (DNA); Darwin, Knuckey's Lagoon, 10 miles Stuart Hwy, 9 July 1955, *R. Erickson s.n.* (PERTH); Cox Peninsula Rd next to Belyuen Community, 3 July 2008, *D.E. Murfet* 6036 (AD, DNA, PERTH); Gatji, 7 Sep. 1998, *P.S. Short & C.R. Dunlop* 4858 (BRI, CANB, DNA); Keep River National Park, 14 May 2011, *B. Stuckey* 815 (DNA); Western Arnhem Land, Oenpelli–Maningrida road, 27 July 2008, *J. Westaway* 2716 (DNA).

Conservation status. Recently listed as Priority One under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). Widespread in the Northern Territory where it is listed as Least Concern according to IUCN criteria (Northern Territory Herbarium 2013).

Typification. Schwarz (1927) named 43 species from the Darwin area using the collections of Florenz August Karl Bleeser (McKee 1963). The type material housed at B was subsequently destroyed in WWII as was Bleeser's private collection in Darwin; duplicate material is sometimes present at NSW and MEL (McKee 1963, Willis 1966). The designated lectotype is the only duplicate of *Bleeser* 360 that is known to exist.

Notes. With the taxonomic recognition of both *S. incognitum* and *S. pezidium* Wege, Brennan & S.J.Dillon (see below), *S. multiscapum* is now mostly known from northern parts of the Northern Territory, although it is also recorded from near Kununurra in Western Australia.

Stylidium pezidium Wege, Brennan & S.J.Dillon, *sp. nov.*

Type: track from Lajamanu to Tanami Road, *c.* 43 km north of Tanami junction, Northern Territory, 9 August 2023, *K. Brennan* 13257 (*holo*: DNA D0290828; *iso*: AD, BRI, CANB, NT, PERTH).

Rosulate *annual herb* 6.5–35 cm high, with a slender tap root. *Glandular hairs* 0.15–0.4 mm long, with a red or yellowish, ellipsoid head. *Stem* contracted. *Leaves* basal, oblanceolate or ± lanceolate (sometimes narrowly so), 6–50 mm long including petiole, 2–10 mm wide, glabrous; apex ± obtuse, subacute, acute or acuminate, with a slender acumen 0.2–1 mm long; margins conspicuously hyaline, ± entire or irregularly serrate. *Scapes* (1–)2–18 per plant, 6.5–35 cm long including inflorescence, 0.4–1 mm wide, glandular-hairy. *Inflorescence* determinate, monochasially or dichasially cymose, 5–*c.* 75-flowered, flowers rotated *c.* 90°; branches glandular-hairy; bracts 1–4 mm long, glandular-hairy; pedicels 1.5–8.5 mm long, glandular-hairy. *Hypanthium* ellipsoid to obovoid, 1–2.5 mm long, 1–1.6 mm wide, glandular-hairy. *Calyx lobes* free, 1–1.7 mm long, glandular-hairy, apex subacute, acute or obtuse. *Corolla* pale to medium bright pink, sometimes with darker pink markings towards base of lobes, white at base of lobes, yellowish green in throat (sometimes with small red markings deep inside), whitish abaxially with a prominent dark red stripe on each lobe; lobes paired laterally, sparsely glandular-hairy abaxially; anterior lobes ± elliptic with an obtuse apex, smaller than the posterior pair, 2.6–4 mm long, 1.8–2.5 mm wide; posterior lobes elliptic or narrowly obovate with an obtuse apex, 3–4.5 mm long, 2–2.8 mm wide; tube 1.7–2.7 mm long, longer than the calyx lobes, with an anterior sinus, glandular-hairy distally. *Labellum* at sinus base or on tube just below, broadly ovate to ± orbicular, 0.5–0.7 mm long, glabrous or sparsely glandular-hairy; lateral appendages 0.1–0.2 mm long or sometimes absent. *Throat appendages* 2–8 (1 or 2 on each anterior corolla lobe, 0 or 2 on each posterior lobe), completely or basally adnate to corolla, pink with a white base or white if rudimentary, ± oblong or tooth-like, *c.* 0.1–1 mm long, obtuse. *Column* 6–8.5 mm long, with a slight lateral curve when extended, slender above main bend with a second bend below the anthers, glabrous; anther locules 0.7–0.9 mm long, corona present; stigma sessile, entire. *Capsules* ellipsoid to obovoid, 1.5–3 mm long excluding calyx lobes, halves detaching distally. *Seeds* brown with a pale nipple, ellipsoid, ovoid or globose, 0.2–0.25 mm long, reticulate. (Figure 18)

Diagnostic features. A basally-rosetted annual with the following key features: a slender tap root; oblanceolate or ± lanceolate leaves with a prominent hyaline border and fibrous acumen 0.2–1 mm long; glandular-hairy scapes and inflorescences; an ellipsoid to obovoid hypanthium; pink, laterally paired corolla lobes with 2–8 appendages near the base (the posterior ones absent or inconspicuous); a glabrous column with a prominent corona (i.e. hairs around the anthers); and reticulate seeds.

Specimens examined. WESTERN AUSTRALIA: drill site named Missing, northern Great Sandy Desert, 2 Oct. 2001, *C.P. Campbell* 4013 (PERTH); Mt Brophy Springs, Gardner Range, 190 km SE of Halls Creek, 4 July 1995, *K. Coate* 375 (PERTH); Lake Betty on Yougga Walla Station, Great Sandy Desert, 4 July 2001, *K. Coate* 627 (PERTH); Bulka Swamp, Bohemia Downs Station, S Kimberley, 3 July 2001, *K. Coate* 640 (PERTH); D2 Red Dune Site, near Edgar Ranges, SE of Broome, 11 Aug. 1976, *K.F. Kenneally* 5569 (BRI, DNA, PERTH); between Walyarta Conservation Park and Anna Plains Station, 48 km E of Sandfire Roadhouse, 207 km SSW of Broome, 28 Aug. 2018, *A. Markey & S. Dillon* WL 10976 (DNA, PERTH).

NORTHERN TERRITORY: Attack Creek, 1.2 km W of Stuart Hwy crossing, 18 Oct. 2006, *D.E. Albrecht* 12073 (K *n.v.*, NT); 20 km NW The Granites, 18 July 2000, *B. Davies & M. Richardson s.n.* (NT); Lake Surprise, 12 Aug. 1993, *J. Cole s.n.* (NT); 43 km ENE Lake Surprise, 21 Sep. 1991, *P.K. Latz* 12252 (BRI, CANB, DNA, MEL *n.v.*, NSW, NT, PERTH); Tipirinpa Rockhole, 70 km E Lake Surprise, 22 Sep. 1991, *P.K. Latz* 12280 (AD, MO *n.v.*, NT).

QUEENSLAND: Nicholson River area, 3 June 1974, *T.S. Henshall* 251 (DNA).

Spirit material examined. *K. Brennan* 13257 (DNA); *K.F. Kenneally* 5569 (PERTH; corolla dissolved on dissection). Flower reconstituted from *A. Markey & S. Dillon* WL 10976 (PERTH).

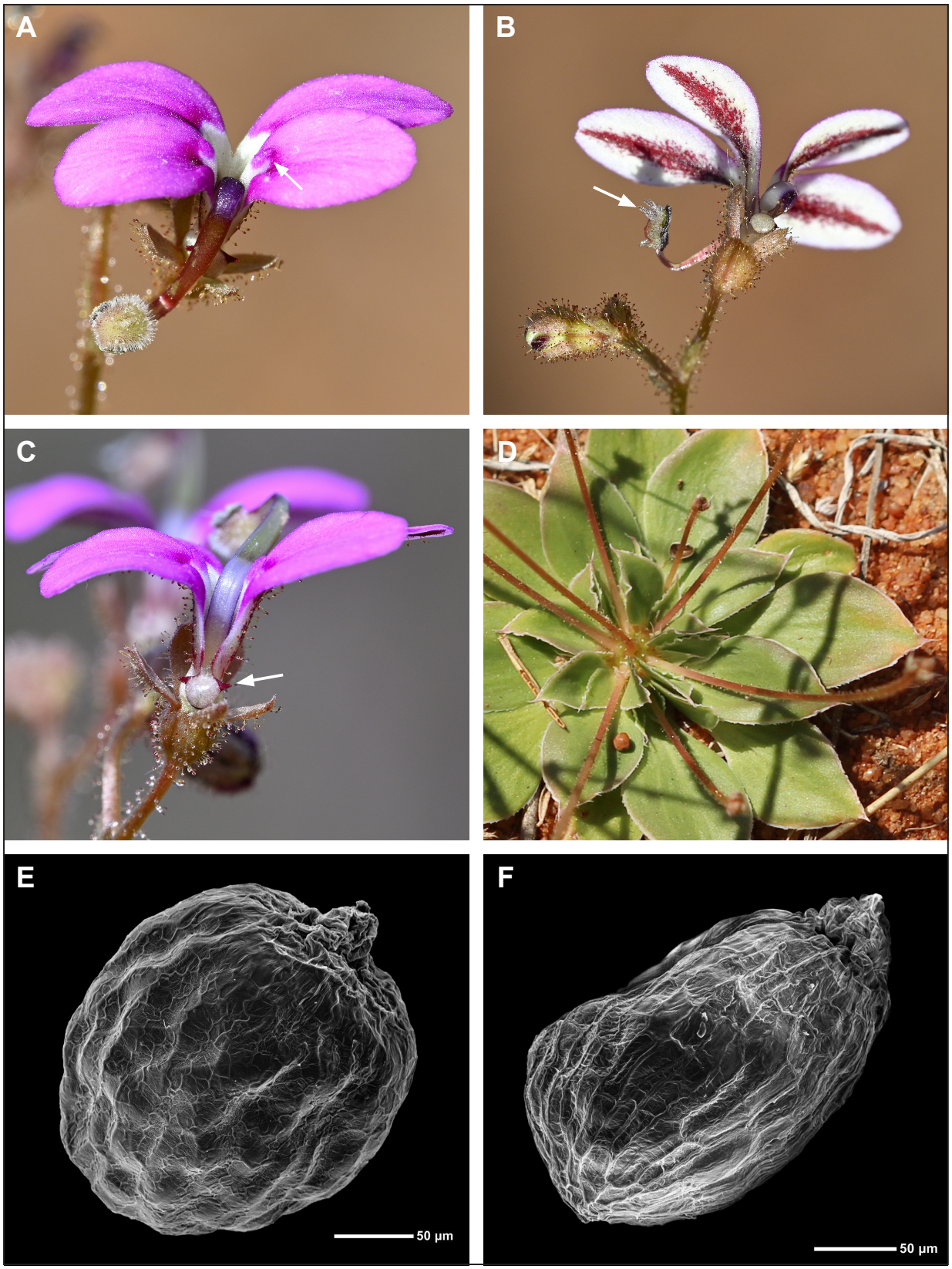

Figure 18. *Stylidium pezidium*. A – flower, showing the laterally paired corolla lobes with small appendages at the base of the anterior ones (arrow) and developed stigma; B – flower, showing the strong markings on the undersurface of the corolla and hairs around the anthers (arrow); C – triggered flower, revealing the labellum with lateral appendages (arrow); D – basal leaves with a conspicuous hyaline margin; E, F – seeds with a reticulate surface. Photographs by K. Brennan (A–C) from *K. Brennan* 13257, A. Markey (D) from *A. Markey & S. Dillon* WL 10976, and S.J. Dillon from *A. Markey & S. Dillon* WL 10976 (E: PERTH) and *K.F. Kenneally* 5569 (F: PERTH).

Flowering period. Late June–October.

Distribution and habitat. Found across Australia's northern deserts, with records extending from east of Eighty Mile Beach in Western Australia to the Nicholson River area in western Queensland, including the Great Sandy and Tanami Deserts. Grows in red sand or clayey sand on plains in seasonally damp areas, either between dunes, near watercourses and seasonal swamps, or within paleo-drainage channels. Recorded in *Melaleuca* shrubland, *Eucalyptus victrix* open woodland, and *Triodia* hummock grassland.

Conservation status. A widespread species that is somewhat poorly collected but not currently considered to be at risk. It will not be conservation-listed in Western Australia (T. Llorens pers. comm.) and will be categorised as Least Concern in the Northern Territory under IUCN criteria (N. Cuff pers. comm.). Known from a single population in Queensland where its conservation status has not been assessed.

Etymology. From the Greek *pezidion* (diminutive of *peza* = border, edge, ribbon), a reference to the leaf margins.

Vernacular name. Ribbon Triggerplant.

Affinities. *Stylidium pezidium* is extremely similar to *S. multiscapum*, differing primarily in having seeds with a reticulate rather than colliculate surface (compare Figure 18E, F with Figure 13C, D). This difference is taxonomically compelling and correlates with discrete geographic distributions (*S. multiscapum* is confined to northern parts of the Northern Territory and the adjacent Kimberley). *Stylidium pezidium* also has less prominent throat appendages than *S. multiscapum* (particularly the posterior ones, which are rudimentary or absent), and leaf margins that tend to be more prominently hyaline.

Stylidium pezidium could be confused with *S. incognitum* (Figure 12), although the latter has a corolla with a bare, golden yellow throat, a distally broadened column without a corona, colliculate seeds, and a more northerly distribution. Material of *S. pezidium* has been previously misidentified as *S. pindanicum* R.L.Barrett, a species with glandular-hairy leaves that lack an acumen, vertically paired corolla lobes, a column with both simple and glandular hairs, and a distribution centred on Western Australia's Dampier Peninsula.

Stylidium pezidium can grow in sympatry with *S. desertorum* Carlquist, a species with linear leaves, a denser indumentum of glandular hairs to 1.2 mm long, a longer column (more than 10 mm), and flowers without throat appendages. It can also co-occur with the similarly broad-leaved *S. floribundum* R.Br., which has an indumentum of both simple and glandular hairs, flowers that lack throat appendages, and obconical capsules.

Stylidium pseudotenellum O.Schwarz, *Repert. Spec. Nov. Regni Veg.* 24(4–13): 104 (1927). *Type*: 'Port Darwin, 8 miles NE, moist flat (Bleeser no. 466)' (*holo*: B, destroyed in WWII).

Notes. *Stylidium pseudotenellum* has long been treated as a synonym of *S. fissilobum* (Carlquist 1978; Bean 2000); however, Schwarz's (1927) description of the corolla—specifically the strongly dissected upper (anterior) corolla lobes and the basally connate lower (posterior) lobes—does not agree with our revised concept of this species (refer to the notes under *S. fissilobum*). We have also ruled out *S. pseudotenellum* as an earlier name for the novel species *S. torquatum* on account of the latter's emarginate upper corolla lobes and throat appendages (prominent, basally connate, somewhat irregularly lobed and non-glandular *cf.* minute, four (the middle ones bifid), and glandular in *S. pseudotenellum*).

Corolla shape is taxonomically informative in this group of scapiform annuals, with both *S. aquaticum* and *S. brennanianum* characterised by highly dissected upper lobes; however, unlike both *S. fissilobum* and *S. torquatum*, neither species is known from the Darwin area, with both differing from Schwarz's description in corolla colour and throat appendage morphology; *S. aquaticum* also has distinctly filiform

leaves clustered near the base of the stem (*cf.* alternate and linear in *S. pseudotenellum*). There are unplaced specimens from Kakadu with dissected upper corolla lobes (e.g. *K. Brennan* 3147: DNA; *L. Craven* 548: DNA); this material remains the subject of ongoing taxonomic assessment although a preliminary examination of key features (e.g. throat appendage morphology and hypanthium length) suggests that the name *S. pseudotenellum* is similarly unlikely to be able to be confidently applied to this material (refer to the notes under *S. torquatum*).

The holotype of *S. pseudotenellum* was destroyed in WWII and no duplicates are known (see typification section under *S. multiscapum* for notes on Bleeser's collections). We regard *S. pseudotenellum* as a name of uncertain application.

Stylidium rubriscapum W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 3: 218 (1918). *Type citation*: 'Calder River; Messmate Creek in the Packhorse Range (W.V.F.)'. *Type specimens*: Calder River, Western Australia, August 1905, *W.V. Fitzgerald 1442* (*lecto*, here designated: PERTH 01642057!; *isolecto*: NSW 923308 image!); Charnley River, August 1905, *W.V. Fitzgerald s.n.* (*syn*: BM 000563901!).

Typification. The PERTH sheet is designated as an appropriate lectotype since the locality information matches the protologue and, unlike NSW 923308, the specimen is annotated by Fitzgerald with the published name. Although the locality information 'Charnley River' is not a precise match for the protologue, BM 000563901 is interpreted as part of the original material since it is from Fitzgerald's personal herbarium and is annotated by him with the published name.

PERTH 09565949 is a fragment of *S. rubriscapum* affixed to Fitzgerald's collection of *S. costulatum* Lowrie & Kenneally from the Isdell Range (PERTH 02946327; as *S. floodii* by Fitzgerald *loc. cit.*). It is unclear whether this represents a mixed collection or whether the fragment of *S. rubriscapum* is type material that has subsequently been mixed with this collection.

Stylidium synaptum Wege, Brennan & A.R.Bean, *sp. nov.*

Type: Melville Island, *c.* 8 km south of Milikapiti, Northern Territory, 24 March 2021, *K. Brennan* 12044 *& W. Rioli* (*holo*: DNA D0286793; *iso*: BRI, CANB, PERTH 09624716).

Stylidium sp. Melville Island (R.J. Fensham 432) K.G. Brennan, in Northern Territory Government, FloraNT, https://eflora.nt.gov.au/ [accessed 15 May 2023].

Rosulate *annual herb* 3–20 cm high. *Glandular hairs c.* 0.1–0.15 mm long, with a red or black, discoid or globose head. *Stem* contracted. *Leaves* basal, spreading, narrowly oblanceolate to oblanceolate or spathulate, 1.5–8 mm long, 0.8–2.8 mm wide, glabrous, apex obtuse or rounded; margins entire. *Scape* 1–3 per plant, 5–20 cm long including inflorescence, 0.2–0.5 mm wide, glabrous, sometimes with 1 or a few scattered sterile bracts 0.4–0.9 mm long. *Inflorescence* determinate, monochasially or dichasially cymose, 1–25-flowered, flowers rotated 180°; branches glabrous; bracts 0.6–2 mm long, glabrous; pedicels indistinct or *c.* 0.5 mm long and glabrous. *Hypanthium* linear in outline, 2.5–12 mm long, 0.3–0.6 mm wide, sparsely glandular-hairy distally. *Calyx lobes* arranged in 2 groups, connate within each group for more than half their length, 0.8–1.5 mm long, glabrous or sparsely glandular-hairy towards base, apex obtuse or subacute to acute. *Corolla* pale mauve-pink or white (or with the lower lobes mauve-pink and the upper ones white), with small purple-pink markings towards base of each lobe; lobes ± paired vertically with the upper pair often somewhat spreading, glabrous or with the anterior lobes sparsely glandular-hairy abaxially; anterior (upper) lobes elliptic or narrowly obovate with an emarginate (rarely obtuse) apex, smaller than the posterior pair, 0.8–2.1 mm long, 0.5–1.5 mm wide; posterior (lower) lobes obovate with a bilobed apex (segments rounded or sometimes emarginate, usually divergent), 2.2–4.6 mm long, 1.8–3.5 mm wide; tube 1.2–2.5 mm long, longer than the calyx lobes, with a sinus on both the anterior and posterior sides, glabrous or sparsely glandular-hairy near anterior sinus. *Labellum* on corolla tube below anterior sinus, narrowly ovate, 0.5–0.8 mm long, sometimes with a terminal appendage *c.* 0.1 mm

long, glabrous. *Throat appendages* 2 or 4 (0 or 1 on each anterior corolla lobe, 1 on each posterior lobe), glabrous or scarcely papillose, white or pink-tipped, usually with a small yellow callosity in the sinus each anterior and posterior corolla lobe; posterior (lower) appendages broad and thick with a rounded to scarcely emarginate or subacute apex, 0.2–0.5 mm high, sometimes connecting basally to a barely visible obtuse protuberance *c.* 0.1 mm high on the adjacent anterior corolla lobe. *Column* 5.5–8 mm long, straight when extended, slender above the main bend with a second bend well below the anthers, glabrous; anther locules 0.5–0.8 mm long, corona absent; stigma sessile, entire. *Capsules* linear in outline, 5.8–13 mm long excluding calyx lobes, without ribs; halves detaching distally, recurved. *Seeds* brown, ellipsoid, ovoid or globose, 0.15–0.2 mm long, scarcely and somewhat irregularly colliculate, with concave depressions. (Figure 19)

Diagnostic features. A rosulate annual herb with the following key features: strictly basal, spathulate to oblanceolate leaves that are 1.5–8 mm long; a ± linear hypanthium with glandular hairs restricted to the distal end; calyx lobes that are arranged in 2 groups (each fused for more than half their length) and glabrous or sparsely glandular-hairy towards the base; mauve-pink or white, vertically paired corolla lobes with small purple-pink markings towards the base, the upper pair smaller than the lower ones and usually emarginate, the lower pair bilobed; a sinus on both the anterior and posterior sides of the corolla tube; a slender, glabrous column; and scarcely colliculate seeds (protuberances barely visible).

Specimens examined. WESTERN AUSTRALIA: [localities removed for conservation reasons] 16 Mar. 2011, *M.D. Barrett* MDB 3327 (BRI, CANB, DNA, MEL, PERTH); 18 Apr. 1993, *R.L. Barrett* RLB 580 (PERTH); 20 May 1995, *R.L. Barrett* RLB 8565 (BRI, DNA, PERTH).

NORTHERN TERRITORY: Snake Bay [Melville Island], 16 Feb. 1987, *R.J. Fensham* 432 (DNA).

QUEENSLAND: Jumna Creek on the access road to the Bluff Mine between Watsonville and Irvinebank, 1 Apr. 2001, *R.L. Jago & B. Wannan* 5856 (BRI); 1.5 km N along Stannary Hills Rd, 6 Apr. 2004, *K.R. McDonald* KRM1957 (BRI).

Spirit material examined. *M.D. Barrett* MDB 3327 (PERTH); Nitmiluk, Murrawal Plateau, 1 Apr. 2005, *K. Brennan* 6526 (DNA, spirit only); Gurig National Park, along Main Rd, site 100, before Danger Point turn off, 5 Apr. 2006, *K. Brennan* 6885 (DNA, spirit only); Groote Eylandt, eastern gorges, 29 May 2019, *K. Brennan* 11494 (DNA, spirit only); Melville Island, *c.* 8 km S of Milikapiti, 6 Mar. 2021, *K. Brennan* 12025 (DNA, spirit only); *K. Brennan* 12044 *& W. Rioli* (DNA); *R.L. Jago & B. Wannan* 5856 (BRI).

Flowering period. February–May.

Distribution and habitat. Broadly distributed across monsoonal Australia, from Charnley River – Artesian Range Wildlife Sanctuary in the Kimberley to east of Herberton on the Atherton Tablelands in Queensland, including Melville Island, Nitmiluk and Gurig National Parks, and Groote Eylandt in the Northern Territory. Grows in damp sand in seepage areas near creeks, and on sandstone pavement and granitic hills. Recorded in open woodland with *Lophostemon lactifluus*, *Grevillea pteridifolia*, *Melaleuca viridiflora*, *Eucalyptus* or *Callitris*.

Conservation status. A widespread albeit infrequently recorded species. To be listed as Priority Three under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Least Concern in the Northern Territory under the Common Assessment Method (CAM) in light of its widespread distribution and lack of plausible threat (N. Cuff pers. comm.). A conservation assessment is required in Queensland where there are only two records.

Etymology. From the Greek *synaptos* (joined together, united), a reference to the calyx lobes, which are arranged in two, basally connate groups.

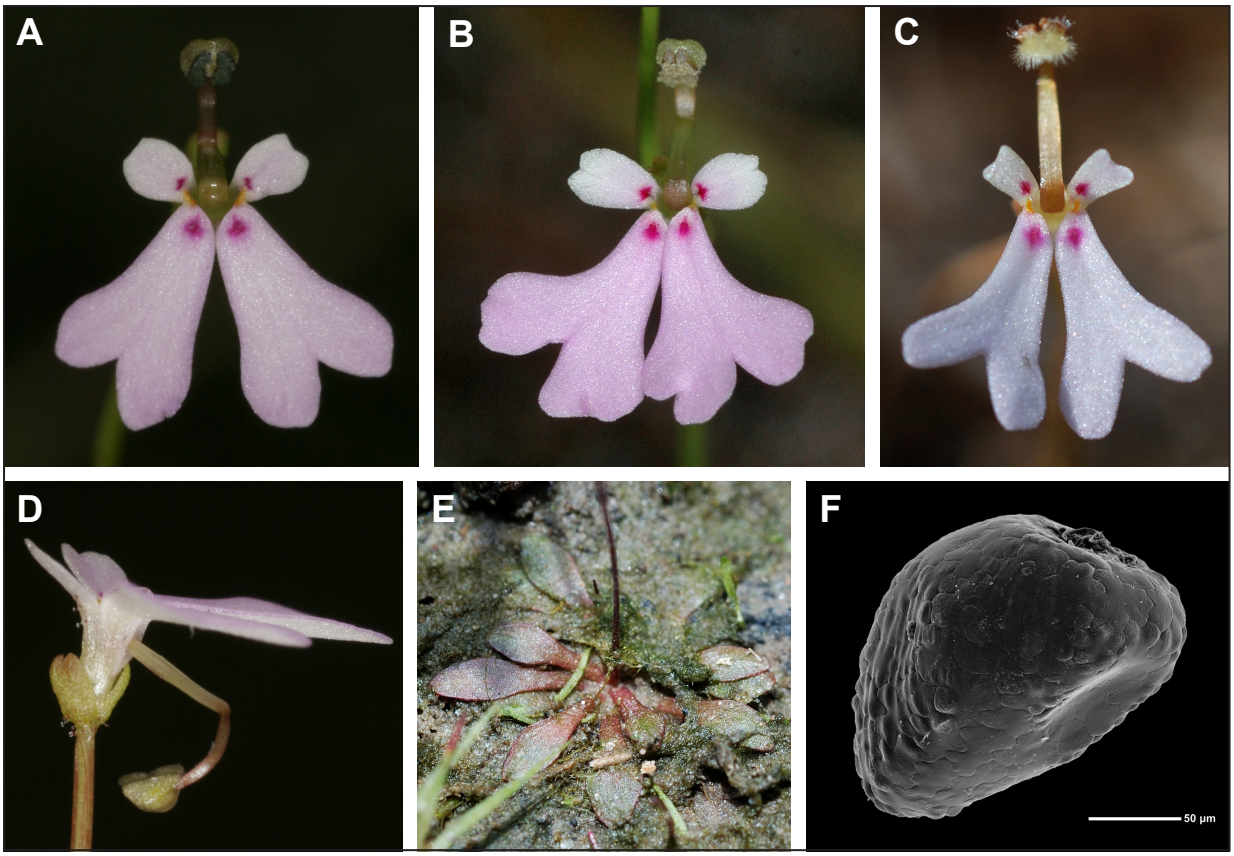

Figure 19. *Stylidium synaptum*. A–C – flowers showing subtle variation in corolla shape; D – side view of flower showing the distinctive calyx lobes and triggered column, which is resting through the posterior corolla sinus; E – basal leaf rosette; F – seed with subtle protuberances. Photographs by M.D. Barrett (A, D), K. Brennan (B, C, E) and S.J. Dillon (F) from *M.D. Barrett* MDB 3327 (A, D; F: PERTH), *K. Brennan* 6885 (B), *K. Brennan* 11494 (C) and *K. Brennan* 12025 (E).

Vernacular name. Connected Triggerplant.

Affinities. *Stylidium synaptum* has similarities to *S. candelabrum* Lowrie & Kenneally *s. lat.* (Figure 20A–C), a species endemic to the northern part of the Northern Territory including regions where *S. synaptum* occurs. Both species have calyx lobes arranged in two basally connate groups, a sinus on both the anterior and posterior sides of the corolla, and a comparable column morphology. *Stylidium synaptum* is most readily distinguished from *S. candelabrum* by its strictly basally-rosetted habit (i.e. with a contracted stem *cf.* with an elongated, leafy stem and loose, terminal rosette), spathulate to oblanceolate leaves that lack a slender petiole (*cf.* with an ovate or elliptic lamina and distinct petiole), and scarcely colliculate rather than ± smooth (areolate) seeds.

Stylidium synaptum is also morphologically similar to *S. uliginosum* Sw. ex Willd. (Figure 20G–I), a rosulate species with capsules of similar size and comparable seeds but with glandular-hairy scapes and inflorescences, three free and two part-connate calyx lobes, a shorter column (2.5–4 mm long *cf.* 5.5–8 mm in *S. synaptum*), and a morphologically distinct throat appendages.

Stylidium synaptum could be confused with the basally-rosetted *S. capillare* (Figure 7, 2J) and *S. exiguum* A.R.Bean (Figure 20D–F), although both of these species have three free and two part-connate calyx lobes, ± smooth (areolate) seeds, and lack a posterior corolla sinus. *Stylidium capillare* differs further in having flowers with four basally connate, yellow-tipped throat appendages, while *S. exiguum* has longer sterile scape bracts (2–6 mm *cf.* 0.4–0.9 mm in *S. synaptum*) and flowers with red-tipped throat appendages.

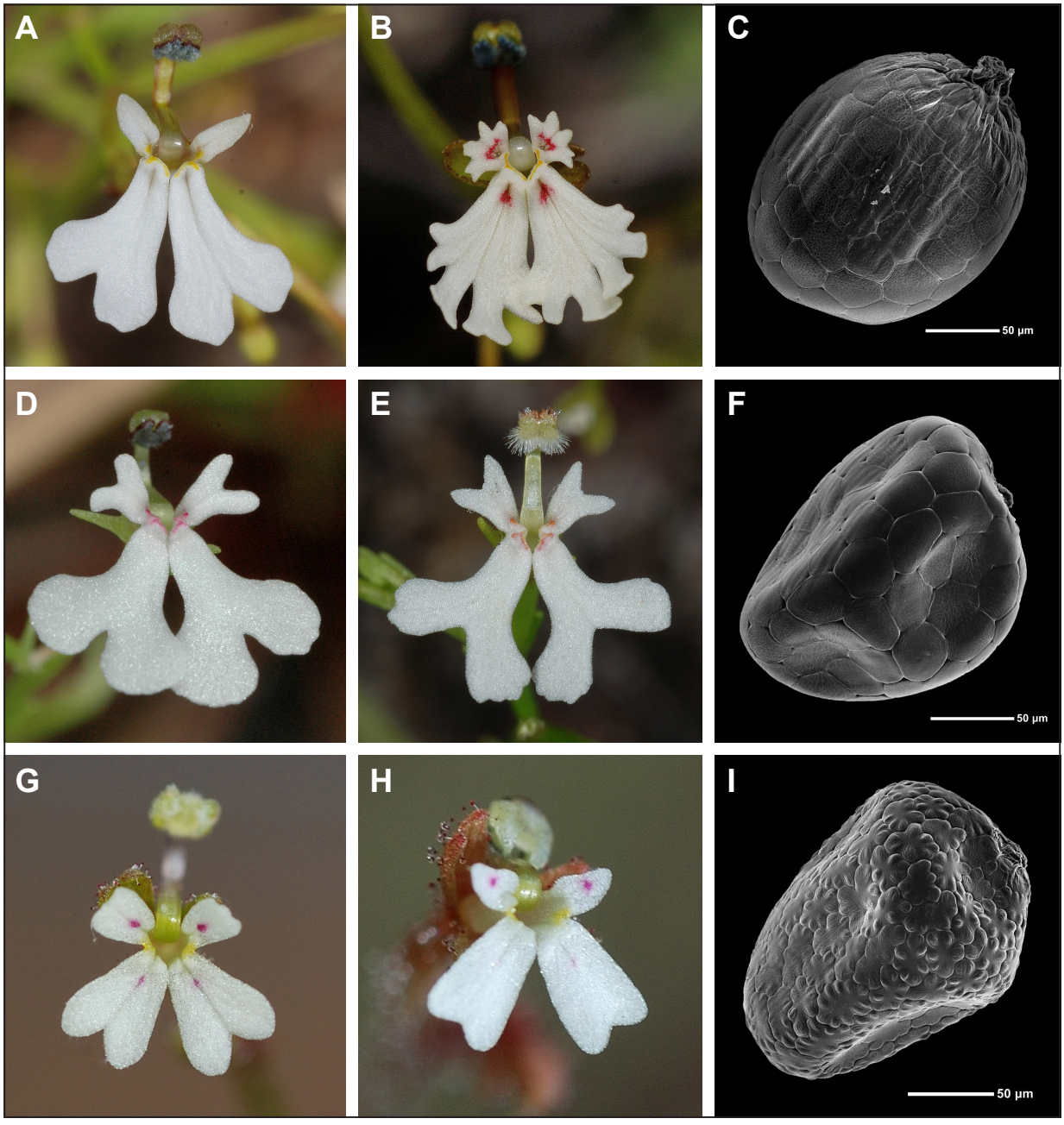

Figure 20. A, B – *Stylidium candelabrum* flowers with yellow-tipped throat appendages (note the atypical form (A; see Wege & Brennan 2024) lacks coloured markings near the base of the corolla lobes and has entire upper lobes); C – *S. candelabrum* (typical form) ± smooth (areolate) seed; D, E – *S. exiguum* flowers with red-tipped throat appendages; F – *S. exiguum* ± smooth (areolate) seed; G, H – *S. uliginosum* flowers (throat appendages present but minute); I – *S. uliginosum* seed with subtle protuberances. Photographs by K. Brennan (A, B, D, E, G, H) and S.J. Dillon (C, F, I) from *K. Brennan* 7523 (A), *K. Brennan* 7486 (B), *G.M. Wightman* 3906 (C: BRI), *K. Brennan* 6907 (D), *K. Brennan* 7576 (E), *I.D. Cowie* 8869 (F: DNA), *K. Brennan* 9843 (G), *D.L. Lewis 3580 & K. Brennan* (H) and *D. Halford & M. Mathieson* QM146 (I: BRI).

Stylidium tantillum Wege & Brennan, *sp. nov.*

Type: Baroalba Creek, Mt Brockman massif, Northern Territory, 28 March 1995, *K. Brennan* 3072 (*holo*: DNA D0141473).

Illustrations. A.R. Bean, *Austrobaileya* 8(2): 108, Figure 1A–C (2010), as *S. exiguum*.

Rosulate *annual herb* 1.2–7.5 cm high. *Glandular hairs* to *c.* 0.1 mm long, with a red or red-black, discoid or globose head. *Stem* contracted, sometimes to 0.3 cm long, to 1 mm wide, white, simple, glabrous. *Leaves* basal, sometimes loosely rosetted or with a few leaves below rosette, narrowly oblanceolate to spathulate, 2–5 mm long, 0.3–1.3 mm wide, glabrous, apex subacute to obtuse; margins entire. *Scape* solitary, 1.2–7.5 cm long including inflorescence, 0.15–1 mm wide, glabrous, usually with scattered sterile bracts 2–4 mm long (although sometimes absent when branched close to base). *Inflorescence* determinate, monochasially or dichasially cymose, 1–*c.* 100-flowered, flowers rotated 180°; branches glabrous; bracts 1–4 mm long, glabrous; pedicels ± indistinct. *Hypanthium* oblong to linear in outline, 1.5–4.5 mm long, 0.2–0.5 mm wide, glabrous or very sparsely glandular-hairy distally. *Calyx* with 3 free lobes and 2 connate for *c.* half their length, 1–1.7 mm long, sparsely glandular-hairy on margins or sometimes glabrous, subacute to acute. *Corolla* creamy white; lobes paired vertically, with sparse glandular hairs mostly on margins (sometimes restricted to anterior lobes); anterior (upper) lobes ± narrowly obovate to elliptic or cuneiform with a rounded, emarginate or bilobed apex, smaller than the posterior pair, 1–1.2 mm long, 0.3–1 mm wide; posterior (lower) lobes narrowly cuneiform to narrowly obovate with an emarginate or bilobed apex, 1.2–2 mm long, 0.7–1.5 mm wide; tube 0.5–0.7 mm long, shorter than the calyx lobes, usually with sparse glandular hairs near anterior sinus. *Labellum* at edge of sinus or on tube immediately below, narrowly ovate, 0.3–0.5 mm long with a terminal appendage *c.* 0.1 mm long, glabrous. *Throat appendages* 2 (1 on each posterior corolla lobe), creamy yellow, rounded, concave, 0.3–0.5 mm high, glabrous. *Column* 2.5–3.7 mm long, straight when extended, slender above main bend with a second bend well below the anthers, glabrous; anthers 0.3–0.5 mm long, corona absent; stigma sessile, entire. *Capsules* oblong to linear in outline, 3–6 mm long excluding calyx lobes, without raised ribs; halves detaching distally, not recurved. *Seeds* brown, ellipsoid, 0.15–0.2 mm long, ± smooth (areolate), with concave depressions. (Figure 21)

Diagnostic features. A diminutive annual herb with the following key features: a basally-rosetted habit; a glabrous scape to 7.5 cm high (including inflorescence), with scattered sterile bracts 2–4 mm long; an oblong to linear hypanthium (1.5–4.5 mm long) and capsules (3–6 mm long); 3 free and 2 part-connate calyx lobes; creamy white, vertically paired corolla lobes, the lower (posterior) pair larger than the upper ones; 2 yellowish, rounded throat appendages (1 on each lower lobe); and a short column (< 4 mm long).

Specimens examined. NORTHERN TERRITORY: near carpark at start of Baroalba spring walking track, 9 Apr. 1994, *K. Brennan* 2772 (DNA); Kakadu Fire Plot 140, 24 Apr. 1999, *K. Brennan* 3838 (DNA); Nabarlek, outcrops N of lease entrance, 25 Apr. 2008, *K. Brennan* 7560 (BRI, DNA); Arnhem Land, upper catchment of Magela Creek, 11 Apr. 1995, *I.D. Cowie* 5618 *& K. Brennan* (BRI, DNA, PERTH); Mt Brockman, Kakadu National Park, 28 Mar. 1995, *J. Egan* 4548 (DNA); Mt Brockman, Kakadu National Park, 31 Mar. 1995, *J. Egan* 4597 (DNA); Kakadu National Park, S end of Northern Outliers 11.5 km NE of Jabiru Airfield, 18 Mar. 2004, *R.A. Kerrigan* 780 (DNA); Cooper Creek, Nabarlek, 26 Apr. 1979, *M.O. Rankin* 2213 (CANB, DNA).

Spirit material examined. *K. Brennan* 7560 (DNA); Kakadu National Park, near Fire Plot 65, 1 Mar. 2014, *K. Brennan* 10246 (DNA, spirit only); Kakadu National Park, adjacent 'bottom' carpark for Gubarra Pools, 20 Mar. 2021, *K. Brennan* 12043 (DNA, spirit only); *R.A. Kerrigan* 780 (DNA); *M.O. Rankin* 2213 (DNA).

Flowering period. March–April.

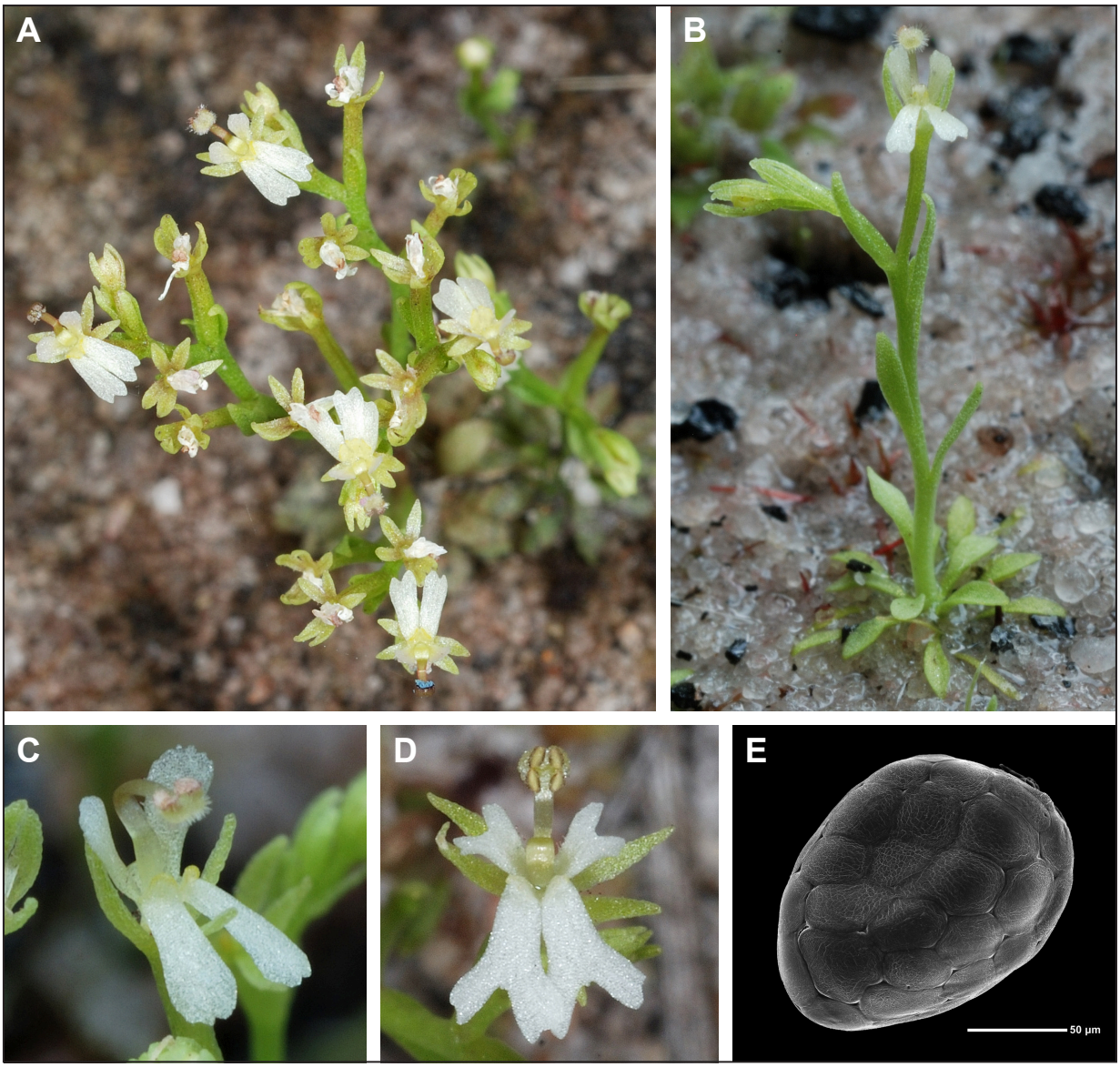

Figure 21. *Stylidium tantillum*. A – a many-flowered plant viewed from above; B – habit, showing the basal leaves and scattered scape bracts; C – flower, with rounded or emarginate corolla lobes and a triggered column. Note the yellowish, rounded throat appendages on the lower corolla lobes; D – flower, with bilobed corolla lobes; E – ± smooth (areolate) seed. Photographs by K. Brennan (A–D) and S.J. Dillon (E) from *K. Brennan* 10246 (A), *K. Brennan* 12043 (B, C), *K. Brennan* 7560 (D) and *K. Brennan* 2772 (E: DNA).

Distribution and habitat. Endemic to the Northern Territory where it is known from Kakadu National Park and Arnhem Land, from south and south-west of Jabiru to Narbarlek. Grows in shallow, damp sand on sandstone escarpments and pavements or at the base of sandstone outliers, sometimes near creek lines. Found amongst other ephemeral herbs and *Dapsilanthus*, sometimes in association with *Verticordia* and *Banksia*, or in heath with *Micraira pungens*.

Conservation status. Data Deficient according to IUCN criteria but may qualify under a Threatened category with further survey due to its small extent of occurrence and area of occupancy (N. Cuff pers. comm.). Readily overlooked due to its small stature and potentially short flowering period.

Etymology. From the Latin *tantillus* (so little, such a trifle), a reference to its tiny stature.

Vernacular name. Trifling Triggerplant.

Affinities. Akin to *S. exiguum*, with material previously included under that species (Bean 2010); however, the two species have distinct floral morphologies. The corolla is creamy white in *S. tantillum* with narrowly cuneiform to narrowly obovate lower (posterior) lobes that have an emarginate or bilobed apex and a creamy yellow, rounded appendage at the base (Figure 21C, D). In contrast, the corolla of *S. exiguum* has a pure white corolla that has strongly bilobed lower lobes with flared or divergent segments, and red- or pink-tipped throat appendages that connect across the upper and lower lobes (Figure 20D, E). The corolla lobes are also shorter in *S. tantillum* (the longer, posterior pair are 1.2–2 mm long *cf.* 3–3.8 mm in *S. exiguum*) as is the corolla tube (0.5–0.7 mm long *cf.* 1.5–1.7 mm) and column (2.5–3.7 mm long *cf.* 4.2–5.5 mm). The hypanthium and capsules are also mostly shorter (hypanthium 1.5–4.5 mm long *cf.* 4–10 mm in *S. exiguum*; capsules 3–6 mm long *cf.* 7–13 mm).

Stylidium tantillum has also been confused with *S. capillare*, a species with shorter sterile scape bracts (0.7–1.6 mm long *cf.* 2–4 mm in *S. tantillum*), a longer hypanthium (6.5–20 mm long) and column (4.8–7 mm long), longer capsules (11–22 mm long), and morphologically distinct corolla lobes with four, yellow-tipped throat appendages (Figure 7).

Note. A plant has been removed from the holotype, although we do not know when or by whom; an isotype may therefore be extant somewhere.

Stylidium tenerrimum F.Muell., *Fragm.* 1(6): 150 (1859); *Candollea tenerrima* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Type*: Between Providence Hill and M'Adam's [MacAdam] Range, Northern Territory, October 1855, *F. Mueller s.n.* (*lecto*, designated by A.R. Bean*, Austrobaileya* 5(4): 636 (2000): MEL 1061526!; *isolecto*: BM 000563903!, K 000741775!, PERTH 09703314! [ex Herbarium Lowrieanum; material appropriated from K 000741775]).

Diagnostic features. A weak-stemmed herb with the following key features: a diminutive stature (2.5–12 cm high) with delicate, branched stems 0.2–0.5 mm wide; scattered, narrowly lanceolate to lanceolate or ± elliptic leaves 1–4 mm × 0.2–1 mm; conspicuous pedicels (1–6 mm long); a glabrous hypanthium 3–6 mm long; a glabrous calyx with 3 free and 2 part-connate lobes; a white or very pale pink corolla with discrete red-pink or purplish markings, the lobes laterally paired with each pair fused for less than half their length; ± oblong-linear capsules with distally coherent halves; and densely papillose seeds 0.3–0.5 mm long. (Figure 10)

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 1 July 2021, *B. Buirchell s.n.* (PERTH); 20 July 2022, *S.A. James* SAJ2824*, B. Anderson, A. Markey & S. Nulgit* (PERTH).

NORTHERN TERRITORY: 1 km S of the Arnhem Hwy, Annaburroo [Annaburro] Station, 11 July 1984, *H.I. Aston* 2553 (CANB, DNA, MEL *n.v.*, PERTH); Annaburroo Billabong, *c.* 1.8 km SW of Bark Hut, 26 July 2023, *K. Brennan* 13191 (BRI, DNA, PERTH); near lagoon, Daly River area, 26 June 1977, *L.A. Craven* 4412 (CANB, DNA, PERTH); Daly River area, 26 June 1976, *L.A. Craven* 4443 (CANB); 0.7 km W of Drum Creek on the track to Leichhardt Billabong, 18 May 1987, *B.S. Wannan & K.L. Wilson* UNSW20291 (UNSW image!).

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Data Deficient according to IUCN criteria in the Northern Territory but may qualify as Near Threatened with further survey (N. Cuff pers. comm.). Sparsely recorded but likely to have been overlooked by collectors due to its diminutive stature. Potentially threatened by feral pig activity.

Typification. The locality on the isolectotype at K is near Table Hill, which is between Providence Hill and MacAdam Range. This sheet is interpreted as type material since it was collected by Mueller in October 1855 and is comparable to the other duplicates. Some of its packet contents were appropriated and incorporated into Herbarium Lowrieanum, presumably while the specimen was on loan from K to

PERTH. Herbarium Lowrieanum was bequeathed to PERTH following Lowrie's passing in 2021 and is gradually being processed and incorporated; the type material of *S. tenerrimum* is one of a number of stolen fragments and specimens that has thus far been unearthed, among them the PERTH duplicate of *S. austrocapense* A.R.Bean (Bean 1999b; PERTH 09593381) and floral fragments from the holotype of *S. ferricola* Wege (PERTH 09549862). It is unclear whether further appropriated type material will be discovered.

Notes. A collection made in 1984 from Annaburro Station in the Northern Territory (*H.I. Aston* 2553) was examined at DNA in 2019 and initially thought to represent a novel species within *S.* sect. *Alsinoida* on account of its diminutive habit with slender stems, distinctly pedicellate flowers, and a white corolla with discrete red-pink or purplish markings; however, re-examination of the type of *S. tenerrimum* and Mueller's (1859) description—'corolla alba, lobis omnibus macula sanguinea signatus' [corolla white, the lobes all marked blood-red]—has revealed this anomalous collection to be an excellent match for this species. Two comparable collections have recently been made from Charnley River – Artesian Range Wildlife Sanctuary in the west Kimberley and the Annaburro population relocated, with photographs from both areas matching one another and the protologue. Additional collections from the Daly River area were recently unearthed at CANB, and a collection at UNSW from Kakadu confirmed following examination of a specimen image.

Stylidium tenerrimum grows amongst herbs in damp sand on floodplains near billabongs or semi-permanent lakes. *Stylidium evolutum* has been reinstated to accommodate populations from the Darwin Coastal bioregion mistakenly referred to *S. tenerrimum* (refer to the comparative notes under that species).

Stylidium torquatum Wege & Brennan, *sp. nov.*

Type: Shoal Bay Conservation Reserve, Gunn Point Road, *c.* 5 km north of Howard River bridge, Northern Territory, 25 June 2023, *A.T. Webb* 78 *& K. Brennan* (*holo*: DNA D0290061; *iso*: BRI, CANB, MEL, PERTH).

Weak-stemmed *annual herb* 10–45 cm high. *Glandular hairs* 0.1–0.2 mm long, with a red or red-black, discoid or globose head. *Stem* scapiform, sometimes a little fleshy towards base, 10–45 cm long including inflorescence, 0.7–2.5 mm wide, green with a reddish base, glabrous. *Leaves* bract-like, ± *evenly scattered on stem,* sometimes rotting if submerged in water, adpressed or sometimes porrect towards base, narrowly ovate to narrowly lanceolate, 1–3.5 mm long, 0.3–0.8 mm wide, glabrous; apex obtuse to somewhat truncate; margins entire. *Scape* absent. *Inflorescence* determinate, monochasially cymose, (3–)9–*c.* 50-flowered, flowers rotated 180°; branches glabrous; bracts 1.5–3.5 mm long, glabrous or with a few glandular hairs; pedicels ± indistinct. *Hypanthium* ± linear in outline, 6–20 mm long, 0.3–0.7 mm wide, glandular-hairy distally. *Calyx* with 3 free lobes and 2 connate for more than half of length, 1.8–3 mm long, glandular-hairy on margins and usually near base, apex obtuse. *Corolla* mauve-pink or deep pink with white towards base of lobes, creamy yellow abaxially; lobes paired vertically, sparsely glandular-hairy abaxially (mostly on anterior lobes); anterior (upper) lobes cuneiform with an emarginate to shallowly bilobed apex, smaller than the posterior pair, 1.3–2.2 mm long, 0.6–1.5 mm wide; posterior (lower) lobes free to top of tube or more often basally connate for *c.* 0.2–0.5 mm, obovate with a bilobed apex, 3–5 mm long, 1.5–3 mm wide; tube 2–3 mm long, *c.* equal to or just longer than the calyx lobes, sparsely glandular-hairy near anterior sinus. *Labellum* on outside of corolla tube, narrowly ovate, 0.5–0.9 mm long with a terminal appendage 0.2–0.5 mm long, glabrous. *Throat appendages* basally connate, ± *semi-circular* and somewhat irregularly lobed, predominantly dark purple or purple-pink (occasionally with the anterior-most lobe red), 0.2–0.7 mm high, glabrous. *Column* 7–9.5 mm long, straight when extended, with raised margins above the main bend and a second bend well below the anthers, glabrous; anther locules 0.5–0.9 mm long, corona present; stigma sessile, entire. *Capsules* ± linear in outline, 9–20 mm long excluding calyx lobes, halves coherent distally. *Seeds* brown, ± ellipsoid, 0.15–0.2 mm long, colliculate with concave depressions. (Figure 22)

Diagnostic features. A weak-stemmed annual herb with the following key features: bract-like leaves 1–3 mm long, ± evenly scattered along a scape-like stem; a ± linear hypanthium with glandular hairs

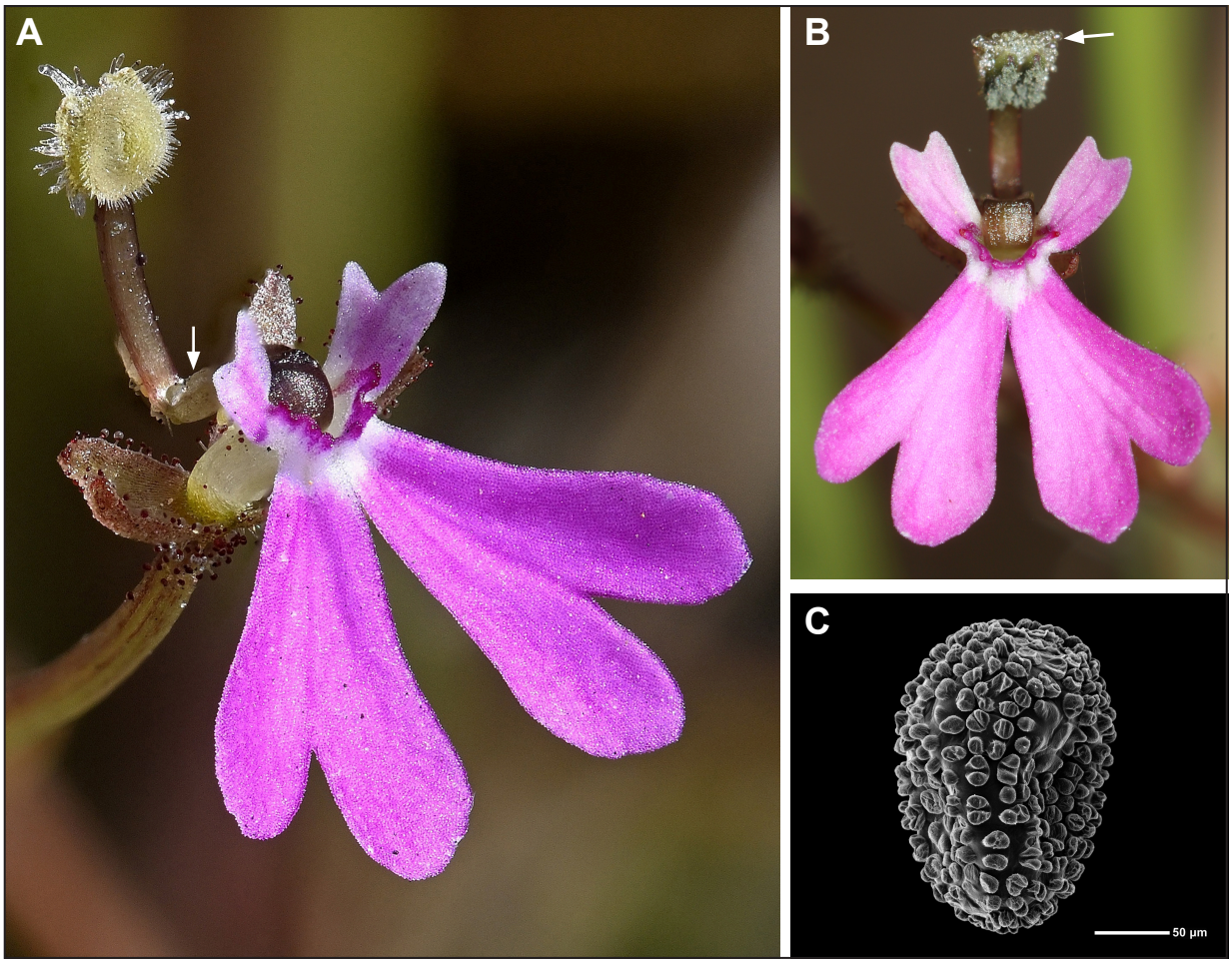

Figure 22. *Stylidium torquatum*. A – flower, showing the emarginate upper corolla lobes, bilobed and basally connate lower lobes, dark purple-pink throat appendages, and raised margins of the column above the main bend (arrow); B – flower, showing the hairs around the anthers (arrow); C – colliculate seed. Photographs by K. Brennan (A), J.A. Wege (B) and S.J. Dillon (C) from *A. Webb* 78 *& K. Brennan* (A, B) and *N.J. Cuff* 57 *& I.D. Cowie* (C: DNA).

restricted to the distal end; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; mauve-pink or deep pink, vertically paired corolla lobes with a white base, the upper (anterior) pair smaller than the lower ones and with an emarginate apex, the lower pair bilobed and basally connate or free to the top of the corolla tube; dark purple or purple-pink, basally connate and somewhat irregularly lobed throat appendages; a 7–9.5 mm long column with raised margins above the main bend and a corona (i.e. hairs around the anthers); and colliculate seeds.

Specimens examined. NORTHERN TERRITORY: Elizabeth Valley area, S off Noonamah Rd off Alverty Rd, 3 July 2022, *K. Brennan* 12881 (DNA, PERTH); Berry Springs, 2 km E t/o on road to Darwin water supply dam, 26 June 1977, *S. Carlquist* 15195 (CANB, DNA, NSW, RSA); Churcher Wetland Reserve, central area, 19 Aug. 2014, *N.J. Cuff* 57 *& I.D. Cowie* (DNA); Sunday Creek, Arnhem Hwy, 20 Aug. 2018, *N.J. Cuff* 754 (DNA); access to mangrove off end of Gulnare Rd, Elizabeth River, 28 Mar. 1995, *D. van Kerckhof* 36 (DNA); Gunn Point, 1 Aug. 2018, *D.L. Lewis* 3200 (DNA); Noonamah, Jenkins Rd, 13 July 2008, *D.E. Murfet* 6066 (AD, DNA); Gunn Point Rd, *c.* 6 km from Howard River, 13 July 2008, *D.E. Murfet* 6088 (AD, DNA); 4 km E of Alligator River, 8 Apr. 2009, *D.E. Murfet* 6486 *& A. Lowrie* (AD); Berry Spring Reserve, 18 May 1977, *M.O. Parker* 852 (CANB, DNA); Berry Springs, 27 Apr. 1978, *M.O. Rankin* 1217 (DNA); Humpty Doo, NE of Arnhem Hwy, track off Trippe Rd, 18 May 2005, *B. Wirf* 179 *& D.L.W. Low Cho* (DNA).

Spirit material examined. *K. Brennan* 12881 (DNA); *M. Parker* 852 (DNA); *A.T. Webb* 78 *& K. Brennan* (DNA).

Flowering period. (March–) May–August.

Distribution and habitat. Endemic to the Northern Territory where it has been collected from the greater Darwin area, although records on *iNaturalist* indicate a broader distribution that includes Kakadu National Park (https://inaturalist.ala.org.au/observations/168471057 [accessed 23 February 2024]). Grows amongst grassy tussocks in damp sand or organic black hydrosol on alluvial plains, in open woodland with *Lophostemon lactifluus*, *Melaleuca nervosa*, *M. viridiflora* or *Grevillea pteridifolia*, often with *Eriachne burkittii*.

Conservation status. Data Deficient according to IUCN criteria although highly likely to qualify as a category of conservation significance with further survey given the threats across much of its distribution (N. Cuff pers. comm.).

Etymology. From the Latin *torquatus* (adorned with a necklace), a reference to the appendages at the base of the corolla lobes.

Vernacular name. Necklace Triggerplant.

Affinities. Most specimens of *S. torquatum* were previously placed under *S. fissilobum* (Figure 6). *Stylidium torquatum* can be readily separated from this species by its dark-tipped, irregularly lobed throat appendages (*cf.* throat bearing orange callosities in *S. fissilobum*), colliculate rather than ± smooth (areolate) seeds, and raised margins above the main bend of the column (*cf.* small lateral lobes).

Stylidium torquatum could be confused with *S. diffusum*, a species with a somewhat similar corolla and throat appendage morphology (Figure 5F) and comparable seeds (Figure 2G); however, *S. diffusum* has mostly longer leaves (2–12 mm long *cf.* 1–3.5 mm in *S. torquatum*) that are more closely spaced toward the base of plant (*cf.* ± evenly spaced), and a shorter column (3–5.5 mm long *cf.* 7–9.5 mm) that is slender above the main bend (i.e. without the raised margins) and lacks hairs around the anthers. *Stylidium diffusum* also has a mostly smaller corolla, with anterior (upper) lobes that are 0.5–1.2 mm long (*cf.* 1.3–2.2 mm in *S. torquatum*) and posterior (lower) lobes that are 1.5–3 mm long (*cf.* 3–5 mm).

Although similar in habit and seed morphology, *S. torquatum* and *S. brennanianum* are unlikely to be confused due to their geographic disjunction and the differences in the shape and colour of the corolla and throat appendages (compare Figure 5A–C with Figure 22A, B). *Stylidium torquatum* usually has a longer column than *S. brennanianum* (7–9.5 mm long *cf.* 4.8–7 mm).

Notes. Several populations of uncertain identification from Kakadu National Park have affinity to *S. torquatum* but have strongly bilobed upper corolla segments (*cf.* emarginate in *S. torquatum*), morphologically distinct throat appendages (a mixture of dark pink and orange protuberances that do not form a continuous ridge across the lower corolla lobes, and red (rather than translucent) hairs at the tip of the column. These collections have been annotated at BRI, CANB and DNA as *S.* sp. (*aff. S. torquatum*); recent research has enabled their taxonomic resolution as a distinct species (see Wege & Brennan 2024).

Stylidium tremendum Wege, M.D.Barrett & R.L.Barrett, *sp. nov.*

Type: northern Prince Regent National Park, 14.9 km south-south-east of Mt Brookes, Kimberley region, Western Australia, 25 April 2023, *M.D. Barrett* MDB 6356*, A. Spiridis & D. Chemello* (*holo*: PERTH 09596836; *iso*: BRI, DNA).

Erect *annual herb* (3.5–)8–32 cm high. *Glandular hairs* 0.1–0.3 mm long, with a red or red-black, discoid or globose head. *Stem* 2–23 cm long, 0.4–2.2 mm wide, straw-brown or reddish, simple or more rarely branched, glabrous. *Leaves* in a loose terminal rosette and usually sparsely scattered on stem below, with an elliptic, orbicular to suborbicular, ovate or obovate lamina, 5–65 mm long including a

slender petiole, 3–28 mm wide, glabrous, apex rounded or obtuse; margins entire, sometimes finely and somewhat irregularly hyaline. *Scapes* 1–6 per plant, 5–22 cm long including inflorescence, 0.3–1 mm wide, glandular-hairy (sometimes sparsely so towards base). *Inflorescence* determinate, monochasially or dichasially cymose, *c.* 3–21-flowered, flowers rotated 180°; branches glandular-hairy; bracts 1–4 mm long, glabrous or sparsely glandular-hairy; pedicels indistinct. *Hypanthium* linear in outline, 9–25 mm long, 0.4–0.7 mm wide, glandular-hairy. *Calyx lobes* with 3 free and 2 connate to near apex, 2–4.5 mm long, glandular-hairy, apex obtuse. *Corolla* magenta or mauve-pink, white abaxially; lobes paired vertically, sparsely glandular-hairy abaxially; anterior (upper) lobes obovate with a rounded or scarcely emarginate apex, smaller than the posterior pair, (1.5–)3–4.8 mm long, 1.5–3 mm wide; posterior (lower) lobes narrowly obovate to obovate with an emarginate or shallowly bilobed apex (segments not or very rarely divergent), (2.8–)4–9 mm long, 1.5–3.5 mm wide; tube 3–5.5 mm long, longer than the calyx lobes, sparsely glandular-hairy near anterior sinus. *Labellum* at base of anterior sinus or on outer wall of corolla tube, elliptic to narrowly ovate, glabrous or with the odd glandular hair, 0.7–1.1 mm long usually with a terminal appendage *c.* 0.1–0.3 mm long. *Throat appendages* 4 (1 on each corolla lobe), magenta or mauve-pink, free or basally connate across each upper and lower corolla lobe, emarginate or obtuse to rounded, 0.2–0.5 mm high, scarcely papillose. *Column* (9–)12–18 mm long, straight when extended, slightly broadened above main bend with a prominent hinge-like second bend well below the anthers, glabrous; anther locules 0.8–1.1 mm long, corona absent; stigma sessile, entire. *Capsules* linear in outline, 13–26 mm long excluding calyx lobes, without ribs; halves detaching distally, usually recurved. *Seeds* brown, ellipsoid or ± ovoid, 0.2–0.25 mm long, ± smooth (areolate), often with concave depressions. (Figure 17)

Diagnostic features. An erect annual herb with the following key features: broad, petiolate leaves in a loose terminal rosette and usually also scattered on the stem below; glandular hairs on the scape and inflorescence including the calyces; calyx with 3 free lobes and 2 connate for more than half their length; magenta or mauve-pink, vertically paired corolla lobes with a white undersurface, the upper (anterior) pair smaller than the lower pair with a rounded or emarginate apex, the lower (posterior) pair emarginate to shallowly bilobed and free to the top of the tube; 4 magenta or mauve-pink throat appendages; a long (3–5.5 mm) corolla tube that is exserted beyond the calyx lobes; a long column (usually 12–18 mm long, although rarely as short as 9 mm) that is slightly broadened above the main bend with a hinge-like second bend well below the anthers; and linear capsules with seeds that have prominent partitions on the surface.

Selected specimens. WESTERN AUSTRALIA: Grevillea Gorge, Beverley Springs Station, 31 May 1992, *M.D. Barrett* MDB 8 (BRI, DNA, PERTH); mainland 8.3 km SE of Gertrude Cove on Kiska Island, N of Roe River mouth, West Kimberley, 23 Apr. 2008, *M.D. Barrett* MDB 1978 *& R.L. Barrett* (BRI, CANB, DNA, MEL, PERTH); 9 km S of new Theda Station Homestead on Loonjool Creek, north Kimberley, 28 Apr. 2008, *M.D. Barrett* MDB 2179 *& R.L. Barrett* (CANB, DNA, PERTH); Grevillea Gorge in the Synnot Range, 25 km NW of Beverley Springs Homestead, 23 Apr. 1993, *R.L. Barrett* 603 (PERTH); SW of Changoola Creek, Doongan Station, E of Gibb River–Kalumburu road, N Kimberley, 23 May 2009, *R.L. Barrett* RLB 5717 (PERTH); 6 km SE of King Edward River on old Mitchell River Rd, 31.2 km NW of Doongan Homestead, 18 May 2011, *R.L. Barrett* RLB 7284 (PERTH); Jack's Melaleuca Wetland site, *c.* 20 km N of Doongan Station Homestead, 3 June 2012, *R.L. Barrett* RLB 7619 (BRI, CANB, DNA, PERTH); Bachsten Creek upper gorge at base of waterfalls, 11 July 2005, *C. Bugden, D. Clark & T. Whiteway* CDT 1 (PERTH); Prince [King] Edward River, Amax Road Crossing, 2 June 1971, *N. Byrnes* 2327 (CANB, DNA, PERTH); 1.5 km SE of Island, Charnley River, 9 km W of Synnot Creek, 14 June 1994, *D.J. Edinger* 889 (BRI, PERTH); Galvans Gorge, 'Mt Barnett', 3 June 1982, *S. Jacobs* 4397 (NSW); upper reaches of Hunter River, W Kimberley coast, 28 May 1996, *K.F. Kenneally* 11664 (CANB, PERTH); King Edward River crossing, 24 June 1993, *A. Lowrie* 758 (PERTH); Mount Hart Station, 14 June 2002, *B.S. Wannan* 2477 (BRI, PERTH).

Spirit material examined. *K.F. Kenneally* 11664 (PERTH). Flowers reconstituted from *M.D. Barrett* MDB 6356*, A. Spiridis & D. Chemello* (PERTH); *R.L. Barrett* RLB 7619 (PERTH).

Flowering period. March–August.

Distribution and habitat. Endemic to Western Australia where it has been mostly recorded from the Northern Kimberley bioregion including Prince Regent National Park and Charnley River – Artesian Range Wildlife Sanctuary, with a single record from the Central Kimberley near Moll Gorge. Favours herbfields and moss beds in seepage areas associated with sandstone, especially rock overhangs, cliff faces and gorge walls, sometimes growing near waterfalls. Also recorded growing amongst boulders or in steep rocky creeklines in open woodland with dense grasses.

Conservation status. Locally common at a number of sites. Not considered to be under threat.

Etymology. From the Latin *tremendus* (something to be trembled at, large), a reference to the column (from the insect's perspective).

Vernacular name. Tremendous Triggerplant.

Affinities. Some specimens of *S. tremendum* were assigned to *S. notabile* A.R.Bean (Western Australian Herbarium 1998–), a species with a similarly long column that is now known to be endemic to Kakadu National Park and West Arnhem in the Northern Territory. *Stylidium tremendum* can be distinguished by its lower (posterior) corolla lobes, which are free to the top of the tube (*cf.* basally connate in *S. notabile*), the absence of hairs (a corona) around the anthers, and ± smooth (areolate) seeds (*cf.* colliculate; compare Figure 17 with Figure 23). Both species have four throat appendages; however, their morphology is distinct: the pair of winged ridges that extend into the corolla tube from the base of the lower corolla lobes in *S. notabile* are absent in *S. tremendum* as are the small callosities in the sinus of each anterior and posterior corolla lobe.

Stylidium tremendum is closely allied to *S. muscicola* and *S. modicum* and can co-occur with either species (but all three species have never been observed growing together at the same site). It can usually be separated from both species by its longer column, which is mostly 12–18 mm long (*cf.* 5.5–8.5 mm in *S. muscicola* and 9–12 mm in *S. modicum*) although can be as short as 9 mm at sites where it co-occurs with *S. muscicola* (e.g. *R.L. Barrett* RLB 2346 *& A.N. Start*: PERTH). It also has a white rather than yellowish corolla lobe undersurface, and magenta or mauve-pink (*cf.* yellow or mostly yellow) throat appendages that are morphologically distinct (see Figure 16 and Figure 17). *Stylidium tremendum* can be further differentiated from *S. muscicola* by its mostly longer corolla tube (3–5.5 mm long *cf.* 2–3 mm) and larger anther locules (0.8–1.1 mm long *cf.* 0.4–0.7 mm), and usually by its larger corolla lobes (upper pair mostly 3–4.8 mm long *cf.* 1.2–2.5 mm long; lower pair mostly 4–9 mm *cf.* 2.2–4 mm long). The apex of the lower (posterior) corolla lobes is often helpful in separating *S. tremendum* from *S. modicum* (usually emarginate or bilobed and without divergent segments *cf.* usually bilobed with divergent segments in *S. modicum*, but apparently with rare exceptions in both species).

Figure 23. *Stylidium notabile*. A, B – flowers, showing the basally connate lower corolla lobes; C – faintly colliculate seed. Photographs by K. Brennan (A, B) and S.J. Dillon (C) from *K. Brennan* 8361 (A), *K. Brennan* 3171 (B) and *K. Brennan* 10089 (C: DNA).

Stylidium tremendum is also potentially confused with *S. willingii*, a species that has a shorter column (5–7 mm long) with small, lateral lobes immediately above the main bend, and 6 or 8, basally connate throat appendages that are mostly yellow (or sometimes with the uppermost appendages red-pink).

Stylidium trichopodum F.Muell., *Fragm.* 10(85): 86 (1876). *Candollea trichopoda* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882). *Type*: Etheridge River [Yeldham Creek], Queensland, *s. dat.*, *W.E. de M. Armit* 622 (*lecto*, here designated: MEL 716064!; *isolecto* [numbered]: MEL 2260465!; *isolecto* [unnumbered]: BM 000645726!, K 000060896!, M 0175778!, MEL 2260466!, MEL 2260467!, WU 0034236!, WU 0034237!).

Typification. Mueller had ample material of this north Queensland species at his disposal, distributing duplicates to several herbaria. The designated lectotype was retained at the National Herbarium of Victoria and is annotated by Mueller with the species name and some diagnostic information. The unnumbered sheets are interpreted here as type material.

Stylidium uliginosum Sw. ex Willd., *Sp. Pl.* 4: 147 (1805); O. Swartz, *Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin* 1: 52, t. II, Figure 4 (1807); *Candollea uliginosa* (Sw. ex Willd.) F.Muell., *Syst. Census Austral. Pl.* 86 (1882). *Type*: Ceylon, *s. dat.*, *J.G. Koenig s.n.* (*holo*: B-W 17045 -01 0 image! [collector incorrectly given as Roestel]; *iso*: BM 000563902!, S-G-5882!).

Stylidium tenerum Spreng., *Syst. Veg.* Edn. 16, 3: 749 (1826); *Stylidium tenellum* R.Br., *Prodr. Fl. Nov. Holland.* 571 (1810), *nom. illeg. non* Sw. ex Willd., *Sp. Pl.* 4(1): 146 (1805). *Type*: East Coast Shoal water Bay [Queensland], 6 August 1802, *R. Brown s.n.* [Bennett no. 2599] (*lecto*, designated by J.A. Wege, *Nuytsia* 28: 245 (2017): BM 000563897!; *isolecto*: BM 000563908!, E 00279223!, K 000060568!, K 000060570!, MEL 1061494!).

Stylidium sinicum Hance in W.G. Walpers, *Ann. Bot. Syst.* 2(6): 1030 (1852). *Type*: 'Hab. in humidis ins. Hong-Kong Chinensium' (*n.v.*).

Notes. *Stylidium tenerum* was considered a synonym of *S. uliginosum* by Bentham (1868) and Mildbraed (1908) but was reinstated by Bean (2000: 600), who applied the name to specimens from Australia and Papua New Guinea. He distinguished it from *S. uliginosum* (from south-east Asia) by the presence of a posterior corolla sinus and small throat appendages at the base of the corolla lobes (both considered absent in *S. uliginosum*, although photographs and flowers preserved in spirit were not available for examination). Both species were otherwise found to be comparable in terms of vegetative, floral and fruiting characteristics (Bean 2000). The posterior corolla sinus (situated between the lower corolla lobes) and throat appendages are features that can be very difficult if not impossible to discern on pressed material, even more so in this instance given the small corolla (with lobes to 2 mm long). Photographs of *S. uliginosum* have since become available for study including from Hong Kong (Hong Kong Herbarium 2021) revealing the presence of a posterior corolla sinus and a corolla shape that is comparable to Australian populations (e.g. Figure 20G, H), with descriptions of material from Hong Kong and mainland China noting the presence of throat appendages (Yip & Au 2009; Hong & Wege 2011). Additional photographs from Hong Kong, Vietnam and mainland China that are available on *iNaturalist* (e.g. https://www.inaturalist.org/observations/196346633, https://www.inaturalist.org/observations/151121547 and https://www.inaturalist.org/observations/113257850 [accessed 9 August 2024]) also confirm the presence of a posterior corolla sinus and throat appendages.

In the absence of any morphological features to support a taxonomic distinction, *S. tenerum* is returned herein to synonymy under *S. uliginosum*.

Typification. We have not located type material of *S. sinicum*, which may no longer be extant: Stafleu and Cowan (1979: 42) suggest that Hance lost his books and herbarium during the burning of the foreign factories at Canton in December 1884. That said, a specimen of *S. uliginosum* from Hance's Herbarium

(n. 887), received by BM in 1887, bears the collection date 25 December 1854, which is before the factory fires but after *S. sinicum* was described. There are duplicates of this gathering at FI and W, and possibly at CGE.

Stylidium youwanjela M.D.Barrett, R.L.Barrett & Wege, *sp. nov.*

Type: near Youwanjela Creek, Prince Regent Nature Reserve, Western Australia [precise locality withheld for conservation reasons], 30 March 2010, *R.L. Barrett* RLB 6865 *& M.D. Barrett* (*holo*: PERTH 09617779; *iso*: BRI, CANB, DNA).

Rosulate *annual herb* 2–11 cm high. *Glandular hairs c.* 0.1–0.15 mm long, with a red or red-black, discoid or globose head. *Stem* contracted. *Leaves* basal, narrowly oblanceolate to oblanceolate, 1–5.5 mm long, 0.4–1.5 mm wide, glabrous, apex obtuse; margins entire. *Scapes* 1 or sometimes 2 per plant, 2–11 cm long including inflorescence, 0.2–0.7 mm wide, glabrous, with scattered sterile bracts 0.5–1.8 mm long. *Inflorescence* determinate, monochasially cymose, 1–16-flowered, flowers rotated 180°; branches glabrous; bracts 0.7–2 mm long, glabrous; pedicels ± indistinct. *Hypanthium* linear in outline, 5–13 mm long, 0.3–0.6 mm wide, glandular-hairy distally. *Calyx lobes* with 3 basally connate and 2 connate for more than half their length, 1.2–2 mm long, sparsely glandular-hairy on margins and sometimes towards base, apex acute. *Corolla* pale mauve pink or sometimes with white upper lobes, pale yellowish abaxially; lobes paired vertically, sparsely glandular-hairy with hairs mostly towards base of lobes or on margins of anterior lobes; anterior (upper) lobes obovate with a bilobed apex (segments of unequal width), a little smaller than the posterior pair, 1.7–3 mm long, 1.5–2.8 mm wide; posterior (lower) lobes ± obovate with a flared, bilobed apex (segments of unequal or subequal width and somewhat divergent), 2–3.5 mm long, 1.9–3.2 mm wide; tube 1.5–2.5 mm long, *c.* equal to or a little longer than the calyx lobes, sparsely glandular hairy near anterior sinus. *Labellum* on corolla tube immediately below sinus or ± at sinus base, narrowly ovate, sparsely glandular-hairy, 0.5–0.7 mm long, sometimes with a terminal appendage *c.* 0.1 mm long. *Throat appendages* 4 (1 on each corolla lobe), basally connate for more than half their length, golden yellow, 0.5–0.8 mm high, thickened, glabrous; lower (posterior) lobes more prominent, with a rounded and recurved apex; anterior (upper) lobes with an obtuse or emarginate and sometimes slightly recurved apex. *Column* 6–7.8 mm long, straight when extended, slender above main bend with a second bend below the anthers, glabrous; anthers 0.5–0.7 mm long, corona absent; stigma sessile, ± entire. *Capsules* linear in outline, 11–16 mm long excluding calyx lobes, without ribs; halves detaching distally, recurved. *Seeds* brown, ellipsoid or globose, 0.15–0.2 mm long, ± smooth (areolate), with concave depressions. (Figure 24)

Diagnostic features. A diminutive annual herb with the following key features: a basal rosette of leaves to *c.* 5.5 mm long; a slender scape with scattered sterile bracts 0.5–1.8 mm long; acute calyx lobes, with 3 basally connate and 2 connate for more than half of length; glandular hairs at the distal end of the hypanthium and on the calyx lobe margins; pale mauve pink corolla lobes (the upper pair sometimes white) with a bilobed apex, the upper (anterior) pair more than half the length of the lower pair and asymmetrically divided, the lower pair free to the top of the corolla tube; 4 golden yellow and basally connate appendages (1 on each corolla lobe), the lower ones very prominent, rounded and recurved; linear capsules with halves detaching distally; and ± smooth (areolate) seeds.

Spirit material examined. *R.L. Barrett* RLB 6865 *& M.D. Barrett* (PERTH).

Flowering period. February–April by inference (the type was collected at the end of March and has both flowers and fruit).

Distribution and habitat. Known from the crest of a single hill in Prince Regent National Park in the Northern Kimberley bioregion, where it grows on shallow sand lenses over sheeting sandstone pavement. Occurs amongst low shrubs of *Calytrix gomphrenoides* and *Acacia froggattii* with *Fimbristylis*, *Cyperus*, *Goodenia*, *Stylidium*, *Utricularia* and *Micraira*.

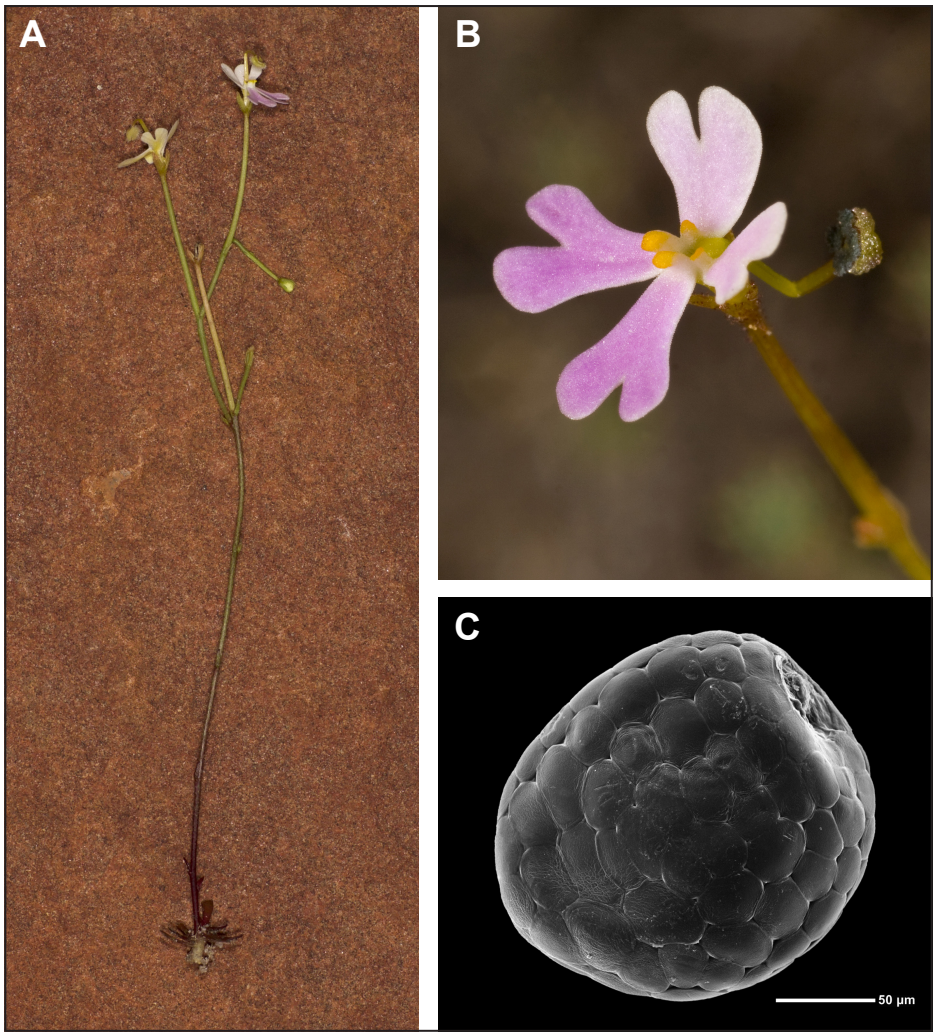

Figure 24. *Stylidium youwanjela*. A – basally rosetted habit with small, scattered bracts on the scape; B – flower, showing the distinctive corolla shape and prominent yellow throat appendages; C – ± smooth (areolate) seed. Photographs by R.L. Barrett (A, B) and S.J. Dillon (C: PERTH) from *R.L. Barrett* RLB 6865*& M.D. Barrett*.

Conservation status. To be listed as Priority Two under Conservation Codes for Western Australian Flora (T. Llorens pers. comm.). Known from a single locality. Wet season surveys of more than 30 sandstone pavement sites in the general vicinity have not located additional populations of this species, suggesting it may be naturally rare and/or highly localised.

Etymology. Named for Youwanjela Creek, the nearest named place to the type locality. The epithet is formed as a noun in apposition.

Vernacular name. Youwanjela Triggerplant.

Affinities. *Stylidium youwanjela* is morphologically similar to *S. nominatum* Carlquist (Figure 25), a species from the Northern Territory with a comparable habit and prominent, golden yellow throat appendages. Unlike *S. nominatum*, all four corolla lobes are bilobed in *S. youwanjela* (*cf.* rounded or with the lower lobes emarginate to shallowly bilobed) and the throat appendages are entire and smaller (0.5–0.8 mm high *cf.* 1.2–1.4 mm high and irregularly dissected in *S. nominatum*). *Stylidium youwanjela* also has shorter sterile scape bracts (1–1.8 mm long *cf.* 2–5 mm in *S. nominatum*).

Stylidium youwanjela may have closer affinity to *S. capillare* (Figures 2J, 7), with pressed material of the two species very difficult to separate since they differ chiefly in corolla and throat appendage morphology

Figure 25. *Stylidium nominatum*. A, B – flowers, showing the prominent yellow throat appendages and white corolla lobes of ± equal length and with a rounded, emarginate or shallowly bilobed apex. Note the difference in throat appendages between these two populations; C – ± smooth (areolate) seed. Photographs by K. Brennan (A, B) and S.J. Dillon (C) from *K. Brennan* 7978 (A), *K. Brennan* 11389 (B) and *C.R. Dunlop* 4884 (C: DNA).

(although both species have four, basally connate appendages). In *S. youwanjela*, the upper corolla lobes are more than half the length of the lower pair and asymmetrically bilobed, and the throat appendages are completely golden yellow, with the lower pair rounded and recurved. In contrast, the upper corolla lobes of *S. capillare* are less than half the length of the lower pair and evenly bilobed, and the throat appendages are white with a yellow, subacute to acute or obtuse apex.

The prominent, rounded throat appendages on the lower corolla lobes of *S. youwanjela* are somewhat reminiscent of those found in *S. divergens* from the Northern Territory; however, *S. divergens* has mostly longer leaves (5–65 mm long) that are usually in a terminal rosette and scattered below on an elongated stem, basally connate lower corolla lobes, hairs around the anthers (a corona), and ribbed capsules with colliculate (Figure 2E) rather than ± smooth (areolate) seeds.

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Key to the Triggerplants of the Northern Territory (*Stylidium*: Stylidiaceae)

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Abstract

Wege, J.A. & Brennan, K.G., Key to the Triggerplants of the Northern Territory (*Stylidium*: Stylidiaceae). *Nuytsia* 35: 199–216 (2024). An annotated dichotomous key and photographic guide to *Stylidium* Sw. ex Willd. in the Northern Territory is provided. *Stylidium gemmatum* Wege & Brennan is formally described and *S. stenophyllum* A.R.Bean placed into synonymy under a broadly circumscribed *S. pachyrrhizum* F.Muell.

Introduction

Recent taxonomic research on *Stylidium* Sw. ex Willd. in northern Australia and the adjacent arid zone has led to a suite of novel discoveries as well as significant range extensions and nomenclatural changes (Wege *et al.* 2024). This identification guide to the 50 named species found in the Northern Territory has been crafted to accommodate these taxonomic updates and includes the novel species *S. gemmatum* Wege & Brennan (described herein) as well as putative novelties that are currently under study. Notes have been provided in some instances to detail taxonomic concepts and highlight ongoing research or atypical variation.

Key to *Stylidium* in the Northern Territory

This key is accompanied by a photographic guide (Figures 1–5) that includes one or more floral photographs of each taxon arranged in the order they appear in the key. Figure numbers are indicated in the key in square brackets after the taxon name and an index to the images is provided. Superscript numbers associated with a subset of the taxa refer to taxonomic commentary provided at the end of the key, including the formal description of *S. gemmatum*.

The anterior corolla lobes are those positioned either side of the labellum (the small, highly modified corolla lobe that accommodates movement of the floral column). The term ‘throat appendages’ refers to the protuberances or ridge of tissue that can be present at the base of the corolla lobes, while the term ‘callosity’ refers to the hardened yellow, orange or red tissue that may be present in the corolla lobe sinuses; these terms are equivalent to the ‘paracorolla’ and ‘paracorolla gland’ of Bean (1999, 2000, 2010), Bean and Mathieson (2012) and Barrett *et al.* (2015). Care should be taken when measuring column length, which is often taxonomically informative yet difficult to measure in pressed material: it is usually more reliably measured when extended, i.e. in flowers that have been triggered (note the base of the column aligns with the base of the calyx lobes). To facilitate identification, collectors and iNaturalist users are encouraged to take photographs of the face of the flower (showing the corolla and throat appendage morphology), a side view of the flower (to show the calyces, corolla tube and column), and the leaves and base of the plant.

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1. Corolla spur present (at the base of the corolla tube on the opposite side of the labellum); hypanthium and capsules ± globose; stigma brush-tipped (stipitate).....**2**

1: Corolla spur absent; hypanthium and capsules ± ellipsoid, obovoid or obconical, or oblong to linear in outline; stigma sessile **3**

2. Corolla lobes orange or salmon-pink (rarely pink) with conspicuous yellow (rarely pink) ridges radiating from throat, rotated 180° (column dorsal); lower (posterior) corolla lobes strongly bilobed (with 4 segments divided to near base); stigma obdeltoid ..... **S. ceratophorum** [1A]

2: Corolla lobes mauve-pink or pale pink to magenta with a white throat, sometimes all white or with the upper lobes white, not rotated (column ventral); lower (anterior) corolla lobes emarginate to weakly asymmetrically bilobed; stigma obloid.....**S. longicornu** [1B, C]

3. Hypanthium and capsules ellipsoid to obovoid or obconical; glandular hairs with an ellipsoid head.....**4**

3: Hypanthium and capsules ± linear or sometimes oblong in outline; glandular hairs with a discoid or globose head.....**15**

4. Leaves linear.....**5**

4: Leaves oblanceolate or spathulate.....**9**

5. Corolla lobes paired laterally (column lateral), tube ≥ 4 mm long; column lacking glandular hairs; throat appendages absent.....**6**

5: Corolla lobes paired vertically (column dorsal), tube < 3.5 mm long; column glandular-hairy; throat appendages present **7**

6. Column 10–13.5 mm long; stem usually contracted or to *c.* 5 cm long (rarely to *c.* 10 cm long), leaves often basal or sometimes terminal and scattered on stem below .....**S. desertorum** (typical form) [1D]

6: Column 15–20 mm long; stem (1–) 5–23 cm long, leaves usually terminal and scattered on stem below, rarely strictly basal.....**S. desertorum** (atypical form)[1] [1E]

7. Hypanthium and capsules with prominent longitudinal ribs; throat appendages glandular-hairy ..... **S. turbinatum** [1F]

7: Hypanthium and capsules without prominent ribs; throat appendages glabrous or papillose, lacking glandular hairs **8**

8. Leaves glabrous; stem pale straw-brown; throat appendages basally connate, somewhat irregularly lobed, *c.* 0.2–0.5 mm high; column with glandular hairs but no simple hairs above main bend, corona (hairs around anthers) present; seed surface ± smooth (areolate) ..... **S. floodii** [1G]

8: Leaves glandular-hairy, sometimes hairs sparse near apex or occasionally absent; stem pale to dark red (rarely straw-brown); throat appendages free, the upper (anterior) pair tapered, angled inwards and 0.5–1.2 mm high; column with glandular and simple hairs above main bend, corona absent; seed surface wrinkled and papillose.....**S. adenophorum** [1H]

9. Leaves glandular-hairy ..... **S. semipartitum** [1I]

9: Leaves glabrous.....**10**

10. Scape with long simple hairs below inflorescence or with both simple and glandular hairs; capsules usually obconical (sometimes narrowly obovoid).....**11**

10: Scape strictly glandular-hairy below inflorescence; capsules ellipsoid to obovoid **12**

11. Scape with strictly simple hairs below inflorescence; glandular hairs on inflorescence of ± equal length, 0.2–0.3 mm long; column 4.5–6.5 mm long; seed surface colliculate.....**S. floribundum** [1J]

11: Scape with both simple and glandular hairs below inflorescence; glandular hairs of unequal length, 0.1–1.2 mm long; column 6–10 mm long; seed surface finely reticulate .....**S. inaequipetalum**[2] [1K]

12. Corolla lobes ± paired vertically (column dorsal), tube 4–5 mm long (exserted well beyond calyx); column with both glandular and short simple hairs above main bend; throat appendages prominent, the upper (anterior) ones broad and wing-like.....**S. leptorrhizum** [1L]

12: Corolla lobes paired laterally (column lateral), tube 1.2–2.7 mm long; column glabrous above main bend; throat appendages absent, slender or inconspicuous **13**

13. Flowers with a golden yellow throat, lacking throat appendages; corona (hairs around anthers) absent..... **S. incognitum** [2A]

13: Flowers with a white throat, throat appendages present; corona present.....**14**

14. Seed surface colliculate; throat appendages conspicuous at base of all corolla lobes; leaf margin sometimes finely hyaline; associated with catchments that discharge to the coast.....**S. multiscapum** [2B]

14: Seed surface reticulate; throat appendages present on anterior lobes but absent or rudimentary on posterior lobes; leaf margin prominently hyaline; associated with catchments that discharge inland..... **S. pezidium** [2C]

15. Plants without a leaf rosette, scape absent (stem often scapiform); leaves cauline, evenly scattered or more densely arranged towards base of plant **16**

15: Plants with a leaf rosette from which a scape arises (scape sometimes with scattered bracts); leaf rosette either basal (stem contracted) or terminal (usually also with scattered stem leaves) **29**

16. Corolla lobes paired vertically (column dorsal), free to top of tube or with the larger (posterior) pair basally connate, tube ≥ calyx lobes; throat appendages usually present (sometimes absent in *S. prophyllum*); seeds 0.15–0.25 mm long, without a pale nipple **17**

16: Corolla lobes paired laterally (column lateral) with each pair connate for 1/3–3/4 of length, tube < calyx lobes; throat appendages absent; seeds 0.25–0.5 mm long, with a pale nipple **26**

17. Corolla lobes obtuse or rounded; labellum at base of anterior corolla sinus **18**

17: Corolla lobes emarginate or bilobed (the larger, lower pair always bilobed); labellum on outside of corolla tube below anterior sinus **19**

18. Calyx lobes 1–1.5 mm long; lower (larger, posterior) corolla lobes 1.5–2.7 mm long; column 3–4.8 mm long ..... **S. elachophyllum** [2D]

18: Calyx lobes 1.8–3.7 mm long; lower corolla lobes 4–9.5 mm long; column 5.5–9.5 mm long ..... **S. prophyllum** [2E]

19. Leaves more closely spaced toward base of plant **20**

19: Leaves ± evenly spaced along stem **23**

20. Column 7.5–9 mm long; leaves 1–4 mm long; corolla lobes deep pink to mauve-pink (rarely with the upper lobes white or tinged white) ..... **S. fissilobum** [2F]

20: Column 3–6.7 mm long; leaves 2–12 mm long; corolla lobes white or pale pink to pale mauve-pink (or a combination of the two) **21**

21. Flowers lacking orange-yellow callosities; leaves 0.4–2.5 mm wide; corona (hairs around anthers) absent ..... **S. diffusum** [2G]

21: Flowers with prominent orange-yellow callosities; leaves 0.2–0.5 mm wide; corona present **22**

22. Column with small lateral lobes above main bend; throat appendages on lower corolla lobes pale; known from the Victoria Bonaparte bioregion ..... **S. aquaticum** (typical form) [2H]

22: Column with raised margins above main bend; throat appendages on lower corolla lobes red-tipped; known from the Pine Creek bioregion (Nitmiluk NP) ..... **S. aquaticum** (atypical form)[3] [2I]

23. Upper (smaller, anterior) corolla lobes strongly bilobed (divided *c.* 1/2 or > 1/2 their length) **24**

23: Upper corolla lobes emarginate or shallowly bilobed (divided < 1/3 their length) **25**

24. Corolla lobes pure white, the upper (smaller, anterior) ones with ± equal, spreading segments; column 4.8–7 mm long; known from the Tanami and Gulf Coastal bioregions ..... **S. brennanianum** [2J]

24: Corolla lobes pink, mauve-pink, or sometimes pink and white, the upper ones with unequal segments; column 7–9.5 mm long; known from the Darwin Coastal and Pine Creek bioregions ..... **S. gemmatum**[4] [2K]

25. Flowers with a prominent orange or yellow callosity in sinus between upper and lower corolla lobes and sometimes between the lower lobes; column with small lateral lobes above main bend; seed surface ± smooth (areolate) ..... **S. fissilobum** [2F]

25: Flowers with a dark pink- or purple-tipped throat appendages, lacking orange or yellow callosities; column with raised margins above main bend; seed surface colliculate ..... **S. torquatum** [2L]

26. Hypanthium glabrous; pedicels distinct, 1–6 mm long: stem delicate, 0.2–0.5 mm wide; corolla lobes with a discrete colour blotch towards base ..... **S. tenerrimum** [3A]

26: Hypanthium sparsely glandular-hairy; pedicels indistinct or to *c.* 1 (rarely 2) mm long; stem (0.3–)0.5–1.8 mm wide; corolla lobes with a broad colour band towards base (markings rarely absent) **27**

27. Leaf base cordate or rounded; each pair of corolla lobes connate for 1/3–1/2 of length, with a thin, red, medial stripe on undersurface of each lobe ..... **S. cordifolium** [3B]

27: Leaf base attenuate or cuneate; each pair of corolla lobes connate for ≥ 1/2 of length, undersurface pale or flushed pink **28**

28. Corolla lobes very unequal (the upper pair much smaller than the lower ones), white or dusky pink with dark markings; leaves mostly linear-lanceolate (ovate or elliptic and smaller near stem base) ..... **S. evolutum** [3C]

28: Corolla lobes of ± equal length, pink or mauve-pink (rarely white) with dark markings; leaves mostly lanceolate or broadly elliptic (becoming narrower distally) ..... **S. fluminense** [3D]

29. Inflorescences consistently 1-flowered (although numerous scapes produced/plant); leaves at base of inflorescences with a fibrous projection or tuft of hairs at the tip **30**

29: Inflorescences usually 2 to many-flowered (although solitary-flowered individuals sometimes occur); leaf apex obtuse or rounded **32**

30. Corolla minute, the lower (larger, posterior) lobes < 1 mm long; column 2.2–4 mm long ..... **S. pedunculatum** [3E]

30: Lower (larger, posterior) corolla lobes 1.3–3.7 mm long; column > 5 mm long **31**

31. Column 5.2–8 mm long ..... **S. ericksoniae** [3F]

31: Column 11–14 mm long ..... **S. contrarium** [3G]

32. Calyx 2-lipped or with lobes arranged in 2 partly connate groups **33**

32: Calyx with 3 free and 2 partly connate lobes **40**

33. Calyx lobes glabrous or with sparse glandular hairs near base; column slender above main bend **34**

33: Calyx lobes sparsely glandular-hairy on margins and usually near base; column dilated distally or with lateral lobes **37**

34. Leaves in a loose terminal rosette and scattered below on an elongated stem, rarely appearing ± basal through contraction of stem but if so then not spreading against substrate, 2.5–22 mm long including a conspicuous, slender petiole **35**

34: Leaves in a small basal rosette (stem contracted), spreading against soil surface, 1.5–8 mm long, ± sessile or inconspicuously petiolate **36**

35. Corolla with prominent red-pink markings towards base of lobes on upper surface; upper (smaller, anterior) corolla lobes obovate and bilobed (each segment usually with additional lobing); grows in shallow sand amongst boulders and in rock crevices on sandstone pavements, ridges and plateaus ..... **S. candelabrum** (typical form) [3H]

35: Corolla lacking markings on upper surface (occasionally with a red-pink stripe abaxially along midvein near base of lobes and on tube); upper corolla lobes ± narrowly elliptic with a rounded, obtuse or subacute apex; usually grows in heavy soils with lateritic and quartzite gravels, rarely on sandstone ..... **S. candelabrum** (atypical form)[5] [3I]

36. Upper (anterior) corolla lobes much smaller than the lower ones, the latter bilobed; throat appendages 2 or 4, not connected across the lower corolla lobes (corolla with a sinus on posterior side); seed surface scarcely and somewhat irregularly colliculate ..... **S. synaptum** [3J]

36: Corolla lobes *c.* equal in length or with the upper pair a little shorter than the lower ones, the latter emarginate; throat appendages 6, basally connate (corolla lacking a sinus on posterior side); seed surface ± smooth (areolate) ..... **S.** sp. **Twin Falls** (L.A. Craven 5870)[6]

37. Labellum on outside of corolla tube below anterior sinus; corolla lobes unequal, the lower (larger, posterior) ones emarginate or bilobed; throat appendages yellow, v-shaped, glabrous ..... **S. osculum** [3K]

37: Labellum at base of anterior sinus; corolla lobes ± equal or with the upper (anterior) pair a little shorter than the lower ones, lower lobes obtuse, rounded or scarcely emarginate; flowers with faint ridges and glandular hairs in throat **38**

38. Corolla tube 4–5 mm long, much longer than the calyx lobes; column 8–10.5 mm long ..... **S. dunlopianum**[7] [3L]

38: Corolla tube to 3 mm long, a little longer than the calyx lobes; column 4–7 mm long **39**

39. Seed surface colliculate; rosette leaves with an oblanceolate, spathulate or obovate lamina, usually widely spreading ..... **S. rotundifolium** [4A]

39: Seed surface ± smooth (areolate); rosette leaves with a narrowly oblanceolate or elliptic lamina, usually erect to suberect ..... **S. irriguum** [4B]

40. Column exceptionally long, 15–19 mm ..... **S. notabile** [4C]

40: Column 2.5–10 mm long **41**

41. Scape glabrous below inflorescence or glandular hairs very sparse and not extending to base **42**

41: Scape glandular-hairy throughout **47**

42. Basal leaves 1.8–8 mm long; scape with scattered sterile bracts below inflorescence; lower (larger, posterior) corolla lobes free to top of tube; capsules without longitudinal ribs **43**

42: Basal leaves 5–70 mm long; scape without sterile bracts below inflorescence (sometimes with 1 or 2 bracts with growth buds in axils); lower corolla lobes connate basally or for > 1/2 their length; capsules with longitudinal ribs **46**

43. Column 2.5–3.7 mm long; throat appendages confined to lower (posterior) corolla lobes; lower corolla lobes 1.2–2 mm long; capsules 3–6 mm long excluding calyx lobes ..... **S. tantillum** [4D]

43: Column 4.2–9 mm long; throat appendages present on both the upper and lower corolla lobes; lower corolla lobes 2.5–5 mm long; capsules 7–22 mm long excluding calyx lobes **44**

44. Corolla lobes ± equal; throat appendages 1.2–1.4 mm high, golden yellow, forming a prominent eye; column 6.8–9 mm long ..... **S. nominatum** [4E, F]

44: Upper (anterior) corolla lobes much smaller than the lower ones; throat appendages 0.3–0.5 mm high, white with a pink, red or yellow tip; column 4.2–7 mm long **45**

45. Sterile scape bracts 0.7–1.6 mm long; throat appendages yellow-tipped; capsules 11–22 mm long excluding calyx lobes, with halves coherent distally ..... **S. capillare**[8] [4G]

45: Sterile scape bracts (2–)3–6 mm long; throat appendages red- or pink-tipped; capsules 7–13 mm long excluding calyx lobes, with halves detaching distally ..... **S. exiguum** [4H]

46. Corolla without an orange or yellow callosity in sinus between each upper and lower lobe (but with prominent yellow or white throat appendages at base of lobes); column slender below anthers, lacking membranous appendages at tip; seed surface colliculate ..... **S. divergens** [4I]

46: Corolla with a prominent yellow or orange callosity in sinus between upper and lower lobes; column dilated below anthers, with 2 membranous appendages at tip (more readily observed before stigma develops); seed surface ± smooth (areolate) ..... **S. pachyrrhizum**[9] [4J–L]

47. Corolla with an orange, yellow or red callosity near sinus between upper and lower lobes **48**

47: Corolla without a coloured callosity near sinus between upper and lower lobes **51**

48. Lower (larger, posterior) corolla lobes free to top of tube or basally connate; column slender between distal bend and anthers (anthers not resting against column when poised) **49**

48: Lower corolla lobes connate for just under to > 1/2 their length forming a 4-lobed lower lip; column scarcely but distinctly dilated above a strong distal hinge (anthers resting against dilated portion when poised, including in pressed material) **50**

49. Leaves in a basal rosette; glandular hairs on pressed material with a pale red, yellowish or translucent head (rarely darker near flowers); upper (smaller, anterior) corolla lobes held close to one another; column somewhat concave above main bend (without lateral lobes), with tissue extending above anthers ..... **S. lobuliflorum** [5A]

49: Leaves in a terminal rosette and scattered on stem below (rarely basal through contraction of stem); glandular hairs on pressed material with a red to red-black head; upper corolla lobes somewhat spreading; column with lateral lobes above main bend, without tissue above anthers ..... **S. ensatum** [5B]

50. Glandular hairs absent from corolla lobe margins and throat of flower; lower (larger, posterior) corolla lobes bilobed with ± incurved outer segments; leaves oblanceolate, spathulate or with an elliptic, oblong, obovate or orbicular lamina, 1.8–15 mm wide ..... **S. schizanthum**[10] [5C–F]

50: Glandular hairs present on corolla lobe margins and in throat of flower (below the throat appendages); lower corolla lobes bilobed with widely spreading outer segments; leaves narrowly oblanceolate to ± linear, 0.4–1.8 mm wide ..... **S. aliforme** [5G]

51. Lower (larger, posterior) corolla lobes connate basally or for up to *c.* 1/2 their length, strongly bilobed with 4 ± equal segments; column scarcely but distinctly dilated above a strong distal hinge (anthers resting against dilated portion when poised, including in pressed material) **52**

51: Lower corolla lobes free to top of tube, emarginate or bilobed; column slender above a distal bend (anthers not resting against length of column) **53**

52. Upper (anterior) corolla lobes < 1/2 the length of the lower pair; seed surface colliculate; corona (hairs around anthers) absent; plants (8–)12–32 cm high ..... **S. brachyotis** [5H]

52: Upper corolla lobes > 1/2 the length of the lower pair; seed surface ± smooth (areolate); corona present at column tip (best viewed before stigma develops); plants 5–13 cm high ..... **S. simulans** [5I]

53. Column 5.5–8.5 mm long, broadened or with raised margins or lateral lobes above main bend; capsules 8–25 mm long excluding calyx lobes; seed surface ± smooth (areolate) **54**

53: Column 2.5–4 mm long, slender above main bend; capsules 3–9 mm long excluding calyx lobes; seed surface colliculate (sometimes scarcely so) **55**

54. Leaves petiolate; labellum at base of anterior corolla sinus; throat appendages yellow, ± uniform; occurs in sheltered, rocky sandstone habitats ..... **S. muscicola** [5J]

54: Leaves ± sessile; labellum on outside of corolla tube; throat appendages dark red-pink or dark mauve (rarely white), with a small yellow callosity in the sinus between the corolla lobes (callosities often obscure in pressed material); occurs in seasonally inundated lowlands ..... **S. ensatum**[11] [5B]

55. Glandular hairs on scape and inflorescence with a translucent to yellowish or pale red head in pressed material; corolla with a sinus on the anterior side, upper lobes bilobed; seed surface colliculate ..... **S. accedens** [5K]

55: Glandular hairs on scape and inflorescence with a dark red to red-black head in pressed material; corolla with a sinus on both the anterior and posterior sides, upper lobes obtuse, truncate or emarginate; seed surface scarcely and somewhat irregularly colliculate ..... **S. uliginosum** [5L]

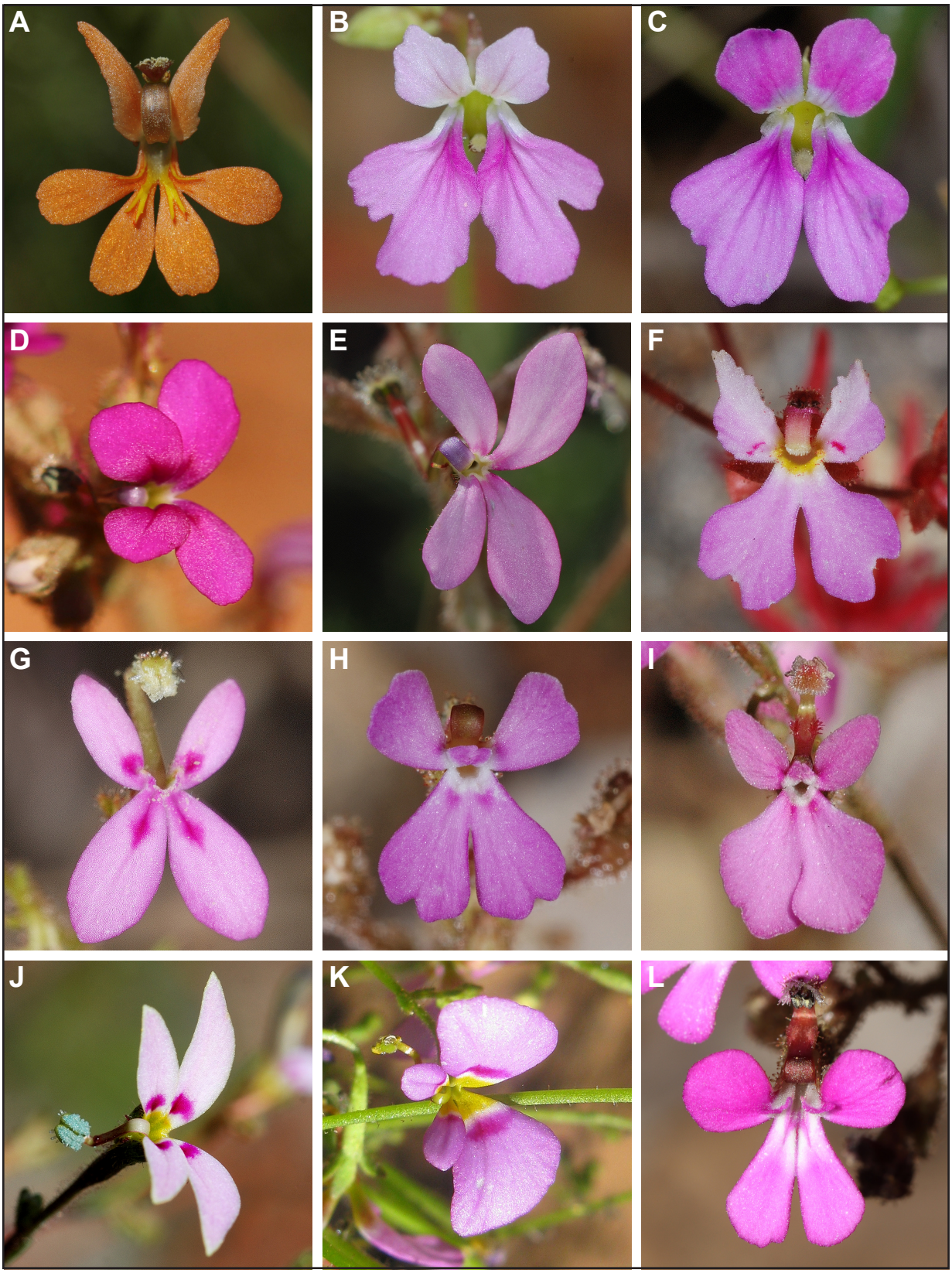

Figure 1. A floral guide to *Stylidium* in the Northern Territory. A – *S. ceratophorum*; B, C – *S. longicornu*; D – *S. desertorum* (typical form); E – *S. desertorum* (atypical form with long column); F – *S. turbinatum*; G – *S. floodii*; H – *S. adenophorum*; I – *S. semipartitum*; J – *S. floribundum*; K – *S. inaequipetalum*; L – *S. leptorrhizum*. Refer to index for voucher details and photographic credits.

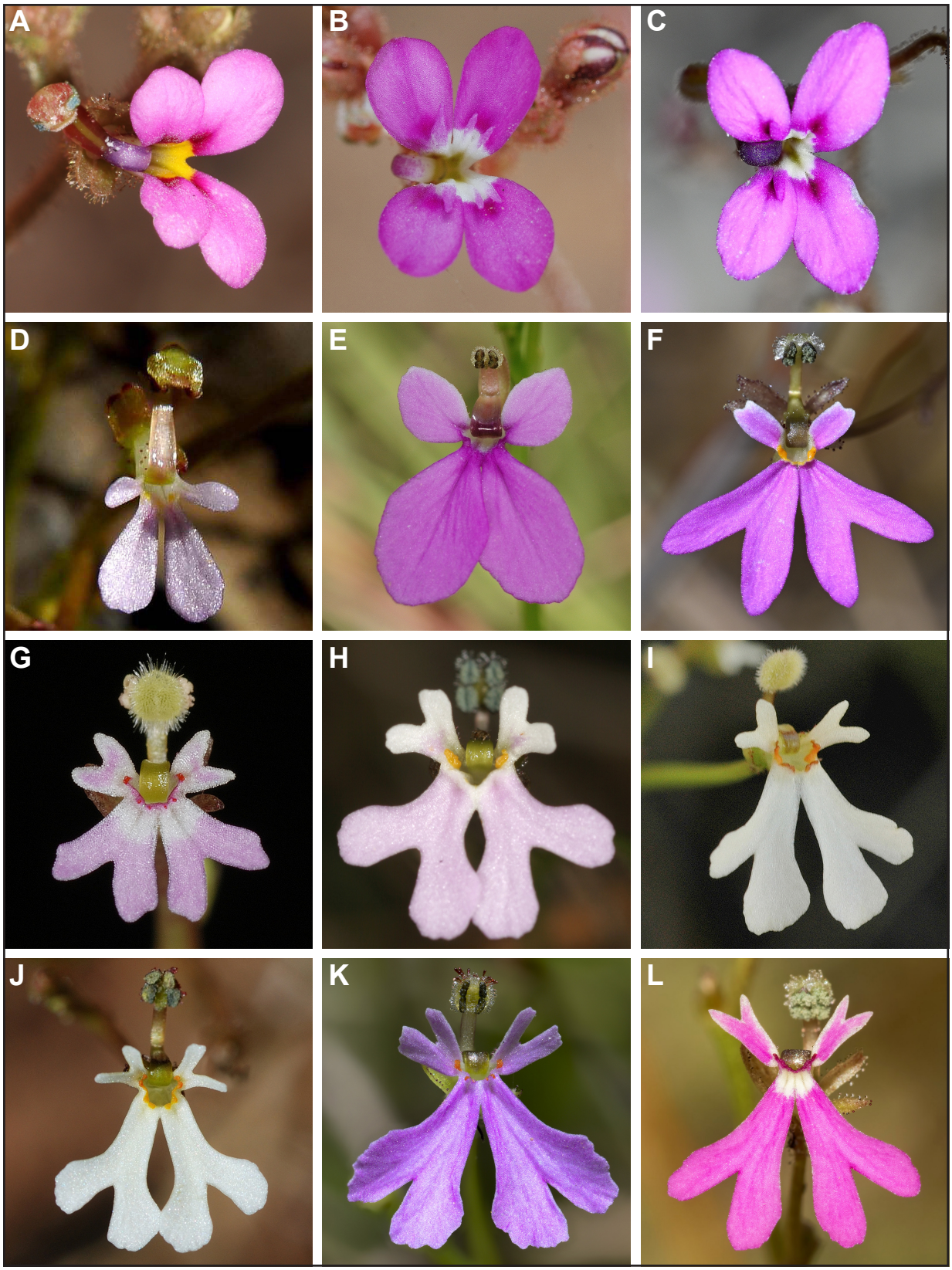

Figure 2. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. incognitum*; B – *S. multiscapum*; C – *S. pezidium*; D – *S. elachophyllum*; E – *S. prophyllum*; F – *S. fissilobum*; G – *S. diffusum*; H – *S. aquaticum* (typical form); I – *S. aquaticum* (atypical form); J – *S. brennanianum*; K – *S. gemmatum*; L – *S. torquatum*. Refer to index for voucher details and photographic credits.

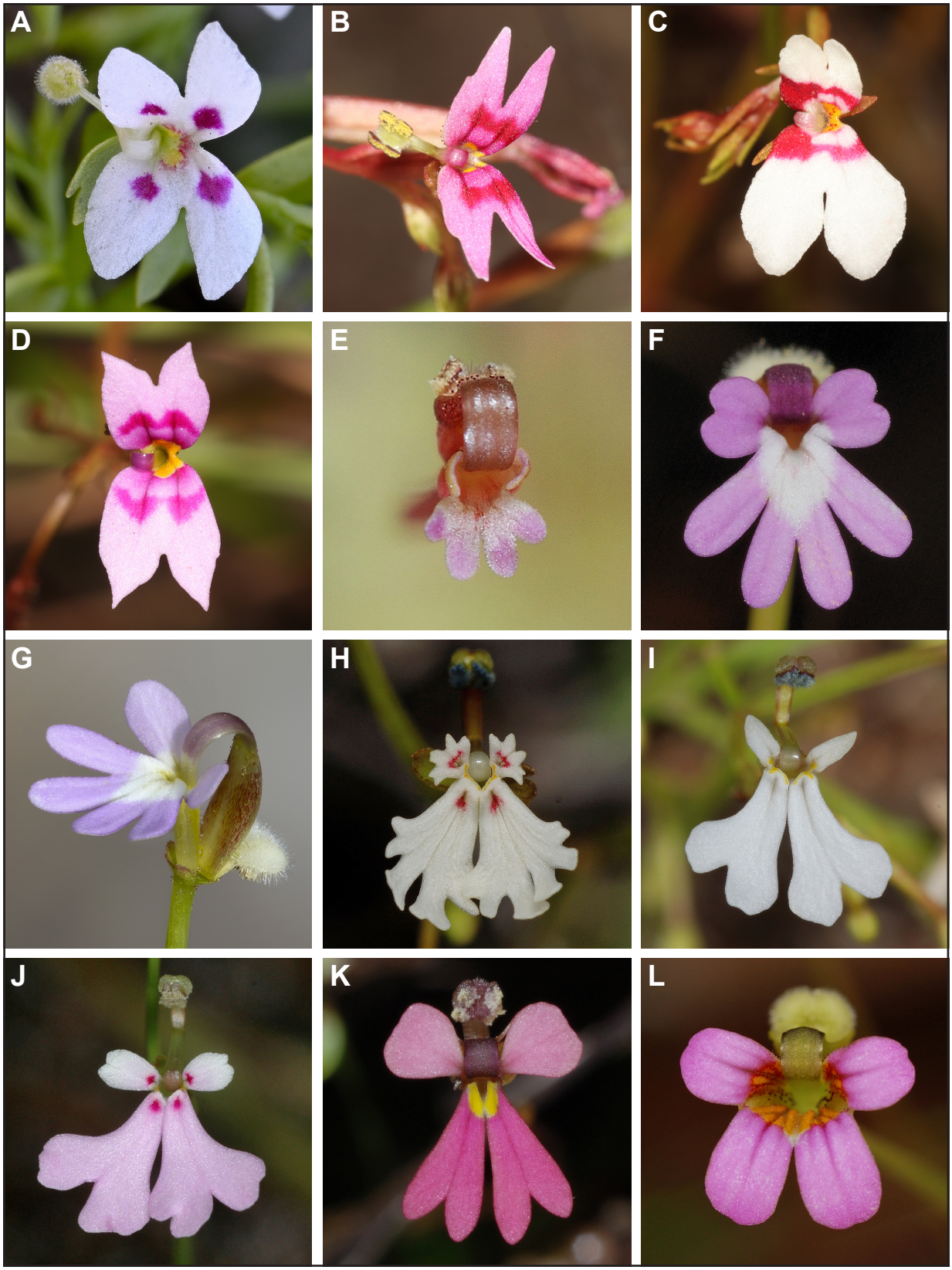

Figure 3. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. tenerrimum*; B – *S. cordifolium*; C – *S. evolutum*; D – *S. fluminense*; E – *S. pedunculatum*; F – *S. ericksoniae*; G – *S. contrarium*; H – *S. candelabrum* (typical form); I – *S. candelabrum* (atypical form); J – *S. synaptum*; K – *S. osculum*; L – *S. dunlopianum*. Refer to index for voucher details and photographic credits.

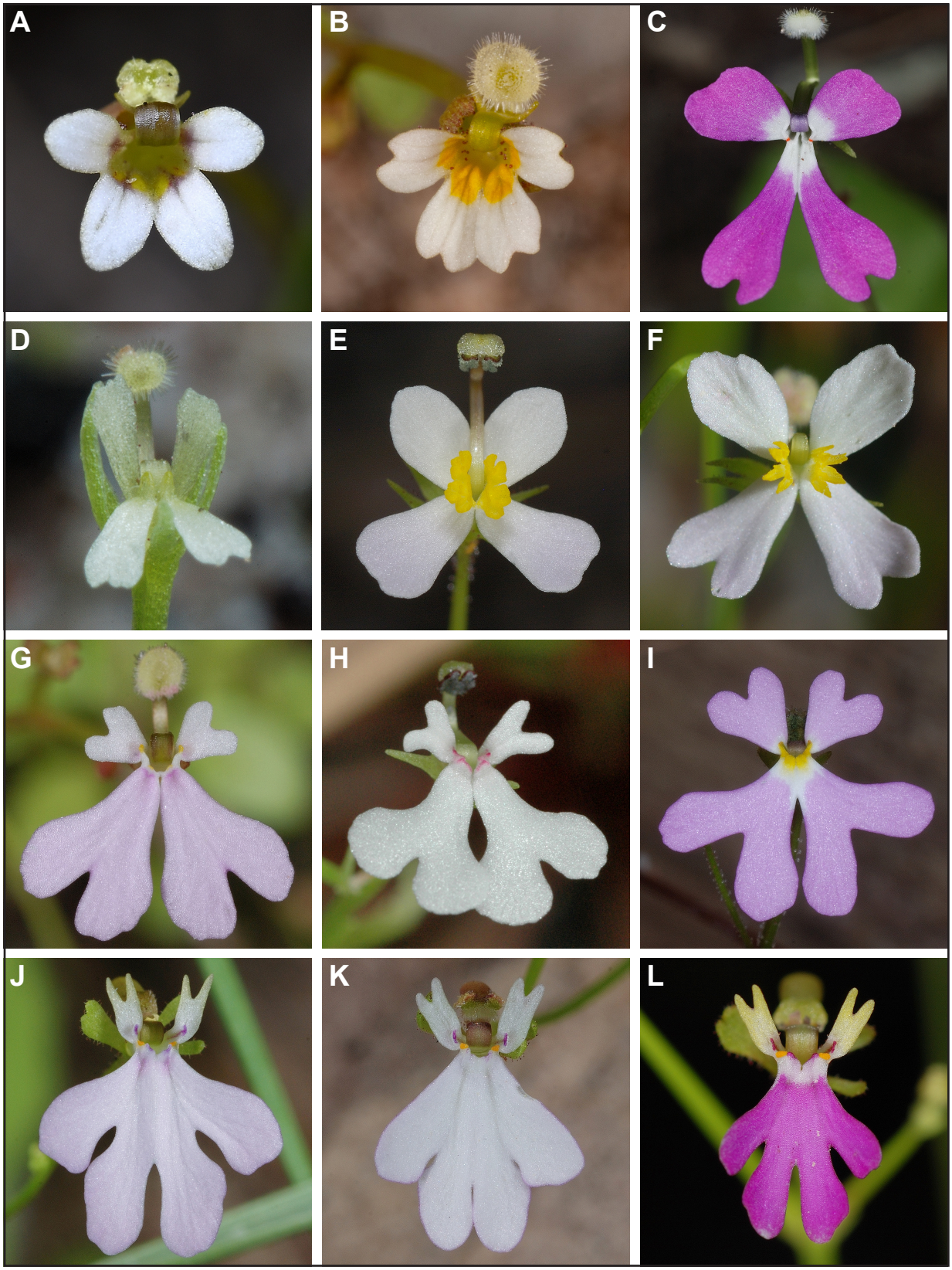

Figure 4. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. rotundifolium*; B – *S. irriguum*; C – *S. notabile*; D – *S. tantillum*; E, F – *S. nominatum*; G – *S. capillare*; H – *S. exiguum*; I – *S. divergens*; J–L – *S. pachyrrhizum*. Refer to index for voucher details and photographic credits.

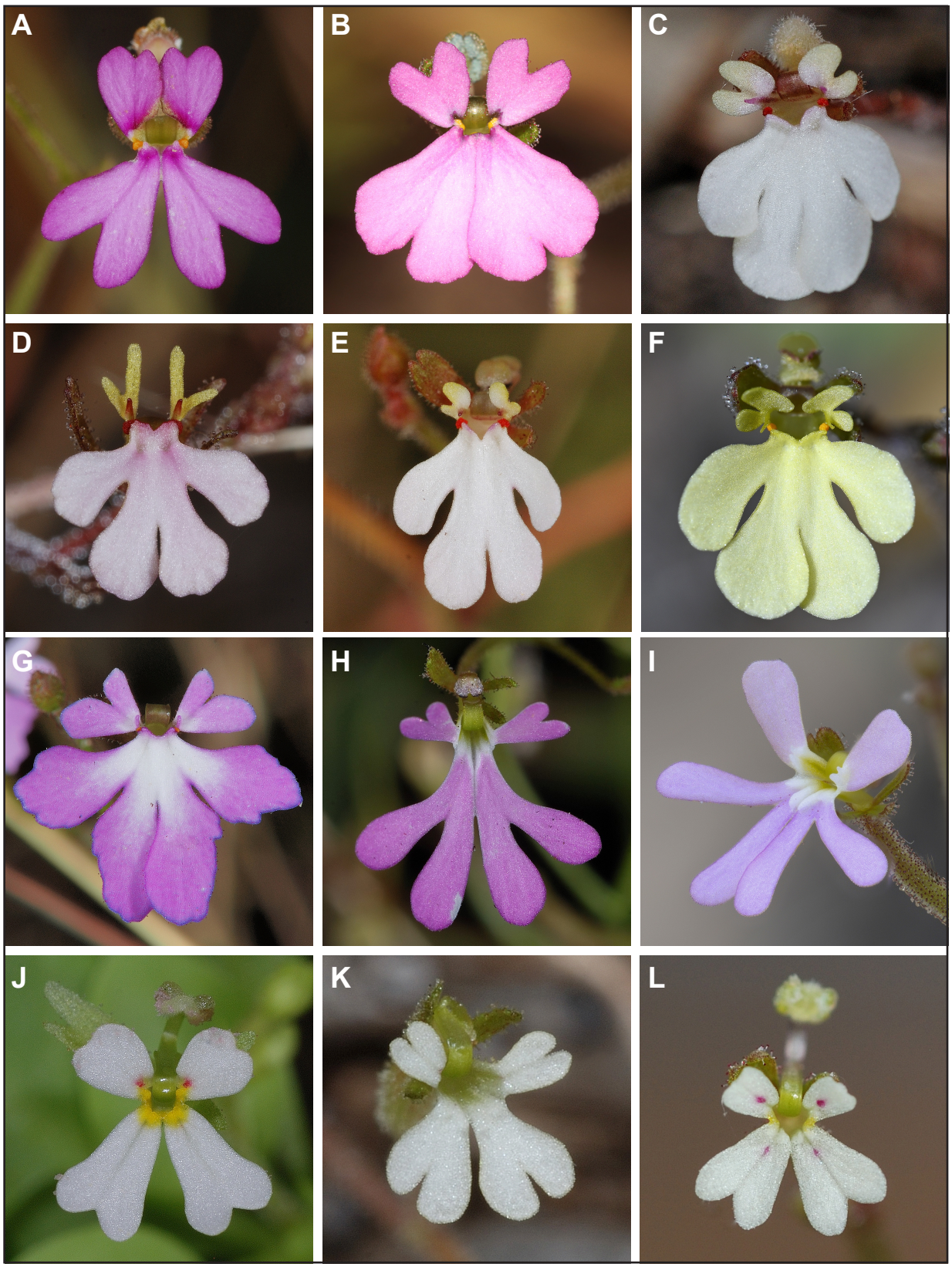

Figure 5. A floral guide to *Stylidium* in the Northern Territory (cont'd). A – *S. lobuliflorum*; B – *S. ensatum*; C–F – *S. schizanthum*; G – *S. aliforme*; H – *S. brachyotis*; I – *S. simulans*; J – *S. muscicola*; K – *S. accedens*; L – *S. uliginosum*. Refer to index for voucher details and photographic credits.

1. Stylidium desertorum Carlquist (atypical form). Some populations of *S. desertorum* have a longer column than the typical form (15–20 mm long *cf.* 10–13.5 mm) and a generally more robust habit with elongated, leafy stems and a terminal tuft of leaves (*cf.* stem usually contracted or shortly elongated with leaves usually appearing basal, although more robust individuals are sometimes evident). This form is recorded from the Northern Territory, South Australia and Queensland, with the typical form apparently restricted to the Northern Territory and Western Australia. A collection from the northern Tanami Desert (*P. Latz* 19249: NT) comprises two individuals of the typical form and four individuals with a long column, suggesting that the two forms may co-occur; however, field observations are required to establish whether column length is taxonomically informative and to determine if there are additional differences between the two forms.

2. Stylidium inaequipetalum J.M.Black. Simple hairs can be absent from the scape (below the inflorescence) in some Western Australian material.

3. Stylidium aquaticum A.R.Bean (atypical form). Populations from Nitmiluk National Park differ in column morphology and throat appendage colour (and potentially throat appendage morphology) to the typical form and may represent a distinct taxon (see Wege *et al.* 2024).

4. Stylidium gemmatum Wege & Brennan, *sp. nov.*

Type: Kakadu National Park, *c.* 50 m east of Malabanbandju Camping Area, south of billabong, Northern Territory, 27 April 2024, *K. Brennan* 13480 *& O. Scheibe* (*holo*: DNA D0291599; *iso*: BRI, CANB, PERTH, MEL).

Weak-stemmed *annual herb* 8–23 cm high. *Glandular hairs* 0.1–0.2 mm long, with a red or red-black, discoid or globose head. *Stem* scapiform, sometimes a little fleshy towards base, 8–23 cm long including inflorescence, 0.5–2 mm wide, greenish or reddish brown towards base, glabrous. *Leaves* bract-like, ± evenly scattered on stem, adpressed to porrect or sometimes spreading, ± *linear or* narrowly ovate to narrowly lanceolate, 1–5 mm long, 0.3–0.6 mm wide, glabrous; apex obtuse to somewhat truncate; margins entire. *Scape* absent. *Inflorescence* determinate, monochasially cymose, (2–)5–*c.* 60-flowered, flowers rotated 180°; branches glabrous; bracts 1.5–3.5 mm long, glabrous; pedicels ± indistinct. *Hypanthium* ± linear in outline, 7–18 mm long, 0.4–0.8 mm wide, glandular-hairy in upper half or distally. *Calyx* lobes with 3 free and 2 connate for more than half their length, 1.8–3 mm long, glandular-hairy on margins and usually near base, apex obtuse. *Corolla* mauve-pink or pink, sometimes with the upper lobes partly to mostly white (rarely mottled pink and white), white abaxially; lobes paired vertically, sparsely glandular-hairy abaxially (mostly on anterior lobes); anterior (upper) lobes obovate with a strongly bilobed apex (divided for ± half of length, with the outer segment a little broader than the inner one), smaller than the posterior pair, 1.5–2.5 mm long, 0.9–2.5 mm wide; posterior lobes basally connate for *c.* 0.5–1 mm, obovate with a bilobed and sometimes flared apex (segments ± equal or with the outermost one a little smaller), 3.5–7 mm long, 2–5 mm wide; tube 2–3 mm long, *c.* equal to or just longer than the calyx lobes, sparsely glandular-hairy near anterior sinus. *Labellum* on outside of corolla tube, elliptic to narrowly ovate, 0.5–0.7 mm long with a terminal appendage 0.2–0.6 mm long, glabrous or with a few glandular hairs. *Throat appendages* 8 (2 on each corolla lobe), arranged in 2 basally connate groups, orange, orange with a pink base or dark orange-pink, 0.2–0.5 mm high, glabrous, apex obtuse or rounded. *Column* 7–9.5 mm long, straight when extended, slightly broadened and with raised margins above the main bend and with a second bend well below the anthers, glabrous; anther locules 0.6–0.8 mm long, corona present (hairs translucent or red, the latter prominent at column tip); stigma sessile, entire. *Capsules* ± linear in outline, 12–20 mm long excluding calyx lobes (few seen), without ribs, halves coherent distally. *Seeds* brown, ± ellipsoid, *c.* 0.2 mm long, colliculate. (Figures 2K, 6)

Diagnostic features. A weak-stemmed annual herb with the following key features: bract-like leaves 1–5 mm long, ± evenly scattered along a scape-like stem; a ± linear hypanthium with glandular hairs in the upper half or distally; 3 free and 2 part-connate calyx lobes with glandular-hairy margins; pink or mauve-pink (sometimes part-white), vertically paired corolla lobes, the upper (smaller, anterior) lobes

dissected for *c.* half their length (the outer segment a little broader than the inner one), the lower lobes bilobed and basally connate; 8 orange or orange-pink throat appendages arranged in 2 basally connate groups, with an obtuse or rounded apex; a 7–9.5 mm long column with raised margins above the main bend; a prominent red corona (hairs) at the tip of the column; and colliculate seeds.

Specimens examined. NORTHERN TERRITORY: Kakadu National Park, Magela Creek, 18 Apr. 1995, *K. Brennan* 3147 (DNA); 10 km E Nourlangie Ranger Station, Malabanbandjii Swamp, 15 May 1980, *L. Craven* 5484 (CANB, DNA); near mouth of Sawcut Gorge, 3 June 1980, *L.A. Craven* 6284 (CANB); *c.* 50 m E of the Kakadu Hwy, *c.* 0.5 km N of the turnoff to Nourlangie Rock, *c.* 16 km due SWS of Jabiru, Kakadu National Park, 18 Apr. 2012, *R.P. Gibson* 425 *& K.S. Hirsch* (NSW); Anbangbang Lagoon, SE of Darwin, May 1994, *M. Hancock s.n.* (NSW); 5 km NNW of Koongarra, 18 May 1980, *M. Lazarides* 8805 (CANB); Dundee Beach, Maritana Rd off Koonakarra Rd, 5 Apr. 2009, *D.E. Murfet* 6443 *& A. Lowrie* (AD); Burdulba campground, Kakadu National Park, 7 Apr. 2009, *D.E. Murfet* 6477 *& A. Lowrie* (AD, NT); near Malabanjbanjdju Campground, 13 May 2012, *D.E. Murfet* 7487 *& A. Lowrie* (AD, DNA); Nourlangie Creek, 21 May 1974, *J. Must* 1211 (BRI, CANB, DNA); Nourlangie Rock area, 23 May 1973, *J. Must* 1125 (BRI, DNA).

Spirit material examined. *K. Brennan* 3147 (DNA); *K. Brennan* 13480 & *O. Scheibe* (DNA).

Flowering period. April–June.

Distribution and habitat. Endemic to the Northern Territory where it is mostly known from Kakadu National Park, with an outlying record near Dundee Beach. Found in damp sand or sandy clay on seasonally flooded plains on the fringes of rivers, swamps and billabongs. Grows in herbfields and amongst grasses, rushes and sedges, including beneath *Lophostemon lactifluus*, *Asteromyrtus symphyocarpa* and *Melaleuca nervosa*.

Conservation status. Data Deficient according to IUCN criteria due to inadequate survey (N. Cuff pers. comm.).

Etymology. From the Latin *gemmatus* (jewelled), a reference to the jewel-like corona at the tip of the column and the decorative throat appendages.

Vernacular name. Jewelled Triggerplant.

Affinities. *Stylidium gemmatum* is akin to *S. brennanianum* Wege, M.D.Barrett & A.R.Bean and *S. torquatum* Wege & Brennan, two species recently segregated from *S. fissilobum* F.Muell. (Wege *et al.* 2024). Unlike *S. fissilobum*, all three species have lower corolla lobes that are basally connate (*cf.* ± free to the top of the tube in *S. fissilobum*), prominent throat appendages at the base of each corolla lobe (*cf.* with an orange or yellow callosity in the corolla lobe sinuses), colliculate rather than ± smooth (areolate) seeds, and lack lateral lobes above the main bend of the column.

Stylidium gemmatum differs from *S. brennanianum* in having a mostly longer column (7–9.5 mm long *cf.* 4.8–7 mm) and predominantly pink or mauve-pink corolla lobes (*cf.* white in *S. brennanianum*) with a distinct shape. Most notably, the anterior (upper) lobes are less strongly dissected (divided for about half their length rather than more than half their length) and each outer segment is a little larger than the inner one (*cf.* ± equal and divergent; compare Figures 2K and 2J). The two species have similar throat appendages suggesting they are closely allied, and both have a combination of translucent and red hairs around the anthers, although the latter appear to be more pronounced in *S. gemmatum* (see Figure 6A). The two species are geographically separated in the Northern Territory: *S. gemmatum* occurs in the Pine Creek and Darwin Coastal bioregions whereas *S. brennanianum* has only been recorded from the Tanami and Gulf Coastal bioregions, although is more broadly distributed in Western Australia and Queensland (see Wege *et al.* 2024).

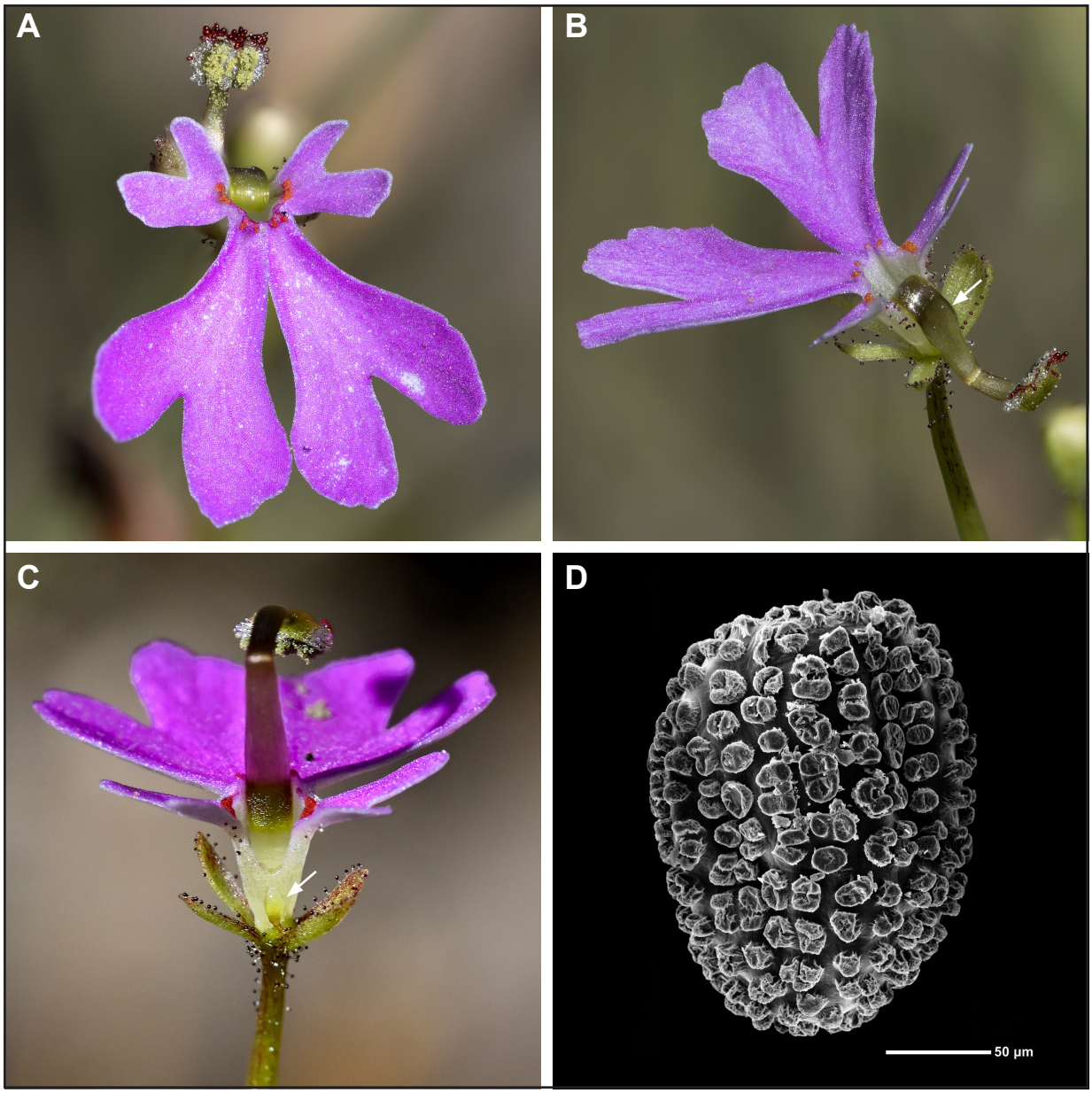

Figure 6. *Stylidium gemmatum*. A – flower showing the bilobed corolla lobes, the upper (anterior) ones with unequal segments, the lower (posterior) ones basally connate. Note the prominent red hairs at the tip of the column; B – anterior view of flower with poised column, showing the slight broadening of the column (raised margins) above the main bend (white arrow) and a second bend well below the anthers; C – anterior view of flower with triggered column, showing the position of the labellum (white arrow) below the anterior sinus; D – colliculate seed. Photos by K. Brennan from *K. Brennan* 13480 *& O. Scheibe* (A–C) and S. Dillon from *J. Must* 1211 (D: DNA).

Stylidium gemmatum can be separated from *S. torquatum* by its strongly bilobed upper corolla lobes with unequal segments (*cf.* emarginate to shallowly and evenly bilobed in *S. torquatum*), the absence of white markings at the base of the lower corolla lobes (present in *S. torquatum*), and its orange or orange-pink throat appendages arranged in two basally connate groups (*cf.* dark purple or dark purple-pink, somewhat irregular lobes arranged in a basally connate semicircle). The two species have a similar column structure, although the hairs around the anthers are strictly translucent in *S. torquatum* rather than red at the tip of the column. They have overlapping distributions but have not been observed growing together.

Notes. This taxon is noted as *S. aff. torquatum* in Wege *et al.* (2024). Its strongly dissected upper corolla lobes and basally connate lower lobes agree with the protologue of *S. pseudotenellum* O.Schwarz (Schwarz 1927), a name of uncertain application (Wege *et al.* 2024); however, Schwarz's description of the throat appendages (appendages minute, four (the middle ones bifid), and glandular) cannot be matched to *S. gemmatum*. In the absence of type material, the identity of *S. pseudotenellum* remains a mystery.

5. Stylidium candelabrum Lowrie & Kenneally (atypical form). The typical form of *S. candelabrum* has ornate corolla lobes with strong red markings towards the base, with the upper (anterior) lobes obovate, bilobed and often with additional lobing (Figure 3H). In contrast, atypical populations lack prominent coloured markings on the upper surface of the corolla (although markings can be present abaxially along the midvein towards the base of the lobes and on the tube) and the upper lobes are narrowly elliptic and undivided (Figure 3I). Both forms were cited in the protologue of *S. candelabrum* (Lowrie & Kenneally 1999). The two forms have not been observed growing together and intermediates are not known, although variation in the presence of markings in noted in one collection of the typical form (*J.A. Wege* 483: BRI, K, PERTH). Research to establish whether the atypical form warrants taxonomic recognition is ongoing.

6. Stylidium sp. **Twin Falls** (L.A. Craven 5870). This putative novel species is known from a spirit collection obtained by Lyn Craven in late May 1980 from 9.5 km south of Twin Falls in Kakadu National Park (CANB 316170). It has affinity to *S. capillare* R.Br. and allies on account of its habit, sterile scape bracts and ± smooth seed, although keys with *S. candelabrum* and *S. synaptum* Wege, Brennan & A.R.Bean due to its calyx lobe arrangement. Additional material and photographs are needed to resolve its taxonomic status. Diagnostic information and habitat details are provided below to facilitate its recollection.

Diagnostic features. A basally-rosetted annual with the following key features: a diminutive stature (2–4.5 cm high), with spreading, narrowly oblanceolate to ± oblong-spathulate leaves to *c.* 2 mm long; a glabrous scape with scattered bracts 1–2.2 mm long; an oblong to linear hypanthium 3.5–7 mm long, with a few glandular hairs distally; calyx lobes arranged in 2 groups, with 2 connate for *c.* half their length and 3 basally connate (or with 1 of these free); white or pink, vertically paired and emarginate corolla lobes, the upper and lower lobes *c.* equal in length or with the lower lobes slightly longer; 6 obtuse and basally connate throat appendages; a slender column 4.5–6 mm long; and ± smooth (areolate) seed.

Distribution and habitat. Known from a sandstone plateau in Kakadu National Park where it grows amongst other herbs (including the typical form of *S. candelabrum*) near a perennial creek in shrubby woodland with *Eucalyptus phoenicea*, *Terminalia*, *Petalostigma*, *Gardenia*, *Grevillea* and spinifex.

Conservation status. Data Deficient according to IUCN criteria due to inadequate survey (N. Cuff pers. comm.).

7. Stylidium dunlopianum Carquist. Specimens from Western Australia currently assigned to *S. dunlopianum* can have a column up to 15 mm long (*cf.* 8–10.5 mm long in material from the Northern Territory). The circumscription of this species is the subject of ongoing taxonomic assessment as part of a review of species with bilobed calyces.

8. Stylidium capillare R.Br. Some collections from Western Australia have capsules that separate distally (see Wege *et al.* 2024).

9. Stylidium pachyrrhizum F.Muell., *Fragm.* 1(6): 152 (1859); *Candollea pachyrrhiza* (F.Muell.) F.Muell., *Syst. Census Austral. Pl.*: 86 (1882), *nom. illeg. non* Benth., *Fl. Austral.* 1: 44 (1863) [Dilleniaceae]. *Type*: Between M'Adam [Macadam] Range and Providence Hill, Northern Territory, October 1855, *F. Mueller s.n.* (*lecto*, inadvertently designated by A.R. Bean*, Austrobaileya* 5(4): 611 (2000): MEL 1061539!; *isolecto*: BM 000645708!, K 000741777!).

Stylidium stenophyllum A.R.Bean, *Austrobaileya* 5(4): 612–613, fig. 4E–G (2000), *syn. nov. Type*: Caranbirini Conservation Park, SW of Borroloola, Northern Territory, 7 June 1999, *A.R. Bean* 15066 (*holo*: BRI-AQ0679158!; *iso*: CANB 483062 image!, DNA D0147345!, MEL 2295045 image!, NSW 840802 image!, PERTH 05897750!).

Diagnostic features. An annual or perennial herb with the following key features: stem contracted and leaves basal or with a somewhat woody stem elongated below the rosette and bearing scattered leaves; a

glabrous or mostly glabrous scape (i.e. glandular hairs absent below the inflorescence or sometimes very sparse just below the inflorescence) and glabrous or very sparsely glandular-hairy inflorescence branches; calyx with 3 free lobes and 2 connate for most of their length; unequal corolla lobes, the upper (anterior) pair much smaller than the lower ones and bilobed with ± equal segments, the lower (posterior) pair strongly bilobed and basally connate forming a 4-lobed lower lip (the outer segments smaller than the inner ones; Figure 4J–L); 4 dimorphic throat appendages as well as a prominent yellow or orange callosity in the sinus between each upper and lower corolla lobe; a 6.8–10 mm column that is dilated below the anthers above a strong distal hinge and has two hyaline appendages at the tip (most readily observed before the stigma develops); linear capsules with longitudinal ribs; and ± smooth (areolate) seeds.

Notes. Many specimens formerly assigned to the widespread and morphologically variable *S. schizanthum*[10] have been recently redetermined as *S. pachyrrhizum* due to the presence of two hyaline appendages at the tip of the column (most readily observed when the flowers are in their male phase, i.e. before the stigma develops; see Wege *et al.* 2024: Figure 1D) and their sparse indumentum (scape glabrous or mostly glabrous below the inflorescence, and inflorescence branches glabrous or very sparsely glandular-hairy). *Stylidium schizanthum* lacks these membranous appendages and the scape is glandular-hairy throughout. Thus defined, *S. pachyrrhizum* is highly variable with respect to plant height (3–70 cm high) and leaf size and shape, with both perennial and annual habit forms represented. The full extent of corolla and throat appendage variation within *S. pachyrrhizum* remains to be assessed; however, it tends to have bilobed upper (anterior) corolla lobes with ± equal segments (*cf.* usually unequal in *S. schizanthum* although emarginate forms are known; compare Figures 4J–L and 5C–F). The indumentum on the undersurface of the corolla is somewhat variable in *S. pachyrrhizum*, with glandular hairs present on both the upper and lower lobes, restricted to the upper lobes (sometimes confined to near the base), or apparently absent altogether.

Stylidium stenophyllum is not supported as taxonomically distinct from *S. pachyrrhizum* and is synonymised herein. Leaf shape and width was a key feature used to separate the two species (linear and 1.4–2.6 mm wide in *S. stenophyllum cf.* oblanceolate or obovate and 3.5–18(–24) mm wide in *S. pachyrrhizum* (Bean 2000); however, an intermediate collection from McArthur River Station (*C.R. Michell & J. Risler* 1688: DNA), not far from the type locality of *S. stenophyllum*, has linear, narrowly oblanceolate or oblanceolate leaves 1–7 mm wide. Variation is also evident at the type locality (e.g. *L.A. Craven* 4678 has leaves 1–5 mm wide). Other features used to support a distinction between *S. stenophyllum* and *S. pachyrrhizum* do not hold upon examination of currently available material: both have ribbed capsules and can have a thickened stem base, glandular hairs can be variously present on the undersurface of the corolla lobe (including on the type of *S. stenophyllum*), and seed shape is variable in *S. pachyrrhizum*. A broadly defined *S. pachyrrhizum* will be adopted for the *Flora of Australia*, with molecular work needed to support further taxonomic work.

10. Stylidium schizanthum F.Muell. This widespread and morphologically variable species exhibits considerable (and often subtle) floral variation, especially with regards to corolla colour (white or various shades of mauve, pink or yellow, or a combination of colours), corolla shape (e.g. the degree of division of each lobe and relative size of the secondary lobes (segments), and the degree to which the posterior (lower) lobes are fused), and the colour and shape of the throat appendages (Figure 5C–F). Specimens at DNA have undergone a preliminary sort to correct obvious misidentifications, i.e. mainly removing material of *S. lobuliflorum* F.Muell., *S. pachyrrhizum* and *S. brachyotis* Wege & Brennan (and vice versa in the case of *S. lobuliflorum* and *S. pachyrrhizum*). Specimens have also recently been examined and annotated at AD, BRI, CANB, NSW and PERTH.

Diagnostic features. A rosulate annual herb with the following key features: stem contracted and leaves basal, or more rarely with the stem elongated below the rosette and bearing scattered leaves; a glandular-hairy scape and inflorescence (including the branches, hypanthium and calyx lobes); calyx with 3 free lobes and 2 connate for most of their length; unequal corolla lobes, the upper (anterior) pair much smaller than the lower ones and usually bilobed with unequal segments (or more rarely broad and emarginate), the lower (posterior) pair strongly bilobed and basally connate forming a 4-lobed lower lip (the outer

segments smaller than the inner ones and usually inwardly curved; Figure 5C–F); 4 dimorphic throat appendages as well as a prominent red or orange callosity near the sinus of each upper and lower corolla lobe; a 6–9 mm column that is dilated below the anthers above a strong distal hinge and scarcely apiculate above each terminal anther locule (but lacking hyaline appendages); linear capsules with longitudinal ribs; and ± smooth (areolate) seeds.

Notes. A spirit collection from Naberlek (*K. Brennan* 7574, DNA) is notable for its short column (*c.* 4.3–4.5 mm long). Additional material is required to aid further taxonomic assessment as part of a broader revision of this species complex.

Specimens from Queensland with a glabrous scape and colliculate seeds represent a novel species that is in the process of being formally described. A second putative novelty from the northern Cape York Peninsula with a glabrous scape and ± smooth seed is also under taxonomic investigation.

11. Stylidium ensatum A.R.Bean. In addition to the pairs of red-pink or mauve-pink (rarely white) appendages at the base of each corolla lobe, this species has a small, yellow callosity in the sinus between each upper and lower corolla lobe (Figure 5B) and often also between the lower lobes. These callosities are sometimes less well-developed than those found in other species and as such can be readily overlooked, especially in pressed material. We have therefore keyed this species twice, to allow for misinterpretation of this feature at couplet 47.

Acknowledgements

This research was supported by the Australian Government's Australian Biological Resources Study National Taxonomy Research Grant Programme for the project 'Time to pull the trigger – an eFlora account of Stylidiaceae'. We thank staff at the Northern Territory Herbarium for accommodating this research and their associated curatorial support; Matthew Barrett, Russell Barrett, Steven Dillon, Neil Gibson, Adrienne Markey, Denzel Murfet and Aiden Webb for providing photographs; and Tony Bean and Kelly Shepherd for comments on the manuscript.

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Index to Figures

Stylidium aliforme Wege & Brennan: © K. Brennan from *K. Brennan* 7268 (DNA) **5G**

Stylidium aquaticum A.R.Bean: © M.D. Barrett from *M.D. Barrett* 3550 (PERTH)..... **2H**

Stylidium aquaticum, atypical form: © K. Brennan from *K. Brennan 6523* (DNA) **2I**

Stylidium brachyotis Wege & Brennan: © K. Brennan from *K. Brennan* 7759 (DNA)..... **5H**

Stylidium brennanianum Wege, M.D.Barrett & A.R.Bean: © K. Brennan from *K. Brennan* 12100 (DNA, NT, PERTH)..... **2J**

Stylidium candelabrum Lowrie & Kenneally: © K. Brennan from *K. Brennan* 7486 (DNA) **3H**

Stylidium candelabrum, atypical form: © K. Brennan from *K. Brennan* 7523 (DNA)..... **3I**

Stylidium capillare R.Br.: © K. Brennan from *K. Brennan* 7501 (DNA)..... **4G**

Stylidium ceratophorum O.Schwarz: © J.A. Wege from *J.A. Wege* 2004 *& B.P. Miller* (BRI, CANB, DNA, MEL, PERTH)..... **1A**

Stylidium contrarium Wege: © K. Brennan from *K. Brennan* 13470 (BRI, CANB, DNA, MEL, PERTH)..... **3G**

Stylidium cordifolium W.Fitzg.: © J.A. Wege from population NT A0065532..... **3B**

Stylidium desertorum Carlquist: © A. Markey from Mandora Marsh, W.A. **1D**

Stylidium desertorum, atypical form: © K. Brennan from *K. Brennan* 8500 (DNA)..... **1E**

Stylidium diffusum R.Br.: © K. Brennan from *K. Brennan* 8174 (DNA) **2G**

Stylidium divergens A.R.Bean © K. Brennan from *K. Brennan* 7693 (DNA) **4I**

Stylidium dunlopianum Carlquist © K. Brennan from *K. Brennan* 7399 (DNA)..... **3L**

Stylidium elachophyllum A.R.Bean & M.T.Mathieson: © D.E. Murfet from *D.E. Murfet* 5612 *& A. Lowrie* (AD, DNA)..... **2D**

Stylidium ensatum A.R.Bean: © J.A. Wege from *J.A. Wege* 470 (BRI, PERTH) **5B**

Stylidium ericksoniae J.H.Willis: © K. Brennan from Koongarra, N.T. **3F**

Stylidium evolutum Carlquist: © J.A. Wege from population DNA D0192632 ..... **3C**

Stylidium exiguum A.R.Bean: © K. Brennan from *K. Brennan* 6907 (DNA) **4H**

Stylidium fissilobum F.Muell.: © K. Brennan from *K. Brennan* 13102 (DNA)..... **2F**

Stylidium floodii F.Muell.: © K. Brennan from *K. Brennan* 8672 (DNA)..... **1G**

Stylidium floribundum R.Br.: © K. Brennan from *K. Brennan* 12407 (DNA, PERTH)..... **1J**

Stylidium fluminense F.L.Erickson & J.H.Willis: © J.A. Wege from *J.A. Wege* 2285 *& B.P. Miller* (CANB, DNA, PERTH)..... **3D**

Stylidium gemmatum Wege & Brennan: © K. Brennan from *K. Brennan* 13480 *& O. Scheibe* (BRI, CANB, DNA, MEL, PERTH)..... **2K, 6**

Stylidium inaequipetalum J.M.Black: © N. Gibson from *N. Gibson* 4614 (PERTH) **1K**

Stylidium incognitum Wege: © J.A. Wege from *J.A. Wege* 2284 *& B.P. Miller* (BRI, CANB, DNA, MEL, PERTH)..... **2A**

Stylidium irriguum W.Fitzg.: © M.D. Barrett & R.L. Barrett from *M.D. Barrett* 2962 *& R.L. Barrett* (BRI, DNA, PERTH) **4B**

Stylidium leptorrhizum F.Muell.: © J.A. Wege from *J.A. Wege* 2286 *& B.P. Miller* (BRI, DNA, PERTH) **1L**

Stylidium lobuliflorum F.Muell.: © K. Brennan from *K. Brennan* 7591 (DNA) **5A**

Stylidium longicornu Carlquist: © K. Brennan from *K. Brennan* 6888 & 8591 (DNA)..... **1B, C**

Stylidium multiscapum O.Schwarz: © K. Brennan from *K. Brennan* 7544 (DNA) **2B**

Stylidium muscicola F.Muell.: © K. Brennan from *K. Brennan* 10088 (DNA)..... **5J**

Stylidium nominatum Carlquist: © K. Brennan from *K. Brennan* 7978 & 11389 (DNA)..... **4E, F**

Stylidium notabile A.R.Bean: © K. Brennan from *K. Brennan* 8361 (DNA)..... **4C**

Stylidium osculum A.R.Bean: © K. Brennan from *K. Brennan* 7539 (BRI, DNA) **3K**

Stylidium pachyrrhizum F.Muell.: © K. Brennan from *K. Brennan* 7617, 7813 & 7493 (DNA) **4J–L**

Stylidium pedunculatum R.Br.: © K. Brennan from *K. Brennan* 7334 (DNA) **3E**

Stylidium pezidium Wege, Brennan & S.J.Dillon: © K. Brennan from *K. Brennan* 13257 (AD, BRI, CANB, DNA, NT, PERTH) **2C**

Stylidium prophyllum Lowrie & Kenneally: © K. Brennan from *K. Brennan* 7499 (DNA) **2E**

Stylidium rotundifolium R.Br.: © K. Brennan from *K. Brennan* 12898 (DNA) **4A**

Stylidium schizanthum F.Muell.: © K. Brennan from *K. Brennan* 7336, 7764, 7543 & 12840 (DNA) **5C–F**

Stylidium semipartitum F.Muell.: © K. Brennan from *K. Brennan* 7507 (DNA) **1I**

Stylidium simulans Carlquist: © K. Brennan from *K. Brennan* 13453 (DNA) **5I**

Stylidium synaptum Wege, Brennan & A.R.Bean: © K. Brennan from *K. Brennan* 6885 (DNA) **3J**

Stylidium tantillum Wege & Brennan: © K. Brennan from *K. Brennan* 12043 (DNA) **4D**

Stylidium tenerrimum F.Muell.: © K. Brennan from *K. Brennan* 13191 (BRI, DNA, PERTH) **3A**

Stylidium torquatum Wege & Brennan: © A.T. Webb from *A.T. Webb* 78 *& K. Brennan* (BRI, CANB, DNA, MEL, PERTH) **2L**

Stylidium turbinatum Lowrie & Kenneally: © K. Brennan from *K. Brennan* 7622 (DNA) **1F**

Stylidium uliginosum Sw. ex Willd.: © K. Brennan from *K. Brennan* 9843 (DNA) **5L**

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Tecticornia crotalus and *T. dactylifera* (Chenopodiaceae), two new, short-range species endemic to the Goldfields of Western Australia

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SHORT COMMUNICATION

Species of *Tecticornia* Hook.f. (subfamily Salicornioideae Ulbr. in the Chenopodiaceae–Amaranthaceae clade) can be broadly categorised into two morphological groups characterised by either having hard fruits and mostly smooth seeds, or soft, papery fruits and ornamented seeds, with a few exceptions. In the latter group, seeds generally fall from the adult plant as soon as the fruits mature and begin to disintegrate, while fruits in the former group may be retained on the adult plant for more than one season. Once the small seeds are released, they are readily transported away from the parent plant by wind and water, so it would be expected that many species are widely dispersed, particularly within the soft-fruited group. However, at least nine soft-fruited taxa in Western Australia have a relatively restricted distribution, each being recorded from five or less populations, with an additional three Priority One taxa only known from a single population. Similarly, the two new soft-fruited species described herein are also only recorded from a single location. *Tecticornia crotalus* K.A.Sheph. & Zerdoner was first collected in 1994 from Lake Baladjie northwest of Bullfinch by Nic Casson and Mal Graham, while *T. dactylifera* K.A.Sheph. & Zerdoner was discovered on Lake Cowan near Norseman by Jenny Borger in 2021. Molecular analyses confirm these species are genetically distinct (Žerdoner Čalasan *et al.*, unpublished).

While *T. crotalus* and *T. dactylifera* are rather unassuming low-lying plants, they are quite distinctive in the landscape due to where they grow, as both are confined to a narrow band of the salt pan bed near the edge of the high-water mark. It is unclear why these plants are not more widespread as they have papery fruits and small seeds that are presumably readily dispersed. Perhaps these species cannot outcompete other *Tecticornia* present higher in the landscape, where plants are denser and the water table is lower. It is likely that these species are naturally range-restricted as no other populations have been discovered despite widespread mining activity and associated vegetation surveys in and around salt lakes in the Goldfields over the decades. Due to their apparently restricted distribution and narrow habitat niche, and increasing potential threats from changes to hydrology through climate change or impacts from infrastructure development from proposed mining activity, it is suspected these species may be under threat of extinction.

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Tecticornia crotalus K.A.Sheph. & Zerdoner, *sp. nov.*

Type: Lake Baladjie, north-west of Bullfinch, Western Australia [precise locality withheld for conservation purposes], 6 December 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (*holo*: PERTH 09541667; *iso*: AD, CANB, M, MEL, NSW, NY).

Decumbent *perennial*, to 0.1 m high. *Vegetative articles* obovoid, ellipsoid or spheroid, not compressed, light green tinged with yellow or bright red, 4–9 mm long, 4–6 mm wide, without lateral grooves; epidermis smooth, glossy; apex truncate, sometimes with a very short apiculus; margin narrow, entire. *Inflorescence* spike-like, terminal, cylindrical, with a slightly undulate outline, 14–26 mm long, 6–7 mm wide, with 6–16 paired bracts, with opposite, decussate, axillary 3-flowered cymes; florets in each cyme bisexual, equally sized. *Bracts* fused at base of inflorescence otherwise free, obovoid to rectangular in face-view (flowers facing forward), 1.3–3.8 mm long, 3.1–6.2 mm wide, with upper edge shallowly convex and gently curved; bracts in side-view 1.2–1.6 mm long (only basal bracts fused, remaining bracts are free and thus length cannot be measured), with upper edge sharply concave, outer face slightly protruding; epidermis smooth, glossy; apex truncate; margin narrow, entire. *Flowers* obscured by subtending bracts, free from bracts above and below, free from adjacent florets, clearly separated from opposite 3-flowered cyme. *Perianth* fused, dorsiventrally flattened with a truncate apex, abaxial surface strongly ascending, adaxial surface slightly to strongly ascending; lobes 2 or 3, sometimes with a small, ± obsolete abaxial lobe; margin entire. *Stamen* 1; anther oblong to elliptic, 1–1.2 mm long, 0.5–0.6 mm wide. *Ovary* free from stem cortex; style bifid, membranous. *Fruiting spike* scarcely expanded, chartaceous; apical vegetative growth absent. *Fruits* obscured by subtending bracts, free from bracts above and below, free from adjacent florets, clearly separated from opposite 3-flowered cyme; fruiting perianth scarcely expanded, chartaceous, outer surface texture dull; aperture flat. *Pericarp* fused to fruiting perianth or free, base of seed exposed; fruiting style membranous. *Seeds* slightly ascending relative to stem axis, ovate, 1.1–1.5 mm long, 0.7–1 mm wide, sometimes with a small beak up to 0.1 mm long, slightly transparent to opaque, brown to reddish brown, long edge opposite radicle with up to 4 rows of faintly granular bumps, sides with flat cells appearing smooth. (Figures 1A, 2)

Diagnostic features. *Tecticornia crotalus* is readily distinguished from all other *Tecticornia* by virtue of the following combination of characters: a low, decumbent habit to 0.1 m high; articles glossy, light green tinged with yellow or red, 4–9 mm long, 4–6 mm wide; inflorescence terminal, spike-like, with a slightly undulate outline, 14–26 mm long, 6–7 mm wide, with 6–16 paired bracts, basal pair of bracts fused and the remainder free; cymes with 3 bisexual flowers; flowers dorsiventrally flattened, obscured by subtending bracts; fruiting spike chartaceous, scarcely expanded; seeds brown to reddish brown, 1.1–1.5 mm long, with ornamentation of up to 4 rows of faintly granular bumps on the outer surface, sides appearing smooth.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 10 Dec. 1994, *N. Casson & M. Graham* G 17.4 (PERTH 04178114); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 883 (MEL 2420004, NSW 947807, PERTH 08680175); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 884 (PERTH 08680191); 1 Apr. 2002, *K.A. Shepherd & S.R. Willis* KS 885 (MEL 2420005, PERTH 08680183); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1951 (CANB, M, PERTH 09541624); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1952 (BRI, M, PERTH 09541586); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1953 (K, M, PERTH 09542507); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1954 (M, PERTH 09542558); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1955 (M, PERTH 09542590); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1956 (M, PERTH 09542639); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1957 (M, PERTH 09542671); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1958 (M, PERTH 09542736); 6 Dec. 2022, *K.A. Shepherd & A. Žerdoner Čalasan* KS 1959 (M, PERTH 09542779).

Phenology. Flowering from spring to early summer. Fruiting from mid to late summer.

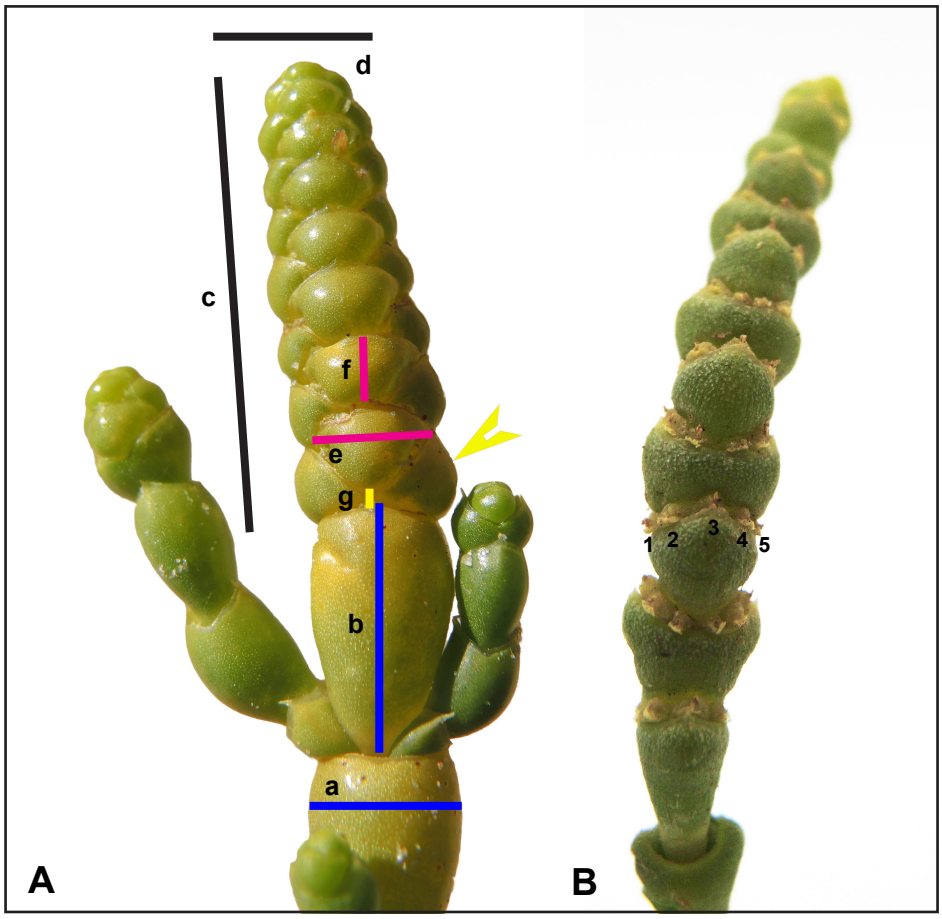

Figure 1. A – *Tecticornia crotalus* highlighting features used in the taxonomic description: vegetative article width (a) and length (b); inflorescence length (c), width (d) (the inflorescence being comprised of up to 16 'nodes' of opposite and decussate pairs of bracts); bract in face-view width (e) and length (f) (flowers facing forward are obscured behind the subtending bract); bract in side-view length (g), which can only be measured in the fused basal pair (yellow arrow) as the others are free so the length is reduced to zero (this cannot be easily observed as the free base is obscured by each subtending bract); and curvature of bract in side-view (yellow arrow). B – *T. dactylifera* inflorescence showing the apex of flowers exposed above the subtending bracts, the flowers are numbered in one of the cymes above a bract in face view. Vouchers: *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (A) and *K.A. Shepherd & L. Webb* KS 1993 (B). Images: K.A. Shepherd.

Distribution and habitat. Known from Lake Baladjie, north-west of Bullfinch, where it is found on a gentle slope near the shoreline in pale brown clayey sand. Nearby vegetation includes *T. pergranulata*, with *Maireana* sp., *Podolepis capillaris*, *Atriplex nana*, and *Hakea preissii* occurring further up the dune slope.

Conservation status. To be listed as Priority Two under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). This species is currently known only from a single, small population within a nature reserve, with plants confined to a narrow band *c.* 500 m long near the highwater line. This population is likely to be significantly impacted by any changes to the salinity or hydrology of the lake, for example due to ongoing climate change.

Etymology. Named after the rattlesnake genus *Crotalus*, as the inflorescence shape resembles a rattlesnake's tail. The epithet is formed as a noun in apposition.

Affinities. Based on molecular sequence data from target enrichment capture using a customised bait set, *T. crotalus* is most closely related to *T. indefessa* K.A.Sheph. (Žerdoner Čalasan *et al.*, unpublished data), a Priority Two species from near Truslove, north of Esperance. *Tecticornia crotalus* is readily distinguished from *T. indefessa* by its decumbent habit (vs mat-like), larger inflorescence (14–26 mm ×

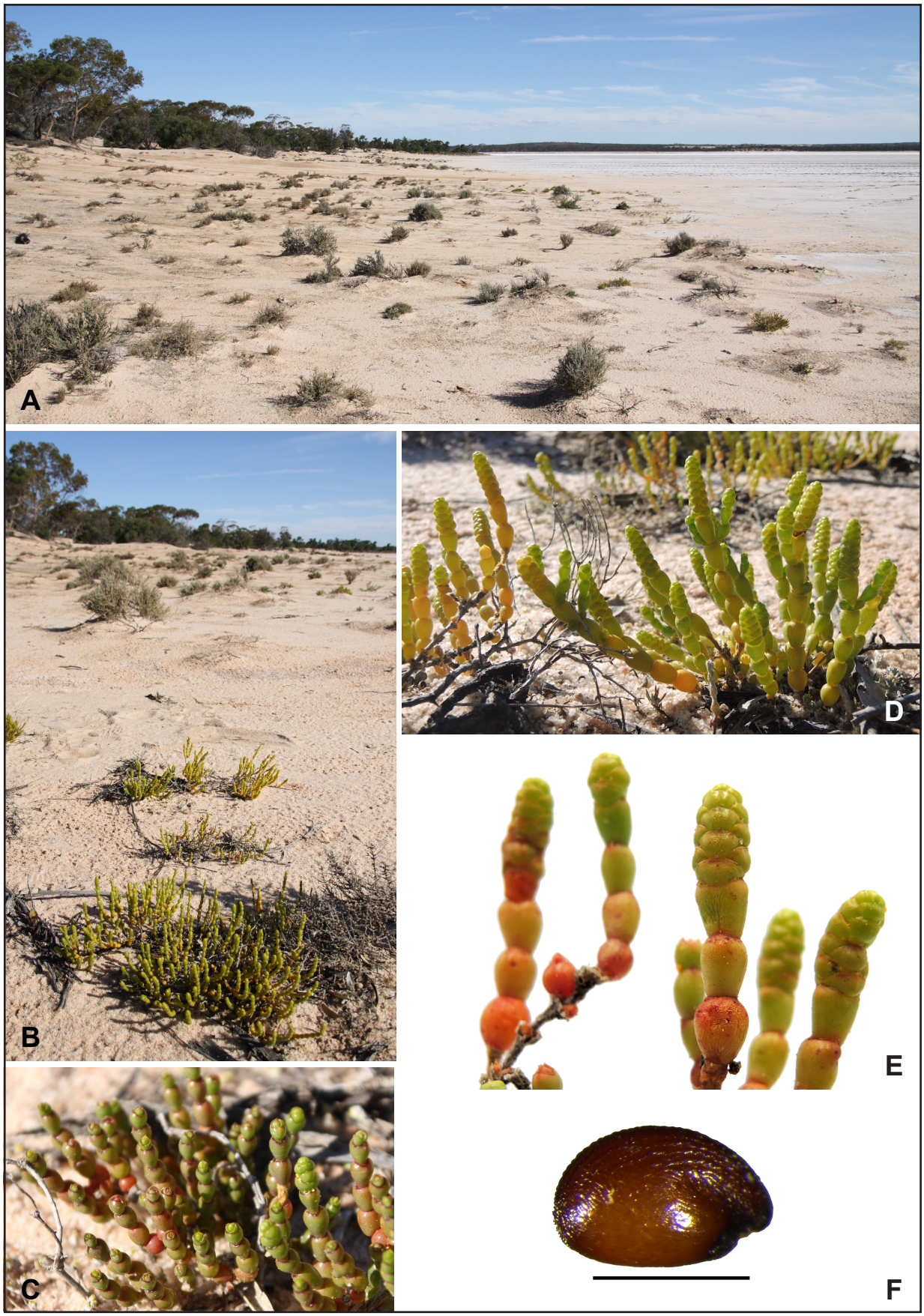

Figure 2. *Tecticornia crotalus*. A – habitat at the type locality; B – habit; C – glossy green vegetative articles with a red tinge; D – plants showing terminal, spike-like inflorescences; E – branchlet showing the obovoid to spherical vegetative articles and inflorescence with distinctive overlapping free bracts, reminiscent of a rattlesnake's tail; F – seed, scale bar = 1 mm. Vouchers: *K.A. Shepherd & A. Žerdoner Čalasan* KS 1950 (A–E); *K.A. Shepherd & S.R. Willis* KS 885 (F). Images: K.A. Shepherd.

6–7 mm vs 5–10 mm × 3.2–6 mm) with 6–16 paired bracts that are free with the exception of the basal pair (vs with 3–7 fused bracts), and larger seeds (1.1–1.5 mm long vs 0.7–0.8 mm).

Tecticornia crotalus appears most morphologically similar to *T. flabelliformis* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson, and was previously mistaken for that species due to its shared similar habit and the presence of free rather than fused bracts. Despite this superficial similarity, these species are not particularly closely related (Žerdoner Čalasan *et al.*, unpublished data). *Tecticornia crotalus* can be recognised as distinct from *T. flabelliformis* by its glossy vegetative articles and bracts (vs dull), shorter and broader inflorescences that usually have fewer bracts (14–26 mm × 6–7 mm with 6–16 paired bracts vs 18–37 mm × 3.5–4 mm with 12–30 paired bracts), wider bracts in face view (3.1–6.2 mm wide vs 2.9–3.2 mm), and dorsiventrally flattened flowers that are completely covered by subtending bracts (vs cuboid flowers that are two thirds to fully exposed above the bracts).

Tecticornia dactylifera K.A.Sheph. & Zerdoner, *sp. nov.*

Type: Lake Cowan, Norseman, Western Australia [precise locality withheld for conservation purposes], 9 February 2023, *K.A. Shepherd & L. Webb* KS 1993 (*holo*: PERTH 09553355; *iso*: CANB, M).

Decumbent *perennial*, 0.1–0.12 m high. *Vegetative articles* obovoid, cylindrical or spheroid, not compressed, yellowish green, 2.3–8 mm long, 2.8–4.3 mm wide, without lateral grooves; epidermis smooth, dull; apex apiculate; margin narrow to obsolete, entire. *Inflorescence* spike-like, terminal, cylindrical, with a slightly undulate outline, 19.5–37 mm long, 3–4 mm wide, with 12–20 paired bracts, with opposite, decussate, axillary 5-flowered cymes; florets in each cyme bisexual, central flower slightly larger, lateral flowers not always fully developed. *Bracts* fused, cylindrical to obovoid in face-view (flowers facing forward), 1.8–3.9 mm long, 2.2–3.3 mm wide, with upper edge convex and moderately curved; bracts in side-view 0.6–1.8 mm long, with upper edge shallowly concave, outer face slightly protruding; epidermis smooth, dull; apex truncate with a small apiculus; margin narrow to obsolete, entire. *Flowers* two thirds to fully exposed above subtending bracts, free from bracts above and below, free from adjacent florets, almost contiguous with opposite 5-flowered cyme. *Perianth* fused, cuboid with a truncate apex, abaxial surface ascending, adaxial surface slightly ascending; lobes 3, abaxial lobe obvious and external; margin entire with abaxial lobe margin sometimes denticulate. *Stamen* not seen. *Ovary* free from stem cortex; style bifid, membranous. *Fruiting spike* scarcely expanded, chartaceous; apical vegetative growth absent. *Fruits* fully exposed above subtending bracts, free from bracts above and below, free from adjacent florets, contiguous with opposite 5-flowered cyme; fruiting perianth scarcely expanded, chartaceous, outer surface texture dull; aperture flat. *Pericarp* fused or free from fruiting perianth, base of seed exposed; fruiting style absent. *Seeds* horizontal relative to stem axis, ovate, 1–1.2 mm long, 0.7–0.9 mm wide, sometimes with a small beak up to 0.05 mm long, slightly transparent, brown to reddish brown, long edge opposite radicle with up to 4 or 5 rows of contiguous bumps, sides with flat cells appearing smooth. (Figures 1B, 3)

Diagnostic features. *Tecticornia dactylifera* can be recognised within the genus based on the following key features: a low, decumbent habit 0.1–0.12 m high; articles dull, yellowish green 2.3–8 mm long, 2.8–4.3 mm wide; inflorescence terminal, spike-like, with a slightly undulate outline, 19.5–37 mm long, 3–4 mm wide, with 12–20 pairs of fused bracts; cymes with 5 bisexual flowers; flowers cuboid with a truncate apex, exposed above the subtending bracts; fruiting spike chartaceous, scarcely expanded; seeds brown to reddish brown, 1–1.2 mm long, with ornamentation of up to 4 or 5 rows of contiguous bumps on the outer surface, sides appearing smooth.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 25 Nov. 2021, *J. Borger* Yogi 10-1 (PERTH 09555412); 25 Nov. 2021, *J. Borger* Yogi 10-2 (PERTH 09555285); 9 Feb. 2023, *K.A. Shepherd & L. Webb* KS 1994 (AD, MEL, PERTH 09553312); 9 Feb. 2023, *K.A. Shepherd & L. Webb* KS 1995 (M, PERTH 09553401).

Phenology. Flowering presumably from spring to early summer. Fruiting late summer.

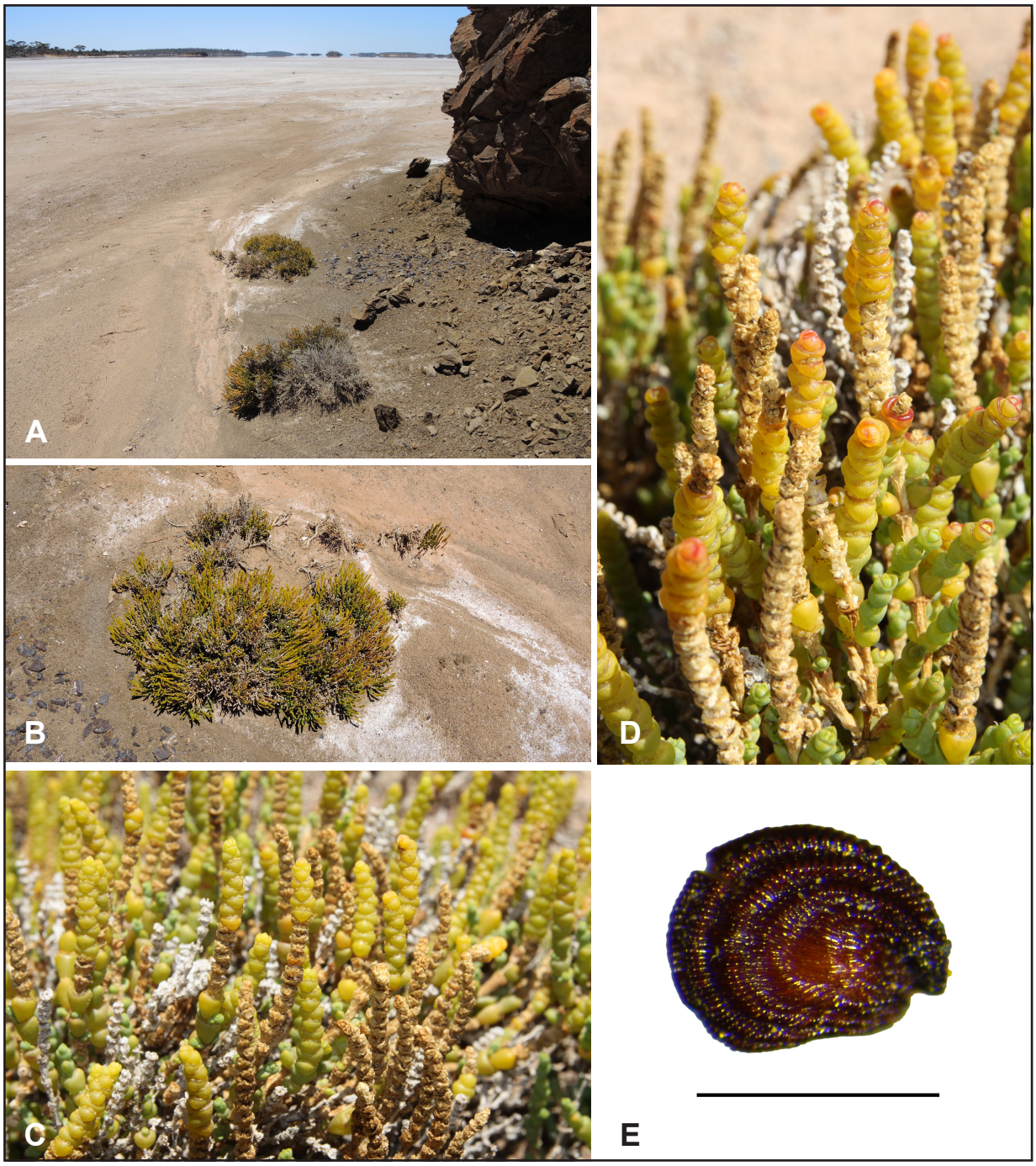

Figure 3. *Tecticornia dactylifera*. A – habitat at the type locality; B – habit; C – plant showing the long, terminal, spike-like inflorescences; D – dull yellowish green inflorescences becoming chartaceous in fruit; E – seed, scale bar = 1 mm. Voucher: *K.A. Shepherd & L. Webb* KS 1993. Images: K.A. Shepherd.

Distribution and habitat. This species is confined to a narrow margin at the edge of Lake Cowan, where it can be found growing near a rocky outcrop in pale brown sandy loam. Nearby vegetation includes *Tecticornia* sp. with *Melaleuca lateriflora*, *Frankenia glomerata* and *Maireana amoena* occurring further away from the lake shoreline.

Conservation status. Currently known only from a single population. To be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). This species may be under potential threat of extinction from changes to hydrology through infrastructure development and habitat damage by off-road vehicles.

Etymology. From the Latin *dactyl-* (finger-) and *-fer* (bearing) in reference to its the long, narrow, finger-like inflorescences.

Affinities. Molecular analyses by Žerdoner Čalasan *et al*. (unpublished data), confirm *T. dactylifera* as a genetically distinct species placed sister to *T. pluriflora* (Paul G.Wilson) K.A.Sheph. & Paul G.Wilson, a species that is widespread in South Australia with a few scattered populations in New South Wales. Species of *Tecticornia* usually have 3-flowered cymes but they are 5-flowered in *T. dactylifera* and 5–7-flowered in *T. pluriflora* (with the lateral flowers often reduced in size). *Tecticornia dactylifera* can be distinguished from *T. pluriflora* by its low, decumbent habit (0.1–0.12 m high vs erect shrub 0.5–1 m), longer and broader inflorescences (19.5–37 mm × 3–4 mm vs 7–11 mm × 1.5–2 mm), and smaller bracts in side-view (0.6–1.8 mm long vs 2.4–3.5 mm).

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Eucalyptus sweedmaniana subsp. *noongaring*, a new four-winged mallee (*E.* series *Tetrapterae*: Myrtaceae) endemic to *boylya* (granite outcrops) of the *kwongkan* east of Esperance, Western Australia

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SHORT COMMUNICATION

Eucalyptus sweedmaniana Hopper & McQuoid is a sprawling, lignotuberous mallee with relatively small buds, flowers and fruits confined to coastal granitic slopes of *Yorlining* (Mt Arid) in Cape Arid National Park. This species was originally recognised as distinct from *E. tetraptera* Turcz. in part due to it having larger leaves ranging from 17–26.5 cm long (vs 10–17 cm long in the latter) (Hopper & McQuoid 2009). However, while a 2010 collection from east of Scadden currently labelled as *E. sweedmaniana* (*D. Nicolle & M. French* DN 5482, PERTH 08299161) has large leaves to 26 cm long, this specimen appears more similar to *E. tetraptera* based on habit, fruit, bud and flower size (Table 1). Leaf measurements do not distinguish taxa consistently in this species complex as previously reported.

Here, a new subspecies is described of *E. sweedmaniana*, encountered in the course of extensive studies of the biodiversity, landscapes and cultural history of the Cape Arid National Park region over the past four decades (Brooker & Hopper 1993; Hopper *et al.* 1997, 2021; Mitchell *et al.* 2013). Although seen and collected by botanists since 1960, the new taxon named herein as *E. sweedmaniana* subsp. *noongaring* Hopper was not recognised as new and distinct from typical *E. tetraptera* or *E. sweedmaniana* until it was encountered in full flower at localities in or near Cape Arid National Park in October 2014 in company with colleagues participating on a Gabbie Kylie Foundation Field School (Mitchell *et al.* 2013).

To affirm the status of the new subspecies, individuals in a number of nearby populations of *E. tetraptera*, as well as the type location of *E. sweedmaniana*, were examined critically, photographed and illustrated in field notebooks. Specimens in the Western Australian Herbarium and living plants in Kings Park and Botanic Garden were investigated to undertake comparative observations and morphometrics (Table 1). These investigations revealed consistent morphological and ecological differences from other taxa in *E.* series *Tetrapterae* Blakely (see Brooker 2000), and established that *E. sweedmaniana* was a near relative, but the characters revealed were sufficient to warrant the following recognition of *E. sweedmaniana* subsp. *noongaring* as new. *Eucalyptus sweedmaniana* subsp. *noongaring* is confirmed as distinct from the typical subspecies based on differences such as an upright habit (vs prostrate), having a wider operculum in mature buds (14–18 mm wide vs 12.1–14 mm wide), generally longer stamens (9–12 mm long vs 8–10 mm long), and a ribbed hypanthium surface between wings vs a smooth (rarely slightly ribbed apically) hypanthium surface.

Eucalyptus sweedmaniana subsp. *noongaring* is distributed from Howick Hill, east of Esperance to Mt Baring. In contrast, the typical subspecies remains very rare indeed, now known only from the type population on the coastal slopes of *Yorlining*. In light of this, the conservation status of *E. sweedmaniana* subsp. *sweedmaniana* should be reassessed.

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Subspecies concept. Following past modern practice (e.g. Brooker & Hopper 1991; Ellison *et al.* 2014), I define subspecies as diagnosable races with minor morphological differences, that are largely geographically isolated but may intergrade over narrow zones with at least 75% of their individuals across wild populations remaining distinguishable.

Eucalyptus sweedmaniana subsp. **noongaring** Hopper, *subsp. nov.*

Type: N of Cape Arid National Park, Western Australia [precise locality withheld for conservation reasons], 21 July 2016, *S.D. Hopper* 8696 (*holo*: PERTH 09723188 [sheet 1 of 2], PERTH 09723196 [sheet 2 of 2]; *iso*: AD, CANB, K, MEL, MO, NSW).

Erect, lignotuberous *mallee* up to 2 m high and 4 m wide; bark smooth, shiny when fresh, to dull when older, silver-grey. *Cotyledons* reniform. *Seedling leaves* broadly lanceolate to elliptical. *Adult leaves* long-lived (several years), with lamina 14–25 cm long × 5.1–8.7 cm wide, alternate, apiculate, concolorous, green, glossy, broad-lanceolate, robust, thick; petioles thick, parallel-sided, angular, 3.4–6 cm long; venation prominent, both the midrib and intramarginal vein conspicuous, side veins parallel, reticulation dense with scattered intersectional oil glands. *Inflorescence* axillary, unbranched, 1-flowered. *Buds* sparse, red, pendulous to horizontal, 37–60 mm long; operculum flattened, pyramidal, 13–22 mm long × 14–18 mm wide; hypanthium square in cross-section, cuboid to shortly oblong, scarcely tapering towards the base, prominently ribbed, prominently winged (wings to 6 mm wide), 24–38 mm long × 21–35 mm wide; pedicels absent; peduncle shortly winged and downcurved. *Stamens* pink, 9–12 mm long, inflexed; staminodes present. *Style* 12–17 mm long. *Ovary* with four locules. *Fruit* sparse, 31–50 mm long × 27–45 mm wide, prominently ribbed between the wings, usually greenish- brown, cuboid to shortly oblong, square in cross-section, prominently winged (wings to 10 mm wide); disc descending, valves 4, enclosed; pedicels absent; peduncle as wide as base of fruit, margins curved, contorted, shortly winged, often down-curved. *Seed* black, 3.5–4.5 mm long × 2.5–3.5 mm wide × 1.5–2.5 mm thick, strongly flanged or winged, to 47 per fruit. (Figures 1, 2; Table 1)

Characteristic features. Small erect mallee to 2 m tall, large-leaved with glossy green, concolorous, thick lamina 14–25 cm long × 5.1–8.7 cm wide. Buds and flowers sparse, bright red, with winged hypanthia, prominently ribbed between the wings. Floral hypanthium 24–38 mm long × 21–35 mm wide; fruit cuboidal, 10–50 mm long × 27–45 mm wide, usually greenish brown, prominently ribbed between the wings. Largely endemic to *boylya* (granite outcrops and inselbergs).

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 25 Oct. 1963, *T.E.H. Aplin* 2628a (PERTH 01470817); 6 Dec. 1960, *A.S. George* 2067 (PERTH 01459236; PERTH 01459260; PERTH 09720278 (carpologica)); 20 Sep. 1976, *R. Hnatiuk* 761181 (PERTH 01456520); 11 Oct. 2014, *S.D. Hopper* 8691 (CANB, MEL, PERTH 09714588); 20 July 2016, *S.D. Hopper* 8695 (AD, K, PERTH 09714561); 21 Nov. 1994, *D. Nicolle* 1097 (PERTH 06094643 [ex AD 99625320]).

Distribution. Confined to the summits and flanks of *boylya* (granite outcrops and inselbergs) found east of Esperance in the western parts of Cape Arid National Park and west into adjacent farmland (Figure 3).

Habitat. At Hawes Hill *E. sweedmaniana* subsp. *noongaring* occurred in dense heath and low mallee with *Eucalyptus extrica*, *E. semiglobosa*, *Agonis baxteri*, *Banksia armata*, *Melaleuca globifera*, *Gastrolobium bilobum*, *Melaleuca fulgens* subsp. *fulgens*, *Anthocercis viscosa*, *Eutaxia myrtifolia*, *Spartochloa scirpoidea*, *Lepidosperma* sp., *Acacia nigricans*, *A. subcaerulea*, *Olax phyllanthi*, *Xanthorrhoea platyphylla*, *Hakea corymbosa*, *Grevillea anethifolia* and *Platysace compressa*. The subspecies occurs in both broken granite at the foot of steep slopes and in white sand on the surrounding base of Hawes Hill. On Mt Baring, *E. sweedmaniana* subsp. *noongaring* favours the summit and high plateau in shallow soil adjacent to sheet granite and boulders, growing with *E. semiglobosa* and *E. lehmannii* in dwarf mallee and *kwongkan* shrubland with scattered emergent *Xanthorrhoea platyphylla* and *Exocarpos sparteus*. A population south of Bebenorin grows on white sand in *kwongkan* (note that contemporary Noongar elders

Figure 1. (A) Merningar Bardok Noongar man Harrison Rodd-Knapp at the type locality of *E. sweedmaniana* subsp. *noongaring* north of Cape Arid National Park with a plant in hand; (B) looking south down the west boundary of Cape Arid National Park to Hawes Hill. Photos by S.D. Hopper.

Figure 2. A bud, flower, fruit and leaf of *E. tetraptera* (A, top) and *E. sweedmaniana* subsp. *noongaring*, note the diagnostic smaller reproductive organs with their prominently ribbed hypanthia (A, bottom); subsp. *noongaring in situ* (B); dried fruits of subsp. *sweedmaniana* (C, top row) and fresh fruits of subsp. *noongaring*, illustrating the prominent ribbing (C, bottom row); seeds of subsp. *noongaring* (D); maturing buds of subsp. *sweedmaniana*, note the more prominent hypanthial wings and lack of ribbing (E, top), and subsp. *noongaring* (E, bottom); and top of fruit of subsp. *noongaring*, highlighting the prominent ribbing between the wings (F). Scale bars = 2 cm, except seed (A, E = 0.5 mm, and fruit (F = 3 mm). Voucher populations: *E. tetraptera* Wittenoom Road, E of Scadden, NE of Esperance (A, top); *E. sweedmaniana* subsp. *noongaring* Hawes Hill (bottom A, C, D, F) and Mt Baring (B); *E. sweedmaniana* subsp. *sweedmaniana* collections by Luke Sweedman from the type location in November 2012 (C, top) and type location ex cult. Kings Park & Botanic Garden (E, top). Photos S.D. Hopper.

Table 1. Comparative morphology of *E. sweedmaniana* subsp. *noongaring* and allied taxa, based on measurements of live samples plus PERTH herbarium specimens of *E. tetraptera*. Data for *E. brandiana* and *E. sweedmaniana* subsp. *sweedmaniana* are from the wild (Hopper & McQuoid 2009) and from the living and fruit collections of Kings Park & Botanic Garden. Populations and sample sizes (one of each organ per plant): *E. sweedmaniana* subsp. *noongaring* (Mt Hawes – 7 leaves, 3 buds, 3 flowers, 13 fruits (A); Mt Baring – 11 leaves, 3 buds, 2 flowers, 2 fruits); *E. sweedmaniana* subsp. *sweedmaniana* (Cape Arid National Park – 10 leaves, 4 buds, 1 flower, 11 fruits) (B); *E. tetraptera* (Wittenoom Rd E of Scadden, NE of Esperance – 4 leaves, 5 buds, 4 flowers, 5 fruits (C); S of Mt Ney – 4 leaves, 2 buds, 2 flowers, 4 fruits; N of Wittenoom Hills – 5 leaves; Hwy 1, 95 km W of Esperance – 7 leaves; herbarium specimens Stirling Range to Mt Ragged – 15 leaves); *E. brandiana* (Fitzgerald River National Park – 10 leaves, 4 buds, 2 flowers, 10 fruits) (D); Exemplar voucher specimens from a sample population of each taxon: *E. sweedmaniana* subsp. *noongaring* (A) Mt Hawes, *S.D. Hopper* 8691 (PERTH 09714588); *E. sweedmaniana* subsp. *sweedmaniana* (B) Cape Arid National Park, *L.S.J. Sweedman* 7210 (PERTH 08231265); *E. tetraptera* (C) Scadden Rd, NW of Wittenoom Rd, E of Scadden, NE of Esperance, *D. Nicolle & M. French* DN 5482 (PERTH 08299161); and *E. brandiana* (D) Fitzgerald River National Park, *L.S.J. Sweedman* 7008 (PERTH 07478488).

Character	***E. sweedmaniana* subsp. *noongaring***	***E. sweedmanian* subsp. *sweedmaniana***	***E. tetraptera***	***E. brandiana***
Habit	erect mallee to 2 m tall	sprawling to prostrate mallee to 1 m tall	erect to prostrate mallee to 5 m tall	erect mallet to 5 m tall
Canopy	covers most levels above ground	covers most levels above ground	covers most levels above ground	confined to upper stems
Mature leaf:				
lamina L (mm)	140–250	165–263	110–280	140–238
lamina W (mm)	51–87	45–67	35–84	42–62
petiole L (mm)	34–60	38–48	25–70	38–45
Mature bud:				
length (mm)	37–60	36–45	68–99	50–65
operculum length (mm)	13–22	13.8–16.7	25–44	24.4
operculum width (mm)	14–18	12.1–14	18–31	34
hypanthium length (mm)	24–38	26.9–27.6	40–65	60.7
hypanthium width (mm)	21–35	24–26	35–52	30–59
max wing width (mm)	4–6	5.7–8.2	6.4–15.7	14.1
Flower:				
hypanthium length (mm)	28–35	34	39–53	53–56
hypanthium width (mm)	23–30	28	35–50	44–51
stamen length (mm)	9–12	8–10	15–20	17–20
style length (mm)	12–17	11	13–22	17–20
max wing width (mm)	5–9	5.1	6.3–15.7	16.2–16.8
Fruit:				
length (mm)	31 –50	34–38	42–58	56–68
width (mm)	27–45	30–41	46–60	48–59
max wing width (mm)	5–10	7.3–11.9	9.9–17.8	6.4–14.3
hypanthium surface between wings when fresh	ribbed	smooth, rarely slightly ribbed apically	smooth	smooth

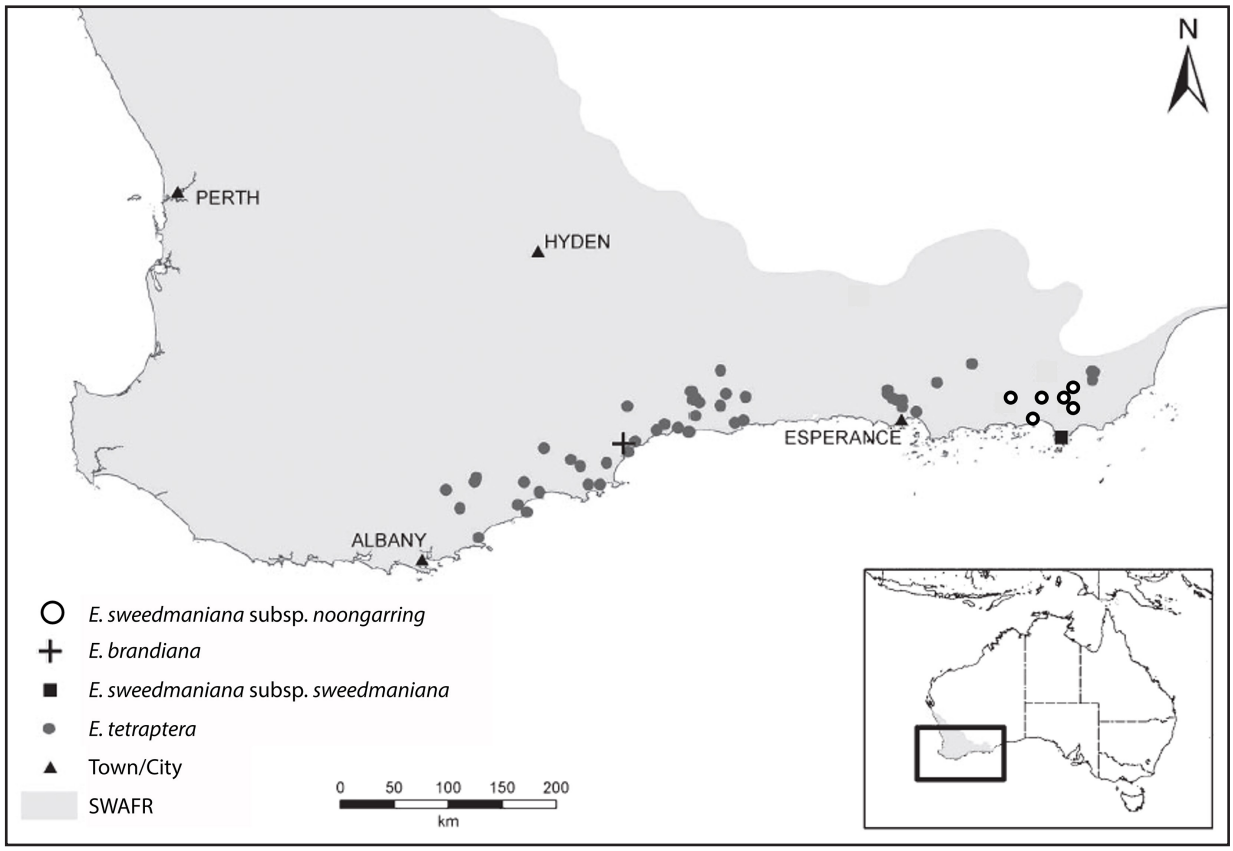

Figure 3. Map of distributions of *E. sweedmaniana* subsp. *noongaring* and related taxa based on collections in PERTH. Base map from Hopper and McQuoid (2009), with modifications. SWAFR refers to the Southwest Australian Floristic Region, *sensu* Gioia and Hopper (2017).

and linguists are followed in this preferred spelling of *kwongkan*, see Hopper 2014). At the Tagon Road type locality, on a subdued granite flatrock flanked by white sand, *E. sweedmaniana* subsp. *noongaring* occurs with *E. extrica*, *Nuytsia floribunda*, *Acacia cyclops*, *A. myrtifolia*, *Calothamnus quadrifidus*, *Banksia armata* and *Xanthorrhoea platyphylla.*

Phenology. Recording flowering in September, October, November and December.

Conservation status. To be listed as Priority Four under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). This subspecies is a narrow endemic, but not threatened. Although its habitat is geographically restricted, *E. sweedmaniana* subsp. *noongaring* is common where it occurs, numbering in thousands of plants for example on Mt Baring. Four of the six known populations are within Cape Arid National Park.

Etymology. Named as a noun in apposition to honour the *Noongar* Aboriginal people of south-west Australia, originally custodians of the land and carers of country in the Thomas River–Esperance region for thousands of years. They are known as the Shell People, or *Nyookuring* as recorded by the earliest white settlers at Lynburn Station on the Thomas River. These days the *Noongar* are part of the Wudjarri people or the Merningar Bardok of the Noongar nation of southwest Australia (Knapp *et al.* 2024). In 1988, linguist Carl von Brandenstein (1988) provided a detailed account of the derivation and meaning of the word '*Noongar*'. To Merningar Bardok Elder Lynette Knapp *Noongar* alludes to warriors (men) who have gone through two sets of law – inland and coastal (Knapp *et al.* 2024).

The suffix *–ing* or *–iny*, like *–ap* (= –up, for many place names) means 'as' (von Brandenstein 1988), implying related to, having become, concerning, having to do with, referring to, characteristic of, or symbolic for. Thus, it gives a more sophisticated nuance, indicating that the plant is a commemoration of *Noongar* people.

I favour the name as a mark of respect to the many Elders who have helped me learn about their culture over the past four decades, and in particular to those descendants of the Shell people who remain living in the Albany–Esperance district and have so generously shared their knowledge and company on joint field trips undertaken as part of the Gabbie Kylie Field School programme and subsequent trips with the Knapp family (e.g. Knapp *et al.* 2024).

Common name. Noongaring muert. The word *muert* means 'plant, mallee scrub', or possibly the *moort* tree (*E. platypus* – von Brandenstein 1988). *Muert* also alludes to *muerditj*, meaning 'hard, strong, fast'. Given that *mallee* is a north-west Victorian *Wergaia* people's word for the white mallee (*E. dumosa*), or *mallee* scrub, and the new subspecies is named to celebrate the strong *Noongar* people, the local *Noongar* word for a strong mallee seems apposite.

Affinities. *Eucalyptus sweedmaniana* subsp. *noongaring* is distinguished from *E. sweedmaniana* subsp. *sweedmaniana* in its erect mallee habit (vs sprawling to prostrate), its prominently ribbed hypanthia (vs smooth, rarely ribbed apically between the wings), its mature buds with longer, broader opercula, 13–22 mm × 14–18 mm (vs 13.8–16.7 × 12.1–14 mm) and narrower wings on the hypanthium 4–6 mm wide (vs 5.7–8.2 mm wide), and in its preference for inland granite inselbergs or *boylya* (vs near-coastal low elevation granite). It would be useful to explore population genetic relationships within and between these sister subspecies.

Notes. The *boylya* of the *kwongkan* east of Esperance continue to yield botanical novelties with intensifying survey in recent decades. *Eucalyptus sweedmaniana* subsp. *noongaring* joins more than 20 species now known to be endemic to *boylya* in the region (Hopper *et al.* 2021), including *Acacia conniana* Maslin, *A. incanicarpa* A.R.Chapman & Maslin, *Caladenia exstans* Hopper & A.P.Br., *Gastrolobium involutum* G.Chandler & Crisp, *Gonocarpus pycnostachyus* (F.Muell.) Orchard, *Gonocarpus scordioides* (Benth.) Orchard, *Goodenia quadrilocularis* R.Br., *Hydrocotyle perforata* A.J.Perkins, *Kennedia beckxiana* (F.Muell.) F.Muell., *Myriophyllum balladoniense* Orchard, *Myriophyllum* sp. Mt Arid (L.S.J. Sweedman 6767) and *Prostanthera carrickiana* B.J.Conn.

These *boylya*, conspicuously emergent from the surrounding plains (Figure 1), are culturally significant, replete with evidence of the ceremonies, artefacts, and plant and animal husbandry of the *Noongar* Shell People. Unless the Shell People moved and cultivated *E. sweedmaniana* subsp. *noongaring* for cultural purposes from *boylya* to *boylya*, the disjunct populations of the new species would be expected to display high genetic differentiation among locations, comparable to that documented for other granite rock endemics such as *Eucalyptus caesia* (Byrne & Hopper 2008; Bezemer *et al.* 2019).

A single hybrid of *E. lehmannii* × *E. sweedmaniana* subsp. *noongaring* was collected on 1 Nov. 1989 from Mt Baring, represented by a single fruit (*G.J. Keighery s.n.*, PERTH 01643185). It must be rare, as two ascents undertaken of the inselberg, each with ample time for inspection of many of the low mallees, failed to locate this hybrid. Both parental taxa are common on the summit plateau and grow thoroughly intermixed. This hybrid, and *E. sweedmaniana* subsp. *noongaring* itself, show considerable potential for horticulture, with their small compact habit and colourful flowers attractive to birds and mammals as pollinators. Kings Park and Botanic Garden have commenced research in this arena.

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Additions to the *Styphelia pendula* group (Ericaceae: Epacridoideae: Styphelieae) including updated descriptions for *S. erubescens*, *S. pendula* and *S. retrorsa*

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Abstract

Hislop, M. Additions to the *Styphelia pendula* group (Ericaceae: Epacridoideae: Styphelieae) including updated descriptions for *S. erubescens*, *S. pendula* and *S. retrorsa*. *Nuytsia* 35: 233–262. Six new species from the *Styphelia pendula* group, *S. altivallis* Hislop, *S. innoxia* Hislop, *S. longiloba* Hislop, *S. porcata* Hislop, *S. speciosa* Hislop and *S. tarinensis* Hislop are described and illustrated. Four of these are conservation-listed. Updated descriptions of three, long-established species from the group, *S. erubescens* F.Muell., *S. pendula* (R.Br.) Spreng. and *S. retrorsa* Hislop, Crayn & Puente-Lel. are provided for purposes of comparison. A key to those members of the *S. pendula* group with strictly pendulous inflorescences is also included.

Introduction

The *Styphelia pendula* group is one of the largest of the informal infrageneric groups established by Puente-Lelièvre *et al.* (2016; their Group V), with around 40 taxa in Western Australia, 30 of which were included in that study, while the remainder have been placed in the group based on morphological affinity. Not only was it a strongly supported clade in the published phylogenetic tree but unlike most of the other groups it also showed good internal resolution with three well-supported subclades evident. These are referred to here as subclade A (taxa allied to *S. pendula* (R.Br.) Spreng.), subclade B (taxa allied to *S. propinqua* (R.Br.) Spreng.) and subclade C (*S. racemulosa* (DC.) F.Muell. plus *S. filifolia* Hislop & Puente-Lel.). A recent paper (Hislop 2021a) included descriptions of six new taxa, all from subclade A. It is noteworthy that all taxa from the *S. pendula* group with strictly pendulous (rather than those with erect or spreading) inflorescences belong in subclade A, with the single exception of *S. filifolia*. However, this character does not define subclade A as it also includes species with spreading or erect inflorescences. The current paper completes the descriptions of new taxa from the subclade, while also providing updated treatments of three long-established species for purposes of comparison. The similarly large subclade B is also in need of further study and probably includes at least six undescribed taxa.

Although it is premature to present here a full morphological description of the *S. pendula* group, the recently published interim key to the Western Australian groups (Hislop 2021b) enables users to recognise the critical features that distinguish it.

Methods

This study was based on an examination of dried specimens housed at the Western Australian Herbarium, together with field observations of all species treated. Details of the methods used to measure plant parts and make other morphological observations are the same as those described in a recent paper (Hislop

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& Nguyen 2022). Sepal colour is based on observations of dried specimens. Measurement of the style width is only given for the similar species, *S. longiloba* Hislop, *S. pendula* and *S. tarinensis* Hislop, where it has particular diagnostic importance and is measured 1 mm from the base. A floral character not previously used in the taxonomy of *Styphelia* was found to be informative in this species group and is included in the descriptions below. It was found that species varied in regard to the presence or absence of longitudinal ridges on either side of the adnate, decurrent filament bases of the internal corolla tubes. And where present the elevation of the ridges relative to the decurrent portions of the filament bases was also found to be important. This character is illustrated below for *S. porcata* Hislop, in which these ridges are particularly well developed (see description and associated figure).

Bioregions referred to in the text follow *Interim Biogeographic Regionalisation for Australia* (IBRA) v. 7 (Department of Agriculture, Water and the Environment 2012).

Key to the Western Australian members of the *Styphelia pendula* group with strictly pendulous inflorescences

Note that not all members of the *S. pendula* group have pendulous inflorescences (refer to Hislop 2021a: 200 for definitions of inflorescence orientation), and that most species in the *S. conostephioides* group also have pendulous inflorescences (refer to the key to species groups in Hislop 2021b: 29–31 for distinguishing characters between the groups).

1. Leaf apices mucronate or not but if so the mucro innocuous, to 0.4 mm long (rarely to 0.6 mm and sub-pungent)

2. Leaves adaxially concave, the margins not recurved; leaf apex a broad callus tip (Porongurup and Stirling Range–Israelite Bay)..... **S. woodsii**

2: Leaves adaxially convex, the margins variously recurved to revolute (occasionally some leaves ± flat in a few species); leaf apex often clearly mucronate

3. Fruit strongly zygomorphic, bilaterally compressed, the style base displaced onto the adaxial edge; leaves mostly linear, occasionally very narrowly ovate, 12–27 mm long, with 3–5 well-defined sunken lines on adaxial surface (sporadically from N of Eneabba–Harvey) ..... **S. filifolia**

3: Fruit actinomorphic, circular in transverse section, the style base centrally fixed; leaves variously shaped but if linear then not > 11 mm long, without obvious sunken lines on the adaxial surface

4. Ovary 3(4)-locular; fruit cylindrical or very narrowly ellipsoid, 0.8–1.2 mm wide (widespread: New Norcia–Lake Muir–Gibson, and inland in the south of its range to Kojonup and Lake Magenta)..... **S. concinna**[1]

4: Ovary 5-locular, fruit variously shaped, but only *S. dielsiana* has the above combination of shape and width

5. Sepals and bracteoles shortly and densely hairy; fruit globose or occasionally broadly ellipsoid, 3.8–5.5 mm long, 3.8–5.5 mm wide (Busselton–Scott River–Donnybrook)..... **S. globosa**

5: Sepals and bracteoles glabrous; fruit variously shaped but if globose or broadly ellipsoid (*S. innoxia*), then 3.0–4.0 mm long, 2.0–3.4 mm wide

6. Leaves variably retrorse

7. Fruit globose or broadly ellipsoid; leaves variably retrorse, but never retrorse-appressed, 3.5–8.0 mm long (restricted: W of Highbury; SW of Harrismith) ..... **S. innoxia**

7: Fruit very narrowly ellipsoid to ± cylindrical; leaves usually ± retrorse-appressed, to *c.* 3.0 mm long (widespread: E Darling Range–Gt Eastern Hwy–Cascade –S of Pingrup).. **S. dielsiana**

6: Leaves mostly antrorse, a few shallowly retrorse leaves may be present

8. Corolla tube longer than the sepals

9. Fruit very narrowly ellipsoid to ± cylindrical; inflorescence axis with moderately

dense to dense indumentum; style base smoothly attenuated from ovary apex; stigma expanded (restricted; NW to SW of Lake Grace) ..... **S. tarinensis**

9: Fruit narrowly obovoid; inflorescence axis glabrous or with sparse indumentum; style base abruptly differentiated from ovary apex; stigma not expanded, filiform

10. Corolla tube obovoid, broadly obovoid or ± obconic, 2.3–3.7 mm long, 2.1–2.6 mm wide, usually longer than or occasionally slightly shorter than the lobes; corolla lobes 1.1–1.4 mm wide; style *c.* 0.1 mm wide near base; filaments attached to anthers 1/2–2/3 above anther base (Augusta–Collie–Mount Barker–Mt Manypeaks, with an apparent outlier SE of Kelmscott)..... **S. pendula**

10: Corolla tube broadly obovoid, depressed-obovoid or depressed-obconic, 1.3–2.0 mm long and 1.3–2.0 as wide, always shorter than the lobes; corolla lobes 0.7–1.0 wide; style 0.15–0.2 wide near base; filaments attached to anthers 1/3–1/2 above anther base (S of Pemberton–Albany–Stirling Range)..... **S. longiloba**

8: Corolla tube equal to or shorter than the sepals

11. Fruit narrowly ellipsoid to narrowly ovoid; leaves linear, the longer ones 8–16 mm long; stigma slightly expanded (restricted: E peaks, Stirling Range) ..... **S. psilopus**

11: Fruit narrowly obovoid; leaves very narrowly elliptic to very narrowly obovate, or linear to very narrowly obtriangular, the longer ones 4–9 mm long; stigma not expanded, filiform (S of Pemberton–Albany–Stirling Range)..... **S. longiloba**

1: Leaf apices always long-mucronate and sharply pungent, the mucros 0.4–2.0 mm long, always with some longer than 0.6 mm

12. Ovary 3(4)-locular; fruit cylindrical or very narrowly ellipsoid, 0.8–1.2 mm wide (widespread: New Norcia–Lake Muir–Gibson, and inland in the south of its range to Kojonup and Lake Magenta) ..... **S. concinna**[1]

12: Ovary 5-locular; fruit variously shaped, but not of the above combination of shape and width

13. Leaves mostly retrorse, varying from shallowly antrorse to strongly retrorse

14. Corolla tube longer than the lobes

15. Inflorescences 1- or 2-flowered; style 6.5–9.0 mm long; filaments attached to anthers 1/3–1/2 above anther base; fruit usually ovoid or narrowly ovoid, occasionally ellipsoid or narrowly ellipsoid (mostly Darling Range; N of Bindoon–Boyup Brook) ..... **S. nitens**

15: Inflorescences (1)2–5-flowered; style 3.0–6.0 mm long; filaments attached to anthers 1/2–3/4 above anther base; fruit usually variously obovoid or cylindrical, sometimes globose or narrowly ellipsoid

16. Fruit very narrowly obovoid to cylindrical, sometimes curved, 4.5–6.8 mm long, 2.0–2.7 mm wide; inner corolla tube with longitudinal ridges on either side of the decurrent filament bases strongly developed and distinctly higher than the filament bases themselves, the ridge apices usually produced into distinct lobes on one or both sides of the attachment point; wider leaves per specimen, 1.8–2.6 mm wide (W coastal plain, Lancelin–Neerabup)..... **S. porcata**

16: Fruit broadly to narrowly obovoid, narrowly ellipsoid, or globose, 3.2–5.5 mm long, 2.5–3.5 mm wide; inner corolla tube with longitudinal ridges on either side of the decurrent filament bases present but these lower than or of ± equal elevation to the filament bases themselves, apical lobes absent; wider leaves per specimen, 2.5–4.5 mm wide (Cataby–Moora–W of Toodyay, with an apparent outlier in the Nambung area)..... **S. retrorsa**

14: Corolla tube shorter than the lobes

17. Spreading, tangled shrubs; leaves linear or very narrowly ovate, 0.5–1.7 mm wide; inflorescence axes glabrous; filaments 0.3–0.6 mm long (wetlands, SE of Margaret River–E of Augusta..... **S. intricata**

17: Erect shrubs, never tangled; leaves mostly narrowly obovate or narrowly elliptic, occasionally narrowly ovate, wider leaves always > 1.7 mm;

inflorescence axes with a sparse to moderately dense indumentum, sometimes glabrous in *S. retrorsa*; filaments 0.5–1.2 mm long (plants of dry habitats)

18. Inflorescences 1- or 2-flowered; filaments attached to anthers 1/3–1/2 above anther base; corolla lobes 2.5–4.0 mm long (Denmark–Albany–Stirling Range)..... **S. inframediana**

18: Inflorescences (1)2–5-flowered; filaments attached to anthers 1/2–3/4 above anther base; corolla lobes 2.0–2.8 mm long

19. Fruit very narrowly obovoid to cylindrical, sometimes curved, 4.5–6.8 mm long, 2.0–2.7 mm wide; inner corolla tube with longitudinal ridges on either side of the decurrent filament bases strongly developed and distinctly higher than the filament bases themselves, the ridge apices usually produced into distinct lobes on one or both sides of the attachment point; wider leaves per specimen, 1.8–2.6 mm wide (W coastal plain, Lancelin–Neerabup)..... **S. porcata**

19: Fruit broadly to narrowly obovoid, narrowly ellipsoid, or globose, 3.2–5.5 mm long, 2.5–3.5 mm wide; inner corolla tube with longitudinal ridges on either side of the decurrent filament bases present but these lower than or of ± equal elevation to the filament bases themselves, apical lobes absent; wider leaves per specimen, 2.5–4.5 mm wide (Cataby–Moora–W of Toodyay, with an apparent outlier in the Nambung area) ..... **S. retrorsa**

13: Leaves mostly antrorse, a few shallowly retrorse leaves may be present

20. Corolla tube longer than the lobes

21. Leaves narrowly elliptic to narrowly obovate, 7–12 mm long, 1.9–3.6 mm wide, the margins usually barely recurved; fruit narrowly ellipsoid to narrowly obovoid, 3.4–4.3 mm long, 1.7–2.0 mm wide, without a gynophore (restricted: SW to NE of Walpole)..... **S. graniticola**

21: Leaves very narrowly elliptic to very narrowly obovate or linear to very narrowly obtriangular, 3.0–11 mm long, 0.5–1.8 mm wide, the margins variably recurved to revolute; fruit narrowly obovoid, 4.2–6.0 mm long, 1.7–2.2 mm wide, with a prominent narrow gynophore (Augusta–Collie–Mount Barker–Mt Manypeaks, with an apparent outlier SE of Kelmscott)..... **S. pendula**

20: Corolla tube shorter than the lobes

22. Leaves 3.5–9.0 mm long, including a mucro 0.4–0.8 mm long; bracteoles 0.8–1.0 mm long, including a mucro 0.1–0.2 mm long; inflorescences axes 2.0–5.2 mm long; fruit broadly obovoid to ellipsoid (Denmark–Albany–Stirling Range)..... **S. inframediana**

22: Leaves 8.0–21 mm long, including a mucro 0.7–2.0 mm long; bracteoles 1.0–1.6 mm long, including a mucro 0.2–0.7 mm long; inflorescence axes 3.0–10 mm long; fruit usually globose or sometimes broadly ellipsoid

23. Young branchlets with a sparse to moderately dense indumentum of short, straight hairs to *c.* 0.1 mm long; leaves 0.8–2.0 mm wide, the widest usually 1.8 mm or less; bracteole mucros 0.2–0.4 mm long; sepals 1.8–2.7 mm long (NW of Walpole–William Bay)..... **S. madida** subsp. **madida**

23: Young branchlets with a dense indumentum of straight or wavy hairs 0.1–0.4 mm long; leaves 1.5–3.8 mm wide, the widest usually at least 2.2 mm; bracteole mucros 0.4–0.7 mm long; sepals 2.5–3.0 mm long (just E of Albany–Bald Island)..... **S. madida** subsp. **hirtigera**

[1] As currently circumscribed *S. concinna* is the most variable of the pendulous-flowered species in the *S. pendula* group and it is quite likely that further study will conclude that segregate taxa should be recognised. It currently includes variants with consistently antrorse or strongly retrorse leaves, long-mucronate, pungent mucros or very short, innocuous mucros and with potentially significant variation in regard to flower number per inflorescence. What unites them is a 3(4)-locular ovary (the only species in the group not to have a 5-locular ovary) and a cylindrical or very narrowly ellipsoid fruit.

Taxonomy

Styphelia altivallis Hislop, *sp. nov.*

Type: Warradarge area, Western Australia [precise locality withheld for conservation reasons], 30 April 2000, *M. Hislop* 1996 (*holo*: PERTH 05556309; *iso*: CANB, NSW 818914).

Erect *shrubs*, to *c.* 60 cm high and 60 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense indumentum of very short hairs < 0.05 mm long. *Leaves* helically arranged, mostly patent to shallowly antrorse; apex long-mucronate, pungent, the mucro ± straight, 0.5–1.2 mm long; base attenuate or sometimes cuneate; petiole 0.8–1.8 mm long, adaxial surface hairy, abaxial surface glabrous, margins glabrous or shortly and sparsely hairy; lamina mostly narrowly elliptic, or occasionally narrowly obovate, 10–18 mm long, 2.8–5.8 mm wide, discolorous, adaxially convex to concave, longitudinal axis gently incurved to gently recurved; adaxial surface shiny, glabrous apart from a few basal hairs, venation either not evident or with 3–5 poorly defined veins; abaxial surface paler, glabrous, matt, with 7–9 primary veins, ± flat to openly and shallowly grooved between the veins; margins glabrous or with a few, minute, coarse hairs < 0.05 mm long. *Inflorescence* axillary, spreading at *c.* 45°–120°; axis 2.2–4.2 mm long, 1–2-flowered, with a moderately dense indumentum of very short hairs, ± terete below the uppermost fertile bract, planoconvex and narrowly winged above, terminating in a bud-rudiment; flowers spreading, shortly pedicellate below the bracteoles with a thick pedicel to 0.5 mm long or subsessile. *Fertile bracts* broadly ovate to ovate, 0.8–1.5 mm long, 0.7–1.5 mm wide, with 2–3 sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate to elliptic, 1.7–2.5 mm long, 1.7–2.0 mm wide, obtuse, obscurely keeled, not or very shortly mucronate; abaxial surface glabrous or very shortly and sparsely hairy, not striate; margins ciliolate. *Sepals* narrowly elliptic to narrowly obovate, 4.5–6.4 mm long, 2.0–3.0 mm wide, obtuse or subacute; abaxial surface glabrous or very shortly and sparsely hairy in the upper half, various shades of pink, sometimes fading to straw-coloured, venation indistinct or sometimes obvious; adaxial surface sparsely hairy in the upper half, glabrous below; margins minutely ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* red, cylindrical, usually longer than, or occasionally ± equal to, the sepals, 5.0–9.0 mm long, 2.6–3.6 mm wide, external surface glabrous, internal surface sparsely hairy to *c.* half way or a little below, the tissue on either side of the decurrent filament bases not or scarcely raised. *Corolla lobes* red, shorter than the tube, 4.0–5.6 mm long, 1.7–2.0 mm wide at base, erect in basal 1/2–2/3 of their length and then spreading and recurved, external surface glabrous, internal surface with a dense, pink indumentum of flattened, twisted and ornamented hairs. *Anthers* partially exserted from corolla tube (by *c.* 7/8 of their length) or fully exserted, 2.2–2.6 mm long, deeply emarginate (as far as the filament connective). *Filaments* terete, 1.4–2.0 mm long, attached to the anther 2/3–3/4 above anther base, adnate to the tube just below sinuses; *Nectary* annular, *c.* 0.5 mm long, glabrous, truncate. *Ovary* globose or depressed-globose, 1.0–1.4 mm long, 1.0–1.5 mm wide, glabrous, 5-locular, ± black. *Style* 5.5–11.5 mm long, scabrous towards the apex, exserted from the corolla tube but not beyond the erect lobe bases, abruptly differentiated from ovary apex; stigma much-expanded and ± 5-lobed. *Fruit* obovoid to narrowly obovoid, tapering to a rather broad, rugose gynophore, 5.0–6.0 mm long, 3.0–3.5 mm wide, much longer than the sepals, distinctly but bluntly angular in transverse section; surface smooth above the gynophore (mesocarp not developed); apex ± flat but with rounded shoulders; style shed before maturity. (Figure 1)

Diagnostic characters. Within the *S. pendula* group distinguished by the following character combination: leaves mostly patent to shallowly antrorse, narrowly elliptic or occasionally narrowly obovate, adaxially convex to concave, leaf apices long-mucronate and pungent, the mucro 0.5–1.2 mm long; inflorescences spreading, 1–2-flowered; sepals large, 4.5–6.4 mm long, 2.0–3.0 mm wide, glabrous or very shortly and sparsely hairy, obtuse or subacute, without an apiculus; corolla red; corolla tube usually longer than or sometimes ± equal to the sepals, longer than the corolla lobes, internal surface sparsely hairy to *c.* half way or a little below, not or scarcely raised on either side of the decurrent filament bases; ovary 5-locular, glabrous; style scabrous towards the apex; stigma much-expanded; fruit obovoid to narrowly obovoid, smooth above an often rugose gynophore.

Figure 1. *Styphelia altivallis*. A – flowering branchlet *in situ*; B – fruit. Scale bar = 1 mm. Voucher *M. Hislop* 2774 (B). Drawing by Skye Coffey. Photograph by Jolanda Keeble (unvouchered).

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 23 June 1978, *I.R. Clarke s.n.* (NSW, PERTH); 16 May 1998, *M. Hislop* 1048 (NSW, PERTH); 30 Sep. 2002, *M. Hislop* 2774 (PERTH); 7 July 2010, *C. Puente-Lelièvre, M. Hislop & E.A. Brown* CPL 58 (NSW, PERTH).

Distribution and habitat. A short-range endemic from the Warradarge–Eneabba area of the Geraldton Sandplains bioregion. Grows in white sand over laterite in species-rich heath or open woodland.

Phenology. Flowering is between April and June. Mature fruit has been collected at the end of September but is likely to be present at least until November.

Etymology. From the Latin *altus* (high) and *vallis* (a valley), in reference to the property Hi Vallee where the species occurs. Even within the floristically rich Lesueur Sandplains, the bushland on this farming property and eco-retreat is justifiably famous for its beauty and diversity. The name is applied here as a noun in apposition.

Conservation status. To be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). On the basis of current knowledge, it seems likely that this is a very rare plant. Aside from a scattered population on private farmland, the species is only known from a specimen collected in 1978 with the vague locality statement, ‘Eneabba’.

Affinities. In terms of gross morphology, the species most similar to *S. altivallis* is *S. erubescens* F.Muell. The two share a spreading inflorescence, much-enlarged stigma, and a ± dry fruit with a wrinkled gynophore. In addition, and most significantly, they are also the only Western Australian species within the *S. pendula* group to have hairs on the internal corolla surfaces. The most diagnostic differences between the two are as follows: in *S. altivallis* the anthers are either partially exserted (by *c.* 7/8 of their length) from the corolla tube or if fully exserted then only just, with the anther bases *c.* level with the mouth of the tube (*cf.* anthers always well-exserted from corolla tube in *S. erubescens*); fruit bluntly angular in transverse section (*cf.* circular); inner surfaces of corolla tube hairy to about half way or a little below (*cf.* hairy to ovary apex). In addition, most foliar, flower and fruit measurements in *S. altivallis* are close to or beyond the upper limits recorded for *S. erubescens*. Particularly notable in this regard are sepal length (4.5–6.4 mm long, *cf.* 2.6–4.0 mm in *S. erubescens*), anther length (2.2–2.6 mm long, *cf.* 1.5–2.2 mm) and corolla lobe width (1.7–2.0 mm, *cf.* 1.0–1.5 mm).

Flower colour is also informative. Although *S. erubescens* may have pink to red, as well as white flowers, coloured flowers are restricted to the southern part of that species' range. Across the rest of its distribution, including those populations closest to *S. altivallis*, the flowers are apparently always white. *Styphelia altivallis* by contrast has uniformly red flowers. The northernmost known occurrence of *S. erubescens* at Moore River National Park is about 110 km south of the most southerly occurrence of *S. altivallis*.

Styphelia speciosa Hislop, described below, is another member of the *S. pendula* group from the Geraldton Sandplains that frequently has pink to red flowers, and *S. altivallis* occurs within the distribution of that species. *Styphelia speciosa* differs from *S. altivallis* in having a glabrous rather than hairy inner corolla tube, more numerous sterile bracts on the inflorescence axes (4–6, *cf.* 2–3), much smaller sepals (2.0–2.5(3.0) mm long × 0.9–1.2 mm wide, *cf.* 4.5–6.4 mm long × 2.0–3.0 mm wide) and narrower fruit (1.6–2.5 mm wide, *cf.* 3.0–3.5 mm in *S. altivallis*) that are circular rather than bluntly angular in transverse section.

Styphelia erubescens F.Muell., *Fragm.* 6(42): 33 (1867) [*nom. nov.*]; *Leucopogon rubicundus* F.Muell., *Fragm.* 4(27): 102 (1864). *Type citation*: 'In montibus Warriup Hills, Mount Manypeak et Mount Gairdner. Maxw.'. *Type*: Mount Manypeak [Western Australia], *s. dat.*, *G. Maxwell s.n.* (*syn*: MEL 0089105 image!).

Leucopogon racemulosus var. *pauciflorus* Sond. in J.G.C. Lehmann (ed.), *Pl. Preiss.* 1(2): 312 (1845). *Type citation*: 'Huc pertinet specimen Drummondianum sub No. 482 in herb. Shuttleworth. asservatum, alterum Drummondianum a Cl. Alph. DC. mecum communicatum racemulisaxillaribus instructum est. In collectione Preissiana formas intermedias vidi. Intelligitur hanc speciem eodem jure ad sectionem quintam "Axilliflori" accenseri posse'. *Type*: [Western Australia], 1843, *J. Drummond* 482 (*syn*: MEL 0089102A *n.v.*, P 00760601 image!).

Leucopogon rotundifolius var. *oblongatus* Sond. in J.G.C. Lehmann (ed.), *Pl. Preiss.* 1(3): 324 (1845). *Type citation*: 'Crescit ad fluvium Canning. Herb. Preiss. No. 434 (ad sinum regis Georgii herb. Kunth!)'. *Types*: Canning River [Western Australia], 23 July 1839, *L. Preiss* 434 (*syn*: LD 1803425 image!, MEL 1512215 image!, MEL 1512222 image!, MEL 1512223!, S 08-5908 image!); King Georges Sound [Western Australia], *s. dat.*, *L. Preiss s.n.* (*syn*: MEL 2116243!).

Leucopogon oxycedrus var. *brevifolius* Benth., *Fl. Austral.* 4: 219 (1868). *Type citation*: 'Canning River, *Preiss*; Gordon plains, *Maxwell*; also *Drummond*, 5th Coll. n. 309'. *Types*: Canning River [Western Australia], 23 July 1839, *L. Preiss* 434 (*syn*: LD 1803425 image!, MEL 1512215 image!, MEL 1512222 image!, MEL 1512223!, S 08-5908 image!); Gordon Plains [Western Australia], *s. dat.*, *G. Maxwell s.n.* (*syn*: K 000348862 image!); [Western Australia], 1847–1849, *J. Drummond* V: 309 (*syn*: CANB 210963 image!, K000348863 image!).

[*Leucopogon oxycedrus auct. non* Sond.: G. Bentham, *Fl. Austral.* 4: 219 (1868) *p.p.*; F.L.E. Diels & E.G. Pritzel, *Bot. Jahrb. Syst.* 35: 477 (1904); W.E. Blackall & B.J. Grieve, *How to Know W. Austral. Wildfl.* IIIB: 342 (1981); J.W. Green, *Census of the Vascular Plants of Western Australia*, 2nd edn.: 138 (1985); J.R. Wheeler in N.G. Marchant *et al.*, *Fl. Perth Region*: 188 (1987); G. Paczkowska & A.R. Chapman, *The Western Australian flora, a descriptive catalogue*: 239 (2000); J.R. Wheeler in J.R. Wheeler *et al.*, *Fl. South West* 2: 604 (2002).]

Erect *shrubs* to *c.* 90 cm high and 90 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short hairs < 0.1 mm long. *Leaves* helically arranged, mostly shallowly antrorse to shallowly retrorse; apex long-mucronate, pungent, the mucro slightly inflexed to slightly deflexed, 0.6–1.3 mm long; base cuneate to attenuate; petiole 0.6–1.2 mm long, adaxial surface hairy, abaxial surface glabrous, margins usually sparsely hairy; lamina narrowly elliptic to narrowly obovate, 4–15 mm long, 1.8–5.0 mm wide, discolorous, curvature variable, usually convex adaxially with the margins variably recurved, less often flat to slightly concave, longitudinal axis straight to recurved; adaxial surface shiny, usually with some hairs towards the base and with 3–5 obscurely defined veins often evident; abaxial surface paler, glabrous, ± matt, with 5–9 primary veins, ± flat

to openly and shallowly grooved between the veins; margins with minute, antrorse hairs < 0.05 mm long or ± glabrous. *Inflorescence* axillary, spreading at *c.* 45°–120°; axis 1.5–3.6 mm long, 1–3(4)-flowered, with a dense indumentum of short hairs, terete or slightly compressed below the uppermost fertile bract, planoconvex and narrowly winged above, terminating in a bud-rudiment; flowers spreading, subsessile or rather obscurely pedicellate below the bracteoles with a thick pedicel to 0.3 mm long. *Fertile bracts* ovate or broadly ovate, 0.6–1.2 mm long, 0.5–1.0 mm wide, with 2–3 sterile bracts below the lowest fertile bract. *Bracteoles* ovate to depressed-ovate or ± orbicular, 1.2–2.0 mm long, 1.1–1.9 mm wide, obtuse, obscurely to distinctly keeled, not or shortly mucronate; abaxial surface very shortly hairy or glabrous, not striate; margins ciliolate. *Sepals* ovate or narrowly ovate, 2.6–4.0 mm long, 1.2–2.0 mm wide, usually obtuse or occasionally subacute, rarely with a very short apiculus; abaxial surface very shortly hairy mostly in the upper half, less often glabrous, straw-coloured or pink, venation obscure; adaxial surface sparsely hairy in the upper half, glabrous below; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white or various shades of pink to red, cylindrical or sometimes narrowly obovate, longer than the sepals, 4.5–7.1 mm long, 2.0–3.1 mm wide, external surface glabrous, internal surface hairy from the orifice to a point adjacent to the ovary apex, the tissue on either side of the decurrent filament bases not or scarcely raised. *Corolla lobes* white or various shades of pink to red, shorter than the tube, 3.5–4.6 mm long, 1.0–1.5 mm wide at base, erect in basal 1/2–2/3 of their length and then spreading and revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* well-exserted from the corolla tube, but only partially exserted from the erect basal portion of the corolla lobes, 1.5–2.2 mm long, deeply emarginate (as far as the filament connective). *Filaments* terete or somewhat compressed dorsiventrally, 1.7–3.0 mm long, attached to the anther 2/3–3/4 above the anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.4–0.5 mm long, glabrous, truncate. *Ovary* ellipsoid to narrowly ellipsoid, or obovoid to narrowly obovoid, 0.9–1.1 mm long, 0.5–0.8 mm wide, glabrous, 5-locular, very dark green to almost black. *Style* 5.8–10.5 mm long, scabrous at least in the distal half, exserted from the corolla tube and usually also beyond the erect lobe bases, abruptly differentiated from ovary apex; stigma much-expanded and ± 5-lobed. *Fruit* usually obovoid or narrowly obovoid and tapering rather abruptly towards a narrow gynophore, or occasionally narrowly ellipsoid and tapering more gradually towards a relatively broader gynophore, 3.8–5.5 mm long, 1.8–3.2 mm wide, much longer than the sepals, circular in transverse section; surface glabrous, essentially smooth above the gynophore (mesocarp not or very poorly developed); apex ± flat but with rounded shoulders; style shed before maturity. (Figure 2)

Other specimens examined. WESTERN AUSTRALIA: 5.7 km E along Orange Springs Rd from junction with Cowalla Rd, *c.* 50 m along firetrail to S of road, Badgingarra [error: Moore River] National Park, 4 Oct. 1997, *E.A. Brown* EAB 97/188 *& G. Taaffe* (NSW, NY, PERTH, UNSW); Cheyne Beach [S of caravan park along track to Bald Island], 27 Mar. 2006, *G. Byrne* 1824 (PERTH); 550 m along East Pillenorup track, from Chester Pass Rd, Stirling Range National Park, 20 Aug. 1986, *A.R. Chapman* 433 (HO, NSW, PERTH); Lake Ngartiminny, reserve 19203/4138, MacAlinden, 23 Aug. 2006, *R.J. Cranfield* 22538 (PERTH); W side of reserve off O'Connor Rd, 6 km ENE of Daradine, 2 May 1993, *V. Crowley* DKN 589 (PERTH); Cape Riche, 18 Mar. 1997, *R. Davis* 2868 (PERTH); 300 m W of Darkin Rd, 1.7 km S of Qualen Rd, Wandoo Conservation Park, *c.* 39.5 km WSW of Beverley, 11 Sep. 1997, *N. Gibson* 4086 (PERTH); Sheepwash State Forest [NE of Denmark], N boundary, 1.5 km W from boundary with Loc. 5251, 6 July 1994, *B.G. Hammersley* 1080 (PERTH); remnant bushland between Kwinana Fwy and St John of God Hospital, Murdoch, 9 May 1998, *M. Hislop* 1038 (NSW, PERTH); SW corner of block 3307, Clackline Nature Reserve, NE of Bakers Hill, 26 Apr. 1999, *M. Hislop* 1288 (PERTH); *c.* 7 km NW of Nannup on W side of Vasse Hwy, 23 May 1999, *M. Hislop* 1293 (NSW, PERTH); Moore River National Park, firebreak along N boundary adjacent Orange Springs Rd, 1.4 km W of E boundary of park, 17 June 2001, *M. Hislop* 2229 (PERTH); Hamilla Hill Nature Reserve [E of Cranbrook], N boundary firebreak adjacent gravel extraction site, 18 Apr. 2003, *M. Hislop* 2925 (PERTH); Reef Beach Rd, 800 m S of Borden–Bremer Bay Rd, W of Bremer Bay, 19 Apr. 2003, *M. Hislop* 2934 (PERTH); remnant bushland, cnr Wright St and Ranford Rd, Forrestdale, 11 Oct. 2004, *M. Hislop* 3323 (PERTH); Blythe Rd, Yelverton State Forest, 25 km NW of Margaret River, 25 Apr. 1990, *G.J. Keighery* 11310 (PERTH); 2.1 km along unnamed track from intersection of Banksia and Yanchep roads, NE of Yanchep, 3 Oct. 2001, *B. Koch s.n.* (PERTH); *c.* 15 km from Collie on the McAlinden Rd, 7 Aug. 2009, *F. Littleton* FL 106 (PERTH);

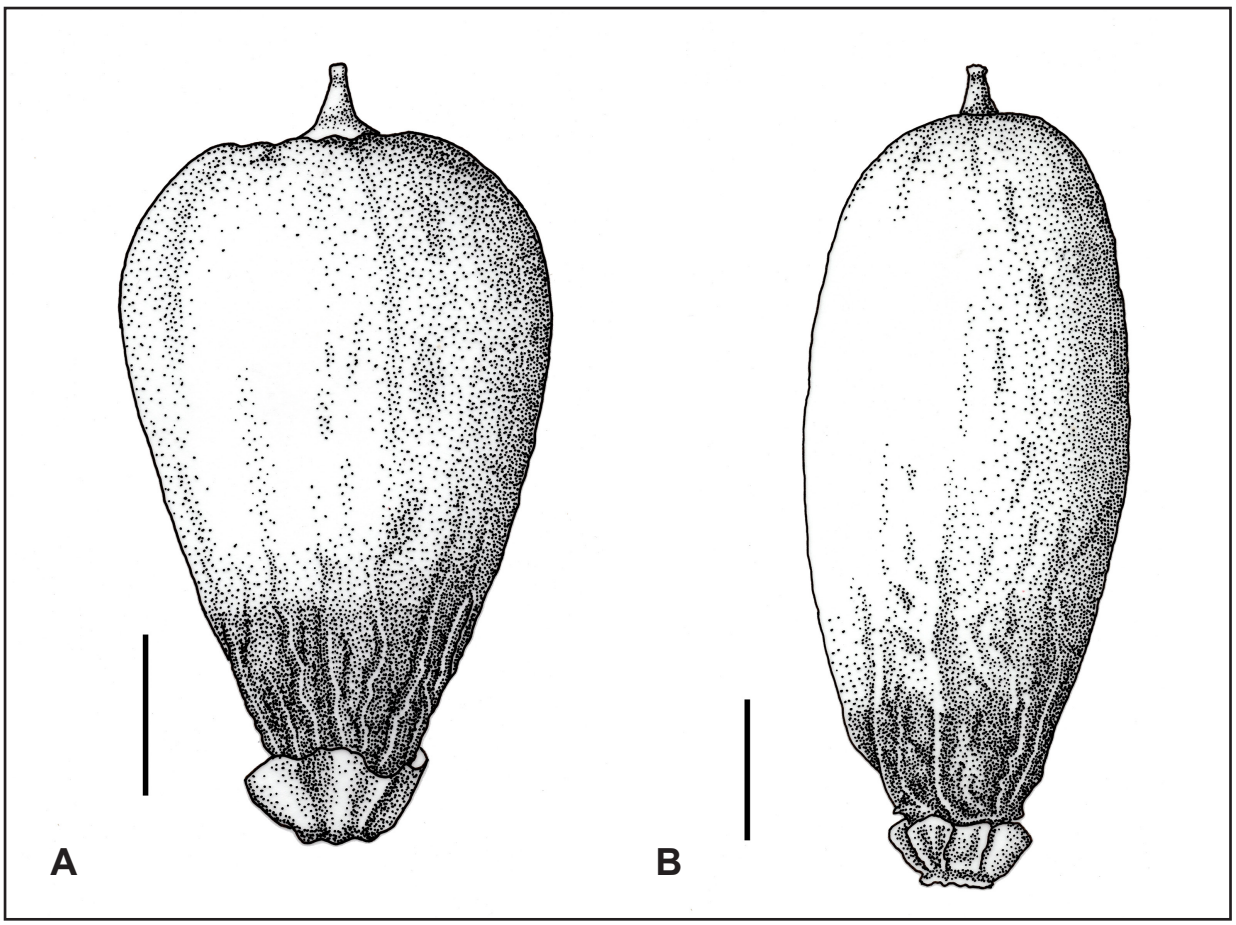

Figure 2. *Styphelia erubescens*. A, B – variation in fruit shape. Scale bars = 1 mm. Vouchers *R.J. Cranfield* 22538 (A), *B. Koch s.n.* (B). Drawings by Skye Coffey.

granite complex, *c.* 10 km S of Schulstaad Rd on Watershed Rd, S of Brookton Hwy, 7 June 1999, *L. Sage, F. Hort & J. Hort* LWS 1484 (CANB, NSW, PERTH); quadrat 2, Mt Martin Regional Botanic Park [E of Albany], *c.* 500 m WNW of Ledge Beach car park, 29 May 1999, *E.M. Sandiford, E. Croxford & P. Foreman s.n.* (PERTH); top of Boulder Hill [near Two People Bay], 2 May 1992, *G. Wardle-Johnson* GWJ 106 (PERTH).

Distribution and habitat. Widely distributed from Moore River National Park south to Augusta and east to near Bremer Bay, and inland as far as York and the Stirling Range; in the Swan Coastal Plain, Jarrah Forest, Warren, Esperance Plains and western edge of the Avon Wheatbelt bioregions. Grows in various forest, woodland or heathland communities, in deep sands, or shallow sandy soils over laterite, granite or quartzite, usually in dry situations but occasionally recorded in winter-wet habitats.

Phenology. The main flowering period is between April and June although many flowering collections have been made outside of that period, at least as late as August. Most fruiting collections have been made between August and October.

Conservation status. Widespread and locally common across a large area of the lower south-west of Western Australia. No conservation coding is recommended.

Notes. *Styphelia erubescens* is one of the most widespread and distinctive species in the *S. pendula* group. Until the recently published nomenclatural changes of Crayn *et al.* (2020) it had been generally referred to *Leucopogon oxycedrus* Sond. However, that had been a misapplication of the name as the type of that species is the plant now referrable to *S. nitens* Sleumer, previously known as *Leucopogon nutans* E.Pritz. Among its congeners *S. erubescens* can be readily identified by the following morphological features:

inflorescences spreading; stigma much expanded; internal corolla tube hairy from the orifice to the ovary apex; anthers well-exserted from the corolla tube; drupe more or less dry with a well-defined gynophore. In the far south of the species' range the corolla colour may be either white or various shades of pink to red (these frequently mixed in the same population), further north it is apparently always white.

Across the species' geographic range there is considerable variation in regard to leaf size and curvature, corolla size and colour, presence/absence of a short indumentum on bracteoles and sepals and fruit shape. With one possible exception the pattern of variation is overlapping in nature and not amenable to the recognition of segregate taxa. The most distinctive variant occurs in the north-west of the species' range, on the coastal plain from the south of Perth to Moore River National Park. Across most of its distribution *S. erubescens* has a fruit that is obovoid or narrowly obovoid in shape and which tapers, often abruptly, towards a much narrower gynophore. The coastal plain variant differs from this in having the fruit narrowly ellipsoid to narrowly obovoid and tapering more gradually to a relatively broader gynophore. In addition, it always has glabrous bracteoles and sepals whereas at least the sepals are usually shortly hairy in the upper half away from the coastal plain. Whether this variant warrants taxonomic recognition is a question best addressed with reference to molecular data.

Typification. In his protologue for *Leucopogon rubicundus*, Mueller (1864) gave three locations for *Maxwell* collections that he nominated as types for his new species: the Warriup Hills, Mount Manypeak and Mount Gardner. So far only the Mount Manypeak syntype has been accounted for.

Styphelia innoxia Hislop, *sp. nov.*

Type: near Harrismith, Western Australia [precise locality withheld for conservation reasons], 15 June 2022, *M. Hislop* 4897 (*holo*: PERTH 09544437; *iso*: CANB, CNS, K, MEL, NSW).

Erect, rather open *shrubs* to *c.* 120 cm high and 100 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of very short, patent hairs < 0.05 mm long. *Leaves* helically arranged, variably retrorse; apex obtuse to acute, with or without a poorly defined, innocuous mucro, to 0.2 mm long; base cuneate to ± cordate; petiole 0.2–0.5 mm long, adaxial surface hairy, abaxial surface glabrous, margins glabrous or very sparsely hairy; lamina narrowly obovate to obovate, 3.5–8.0 mm long, 2.2–3.8 mm wide, slightly discolorous, ± glaucous when young, convex adaxially, the margins variably recurved, longitudinal axis ± straight to distinctly recurved in the upper half; adaxial surface shiny at maturity, glabrous or shortly hairy towards the base, the venation usually not evident; abaxial surface slightly paler, glabrous, ± matt, with 5–7 primary veins, ± flat between the veins; margins either with very short, stiff, antrorse hairs < 0.05 mm long or ± glabrous. *Inflorescence* axillary, pendulous; axis 1.0–4.5 mm long, 1–2-flowered, with a sparse to moderately dense indumentum, terete below the uppermost fertile bract, planoconvex above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a thick pedicel 0.3–0.7 mm long. *Fertile bracts* broadly ovate to depressed-ovate, 0.5–0.7 mm long, 0.5–0.8 mm wide, with 2–4 sterile bracts below the lowest fertile bract. *Bracteoles* transversely elliptic to depressed ovate, 0.7–1.2 mm long, 1.0–1.4 mm wide, obtuse to subacute, obscurely keeled, not or very shortly mucronate; abaxial surface glabrous, ± striate; margins minutely ciliolate. *Sepals* ovate, 2.0–2.5 mm long, 1.0–1.3 mm wide, obtuse to acute, with or without a short apiculus; abaxial surface glabrous, cream or straw-coloured, often with pink tinges in fruit, venation very obscure; adaxial surface sparsely hairy towards the apex; margins minutely ciliolate with hairs < 0.05 mm long. *Corolla tube* white, narrowly ellipsoid to ± cylindrical, longer than the sepals, 3.5–4.2 mm long, 2.0–2.4 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases not or scarcely raised. *Corolla lobes* white, shorter than to equal to the tube, 2.7–4.0 mm long, 1.0–1.2 mm wide, erect in basal 2/3 of their length and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of ± flattened, twisted and ornamented hairs. *Anthers* fully exserted from corolla tube, but not beyond the erect, basal portion of the corolla lobes, 1.7–2.3 mm long, distinctly emarginate. *Filaments* terete, 1.0–1.2 mm long, attached to the anther *c.* 1/2 above anther base or a little below, adnate to the tube just below the sinuses. *Nectary* annular, 0.4–0.5 mm long, glabrous, lobed. *Ovary* ellipsoid to ovoid, 0.7–

1.0 mm long, 0.6–0.7 mm wide, glabrous, 5-locular, very dark green to almost black. *Style* 5.2–6.5 mm long, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not or barely expanded. *Fruit* broadly ellipsoid to globose, 3.0–4.0 mm long, 2.0–3.4 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, rugose at maturity (mesocarp well-developed); apex rounded; style mostly shed before maturity, usually breaking a little above the base. (Figure 3)

Diagnostic characters. Within the *S. pendula* group, distinguished by the following character combination: leaves variously retrorse, narrowly obovate to obovate, adaxially convex, leaf apices obtuse to acute, with or without a poorly defined mucro to 0.2 mm long; inflorescence pendulous, 1–2-flowered; sepals glabrous, obtuse to acute, with or without a short apiculus; corolla white; corolla tube longer than the sepals, longer than or equal to the lobes, internal surface glabrous, not or scarcely raised on either side of the decurrent filament bases; ovary 5-locular, glabrous; style glabrous and smooth; stigma not or barely expanded; fruit broadly ellipsoid to globose, rugose.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 6 June 2004, *M. Hislop* 3245 (CANB, CNS, PERTH); 6 Oct. 2013, *M. Hislop* 4287 (PERTH); 28 Oct. 2021, *M. Hislop* 4875 (CANB, CNS, PERTH); 18 May 2021, *F. Hort & J. Hort* FH 4227 (CANB, PERTH); 27 May 2000, *G. Warren* 385 B (MEL, PERTH).

Distribution and habitat. Known from two rather disjunct localities, west of Highbury and south-west of Harrismith, in the south of the Avon Wheatbelt bioregion. At these localities it occurs in heath or woodland over a variety of substrates: sandy loam over either laterite or granite, at the base of lateritic breakaways and in clay-loam, possibly over quartzite.

Figure 3. *Styphelia innoxia*. A – flowering branchlet *in situ*; B – fruit. Scale bar = 1 mm. Vouchers *M. Hislop* 3245 (A), *M. Hislop* 4287 (B). Drawing by Skye Coffey. Photograph by Michael Hislop.

Phenology. Flowering collections have been made in May and June, and those with mature fruit in October.

Etymology. From the Latin *innoxius* (harmless), a reference to the lack of pungent leaf mucros in this species, in contrast to its probable close relatives in the *S. pendula* group.

Conservation status. To be listed as Priority Two under Conservation Codes for Western Australian Flora (Tanya Llorens pers. comm.). The two known occurrences of the species are about 50 km apart, one is in state forest and the other a nature reserve. At both localities the species is reasonably common. It likely also occurs somewhere in the intervening country between these two population centres, and ideally reserves in the area should be surveyed for its presence.

Affinities. Although not included in the phylogeny of Puente-Lelièvre *et al.* (2016) this species shares all key attributes of the *S. pendula* group and would therefore key out at the second lead of couplet 11 in the recently published interim key to species groups in Western Australian *Styphelia* Sm. (Hislop 2021b). Within that group it is most likely to be confused with either *S. retrorsa* Hislop, Crayn & Puente-Lel., a species that is disjunctly distributed to the north (refer below for details), or *S. inframediana* Hislop that has a more southerly distribution between Denmark, Albany and the Stirling Range. *Styphelia innoxia* differs most obviously from both these species in lacking long-mucronate, pungent leaf apices. From *S. retrorsa* it also differs in having a 1- or less often 2-flowered inflorescence (*cf.* (1)2–5-flowered in *S. retrorsa*). It can be further distinguished from *S. inframediana* in its broadly ellipsoid to globose fruit (*cf.* broadly obovoid to ellipsoid), generally wider leaves, 2.2–3.8 mm wide (*cf.* 1.0–2.5 mm), longer corolla tubes, 3.5–4.2 mm long (*cf.* 1.6–2.2(2.5)) and corolla lobes that are shorter than to equal to the corolla tube (*cf.* always longer than the tube in *S. inframediana*).

Two other members of the *S. pendula* group, *S. dielsiana* (E.Pritz.) Sleumer and *S. concinna* (Benth.) F.Muell. are similar to *S. innoxia* in that they also have retrorse leaves, pendulous inflorescences and often lack long-mucronate, pungent leaf tips (always absent in the former, present or absent in *S. concinna*). Both of these species occur in the same general area as *S. innoxia*. *Styphelia innoxia* differs from *S. concinna* in having the 5-locular fruit typical of the *S. pendula* group (rather than 3(4)-locular) and a globose to broadly ellipsoid (rather than narrowly ellipsoid to ± cylindrical) fruit. *Styphelia dielsiana* can be distinguished from *S. innoxia* by its consistently shorter leaves (to *c.* 3 mm long, *cf.* 3.5–8 mm in *S. innoxia*) that are ± retrorse-appressed (*cf.* variably retrorse but never retrorse-appressed in *S. innoxia*) and by its narrowly ellipsoid or ± cylindrical, rather than globose to broadly ellipsoid fruit.

Styphelia longiloba Hislop, *sp. nov.*

Type: close to Coalmine Beach, on track to Walpole, [Western Australia], 30 March 2021, *M. Hislop* 4848 (*holo*: PERTH 09332138; *iso*: CANB, CNS, K, MEL, NSW).

Erect *shrubs*, to *c.* 100 cm high and 70 cm wide, but usually smaller, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short hairs < 0.05 mm long, or sometimes ± glabrous. *Leaves* helically arranged, mostly steeply antrorse; apex obtuse to acute, a broad callus or innocuous mucro, to 0.4 mm long; base attenuate or cuneate; petiole 0.5–1.2 mm long, adaxial surface hairy, abaxial surface and margins glabrous; lamina very narrowly elliptic to very narrowly obovate (when margins recurved) or linear to very narrowly obtriangular (when margins revolute), 3.0–9.0 mm long, 0.5–1.8 mm wide, the margins variably recurved to revolute, longitudinal axis ± straight to slightly recurved; adaxial surface shiny, glabrous or with a few hairs towards the base, venation usually not evident; abaxial surface, glabrous, ± matt, with 5–7 primary veins, ± flat or very shallowly and openly grooved between the veins; margins glabrous or very occasionally with sparse apical hairs. *Inflorescence* axillary, pendulous; axis 2.0–9.0 mm long, 1–2(3)-flowered, glabrous or very occasionally with sparse hairs, terete below the uppermost fertile bract, planoconvex and ± winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles with a thick pedicel, 0.4–1.0 mm long. *Fertile bracts* ovate or broadly ovate, 0.5–0.6 mm long, 0.4–0.6 mm wide,

with 2–5 sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate, transversely elliptic, to ± orbicular, 0.8–1.1 mm long, 0.8–1.1 mm wide, obtuse, keeled, not or very shortly mucronate; abaxial surface glabrous, not or scarcely striate; margins ciliolate. *Sepals* narrowly ovate, 1.4–2.3 mm long, 0.8–1.1 mm wide, acute or subacute, with or without a short apiculus; abaxial surface glabrous, straw-coloured, venation obscure; adaxial surface hairy in the distal half, glabrous below; margins ciliolate with hairs < 0.05 mm long. *Corolla tube* white, broadly obovoid, depressed-obovoid or depressed-obconic, usually as wide or wider than long, equal to or slightly longer than the sepals, 1.3–2.0 mm long, 1.3–2.0 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases slightly raised, but lower than or ± equal to the filament bases themselves. *Corolla lobes* white, always longer than the tube, 2.2–3.6 mm long, 0.7–1.0 mm wide at base, erect in *c.* basal 2/3 of their length and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs, the hairs particularly dense in the lower half and usually projecting conspicuously into the top of the tube. *Anthers* partially exserted from the corolla tube (by *c.* 7/8 of their length) or sometimes fully exserted (with anther base level with top of the tube), 1.3–2.2 mm long, emarginate, usually partially obscured by the dense corolla lobe hairs. *Filaments* terete, 0.4–1.0 mm long, attached to the anther 1/3–1/2 above anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, variably lobed to ± truncate. *Ovary* ellipsoid or ovoid, 0.6–1.0 mm long, 0.4–0.6 mm wide, glabrous, 5-locular, very dark green to ± black. *Style* 2.9–4.0 mm long, 0.15–0.2 mm wide, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, abruptly differentiated from ovary apex; stigma not expanded. *Fruit* narrowly obovoid, 3.8–6.0 mm long, 2.2–2.3 mm wide, much longer than the sepals, circular in transverse section, with a well-defined gynophore; surface glabrous, smooth above the gynophore; apex rounded; style shed before maturity. (Figure 4A, B)

Diagnostic characters. Within the *S. pendula* group distinguished by the following character combination: leaves mostly steeply antrorse, very narrowly elliptic to very narrowly obovate, when margins recurved, or linear to very narrowly obtriangular when margins revolute, convex adaxially with the margins variably recurved to revolute, leaf apices with a broad callus or innocuous mucro, to 0.4 mm long; inflorescences pendulous, 1–2(3)-flowered; sepals glabrous, acute or subacute, with or without a short apiculus; corolla white; corolla tube equal to or slightly longer than the sepals, much shorter than the lobes, internal surface glabrous, raised into longitudinal ridges on either side of the decurrent filament bases that are lower than or of ± equal elevation to the filament bases themselves; ovary 5-locular, glabrous; style glabrous and smooth, 0.15–0.2 mm wide; stigma not expanded; fruit narrowly obovoid, mostly smooth above a well-defined gynophore.

Other specimens examined. WESTERN AUSTRALIA: Walpole–Nornalup National Park, 27 Apr. 1988, *A.R. Annels* 274 (PERTH); 7.1 km S of Wallace Rd on South Western Hwy, N of Walpole, 22 May 2001, *R.J. Cranfield* 16384 (PERTH); Forest Reserve, Spencer Rd, 5 km W of Narrikup, 24 Apr. 1996, *E.J. Croxford* 7356 (PERTH); Speedway Reserve, Reddale Rd, off Albany Hwy, Albany, 25 Aug. 1996, *E.J. Croxford* 7365 B (PERTH); Mooliarup Rd, near Orana Farm, off Takalarup Rd, 25 km NNE of Albany, 11 Apr. 2000, *E.J. Croxford* 8286 (PERTH); 27.3 miles [*c.* 44 km] from Walpole–Shannon River, 3 May 1972, *H. Demarz* 3750 (PERTH); BCRC site 12, Rate Forest Block, Romance Rd [Mt Roe National Park, N of Denmark], 11 Oct. 2007, *C.P. Dornan* 545 (PERTH); Torbay, W of Albany, May 1903, *W.V. Fitzgerald s.n.* (PERTH); 28 miles [*c.* 45 km] SE of Shannon, 24 Apr. 1962, *A.S. George* 3697 (CNS, PERTH); E side of South Western Hwy, 2.25 km S of Deeside Coast Rd intersection [Shannon National Park, E of Northcliffe], 7 May 1991, *N. Gibson & M. Lyons* 722 (PERTH); Kangaroo Rd, 2.2 km E of Collis Rd [N of Walpole], 7 May 1991, *N. Gibson & M. Lyons* 733 (PERTH); Stirling Range National Park, Formby Rd South, 4.6 km N of Chester Pass Rd, 22 Apr. 2005, *M. Hislop* 3428 (CANB, CNS, MEL, PERTH); Stirling Range National Park, Formby Rd South, 4.6 km N of Chester Pass Rd, 31 Aug. 2005, *M. Hislop* 3491 (PERTH); Denmark–Mount Barker Rd, 13.8 km N of Albany–Denmark Rd, 18 Apr. 2003, *F. Hort & J. Hort* 1968 (CANB, CNS, PERTH); vicinity of Mt Pingerup track, Walpole, 21 Apr. 1989, *W. Jackson* BJ 101 (PERTH); 6 km W of Redmond, NW of Albany, 9 May 1986, *G.J. Keighery* 8074 (PERTH); Crowea State Forest approx. 1 km from junction with Crowea Rd and 3 km from junction with Datchett Rd, on Orchard [?Orchid] Rd [SE of Pemberton], 14 May 2006, *C. Perry* 35 (PERTH);

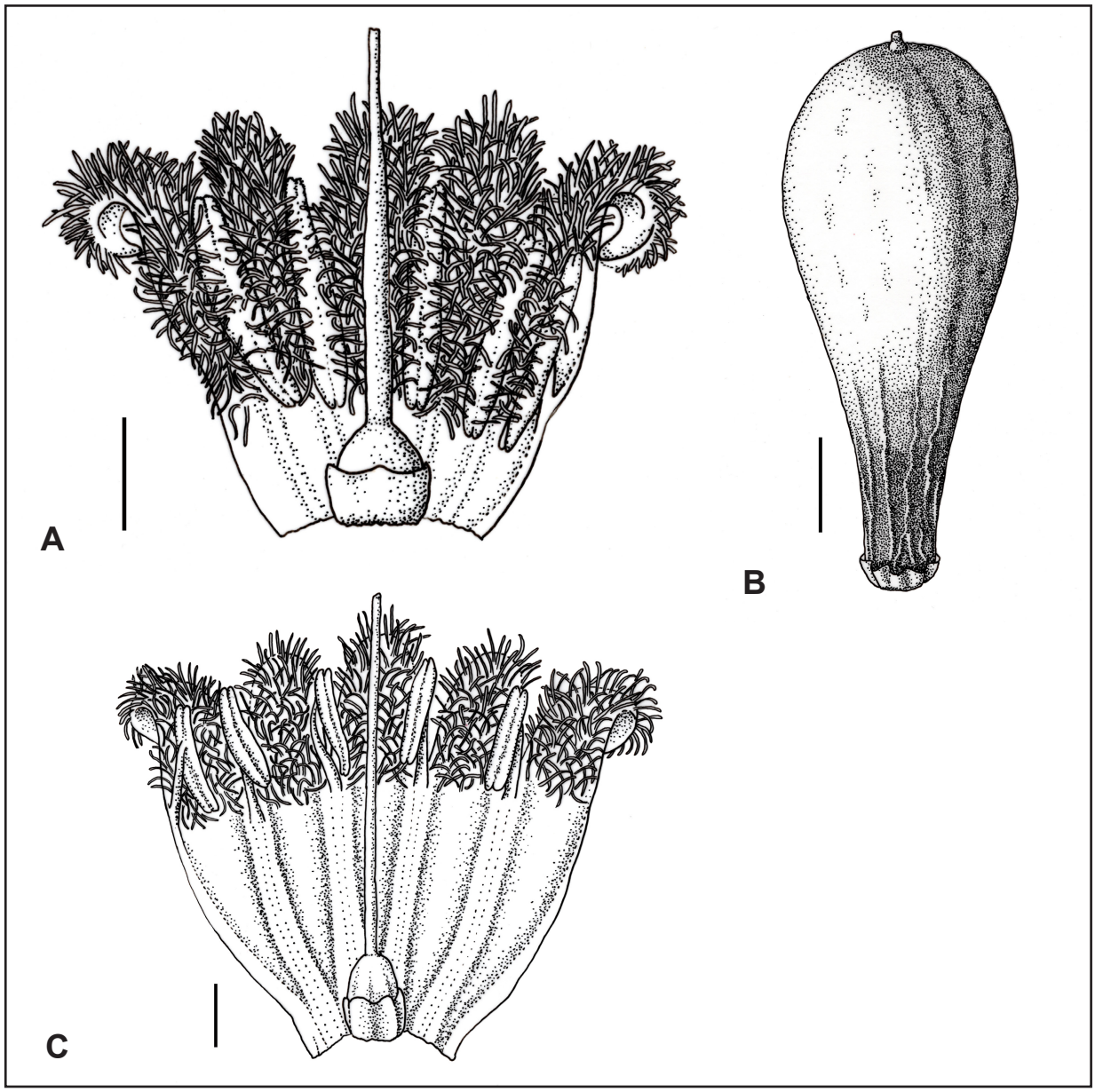

Figure 4. *Styphelia longiloba*. A – corolla, internal view; B – fruit. *Styphelia pendula*. C – corolla, internal view. Scale bars A–C = 1 mm. Vouchers *F. Hort & J. Hort* 1968 (A), *M. Hislop* 3491 (B), *M. Hislop* 3300 (C). Drawings by Skye Coffey.

entrance of road to Mt Trio track, Stirling Range National Park, 22 July 1982, *J.M. Powell* 1917 (CANB, K, L, NSW, PERTH); site 135, ENE off Angrove Rd [N of Walpole], 24 Aug. 1997, *K.A. Redwood* 389 (PERTH); climbing path, summit of Mt Toolbrunup, Stirling Range National Park, Mar. 1966, *F.A. Spratt* 20 (PERTH).

Distribution and habitat. Distributed from south of Pemberton eastwards to Albany and north to the Stirling Range; in the Warren, far south of the Jarrah Forest and far west of the Esperance Plains bioregions. Occurs in forest, woodland and heath, in sandy soils, most often in winter-wet but sometimes also dry habitats.

Phenology. Flowering is between March and June with a peak in April and May. Mature fruit has been collected between August and October.

Etymology. From the Latin *longus* (long) and *lobus* (lobe), a reference to the long corolla lobes, relative to the tube length, which is a notable feature of the species.

Conservation status. Fairly widely distributed in a part of Western Australia that has generally good coverage of native vegetation and also known to be well represented on the conservation estate. No conservation coding is recommended.

Affinities. *Styphelia longiloba* has hitherto been confused with *S. pendula*, a species with which it is sympatric across its range except for in the Stirling Range. When flowering the two can be readily distinguished on the basis of differences in the size and shape of the corolla tubes, in the relative proportions of the tubes to the corolla lobes, and of the tubes to sepal length. *Styphelia longiloba* has corolla tubes that are equal to or slightly longer than the sepals and always much shorter than the corolla lobes; the tubes are broadly obovoid, depressed-obovoid or depressed-obconic in shape, 1.3–2.0 mm long and 1.3–2.0 mm wide, and usually as wide or wider than long. By contrast in *S. pendula* the corolla tubes are always longer than the sepals (usually markedly so) and mostly longer than the lobes (occasionally slightly shorter); the tubes are obovoid, broadly obovoid or ± obconic, and are 2.3–3.7 mm long, 2.1–2.6 mm wide, and always longer than wide. The corolla lobes also include other useful differentiating features. The lobes of *S. longiloba* are narrower than those of *S. pendula* (0.7–1.0 mm wide at base compared to 1.1–1.4 mm wide in *S. pendula*) and are noticeably more densely hairy in the lower half with the hairs often obscuring the anthers and projecting conspicuously into the tube.

Other differences between the species are those of style width and the attachment point of filament to anther. The styles of *S. longiloba* are noticeably broader than those of *S. pendula*, being 0.15–0.2 mm wide as measured 1 mm above the ovary, compared to *c.* 0.1 mm in *S. pendula*. And where the filaments are attached to the anthers about a third to halfway above the anther base in *S. longiloba*, in *S. pendula* the attachment point is halfway to two-thirds above the base, but mostly above halfway. There is also a difference in flowering time between the two, with little overlap. *Styphelia longiloba* flowers between March and June (mostly in April and May). While flowering in *S. pendula* has been recorded over many months of the year (between May and November), the period July to September is when most flowering collections have been made.

Aside from the fact that the two species have substantially overlapping distributions, the most likely reason that *S. longiloba* has remained unrecognised for so long is because in its foliar and fruiting characters it is almost indistinguishable from *S. pendula*. The only partial difference in vegetative character is that while there is a variant of *S. pendula* that has pungent, long-mucronate leaf tips, in *S. longiloba* the leaf tips are always innocuous. Fruiting specimens can only be distinguished if style remnants are present (which they frequently are), these being broader in *S. longiloba* as detailed above. Time of collection also has some utility. Specimens with mature fruit collected in the period August to October are much more likely to be *S. longiloba*. Still, this does mean that sterile specimens, those in early bud, as well as some in fruit, cannot be confidently assigned to either species.

Notes. A lone specimen from the western Stirling Range (*S. Barrett* 1481) is not typical of *S. longiloba*, which is known to occur sporadically towards the east of the range. Its floral morphology is somewhat intermediate between *S. longiloba* and *S. pendula.* The corolla tube is markedly longer than the sepals and at *c.* 2.5 mm long is considerably longer than has been recorded for *S. longiloba*, but the corolla lobes (*c.* 3.0 mm) are significantly longer than the tube and beyond the size range recorded for *S. pendula*. Other critical features, those of style width (barely wider than 0.1 mm), corolla lobe width (*c.* 1.2 mm) and the relatively sparse hairs towards the base of the corolla lobes suggest *S. pendula*. The latter species has not otherwise been recorded from the Stirling Range and pending further collections from that area the specimen is referred to *S. aff. pendula*.

Ernst Pritzel described *Leucopogon pendulus* var. *robustus* from material that he and his colleague Ludwig Diels collected near the settlement of Serpentine. Since those type collections were made in May 1901 the only specimens (*P. Foreman & G. Smith* 607; *M. Hislop* 4274) closely matching them have come from a single, small reserve near Pinjarra, about 35 km south of Serpentine. The morphology of the type does not closely match either that of *S. longiloba* or *S. pendula*, having some floral attributes of each and with a somewhat different fruit character to either. It combines corolla proportions (tube *c.* 2.3 mm long,

lobes *c.* 3.3 mm) and style width (0.2 mm) more like those of *S. longiloba* with the filament to anther attachment point (*c.* 2/3 up the anther), corolla lobe width (1.2 mm) and longer style (*c.* 5 mm long) of *S. pendula*. The fruit shape is obovoid-ellipsoid with the widest part of the fruit extending further into the central portion than in the typical, narrowly obovoid fruit of *S. longiloba* and *S. pendula*. The fruit width is also greater (up to 2.8 mm wide) than recorded in either species. The area of its occurrence represents a significant outlier in the distributions of both *S. longiloba* and *S. pendula*. It is closest geographically to disjunct populations of *S. pendula* in the northern Darling Range but bears no close resemblance to plants from that area which are quite typical for that species.

While at this stage I consider *L. pendulus* var. *robustus* a name of uncertain application there is certainly a case for its recognition as a distinct taxon. However, given the paucity of material and the rather subtle nature of the differences that have been identified here it seems prudent to seek to confirm their consistency with material from other populations. A potential problem with this approach is the fact that there is relatively little conserved bushland remaining in the Serpentine–Pinjarra area of the Swan Coastal Plain and what remains is often badly degraded by environmental weeds and the presence of the root-rot pathogen, *Phytophthora cinnamomi*. The optimum taxonomic placement of the var. *robustus* morphotype is probably best determined with reference to genomic data.

Styphelia pendula (R.Br.) Spreng., *Syst. Veg.*, ed. 16 1: 657 (1824); *Leucopogon pendulus* R.Br., *Prodr.*: 545 (1810). *Type citation*: '(M.) *v.v.*'. *Type*: King George Sound [Albany, Western Australia], December 1801, *R. Brown s.n.* (*syn*: BM 000907506!, BM 000907507!, G 00455447 image!, K 000348780 image!, K 000348781 image!, MEL 1513050!, P 00760591 image!, P 00760592 image!).

Leucopogon secundiflorus Sond. in J.G.C. Lehmann (ed.), *Pl. Preiss.* 1(2): 320 (1845). *Type citation*: 'Ad sinum regis Georgii leg. cl. Preiss. (King George's Sound, Hügel! New South Wales, Fraser!'. *Types*: King George's Sound [Albany, Western Australia], *s. dat.*, *L. Preiss s.n.* (*syn*: *n.v.*); King George's Sound [Albany, Western Australia], 1837 [January 1834], *C.A.A.F. Hügel s.n.* (*syn:* K 000348779 image!); 'New South Wales' [?Western Australia], *s. dat.*, *C. Fraser s.n.* (*syn*: MEL 89129 image!).

Erect *shrubs* to *c.* 100 cm high and 80 cm wide, but usually smaller, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of short hairs < 0.05 mm long. *Leaves* helically arranged, variably antrorse, mostly steeply so; apex variable, obtuse to acute, either a broad callus or clearly mucronate with an innocuous mucro to 0.4 mm long, occasionally the mucro longer, sharply pungent and up to 0.8 mm long; base attenuate, cuneate or rounded; petiole 0.4–1.0 mm long, adaxial surface hairy, abaxial surface glabrous, margins usually glabrous; lamina very narrowly elliptic to very narrowly obovate (when margins recurved) or linear to very narrowly obtriangular (when margins revolute), 3.0–11 mm long, 0.5–1.8 mm wide, discolorous, convex adaxially, the margins variably recurved to revolute, longitudinal axis slightly incurved to slightly recurved; adaxial surface shiny, glabrous or with a few hairs towards the base, venation usually not evident; abaxial surface paler, glabrous, ± matt, with 5–7 primary veins, ± flat or very shallowly and openly grooved between the veins; margins glabrous. *Inflorescence* axillary, pendulous; axis 1.8–6.0 mm long, 1–2(3)-flowered, glabrous or with a sparse, very short indumentum, terete below the uppermost fertile bract, planoconvex and often ± winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles with a thick pedicel, 0.4–1.0 mm long. *Fertile bracts* broadly ovate or ovate, 0.5–0.8 mm long, 0.5–0.6 mm wide, with 2–4 sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate, depressed-ovate to transversely elliptic, 0.7–1.0 mm long, 0.8–1.2 mm wide, obtuse, keeled, usually very shortly mucronate; abaxial surface glabrous, not or scarcely striate; margins ciliolate. *Sepals* ovate or narrowly ovate, 1.7–2.4 mm long, 0.9–1.3 mm wide, acute to obtuse, with or without a short apiculus; abaxial surface glabrous, straw-coloured, venation obscure; adaxial surface hairy in the distal half, glabrous below; margins ciliolate with hairs < 0.05 mm long. *Corolla tube* white, obovoid, broadly obovoid or ± obconic, longer than the sepals, 2.3–3.7 mm long, 2.1–2.6 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases raised into longitudinal ridges ± equal to, or more often distinctly higher than, the filament bases themselves. *Corolla lobes* white, usually shorter than or occasionally slightly longer than the tube, 2.0–2.7 mm long, 1.1–1.4 mm wide at

base, erect in basal 1/2–2/3 of their length and then spreading and recurved to revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and scarcely ornamented hairs. *Anthers* usually partially exserted from corolla tube (by *c.* 3/4–7/8 of their length) or sometimes fully exserted (with anther base level with top of the tube), 1.2–1.9 mm long, emarginate, not obscured by corolla lobe hairs. *Filaments* terete, 0.8–1.0 mm long, attached to the anther 1/2–2/3 (but usually > 1/2) above anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, variably lobed. *Ovary* ellipsoid or narrowly ellipsoid, 0.7–1.0 mm long, 0.5–0.7 mm wide, glabrous, 5-locular, very dark green to ± black. *Style* 3.5–5.0 mm long, *c.* 0.1 mm wide, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, abruptly differentiated from ovary apex; stigma not expanded. *Fruit* narrowly obovoid, 4.2–6.0 mm long, 1.7–2.2 mm wide, much longer than the sepals, circular in transverse section, with a prominent narrow gynophore; surface glabrous, smooth above the gynophore or sometimes with some longitudinal ridges immediately above it; apex rounded; style shed before maturity. (Figure 4C)

Other specimens examined. WESTERN AUSTRALIA: cnr Lejune and Seaton Ross roads [S of Bridgetown], 15 Sep. 1993, *A.R. Annels* ARA 3623 (NSW, PERTH); Gull Rock Rd in Gull Rock National Park [E of Albany], 6 Aug. 2011, *G. Byrne* 4157 (PERTH); track into Perup Nature Cottages, Perup Nature Reserve [E of Manjimup], 15 Aug. 2018, *G. Byrne* 6890 (PERTH); Lake Ngartiminny, Reserves 19203/4138, MacAlinden, 23 Aug. 2006, *R.J. Cranfield* 22593 (PERTH); Mt Melville, Albany, 6 June 1999, *P. Foreman* 49 (PERTH); 12.5 km W of Frankland R [River], Muir Hwy [W of Rocky Gully], 2 Nov. 1977, *A.S. George* 15025 (PERTH); transect 3, Lake Pleasant View on S side of lake, *c.* 35 km NE of Albany, 2 Oct. 2001, *N. Gibson* 3873 (PERTH); Granite Rd, *c.* 3 km N of Denmark River [N of Denmark], 26 Sep. 2000, *B.G. Hammersley* 2658 (PERTH); environs of Fernhook Falls campsite on Deep River, NW of Walpole, 2 Sep. 2005, *M. Hislop* 3506 (NSW, PERTH); summit of Mt Pingerup, NW of Walpole, 2 Sep. 2005, *M. Hislop* 3508 (NSW, PERTH); 150 m S along Tailing Rd which intersects with Mordalup Rd, 3.1 km E of Tone River crossing, W of Frankland, 23 Aug. 2008, *M. Hislop* 3817 (CANB, PERTH); Mt Barker hill, close to summit, near Mt Barker township, 9 May 2009, *M. Hislop* 3876 (CANB, PERTH); Water Reserve 23229/1255, Canning River East Branch, Brookton Hwy, S side of river *c.* 750 m SW of Omeo Rd, 19 July 2005, *F. & B. Hort* 2533 (AD, K, PERTH); Millinup Rd, Porongurup National Park, 35 km NNE of Albany, 9 July 1986, *G.J. Keighery* 8162 (PERTH); McAffee Creek crossing, Jalbarragup Rd [W of Nannup], 4 Sep. 2008, *G.J. & B.J. Keighery* 1371 (AD, MEL, PERTH); C. Milton's property, 3 km S of Mt Barker, 25 Oct. 1977, *K.F. Kenneally* 6501 (PERTH); Collie basin, 26 Jan. 1982, *J. Koch* CJK 598 (PERTH); *c.* 16 km SSW of Busselton, 31 May 1995, *B.J. Lepschi* 1860 (BRI, CANB, NY, PERTH); *c.* 7 km out of Collie travelling to Cardiff, 5 Nov. 2008, *F. Littleton* 97 (PERTH); Nuyts Wilderness, Walpole–Nornalup National Park, *c.* 1.5 km ENE of Mt Hopkins, 27 Aug. 2005, *E.D. Middleton* EDM 720 (PERTH); Long Swamp area, 4.6 km W from S end of Scott River Rd [E of Augusta], 24 Aug. 1986, *J.M. Powell* 2628 (BRI, MO, NSW, NY, PERTH); Mt Manypeaks, E ridge track, 27 Aug. 1986, *J.M. Powell* 2666 (CANB, CHR, NSW, PERTH); 1.1 km NW of Shannon River bridge on South-Western Hwy, 10 Nov. 1985, *J.M. Powell* 3114 (NSW, NY, PERTH); Gnarawary Rd, between Margaret River and Witchcliffe, 2 July 1998, *J. Scott* 11 (PERTH); 24 km SE of Pemberton on road to Northcliffe, 1 Oct. 1967, *P.G. Wilson* 6293 (CANB, PERTH).

Distribution and habitat. Widely distributed from Augusta to Collie, south to Mount Barker and then eastwards in near coastal localities to Mt Manypeaks, with an apparent outlier in the northern Darling Range south-east of Kelmscott; in the Jarrah Forest, Swan Coastal Plain and Warren bioregions. Occurs in a variety of plant communities in sand or light loam soils, in both winter-wet and dry habitats.

Phenology. Flowers have been recorded between May and November, with a peak between July and September. Mature fruit has similarly been collected over an extended period between September and January.

Conservation status. Widespread and locally common. No conservation coding is recommended.

Notes. Among its congeners *S. pendula* is usually readily distinguished by the following morphological

features: erect, narrow leaves with mostly non-pungent apices and often strongly recurved margins; inflorescences pendulous, corolla tubes that are always significantly longer than the sepals and usually longer than the corolla lobes; filaments usually attached to the anthers about two-thirds above the anther base; stigma unexpanded; fruit narrowly obovoid with a well-defined gynophore.

Typification. The type collections of *S. pendula* were made by Robert Brown close to Albany in December 1801. These specimens are fruiting-only and as described above, *S. pendula* is very similar to *S. longiloba* in the fruiting condition. Because the latter species also occurs in the vicinity of Albany it is necessary therefore to confirm which of the two the type represents. Style remnants are no longer present in the 220-year-old specimens, but a couple of other indicators strongly suggest that the type is of the species treated here as *S. pendula* and not the newly described *S. longiloba*. The type material is of a variant of *S. pendula* that has long-mucronate, pungent leaf tips and which is fairly common in the Albany area. As far as is known *S. longiloba* never has pungent leaf tips. The December collecting date offers another clue in that it seems less likely that fruit of the earlier flowering *S. longiloba* would still be present at the end of the year.

Styphelia porcata Hislop, *sp. nov.*

Type: near Yanchep, Western Australia [precise locality withheld for conservation reasons], 19 May 2005, *M. Hislop & L.W. Sage* MH 3446 (*holo*: PERTH 07293178; *iso*: CANB, CNS, MEL, NSW 830976).

Leucopogon sp. Yanchep (M. Hislop 1986), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 2 August 2024].

Leucopogon sp. A Perth Flora, Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 5 November 2024].

Leucopogon sp. A, N.G. Marchant, J.R. Wheeler, B.L. Rye, E.M. Bennett, N.S. Lander, T.D. Macfarlane, *Fl. Perth Region* 1: 193 (1987).

Erect *shrubs* to *c.* 70 cm high and 70 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense indumentum of ± straight, patent hairs to *c.* 0.1 mm long. *Leaves* helically arranged, shallowly antrorse to strongly retrorse; apex long-mucronate, pungent, the mucro slightly inflexed to slightly deflexed, 0.4–1.0 mm long; base attenuate to cuneate; petiole 0.4–0.8 mm long, adaxial surface hairy, abaxial surface glabrous, margins glabrous or hairy; lamina narrowly to very narrowly obovate, 5–13 mm long, 1.2–2.6 mm wide, discolorous, convex adaxially, the margins variably recurved, longitudinal axis ± straight to slightly recurved in the upper half; adaxial surface shiny, hairy towards the base or glabrous throughout, with 3–5 obscurely defined veins sometimes evident; abaxial surface paler, glabrous, ± matt, with 5–7 primary veins, ± flat or openly and shallowly grooved between the veins; margins glabrous. *Inflorescence* axillary, pendulous; axis 2.0–6.4 mm long, (1)2–4(5)-flowered, with a very sparse to moderately dense indumentum, terete below the uppermost fertile node, planoconvex or subterete above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a thick pedicel 0.3–1.0 mm long. *Fertile bracts* ovate to broadly ovate, 0.5–0.8 mm long, 0.5–0.7 mm wide, with 2–5 sterile bracts below the lowest fertile bract. *Bracteoles* transversely elliptic to ± orbicular, 0.7–1.0 mm long, 0.8–1.2 mm wide, obtuse, obscurely keeled, not or very shortly mucronate; abaxial surface glabrous, not or scarcely striate; margins ciliolate. *Sepals* ovate or narrowly ovate, 1.5–2.0 mm long, 0.7–1.1 mm wide, obtuse to subacute, with or without a short apiculus; abaxial surface glabrous, straw-coloured, venation very obscure; adaxial surface sparsely hairy towards the apex; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white, obovoid to broadly obovoid, or ± obconic, longer than the sepals, 1.7–3.0 mm long, 1.7–2.2 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases produced into well-defined, longitudinal ridges that are distinctly higher than the filament bases themselves, the ridge apices usually produced into distinct lobes. *Corolla lobes* white, slightly longer than to shorter than the tube, 2.0–2.7 mm long, 1.0–1.3 mm wide at base, erect in basal 1/2–2/3 of their length and

then spreading and revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* fully exserted from corolla tube, but not exserted beyond the erect, basal portion of the corolla lobes, 1.0–1.5 mm long, distinctly emarginate. *Filaments* terete, 0.8–1.0 mm long, attached to the anther 1/2–2/3 above anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.4 mm long, glabrous, lobed. *Ovary* narrowly ellipsoid to narrowly ovoid, 0.7–1.0 mm long, 0.5–0.7 mm wide, glabrous, 5-locular, very dark green to almost black. *Style* 3.0–4.7 mm long, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not or barely expanded. *Fruit* very narrowly obovoid to cylindrical, sometimes curved, 4.5–6.8 mm long, 2.0–2.7 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, ± rugose at maturity (mesocarp usually well-developed), with broad longitudinal ribs evident; apex rounded; style shed before maturity, usually breaking a little above the base. (Figure 5)

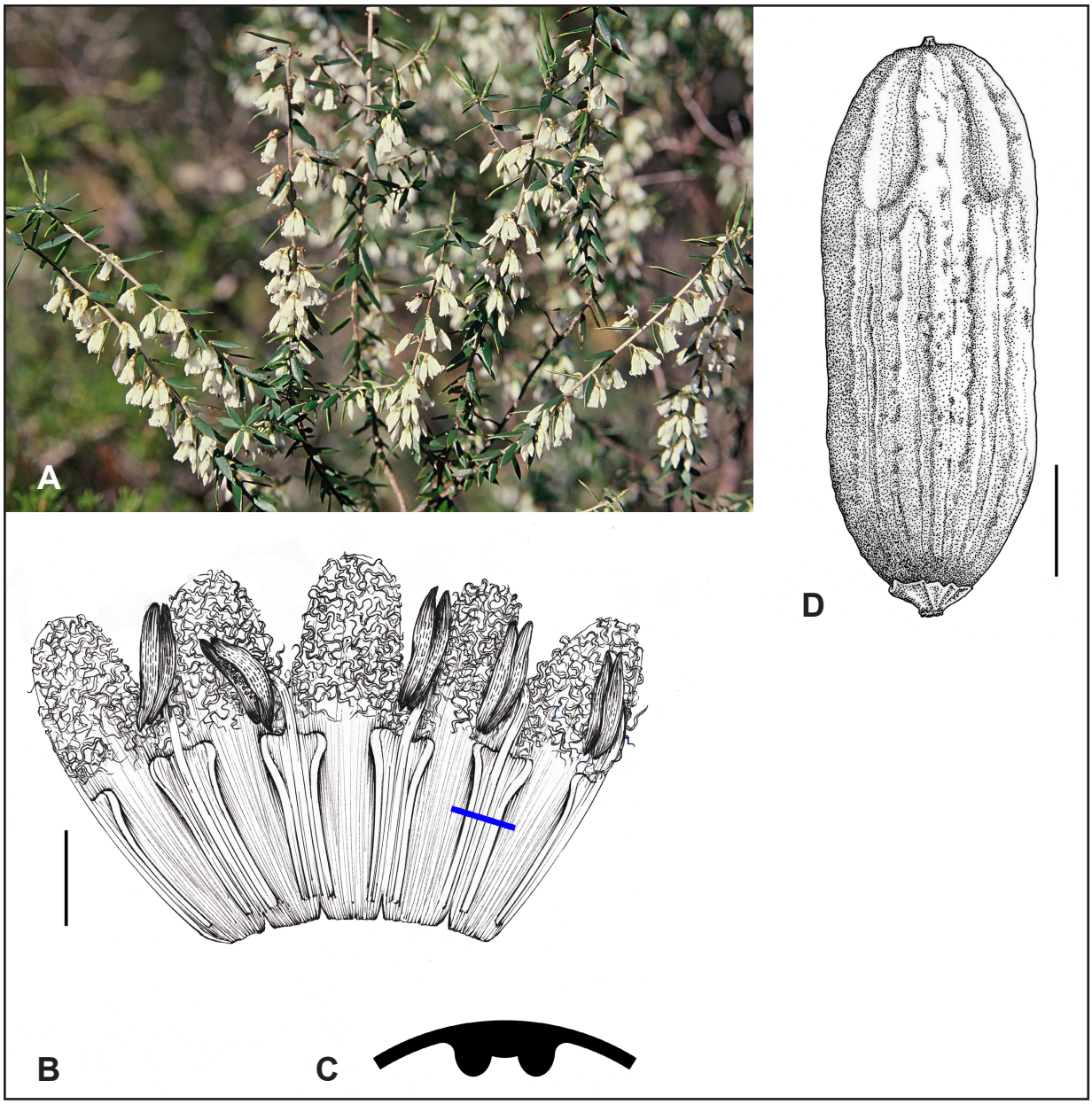

Figure 5. *Styphelia porcata*. A – flowering branchlet *in situ*; B – corolla, internal view; C – portion of transverse section of internal corolla tube (as indicated by the blue line in B) showing two ridges on either side of a decurrent filament base; D – fruit. Scale bars B, D = 1 mm. Vouchers *M. Hislop* 2238 (A), *M. Hislop & L.W. Sage* MH 3446 (B, C), *M. Hislop* 2336A (D). Drawings by Hung Ky Nguyen (B, C) and Skye Coffey (D). Photograph by Michael Hislop.

Diagnostic characters. Within the *S. pendula* group distinguished by the following character combination: leaves shallowly antrorse to strongly retrorse, narrowly to very narrowly obovate, 1.2–2.6 mm wide, adaxially convex, leaf apices long-mucronate, pungent, the mucro 0.4–1.0 mm long; inflorescences pendulous, (1)2–4(5)-flowered; sepals glabrous, obtuse to subacute, with or without a short apiculus; corolla white; corolla tube longer than the sepals, slightly shorter than to longer than the lobes, internal surface glabrous, with 10 well-defined, longitudinal ridges extending on either side of the decurrent filament bases for the full length of the tube, these raised distinctly higher than the adnate portion of the filaments; ovary 5-locular, glabrous; style glabrous and smooth; stigma not or barely expanded; fruit very narrowly obovoid to cylindrical, rugose, gynophore absent.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 4 Nov. 1979, *J. Dodd* 55 (PERTH); 31 May 1966, *A.R. Fairall* 1758 (PERTH); 16 Apr. 2000, *M. Hislop* 1986 (CANB, CNS, NSW); 21 May 2000, *M. Hislop* 2018 (NSW, PERTH); 24 June 2001, *M. Hislop* 2237 (PERTH); 24 June 2001, *M. Hislop* 2238 (PERTH); 24 June 2001, *M. Hislop* 2240 (PERTH); 16 Sep. 2001, *M. Hislop* 2311 (PERTH); 21 Oct. 2001, *M. Hislop* 2336 A (CNS, PERTH), 2336 B (CANB, PERTH); 28 Nov. 2004, *M. Hislop* 3382 A (PERTH); 30 May 1990, *G.J. Keighery* 11159 (PERTH); 23 Nov. 2017, *B. Morgan* IOBM-43 (PERTH); 30 Aug. 1979, *J.M. Powell* 1338 (AD, NSW, PERTH); 3 June 1965, *F.G. Smith* 1792 (PERTH); 17 June 1965, *F.G. Smith* 1805 (PERTH).

Distribution and habitat. Distributed sporadically in near-coastal areas from the Lancelin area southwards to Neerabup in the northern half of the Swan Coastal Plain bioregion. Occurs on yellow sand, often over limestone, in low woodland or heath. Commonly associated species include *Banksia attenuata*, *B. menziesii*, *B. prionotes*, *B. sessilis*, *Eucalyptus todtiana*, *Acacia lasiocarpa*, *Jacksonia calcicola* and *Hakea costata*.

Phenology. Peak flowering is in May and June. Mature fruit is present from late September until November.

Etymology. From the Latin *porcatus* (ridged), a reference to the prominent, longitudinal ridges on the inner corolla tubes.

Conservation status. Listed as Priority Three under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Yanchep (M. Hislop 1986).

Affinities. In the published phylogeny of Puente-Lelièvre *et al.* (2016), *S. porcata* (as *Leucopogon* sp. Yanchep) was one of sixteen taxa that were placed in a well-supported subclade of the *S. pendula* group. Resolution within this subclade was poor however, and the majority of taxa, including *S. porcata*, were grouped in a polytomy. *Styphelia retrorsa* (as *Leucopogon* sp. Northern Scarp) was another taxon that was placed in that polytomy and based on overall morphological similarity that species may be the closest relative of *S. porcata*. The two share a very similar vegetative morphology and a usually 2–5-flowered, pendulous inflorescence. At flowering the most useful distinction between them is to be found on the internal surfaces of the corolla tube. In *S. porcata* the longitudinal ridges on either side of the decurrent filament bases are strongly developed and distinctly higher than the filament bases themselves. The ridge apices are usually produced into distinct lobes on one or both sides of the attachment point of the free portion of the filaments. This character varies between species in the *S. pendula* group, with most having either no ridge development or if ridges are developed, as in the case of *S. retrorsa*, then they are of no greater elevation than the adnate portion of the filaments.

Relatively long drupes that are very narrowly obovoid to cylindrical are another feature by which *S. porcata* may be distinguished from *S. retrorsa*. Although the latter species is unusually variable in regard to fruit shape, as described below, specimens with narrowly obovoid fruit that fall within the length range for *S. porcata* may be distinguished by their greater width (usually about 3 mm) and hence have a broader overall profile. In terms of macro spotting features the two can also mostly be distinguished by leaf width: wider leaves per specimen, 1.8–2.6 mm wide in *S. porcata*, 2.5–4.5 mm in *S. retrorsa*. The distributions of the two species are allopatric with *S. porcata* occurring exclusively on the western part of the Swan

Coastal Plain and *S. retrorsa* mostly on the Darling scarp to the east, with a limited occurrence in the east of the coastal plain. The apparently isolated population of *S. retrorsa* that occurs in the Nambung area (refer below) is about 70 km north of the most northerly known populations of *S. porcata*.

Three other members of the *S. pendula* group occur in western parts of the Swan Coastal Plain and could conceivably be confused with *S. porcata*: *S. insularis* (DC.) Hislop, Crayn & Puente-Lel., *S. propinqua* (R.Br.) Spreng. and *S. racemulosa* (DC.) F.Muell. All three of these species can be distinguished from *S. porcata* by their erect to spreading, rather than strictly pendulous, inflorescences, and in having distinctly expanded stigmas (*cf.* not or barely expanded in *S. porcata*).

Styphelia retrorsa Hislop, Crayn & Puente-Lel., *Austral. Syst. Bot.* 33(2): 152 (2020) [*nom. nov.*]; *Leucopogon ovalifolius* Sond. in J.G.C. Lehmann (ed.), *Pl. Preiss.* 1(3): 324 (1845). *Type citation*: 'In planitie arenosa Quangen, Victoria, d. 20. Mart. 1840. Herb. Preiss. No. 417'. *Type*: [Western Australia], 20 March 1840, *L. Preiss* 417 (*syn*: LD 1242445 image!, MEL 1512208!).

Leucopogon sp. Northern Scarp (M. Hislop 2233), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [before February 2020].

Erect, rather open *shrubs* to *c.* 100 cm high and 100 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a moderately dense indumentum of straight or gently curved, patent hairs to *c.* 0.2 mm long. *Leaves* helically arranged, shallowly antrorse to strongly retrorse; apex long-mucronate, pungent, the mucro ± straight, 0.6–1.2 mm long; base attenuate to cuneate; petiole 0.8–1.3 mm long, adaxial surface hairy, abaxial surface and margins glabrous or hairy; lamina narrowly elliptic to narrowly obovate, 8–18 mm long, 1.8–4.5 mm wide, slightly discolorous, convex adaxially, the margins variably recurved, longitudinal axis ± straight to slightly recurved; adaxial surface shiny, variably hairy in the lower half with 3–5 obscurely defined veins sometimes evident; abaxial surface slightly paler, glabrous, ± matt, with 5–7 primary veins, ± flat or very openly and shallowly grooved between the veins; margins either with very short, stiff, antrorse hairs < 0.05 mm long or ± glabrous. *Inflorescence* axillary, pendulous; axis 2.5–7.2 mm long, (1)2–5-flowered, with a very sparse to moderately dense indumentum or sometimes glabrous, terete below the uppermost fertile node, planoconvex above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles, with a thick pedicel 0.5–1.0 mm long. *Fertile bracts* ovate to broadly ovate, 0.5–1.2 mm long, 0.4–0.8 mm wide, with 2–5 sterile bracts below the lowest fertile bract. *Bracteoles* depressed-ovate, transversely elliptic to ± orbicular, 0.5–1.0 mm long, 0.9–1.2 mm wide, obtuse, obscurely keeled, not or very shortly mucronate; abaxial surface glabrous, not or scarcely striate; margins ciliolate. *Sepals* ovate or narrowly ovate, 1.7–2.2 mm long, 0.9–1.2 mm wide, obtuse to acute, often with a short apiculus; abaxial surface glabrous, straw-coloured, venation very obscure; adaxial surface sparsely hairy; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white, narrowly obovoid, obovoid, or narrowly ellipsoid, longer than the sepals, 2.3–3.8 mm long, 1.8–2.2 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases raised into longitudinal ridges that are lower than or of ± equal elevation to the filament bases themselves. *Corolla lobes* white, distinctly shorter than to slightly longer than the tube, 2.4–2.8 mm long, 0.9–1.2 mm wide at base, erect in the basal 2/3 of their length or a little higher and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* partially exserted (by at least 7/8 of their length) or fully exserted from the corolla tube, but not exserted beyond the erect basal portion of the corolla lobes, 1.2–1.7 mm long, distinctly emarginate. *Filaments* terete, 0.9–1.2 mm long, attached to the anther 1/2–3/4 above the anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, lobed. *Ovary* ellipsoid to ovoid, 0.6–1.0 mm long, 0.5–0.8 mm wide, glabrous, 5-locular, very dark green. *Style* 3.0–6.0 mm long, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma not or very slightly expanded. *Fruit* broadly to narrowly obovoid, narrowly ellipsoid, or globose, 3.2–5.5 mm long, 2.5–3.5 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, ± rugose at maturity (mesocarp usually well-developed), often with longitudinal ribs evident; apex rounded; style shed before maturity, leaving only the broken base. (Figure 6)

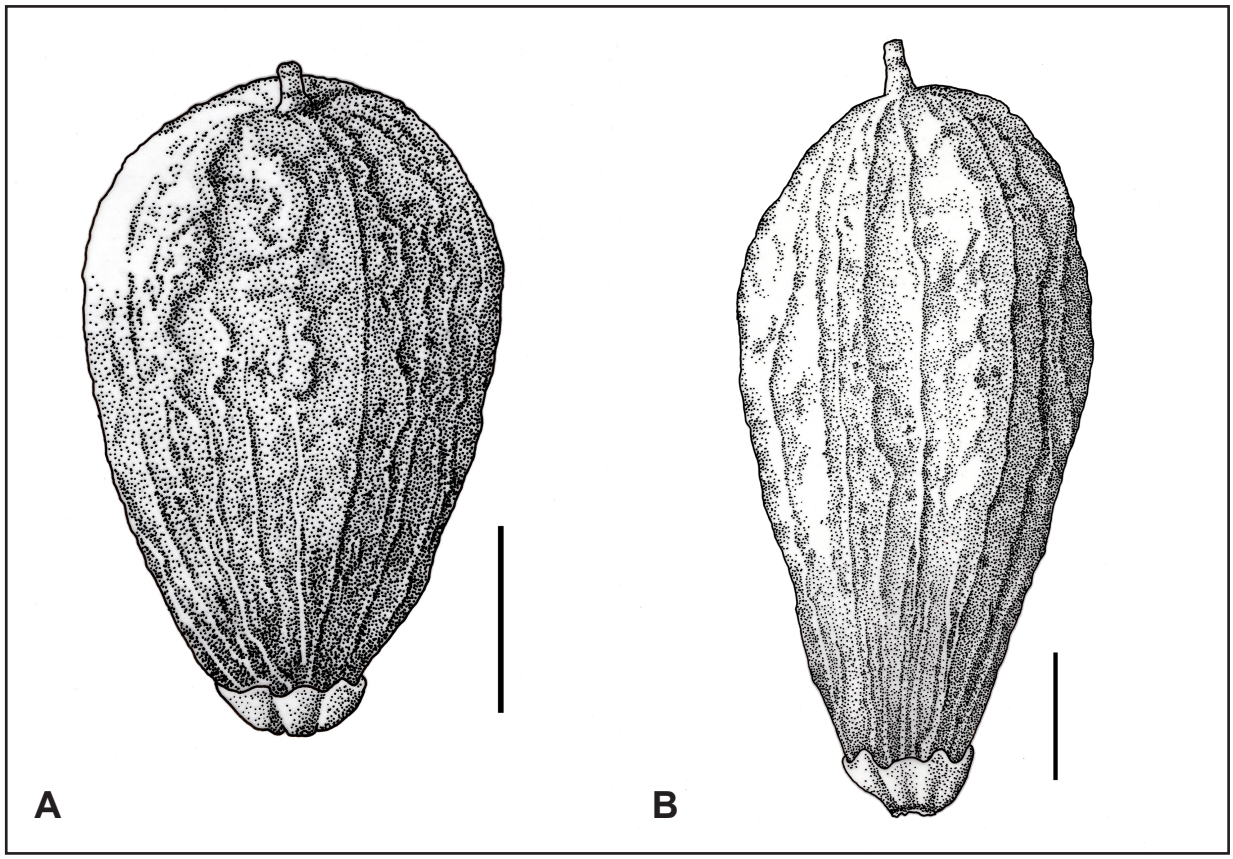

Figure 6. *Styphelia retrorsa*. A, B – variation in fruit shape. Scale bars = 1 mm. Vouchers *M. Hislop* 2332A (A), *M. Hislop* 2332B (B). Drawings by Skye Coffey.

Other specimens examined. WESTERN AUSTRALIA: Cooljarloo West [SE of Cervantes], 5 Nov. 2008, *D. Coultas & K. Greenacre* CM32-05 (PERTH); 2 km SSE of Walyoo Hill [N of Regans Ford], 12 June 1996, *R.J. Cranfield* 10744 (PERTH); Jam Hill Nature Reserve. W of Moora, 27 June 1988, *E.A. Griffin* 4810 (PERTH); Bidgerabbie Hill, SE of Dandaragan, 28 June 1988, *E.A. Griffin* 4819 (PERTH); chert ridge, about 15 km N of Moora, 26 Nov. 2000, *M. Henson* MJH 64 (PERTH); Yandin Rd, 2.1 km E of Brand Hwy, S of Cataby, 21 May 2000, *M. Hislop* 2020 (NSW, PERTH); Pollinelli Rd *c.* 600 m S of Seven Mile Rd, Julimar State Forest [SE of Bindoon], 5 June 2000, *M. Hislop* 2024 (CANB, NSW, PERTH); Marri Heights Rd, 8.8 km E of Brand Hwy, S side of fence line, SE of Regans Ford, 17 June 2001, *M. Hislop* 2233 (CNS, NSW, PERTH); W side of Fynes Rd, 300 m N of Red Gully Rd, SE of Regans Ford, 17 June 2001, *M. Hislop* 2235 (PERTH); Red Gully off Brand Hwy, E side of picnic area, S of Regans Ford, 17 June 2001, *M. Hislop* 2236 (PERTH); Gillingarra Rd, 1.6 km E of Brand Hwy, NE of Regans Ford, 24 June 2001, *M. Hislop* 2241 (PERTH); Pollinelli Rd *c.* 600 m S of Seven Mile Rd, Julimar State Forest [SE of Bindoon], 1 Oct. 2001, *M. Hislop* 2332 A (MEL, PERTH), 2332 B (PERTH), 2332 C (PERTH); Red Gully off Brand Hwy, E side of picnic area, S of Regans Ford, 21 Oct. 2001, *M. Hislop* 2344 A (CNS, MEL, PERTH), 2344 B (PERTH); Mount Byroomanning Nature Reserve, N of Bindoon, along E boundary S of Stephens Rd, 24 May 2015, *M. Hislop* 4428 (MEL, PERTH); Boonanarring Nature Reserve [N of Gingin], Boonanarring Rd, 4.25 km E of Brand Hwy, then 0.9 km NNE, 2 July 2001, *F. Hort* 1314 (CNS, PERTH); Bartletts Well Nature Reserve [N of Gingin], from Brand Hwy go 1.8 km E and 0.2 km N, 10 Oct. 2001, *F. & J. Hort* 1512 (PERTH); Boonanarring Nature Reserve, 4.2 km E of Brand Hwy on Boonanarring Rd, then NNE for 0.9 km, 12 Oct. 2001, *F. Hort* 1575 (PERTH); 9 km along Rowes Rd, opposite Lupin Valley Rd, 31 km WSW of Moora, 15 May 1984, *G.J. Keighery* 6859 (PERTH); Bartletts Well Nature Reserve, N of Gingin, 21 June 1995, *G.J. Keighery* 14196 (PERTH); 20 miles [*c.* 32 km] W of Moora, 3 Nov. 1954, *R.D. Royce* 4925 (PERTH).

Distribution and habitat. The main area of distribution is from Cataby and Moora in the north, then south and eastwards to the Toodyay area (but see notes on type locality below); in the far south of the Geraldton

Sandplains and north of the Swan Coastal Plain and Jarrah Forest bioregions. There is also an apparently disjunct occurrence in the Nambung area south-east of Cervantes. Mostly grows in sand or light loam over laterite, high in the landscape, less often in yellow sand on the coastal plain. Associated vegetation is usually Jarrah-Marri, sometimes Banksia woodland, or less often in heath.

Phenology. Flowering is between late April and June. Mature fruit is usually present from the second half of September to November.

Conservation status. This species has a fairly restricted distribution but is often locally common and is known to occur in several nature reserves and in state forest. No conservation coding is recommended.

Notes. As recognised here *S. retrorsa* is variable in fruit shape to an extent that has not been previously documented for any other western *Styphelia*. Infra-populational variation has been confirmed at one collecting site (*M. Hislop* 2332 A, 2332 B, 2332 C) where fruit shape on different plants varied from broadly to narrowly obovoid. Two fruiting collections from another reserve (*F. Hort* 1575, *P. Armstrong s.n.* PERTH 06740634) have obovoid and narrowly ellipsoid fruit respectively. What is particularly unexpected however, is the presence in the north-east of the species range of a morphotype with uniformly globose fruit (e.g. *R.D. Royce* 4925, *M. Henson* MJH 64). The question of whether a second cryptic taxon is present in this area requires further study.

The occurrence of a disjunct population of *S. retrorsa* on sandplain south-east of Cervantes appears somewhat surprising in the context of the species' overall distribution, it being well to the west of other collections at that latitude. There are two records from the area, about 3 km apart, one fruiting (*D. Coultas & K. Greenacre* CM32-05), the other sterile (*B. Morgan* BMor 1328). The fruiting specimen is quite typical for the species while the sterile specimen has leaves that are narrower than is usual, more like those of *S. porcata*. A recent effort by the author to collect flowering specimens from this population was not successful and it appears that the plant is an uncommon one in the area. Until flowering material is seen there remains some doubt regarding the identity of the plants in this area.

There are reasons to believe that a locality error is responsible for an apparent distributional outlier (*J.J. Alford* 954), putatively collected from the Bobakine Hills, south-west of Northam in 1986. Apart from the geographic disjunction, the specimen is also anomalous for being in late bud at the end of September, a time of year when plants of this species would normally be at least in early fruit. The collector is known to have been involved in a survey of the Boonanarring Nature Reserve during the same year and visited that reserve in March of 1986. It seems likely that the collection was in fact made at that time.

Typification. In his list of collecting localities for Preiss's Western Australian collections, Marchant (1990) interpreted the modern locality for the type specimen of *Leucopogon ovalifolius* (i.e 'Quangen, Victoria') as being near Wongamine, about 15 km east of Toodyay. There have been no subsequent collections from that area, which is about 35 km to the south-east of the nearest collection of the species currently held at the Western Australian Herbarium. It may be the case that it is now extinct east of Toodyay, an area that was subject to heavy clearing for agriculture in the decades following Preiss's visit to the Swan River Colony.

Styphelia speciosa Hislop, *sp. nov.*

Type: east side of Rose Thompson Road, 3.5 km south of Carnamah–Eneabba Road, [east of Eneabba], Western Australia, 15 July 2006, *M. Hislop* 3614 (*holo*: PERTH 07516177; *iso*: CANB, CNS, MEL, NSW).

Leucopogon sp. Coomallo (R.J. Cranfield 1457), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 2 August 2024].

[*Leucopogon strictus* Benth., *Fl. Austral.* 4: 219 (1868) *p.p.*, with respect to: *J. Drummond* VI: 123 (BM 001040170 image!; K 000348868 image!), see D. Crayn *et al., Austral. Syst. Bot.* 33(2): 152 (2020).]

Erect *shrubs* to *c.* 100 cm high and 100 cm wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse indumentum of short hairs < 0.1 mm long. *Leaves* helically arranged, often ± glaucous, mostly shallowly to steeply antrorse, sometimes ± patent; apex long-mucronate, pungent (or very occasionally the leaf tip a blunt callus, see notes below), the mucro slightly inflexed to slightly deflexed, 0.3–1.0 mm long; base usually attenuate, occasionally ± cuneate; petiole 0.7–1.2 mm long, adaxial surface hairy, abaxial surface glabrous, margins glabrous or sparsely hairy; lamina narrowly obovate to narrowly elliptic, 7–18 mm long, 1.5–4.2 mm wide, slightly discolorous, usually convex adaxially with the margins variably recurved, occasionally ± flat (very occasionally slightly concave), longitudinal axis straight to slightly incurved; adaxial surface shiny, usually with some hairs towards the base with 3–5 obscurely defined veins often evident; adaxial surface slightly paler, glabrous, ± matt, with 5–7 primary veins, ± flat to shallowly and openly grooved between the veins; margins with minute, antrorse hairs < 0.05 mm long in the upper half or ± glabrous. *Inflorescence* axillary, spreading at *c.* 45°–120°; axis 1.6–3.2 mm long, 1–3-flowered, with a dense indumentum of short hairs, terete below the uppermost fertile bract, planoconvex and winged above, terminating in a bud-rudiment; flowers spreading, shortly pedicellate below the bracteoles with a thick pedicel 0.2–0.5 mm long. *Fertile bracts* ovate or broadly ovate, 0.5–0.8 mm long, 0.5–0.8 mm wide, with 4–6 sterile bracts below the lowest fertile bract. *Bracteoles* broadly ovate, depressed-ovate to ± orbicular, 1.0–1.5 mm long, 1.0–1.3 mm wide, obtuse, obscurely to distinctly keeled, not mucronate; abaxial surface glabrous, not striate; margins ciliolate. *Sepals* narrowly ovate, 2.0–2.5(3.0) mm long, 0.9–1.2 mm wide, obtuse or occasionally subacute, without an apiculus; abaxial surface glabrous, pale green, straw-coloured or pink, venation very obscure; adaxial surface with a few hairs towards the apex, otherwise glabrous; margins ciliolate with hairs to *c.* 0.1 mm long. *Corolla tube* white or various shades of pink to red, cylindrical, longer than the sepals, 5.6–6.7(8.0) mm long, 2.2–3.0 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases not or scarcely raised. *Corolla lobes* white or various shades of pink to red, shorter than the tube, 2.2–3.2(3.5) mm long, 1.0–1.5 mm wide at base, erect in basal 2/3–2/3 of their length and then spreading and recurved to revolute, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs, becoming less hairy towards the base. *Anthers* exserted from the corolla tube, but not exserted beyond the erect, basal portion of the corolla lobes, 1.2–1.7 mm long, deeply emarginate (as far as the filament connective). *Filaments* terete, 1.2–1.8(2.2) mm long, attached to the anther 2/3–3/4 above the anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.5 mm long, glabrous, truncate. *Ovary* narrowly ellipsoid or occasionally ellipsoid, 0.8–1.1 mm long, 0.5–0.6 mm wide, glabrous, 5-locular, very dark green to almost black. *Style* 6.4–8.5(11) mm long, scabrous at least in the distal half, exserted from the corolla tube and beyond the lobe bases, usually well-differentiated from ovary apex; stigma much-expanded. *Fruit* cylindrical, narrowly ellipsoid or narrowly obovoid, 3.7–5.3 mm long (inclusive of gynophore), 1.6–2.5 mm wide, much longer than the sepals, circular in transverse section, with a well-defined gynophore; surface glabrous, smooth above the often prominently rugose gynophore; apex ± flat but with rounded shoulders; style shed before maturity. (Figure 7)

Diagnostic characters. Within the *S. pendula* group distinguished by the following character combination: leaves mostly shallowly to steeply antrorse, narrowly obovate to narrowly elliptic, adaxially convex or occasionally ± flat, leaf apices usually long-mucronate and pungent, the mucro 0.3–1.0 mm long; inflorescences spreading, 1–3-flowered; sepals 2.0–2.5(3.0) mm long, 0.9–1.2 mm wide, glabrous, obtuse or occasionally subacute, without an apiculus; corolla white or pink to red; corolla tube longer than the sepals and corolla lobes, internal surface glabrous, not or scarcely raised on either side of the decurrent filament bases; ovary 5-locular, glabrous; style scabrous, at least in the distal half; stigma much-expanded; fruit cylindrical, narrowly ellipsoid or narrowly obovoid, smooth above an often rugose gynophore.

Other specimens examined. WESTERN AUSTRALIA: [UCL bounded by Mt Adams Rd, Tompkins Rd and Natta Rd, 27 km SW of Mingenew], 26 July 2014, *D. Coultas* DC-14-02 (PERTH); Marchagee track, 1 km E of Brand Hwy [N of Badgingarra], 30 May 1980, *R.J. Cranfield* 1457 (CANB, PERTH);

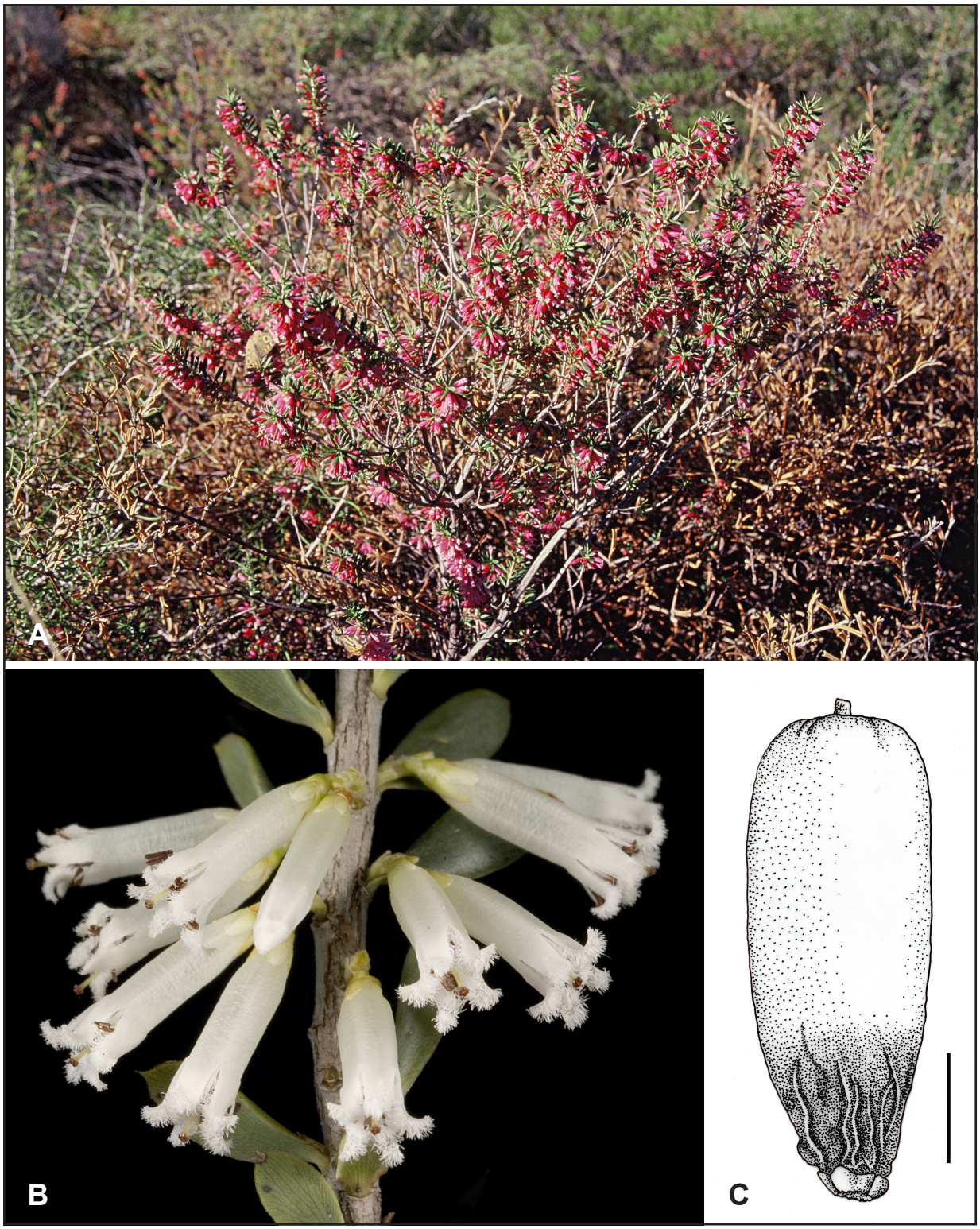

Figure 7. *Styphelia speciosa*. A – habit *in situ*; B – flowering branchlet *in situ*; C – fruit. Scale bar = 1 mm. Vouchers *M. Hislop* 2355 (A), *K.R. Thiele* 3244 (B), *M. Hislop* 2023 (C). Drawing by Skye Coffey. Photographs by Michael Hislop (A) and *Kevin Thiele* (B).

Cockleshell Gully, near Hill River, 10 June 1931, *C.A. Gardner s.n.* (PERTH 03011550); *c.* 8.5 miles [*c.* 13.7 km] SE of Badgingarra, 28 May 1965, *A.S. George* 6709 (NSW, PERTH); Mt Misery, W of Dandaragan, 11 Sep. 1988, *E.A. Griffin* 5041 (PERTH); remnant vegetation where Cataby Brook crosses Brand Hwy, Cataby, 29 May 1999, *M. Hislop* 1310 (CNS, NSW, PERTH); Yandin Rd, 2.1 km E of Brand Hwy, SE of Cataby, 21 May 2000, *M. Hislop* 2019 (NSW, PERTH); E side of Badgingarra Rd, 13 km S of North West Rd, N of Dandaragan, 21 May 2000, *M. Hislop* 2023 (CANB, NSW, PERTH); Yandin Rd,

2.1 km E of Brand Hwy, SE of Cataby, 3 Nov. 2001, *M. Hislop* 2354 (CANB, CNS, PERTH); Coomallo Nature Reserve, N side of Marchagee track, 1.1 km E of Brand Hwy, 3 Nov. 2001, *M. Hislop* 2355 (CNS, PERTH); S end Sundalara Rd, NE of Eneabba, 8 June 2002, *M. Hislop* 2680 (MEL, PERTH); Badgingarra National Park, Cadda Rd, 7.2 km W of Brand Hwy, 7 June 2010, *M. Hislop* 4029 (CNS, K, MEL, PERTH); Lesueur National Park, Banksia track, *c.* 4.8 km E of Stockyard Gully Rd, 1 July 2012, *M. Hislop* 4215 (CANB, CNS, PERTH); Coomallo Nature Reserve, 6 km [W] of Brand Hwy along Jurien Rd and then 1 km S along powerline track, 3 June 1988, *S.D. Hopper* 6359 (K, PERTH); Yandin Nature Reserve [SE of Cataby], 1.8 km E of Brand Hwy, 11 June 2002, *F. & J. Hort* 1759 (CANB, PERTH); W side of Black Arrow Rd and S of Jurien Rd [E of Jurien Bay], 8 June 2002, *M. Puckridge* 305 (PERTH); 1.1 km E of Peron Buffer along Brumby Buffer, then 80 m S [Lesueur National Park], 16 Oct. 2008, *W. Westcott* 08-22-8 (PERTH).

Distribution and habitat. Distributed from south-east of Dongara to a little south of Cataby, in the Geraldton Sandplains and far north of the Swan Coastal Plain bioregions. Mostly recorded from lateritic heath, less often in open woodland. It is noteworthy that collections from the Eneabba area and northwards have been made in close association with breakaways.

Phenology. The main flowering period is between May and July. Mature fruit has been collected in October and November.

Etymology. From the Latin *speciosus* (showy), a reference to the plant's showy aspect during flowering when it is common for flower colour within one population to vary from white through various shades of pink to red.

Conservation status. Has a fairly wide, but localised, distribution in the Geraldton sandplains. Known to occur in three national parks and one nature reserve. No conservation coding is recommended.

Affinities. According to the phylogeny of Puente-Lelièvre *et al.* (2016) the closest relative of *S. speciosa* is *S. leptantha* (Benth.) F.Muell. (the two were placed in a sister relationship with a moderate level of support). There are several obvious differences between the two species. *Styphelia speciosa* has long-mucronate, pungent leaf tips (with the rare exception noted below), spreading inflorescences with white or pink to red flowers and drupes that are circular in transverse section. In *S. leptantha* by contrast the leaf tip is an innocuous callus, the inflorescence is erect and always white-flowered, and the drupe is strongly angular in section.

In terms of gross morphology, the species most similar to *S. speciosa* is *S. erubescens*. Indeed, collections of *S. speciosa* had been referred to 'the northern variant' of that species until early molecular results obtained during Puente-Lelièvre's PhD studies (Puente-Lelièvre 2013) indicated that it needed to be recognised as a distinct species. The phrase name, *Leucopogon* sp. Coomallo, was subsequently installed on Florabase (Western Australian Herbarium 1998–). Two always-reliable, and several useful but sometimes overlapping, character differences distinguish the two. *Styphelia erubescens* is notable in being one of only two members of the *S. pendula* group (along with *S. altivallis*, described above) that have hairs on the surfaces of the internal corolla tube. That *S. speciosa* is glabrous on this part of the corolla is therefore a critical difference between the two. Another is the number of sterile bracts on the inflorescence axis: 4–6 in *S. speciosa*, 2–3 in *S. erubescens*. Other usually useful differences are sepal size (2.0–2.5 mm long and 0.9–1.2 mm wide in *S. speciosa*, *cf.* 2.6–4.0 mm long and 1.2–2.0 mm wide in *S. erubescens*); corolla lobe length (2.2–3.2 mm long, *cf.* 3.5–4.6 mm); and filament length (1.2–1.8 mm, *cf.* 1.7–3.0 mm).

As noted above under the treatment of *S. altivallis*, flower colour is also taxonomically useful in this case, in that pink to red flowered variants of *S. erubescens* are restricted to the southernmost part of that species range. North of there it is only known to produce white flowers. The distributions of the two species approach each other closely in the north of the Swan Coastal Plain bioregion, with the northernmost known occurrence of *S. erubescens* at Moore River National Park only about 35 km south of the most southerly occurrence of *S. speciosa* at Yandin Hill. Differences between *S. speciosa* and *S. altivallis* are

given above under the treatment of the latter species.

A collection of *S. speciosa* (*J. Drummond* VI: 123) was cited by Bentham (1868) as one of two syntypes for his new species, *Leucopogon strictus* Benth. However, that material is not conspecific with the other syntype (*W.H. Harvey s.n.*) and because the latter represented the species to which the name has most commonly been applied it was recently selected as lectotype (Crayn *et al.* 2020: 152). Despite this early confusion the two species are readily distinguished even where fertile material is lacking. Whereas *S. speciosa* has leaf margins either with minute hairs < 0.05 mm long or ± glabrous, in *S. stricta* they are obviously ciliate with stiff hairs 0.1–0.2 mm long. And where the inflorescences of *S. speciosa* are clearly spreading, in *S. stricta* they are always erect. The fruit of the two species is also quite dissimilar: circular in transverse section for *S. speciosa*, rather sharply angular in *S. stricta*.

Notes. The two most northerly collections of *S. speciosa* (*D. Coultas* DC-14-02; *D. Coultas* DC opp 55) are anomalous in respect to aspects of their leaf morphology and in having some floral parts longer than any recorded elsewhere in the species' range. The collection *D. Coultas* DC-14-02 consists of several small pieces evidently taken from different plants. One of these pieces has pungent leaf tips with mucros to about 0.5 mm long (i.e. ± typical for the species), others have either well-developed, but innocuous mucros or else terminate in a very short callus. In addition, the curvature of the leaves in these specimens varies from slightly convex adaxially to slightly concave. The measurements given in brackets in the description after the normal measurement range for sepal length, corolla tube and lobe length, filament length and style length were all obtained from *D. Coultas* DC-14-02. While these measurements are clearly atypical, the often taxonomically important fruit character is consistent for the species. Pending further collections of this morphotype these specimens are provisionally treated here as representing infraspecific variation only.

Styphelia tarinensis Hislop, *sp. nov.*

Type: Tarin Rock Nature Reserve [east of Dumbleyung], Western Australia [precise locality withheld for conservation reasons], 25 April 2007, *M. Hislop* 3690 (*holo*: PERTH 07703880; *iso*: CANB, CNS, K, MEL, NSW).

Leucopogon sp. Dumbleyung (M. Hislop & F. Hort MH 3239), Western Australian Herbarium, in *Florabase*, https://florabase.dbca.wa.gov.au/ [accessed 2 August 2024].

Erect, open *shrubs* to *c.* 1.5 m high and 1.2 m wide, single-stemmed at ground level, with a fire-sensitive rootstock. Young *branchlets* with a sparse to moderately dense indumentum of very short hairs < 0.05 mm long. *Leaves* helically arranged, mostly steeply antrorse; apex obtuse to acute, with or without a poorly defined, innocuous mucro, to 0.2 mm long; base mostly cuneate to ± rounded, occasionally attenuate; petiole 0.4–1.0 mm long, adaxial surface hairy, abaxial surface glabrous, margins glabrous or sparsely hairy; lamina mostly narrowly obovate or narrowly elliptic, sometimes very narrowly obtriangular to ± linear where the margins are strongly recurved, 3.0–9.0 mm long, 1.2–2.6 mm wide, discolorous, convex adaxially, the margins variably recurved to revolute, longitudinal axis slightly incurved to slightly recurved; adaxial surface shiny, glabrous or with a few hairs towards the base, venation usually not evident; abaxial surface paler, glabrous, ± matt, with 5–7 primary veins, flat or very shallowly and openly grooved between the veins; margins glabrous. *Inflorescence* axillary, pendulous; axis 1.5–3.1 mm long, 1–2(3)-flowered, with a moderately dense to dense indumentum, terete below the uppermost fertile bract, planoconvex and often ± winged above, terminating in a bud-rudiment; flowers pendulous, pedicellate below the bracteoles with a thick pedicel, 0.5–0.7 mm long. *Fertile bracts* narrowly to broadly ovate, 0.6–1.2 mm long, 0.5–0.6 mm wide, with 2–5 sterile bracts below the lowest fertile bract. *Bracteoles* depressed-ovate to ± orbicular, 0.9–1.1 mm long, 1.0–1.2 mm wide, obtuse to subacute, obscurely keeled, not or very shortly mucronate; abaxial surface glabrous, not or scarcely striate; margins ciliolate. *Sepals* narrowly ovate, 2.0–2.5 mm long, 1.0–1.2 mm wide, acute or subacute, with or without a short apiculus; abaxial surface glabrous, straw-coloured, sometimes flushed pink in fruit, venation usually obscure, but sometimes the midvein evident towards the apex; adaxial surface with some hairs in the distal half,

glabrous below; margins ciliolate with hairs < 0.05 mm long. *Corolla tube* white, usually narrowly ellipsoid, or sometimes obovoid, longer than the sepals, 2.2–3.7 mm long, 2.0–2.6 mm wide, external surface glabrous, internal surface glabrous, the tissue on either side of the decurrent filament bases raised into longitudinal ridges that are lower than or of ± equal elevation to the filament bases themselves. *Corolla lobes* white, shorter than to longer than the tube, 2.2–3.3 mm long, 0.8–1.3 mm wide at base, erect in the basal 1/3–1/2 of their length and then spreading and revolute to partially coiled, external surface glabrous, internal surface with a dense, white indumentum of flattened, twisted and ornamented hairs. *Anthers* fully exserted from corolla tube, 1.0–1.7 mm long, shallowly emarginate, not obscured by corolla lobe hairs. *Filaments* terete, 0.8–1.2 mm long, attached to the anther 2/3–3/4 above anther base, adnate to the tube just below the sinuses. *Nectary* annular, 0.3–0.4 mm long, glabrous, lobed. *Ovary* narrowly ellipsoid to ovoid, 0.8–1.2 mm long, 0.5–0.6 mm wide, glabrous, 5-locular, very dark green to ± black. *Style* 2.7–4.5 mm long, 0.15–0.2 mm wide, glabrous and smooth, exserted from the corolla tube beyond the erect corolla lobe bases, tapering smoothly from ovary apex; stigma expanded. *Fruit* very narrowly ellipsoid to ± cylindrical, 3.3–4.0 mm long, 1.2–1.4 mm wide, much longer than the sepals, circular in transverse section, gynophore absent; surface glabrous, rugose at maturity (mesocarp well-developed), with mostly longitudinally aligned ridges and grooves; apex rounded but with narrow shoulders; style mostly shed before maturity. (Figure 8)

Diagnostic characters. Within the *S. pendula* group distinguished by the following character combination: leaves mostly steeply antrorse, usually narrowly obovate or narrowly elliptic, sometimes very narrowly obtriangular to ± linear where the margins are strongly recurved, convex adaxially with the margins variably recurved to revolute, leaf apices with or without a poorly defined, innocuous mucro, to 0.2 mm long; inflorescences pendulous, 1–2(3)-flowered; sepals glabrous, acute or subacute, with or without a short apiculus; corolla white; corolla tube longer than the sepals, shorter than to longer than the lobes, internal surface glabrous, raised into longitudinal ridges on either side of the decurrent filament bases that are lower than or of ± equal elevation to the filament bases themselves; ovary 5-locular, glabrous; style glabrous and smooth, 0.15–0.2 mm wide; stigma expanded; fruit very narrowly ellipsoid to ± cylindrical, rugose, gynophore absent.

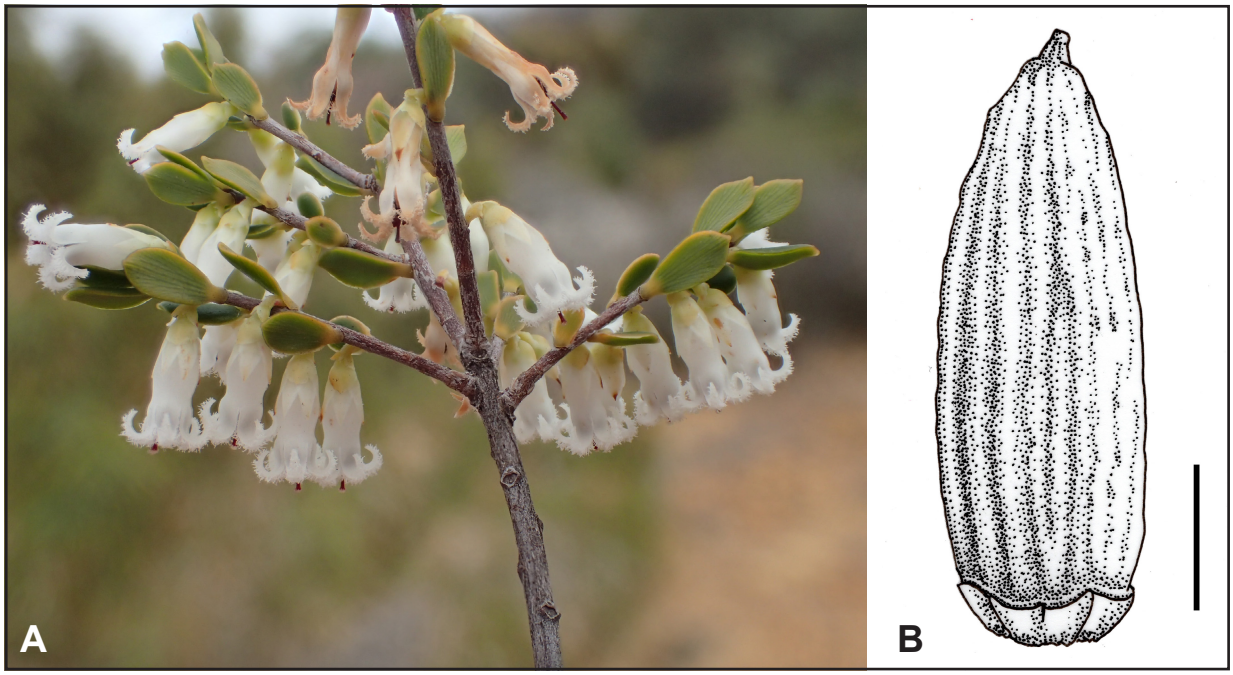

Figure 8. *Styphelia tarinensis*. A – flowering branchlet *in situ*; B – fruit. Scale bar = 1 mm. Voucher *M. Hislop* 3654 (B). Drawing by Skye Coffey. Photograph by Jolanda Keeble (unvouchered).

Other specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 7 Oct. 1997, *E.A. Brown* 97/225 *& G. Taaffe* (NSW, NY, PERTH, UNSW); 21 Apr. 2014, *G. Byrne* 5074 (PERTH); 25 May 2004, *M. Hislop & F. Hort* MH 3239 (CANB, K, NSW, PERTH); 25 May 2004, *M. Hislop & F. Hort* MH 3242 (PERTH); 7 Oct. 2006, *M. Hislop* 3654 (CNS, PERTH); 26 Apr. 2015, *M. Hislop* 4396 (PERTH); 29 June 2015, *M. Hislop* 4432 (PERTH); 12 Apr. 2018, *M. Hislop* 4748 (PERTH); 5 May 1999, *G.J. Keighery & N. Gibson* 5566 (PERTH); 19 Mar. 1970, *M.D. Tindale* 179 *& B.R. Maslin* (NSW, PERTH).

Distribution and habitat. Narrowly distributed in the Tarin Rock area, in the far west of the Mallee bioregion. Occurs in heath or open mallee woodland in sandy soils over laterite.

Phenology. Peak flowering is between April and June. Mature fruit has been collected in October but is also likely to be present in September and November. A collection from late June also has fruit close to maturity which probably indicates that flowering may begin in the late summer–early autumn period if sufficient moisture is available.

Etymology. From the place name Tarin Rock and the Latin *-ensis* (native of).

Conservation status. Recently listed as Priority Two under Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), as *Leucopogon* sp. Dumbleyung (M. Hislop & F. Hort MH 3239). Although often locally common, *S. tarinensis* is a range-restricted species which is currently known to occur in three nature reserves and at one roadside locality.

Affinities. In gross morphology *S. tarinensis* is very similar to *S. pendula*. When fruiting the two species are easily separated, with *S. tarinensis* having a narrowly ellipsoid to ± cylindrical fruit compared to the narrowly obovoid fruit of *S. pendula*. Flowering specimens may be distinguished by differences in the inflorescence axis indumentum (moderately to densely hairy in *S. tarinensis*, *cf.* glabrous to sparsely hairy in *S. pendula*) and in the detail of the style and stigma. In *S. tarinensis* the stigma is noticeably expanded, while in *S. pendula* it is completely filiform. And whereas the style base of *S. tarinensis* is smoothly attenuated from the ovary apex and about 0.15–0.2 mm wide, in *S. pendula* it is more abruptly differentiated from the ovary and only *c.* 0.1 mm wide. There is another difference in the shape of the corolla tube: usually narrowly ellipsoid or sometimes obovoid in *S. tarinensis*, obovoid, broadly obovoid or ± obconic in *S. pendula*. Current records indicate that the closest that *S. tarinensis* and *S. pendula* approach each other is about 150 km.

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