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A taxonomic revision of *Polygala* L. in Northern
Australia

Thesis submitted by
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In January 2008

for the degree of Masters of Science
in Botany within the School of Tropical Biology
James Cook University

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Acknowledgements

I wish to acknowledge and thank, succinctly but no less gratefully, the contribution and support provided by the following organisations and individuals in the completion of this thesis.

- My supervisors Dr Dale Dixon and Prof Paul Gadek.
- Dr Greg Leach and NRETA (Natural Resources, Environment and The Arts, NT Government).
- All the staff, past and present at Northern Territory Herbaria (NT and DNA) as well as associated NT collectors.
- CALM (WA) and EPA (Qld) for collecting permits in Western Australia and Queensland.
- Staff of Australian and overseas herbaria (B, K, BM, P, GDC, PR, LINN., MEL, BRI, CANB, SING, L) particularly loan officers and ABLOs, Alex George, Jenny Tonkin, Juliet Wege and Jeremy Bruhl, who greatly assisted with locating, imaging and sending specimens.
- B, K, BM, P, GDC, PR, LINN., MEL, BRI, CANB, E for specimen images.
- Library staff at JCU and NRETA.
- Anna Monro and Ruud van der Meijden for responding quickly and generously to various queries.
- Rory Ryan and John, Mhornin and Mark Kerrigan for field and moral support.
- Andrea Hope and Bob Harwood for lending fresh eyes to proof reading.
- Donna Lewis, Jenni Low Choy, Ian Cowie, Taegan Calnan and John Westaway for testing keys.
- Monika Madsen Osterkamp helped with German translation and general encouragement, Emma Short assisted with latin diagnoses and Phil Short with nomenclatural issues.
- Anonymous examiners provided very useful feedback on nomenclature and phenetic analyses.

Abstract

This research documents twenty six new species and four new varieties of *Polygala* L. in Australia. *Polygala* diversity across Northern Australia is sampled and taxonomic diversity is assessed using taxonomically informative morphological characters to diagnose phylogenetic species. Morphological characters are compared using alpha-taxonomic techniques and multi-variate analyses.

A treatment of Australian material including descriptions and a key to species are provided. This treatment is now the most recent treatment for *Polygala* in Australia and clarifies the misapplication of names to Australian taxa in the literature. Nomenclatural problems with *Polygala triflora* L., *Polygala glaucoides* L., *Polygala linariifolia* Willd., *Polygala chinensis* L. and *Polygala polifolia* Presl., irresolvable in the absence of a monograph, are summarised.

Other findings include the provision of a suite of putative phylogenetically informative characters for use in future phylogenetic investigations. An overview of *Polygala* taxonomy is given and issues regarding phylogeny and the inadequacy of current treatments and classifications are discussed. The need for a monograph of this group is highlighted. While species epithets and latin diagnoses for new species are provided it is not the intention of the author that this document represent the valid publication of new names.

A taxonomic revision of *Polygala* L. in Australia

Table of contents

Acknowledgements	i
Abstract	ii
List of Tables	vi
List of Figures	vii-xi
CHAPTER ONE: Introduction and Aims.....	1-13
Introduction	2
Taxonomy	2
Order	2
Family.....	3
<i>Polygala</i>	3
Phylogeny	5
Family.....	5
<i>Polygala</i>	8
The Problems	9
Aims	10
Objectives	10
Materials and Methods.....	11
Sampling diversity.....	11
CHAPTER TWO: Sampling Diversity	14-32
Introduction	15
Background.....	15
Taxonomically informative Characters	16
Flowers	16
Floral appendages.....	17
Style and Stigmas.....	18
Seeds	18
Aril	19
Aims	20
Materials and Methods.....	21
Specimens	21
Characters	22
Floral appendages.....	22
Pistil.....	23
Staminal column and upper petals	23
Aril head	26
Seed indumentum	26
Results	27
Morphologically distinct taxa	27
Discussion.....	30
Assigning taxonomic rank.....	30
Species.....	30
Infraspecific ranks.....	31
Conclusions.....	32

CHAPTER THREE: Species Complex	33-51
Introduction	34
Background to complex	34
Numerical Taxonomy	36
Classification or cluster analysis.....	37
Ordination.....	39
PCC.....	39
Aims	40
Materials and Methods.....	40
Specimens	40
Characters	41
Dataset	41
Analysis	43
Ordination.....	43
PCC.....	44
Results	44
Discussion.....	50
Conclusions.....	51
CHAPTER FOUR: Nomenclature	52-72
Introduction	53
Aims	54
Materials and Methods.....	54
Results	54
Misapplied names.....	57
Discussion.....	58
Problematic Taxa.....	58
<i>Polygala chinensis</i> L.	58
Typification and Synonymy.....	58
Application to Australian taxa	63
<i>Polygala glaucoides</i> L. and <i>Polygala triflora</i> L.	64
Typification and Synonymy.....	64
Application to Australian taxa	68
Unlocated types	70
Other excluded and doubtful names	71
Conclusions.....	72
CHAPTER FIVE: Taxonomy	73-270
Introduction	74
Genus description	74
Key to species.....	75
Species descriptions	78
CHAPTER SIX: Phylogeny and General conclusions	271-275
Introduction	272
Phylogeny	272
Future work	273
General Conclusions.....	274

INDEX TO TAXA	276
REFERENCES	277-281
APPENDICES	282-290
Appendix One: Table of diagnostic morphological characters.....	283-284
Appendix Two: Data matrix for OTU 25/40 complex.....	285-288
Appendix Three: Glossary of terms.....	289
Appendix Five: Summary of Chodat's 1893 and 1896 <i>Polygala</i> classification....	
.....	290

List of Tables

Title	Page
TABLE 1.1: Subsections and series of section <i>Polygala</i> as per Chodat (1896).....	5
TABLE 1.2: Combined tribal, generic and subgeneric classifications of Polygalaceae from Persson (2001), Eriksen (1993b) and Chodat (1986).....	7
TABLE 1.3: Australian <i>Polygala</i> species reproduced from Monro (2003; unpublished data)	9
TABLE 2.1: A comparison table showing shared and diagnostic morphological characters of OTU 25 and 40 and variable character states of morphological characters within OTU 35.....	29
TABLE 2.2: Table outlining characters useful for distinguishing infraspecific rank	32
TABLE 3.1: Characters and character states scored in phenetic analysis.	42
TABLE 3.2: The characters with their correlation values resulting from the PCC analysis of OTU 25/41 complex.....	48
TABLE 4.1: Table of types borrowed as either photographs or specimens and list of protologue publications and location of type herbaria.	55
TABLE 4.2: The taxa recognised by the morphological analysis listed as OTU numbers and the valid names, phrase names and misapplied names previously applied in Australia, and the accepted names recognised by this research.....	56
TABLE 4.3: Comparison of descriptions of <i>P. chinensis</i> and <i>P. polifolia</i> from van der Meijden (1988) with OTU 38 and OTU 39.	63
TABLE 4.4: Comparison of diagnostic key characters for <i>P. glaucooides</i> and <i>P. triflora</i> from Pendry (2001), van der Meijden (1988) and Adema (1966).....	68

List of Figures

Title	Page
FIGURE 2.1: Typical flower of Australian <i>Polygala</i> showing upper petal, alae, keel petal and floral appendages.....	16
FIGURE 2.2: Floral appendage types in north Australian <i>Polygala</i> spp	24
FIGURE 2.3: Variations in pistil structure in Australian <i>Polygala</i>	24
FIGURE 2.4: Flower showing fusion of staminal column and upper petals	25
FIGURE 2.5: Variations in aril head shape.....	25
FIGURE 2.6: Variations in seed indumentum in Australian <i>Polygala</i>	27
FIGURE 2.7: Photo of two seed types of Taxa 23 and 10.....	28
FIGURE 3.1: Images of herbarium sheets showing morphological variation within OTU 25/40 complex	36
FIGURE 3.2: Dendrogram of UPGMA fusion strategy of OTU 25/40 complex ..	46
FIGURE 3.3: Scatter plots resulting from the ordination of the OTU 25/40 complex data set	47
FIGURE 3.4: The PCC results overlaid on scatter plot of the ordination of the OTU 25/40 complex dataset	47
FIGURE 3.5: Bar graph of the average leaf widths and maximum widths (mm) for specimens analysed in the OTU 25/40 complex	48
FIGURE 3.6: Bar graph showing the L:B ratio for the OTU 25/40 complex data set, arranged by OTU group.....	48
FIGURE 3.7: Bar graph showing the distribution of specimens in the OTU 25/40 complex data set found in wet versus dry habitats	49
FIGURE 3.8: Map showing distributions of specimens in the OTU 25/40 complex data set	49
FIGURE 4.1: Putative holotype of <i>Polygala chinensis</i> L.....	60
FIGURE 4.2: Putative holotype of <i>Polygala polifolia</i> Presl.	61
FIGURE 4.3: Putative holotype of <i>Polygala glomerata</i> Lour.....	62
FIGURE 4.4: Holotype of <i>Polygala glaucoides</i> L.....	66
FIGURE 4.5: Holotype of <i>Polygala triflora</i> L.....	67
FIGURE 5.1: Holotype of <i>Polygala barbata</i>	82
FIGURE 5.2: Flower and seed of <i>Polygala barbata</i>	83
FIGURE 5.3: The distribution of <i>Polygala barbata</i> based on available collection data	83
FIGURE 5.4: Holotype of <i>Polygala barklyensis</i>	85
FIGURE 5.5: The distribution of <i>Polygala barklyensis</i> based on available collection data	86
FIGURE 5.6: Holotype of <i>Polygala bifoliata</i>	89
FIGURE 5.7: Seed and mounted specimen of <i>Polygala bifoliata</i>	90
FIGURE 5.8: The distribution of <i>Polygala bifoliata</i> based on available collection data	90
FIGURE 5.9: Holotype of <i>Polygala canaliculata</i>	92
FIGURE 5.10: The distribution of <i>Polygala canaliculata</i> based on available collection data	93
FIGURE 5.11: Holotype of <i>Polygala clavistyla</i>	96
FIGURE 5.12: The distribution of <i>Polygala clavistyla</i> based on available collection data	97
FIGURE 5.13: Holotype of <i>Polygala coralliformis</i>	101
FIGURE 5.14: Flower, floral appendages and seed of <i>Polygala coralliformis</i>	102

Title	Page
FIGURE 5.15: The distribution of <i>Polygala coralliformis</i> based on available collection data	103
FIGURE 5.16: Holotype of <i>Polygala crassitesta</i>	106
FIGURE 5.17: Flower, seed, capsule and alae of <i>Polygala crassitesta</i>	107
FIGURE 5.18: The distribution of <i>Polygala crassitesta</i> based on available collection data	108
FIGURE 5.19: Holotype of <i>Polygala dependens</i>	111
FIGURE 5.20: Habit and seed of <i>Polygala dependens</i>	112
FIGURE 5.21: The distribution of <i>Polygala dependens</i> based on available collection data	112
FIGURE 5.22: Holotype of <i>Polygala difficilis</i>	115
FIGURE 5.23: Flower, seed, and hairy keel petal of <i>Polygala difficilis</i>	116
FIGURE 5.24: The distribution of <i>Polygala difficilis</i> based on available collection data	117
FIGURE 5.25: Holotype of <i>Polygala dimorphotricha</i>	120
FIGURE 5.26: Flower, habit, and seed of <i>Polygala dimorphotricha</i>	121
FIGURE 5.27: The distribution of <i>Polygala dimorphotricha</i> based on available collection data	122
FIGURE 5.28: Holotype of <i>Polygala eriocephala</i>	125
FIGURE 5.29: Seed of <i>Polygala eriocephala</i>	126
FIGURE 5.30: The distribution of <i>Polygala eriocephala</i> based on available collection data	126
FIGURE 5.31: Flowers, styles and seed of <i>Polygala exsuarrosa</i>	130
FIGURE 5.32: The distribution of <i>Polygala exsuarrosa</i>	131
FIGURE 5.33: Holotype of <i>Polygala gabrielae</i>	133
FIGURE 5.34: Flower and seed of <i>Polygala gabrielae</i>	134
FIGURE 5.35: The distribution of <i>Polygala gabrielae</i> based on available collection data	134
FIGURE 5.36: Holotype of <i>Polygala galeocephala</i>	137
FIGURE 5.37: Habit and seed of <i>Polygala galeocephala</i>	138
FIGURE 5.38: The distribution of <i>Polygala galeocephala</i> based on available collection data	138
FIGURE 5.39: Holotype of <i>Polygala geniculata</i>	140
FIGURE 5.40: Flower and seed of <i>Polygala geniculata</i>	141
FIGURE 5.41: The distribution of <i>Polygala geniculata</i> based on available collection data	141
FIGURE 5.42: Holotype of <i>Polygala glaucifolia</i>	144
FIGURE 5.43: Habit and seed variation of <i>Polygala glaucifolia</i>	145
FIGURE 5.44: The distribution of <i>Polygala glaucifolia</i> based on available collection data	146
FIGURE 5.45: Holotype of <i>Polygala glaucoides</i>	148
FIGURE 5.46: Habit of <i>Polygala glaucoides</i>	149
FIGURE 5.47: Style, stamen and seed of <i>Polygala glaucoides</i>	150
FIGURE 5.48: The distribution of <i>Polygala glaucoides</i> based on available collection data	151
FIGURE 5.49: Holotype of <i>Polygala integra</i>	154
FIGURE 5.50: Flower, style and seed of <i>Polygala integra</i>	155
FIGURE 5.51: The distribution of <i>Polygala integra</i> based on available collection data	156

<u>Title</u>	<u>Page</u>
FIGURE 5.52: Holotype of <i>Polygala isingii</i>	159
FIGURE 5.53: Flower and seed variation of <i>Polygala isingii</i>	160
FIGURE 5.54: The distribution of <i>Polygala isingii</i> based on available collection data	161
FIGURE 5.55: The distribution of <i>Polygala japonica</i> based on available collection data	163
FIGURE 5.56: Holotype of <i>Polygala kimberleyensis</i>	165
FIGURE 5.57: Seed of <i>Polygala kimberleyensis</i>	166
FIGURE 5.58: The distribution of <i>Polygala kimberleyensis</i>	166
FIGURE 5.59: Holotype of <i>Polygala linearis</i>	169
FIGURE 5.60: Flower and seed of <i>Polygala linearis</i>	170
FIGURE 5.61: The distribution of <i>Polygala linearis</i> based on available collection data	170
FIGURE 5.62: Habit of <i>Polygala longifolia</i>	174
FIGURE 5.63: Flowers and seed of <i>Polygala longifolia</i>	175
FIGURE 5.64: The distribution of <i>Polygala longifolia</i> based on available collection data	175
FIGURE 5.65: Holotype of <i>Polygala macrobotrya</i>	178
FIGURE 5.66: Flower and seed of <i>Polygala macrobotrya</i>	179
FIGURE 5.67: The distribution of <i>Polygala macrobotrya</i> based on available collection data	179
FIGURE 5.68: Holotype of <i>Polygala obversa</i>	182
FIGURE 5.69: Flower and seed variation of <i>Polygala obversa</i>	183
FIGURE 5.70: The distribution of <i>Polygala obversa</i> based on available collection data	183
FIGURE 5.71: Holotype of <i>Polygala orbicularis</i>	186
FIGURE 5.72: Flower and seed of <i>Polygala orbicularis</i>	187
FIGURE 5.73: The distribution of <i>Polygala orbicularis</i> based on available collection data	187
FIGURE 5.74: Holotype of <i>Polygala parviloba</i>	192
FIGURE 5.75: Flower, seed and style of <i>Polygala parviloba</i>	193
FIGURE 5.76: The distribution of <i>Polygala parviloba</i> based on available collection data	193
FIGURE 5.77: Holotype of <i>Polygala pendulina</i>	195
FIGURE 5.78: Seed of <i>Polygala pendulina</i>	196
FIGURE 5.79: The distribution of <i>Polygala pendulina</i> based on available collection data	196
FIGURE 5.80: Holotype of <i>Polygala persicariifolia</i>	199
FIGURE 5.81: Style and seed of <i>Polygala persicariifolia</i>	200
FIGURE 5.82: The distribution of <i>Polygala persicariifolia</i> based on available collection data	200
FIGURE 5.83: Holotype of <i>Polygala petraphila</i> var. <i>angustifolia</i>	204
FIGURE 5.84: Holotype of <i>Polygala petraphila</i> var. <i>petraphila</i>	205
FIGURE 5.85: Flowers, seed, style and stylar groove of <i>Polygala petraphila</i>	206
FIGURE 5.86: The distribution of <i>Polygala petraphila</i> based on available collection data	207
FIGURE 5.87: Holotype of <i>Polygala polifolia</i>	210
FIGURE 5.88: Habit of <i>Polygala polifolia</i>	211
FIGURE 5.89: Style and seed of <i>Polygala polifolia</i>	211

Title	Page
FIGURE 5.90: The distribution of <i>Polygala polifolia</i> based on available collection data	212
FIGURE 5.91: Holotype of <i>Polygala praecox</i>	214
FIGURE 5.92: Floral appendages, style and seed of <i>Polygala praecox</i>	215
FIGURE 5.93: The distribution of <i>Polygala praecox</i> based on available collection data	216
FIGURE 5.94: Holotype of <i>Polygala pterocarpa</i>	219
FIGURE 5.95: Flower, seed and capsule of <i>Polygala pterocarpa</i>	220
FIGURE 5.96: The distribution of <i>Polygala pterocarpa</i> based on available collection data	220
FIGURE 5.97: Holotype of <i>Polygala pycnophylla</i>	222
FIGURE 5.98: Flower, seed and floral appendages of <i>Polygala pycnophylla</i>	223
FIGURE 5.99: The distribution of <i>Polygala pycnophylla</i> based on available collection data	224
FIGURE 5.100: Holotype of <i>Polygala rhinanthoides</i>	227
FIGURE 5.101: The distribution of <i>Polygala rhinanthoides</i> based on available collection data	228
FIGURE 5.102: Flower and seed of <i>Polygala rhinanthoides</i>	228
FIGURE 5.103: Holotype of <i>Polygala rhynchocarpa</i>	230
FIGURE 5.104: Capsule and style of <i>Polygala rhynchocarpa</i>	231
FIGURE 5.105: The distribution of <i>Polygala rhynchocarpa</i> based on available collection data	231
FIGURE 5.106: Holotype of <i>Polygala saccopetala</i>	234
FIGURE 5.107: Flower, keel petal and seed of <i>Polygala saccopetala</i>	235
FIGURE 5.108: The distribution of <i>Polygala saccopetala</i> based on available collection data	236
FIGURE 5.109: Holotype of <i>Polygala scorpioides</i>	239
FIGURE 5.110: Flower, seed and keel petal of <i>Polygala scorpioides</i>	240
FIGURE 5.111: The distribution of <i>Polygala scorpioides</i> based on available collection data	241
FIGURE 5.112: Lectotype of <i>Polygala stenoclada</i>	244
FIGURE 5.113: Excluded syntype of <i>Polygala stenoclada</i>	245
FIGURE 5.114: Seed and aril head of <i>Polygala stenoclada</i>	246
FIGURE 5.115: The distribution of <i>Polygala stenoclada</i> based on available collection data	246
FIGURE 5.116: Holotype of <i>Polygala succulenta</i> var. <i>congesta</i>	250
FIGURE 5.117: Holotype of <i>Polygala succulenta</i> var. <i>succulenta</i>	251
FIGURE 5.118: Flowers, style and seed of <i>Polygala succulenta</i>	252
FIGURE 5.119: The distribution of <i>Polygala succulenta</i> based on available collection data	253
FIGURE 5.120: Holotype of <i>Polygala tepperi</i>	256
FIGURE 5.121: Flower of and seed of <i>Polygala tepperi</i>	257
FIGURE 5.122: The distribution of <i>Polygala tepperi</i> based on available collection data	257
FIGURE 5.123: Lectotype of <i>Polygala triflora</i>	261
FIGURE 5.124: Flower and seed of <i>Polygala triflora</i>	262
FIGURE 5.125: The distribution of <i>Polygala triflora</i> based on available collection data	262

Title	Page
FIGURE 5.126: Holotype of <i>Polygala validiflora</i>	265
FIGURE 5.127: Flower, floral appendages and seed of <i>Polygala validiflora</i> .	266
FIGURE 5.128: The distribution of <i>Polygala validiflora</i> based on available collection data	267
FIGURE 5.129: Flower and seed of <i>Polygala wightiana</i>	269
FIGURE 5.130: The distribution of <i>Polygala wightiana</i> based on available collection data	270

CHAPTER 1

General Introduction

Introduction

Polygala L. is a widespread genus with a global distribution excluding Antarctica, the Arctic, New Zealand and the islands of Polynesia. The genus is represented by approximately 500 species with the main diversity known from South Africa and the Americas (South, Central and North) (Cronquist 1981). In Australia, native *Polygala* species are typically tropical annual herbs, usually patchily distributed throughout savanna woodland and occurring on a variety of substrates ranging from sandy soil to black clay. The main diversity is found across Northern Australia, the few species recorded in the southern temperate states being mostly introduced shrubs.

Taxonomy

Order

Traditionally, Polygalaceae has been placed in the order Polygalales with Malpighiaceae, Vochysiaceae, Trigoniaceae, Tremandraceae, Xanthophyllaceae and Krameriaceae (Cronquist 1981; Persson 2001).

Molecular data, however, has indicated a close relationship between Polygalaceae and Fabaceae (Kajita *et al.* 2001; Persson 2001) and Polygalaceae is now placed together with Fabaceae, Surianaceae and *Quillaja* Molina in the order Fabales by the Angiosperm Phylogeny Group (APG 2003). Although the typical keel flowers of Polygalaceae and Fabaceae appear to support this phylogeny, the floral structure of the families have been shown to be both morphologically and ontogenetically different suggesting keeled flowers

have arisen more than once in this order (Westerkamp 1997; Westerkamp & Weber 1997a; Persson 2001; Prenner 2004).

Family

The most recent complete monographs on Polygalaceae were published by Chodat (1893; 1896). Ten genera were identified; *Bredemeyera* Willd., *Polygala*, *Securidaca* L., *Monnina* Ruiz & Pav., *Salomonina* Lour., *Carpolobia* G. Don., *Muraltia* Neck., *Mundia* Kunth, *Moutabea* Aubl. and *Xanthophyllum* Roxb. These genera were classified into three tribes: Polygaleae, Moutabeae and Xanthophylleae. The Angiosperm Phylogeny Group list 21 genera, in 4 tribes, for the family (APG2003).

Polygala

Polygala was first published by Linnaeus (1753) in *Species Plantarum*. He described 22 species, one of which, *Polygala chinensis* L., is currently applied to Australian material (Monro 2003). In his key to genera, Chodat (1893) distinguished *Polygala* by the combination of eight stamens united in a semi-circle, a dehiscent capsule, and the absence of a very long tuft of hairs on the seed. Acknowledging the genus as the largest of the family (c. 500 species), Chodat (1893; 1896) divided *Polygala* into 10 sections: *Phlebotaenia* Griseb., *Acanthocladus* Klotzsch ex Hassk., *Hebecarpa* Chod., *Semeiocardium* Hassk. (als Gatt.), *Hebeclada* Chod., *Ligustrina* Chod., *Gymnospora* Chod., *Brachytropis* Rchb., *Chamaebuxus* Spach and *Orthopolygala* Chod..

Many of the North Australian species were initially assigned to section *Orthopolygala*, subsection 11, series *Chloropterae* by Chodat (1893). At the subsectional level the species were distinguished by “*Capsula alata; stylus rimiformis; stigma superius breve, cochleatum, submarginatum; inferius longius, carnosum pendens*”; a winged capsule, cleft style, emarginated and curled shorter upper stigma and a fleshy and pendulous longer lower stigma. At the series level they were distinguished by “*petala integra; arillus conspicua carinatus*”; the entire petals and conspicuous arils on the seed. Chodat’s (1893) concept of *Chloropterae* is confusing, however, as illustrations of species from that series show both cleft styles with globular stigmas and hooked styles with flat stigmas. This is corrected in Chodat’s later publication in which *Chloropterae* is designated as one of three series belonging to subsection 10, *Deltoideae* (Chodat 1896). Although still inclusive of many North Australian taxa, this subsection is defined by:

- a bent style, narrowly ribbon like (flattened in cross section)
- stigma variable, anthers not sessile
- upper petals broadly triangular, more colourful than the wings (alae)
- sepals green and acute
- upper sepals not connate

A brief outline of Chodat’s (1896) (*Ortho*)*Polygala* sections is shown in Table 1.1.

Table 1.1. Subsections and series of section *Polygala* as per Chodat (1896.)

Chodat 1896 Subsections	Chodat 1896 Series
<i>Aptero carpae</i>	
<i>Hemipterocarpae</i>	
<i>Brasilienses</i>	
<i>Australes</i>	
<i>Rupestres</i>	
<i>Buxiformes</i>	
<i>Migratores</i>	<i>Tinctoriae</i> <i>Sphenopterae</i> <i>Persicariaefoliae</i> <i>Arenariae</i> <i>Eriopterae</i> <i>Asiaticae</i>
<i>Fortificatae</i>	
<i>Leptaleae</i>	
<i>Deltoideae</i>	<i>Tetrasepalae</i> <i>Chloropterae</i> <i>Chromopterae</i>
<i>Virgatae</i>	
<i>Formosae</i>	
<i>Macropterae</i>	
<i>Vulgares</i>	<i>Vulgares</i> <i>Papilionaceae</i>

Phylogeny

Family

Regional treatments and recent molecular and morphological analyses of inter- and intra-family phylogeny, conducted by Eriksen (1993a; 1993b), Persson (2001) and Monro (2003), have questioned the classifications of Polygalaceae and sectional treatment of *Polygala* presented by Chodat (1896). While these authors failed to provide a resolved phylogeny for Polygalaceae they were able to highlight issues requiring further research such as polyphyly in a number of genera in Polygalaceae, including *Polygala*, *Monnina* and *Bredemeyera*; and ambiguity regarding the placement of *Xanthophyllum* in the family.

A summary of the results of recent research and regional treatments is given in Table 1.2, which outlines tribal, generic, and sectional classifications currently proposed for Polygalaceae. Changes from Chodat's treatment include the new tribe Carpolobia, which Eriksen (1993b) segregated from Polygaleae to accommodate the new genus *Atroxima* Stapf, and the recognition of 12 other new genera, some recently described, others raised from the rank of subgenus to genus.

Polygala

The polyphyletic nature of *Polygala* is not surprising as several infrageneric groups have previously been recognised as independent genera (Eriksen 1993b). Also undescribed diversity is evident in the genus and a number of authors have noted that infrageneric classifications cannot be attempted until the Neotropical and SE Asia species have been revised (van der Meijden 1988, Pendry 2001, Monro 2003).

Current Australian knowledge

In a recent treatment of Australian *Polygala*, Monro (2003) assigned 19 *Polygala* names to Australian taxa and classified them into infrageneric groups according to Chodat (1896) (Table 1.3). Seven were identified as introduced species and nine of the 12 native species were placed in the series *Chloropterae*, subsection *Deltoideae*. The remaining three native species were placed in series *Leptelae* or *Fortificateae*. All but four of the native taxa, assigned by Monro, were also described and listed by Chodat (1896) and were also placed in series *Chloropterae* based on short axillary inflorescences and flowers with greenish, acute wing sepals. All *Chloropterae* are found North of c. 30° S in Australia and only one native species, *P. japonica* (series *Fortificate*), is found further South in any abundance. The taxa assigned to series *Chloropterae* formed a monophyletic group in phylogenetic analyses based on morphological and molecular data carried out by Monro (2003) but the analysis did not include representatives of the series from Asia nor accounted for any potentially new taxa documented as phrase names in Australian checklists.

Table 1.3. Australian *Polygala* species; reproduced from Monro (2003; unpublished data)

Tribe	Genus	Section	Subsection	Series	Species
Polygaleae	<i>Polygala</i>	(Ortho) <i>Polygala</i>	<i>Aptercarpae</i>	<i>Tenues</i>	* <i>Polygala paniculata</i> L.
			<i>Hemipterocarpae</i>		* <i>P. duarteana</i> At.St.-Hil.
		<i>Migratores</i>	<i>Persicariaefoliae</i>	* <i>P. persicariifolia</i> DC.	
		<i>Fortificatae</i>		<i>P. japonica</i> Houtt.	
		<i>Leptaleae</i>		<i>P. longifolia</i> Poir.	
			<i>Deltoideae</i>	<i>Chloropterae</i>	<i>P. wightiana</i> Wight & Arn.
					<i>P. chinensis</i> L.
					<i>P. eriocephala</i> Benth.
					<i>P. exsuarrosa</i> Adema ?
					<i>P. isingii</i> Pedley ?
					<i>P. linariifolia</i> Willd.
					<i>P. macrobotrya</i> Domin ?
				<i>P. orbicularis</i> Benth.	
		<i>P. rhinanthoides</i> Sol. ex Benth.			
		<i>P. tepperi</i> F.Muell.?			
		<i>Virgatae</i>	* <i>P. virgata</i> Thunb.		
		<i>Formosae</i>	* <i>P. myrtifolia</i> L.		
		<i>Europeae</i>	<i>Vulgares</i>	* <i>P. monospeliaca</i> L.	
				* <i>P. vulgaris</i> L.	

*introduced species

? not listed in Chodat (1893)

The Problems

Preliminary investigations into the status of *Polygala* in Australia highlight three problems which require investigation. Firstly, recent phylogenetic research in Polygalaceae has identified polyphyletic genera within the family, including *Polygala* (Eriksen 1993; Persson 2001; Monro 2003), suggesting Chodat's (1893) classification may be redundant. Secondly, the most recent treatment of the genus in Australia remains unpublished in Monro's (2003) thesis and is incomplete, mostly because the primary aim of the work was to provide a phylogeny for the Polygalaceae within Australia. Monro (2003) recognised 19 species names with 20 additional names treated in synonymy, but does not synonymise or discuss the nomenclatural problems associated with *P. triflora* L., *P. glaucooides* L., and *P. polifolia* Presl., which van der Meijden (1988) reports as having Australian distributions. Thirdly, it is apparent that further work on documenting *Polygala* end taxa in Australia is required. The Northern

Territory checklist (Cowie & Albrecht 2004) records 11 potentially new and 17 described taxa. There are four potentially new and 16 described taxa recorded in the Queensland census (Henderson 2002) and two potentially new and 12 described taxa in FloraBase (Anon. 1998). Preliminary investigation of specimens from Australian Herbaria indicate that there is significant undescribed diversity within the Northern Australian *Polygala* and that this diversity represents discrete species, species complexes and infra specific taxa. Clearly these potentially new taxa must be investigated and taxonomic ranks assigned before any thorough classification can be provided for Australian Polygalaceae.

Aim

The aim of this research is to investigate *Polygala* diversity in Northern Australia, particularly within taxa assigned to series *Chloropterae* and identify and establish the species limits within this series. Morphological characters will be investigated for their usefulness in diagnosing taxa and species according to the phylogenetic species concept.

Objectives

- Documentation of *Polygala* diversity in Northern Australia.
- Assessment of morphological characters in identifying inter-species relationships in *Polygala*.

Materials and Methods

Sampling Diversity

Polygala series *Chloropterae* was extensively sampled across Northern Australia through examination of existing material housed in national herbaria and through targeted field survey. Given the apparent diversity that has remained undescribed in this genus in Northern Australia, specimens were examined for morphological characters which may be informative of phylogenetic lineages, through both comparative and numerical methods. Specimens were examined for taxonomically informative characters which typically occur consistently, invariably and in combination with other characters within and/or across populations and allow for the diagnosis of discrete taxa. Numerical analyses were conducted on complexes which are not easily circumscribed to apply finer resolution pattern analysis to the data.

Taxonomic rank is applied to the resulting observed taxa. Species are defined based on a phylogenetic species concept (PSC), which states that a species is “the smallest aggregation of populations (sexual) or lineages (asexual) diagnosable by a unique combination of character states in comparable individuals” (de Queiroz & Donoghue 1988, 1990; Nixon & Wheeler 1990; Wheeler & Nixon 1990; Davis & Nixon 1992; Mayden 1997; Snow 1997). A discussion on species concepts and how to assign taxonomic rank is beyond the scope of this work and many comprehensive reviews are already available in the literature (Stuessy 1990; Paterson 1993; Quickie 1993; Szalay 1993; Dover 1995; Claridge *et al.* 1997; Hull 1997; Mayden 1997; Stamos 2002; Lee 2003; Nelson 2003; Sandvik 2003). The PSC is applied in this work because it

has the advantage that the types of characters used to diagnose taxa aren't specified. This allows the broad range of characters used by other species concepts to be applied, without the exclusion of asexually reproducing organisms.

The PSC and this study assumes that morphological similarity is the result of shared common ancestry rather than the result of convergent evolution, i.e. that the populations represented by the shared morphological characters are the result of common ancestry and that the shared characters are homologous characters rather than non-homologous characters independently evolving from a different ancestor (homoplasy).

The issue of paraphyletic species is also cause for ongoing debate regarding PSC. A paraphyletic species consists of populations that are more similar to populations of other species than to populations of their own species. It is most often described with the use of a diagram, a paraphyletic species, identified by a shared common ancestor, has populations that are not grouped with all the descendent populations (species) of that common ancestor. There are various versions of the PSC which exclude or include the requirement for species to be monophyletic. The PSC (diagnosable version) proposed in this thesis is that reported by (Mayden 1997) which only applies monophyly at levels of organisation above species and discussion on the assumptions of paraphyly are not relevant in this case.

An additional concern with PSC relates to the recognition of tokogenetic relationships or reticulate relationships between individuals within populations (Nixon and Wheeler 1990; de Querioz and Donoghue 1988, 1990; Wheeler and Nixon 1990). Tokogenetic relationships can lead to polymorphs which may be recognised as monophyletic lineages and will therefore result in more taxa being described as species than other methods or concepts (Mayr 1991; Nixon and Wheeler 1990).

Taxa identified are compared against protologues and types of existing published names and are assigned where valid. New taxa identified are described and named. A key to species is provided as both a tool for identification and as a means of testing the diagnostic capacity of the characters chosen. Problems with assigning names to cosmopolitan species with poor types are discussed. Finally a taxonomic treatment is provided and the result of the treatment is used to test current classifications of *Chloropterae* in Australia and propose future work to help resolve phylogeny of the group.

CHAPTER 2

Sampling diversity: Comparative morphology

Introduction

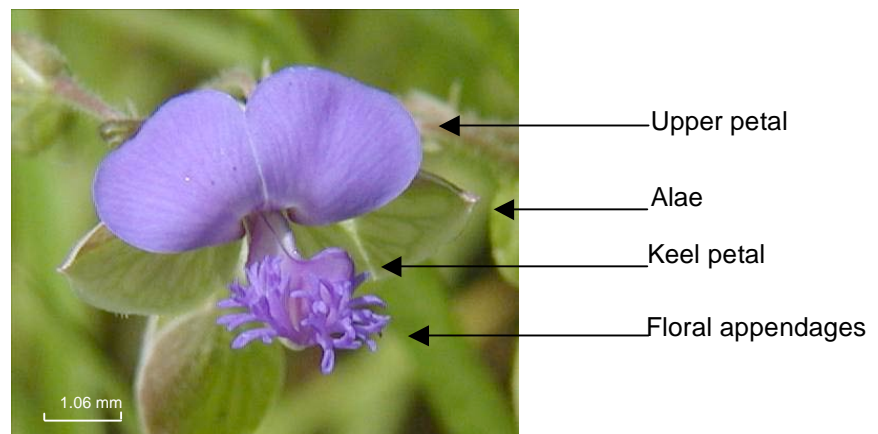
In recognising species, shared morphology is assumed to reflect a shared genetic lineage and genome. Traditionally, morphological characters used to differentiate between species in *Polygala* have included reproductive characters of floral, seed and fruit structure, and vegetative characters of indumentum, leaf shape and habit (Bentham 1863; Chodat 1893; Domin 1930; Adema 1966, 1969; van der Meijden 1988; Pendry 1999, 2001). Typically taxonomically informative characters vary within the group under study but are consistent within taxa, are not easily modified with environmental changes and ideally co-vary with other characters (Stuessy 1990). *Polygala* from series *Chloropterae* were extensively sampled and investigated for taxonomically informative characters. Morphological characters on fresh and dried specimens were assessed and a number of vegetative and reproductive characters were found to be very useful in defining *Polygala* populations into discrete taxa.

Background

In Australia, native *Polygala* species are annual herbs found in savanna woodland, sandstone heath and seasonally inundated lowlands. They are characterised by bilaterally symmetrical flowers. The calyx consists of 5 sepals, 3 small green unmodified sepals and 2 enlarged, herbaceous or petaloid, lateral sepals referred to as alae. The corolla consists of 3 petals, the lower petal a clawed boat-shaped keel, with two dorsal appendages attached either side of the keel, often distally offset to one side, and two broad clawed upper petals (Fig. 2.1). Flowers are bisexual. Eight stamens are fused at the base into a

staminal column surrounding the style and variously fused to the upper petals. The style and stigma are variable and often act as secondary pollen presenters. The fruit consists of a laterally compressed bilocular capsule with one seed per locule. The seeds are hairy, rarely glabrous, and arillate, the aril is variously shaped with 2-3 appendages running longitudinally along the seed.

Fig. 2.1. Typical flower of Australian *Polygala* showing upper petal, alae, keel petal and floral appendages (RK1170).



Taxonomically Informative Characters

It is widely accepted that the reproductive strategy of plants is an important component of their adaptational response. Pollination and dispersal mechanisms lead to increased reproductive success and provide mechanisms for isolating phylogenetic lineages, consequently, reproductive data provides strong evidence for delineating taxa particularly at the species and infraspecific level (Stuessy 1990).

Flowers

The highly modified keel flowers of *Polygala* indicate an adaptation to specialist pollination and bee, butterfly and bird pollination are all reported for *Polygala*

species (Brantjes 1982; Lack & Kay 1987; van der Meijden 1988; Westerkamp & Weber 1997a). These modifications include visual attraction from the enlarged often petaloid sepals and flag petals; the presence of abutments such as the erect upper petals (required for depression of the keel); the development of rewards such as nectaries, the concealment of pollen in a keel to offer protection from pollen robbers; stylar pollen presentation (secondary and tertiary); and the development of tongue guides. Pollen in *Polygala* is usually deposited on the style or stigma from the sheathing staminal column when both the style and androecium are enclosed in the keel petal. Pollination is achieved when the pollinator depresses the keel petal, usually by landing on it or the floral appendages, and releases the enclosed style (and pollen presenter) from the keel, allowing the stigma and pollen to touch the pollinator. This mechanism not only allows selection of pollinators and avoids hybridisation through promotion of cross fertilisation but offers an array of characters (Brantjes 1982; Westerkamp & Weber 1997a), usually discrete and binary, which appear to be very useful for identifying genetic lineages/species.

Floral appendages

Each flower of Australian *Polygala* has two floral appendages found on the upper dorsal surface of the keel petal. Floral appendage structure has only been used to a limited extent by Bentham (1863), Chodat (1893) and Monro (2003) to diagnose Australian material, most likely because they are quite cryptic in dried material. Examination of fresh material of Australian *Polygala* revealed they offer a variety of discrete character states in shape, texture and orientation.

Style and stigmas

Although some species are reported to be autogamous (Kruger & Pretorius 1997) style and stigma structure has been shown to facilitate reproductive isolation and promote cross fertilisation in *Polygala*. For two sympatric species of *Polygala* in Brazil, the exact position of pollen deposition on the pollinator's head is determined by the species specific distance between the style tip and nectary in the visited flower, the two species deposit the pollen 2 mm apart and keep the species reproductively isolated (Brantjes 1982). Mechanisms for promoting cross fertilisation are also reported. For example, *P. vauthieri* Chodat pollen is not presented until after the first pollinator visitation (Brantjes 1982). In *P. lewtonii* Small pollen is restricted to a sterile lobe of a bilobed stigma, only transferring to the fertile lobe as the flower ages and if it has not been picked up by visiting pollinators (Weekley & Brothers 2006). Variations in style and stigma structure are well known in *Polygala* and illustrated at length by Chodat (1893). Observation of Australian *Polygala* indicate they are varied and diverse in style and stigma structure.

Seeds

Arils and caruncles are mechanisms for attracting and rewarding dispersal vectors (Berg 1975) and many types of dispersal have been noted for *Polygala* (van der Meijden 1988), including myrmecochory (ant dispersal), ornithochory (bird dispersal), anemochory (wind dispersal), diplochory (dispersal by two separate vectors, e.g. wind-dispersed seed falls from fruit and is then animal-dispersed), and epizoochory (borne externally by animals). While

myrmecochory has been established in several Australian *Polygala* (Verkerke 1985), studies outside of Australia have shown that aril appendages and seed indumentum act as air sacs and aid in floating, as well as provide enticements and handles for ants to carry the seeds (Oostermeijer 1988, Anon. 2002). While advantages of myrmecochory to Australian *Polygala* are speculative, Berg (1975) suggested that buried seeds are protected from rapid fires and predation and are often planted in positions suitable for germination. While no germination trials have been conducted on Australian *Polygala*, fire and seed predation are prominent features of the North Australian landscape and work on Florida species indicate germination is high if seeds are buried or treated with smoke water (Anon. 2002).

Arils

The presence of aril appendages, the number of appendages and the length and texture of appendages are utilised by Chodat (1893) in subsectional classifications of *Polygala* and keys to species.

The fleshy aril structure and appendages of *Polygala* seed are variously referred to in the literature as a caruncle, aril, exostome aril or strophiole (Bentham 1863; Chodat 1893; Adema 1966; Isaacs *et al.* 1993; Verkerke & Bouman 1980; van der Meijden 1988; Merlee Teresa & Jacob 1999; Monro 2003). Definitions for these structures vary and can often be contradictory making an accurate determination of the structure difficult. Examples of varying definitions in the literature are that caruncles are outgrowths: next to the micropyle (Berg 1975; Mauseth 1988), near the hilum (McCusker 1999), or are

small outgrowths of the integument when small (Berg 1975); and that arils are structures formed by the expansion of the funicle (Mauseth 1988; Bell 1991; McCusker 1999) or are large fleshy outgrowths of the integument (Eames 1961).

Research on ovule ontogeny in *Polygala* refer to the structure as an exostome aril (Verkerke & Bouman 1980). According to Mauseth (1988) an exostome aril is an aril formed from the outer integument of the micropyle. This treatment uses the term aril and aril appendages for the outgrowth at the micropyle and hilum end of the seed, following Verkerke and Bouman (1980) and van der Meijden's (1988) treatment. Also following the convention established by previous treatments the aril is treated as the apex of the seed, because of its location at the stylar end of the capsule, this is apparently against the convention used in other groups, such as Fabaceae, where the end opposite to the hilum and micropyle is treated as the apex (*pers. comm.* Ian Cowie).

Aims

To extensively sample dried and fresh *Polygala* specimens across Northern Australia to identify taxonomically informative morphological characters which may be useful in diagnosing phylogenetic species.

Materials and methods

Specimens

Herbarium specimens from PERTH, BRI, CANB and DNA were examined.

Additional field survey to collect material from QLD, WA and within the NT was conducted. Fresh material and photographs allowed access to floral characters such as appendage type and style structure.

A total of 1608 specimens of *Polygala* N of 26°S were examined from Australian herbaria, 150 specimens from overseas herbaria (SING, L) were examined to help establish Australian endemism.

Characters

The characters and character states assessed are described below.

Floral appendages

Seven broad types of floral appendage have been defined and are illustrated in Fig 2.2. These are :

- **Bifurcate** appendages are divided at least once to the base, they often divide further with age but are generally no more than three or four lobed, when fresh these appendages are very thick and succulent (Fig 2.2 a);
- **Fimbriate** appendages are divided into many fine divisions, each division is of relatively even thickness throughout, are either straight or recurved and sometimes shortly and irregularly divided(Fig. 2.2 b & c);
- **Entire** appendages are undivided appendages, usually with no or very little lobing (Fig. 2.2 d);
- **Spathulate** appendages are similar to fimbriate appendages in that they consist of many even divisions, but the divisions broaden distally and are more or less spathulate (Fig. 2.2 e);
- **Coralline** appendages are irregularly divided with one lobe usually much broader than the others (reminiscent of the branches of staghorn corals) (Fig. 2.2 f);
- **Crenate** appendages are irregularly notched along the margin, often with one protruding lobe like the thumb on a pair of mittens (Fig. 2.2 g);
- **Horned** appendages are comprised of two narrowly oblong lobes with an acute apex, and are turgid (Fig. 2.2 h).

Pistil

The pistil in Australian *Polygala* is variable but generally consists of either a strongly hooked style with a flat stigma on the inner surface of the hook or a curved style with a globular stigma. In many cases when the style is not strongly hooked it extends past the stigma. Chodat (1893) often referred to this extension as a sterile stigma but is here considered an extension or putative pollen presenter. This research has revealed that in many cases the style extension is grooved, or sculptured and forms a pocket where pollen is captured and is in keeping with observations of other researchers (Westerkamp & Weber 1997b). Variations on the length, hairiness and shape of the extension and the type of sculpturing exist between Australian species and may function as a mechanism to keep taxa reproductively isolated (Fig. 2.3). Both floral appendages and style characters can be difficult to see in dried material and are best observed when fresh.

Staminal column and upper petals

In most of the Australian material stamens are monadelphous, fused evenly or are fused in increasing lengths from the outside to the middle pair giving the fused area a deltoid appearance. The stamens of *Polygala wightiana* Wight & Arn. are triadelphous, fused in three bundles of 3, 2, and 3. Useful staminal column and upper petal characters consist of presence or absence of auricles on the upper petal, the extent of, and point of, fusion of staminal column to upper petal, the presence or absence of a flap created by the fusion and the distribution of hairs along the staminal column and upper petal (Fig.2.4).

Fig. 2.2. Floral appendage types in north Australian *Polygala* spp. a) bifurcate (RK727) (1:0.325); b) fimbriate straight (RK745) (1:0.2); c) fimbriate recurved (KB6392) (1:0.2); d) entire (RK725) (1:0.4); e) spatulate (RK723) (1:0.2); f) coral like (RK904) (1:0.385); g) jagged (RK754) (1:0.167); h) horned (RK922) (1:0.492).

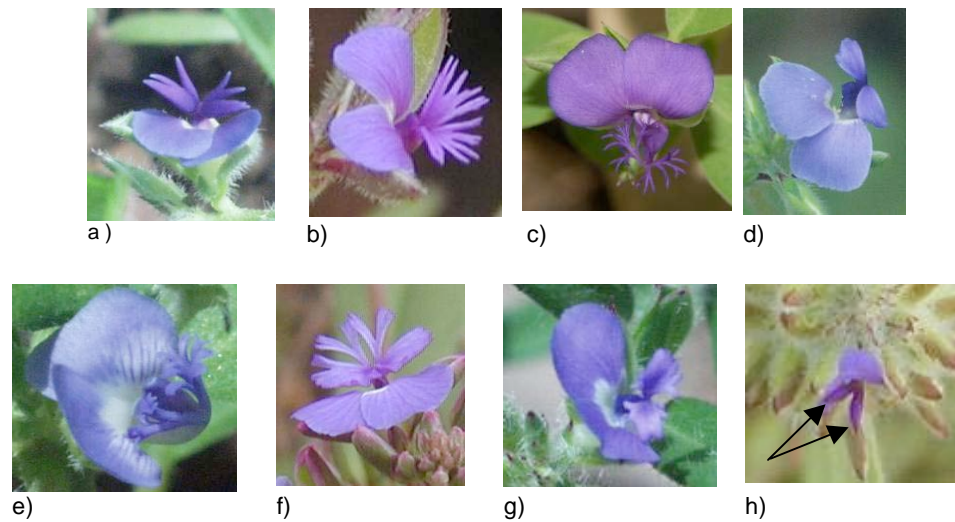


Fig. 2.3. Variations in pistil structure in Australian *Polygala*, scale in brackets: a) style curved and not extending past stigma, stigma flat (RK903) (1:0.125); b) style curved and extended past stigma, stigma globular, note groove above stigma (RK901) (1:0.064); c) style strongly hooked, stigma flat (RK824) (1:0.075); d) style curved and extended past stigma, stigma globular (RK922) (1:0.102); e) style curved, shortly extended past stigma, stigma \pm globular (RK920) (1:0.095); f) style shortly hooked and truncated at stigma, grooved along truncation, stigma globular (RK1131) (1:0.045); g) style shortly hooked and truncated at stigma, stigma flat (RK1129) (1:0.0168).



Fig. 2.4. Flower showing fusion of staminal column and upper petals. a) flap present (RK 1028) and b) flap absent (RK 723).

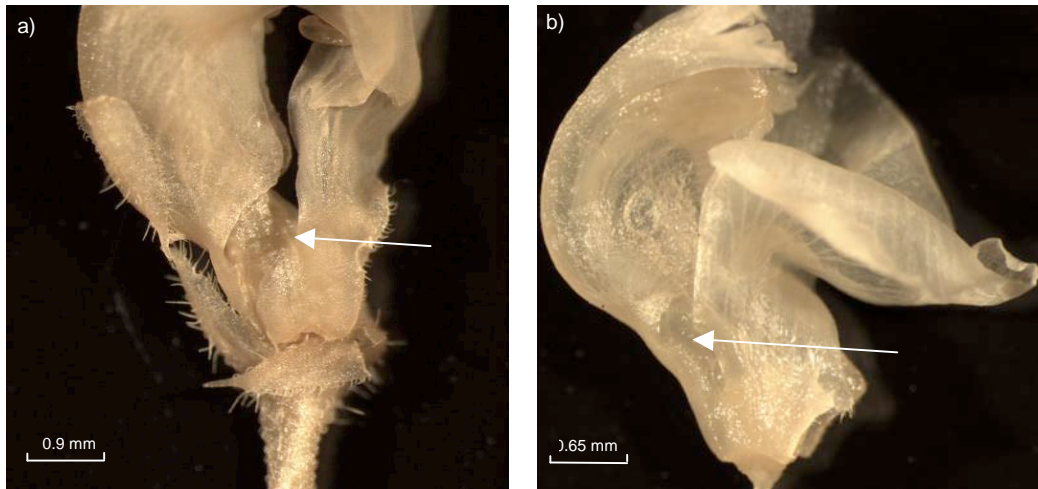
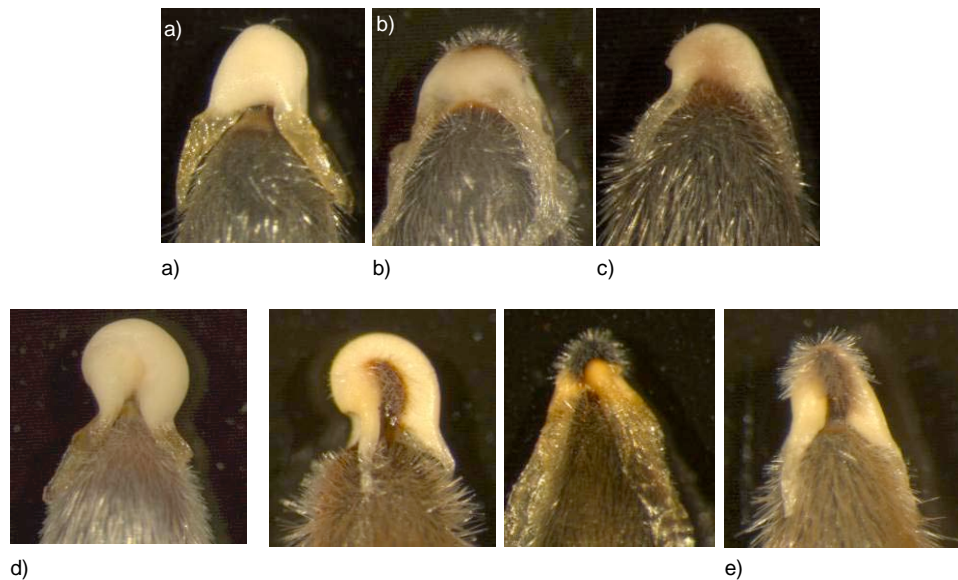


Fig. 2.5. Variations in aril head shape a) Domed (RK727) (1:0.0455); b) Round (RK725) (1:0.0588); c) Hooked or skewed (RK1083) (1:0.0667); d) Helmet without darkened groove (MitchellAA 2902); Helmet with darkened groove (LatzPK 16983) (1:0.066), e) Reduced pin with aril appendages arising from base of head (RK738 (1:0.063)); Reduced pin with aril appendages arising from the side of head and appearing somewhat skewed (LatzPK 16782 (1:0.045))



Aril head

Taxonomically useful seed characters include seed indumentum and aril head shape and colour. The aril head refers to the fleshy white outgrowth at the micropylar end of the seed. In Australian material they are always attached to the stylar end of the capsule, they vary in both shape, size and colour and are categorised into five types, illustrated in Fig. 2.5. These are:

- **Domed** heads are symmetrical and are either longer than wide or as long as wide (Fig. 2.5 a);
- **Round** heads are symmetrical and are generally shorter than wide (Fig. 2.5 b);
- **Hooked or skewed** heads are slightly asymmetrical and are generally shorter than wide (Fig. 2.5 c);
- **Helmet** heads are strongly asymmetrical and the head is as long as it is wide or longer than wide, often the head has a central groove where the aril is reduced to the seed testa (Fig. 2.5 d);
- **Reduced** heads have no aril development at the top of the seed and are reduced to appendages only (Fig. 2.5 e).

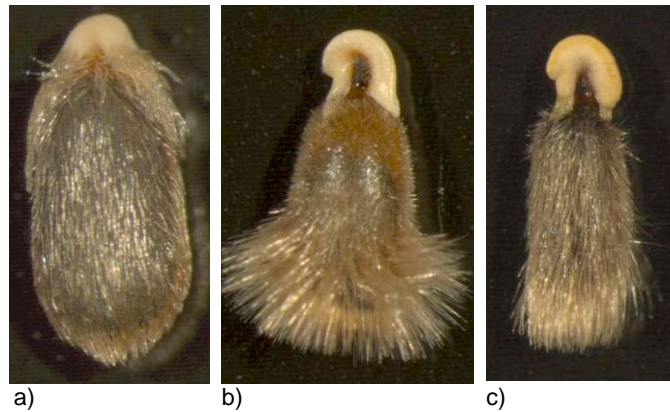
Descriptions of aril head shapes and colours do not include the appendages which extend from the head longitudinally along the seed, and apply to mature seed only.

Seed indumentum

Most Australian *Polygala* seeds are covered in a fine hair of variable length; often shorter and/or recurved at the apex and longer at the base, extending well

beyond the seed, and are white to ferruginous. In some taxa a second hair type is present, and consists of a hollow, thicker hair generally recurved and located just below the aril head (Fig. 2.6)

Fig. 2.6. Variations in seed indumentum in Australian *Polygala* a) hollow hairs (RK753) (1:0.07); b) short hairs and long hairs longer at base (Albrecht 10660) (1:0.1); c) short at apex, long throughout (RK1189) (1:0.093)



Results

Morphologically distinct taxa

All specimens were grouped into operational taxonomic units (OTUs) according to morphological similarity. Characters listed in descriptions in Chapter 5 were measured and scored for each OTU, they include habit, indumentum, leaf size and shape, floral, fruit and seed characters. In total 47 separate OTUs were identified and diagnostic characters for these taxa are presented in APPENDIX ONE. In many cases taxa are clearly distinguished by two or more discrete or continuous characters. OTU 18 and OTU 20, for example, are sympatric species which are superficially very similar and previously had been identified as *P. orbicularis* (OTU 19), close examination of fresh and dried material show that these taxa are both separate to *P. orbicularis* and to each other. In fact, OTU 20 shares more similarities with *P. orbicularis* than OTU 18.

Separation of OTU 23 and 10, is based on seed coat characteristics and ecology. Specimens of both taxa are characterised by an extensive wing on the capsule and large alae. Two distinct groups are readily apparent based on the presence or absence of a thickened seed testa or collar below the aril (Fig. 2.7 b). Specimens with a collar are consistently associated with clay habitats. All specimens within these groups display significant variation in habit, leaf size and shape, density of inflorescence and size of capsule wing and length. The PSC allows for the recognition of taxa at the species level based on one character state.

Fig. 2.7. Photo of two seed types in Taxon 23 and 10 complex, showing a) thickened collar (RK1032) (1:0.09) and b) absence of thickened collar (RK917) (1:0.088).

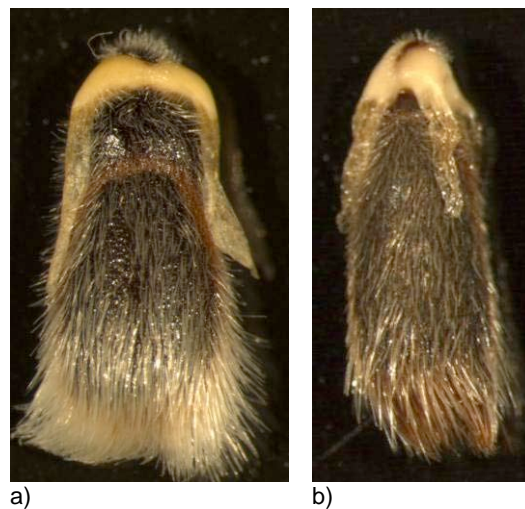


Table 2.1. A comparison table showing shared and diagnostic morphological characters of OTU 25 and 40 and variable character states of morphological characters within OTU 35. Colour: p/b/m = purple blue or mauve; Floral appendage: b = bifurcate; f = fimbriate, e = entire, c = coralline, s = spatulate, cr = crenate, h = horned; Indumentum: c = curved, s = straight, glab = glabrous/glabrescent ; stigma: glob = globular.

OTU	25	40	35
Epithet	<i>P. linearis</i>	<i>P. bifoliata</i>	<i>P. triflora</i>
Alae colour	green and acute	green and acute	green and acute
Flower colour	p/b/m	p/b/m	yellow/white/p/b/m
Floral appendage	fimbriate	fimbriate	fimbriate
Floral appendage texture	petaloid	petaloid	petaloid
Seed shape	ovoid - oblong	ovoid - oblong	ovoid -oblong
Aril head shape	round - hooked	round - hooked	helmet - hooked
Seed hairs	Two hair types	Two hair types	Single hair type
Style shape	hooked	hooked	hooked
Style with pocket or grooves	absent	absent	absent
Stigma	flat	flat	flat
Indumentum	c & s	c & s/c	c & s/c
Leaf shape	linear to lanceolate	elliptic to ovate linear to lanceolate	linear, narrowly elliptic to oblanceolate to obovate
Capsule wing	not winged	not winged	not winged
Misc.	seed with thick hollow recurved hairs	seed with thick hollow recurved hairs	Habit variable: some specimens multi-stemmed with thickened taproot, others with one main stem and lateral branches and taproot not thickened.

It is also clear from the comparison that some putative taxa, e.g. OTU 25 and 40 are not clearly differentiated, or that some taxa are very variable (OTU 35) see Table 2.1 and for full species descriptions see Chapter 5 for species recognized from these OTUs (species names linked to OTU in APPENDIX ONE). In the case of OTU 25 and 40 a gradation in leaf shape and size does

not allow for phenetic gaps to be intuitively observed. These taxa are investigated further in subsequent chapters. In the case of taxon 35 the flower colour and indumentum type are very variable. In total 44 morphologically distinct taxa and 3 problematic taxa, potentially species complexes, were identified.

Discussion

Assigning taxonomic rank

Species

Following the PSC, a species is “the smallest aggregation of populations (sexual) or lineages (asexual) diagnosable by a unique combination of character states in comparable individuals”. It could be argued in accordance with this definition that one character state difference is sufficient to diagnose a group. There are alternatives to this view, some authors suggest, for example, at least two independent characters to differentiate species following the morphological species concept (Hedberg 1958; Davis & Heywood 1963) or five correlated character differences following the phenetic species concept (Sneath & Sokal 1973). Given that morphological and phenetic characters are assessed in this study there is some foundation for applying these rules. These same authors, however, also suggest that the degree of difference required to delineate species depends to some extent on the group being studied and its own internal diversity.

In the case of *Polygala*, given the importance of pollination mechanisms, it is possible that changes in floral structure are sufficient to isolate phylogenetic

lineages and, therefore, offer strong evidence for defining species. Similarly, in sympatric populations the maintenance of discrete character states is taken as evidence of reproductive, and, therefore, phylogenetic isolation, e.g. in *P. triflora* and *P. glaucoides* flower size is sufficient to determine sympatric species (van der Meijden 1988). It is in this context that 42 of the taxa are identified in this research as species based on character differences defined in APPENDIX ONE.

Intraspecific ranks

Defining criteria on which to assign taxa to intraspecific rank is even more difficult than defining species. In fact the PSC does not clearly allow for intraspecific ranks because it determines that a species is the smallest aggregation of a diagnosable group. Perhaps those groups which are not consistently or exclusively diagnosable could qualify for intraspecific rank. This concurs with Stuessy (1990) who proposed that taxa which are in the most part morphologically and geographically distinct but have areas of gradation and are therefore not 100% exclusive qualify for subspecies. Given that the PSC does not allow for intraspecific ranks, ranks below species are not considered evolutionary units, although it could be argued that they represent the beginning of a divergence of a phylogenetic lineage. In this instance they represent a means for describing diversity within a species.

Following Stuessy's (1990) guidelines for distinguishing intraspecific ranks (Table 2.1) geography is the most important component in the recognition of intraspecific taxa : "if morphologically distinct population systems are completely

overlapping, they are probably reproductively isolated and hence best viewed as good species or if the morphological difference is minor and with a simple genetic basis, then forms are probably indicated". Subspecies and varieties only are considered if the distributions are largely allopatric. Based on the definition that varieties are in the most part morphologically and geographically distinct but have areas of gradation, two species are described with varietal variation in this research.

Table 2.2. Table outlining characters useful for distinguishing infraspecific rank, modified from Stuessy (1990) pg 189.

Category	Morphological distinction	Geographical distributions	Hybridisation	Fertility of Hybrids
Subspecies	several conspicuous differences	cohesive/largely allopatric or peripatric	possible along contact zones	markedly reduced fertility
Variety	one to few conspicuous differences	cohesive/largely allopatric with some overlap	probable in overlap region	reduced fertility
Form	usually a single conspicuous difference	sporadic; sympatric	always expected	complete fertility

Conclusions

In total 47 morphologically distinct taxa were identified. They consist of 44 non-problematic taxa and 3 problematic taxa which appear to represent species complexes. Following the phylogenetic species concept 42 are identified as species and 4 identified at the rank of variety. Three taxa require further investigation, they are: OTU 40/25 and OTU 35.

CHAPTER 3

Species complex

Introduction

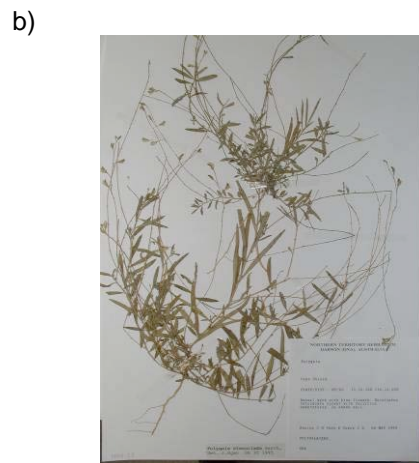
One of the challenges of documenting diversity and defining species is that speciation processes are current and phylogenetic lineages may be in the process of converging or diverging at the time of classification. Species complexes are often an indication of those processes, particularly in plants, where an increased capacity for hybridisation or self pollination can drive speciation events (Gornall 1997). To confound things further complexes can simply represent variation in the phenotypic plasticity of certain genotypes or the inherent genotypic diversity within a taxon rather than an indication of speciation. Numerical analysis can often help uncover taxonomic structure not intuitively recognised through observation of species complexes. The species complex taxon 40/25, identified in the morphological comparison in Chapter 2, is investigated further using numerical analysis in order to determine whether this complex represents morphologically distinguishable populations and therefore two distinct species following the PSC. The species complex taxon 35, formerly identified as *P. linariifolia*, was unable to be investigated due to insufficient material, it is discussed further in Chapters 4 and 5 as *P. triflora*.

Background to complex

The species complex, identified in the morphological comparison in Chapter 2, includes populations of morphological extremes as well as populations which intergrade making it difficult to delineate taxa consistently. The 40/25 complex is characterised by a number of shared characters but in particular the presence of two hair types on their seeds, the asymmetrical to rhomboid capsules and the long pedicels and axillary inflorescences. Specimens in this complex have

previously been identified in the NT as two separate species *P. stenoclada* (taxon 25) and *P. pycnophylla* (taxon 40). Typically, specimens determined as *P. stenoclada* have long linear leaves with an erect to ascending habit and are almost always found in seasonally inundated situations, usually sandy *Melaleuca* woodlands (Fig. 3.1c). Specimens determined as *P. pycnophylla* are generally prostrate or erect with prostrate branches, have wider more elliptic leaves, although linear leaves are often also present, and are usually found growing in eucalypt woodlands (Fig. 3.1 a). The extremes of these taxa are easily distinguished by these characters but a number of specimens cannot be placed unequivocally in either group (Fig. 3.1.b/d).

Fig 3.1. Photos showing morphological variation within OTU 25/40 complex a) RK914 b) Cowie 6715 c) Brennan 1868 d) Dunlop 9464



c)

d)

Numerical taxonomy

Numerical taxonomy in the context of descriptive rather than phylogenetic systematics relates to the use of multivariate statistics to group operational taxonomic units (OTUs) or objects, based on similarity across a suite of quantitative and qualitative variables (Sneath & Sokal 1973; Nogrady 1988; Stuessy 1990; Legendre & Legendre 1998). The most common multivariate techniques used to query species complexes are cluster and ordination/PCA analyses (Henderson 2006). Additional approaches which can be useful in

conjunction with classification and ordination include: discriminant function analysis – which finds the linear function best able to distinguish between pre-defined groups, and canonical correlation – which cross-correlates two sets of variables using a linear model (Williams 2002, Henderson 2006).

Classification or cluster analysis

A classification analysis focuses on finding discontinuities between objects, based on their measured attributes. Classifications require a measurement of similarity between the objects of a multivariate data set (an association coefficient) and then a means of classifying or clustering objects based on similarity (fusion strategy or clustering algorithm) (Legendre & Legendre 1998; Williams 2002). The type of association coefficient and clustering algorithm used is determined by the types of variables in the dataset and the way they are recorded. Characters used in taxonomic analyses, for example, are usually quite diverse and are a mixture of quantitative and categorical or qualitative attributes, and in order to compare them, they must be brought to some common scale either through standardisation or transformation (Sneath & Sokal 1973, Downing *et al.* 2004). The way similarity and dissimilarity are weighted in an association measure is also important. Measures which do not give joint absences the same weighting in the analysis as joint presences are important when dealing with taxonomic data (Sneath & Sokal 1973), the shared absence of wings, for example, should not be given the same weighting as the shared presence of eyes.

An extensive array of classification algorithms is available for classifying groups. Classification is an iterative process in which objects are fused into groups based on similarity/dissimilarity and as each object is added to a new group the distances or similarity between groups are recalculated. Factors to be considered when choosing a fusion strategy or clustering algorithm for a classification include the way intergroup distances are defined and the affect the strategy has on reversals and space conservation (Williams 2002). "Under space contraction, larger groups expand disproportionately and capture nearby objects one by one leading to chaining; under space dilation as group size increases they tend to recede from each other and this can lead to a heterogeneous group of objects being fused together towards the end simply because they were on the periphery of their true group "(Williams 2002)

The fusion strategy used in this analysis was Group Average UPGMA with a beta value of -0.1. The attraction of UPGMA is that it is a space conserving fusion strategy and does not allow reversals (Williams 2002). UPGMA is an average linkage technique (Stuessy 1990) whereby the new OTU is compared to the average value of all the OTUs already in the extant cluster rather than the extreme similarity or difference within it. All objects receive equal weight in the computation and the similarity or distance matrix is updated and reduced in size at each clustering step (Legendre & Legendre 1998). Belbin *et al.* (1992) found that the flexible UPGMA method with a small beta value gives the best recovery of data when tested against generated data configurations.

Ordination

The aim of ordination or multidimensional scaling methods is to plot objects based on their attributes in multidimensional space and then display that data in two or three dimensional space. The aim is to maintain the essentials of the resemblance structure but allow visualisation of the objects in the space.

Ordination methods are metric or non metric methods. Metric methods attempt to maintain the original distances in the ordination space while non metric methods maintain the rank order of the distances. Semi Strong Hybrid scaling is considered an advanced form of ordination because it uses a combination of metric, linear and non metric non linear ordination (Belbin 2004). A study using the same simulation procedure found that hybrid scaling achieves a better recovery of the simulated configuration than a range of other methods (Belbin 1991).

Principal Component Correlation (PCC)

Principal Component Correlation (PCC) uses multiple linear regression to correlate patterns in the ordination with data variables. Regression vectors are added to variables in the ordination space based on direction of best fit. The PCC identifies the variables which influence the pattern in the data by examining the direction of variables that have high correlation ('r-squared') (Belbin 2004).

While both classification and ordination analyses are undertaken independently they are most often interpreted together. In these analyses multi-dimensional relationships are constrained to a hierarchical structure in classifications or constrained to two or three dimensional space in ordinations and as a result

suffer some distortion of the data and loss of information. Consequently when patterns or clusters observed in a dendrogram are corroborated in an ordination they offer more confidence that the observations reflect real patterns in the data rather than artefacts of the analysis.

Aims

To investigate patterns of morphological similarity within a species complex using numerical analyses. The null hypothesis proposed is that the populations are morphologically indistinguishable because they represent interbreeding populations and should be considered one species.

Materials and Methods

Specimens

Specimens examined included material from Australian herbaria BRI, DNA, PERTH, MEL and CANB. Collector's details of OTUs in the complex are available in APPENDIX 2. While all specimens available were compared, a subset of specimens that captured the morphological and geographic variation across the group were coded for the analysis. A total of 51 specimens, from 107 available specimens were included in the analysis. Largely specimens were restricted based on the availability of specimens with sufficient mature fruiting material but also to keep the number of specimens commensurate from each of the available putative OTUs.

Characters

Qualitative and quantitative characters were chosen for the analysis. Non-metric state characters were coded into metric states. Characters with polymorphic states per OTU were excluded.

Dataset

The OTUs were scored for the characters listed in Table 3.1. Of the specimens coded 88% had a full data set, and only one specimen had more than one missing value.

In order to capture the variation in leaf shape within some specimens the first fully formed leaf on the lower branches closest to the roots was measured and the presence or absence of two different leaf shapes i.e. elliptic and linear were coded. On the rare occasion where no branches occurred, the leaves on the lower central axis were measured. Character states for habit type were:

- 1) candelabra, with lower branches erect and arched upwards as in a candelabra,
- 2) prostrate, entirely decumbent, or
- 3) prostrate erect, with an erect central axis and decumbent branches.

Although floral characters were coded, too many specimens had insufficient flower material to allow their inclusion.

Table 3.1: The characters and their states used in scoring OTUs for the phenetic analyses. The table shows the character name and the unit of measurement for quantitative characters, and character codes for qualitative characters.

Character	Character State
1. Lower leaf lengths	mm
2. Lower leaf widths	mm
3. Two leaf morphs	1 = present 2 = absent
4. Habit	1 = candelabra 2 = prostrate only 3 = with prostrate and erect branches
5. Height	cm
6. Whole plant indumentum	3 = looped only 4 = looped and straight
7. Leaf length (Average)	mm
8. Leaf width (Average)	mm
9. L:B	
10. Min leaf length	mm
11. Max leaf length	mm
12. Min leaf width	mm
13. Max leaf width	mm
14. Average rachis length	mm
15. Max inflorescence rachis length	mm
16. Pedicel length (max)	mm
17. Alae length average	mm
18. Alae width average	mm
19. Alae ratio	
20. Capsule length (average)	mm
21. Capsule width (average)	mm
22. Seed length (average)	mm
23. Seed width (average)	mm
24. Seed ratio	
25. Aril head size (average)	mm
26. Aril appendage length (average)	mm

Analysis

Patterns of variation in morphology were assessed using the Pattern Analysis Package (PATN) of Belbin (2004). The association matrix was calculated using the Gower metric association measure and the classification fusion used was unweighted pair-group arithmetic averaging (UPGMA). The Gower metric automatically range-standardises the data matrix and is considered to be the best way to deal with datasets that contain more than one category of character to make attributes commensurate (Sneath & Sokal 1973, Hartman 1988, Legendre & Legendre 1998, Downing *et al.* 2004). The Gower metric is a symmetrical association matrix where joint absences are given the same weight as joint presences. Although data sets with attributes measured at different scales are typically transformed to reduce the weighting of larger values a similar effect is achieved by the range standardisation of the Gower metric association measure (Williams 2002, Belbin 2004).

A Beta value of -0.1 was used. Groups identified by the dendrogram are coded with symbols to allow comparison in the ordination, and codes do not indicate a *priori* groups.

Ordination

OTUs were ordinated using semi-strong hybrid multidimensional scaling (SSH) in three dimensions using the Semi Strong Hybrid method, with 10 random starts and a maximum of 50 iterations. Semi Strong Hybrid uses a combination of metric, linear and non metric non linear ordination. PATN allows the rotation

of objects around any axis in the scatter plots. Scatter plots are rotated and displayed to show the most discrete groupings in the three dimensional space.

PCC

A principle axis correlation (PCC) was used to correlate the characters with the ordination vectors. Highly correlated variables with high r-squared values indicate the processes that are causing the variation seen in the data.

Results

Results of the cluster analysis are shown in the dendrogram Fig 3.2. The UPGMA cluster distinguished two morphological groups (A & B) at an association measure between 0.1977 and 0.3138 and an outlier specimen (C) at an association measure of 0.5459. These groups largely correspond to the two taxa previously identified as *P. stenoclada* (Taxon 25) (Group A) and *P. pycnophylla* (Taxon 40) (Group B); identified in the dendrogram by the Prefix PP or PS. Exceptions include the outlier QPS D71515, and three specimens with equivocal *a priori* identification PP D134157, PP D57824, PS D76405, and a misidentified specimen QPS A589518. These two groups A & B, and the outlier are also distinct in the ordination with a stress value of 0.1305 when plotted in three dimensions (Fig. 3.3). For the equivocal specimens there is conflict between the dendrogram and the ordination; D134157 and D57824, are found in group A in the dendrogram but are clustered in the group B cloud in the ordination. These two specimens are difficult to place intuitively and can feasibly be placed in either group although both specimens have been determined to the

group B taxon in the past. Specimen D76405 and A589518 cluster with group B in the dendrogram and cluster with the group B cloud in the ordination but have previously been identified as *P. stenoclada* which generally equates to Group A, A589518 is not shown in the ordination because it is embedded within the group and is a misidentified specimen rather than an integrade. The outlier specimen D71515 was collected from Cape Shield and differs in overall size, length of inflorescence and seed type and it may represent a hybrid with another taxon.

The PCC analysis indicates that the clusters are correlated with the maximum and average leaf widths (Table 3.2), which are generally wider in group B (Fig. 3.4), and the l:b leaf ratio, which are smaller and therefore more linear in group A (Fig. 3.5).

While these two groups are not geographically separated (Fig. 3.8) they are to a large degree ecologically separated. Group A individuals mostly occur in wet situations in sedgeland or grasslands of *Melaleuca* swamps or adjacent jungle or riparian vegetation, Group B individuals generally occur in savannah woodland in sandy to laterite soils (Fig. 3.7).

Fig 3.2. The dendrogram resulting from the UPGMA (Beta = -0.1) fusion strategy of the species complex showing the division of the data set into three groups.

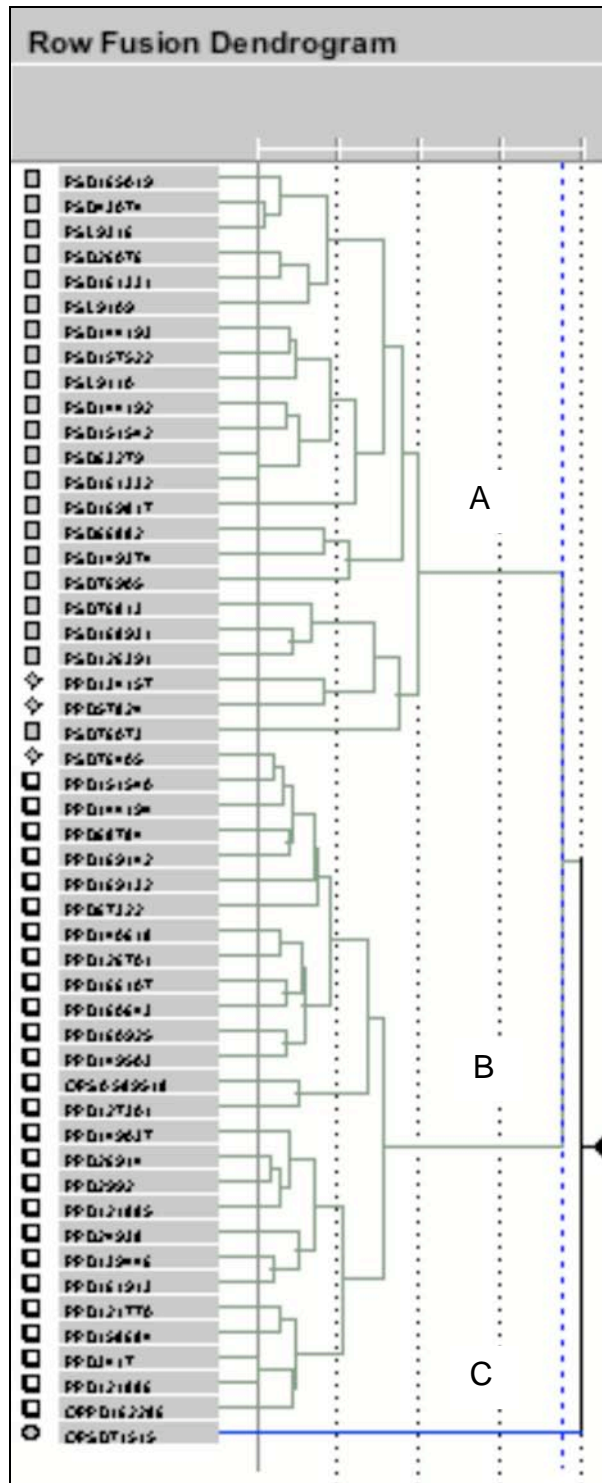


Fig. 3.3. The scatter plots resulting from the ordination of the data set. The plot shows the division of the data sets in to two broad groups, and one outlier. Symbols represent subgroups shown in dendrogram.

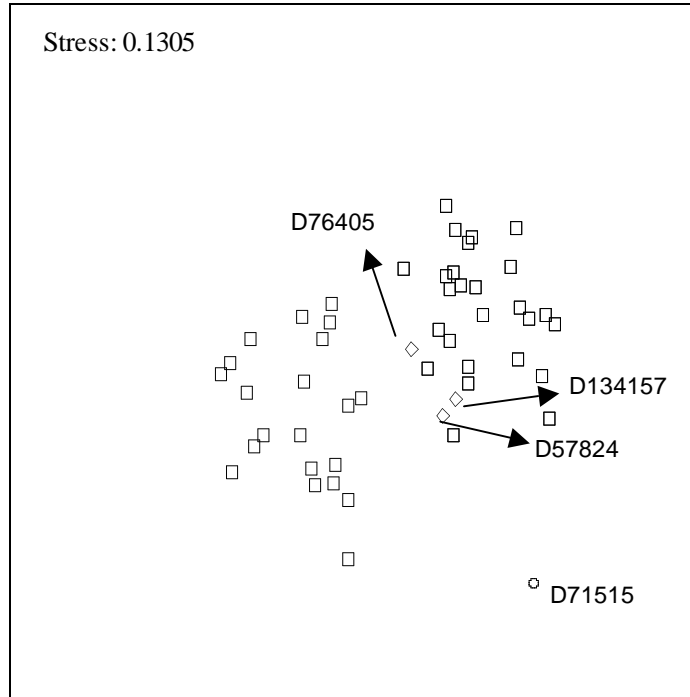


Fig 3.4. The PCC results are overlaid on scatter plot of the ordination of the dataset, correlation values of 0.7 and above are shown. Vectors indicate that groups correlate with leaf width and leaf ratio and outlier by capsule length.

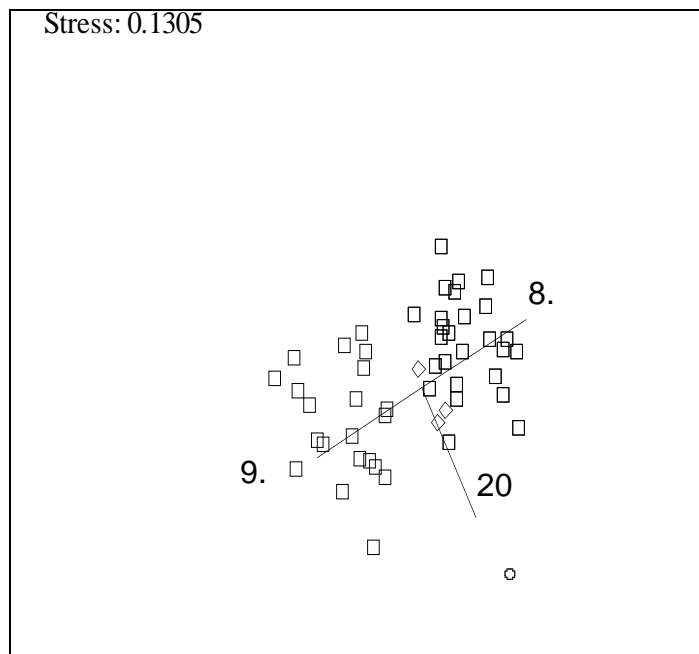


Table 3.2. The characters with their correlation values resulting from the PCC of dataset. The values from the PCC range from zero to one, with values close to one being highly correlated with cluster.

Variable	r^2
8. Leaf width (Average)	0.821
9. L:B	0.791
20. Capsule length (average)	0.822

Fig. 3.5. Bar graph of the average leaf widths and maximum widths (mm) for specimens analysed, arranged by OTU group. R^2 values in the PCC analysis indicate that Group B positively correlates with PCC vector leaf width, while Group A is negatively correlated.

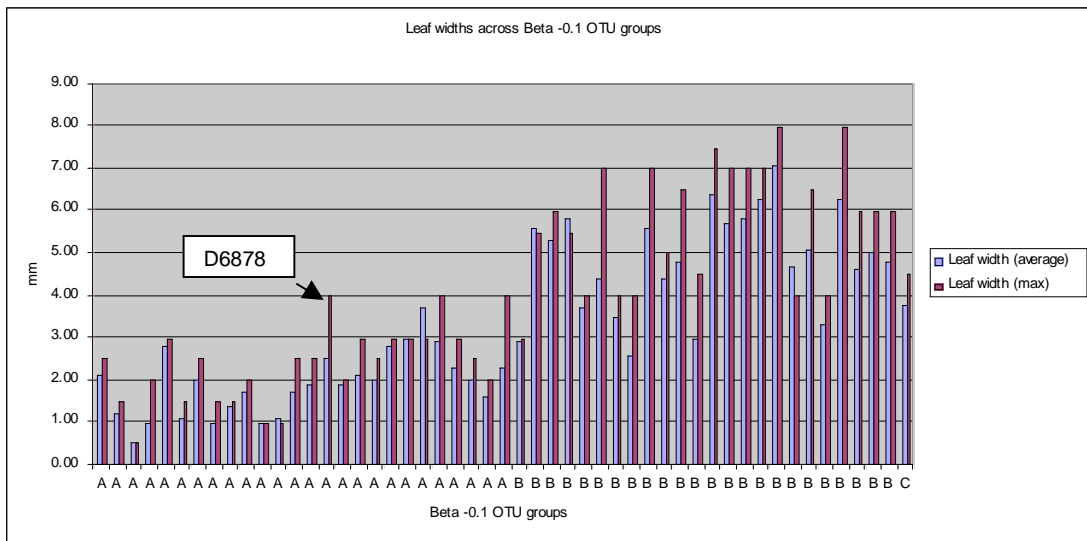


Fig. 3.6. Bar graph showing the leaf L:B ratio for dataset, arranged by OTU group. R^2 values in the PCC analysis indicate that Group A is positively correlated with the PCC vector leaf ratio. Peak in group A equals PS D76073.

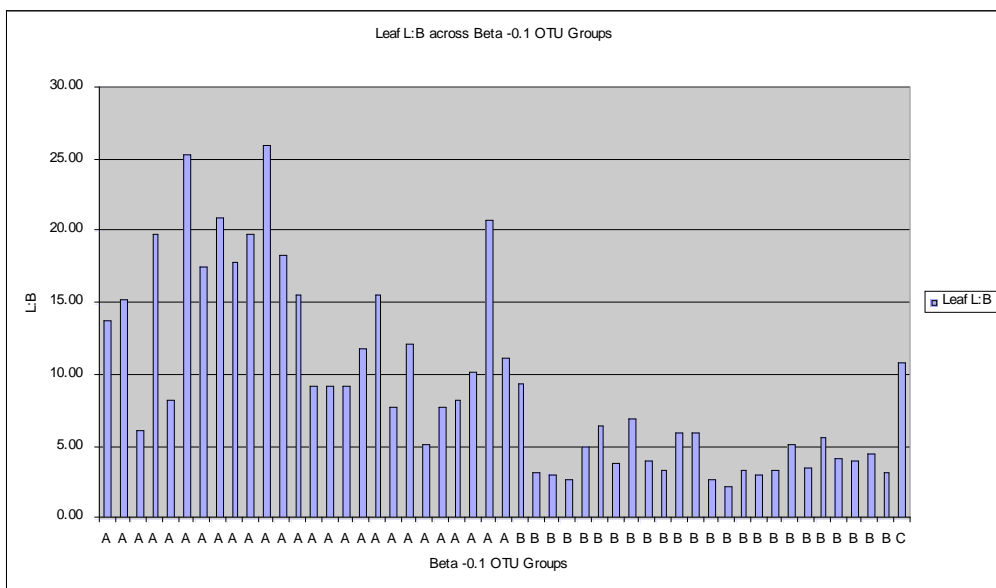


Fig. 3.7. Bar graph showing the distribution of specimens in dataset found in wet versus dry habitats. Specimens arranged by OTU group. 1= wet, 2 = dry

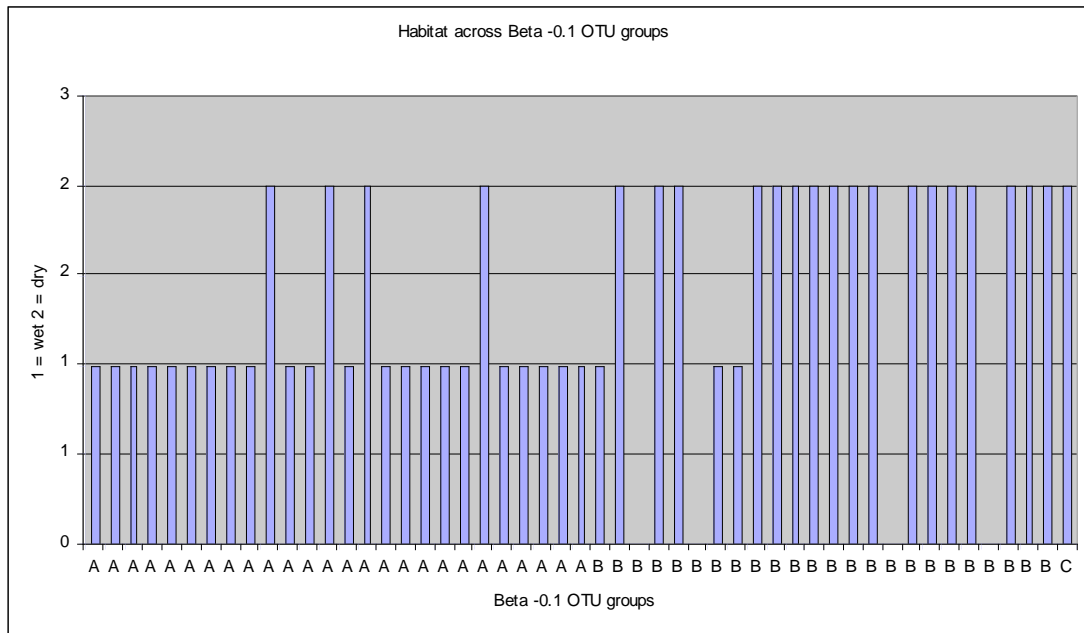
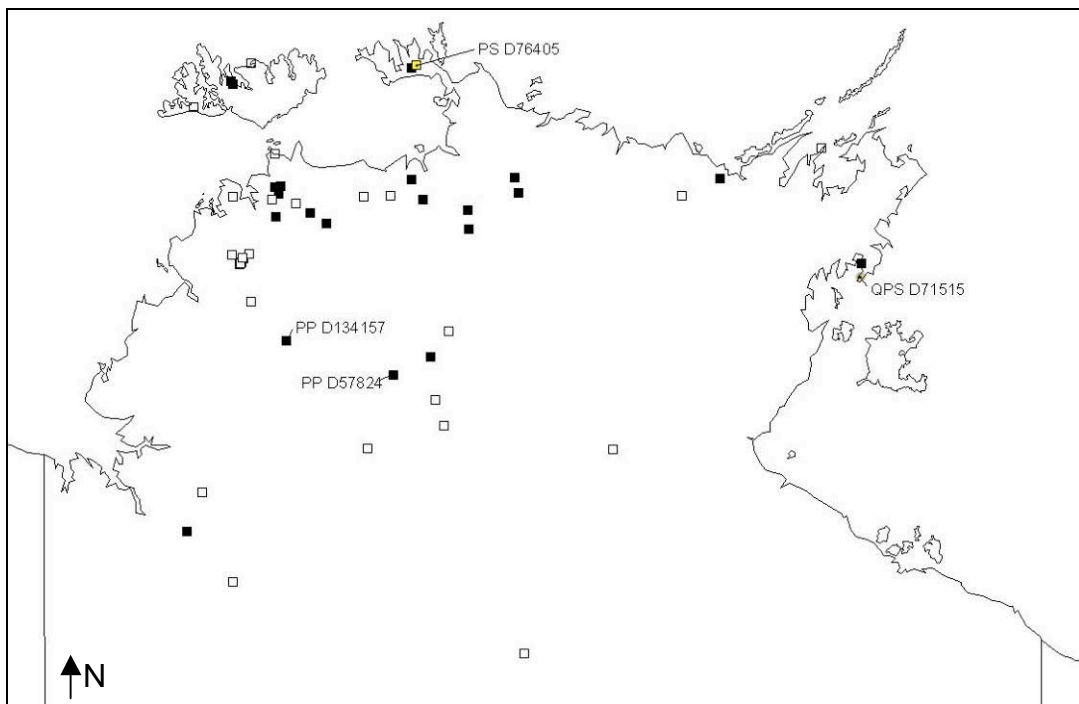


Fig 3.8. Map showing distributions of specimens in dataset. Symbols indicate the two groups shown in dendrogram, A (■), which includes equivocal specimens here labelled with accession numbers, and B (□) and outlier D71515 (●).



Discussion

The null hypothesis that these specimens are not morphologically distinct, and, therefore, represent interbreeding populations of the one species, is rejected by the phenetic analysis. Despite the presence of morphological intermediates the *a priori* groups of Taxon 25 (Group A) and Taxon 40 (Group B) are supported. These groups may represent taxa diverging from a common ancestor as indicated by the shared characters of hooked style, capsule, seed and hair types APPENDIX ONE. It is possible they are becoming isolated via ecological separation, which may affect establishment times and phenology. The observed integrades may represent hybrids. Alternatively, they may represent phenotypic extremes affected by the different conditions of the habitat they occupy, with anomalous specimens linking the two extremes. This, however, is rejected as the few individuals that do occupy the other taxon's habitat do appear to maintain morphological differences, although transplant experiments may help to answer this more conclusively.

Assignment to rank in this instance is difficult. The total geographic overlap in the distribution of these taxa makes it difficult to apply the infraspecific concepts proposed by Stuessy (1990) of 75% geographic and morphological separation. This concept proposes that the morphological distinction between most of the taxa is a consequence of geographic separation influencing the exchange of genes and that proximity would allow full and unrestricted gene exchange. The majority of specimens can be readily distinguished by leaf width, leaf shape and habit, and share a common distribution. It is likely that the integrades represent

hybrids between the two taxa, and it could be argued that the presence of only a few integrades indicates some mechanism of reproductive isolation restricting interbreeding between the two populations. The rank of species is proposed for these two taxa.

Conclusions

Two new species are identified from the analysis of the species complex and are described in Chapter 5. The species complex represented by taxon 35 and formerly identified as *P. linariifolia*, was not investigated further due to insufficient material, it is discussed in more detail Chapter 4 and 5.

CHAPTER 4

Nomenclature

Introduction

Significant taxonomic diversity is still being discovered in northern Australia particularly amongst seasonal species which are poorly collected due to restricted access to habitat during the wetter months in which they are emergent (*pers. obs.*). The Northern Territory Herbarium has recorded, on average, an increase of 46 species per year since 1972 (Kerrigan & Albrecht 2006), a statistic which encompasses previously undescribed species as well as new records for described species. The NT and QLD have yet to produce a more recent treatment of *Polygala* since Bentham's *Flora Australiensis* in 1863. It is not exceptional, therefore, that 47 taxa and 45 species have been documented in this study compared with the 19 species previously known and summarized in Monro (2003).

In order to determine which published names can be attributed to the species documented in this study and which are new, a nomenclatural revision of *Polygala* in Australia is proposed. This is an ambitious objective. Van der Meijden (1988) and Adema (1966) found when researching their Malesian treatments that a number of *Polygala* types have proven to be either illusive or depauperate, making synonymy and typification difficult to determine in some cases. Valid names and new species are identified and synonymy, typification and diagnoses are documented in species descriptions in Chapter 5. Where nomenclature has not been resolved a summary of work to date and current treatment is provided.

Aim

To identify new and undescribed species by assigning, where possible, existing names to Australian species, using protologues and type specimens.

Materials and Methods

Type or putative type material from K, BM, P, G, B, LINN, PR, MEL, BRI and material from L and SING, was borrowed as either photographs or sheets to facilitate the application of published names and assess the validity of currently applied names listed in Table 4.1.

Results

Examination of type material, protologues and existing treatments, indicate that 18 taxa concur with described species for Northern Australia, the remaining 29 taxa are undescribed, see Table 4.2. Comparison with types and protologues also show that several names previously applied to Australian material have either been assigned to the wrong Australian taxa or are not found in Australia at all, see Table 4.2.

Table 4.1. Table of types borrowed as either photographs or specimens and location of type herbaria.

APNI Name	Author	Type_Herbarium	Photo (P) or Specimen (S)
<i>Polygala arvensis</i>	Willd.	B	P
<i>Polygala arvensis</i> var. <i>obovata</i>	Benth.	BM	P
<i>Polygala arvensis</i> var. <i>squarrosa</i>	Benth.	BRI, BM	S
<i>Polygala arvensis</i> var. <i>succulenta</i>	Benth.	BM	P & S
<i>Polygala chinensis</i>	L.	LINN	P
<i>Polygala chinensis</i> subvar. <i>linearifolia</i>	Domin	PR	P & S
<i>Polygala chinensis</i> var. <i>dissitiflora</i>	Domin	PR	S
<i>Polygala chinensis</i> var. <i>normalis</i>	Domin	PR	S
<i>Polygala crotalarioides</i>	DC	G-DC?	Microfiche
<i>Polygala elongata</i>	Willd.	B	P
<i>Polygala eriocephala</i>	Benth.	K	P
<i>Polygala exsuarrosa</i>	Adema	BM, BRI	S
<i>Polygala gabrielae</i>	Domin	PR	P & S
<i>Polygala glaucoides</i>	L.	LINN	P
<i>Polygala glomerata</i>	Lour.	P	P
<i>Polygala isingii</i>	Pedley	NT, BRI	S
<i>Polygala japonica</i>	Houtt.	MEL, K	P & S
<i>Polygala linariifolia</i>	Willd.	B	P
<i>Polygala macrobotrya</i>	Domin	PR	P & S
<i>Polygala orbicularis</i>	Benth.	K	P
<i>Polygala paniculata</i>	L.	LINN	P
<i>Polygala persicariaefolia</i>	DC.	G-DC?	P
<i>Polygala polifolia</i>	C.Presl	PR	P
<i>Polygala pycnophylla</i>	Domin	PR	P & S
<i>Polygala rhinanthoides</i>	Benth.	K	P&S
<i>Polygala rhinanthoides</i> var. <i>minor</i>	Benth.	K	P & S
<i>Polygala rosamarinifolia</i>	Wight & Arn.	E	P
<i>Polygala stenoclada</i>	Benth.	K	P & S
<i>Polygala stenoclada</i> var. <i>queenslandica</i>	Domin	PR	P & S
<i>Polygala stenoclada</i> var. <i>succulenta</i>	Benth.	BM	P & S
<i>Polygala tepperi</i>	F.Muell.	MEL	P
<i>Polygala triflora</i>	L.	LINN	P
<i>Polygala veronicea</i>	F.Muell.	Mel, K	P & S
<i>Polygala wightiana</i>	Wight & Arn.	L	S

Table 4.2. The taxa recognised by the morphological analysis listed as OTU numbers and the valid names, phrase names and misapplied names previously applied in Australia, and the accepted names recognised by this research. + = misapplied names assigned to the wrong Australian taxa, * = names not found in Australia.

Morphological Taxa recognised by this research	Valid names	Phrase name	Misapplied name	Accepted name by this research
1			<i>P. arvensis</i> Willd.*	<i>P. succulenta</i> sp. nov.
2				<i>P. succulenta</i> var. <i>congesta</i> var. nov.
3	<i>P. pycnophylla</i> Domin			<i>P. pycnophylla</i> Domin
4		<i>P. ciliate alae</i>		<i>P. petraphila</i> sp. nov.
5		<i>P. ciliate alae</i>		<i>P. petraphila</i> var. <i>angusta</i> var. nov.
6		<i>P. davenport</i>		<i>P. dependens</i> sp. nov.
7		<i>P. edith River</i>	<i>P. glaucoides</i> L. +	<i>P. clavistyla</i> sp. nov.
8			<i>P. eriocephala</i> .Muell.ex.Benth. +	<i>P. integra</i> sp. nov.
9	<i>P. exsuarrosa</i> Adema			<i>P. exsuarrosa</i> Adema
10			<i>P. rhinanthoides</i> Sol. ex Benth. + <i>P. gabrielae</i> Domin +	<i>P. crassitesta</i> sp. nov.
11		<i>P. Edith River</i>		<i>P. geniculata</i> sp. nov.
12		<i>P. gregory</i>		<i>P. galeacephala</i> sp. nov.
13	<i>P. isingii</i> Pedley			<i>P. isingii</i> Pedley
14		<i>P. Kakadu and P. top</i>		<i>P. coralliformis</i> sp. nov.
15	<i>P. eriocephala</i> F.Muell.	<i>P. Larrimah</i>		<i>P. eriocephala</i> F.Muell. ex. Benth.
16	<i>P. longifolia</i> Poir.			<i>P. longifolia</i> Poir.
17	<i>P. stenoclada</i> Benth.			<i>P. stenoclada</i> Benth.
18		<i>P. mudginberri</i>		<i>P. barbata</i> F.Muell. ex. Benth.
19	<i>P. orbicularis</i> Benth.			<i>P. orbicularis</i> Benth.
20		<i>P. orbicularis</i> var.		<i>P. obversa</i> nom. nov.
21				<i>P. pendulina</i> sp. nov.
22		<i>P. prostrate</i>		<i>P. glaucifolia</i> sp. nov..
23			<i>P. rhinanthoides</i> Sol. ex Benth. +	<i>P. pterocarpa</i> sp. nov.
24				<i>P. saccopetala</i> sp. nov.
25			<i>P. stenoclada</i> Benth. +	<i>P. linearis</i> nom. nov.
26		<i>P. tipperary</i>		<i>P. validiflora</i> sp. nov.
27		<i>P. Timber Creek</i>		<i>P. dimorphotricha</i> sp. nov..
28	<i>P. tepperi</i> F.Muell.			<i>P. tepperi</i> F.Muell.
29			<i>P. triflora</i> L.+	<i>P. parviloba</i> nom. nov.
30	<i>P. wightiana</i> Wight &			<i>P. wightiana</i> Wight & Arn.
31				<i>P. difficilis</i> sp. nov.
32				<i>P. kimberleyensis</i> sp. nov.
33				<i>P. rhynchocarpa</i> sp. nov.
34				<i>P. canaliculata</i> sp. nov.
35	<i>P. triflora</i> L.		<i>P. linariifolia</i> Willd. *	<i>P. triflora</i> L.
36	<i>P. persicariifolia</i> DC			<i>P. persicariifolia</i> DC
37	<i>P. rhinanthoides</i> Sol.			<i>P. rhinanthoides</i> Sol. ex Benth.
38	<i>P. polifolia</i> Presl		<i>P. chinensis</i> L.. *	<i>P. polifolia</i> Presl
39	<i>P. glaucoides</i> L.			<i>P. glaucoides</i> L.
40			<i>P. pycnophylla</i> Domin. +	<i>P. bifoliata</i> sp. nov.
41				<i>P. barkleyensis</i> sp. nov.

Morphological Taxa recognised by this research	Valid names	Phrase name	Misapplied name	Accepted name by this research
42				<i>P. scorpioides</i> sp. nov
43				<i>P. praecox</i> sp nov
44	<i>P. gabrielae</i> Domin			<i>P. gabrielae</i> Domin
45	<i>P. macrobotrya</i> Domin			<i>P. macrobotrya</i> Domin
46	<i>P. japonica</i> Houtt.			<i>P. japonica</i> Houtt.
47	<i>P. paniculata</i> L.			<i>P. paniculata</i> L.

Misapplied names

Twelve names have been misapplied to the taxa studied in Northern Australia, eight of these names are found in Australia (Table 4.2) but have been applied to the wrong taxa and three (Table 4.2) cannot be applied to Australian material. Of those names found in Australia most have been misapplied because of either:

- a) an absence of descriptions or lack of access to type material for comparison,
- or,
- b) because of a lack of lectotypification of mixed type collections, or,
- c) as a consequence of more convoluted problems with synonymy and typification mostly as a result of poor quality types or poorly defined taxa.

The names *P. rhinanthoides* Sol., *P. pycnophylla* Domin, *P. stenoclada* Benth., *P. gabrielae* Domin, *P. eriocephala* F.Muell., *P. glaucoides* L., *P. triflora* L. have been misapplied or inconsistently applied in Australia. Correct application of the names *P. rhinanthoides*, *P. pycnophylla*, *P. stenoclada*, *P. gabrielae*, and *P. eriocephala*, is easily demonstrated and is clearly documented under the species descriptions in Chapter 5. The remaining epithets *P. glaucoides*, *P. triflora*, as well as the two epithets *P. chinensis* and *P. arvensis*, which are not

considered to be found in Australia by this research, remain problematic and are discussed further.

Discussion

Problematic taxa

On his work on *Polygala* in the *Flora of Malesiana* van der Meijden (1988) identified a number of problems which he was unable to fully resolve when trying to locate and assign types. They concerned *P. chinensis* L., *P. glaucoides* L., *P. triflora* L., *P. arvensis* Willd. and *P. polifolia* Presl.

***P. chinensis* L.**

Typification and synonymy

In her treatment of Australian Polygalaceae Monro (2003) cites the lectotype of *P. chinensis* L. as Herb. Linn. 882.26 according to F.Fawcett & A.B.Rendle, Fl. Jamaica, Dicot. pt. 2, 4:244 (1920). There is no clear lectotypification in Fawcett and Rendle and so the typification of this specimen remains unresolved. Burt (1973), however, states that “there is no reason to suppose that the specimen labelled *P. chinensis* in the Linnaean herbarium (sheet 882.26 of the Savage catalogue) is not the type specimen”, and reports that the type material consists of two lateral branches of a plant.

Assuming that Herb. Linn. 882.26 is the holotype, the name *P. chinensis* has been widely misapplied according to Burt (1973) and van der Meijden (1988). So much so that Burt (1973), following Article 69 (ICBN 1972), proposed that the name should be rejected to avoid further confusion and synonymised the

true *P. chinensis* under *P. glomerata* Lour. In addition he synonymised the misapplied *P. chinensis* of Bennett, Chodat, and Adema under *P. arvensis* Willd. This rejection is an illegal procedure according to van der Meijden (1988) and the Vienna ICBN code (ICBN 2005) and consequently, *P. glomerata* Lour and *P. arvensis* Willd. are synonymised by him under *P. chinensis*.

In summary: *P. chinensis* L.

Syn: *P. glomerata* Lour., *P. arvensis* Willd.

P. polifolia Presl.

Syn: *P. chinensis* L. *sensu* Adema *Blumea* 14 (2), 269 (1966)

Based on photographs of candidate type material of *P. chinensis* (Fig. 4.1), *P. polifolia* (Fig. 4.2) and *P. glomerata* (Fig. 4.3) I accept van der Meijden's (1988) concept of synonymy with the caveat that I have not closely examined these putative types nor have a knowledge of the taxa across their global distributions. As a clarification, while van der Meijden in his 1988 treatment synonymises *P. arvensis* Willd. under *P. chinensis* L. the holotype of *P. arvensis* Willd. in B is annotated by him as *P. glaucoides* L. According to van der Meijden (pers comm. 2006) this is an error. While the label of the holotype *P. arvensis* Willd. does not exactly match the Willd. protologue no other potential types were located in this study and, therefore, this specimen must be maintained as the type.

Fig. 4.1. Putative holotype of *P. chinensis* L.
Image courtesy Herbarium Linnean Society of London



Fig. 4.2. Putative holotype of *P. polifolia* Presl. (scale not provided)
 Image courtesy Herbarium National Museum in Prague



Fig. 4.3 Putative holotype of *P. glomerata* Lour. Image courtesy Herbarium National de Paris Muséum National d'Histoire Naturelle



Application to Australian material

Australian material previously assigned to *P. chinensis* by Monro (2003) and assigned to OTU 38 in this research, match both type material from PR and annotated specimens from L and SING of *P. polifolia*. Specimens closely match illustrations and descriptions of *P. polifolia* (van der Meijden 1988), see Table 4.3 for comparison, with the exception of flower colour. Flower colour can be unreliable in this group as flowers can fade to white with age in living material or can appear yellow when dried. Consequently, discrepancies based on descriptions of dried flowers hold little substance. No fresh material was collected for this taxon to allow verification of flower colour and there is no sound evidence on which to base the rejection of the name *P. polifolia* for OTU 38.

Table 4.3. Comparison of key characters of *P. chinensis* and *P. polifolia* based on descriptions from van der Meijden (1988) with OTU 38 and OTU 39.

Character	<i>P. chinensis</i> L.	<i>P. polifolia</i> Presl.	OTU 38	OTU 39
Indumentum	Curved and straight hairs	Curved hairs	Curved hairs	Curved hairs
Longevity	Perennial with woody base	Annual	Annual	Annual
Raceme length	To 1.5 cm long	To 1 cm long	Ca. 2mm long	To 70 mm
Capsule dimensions	Capsule 4 mm long x 4 mm wide	Capsule < 1.5 mm	2.5 mm long x 2.15 mm wide	4-5 mm long x 2.7-3.5 mm wide
Flower colour	White	Purple	White/yellow?	Yellow
Style shape	Horse shoe shaped	Curved with sterile tip	Curved with sterile tip	Horse shoe shaped

A number of specimens previously determined to *P. chinensis* are attributed here to OTU 39. Based on the perennial life history and larger overall habit of the type material compared to OTU 39 and the absence of straight hairs, which are present on *P. chinensis* according to van der Meijden, the application of the name to OTU 39 is not maintained.

To summarise :

OTU 38 = *P. polifolia* Presl. syn: *P. chinensis* non. L. Adema, Blumea 14: 269 (1966),
Monro (2003 p 168)

P. glaucoides L. ("in Zeylona") and ***P. triflora*** L.

Typification and synonymy

There seems little dispute over the types of *P. glaucoides* and *P. triflora* but some discrepancy in the circumscription of the taxa to which they are applied.

P. glaucoides and *P. triflora* are used in the literature by van der Meijden (1988) in *Flora Malesiana*, and Pendry (2001) in *Flora of Thailand*. Both cite an Australian distribution for *P. triflora*, although Australia represents the most SE extreme of a mostly Indian and Asian distribution, with only van der Meijden (1988) citing *P. glaucoides* for Australia. In contrast, Adema (1966) fails to use the names at all, and *P. glaucoides* is synonymised under *P. triflora* by Sumithra'arachchi (1988) in the Revised Handbook of the Flora of Ceylon. According to van der Meijden (1988), Adema (1966) was unaware of the Linnean names and incorrectly applied the names of *P. linariifolia* Willd. and *P. elongata* Willd., although he detes the specimen cited as the type for *P. linariifolia* Willd. by Adema as *P. triflora* L.

P. glaucoides L = *P. linariifolia* (non Willd.) *sensu* Adema Blumea 14, (2), 274
(1966)

P. triflora L = *P. linariifolia* Willd. and *P. elongata* (non Willd.) *sensu* Adema
Blumea 14, (2), 273, (1966)

I accept photographs of the specimens annotated as such by van der Meijden are holotypes of *P. linariifolia* Willd. and *P. elongata* Willd. based on the

absence of other potential type specimens and consequently follow van der Meijden's (1988) treatment of Adema's (1966) concepts.

Discrepancies between Sumithra'arachchi (1988), Pendry (2001) and van der Meijden (1988) who treat these taxa as separate species are less easily resolved. The types of *P. glaucooides* and *P. triflora* cannot be borrowed and while in good condition they are insubstantial, being represented by only one individual without any reproductive parts in *P. glaucooides* (Fig. 4.4) and two individuals with a few flowers/capsules in *P. triflora* (Fig. 4.5). Based on the observation of differences in habit and leaf dimensions in the two types (Figs 4.4 & 4.5) and the taxonomic usefulness of these characters in diagnosing other taxa, I support their treatment as separate taxa. It should be noted, however, these are not the differences cited by van der Meijden (1988), Pendry (2001) and Adema (1966). A summary of differences based on their descriptions, including two varieties of *P. glaucooides* described by Pendry, are presented in Table 4.4. Habit and leaf dimensions are not cited as diagnostic and not only does the circumscription of the taxa vary between the authors but in all cases the only diagnostic characters documented require comparison of reproductive material, not available in the type specimen of *P. glaucooides*. The concepts of *P. triflora* and *P. glaucooides* are confounded even further by van der Meijden (1988), where it appears the illustrations are transposed, with *P. glaucooides* illustrated as having straight hairs on the capsule margin and *P. triflora* illustrated with curved hairs only.

Fig. 4.4. Holotype of *P. glaucoides*.
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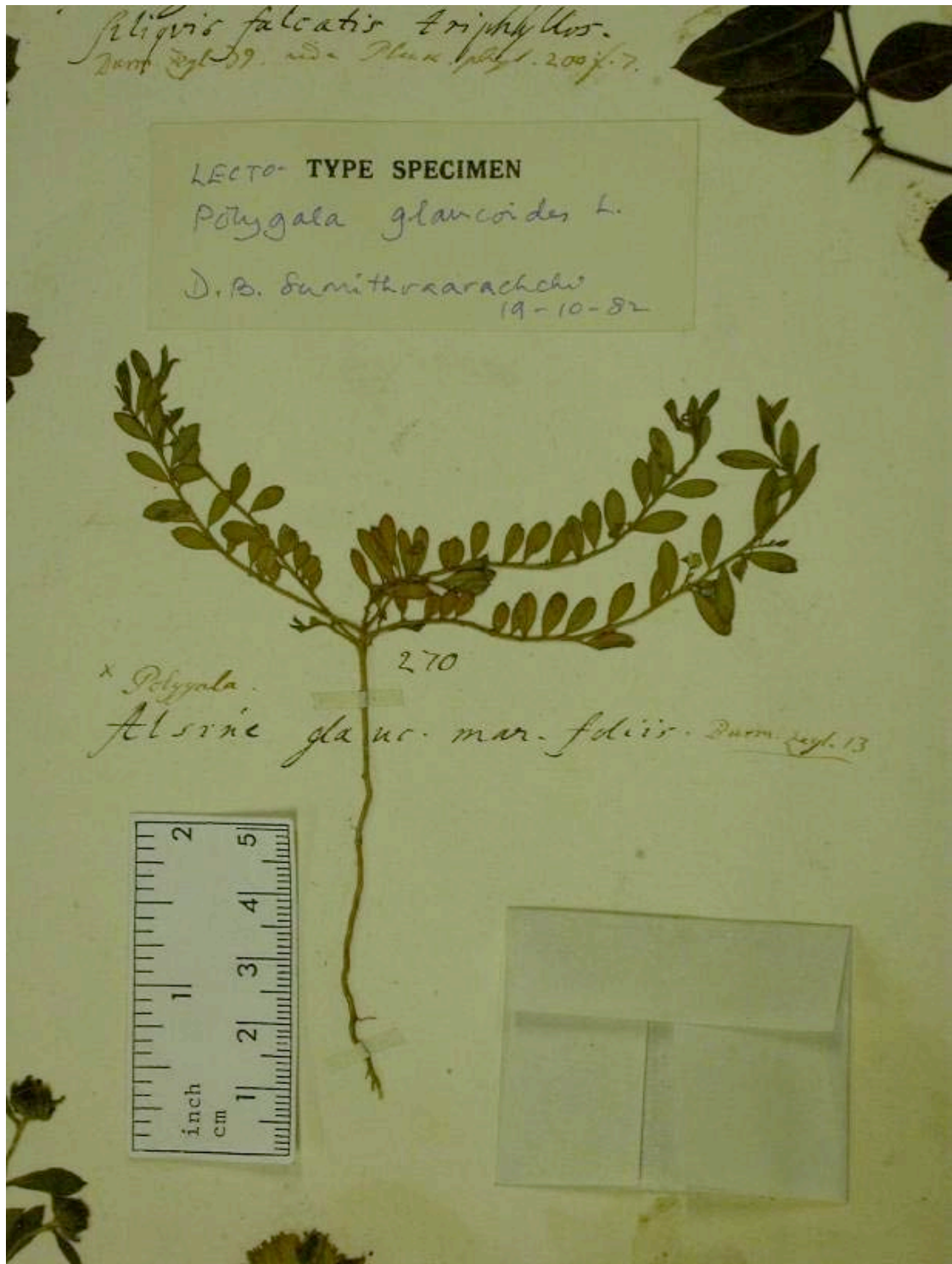


Fig. 4.5. Holotype of *P. triflora*. (Scale not provided)
© The Natural History Museum, London

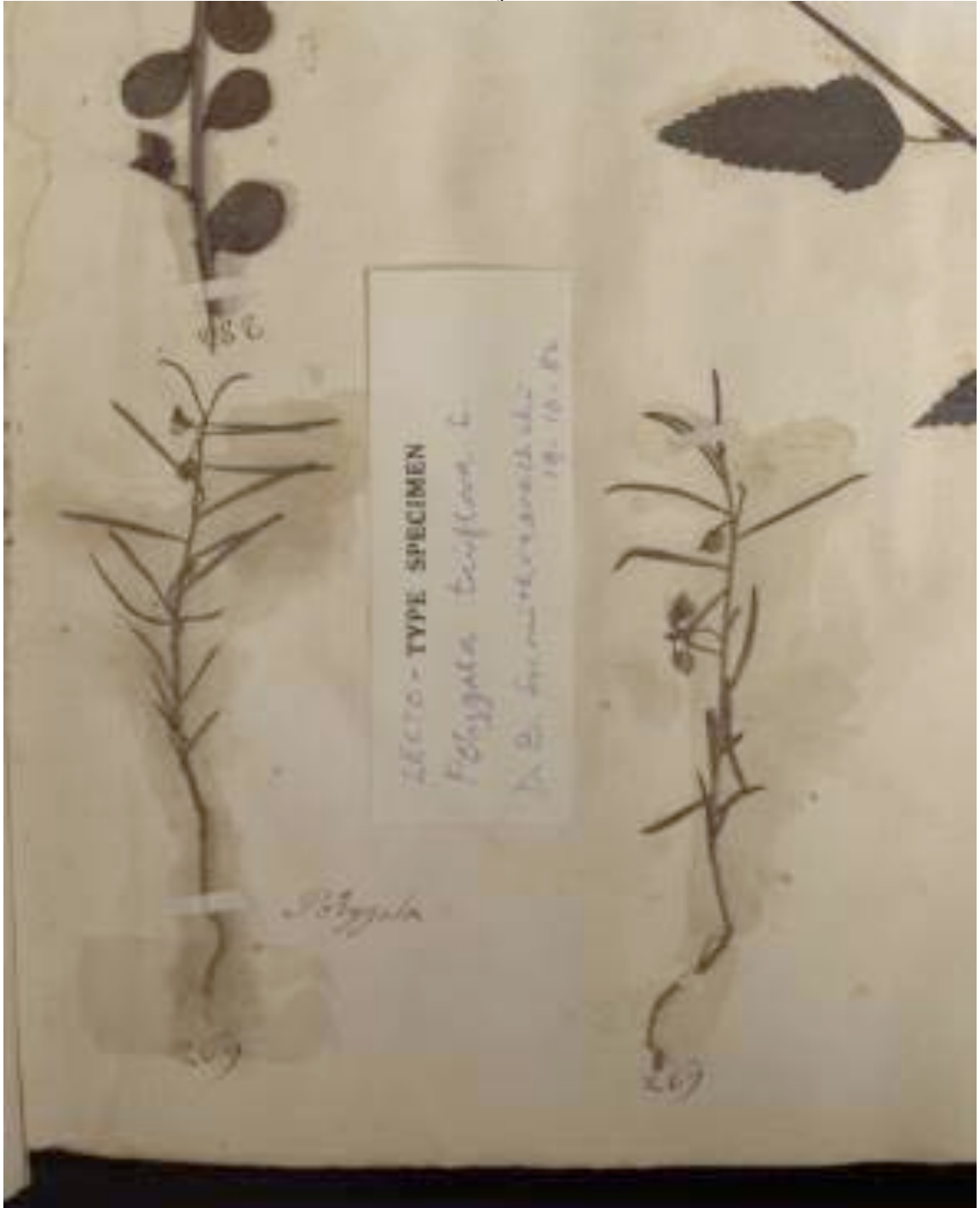


Table 4.4. Comparison of diagnostic key characters for *P. glaucooides* and *P. triflora* by Pendry (2001), and van der Meijden (1988) and for *P. elongata* and *P. liniariifolia* from Adema (1966).

Author	<i>P. glaucooides</i>		<i>P. triflora</i>
van der Meijden	a) Upper petals slightly longer than keel b) Capsule at the margin with curved hairs only		a) Upper petals shorter than the keel b) Capsule at the margin both with curved as well as short straight hairs.
Adema	(syn: <i>P. elongata</i>) a) Fruit asymmetric b) Raceme > 10 cm c) Seed appendage 2 (but illustration shows 3) d) Illustration shows short straight hairs on capsule but not describe		(syn: <i>P. liniariifolia</i>) a) Fruit symmetric b) Raceme < 9 cm c) Seed appendage 3 d) Illustration shows curved hairs on capsule but not describe
Pendry	var. <i>laotica</i> a) Stems with short and straight hairs b) Capsule with curved hairs and straight hairs on margin	var. <i>glaucooides</i> a) Stems with curved hairs only b) Capsule with curved hairs only	a) Stems with curved hairs only b) Capsule with curved hairs and straight hairs on margin

Application to Australian material

Based on photographs of the types neither name can easily be attributable to Australian material. However, there is equally insufficient evidence to reject them. Specimens determined as *P. glaucooides* by Pendry (P 250885 to P 250888) and van der Meijden (B 13019-020) resemble OTU 39. This taxon (OTU 39) has not been recollected in this study and based on existing specimens is tentatively assigned to *P. glaucooides*. Further work is urgently required to establish if it is still extant. Much of its lowland coastal habitat is under cultivation and of the five Australian specimens seen, three were collected in the late 1800's and the remaining two collected in the 1940's and 1960's.

Australian specimens recognised as OTU 35 in this study were determined as *P. triflora* by van der Meijden (Smith, L.S. 3510) and this taxon is tentatively assigned to *P. triflora*. Further work is required, however, as two inconsistencies with van der Meijden's (1988) description can be found, flower colour and indumentum. In his treatment van der Meijden described *P. triflora* as having yellow flowers. Only one fresh flower was collected in this study, it was light purple in colour. Australian collections of this taxon record flower colour as either white, yellow or purple. Van der Meijden (1988) described *P. triflora* as having curved hairs throughout, with straight and curved hairs on the capsule margin, yet with Australian material it is difficult to separate specimens with straight and curved hairs from specimens with curved hairs only, on any other character. Given the unreliability of flower colour and variability in the indumentum described by Pendry (2001) and van der Meijden (1988) for *P. triflora* these discrepancies aren't considered enough to warrant rejection of the name.

In the application of the names *P. triflora* and *P. glaucoides* I have deferred to van der Meijden's (1988) concept based on his description and annotated specimens because I am unable to provide a better treatment and do not wish to confound things further. I have seen virtually no ex-Australian material of either taxon but based on specimens of Australian material determined by van der Meijden it is clear his concept needs to be amended as material previously assigned to those names are a mixture of more than one Australian taxon. Discrepancies between Pendry's (2001) and van der Meijden's (1988) description of *P. glaucoides* and *P. triflora* also exist (Table 4.4), even though

Pendry (2001) cites van der Meijden's (1988) concept in synonymy. It is clear a global revision of the problematic taxa discussed here, in conjunction with further sampling across a global distribution, will allow a clearer concept of these taxa to be determined and from that a better understanding of how the epithets should be applied.

Unlocated types

Types for the following names were not located at PR, BM, K, MEL, BRI, CANB, SA, DNA, NT, or PERTH:

Polygala stenoclada var. *clementii* Domin, *Biblioth. Bot.* 89(4): 859 (1930)
T: "Nordwest-Australien: zwischen Ashburton- und Yule River, E. CLEMENT."

It is not possible to treat *Polygala stenoclada* var. *clementii* based on Domin's description alone.

Types for the following epithets were not located at MEL, DNA:

Polygala rhinanthoides var. *minor* Benth., *Fl. Austral.* 1:140 (1863). T. Upper Victoria River, *F.Muell.*

A possible type of this taxon is : *P. brownii* var. *minor*, Rocks of the Upper Victoria River, *F.Muell.*, K279799, now attributed to *P. galeocephala* R.A.Kerrigan.

Other excluded and doubtful names

Polygala crotalarioides DC., *Prodromus* 1: 327(1824). T: "In Nepauliâ ... (v.s.)" ??
microfiche DNA!

This species appears to be a woody multi-stemmed perennial, with showy alae and large obovate leaves with an obtuse apex. It bears no resemblance to any of the northern taxa revised here or the more southern native *Polygala japonica*. It has been misapplied by Hooker J.D.(1859), perhaps to the introduced species *Polygala myrtifolia*, which is apparently recorded from 1880 in Victoria (Flora of Victoria) although the dates suggest this is unlikely. On the other hand it may be misapplied to *P. triflora sensu* R.A.Kerrigan as a Mueller label (MEL 2244745) determined here as *P. triflora sensu* R.A.Kerrigan is annotated syn. *P. crotalarioides* and syn. *P. rosmarinifolia* apparently in Mueller's hand.

Polygala linariifolia [WA material] *auct. non* Willd.: J.R. Wheeler, *Fl. Kimberley* 643 (1992).

According to specimens deted as *Polygala linariifolia* from WA this name has been misapplied to a number of new species described here including: *P. bifoliata*, *P. dimorphotricha*, *P. galeocephala*, *P. saccopetala*.

Polygala rosmarinifolia Wight & Arn., *Prodromus Florae Peninsulae Indiae Orientalis*: 37 (1834). T. Wight! Cat. 124, 133b... Asewalendan Hills and Cunnewaddy near Dindygul, RBGE photo: DNA !

Like *P. crotalarioides* this name is likely to be misapplied to *P. triflora sensu* R.A.Kerrigan, although the type bears little resemblance

Types for the following epithets were not seen as they were not revised in this treatment: *P. duarteana* A. St.-Hil., *P. monspeliaca* L., *P. myrtifolia* L., *P. virgata* Thumb., *P. vulgaris* L.

Conclusion

Of the 47 taxa identified in this assessment, 18 taxa concur with described species for Northern Australia, 26 constitute undescribed species and four constitute undescribed varieties. New species and varieties are described and diagnosed in Chapter 5. Several names have been misapplied to these taxa in the past. *Polygala chinensis* and *P. linariifolia* are not present in Australia. *Polygala rhinanthoides*, *P. stenoclada*, *P. gabriellae*, and *P. eriocephala* have been applied to the wrong taxa and are correctly assigned along with synonymy and lectotypification in species descriptions outlined in Chapter 5. *Polygala glaucoides* L., and *P. triflora* L., following van der Meijden (1988), are tentatively applied to Australian taxa but it is clear further work is required to identify which taxa these epithets apply to and how they are circumscribed across their global distribution. It is apparent issues related to synonymy and application of these epithets cannot be resolved until a global approach to the complex is undertaken.

CHAPTER 5

Taxonomy

Introduction

A treatment of *Polygala* in Australia native taxa is provided, including new descriptions based on all specimens seen. Twenty six new species are described including latin diagnoses. Two species are described with infraspecific taxa. Lectotypes are chosen for all Australian *Polygala* names and nomenclatural problems associated with misapplied names discussed. A key to Australian material is provided.

Genus description

POLYGALA L.

Annual or perennial herbs, shrubs, small trees or rarely lianas. Young stems and inflorescence rachis often angular or flattened. Leaves usually alternate, rarely opposite or whorled, rarely caducous. Flowers in a many flowered inflorescence, rarely solitary. Inflorescence a terminal, lateral or axillary raceme or spike, or sometimes a terminal panicle; bracts and bracteoles present. Flowers zygomorphic. Sepals 5, 3 unmodified, 2 lateral sepals (alae) enlarged and often petaloid. Petals 3, connate at the base and variously adnate to the stamens; lower petal a boat-shaped keel, clawed, unadorned or crested with variously shaped appendages; upper petals clawed, often auriculate on free outer margins, variously hairy or glabrous. Stamens 8, fused at the base into a staminal column, monadelphous, or partly dia- or triadelphous; anthers 2 celled and dehiscent via a short apical slit. Style variously hooked, bifid, globular or truncated. Ovary laterally compressed, 2- celled with one ovule per cell. Fruit

usually a compressed capsule, usually obovate or orbiculate, with a broad or narrow marginal wing, dehiscing along the outer suture. Seeds hairy, often with a caruncle or aril, the aril with 2-3 appendages running longitudinally along the seed.

A genus of approximately 500 species with a sub-cosmopolitan distribution but with its main diversity focused in tropical areas; 50 species in Australia. The roots of fresh specimens from the Northern Territory have a smell of methyl salicylate (i.e. denkorub) when scratched.

Key to Species – (for glossary of terms see appendix three)

*indicates those species for which no description is provided here.

1. Alae petaloid, blue, mauve, pink or white in colour 2
Alae herbaceous to leaf like, more or less green, rarely tinged dark maroon/purple 10
2. Robust erect branching perennial shrubs, usually 1-2m high 3
Slender spreading, ascending or erect herbs, usually less than 60 cm high 4
3. Leaves obovate to oblong; inflorescences short and few-flowered among the upper leaves, outer sepals glabrous ***P. myrtifolia****
Leaves narrow-obovate to almost linear (sometimes almost absent); inflorescences pyramidal and several-flowered exceeding the upper leaves; outer sepals ciliate ***P. virgata****
4. Flowers borne on terminal racemes 5
Flowers axillary or on short lateral racemes 9
5. Main colour of alae blue to mauve ***P. vulgaris****
Main colour of alae white or cream (rarely pink) 6
6. Aril appendage apparently 2-lobed, with the broad flattened lobes extending some way down the seed 7
Aril appendage 3-lobed and short, confined to apex of seed 8
7. Alae white; fruit very narrowly winged on both margins; seed appendage lobes less than half the length of the seed ***P. paniculata***
Alae cream; fruit wing developed on only one margin; seed appendage lobes running almost the length of the seed ***P. duarteana****
8. Plant glabrous; outer sepals 3–6.4 mm long; style distinctly hooked; fruit narrowly winged ***P. longifolia***
Plant puberulous; outer sepals 7–10 mm long; style short and straight; fruit broadly winged ***P. monspeliaca****

9. Plant erect, branching in upper parts of main stem; leaves with scaberulous hairs; aril head horseshoe shaped ***P. persicariaefolia***
 Plant lax and rather diffuse, stems branching from near the base and often trailing through surrounding vegetation; curved hairs throughout; aril head skewed
 ***P. japonica***
10. Staminal filaments 3+2+3, (triadelphous) 11
 Staminal filaments 8, (monadelphous) 12
11. Stem indumentum of curved hairs only; seed c. 2 mm long, elliptic [QLD] ***P. polifolia***
 Stem glabrous; seed 3–4 mm long, oblong [N Australia] ***P. wightiana***
12. Capsules prominently winged, wing between 0.5 mm and 4 mm wide, sometimes only winged at apex on some capsules 13
 Capsules not prominently winged, if present, wing < 0.5 mm wide 18
13. Alae narrowly elliptic and falcate; capsule asymmetric ***P. praecox***
 Alae very widely ovate to orbicular, not falcate; capsule more or less symmetric ... 14
14. Floral appendages entire; capsule wing usually widest at apex of capsule lobes
 ***P. integra***
 Floral appendages fimbriate, capsule wing usually more or less same width throughout 15
15. Seed with thickened testa adjacent to aril [Fig. 6 f] ***P. crassitesta***
 Seed without thickened testa 16
16. Alae much broader than capsule (incl. wing), almost twice the width ***P. validiflora***
 Alae ± equal to, only slightly wider (incl. wing) or narrower than capsule 17
17. Alae generally broader than capsule (excl. wing); capsule wings if exerted only slightly past alae; [Cape York Peninsula only] ***P. rhinanthoides***
 Alae ± same width as capsule (excl. wing); capsule wings usually well exerted past alae; [northern Australia] ***P. pterocarpa***
18. Style shortly hooked [Fig.3 f & g] or curved [Fig.3 b]; accumulation of pollen above stigma can obscure view in dried material 19
 Style distinctly hooked at apex [Fig.3 c]; pollen accumulation in bend of hook 27
19. Floral appendages horned [Fig. 2 h]; style cleft [Fig. 3 d] ***P. eriocephala***
 Floral appendages not horned; style not cleft 20
20. Style truncated into broad flattened apex, shortly hooked [Fig. 3 b] 21
 Style not truncated into broad flattened apex, straight or curved but not hooked 22
21. Apex of capsule lobes obtuse ***P. canaliculata***
 Apex of capsule lobes acute ***P. rhynchocarpa***
22. Style dorso-ventrally flattened when fresh, without groove above stigma [Fig. 3 f & g] ; seed usually oblong ***P. succulenta***
 Style more or less terete or laterally flattened when fresh, if dorsoventrally flattened then with groove above stigma; seed usually ovoid 23
23. Each floral appendage fimbriate or 2 to 4 pronged [Fig. 2 b] 24
 Each floral appendage entire, coralline or crenate 25
24. Floral appendages fimbriate (≥ 4 prongs per appendage), leaves 4–33 mm long
 ***P. exsuarrosa***
 Floral appendages variously divided, not fimbriate (< 4 prongs per appendage), leaves 6–55 mm long ***P. petraphila***
25. Floral appendages coralline ***P. clavistyla***
 Floral appendages not coralline 26
26. Alae narrowly ovate; inflorescence clustered and capsules more or less erect, tinged pink on margins; floral appendages with crenate margins; stigma globular and situated just below tip of style; style with hispid ascending hairs below stigma ***P. parviloba***
 Alae broadly ovate; inflorescence loose and capsules more or less perpendicular to rachis; floral appendages entire (rarely notched); style glabrous terminated by stigma ***P. integra***
27. Seed with two hair types, fine whitish hairs at base and hollow clear hairs below aril [Fig. 6 a] 28
 Seed with one hair type, fine whitish or ferruginous hairs throughout or glabrous (hairs can be of different lengths) [Fig 6 b-g] 30
28. Floral appendage coralline; leaves elliptic to obovate ***P. coralliformis***
 Floral appendage fimbriate; leaves ovate to lanceolate or linear 29
29. Leaves of two distinct shapes, ovate and lanceolate, plant with erect and decumbent

- branches ***P. bifoliata***
 Leaves uniform, lanceolate, plant erect, branches spreading and ascending in the form
 of a candelabra ***P. linearis***
30. Aril reduced to acute point [Fig. 5 g-h]; if approaching helmet [Fig. 5h], plant tufted,
 foliage ± glaucous and leaf apex emarginate 31
 Aril helmet shaped, hooked or rounded [Fig. 5. a-f]; if approaching acute [Fig. 5f], plant
 erect, foliage green and leaf apex obtuse 34
31. Floral appendage spatulate to coralline ***P. geniculata***
 Floral appendage regularly divided 32
32. Indumentum of curved hairs and soft straight hairs; leaf apex emarginate, leaves
 obovate to oblanceolate, glaucous; plant decumbent ***P. glaucifolia***
 Indumentum of curved hairs only; leaf apex acute, leaves usually linear to oblanceolate,
 rarely obovate; plant erect often with lateral branches 33
33. Inflorescence short, axillary, rarely to 20 mm long; fruit pendulous ***P. dependens***
 Inflorescence longer, axillary to supra-axillary, to 40 mm long; fruit not pendulous
 ***P. barklyensis***
34. Stem and leaf indumentum usually of curved hairs only 35
 Stem and leaf indumentum usually of curved and straight hairs 44
35. Leaves mostly orbicular or depressed orbicular, alae often dark purple/maroon otherwise
 green ***P. orbicularis***
 Leaves mostly linear to obovate, alae usually green 36
36. Lateral pocket on keel well developed [Fig. 4 c] ***P. saccopectala***
 Lateral pocket on keel absent or poorly developed 37
37. Most leaves obovate and seed ovoid ***P. obversa***
 Most leaves other than obovate and if so seed ovoid-oblong 38
38. Plant a creeper; flowers recorded as yellow; coastal lowlands [sandy ridges, Qld]
 ***P. glaucoides***
 Plant erect to ascending, sometimes with spreading lateral branches; flowers purple;
 savannah 39
39. Plants up to 65 cm, capsule apex usually acute and ascending, rarely obtuse; leaves
 linear ***P. tepperi***
 Plants never 65 cm, capsule apex obtuse, ascending, perpendicular to rachis or
 pendulous; leaves various, linear to orbicular 40
40. Leaves linear, usually 0.5–2.5 mm wide, seed 4–5 mm long [Fig. 6 e] (including long
 hairs extending past base to c. 1 mm long) ***P. stenoclada***
 Leaves linear to obovate, 1–14 mm wide; seed < 4 mm long, if > 4 mm leaves not linear
 41
41. Inflorescence sparse, exerted past leaves, to 200 mm long; alae in mature fruit < 4.5
 mm long ***P. macrobotrya***
 Inflorescence not sparse, not exerted past leaves, to 125 mm; alae in mature fruit up to
 8 mm long 42
42. Aril head strongly helmet shaped 43
 Aril head not strongly helmet shaped, hooked to rounded ***P. gabrielae***
43. Alae 3.3–4 mm long ***P. triflora***
 Alae 4.9–8 mm long ***P. galeocephala***
44. Alae much broader than capsule, almost twice the width ***P. validiflora***
 Alae more or less equal to or narrower than capsule 45
45. Most leaves obovate, oblanceolate, orbicular, very widely ovate or very widely elliptic
 46
 Most leaves linear, lanceolate, elliptic, oblong, ovate or if oblanceolate then ≤ 10 mm
 wide 48
46. Aril helmet-shaped; floral appendages fimbriate [Kimberley region] ***P. kimberleyensis***
 Aril not helmet-shaped, rounded or hooked; floral appendages spatulate 47
47. Seed ovoid-oblong; leaves mostly obovate to oblanceolate; staminal column fused to
 lateral petal to create a flap [Fig. 4 a] ***P. dimorphotricha***
 Seed ovoid; leaves mostly obovate to very widely obovate to orbicular; staminal column
 fused to lateral petal but not creating a flap [Fig. 4 b] ***P. barbata***
48. Inflorescence densely hairy, usually short in leaf axils < 30 mm long 49
 Inflorescence sparsely hairy or glabrous, if approaching densely hairy inflorescence
 usually well exerted from leaf axils to 90 mm long 51

49. Keel petal with a few long hairs on back of keel ***P. difficilis***
Keel petal glabrous 50
50. Leaves mostly oblanceolate to obovate; seed with short hairs extending $\frac{1}{4}$ to $\frac{2}{3}$ seed
length from the aril zone ***P. isingii***
Leaves mostly linear to lanceolate; seed with short hairs just below aril ***P. pycnophylla***
51. Inflorescence generally congested; seed 2.5–2.85 mm; alae 5–7.8 mm long (mature
fruit), leaves to 3 mm wide ***P. pendulina***
Inflorescence sparse; seed between 3.0–4.2 mm long; alae between 3.3–6.4 mm long
(mature fruit); leaves 2.5–9 mm wide 52
52. Inflorescence up to 160 mm long, often scorpioid; tap root not usually thickened; pocket
on keel petal ***P. scorpioides***
Inflorescence up to 90 mm long; tap root usually thickened; no pocket on keel petal ...
..... ***P. triflora***

Species descriptions

Please note due to the tendency for *Polygala* flowers to fade with age and the subjectivity of colour descriptions, most of the descriptions refer to the flowers being purple, this colour may equate to some people's blue, pale, or mauve.

A few different species from BRI were annotated with the phrase name *Polygala* sp. Camooweal A. De Lestang 218 (Henderson 2002). I did not see this specimen and consequently cannot treat it appropriately in synonymy.

Descriptions for all native taxa and north Australian taxa are provided. Descriptions for the following introduced southern species are available from the state Floras of Victoria, NSW and South Australia, cited in brackets after each species: *P. monospecliaca* L (SA, VIC), *P. myrtifolia* L. (NSW, SA, VIC), *P. virgata* Thunb. (NSW, SA, VIC), *P. vulgaris* L.(VIC). *Polygala duarteana* At. St-Hil., has not been recollected from a small area around Beaudesert in far south-eastern Qld since 1973 to confirm its persistence. A description is available in Monro (2003). It is apparently similar to *P. paniculata* and can easily be

distinguished by the presence of a marginal wing on only one side of the fruit.

Informal names

- P. sp.* (A Kimberley Flora K.F. Kenneally 7752) Wheeler (1992)
P. sp. (B Kimberley Flora T.E.H. Aplin et al. 715) Wheeler (1992)
P. sp. (Bifoliata N.B.Byrnes 2091) Kerrigan & Albrecht (2007)
P. sp. (Bradshaw C.R.Michell 2113) Cowie & Albrecht (2004)
P. sp. (Camooweal A.De Lestang 218) Henderson (2002)
P. sp. (Cahill K.G.Brennan) Kerrigan & Albrecht (2007)
P. sp. (Ciliate alae C.R.Michell 615) Cowie & Albrecht (2004)
P. sp. (Davenport Ranges C.R.Dunlop 6042) Cowie & Albrecht (2004)
P. sp. (Edith Falls D.M.J.S.Bowman 468) Cowie & Albrecht (2004)
P. sp. (Emerald R.W.Johnson 1322) Henderson (2002)
P. sp. (Gregory G.M.Wightman 2823) Kerrigan & Albrecht (2007)
P. sp. (Kakadu R.Collins 205) Kerrigan & Albrecht (2007)
P. sp. (Kennedy L.S.Smith 3173) Henderson (2002)
P. sp. (Larrimah M.O.Rankin 1932) Cowie & Albrecht (2004)
P. sp. (Portland Roads L. Pedley 2757) Henderson (2002)
P. sp. (Mudginberri J.Russell-Smith 987) Cowie & Albrecht (2004)
P. sp. (*orbicularis* var. Obovate leaves C.P.Mangion 900) Kerrigan & Albrecht (2007)
P. sp. (Prostrate P.K.Latz 4900) Kerrigan & Albrecht (2007)
P. sp. (Rhinanthoides shoulders M.H.Andrews 398) Kerrigan & Albrecht (2007)
P. sp. (Tennant Creek J.L.Egan 2299) Cowie & Albrecht (2004)
P. sp. (Tipperary C.S.Robinson 297) Cowie & Albrecht (2004)
P. sp. (Top End L.A.Craven 5464) Cowie & Albrecht (2004)
P. sp. (Western Tanami D.E. Albrecht 10660) Cowie & Albrecht (2005)

Polygala barbata R.A.Kerrigan, *sp. nov.*

Polygala obversae affinis, a qua pilis rectis indumentorum, indumento petalorum lateralium et lobis latoribus cristae floralis differt.

Type: Litchfield National Park, Wangi Falls, rainforest track, 16.i.2004, R.A. Kerrigan 723 & D.J. Dixon; *holo:* DNA 161431!; *iso:* BRI, CANB, K, PERTH

Polygala sp. Mudginberri (J.Russell-Smith 987) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, erect to 40 cm, often with spreading branches or prostrate; indumentum of curved and straight hairs. Leaves variable, elliptic to orbicular, oblanceolate to depressed obovate, 2–42 mm long, 2.5–30.0 mm wide; petiole 0–3 mm. Inflorescence axillary or supra-axillary, usually a short raceme to 15 mm long or solitary. Pedicel to 2 mm. Alae herbaceous, ovate, usually somewhat dimidiate, 3.6–6.0 mm long, 2.0–3.6 mm wide. Corolla purple; floral appendages spatulate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat along inner bend of hook. Capsule lacking wing, symmetrical, very widely ovate to widely oblong or squarish, 3–6 mm long, 3.5–5.5 mm wide. Seed ovoid, 3.0–4.2 mm long, 1.5–2.1 mm wide; indumentum of fine white or ferruginous hairs, often becoming shorter towards aril or sometimes glabrous or with glabrous patches. Aril head rounded, 0.5–0.7 mm long, white, with fine short hairs. Aril appendages 3, short and linear, 0.9–2 mm long. (Fig. 5.2)

Distribution

Australia (NT). This species is endemic to the NT and is distributed widely across the Top End, from Borroloola to Port Keats. (Fig. 5.3)

Habitat

Found in a variety of habitats and substrates, including river margins, bulwaddy (*Macropteranthes kekwickii* F.Muell. ex Benth.), lancewood (*Acacia shirleyi* Maiden) and dry vine thickets, but mostly in woodlands on sandy loam.

Notes

This species is variable, individuals are prostrate or erect, have small orbicular or large obovate leaves and have hairy or glabrous seeds. Similar to *P. coralliformis* and *P. obversa* it can be distinguished from the former by the evenly divided floral appendages. From the latter it is distinguished by the presence of long straight hairs on the stems and leaves, a pilose tuft of hairs on the upper petal auricle, floral appendages which broaden at the apex and a staminal tube adnate across the whole upper petal.

Etymology

Latin *barbata* (bearded) referring to the presence of a tuft of hairs on the upper petal auricle.

Specimens examined: (60)

Northern Territory

Lake Bennett Rd, 2km from Stuart Hwy, 30/04/1983, *R.M. Barker 384* (AD, DNA); Grant Is, 22/04/1995, *R. Booth 621* (DNA); Kakadu National Park, 17/02/2000, *K.G. Brennan 4798a* (DNA); Kakadu National Park, fire plot 5, 29/02/2000, *K.G. Brennan 4921* (DNA); Kakadu National Park, fire plot 2, 24/02/2000, *K.G. Brennan 4932* (DNA); Nitmiluk National Park, 27/03/2000, *K.G. Brennan 4981* (DNA); Nitmiluk National Park, Veg Site 190, 28/02/2001, *K.G. Brennan 5379* (DNA); Nitmiluk National Park, 02/03/2001, *K.G. Brennan 5425* (DNA); MacArthur Rr Mine lease, M17, 08/04/2003, *K.G. Brennan 5886 & K. Metcalfe* (DNA); MacArthur Rr Mine lease, M2, Mt Stubbs, 02/04/2003, *K.G. Brennan 5932 & K. Metcalfe* (DNA); Kakadu National Park, 8km SSE Jim Jim Falls, 19/02/2004, *K.G. Brennan 6063* (DNA); 20 mls N of Katherine of Stuart Hwy, 20/04/1956, *N.T. Burbidge 5209* (CANB); Amungee Mungee Stn, access road, 02/05/1991, *I.D. Cowie 1770 & B.A. Wilson* (DNA); Cape Hotham Reserve; Escape Cliff, 30/03/1993, *I.D. Cowie 3309* (DNA, MEL); Sturt Plateau; Stuart Hwy, near Daly Waters, 24/02/1999, *I.D. Cowie 8177 & C.P. Mangion* (DNA); Arnhem Land, near Mann Rr, c.104km SSW Maningrida, 22/03/2000, *I.D. Cowie 8982* (DNA); Kakadu National Park, 24.5 km SSW of Cooida on Pine Creek road., 19/05/1980, *L.A. Craven 5616* (CANB); Kapalga, 23/02/1981, *J. Cusack 115* (DNA); Mt Bunday Arnhem Hwy, 06/03/1987, *C.R. Dunlop 6890 & G.M. Wightman* (DNA, BRI, NSW); Kakadu National Park; Kapalga, 07/02/1993, *J.L. Egan 1451* (DNA); Carpentaria Hwy, 07/03/1993, *J.L. Egan 1796* (DNA); Carpentaria Hwy, 25km from Daly Waters, 03/04/1993, *J.L. Egan 1933* (DNA); Kakadu National Park, Kapalga F plot, 15/03/1994, *J.L. Egan 3291* (DNA); Kakadu National Park, Kapalga E plot, 15/03/1994, *J.L. Egan 3299* (DNA, BRI, MEL); Kakadu National Park, Kapalga Q Plot, 04/04/1994, *J.L. Egan 3629* (DNA); Nitmiluk National Park, 12/02/1991, *M. Evans 3634* (DNA, CANB, BRI, MEL, K); Mt. Bunday East, 14/05/1987, *R.J. Fensham 597* (DNA); 17km SE of Twin Falls, 21/03/1988, *R.J. Fensham 597* (DNA); Port Darwin, -2/1883, *P. Foelsche 95* (MEL); Mt McMinn Stn, 14/03/2002, *R.K. Harwood 1201* (DNA); Litchfield National Park, Wangi Falls, rainforest track, 16/01/2004, *R.A. Kerrigan 723 & D.J. Dixon* (DNA); Collopy Road, Darwin Airport, 08/03/2004, *R.A. Kerrigan 814* (DNA); Arnhem Hwy, Mt Bunday area, 08/04/2005, *R.A. Kerrigan 930* (DNA); Mt Bunday, 03/02/1989, *G.J. Leach 2089 & C.R. Dunlop* (DNA); Kintore Caves Reserve., 26/03/1996, *D.T. Liddle 1611 & S.M. Taylor* (DNA); Adelaide Rr Crossing, Daly Rr Road, 31/03/1981, *J.R. Maconochie 2641* (DNA); c.15km S of Borrooloola, 25/04/1998, *C.P. Mangion 570 & C.P. Brock* (DNA); N of Arnhem's Land, *J. McKinlay s.n.* (MEL); McArthur Rr Stn, 25/02/1998, *C.R. Mitchell 1354 & R.B. Carrow* (DNA); Nitmiluk National Park, 26/02/2001, *C.R. Mitchell 3138 & B. Deichmann* (DNA); Nitmiluk National Park, 05/04/2001, *C.R. Mitchell 3139 & B. Deichmann* (DNA); Nitmiluk National Park, 25/03/2001, *C.R. Mitchell 3140 & B. Deichmann* (DNA); Douglas Daly Research Farm, 21/01/1998, *C.R. Mitchell 529 & K.J. Nicholl* (DNA); Bradshaw Stn, fire plot 9, 23/02/1999, *C.R. Mitchell 2241 & C. Yates* (DNA); Nitmiluk National Park; south east corner of park, 14/03/2002, *C.R. Mitchell 3604* (DNA, NT); SW of Minets McArthur Rr camp, 19/02/1976, *B.L. Rice 2257* (CANB); NW of Minets McArthur Rr camp, at W-fold Zinc anomaly, 11/02/1976, *B.L. Rice 2258* (CANB); Nitmiluk National Park, Site 367, 25/03/2001, *J.A. Risler 1452 & M. Waetke* (DNA); Nitmiluk National Park, Site 381, 25/03/2001, *J.A. Risler 1453 & M. Waetke* (DNA); Mt McMinn Stn, Roper Hwy near Dry Rr Stn turnoff, 27/04/2002, *J.A. Risler 1832 & A.J. Fisher* (DNA); Big Rr Stn, 18/03/2003, *J.A. Risler 2115* (DNA); Kakadu National Park, behind Mardugal Campground, 30/03/2003, *J.A. Risler 2137 & R.S.C. Firth* (DNA); Port Darwin, *F. Schultz 114* (MEL); Flora Rr Conservation Park near Kathleen Falls, 16/04/1997, *N.M. Smith 4083 & R. Tingey* (DNA); Wadeye Community, Port Keats, 13/03/1987, *N.M. Smith 489* (DNA); Delissaville, Cox's Peninsula, 27/03/1948, *R.L. Specht 88* (BRI, CANB, MEL, DNA, PERTH); Katherine, Kintore Caves Reserve, 05/03/1996, *S.M. Taylor 364 & D.T. Liddle* (DNA); Sullivan Creek Upper reaches Gregory National Park, 08/03/1986, *B.G. Thomson 1381* (NT); 97km E Daly Waters on Borrooloola Road, 31/01/1989, *B.G. Thomson 3123* (DNA, NT); Katherine Experiment Stn, 01/02/1947, *A.E. Wynne 100* (CANB).

Fig. 5.1. The holotype of *Polygala barbata*; Litchfield National Park, Wangi Falls, rainforest track, 16/01/2004, R.A. Kerrigan 723 & D.J. Dixon (DNA, BRI, PERTH, CANB, K)

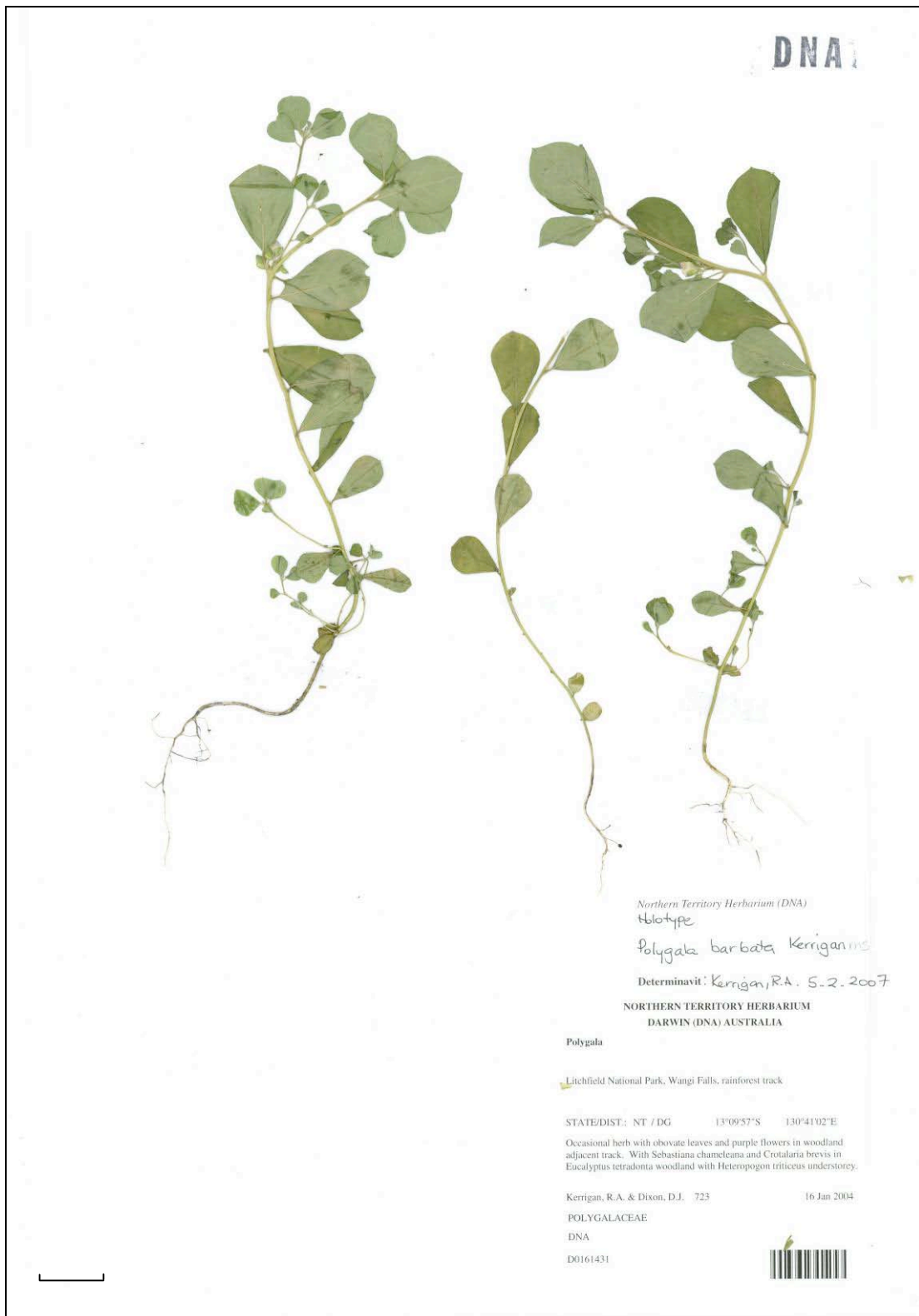


Fig. 5.2. Flower and seed of *Polygala barbata* (R.A. Kerrigan 723). a) flower with spatulate floral appendages; and b) seed with two of the three aril appendages, appendage on left hand side of seed broken.

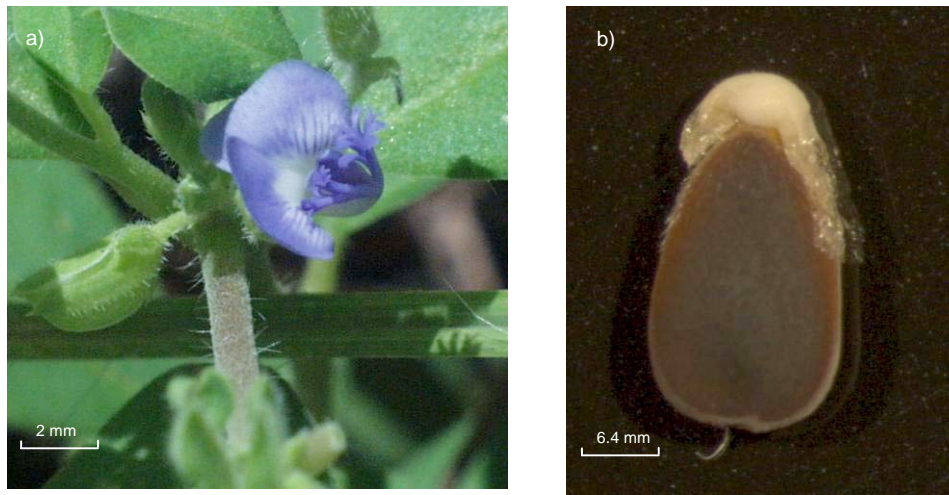
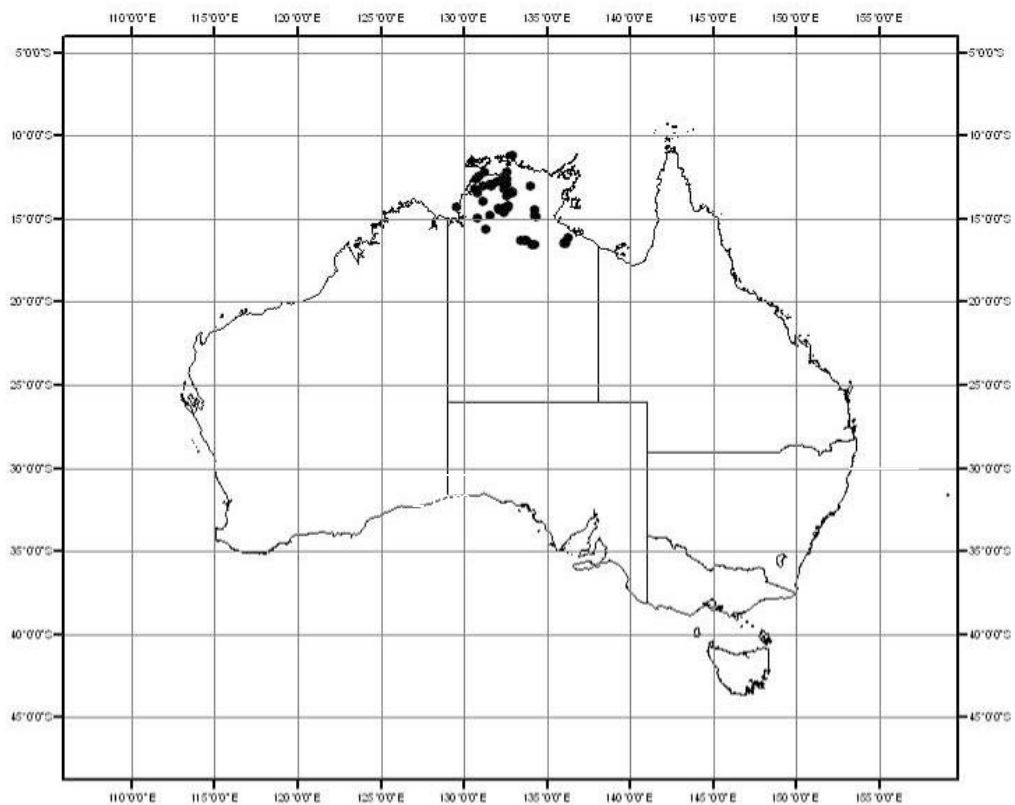


Fig. 5.3. The distribution of *Polygala barbata* based on available collection data.



Polygala barklyensis R.A.Kerrigan, *sp. nov.*

Polygala exquarrosae affinis, a qua stigmatе plano et stylo uncatо differt.

Type: Mallapunyah Stn, 80km S of Cape Crawford, 1km E of Carpentaria Hwy, 29.iv.1991, *I.D. Cowie 1605 & B.A. Wilson*; holo: DNA 59745!; iso: BRI, MEL

Annual herb, erect to 16 cm; indumentum of curved hairs. Leaves linear, narrowly elliptic, oblanceolate or rarely obovate, 5–38 mm long, 1–5 mm wide; petiole to 0.5 mm. Inflorescence a supra-axillary or axillary raceme to 40 mm long. Pedicel to 2 mm. Alae herbaceous, ovate, strongly dimidiate, 3.6–5.2 mm long, 1.6–2.2 mm wide. Corolla purple, floral appendages spatulate. Stamens terminate at stigma, monadelphous. Style hooked, with flat stigma along inner surface of hook. Capsule lacking wing, more or less symmetric, ovoid, 2.25–2.75 mm long, 3–3.2 mm wide. Seed ovoid, 1.5–2.7 mm long, 1.25–1.6 wide; indumentum with fine white or ferruginous hairs present. Aril head reduced, 0.25–0.5 mm long, brown where reduced to seed testa and white where appendages originate, with short hairs. Aril appendages 3, spatulate, 1.3–2.1 mm long.

Distribution

Australia (NT, QLD). This species is known from Mallapunyah Stn north of the Barkly Tableland in the NT from and from around Musselbrook Mining Camp and Lawn Hill National Park in QLD. (Fig. 5.5)

Habitat

Found in *Corymbia dichromophloia* or *Eucalyptus leucophloia* woodlands, usually on stony hill slopes, rarely in seepage areas with *Melaleuca viridiflora*.

Notes

This species is very similar to *P. exsuarrosa* but can be distinguished from it by the hooked style and flat stigma.

Etymology

Latinised place name *barklyensis* after the general region where this species is found.

Specimens examined: (6)

Northern Territory

Lawn Hill National Park, Musselbrook section, stockmans yard, 16/04/2003, *R. Booth 3250* (BRI); C.16 km WNW of Lawn Hill Gorge, 17/06/1998, *R.J. Cumming 17571* (BRI); 16 km (by road) W of Musselbrook Mining Camp on road to Border Waterhole, 175 km N of Camooweal, 25/04/1995, *M.B. Thomas 206 & R.W. Johnson* (BRI); 28.2 km S by road from Musselbrook Mining Camp on road to Camooweal, 26/04/1995, *M.B. Thomas 421 & R.W. Johnson* (BRI); Bat Cave, 3.6 km E of Ridgepole Waterhole which is 27 km E of Musselbrook Mining Camp, 175 km N of Camooweal, 02/05/1995, *M.B. Thomas 734 & R.W. Johnson* (BRI).

Fig. 5.4. The holotype of *Polygala barklyensis*. Mallapunyah Stn, 80km S of Cape Crawford, 1km E of Carpentaria Hwy, 29/04/1991, I.D. Cowie 1605 & B.A. Wilson (DNA, MEL, BRI)

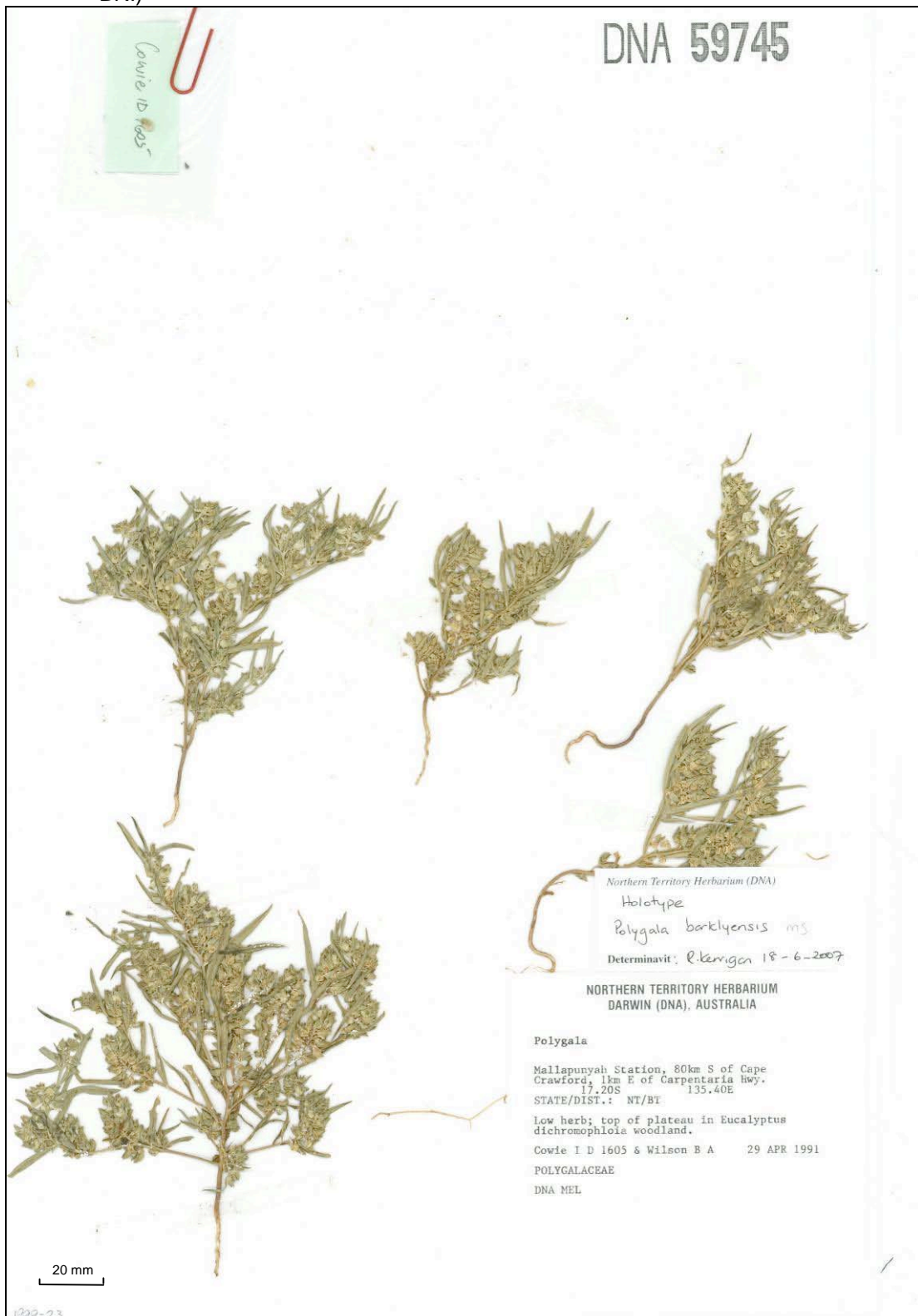
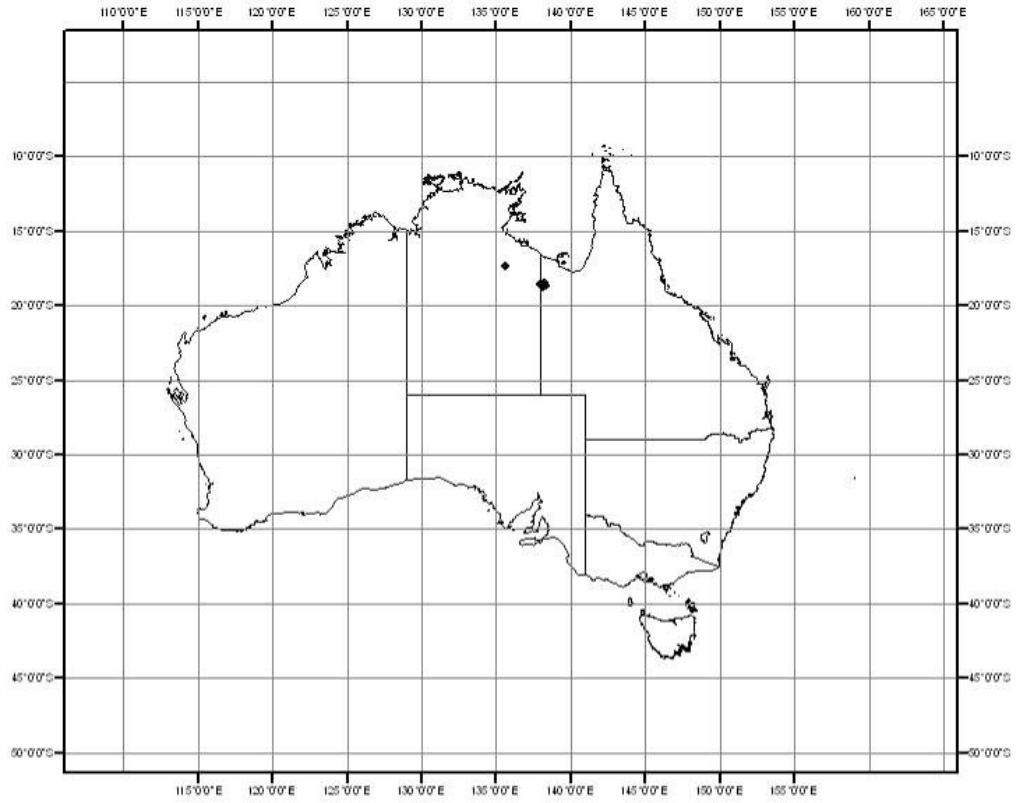


Fig. 5.5. The distribution of *Polygala barklyensis* based on available collection data.



Polygala bifoliata R.A.Kerrigan, *sp. nov.*

Polygala linearis affinis, a qua caulibus prostratis et foliis magis ellipticis differt.

Type: Black Rock Pool, adjacent car park, 17.iv.2006, R.A. Kerrigan 1137; holo: DNA 177040!; iso: BRI, CANB, PERTH,

Polygala sp. Bifoliata (N.B.Bynres 2091) R.A.Kerrigan & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2007)

[*Polygala arvensis* [NT material] *auct. non* Willd.: Benth. *Fl. Austral.* 1 140 (1963) p.p. as to Upper Victoria river F.Muell. K356709 (photol); A.J.Ewart & O.B.Davies, *Fl. N. Terr.*: 160 (1917); I.D. Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004) (1802)]

[*Polygala pycnophylla* [NT material] *auct non.* Domin: I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)]

Annual herb, prostrate, or erect with decumbent branches to 15 cm; indumentum of curved and straight hairs or occasionally with curved hairs only. Stems and leaves occasionally tinged maroon. Leaves variable, two leaf shapes usually always present, linear, lanceolate or narrowly elliptic leaves, often on erect branches distally located, and elliptic or ovate leaves, usually proximal on decumbent branches, 2–46 mm long, 1.5–8.0 mm wide; petiole 0–1 mm. Inflorescence supra-axillary or axillary, usually a loose raceme to 120 mm long, rarely solitary. Pedicel to 9 mm. Alae herbaceous, lanceolate to oblanceolate, or elliptic, dimidiate to falcate; 2.8–6.3 mm long, 1.0–2.9 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked; stigma flat against inner bend of hook. Capsule lacking wing, usually strongly asymmetrical, rhomboid or squarish, 2.5–4.5 mm long, 2.6–3.9 mm wide. Seed ovoid-oblong, 2.0–3.6 mm long, 1.0–1.8 mm wide; indumentum with fine hairs over whole seed and thicker recurved hollow hairs adjacent to aril. Aril head rounded-hooked, 0.3–0.5 mm long, white, with fine short hairs or rarely glabrous. Aril appendages 3, narrow and long, 0.75–2.10 mm long. (Fig. 5.7)

Distribution

Australia (NT, WA). This species is distributed across the Top End of the NT north of 17°S and throughout the Kimberley region of northern WA. (Fig. 5.8)

Habitat

Usually found in Eucalypt woodlands on a variety of soils, sometimes associated with rocky situations, rarely found in seasonally inundated habitats.

Notes

This species is very similar to *P. linearis* and although extremes of both species are easily distinguished by leaf shape and habit, a number of specimens are difficult to clearly assign and may represent integrades between the two species. They include C.R. Dunlop 6322, K.G. Brennan 4868 and 4986, and J.L. Egan 3117. *Polygala bifoliata* is generally prostrate or erect with decumbent branches, while *P. linearis* is usually erect with ascending branches. *Polygala bifoliata* grows in open eucalypt woodlands in contrast to *P. linearis* which is commonly associated with seasonally inundated *Melaleuca* shrublands. Only a few flowering specimens are available for this species and further differences may become apparent with additional material.

Etymology

Latin *bi-* (two) and *foliata* (leaf bearing), because of the two leaf shapes found on most specimens.

Specimens examined: (59)

Western Australia

59 km by road N of Gibb Rr Road, 60 km NE of Derby, 12/6/1976, A.C. *Beauglehole* 52698 (PERTH); 2 km N of Beverley Springs Stn Homestead, 2/5/1988, R.J. *Cranfield* 6684 (PERTH); 6 km from Kulumburu road towards King Edward Rr crossing along Mitchell Rr Stn track, 02/05/1992, I.R.H. *Telford* 11651 (PERTH, CBG).

Northern Territory

Kakadu National Park, Gimbat, about 3.5km SE Fisher Airstrip, 14/02/1992, K.G. *Brennan* 1829 (DNA); Ranger Uranium Lease, 24/03/1994, K.G. *Brennan* 2753 (DNA); Melville Is, Eucalypt woodland on headland near mouth of Goose CK Melville Is, 17/04/2000, K.G. *Brennan* 4469 (DNA); Kakadu National Park, 21/01/2000, K.G. *Brennan* 4813 (DNA); Kakadu National Park, 09/03/2000, K.G. *Brennan* 4820 (DNA); Kakadu National Park, fire plot 34, 08/03/2000, K.G. *Brennan* 4868 (DNA); Nitmiluk National Park, 27/03/2000, K.G. *Brennan* 4986 (DNA); Nitmiluk National Park, Veg Site 179, 26/02/2001, K.G. *Brennan* 5375 (DNA); Groote Eylandt, GE 006, 07/03/2005, K.G. *Brennan* 6403 (DNA); 17M S Darwin, 20/04/1971, N.B. *Byrnes* 2091 (DNA); Groote Eylandt; 12.5km ESE, Emerald Rr Crossing, 14/04/1992, I.D. *Cowie* 2667, (DNA); Litchfield National Park, catchment of Aida Ck, 03/03/1995, I.D. *Cowie* 5251 & S.M. *Taylor* (DNA); Litchfield National Park, Walker Ck Ranger Stn., 15/03/1995, I.D. *Cowie* 5283 & S.M. *Taylor* (DNA); Litchfield National Park, near Florence Falls Rd, 15/03/1995, I.D. *Cowie* 5300 & S.M. *Taylor* (DNA); Litchfield National Park, Tableland Ck, 12/02/1996, I.D. *Cowie* 6125 & R. *Booth* (DNA); Flinders Peninsula, adjacent to N end of Probable Is, 28/04/1996, I.D. *Cowie* 6715 (DNA, BRI); c. 79km SE Maningrida, near Blyth Rr, Arnhem Land, 13/04/2000, I.D. *Cowie* 8892 (DNA); Bathurst Is; SE of Port Hurd, 26/03/2001, I.D. *Cowie* 9102 & C.P. *Mangion* (DNA); Groote Eylandt, 12.4 km W of Umbakumba on main road, 09/03/2005, D.J. *Dixon* 1367 (DNA); Gunn Point, 08/05/1973, C.R. *Dunlop* 3025 (DNA); Kakadu National Park, Headquarters area, 16/03/1982, C.R. *Dunlop* 6322 & S.M. *Taylor* (DNA); Tabletop Range, 19/05/1985, C.R. *Dunlop* 6794 (DNA); Tolmer Plateau, 05/04/1991, C.R. *Dunlop* 8820 & I.D. *Cowie* (DNA, BRI); Fitzmaurice Rr basin, 13/05/1994, C.R. *Dunlop* 9982 & P.K. *Latz* (DNA); King Rr Valley Rd, 09/03/1993, J.L. *Egan* 1820, (DNA); Katherine Gorge, 10/03/1993, J.L. *Egan* 1822, (DNA); Litchfield National Park; Lost City Rd, 02/12/1992, J.L. *Egan* 263, (DNA); Litchfield National Park, on road to Lost City, 24/01/1994, J.L. *Egan* 3045, (DNA); Cobourg Peninsula; near 3-ways, 02/02/1994, J.L. *Egan* 3117, (DNA); Litchfield National Park, Lost City Road, 24/03/1994, J.L. *Egan* 3356, (DNA); Edith Rr, 28/03/1996, J.L. *Egan* 5319 (DNA); Litchfield National Park; Lost City Rd, 26/12/1992, J.L. *Egan* 637, (DNA); Edith Falls Rd, 12km from Stuart Hwy, 28/1/1991, M. *Evans* 3559 (DNA, K); Eva Valley Stn., 06/03/1991, M. *Evans* 3668 (DNA, K); Solar Village, Humpty Doo, 28/02/1988, R.J. *Fensham* 682 (DNA); Cave Creek Stn, 20/03/2003, R.K. *Harwood* 1319 (DNA); Nitmiluk National Park, Eva Valley, E Boundary, 08/03/2002, R.A. *Kerrigan* 546 (DNA); c. 800 m N of Daly Rr Rd, 24/04/2003, R.A. *Kerrigan* 709 & D.J. *Dixon* (DNA); Stuart Hwy, 134 km Bridge, 24/04/2003, R.A. *Kerrigan* 715 & D.J. *Dixon* (DNA); Litchfield National Park, 2.4 km from Table Top swamp, top of 1st jump-up, 16/01/2004, R.A. *Kerrigan* 724 & D.J. *Dixon* (DNA); 1.29 km NE towards East Springs, from Green Ant Creek crossing on Adelaide Rr Scenic Rd, 02/02/2004, R.A. *Kerrigan* 729 & R.K. *Harwood* (DNA); 16.9 km N of Kakadu Hwy turnoff, 13/02/2004, R.A. *Kerrigan* 744 & P.S. *Short* (DNA); Risler Residence, Lot 29 Melaleuca Rd Howard Springs, 04/03/2004, R.A. *Kerrigan* 753 & J.A. *Risler* (DNA); Lot 3208 Edith Farms Rd, Katherine Region, 01/04/2004, R.A. *Kerrigan* 797 (DNA); Victoria Hwy, 1.8 km W of Larizooma turnoff, opposite rest area, 24/03/2005, R.A. *Kerrigan* 914 (DNA); Litchfield Shire Survey. Site 6. Transect 2, 02/04/1997, D.T. *Liddle* 1825 (DNA); Melville Is E side of Brenton Bay, 14/04/2000, C.P. *Mangion* 997 (DNA); Bradshaw Stn, fire plot 16, 17/02/1999, C.R. *Michell* 2102 & J. *Russell-Smith* (DNA); Nitmiluk National Park, 19/03/2001, C.R. *Michell* 3137 & J.A. *Risler* (DNA); Nitmiluk National Park; southern boundary, 01/05/2002, C.R. *Michell* 3606 (DNA); Nitmiluk National Park, Site 366, 23/03/2001, J.A. *Risler* 1449 & M. *Waetke* (DNA); Humpty Doo, Solar Village, 03/03/2002, J.A. *Risler* 1743 & J.C.Z. *Woinarski* (DNA); Cave Creek Stn, 20/03/2003, J.A. *Risler* 2098 (DNA); Lake Dean; vegetable plot, 23/12/1964, C.S. *Robinson* 1067 (DNA); Kakadu National Park, Pine Jungle, 18/02/1995, J. *Russell-Smith* 9519 & D. *Lucas* (DNA); Port Darwin, F. *Schultz* 109 (MEL); Yambaran Range; 19km NE Mt Millik Monmir, 15/05/1994, N.G. *Walsh* 3846 (MEL, DNA).

Fig. 5.6. The holotype of *Polygala bifoliolata*. Black Rock Pool, adjacent car park, 17/4/2006, R.A. Kerrigan 1137 (DNA, BRI, PERTH, CANB)

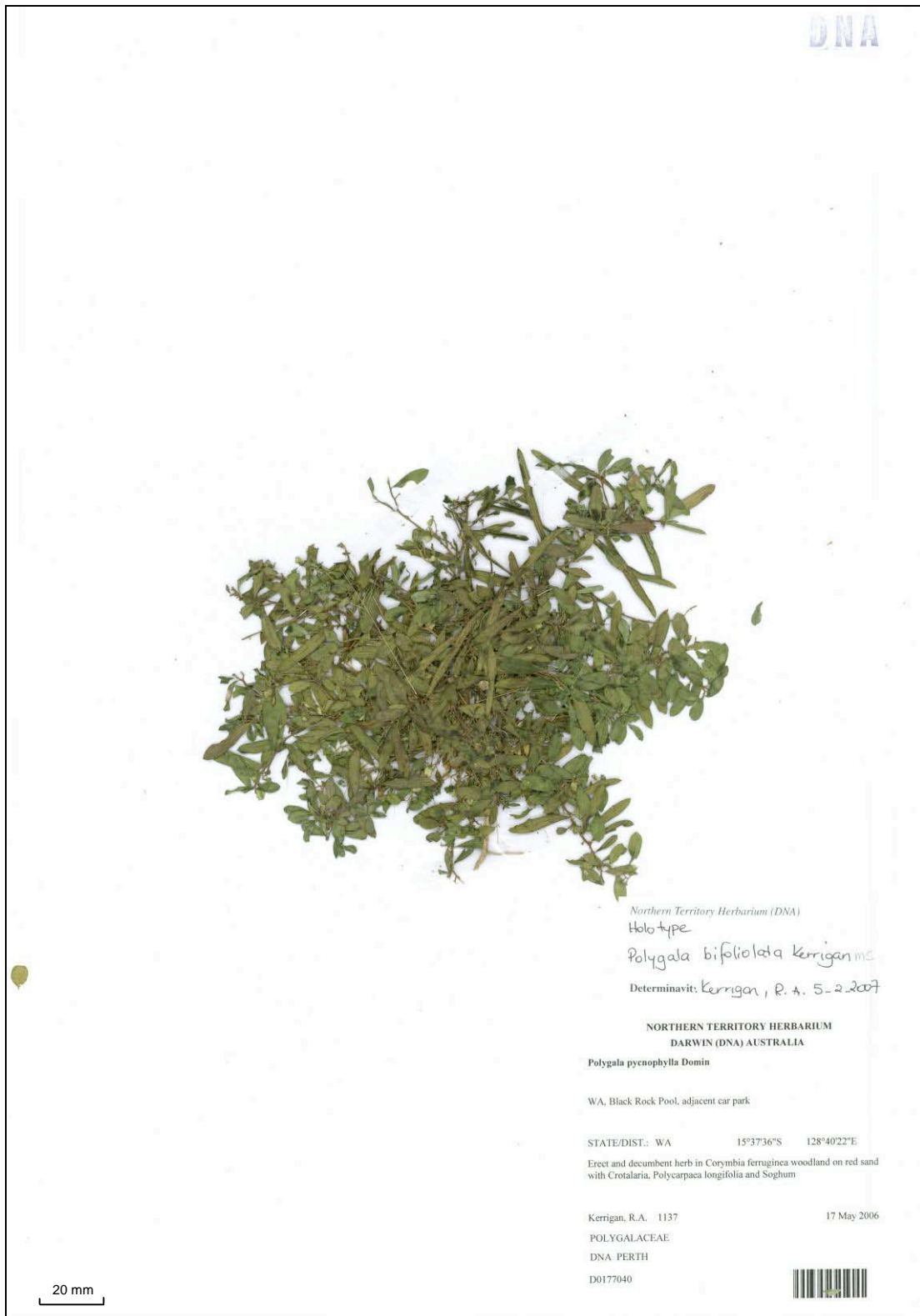
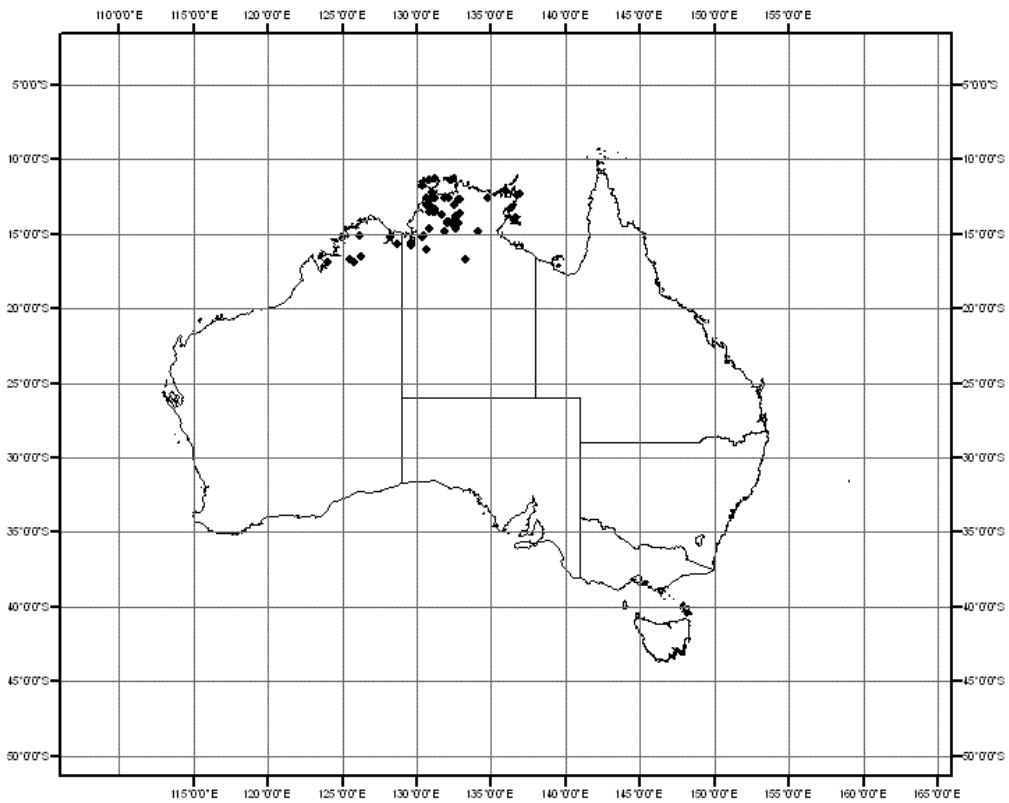


Fig. 5.7. Seed and mounted specimen of *Polygala bifoliata*. a) seed with thick hollow hairs at base of aril head (R.K. Harwood 1319); and b) mounted specimen with two leaf shapes (R.A. Kerrigan 914).



Fig. 5.8. The distribution of *Polygala bifoliata* based on available collection data.



Polygala canaliculata R.A.Kerrigan, *sp. nov.*

Polygala canaliculatae affinis, a qua lobis capsulae apicibus acutis differt.

Type: Kimberley, 142.6 km E from Kalumburu turnoff on Gibb River Rd, 16.v.2006, R.A. Kerrigan 1131; holo: DNA 176690!; iso: BRI, CANB, K, L, MEL, NT, PERTH

Annual herb, erect to 45 cm; with an indumentum of curved hairs. Leaves sparse and caducous; linear, 12–47 mm long, 0.5–1.5 mm wide, sessile. Inflorescence supra-axillary, usually a loose raceme to 150 mm long. Pedicel to 3.6 mm. Alae herbaceous, lanceolate, narrowly elliptic or oblanceolate, dimidiate to falcate, 5–7 mm long, 1.6–2.4 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style curved, flattened at apex above globular stigma, flattened edge shallowly notched or grooved. Capsule lacking wing, more or less asymmetrical, obovate, 5.0–5.5 mm long, 2.6–3.0 mm wide. Seed oblong, 3.5–3.9 mm long, 1.2–1.3 mm wide; indumentum of fine hairs, shorter towards apex. Aril head rounded sometimes hooked to one side, c. 0.6 mm long, white, with short hairs. Aril appendages 3, short and narrow, 0.6–1.0 mm long.

Distribution

Australia (WA). This species is endemic to Western Australia and is only known from the Cockburn and Pentecost Ranges in the Kimberley Region. (Fig. 5.10)

Habitat

Usually growing amongst rocky rubble of sandstone in eucalypt woodland with *Triodia* spp.

Notes

This species is very similar to *P. linearis*, *P. macrobotrya*, *P. pendulina*, and *P. rhyngocarpa*. It can be distinguished from the former three by the curved rather than hooked style and the narrow linear leaves. From *P. rhyngocarpa* it can be distinguished by the groove on the end of the broad truncated style, and the obtuse apex of the capsule lobes. *Polygala rhyngocarpa* has a more twisted and narrowly truncated style with an extension that gives it a hammer head appearance.

Etymology

Latin *canaliculata* (grooved) referring to the shallow groove at the top of the style.

Specimens examined: (3)

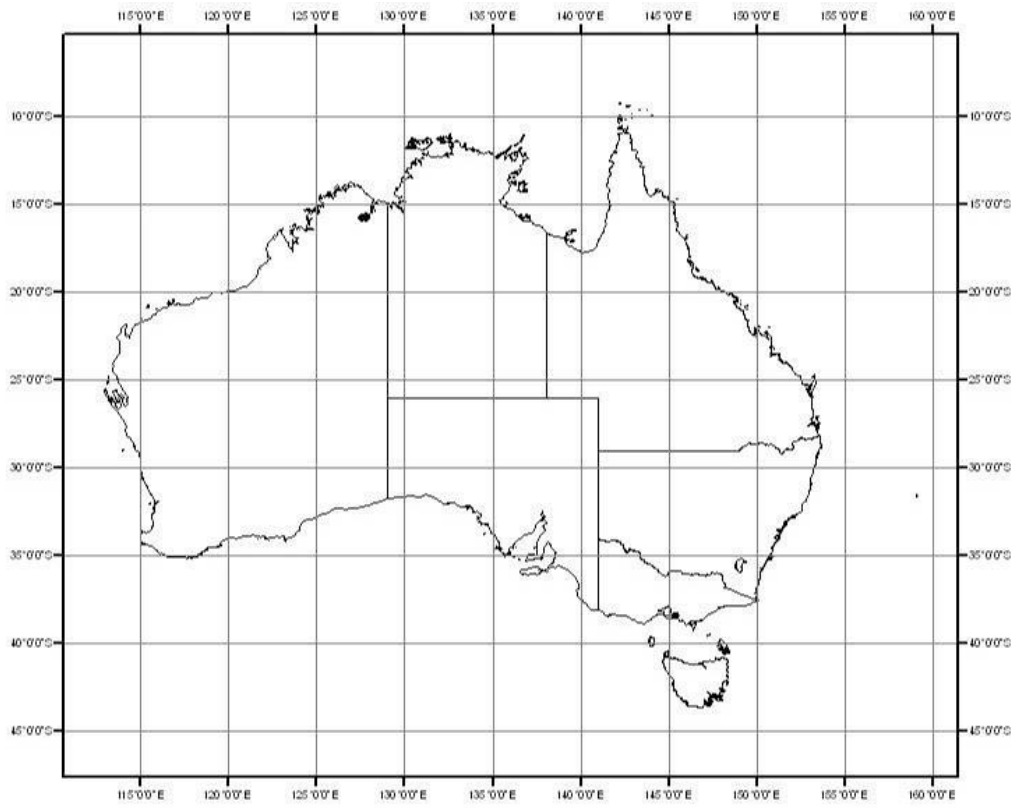
Western Australia

Kimberley, 163.6 km E from Kalumburu turnoff on Gibb River Rd, 16/05/2006, R.A. Kerrigan 1133 (DNA, PERTH); Cockburn Range, 46 km SSW of Wyndham, NE Kimberleys, 16/03/1978, M. Lazarides 8592 (BRI, CANB, PERTH).

Fig. 5.9. The holotype of *Polygala canaliculata*. Kimberley, 142.6 km E from Kalumburu turnoff on Gibb River Rd, 16/05/2006, R.A. Kerrigan 1131 (DNA, PERTH, CANB, BRI, K)



Fig. 5.10. The distribution of *Polygala canaliculata* based on available collection data.



Polygala clavistyla R.A.Kerrigan, *sp. nov.*

Polygala geniculatae affinis, a qua stigmatibus globosis et stylo clavato differt.

Type: Edith Falls, 13.iv.1995, *J.L. Egan 4733* holo: DNA 124519!; iso: BRI, CANB, K, PERTH

Polygala sp. Edith Falls (D.M.J.S.Bowman 468) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, erect or spreading to 10 cm; indumentum of curved hairs. Stems and leaves often tinged red or maroon. Leaves oblanceolate to obovate, 4–26 mm long, 1.5–8.0 mm wide; petiole 0–1.5 mm long. Inflorescence a terminal raceme, flowers closely spaced on rachis to 62 mm long. Pedicels to 3.5 mm long. Alae herbaceous, ovate, dimidiate, 4.0–5.5 mm long, 1.3–3.0 mm wide. Corolla purple; floral appendages irregularly divided, coralline. Style curved, extending beyond globular stigma, clavate at apex. Stamens terminate at stigma, monadelphous. Capsule lacking wing, more or less symmetrical, ovoid, apex notched, often with curved overlapping horns or mucro on each lobe; 3.0–3.5 mm long, 2.65–3.0 mm wide. Seed ovoid, 2.0–2.9 mm long, 1.2–1.5 mm wide, indumentum of fine white to ferruginous hairs. Aril head reduced to an acute point, 0.3–0.5 mm long, brown where reduced to seed testa and white where appendages originate, hairy. Aril appendages 3, cuneate, 0.7–2.0 mm long, thin and translucent.

Distribution

Australia (NT). This species is endemic to the NT and is only known from a restricted distribution around Nitmiluk National Park, extending north into southern Kakadu National Park and east to Big River Stn near the Roper Rr. (Fig. 5.12)

Habitat

Found in woodlands in skeletal soil on plateaus and rocky hills, amongst laterite or sandstone.

Notes

This species is very similar to *P. geniculata* but is distinguished by the globular stigma and club-shaped style.

Etymology

Latin *clavi-*(club shaped) and *-styla* (style) because of the club shaped apex of the style. Affinities belong to *P. geniculata*, from which it differs by the globular stigma and clavate style.

Specimens examined: (20)

Northern Territory

Old Edith Falls track, 21/03/1987, *D.M.J.S. Bowman 468* (DNA); Along walking track to Motor Car Creek Falls, 10/04/1993, *K.G. Brennan 2292* (DNA); Nitmiluk National Park, 24/03/2000, *K.G. Brennan 5055* (DNA); Nitmiluk National Park, veg site 152, 15/02/2001, *K.G. Brennan 5306* (DNA); Nitmiluk National Park, veg site 232, 03/03/2001, *K.G. Brennan 5439* (DNA); Nitmiluk National Park, veg site 234, 03/03/2001, *K.G. Brennan 5449* (DNA); Mt Todd Mine site, 17/03/1995, *J.L. Egan 4446* (DNA); Gouldian Finch Site 9, Yinberrie Hills, 14/02/1996, *J.L. Egan 5143* (DNA); Nitmiluk National Park, 04/04/2005, *J.L. Egan 5672* (DNA); Nitmiluk National Park, 12/02/1991, *M. Evans 3603* (DNA); Eva Valley Stn, 05/03/1991, *M. Evans 3651* (DNA); Ferguson Rr crossing, off Old Stuart Hwy on cutting, 23/03/2005, *R.A. Kerrigan 904*

(DNA); Upper Fergusson Rr, 06/02/1989, *P.K. Latz 11383* (DNA, MEL, NT); Plum Tree Creek Crossing, Kakadu National Park Stage 3, 01/02/1989, *K.A. Menkhorst 262* (DNA, MEL); Nitmiluk National Park, 09/03/2001, *C.R. Mitchell 3134 & B. Deichmann* (DNA); Big Rr Stn, NE corner of property, 18/03/2003, *J.A. Risler 2074* (DNA); Edith Rr Area, 01/03/1999, *C.R. Mitchell & J.A. Risler 2378* (DNA); Nitmiluk National Park, site 418, 02/04/2001, *J.A. Risler 678* (DNA); Kakadu National Park; 19.5 km ENE Mary Rr Ranger Stn, 21/04/1990, *A.V. Slee 2722 & L.A. Craven* (DNA, CANB); MtTodd; plot 12, 02/03/1990, *B. Wilson 174* (DNA).

Fig. 5.11. The holotype of *Polygala clavistyla*. Edith Falls, 13/4/1995, J.L. Egan 4733 (DNA, BRI, PERTH, CANB, K)

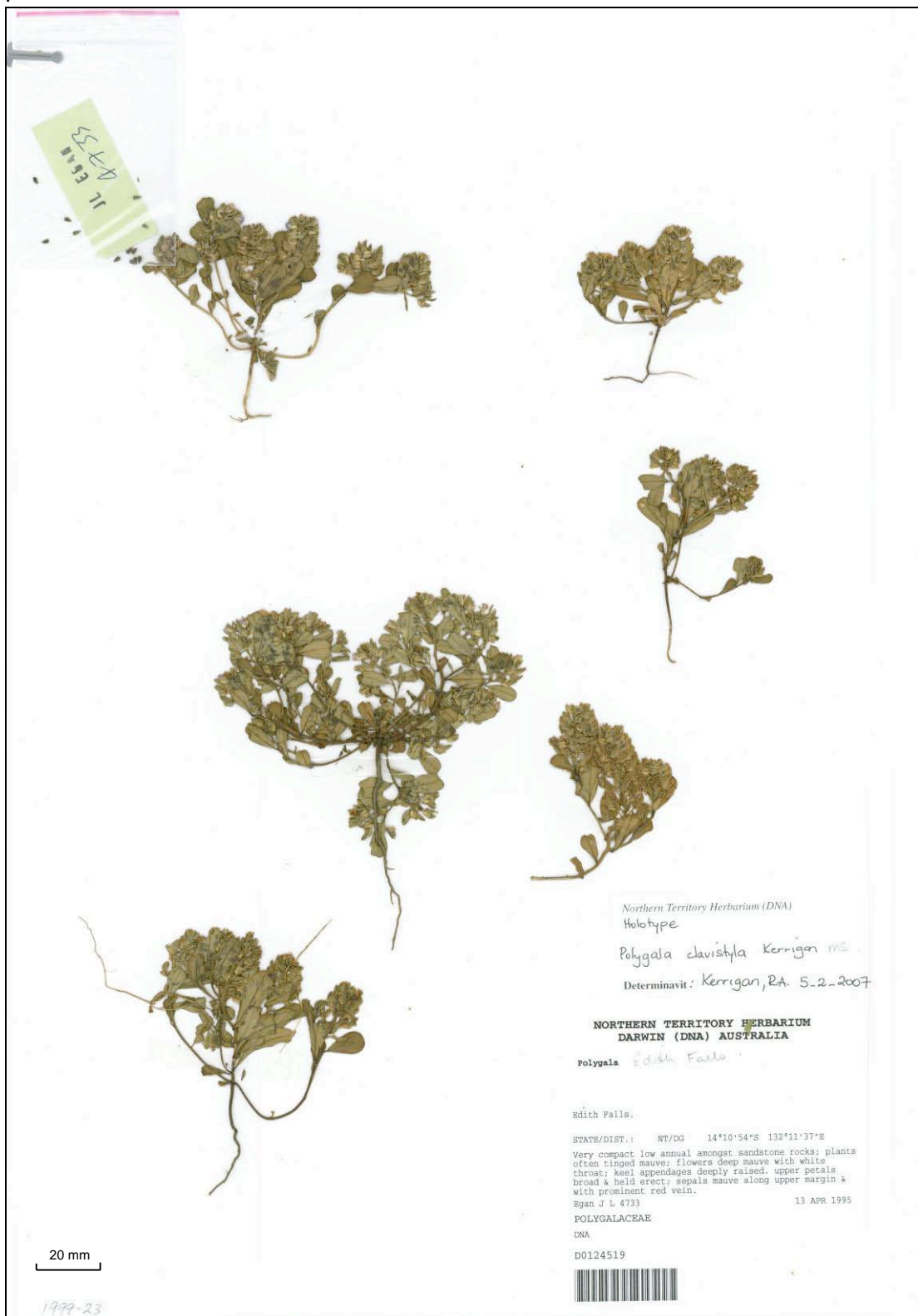
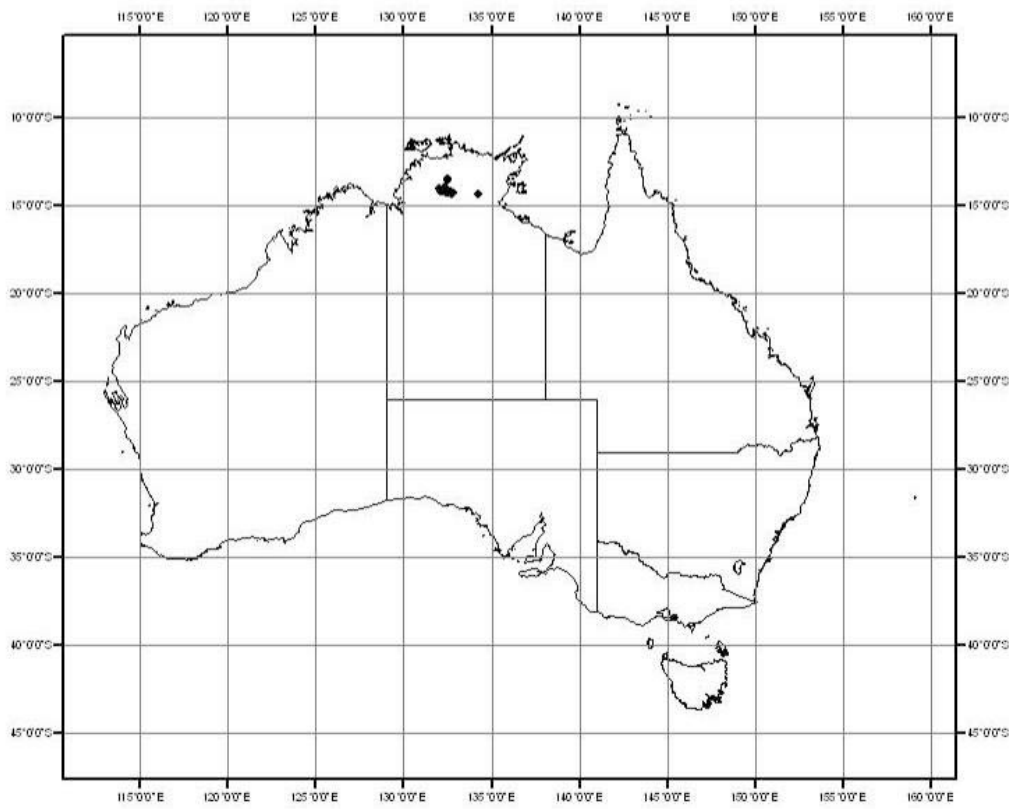


Fig. 5.12. The distribution of *Polygala clavistyla* based on available collection data.



Polygala coralliformis R.A.Kerrigan, *sp. nov.*

Polygala barbatae et *P. obversae* affinis, a quibus crista florali coralliformi differt.

Type: North of Wildman River Ranger Stn, 13.iii.2001, R.K. Harwood 1032; holo: DNA 145411!; iso: BRI, CANB, PERTH

Polygala sp. Kakadu (R.Collins 205) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Polygala sp. Top End (L.A.Craven 5464) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, decumbent or erect to 20 cm; indumentum of curved and straight hairs, leaves glabrescent. Occasionally leaf margins and alae red tinged. Leaves variable, usually elliptic or obovate to depressed obovate, rarely very widely ovate or circular, 5–29 mm long, (2-) 4–22 (-32) mm wide; petiole 0–2 mm. Inflorescence supra-axillary or axillary, solitary or sometimes 2-5 flowers arising separately along internode or very rarely on a short raceme. Pedicel to 2 mm. Alae herbaceous, variable, obovate, oblanceolate, or ovate, dimidiate, 5–11 mm long, 2–6 mm wide. Corolla dark purple, with white throat; floral appendages irregularly divided, coralline. Stamens terminate at stigma, monadelphous. Style hooked and stigma flat along inner bend of hook. Capsule lacking wing, more or less symmetrical, widely ovate to widely oblong, emarginate at apex, 4.5–7.5 mm long, 3.5–5.5 mm wide. Seed oblong-ovoid, 3.7–5.8 mm long, 1.4–4.5 mm wide; indumentum with fine white or ferruginous hairs extending beyond seed, rarely ending at seed base and becoming shorter towards aril and thick clear hollow hairs adjacent aril head. Aril distinctly helmet shaped, rarely with fine short hairs, white to pale brown, 0.6–1.0 mm long. Aril appendages 3, linear, 0.35–1.25 mm long. (Fig. 5.14)

Distribution

Australia (NT). This species is endemic to the NT and occurs east of Darwin across to Bickerton Is in NE Arnhem Land and south to Borroloola. (Fig. 5.15)

Habitat

Found in a variety of habitats including sandstone heath, along the margins of swamps, monsoon vine forest and *Allosyncarpia* forest but mostly in woodlands on sandy loam or sand.

Notes

The species is similar to *P. obversa* and *P. barbata* but is readily distinguished by the coral like floral appendages and the thick hollow hairs below the aril of the seed. Specimens found around the Mt Brockman outlier in Kakadu National Park tend to be generally smaller in habit and leaf size.

Etymology

Latin *coralli-* (coral) and *-formis* (form or shape) named after the irregularly lobed keel appendages, with some lobes broader than others, reminiscent of staghorn corals.

Specimens examined: (87)

Northern Territory

Arnhem Land, Spencer Range, 43 km E of Oenpelli Mission, 17/02/1973, *L.G. Adams 2999* (BRI, CANB); c. 33km E of Goodparla Stn, 26/02/1973, *L.G. Adams 3107 & M. Lazarides* (CANB); Coronation Hill, Kakadu National Park, 15/05/1986, *D. Backshall 63* (DNA); Mt Brockman, 23/02/1977, *L. Barnett 26 & C. Azzopardi* (DNA); Kakadu National Park, Arnhem Hwy, 1km west of Flying Fox Ck, 13/01/1991, *K.G. Brennan 842* (DNA); Kakadu National Park, Jabiru near Arnhem Hwy, Jabiru Drive turnoff, east side of Jabiru Drive, 02/04/1993, *K.G. Brennan 2135* (DNA); Kakadu National Park, East Alligator area, about 1km W Ngarridj Creek on Oenpelli Rd, 21/04/1993, *K.G. Brennan 2290* (DNA); Kakadu National Park, Baroalba Creek, Mt Brockman massif, 31/03/1995, *K.G. Brennan 3096* (DNA); Kakadu National Park, Baroalba Creek, Mt Brockman massif, 31/03/1995, *K.G. Brennan 3101* (DNA); Kakadu National Park, Koongarra Saddle, 04/04/1999, *K.G. Brennan 3929* (DNA); Kakadu National Park, 07/02/2000, *K.G. Brennan 4826* (DNA); Kakadu National Park, 10/03/2000, *K.G. Brennan 4852* (DNA); Kakadu National Park, fire plot 37, 29/02/2000, *K.G. Brennan 4863* (DNA); Kakadu National Park, fire plot 34, 08/03/2000, *K.G. Brennan 4867* (DNA); Nitmiluk National Park, Veg site 98, *K.G. Brennan 5200* (DNA); Nitmiluk National Park, veg site 134, 13/02/2001, *K.G. Brennan 5274* (DNA); Nitmiluk National Park, veg site 253, 06/03/2001, *K.G. Brennan 5493* (DNA); Nitmiluk National Park, veg site 568, on Marrawal Plateau, 20/04/2001, *K.G. Brennan 5634* (DNA); Glyde Rr, west branch, 22/02/2003, *K.G. Brennan 5821 & K. Metcalfe* (DNA); Deaf Adder Gorge, 27km NNE Jim Jim Falls, 16/02/2004, *K.G. Brennan 6037* (DNA); Round Jungle, 22km WSW Jim Jim Falls, 18/02/2004, *K.G. Brennan 6059* (DNA); Aruru Point Rd, 53km S of outStn, 02/05/1987, *M.J. Clark s.n.* (DNA); Kapalga, 09/02/1977, *R. Collins 205* (DNA, CANB); Kapalga, 10/3/1977, *R. Collins 322* (DNA, CANB); Cobourg Peninsula, track to Raffles Bay pearl farm, *I.D. Cowie 10424* (DNA, BRI); Western Arnhem Land, c.62km SE Oenpelli, 19/03/2000, *I.D. Cowie 8645* (DNA); McArthur Rr area., 03/02/1976, *L.A. Craven 3614* (CANB); 10 km WSW Jabiru East, 15/05/1980, *L.A. Craven 5464* (DNA, CANB); c. 50 km SSW of Jabiru, 24/03/1981, *L.A. Craven 7722 & G.H. Whitbread* (CANB); Kakadu National Park, Kapalga, 24/02/1988, *C.R. Dunlop 7643* (DNA); Arnhem Land, Mitchell Range, 07/04/1999, *C.R. Dunlop 10268 & N.G. White* (DNA); Katherine Gorge, 16/02/1993, *J.L. Egan 1509* (DNA); Kakadu National Park, Kapalga F plot, 15/03/1994, *J.L. Egan 3292* (DNA, BRI); Kakadu National Park, Kapalga C plot, 04/04/1994, *J.L. Egan 3616* (DNA); Mary Rr; near Shady Camp, 09/02/1995, *J.L. Egan 4381* (DNA); Kakadu National Park, Mt Brockman, 27/03/1995, *J.L. Egan 4519* (DNA); Kakadu National Park; Mt Brockman, 31/03/1995, *J.L. Egan 4599* (DNA, NSW); Kakadu National Park, Mt Brockman, 31/03/1995, *J.L. Egan 4613* (DNA, CANB); Kakadu National Park, Sleisbeck Track, 14/02/2005, *J.L. Egan 5559* (DNA); Nitmiluk National Park, Katherine Gorge, 24/02/1990, *M. Evans 2944* (DNA, K); South of Maningrida, Arnhem Land, 11/04/2000, *R.K. Harwood 803* (DNA, CANB); Road to Nourlangie Rock, 17/03/2001, *R.K. Harwood 1039* (DNA, CANB); Kakadu National Park, southern end of Jabiluka sandstone outcrop, 03/03/2004, *R.K. Harwood 1412* (DNA); Cox Rr Stn, 08/07/1977, *T.S. Henshall 1654* (DNA); Kakadu National Park, Mt Brockman outlier 15km SE of Jabiru, along Baroalba Ck, 21/04/1989, *R.W. Johnson 4818* (DNA, AD, BRI, MEL); 11.6 km from Central Arnhem Land turnoff, 12/02/2004, *R.A. Kerrigan 741 & P.S. Short* (DNA); Kakadu National Park, 900 m E of Flying Fox Creek crossing Arnhem Hwy, 20/03/2004, *R.A. Kerrigan 759* (DNA); Ferguson Rr crossing, off Old Stuart Hwy on cutting, 23/03/2005, *R.A. Kerrigan 906* (DNA); c. 29 mls NE of Maranboy Police Stn, 03/03/1965, *M. Lazarides 20 & L.G. Adams* (CANB); c. 17 mls N of Oenpelli Mission, 16/02/1973, *M. Lazarides 7716* (CANB); c. 24 mls NNE of Oenpelli Mission, 16/02/1973, *M. Lazarides 7731* (CANB); Blue Mud Bay; Morgan Is, 30/04/1993, *G.J. Leach 3528 & I.D. Cowie* (DNA); Mary Rr Stn. Cycad Site 24, 18/03/2001, *D.T. Liddle 2615* (DNA); 20 mls NE of Wilton Rr – Bulman Crossing, 15/06/1977, *J.R. Maconochie 1447* (DNA); Blain, 19 mls S of Katherine, 15/02/1961, *H.S. McKee 8435* (BRI, CANB, NSW); Wildman Rr, 28/01/1997, *C.R. Michell 339* (DNA); McArthur Rr Stn-Lamont Pass, 08/05/1997, *C.R. Michell 721 & D.S. Calliss* (DNA); Edith Rr area, 14/04/1999, *C.R. Michell 2463 & J.A. Risler* (DNA); Edith Rr Area, 22/03/1999, *C.R. Michell 2464 & J.A. Risler* (DNA); Nitmiluk National Park, 21/03/2001, *C.R. Michell 3141 & B. Deichmann* (DNA); Nitmiluk National Park, 17 Mile Valley, 07/03/2002, *C.R. Michell 3605* (DNA); 5km SSE of De Courcy Head, Arafura Sea, 31/05/1988, *A.A. Munir 6020* (DNA, AD, CANB); Mary Rr Rd Electricity Pole 328, 28/04/1971, *J. Must 687* (DNA); Kapalga, Gaden's Pt Rd, 29/04/1989, *L. Peel 10* (DNA); Road to Bulman Stn, N of the Mainoru Rr, 24/05/1974, *R. Pullen 9384* (CANB); Nitmiluk National Park, site 418, 02/04/2001, *J.A. Risler 677* (DNA); Mt McMinn Stn, N Homestead on track to Little Roper crossing, 28/04/2002, *J.A. Risler 1829 & A.J. Fisher* (DNA); Big Rr Stn, 18/03/2003, *J.A. Risler 2113* (DNA); Big Rr Stn, NE corner of property, 18/03/2003, *J.A. Risler 2114* (DNA); Kakadu National Park, behind Mardugal Campground, 29/03/2003, *J.A. Risler 2136 & R.S.C. Firth* (DNA); Kakadu National Park, Kakadu Hwy N of Mardugal Campground turnoff, 30/03/2003, *J.A. Risler 2140 & R.S.C. Firth* (DNA); 1 km NE Mudginberry Homestead, 31/01/1984, *J. Russell-Smith 987* (DNA); Kakadu National Park, 10km NW Sleisbeck, 04/01/1995, *J. Russell-Smith 9067* (DNA); Kakadu National Park, Pine Jungle, 18/03/1995, *J. Russell-Smith 9521 & D. Lucas* (DNA); Kakadu National Park, Banyan Tree Rd, 19/02/1995, *J. Russell-Smith 9561* (DNA); Kakadu National Park, 3km West Baroalba airstrip, 14/03/1995, *J. Russell-Smith 10032 & D. Lucas* (DNA); Kakadu National Park, 1km N of Baroalba Springs, 16/03/1995, *J. Russell-Smith*

10151 (DNA); Kakadu National Park, 8km NE of Namarrgon, 18/03/1995, *J. Russell-Smith 10304* (DNA); South Bay, Bickerton Is in the Gulf of Carpentaria, 18/06/1948, *R.L. Specht 601* (BRI; CANB, MEL, PERTH); 4 km from Flying Fox Creek crossing on Arnhem Hwy, towards Darwin, 17/04/1980, *I.R.H. Telford 7526 & J.W. Wrigley* (CANB); 4 km ESE of Jabiru, E of Ranger Plant, 18/04/1980, *I.R.H. Telford 7537 & J.W. Wrigley* (CANB); Kakadu National Park, 1 km E of East Alligator Rr crossing, Oenpelli Wood at Obiri rock turnoff, 18/04/1980, *I.R.H. Telford 7605 & J.W. Wrigley* (CANB); Near Angularli Creek crossing along the Oenpelli-Murgenella road, Arnhem Land, 28/05/1988, *J.Z. Weber 9944* (DNA, AD, BRI, CANB); East Coast Rd Murgenella, 08/02/1984, *G.M. Wightman 1082* (DNA); Murgenella, Waldunga Road, 10/07/1985, *G.M. Wightman 1982* (DNA); Arnhem Land, 18 km E of Goomadeer Crossing, 16/06/1987, *G.M. Wightman 3803 & N.M. Smith* (DNA).

Fig. 5.13. The holotype of *Polygala coralliformis*. North of Wildman Rr Ranger Stn, 13/03/2001, R.K. Harwood 1032 (DNA, BRI, PERTH, CANB)

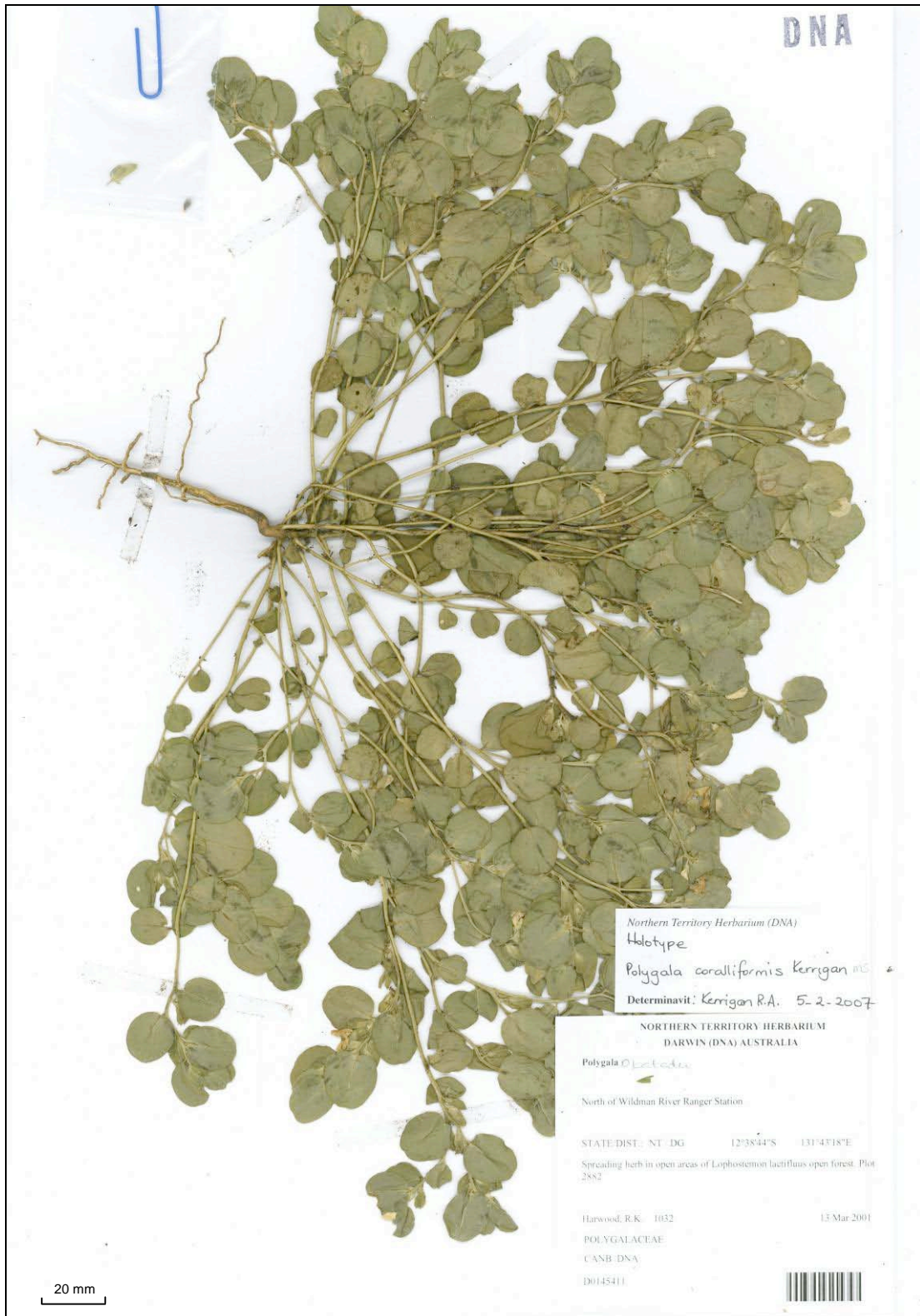


Fig. 5.14. Fresh flower, floral appendage and seed of *Polygala coralliformis*. a) flower showing white throat (R.A.Kerrigan 759); b) coral floral appendage from spirit (R.A. Kerrigan 741); and c) seed with thick hollow hairs on and below aril head (K.G. Brennan 4867).

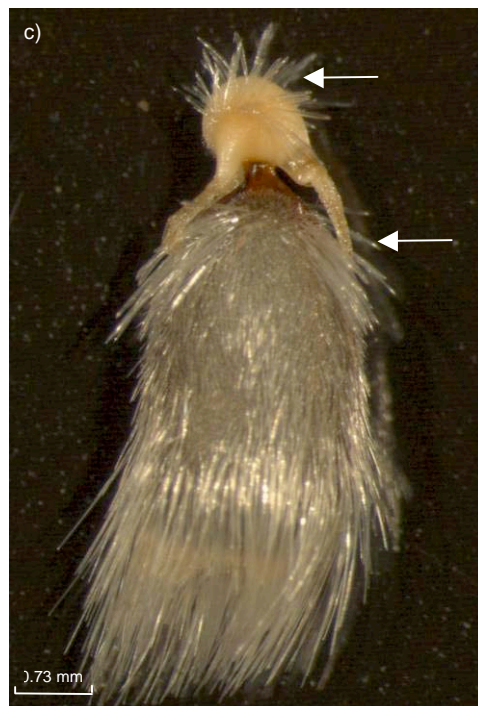
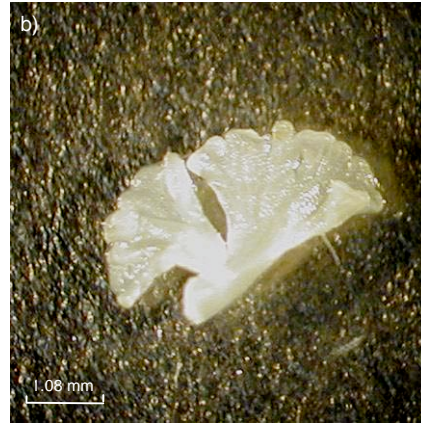
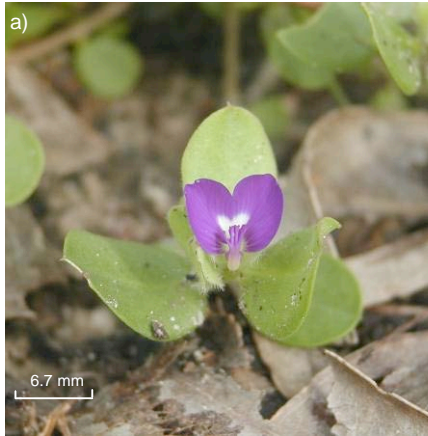
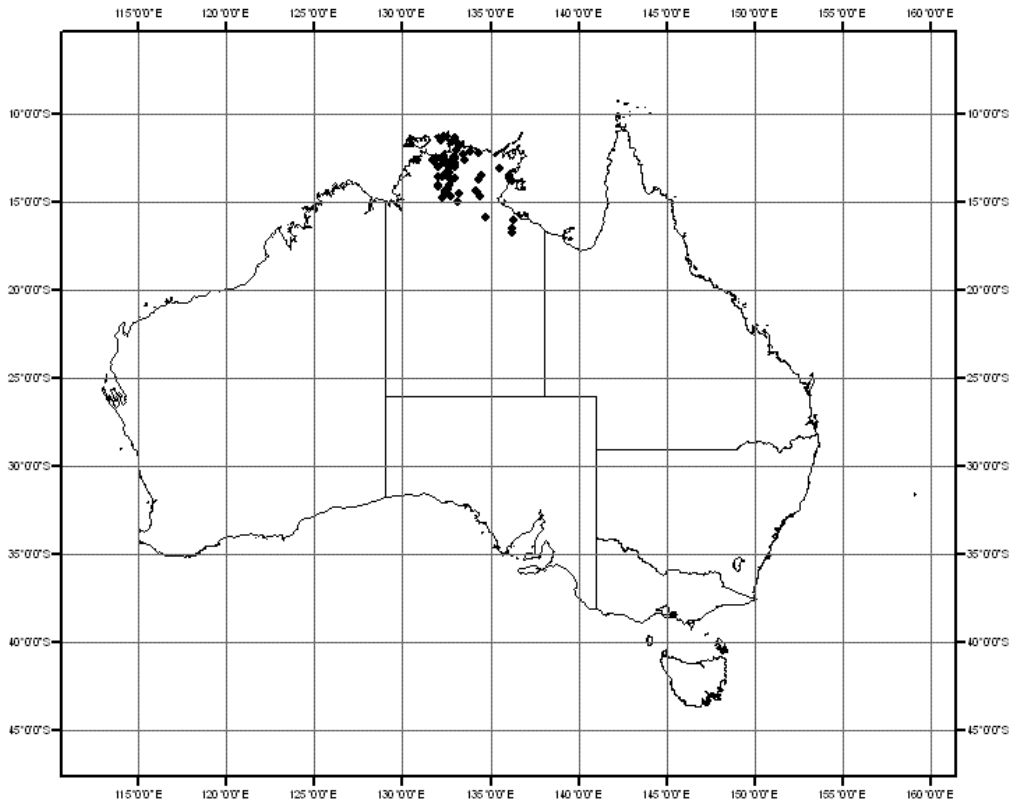


Fig. 5.15. The distribution of *Polygala coralliformis* based on available collection data.



***Polygala crassitesta* R.A.Kerrigan, sp. nov.**

Polygala pterocarpae affinis, a qua testa incrassate ad apicem seminis differt.

Type: Victoria Hwy, Bullo River Stn turnoff, 09.iii.2006, R.A. Kerrigan 1032; holo: DNA 176646!; iso: BRI, CANB, K, NSW, PERTH

Polygala sp. Rhinanthoides shoulders (M.H.Andrews 398) R.A.Kerrigan & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2007) non Sol. ex. Benth. (1863)

Polygala sp. Emerald (R.W.Johnson 1322) R.J.F.Henderson (ed.), *Names Distr. Queensland Pl., Algae Lichens* 16(2002)

[*Polygala gabrielae* [NT material] auct. non Domin: I.D. Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)]

Annual herb, spreading to erect to 56 cm; indumentum of curved and straight hairs, occasionally with only curved hairs on stems. Leaves variable, linear, narrowly elliptic to elliptic, oblanceolate to obovate, 3–85 mm long, 1–16 mm wide; petiole 0–2.5 mm. Inflorescence axillary or supra-axillary; usually a raceme to 80 mm long, rarely solitary. Pedicel to 2.5 mm. Alae herbaceous, ovate and elliptic to very widely so; 3.9–7.0 mm long, 2.9–5.7 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, often with beak on outer edge of bend visible in dried material, stigma flat along inner surface of bend. Capsule with wing, 0.55–2.0 mm; symmetrical, widely elliptic, ovate, oblong or occasionally orbicular, 5.3–6.5 mm long, 3.7–5.7 mm wide. Seed shape irregularly oblong (hour-glass shape), 4.2–5.7 mm long, 1.7–2.4 mm wide; testa thickened adjacent aril; indumentum of fine white hairs, hairs extending past seed base, becoming shorter towards apex. Aril head round, 0.4–0.8 mm long, white and brown or black, short hairs present. Aril appendages 3, linear, 2.4–4.6 mm long. (Fig. 5.17)

Distribution

Australia (QLD, NT, WA). The main distribution of this species lies within NT and QLD and just extends into WA east of Kununurra. In the NT it occurs in latitudes south of Katherine from the Victoria River District (VRD) to the Gulf region and south to the Barkly Tableland, in QLD it occurs as far east as Mt Coolon SW of Mackay and S to Blackall. (Fig. 5.18)

Habitat

Almost always found on clay or cracking clay soils in grasslands with *Dicanthium*, *Astrebla* and *Iseilema* spp. often with *Eucalyptus microtheca*, *E. pruinosa*, *Corymbia terminalis* or *Bauhinia cunninghamiana*.

Notes

Specimens from QLD tend to be shorter and have smaller alaes than other districts and specimens from the Gulf and Barkly Tablelands tend to be taller with more linear leaves.

Etymology

Latin *crassi-* (thick) and *testa* (outer coat of seed) because of the thickened seed coat forming a collar at the base of the aril.

Specimens examined: (50)

Western Australia

40 km E Kununurra, 02/03/1979, *M.H. Andrew 398* (DNA).

Northern Territory

c. 11 km SW junction Wickham Rr & Broadarrow Ck, 14/04/1996, *D.E. Albrecht 7362* (NT); E of Mataranka, on Eley Stn, 29/04/1947, *S.T. Blake 17550* (BRI); Jasper Gorge Rd, S of gorge, 01/04/2000, *K.G. Brennan 4359* (DNA); MacArthur Rr Mine lease, 08/04/2003, *K.G. Brennan 5879 & K. Metcalfe* (DNA); 12 mls N Creswell Downs Homestead, 13/03/1959, *G.M. Chippendale 5573* (BRI, NSW, CANB, AD, MEL, L); Gregory National Park; Victoria Hwy, 15/02/1992, *I.D. Cowie 2472 & P.S. Brocklehurst* (DNA, CANB, BRI, MEL); Jalboi Rr catchment; 14.8 km NE by N of Mt Chapman, 19/03/2003, *I.D. Cowie 9865* (DNA, CANB, BRI, MEL, MO); VRD Stn, 05/05/1995, *J.L. Egan 4865* (DNA); SE corner outside Connells Lagoon, Mittiebah Stn, 21/04/1996, *V.T. Garbin 1* (NT); Newry Stn, along Victoria Hwy, 37 km E of Western Australia - Northern Territory border, 22/04/1989, *D.A. Halford H60* (BRI); NE of Mt McMinn Homestead, 12/03/2002, *R.K. Harwood 1210* (DNA); Big River Stn, 19/03/2003, *R.K. Harwood 1244* (DNA); Big River Stn, 19/03/2003, *R.K. Harwood 1252* (DNA); Victoria Hwy, E of Desmond's Passage 16 km E of Saddle Creek, 07/04/2003, *R.A. Kerrigan 616* (DNA); 21 km N of Connell's Bore, 31/05/1982, *P.K. Latz 9159* (NT); Junction Reserve, 15/07/1982, *P.K. Latz 9282* (DNA); Connells Lagoon Conservation Reserve, 23/05/1993, *D.T. Liddle 755* (DNA); c. 15 km W of Borrooloola, 25/04/1998, *C.P. Mangion 876* (DNA); Balbarini Stn, 27/02/1998, *C.R. Michell 1387 & R.B. Carrow* (DNA); Victoria Hwy, 17 km W of Victoria Rr crossing, 03/02/1988, *T.M. Orr s.n.* (DNA); Big River Stn, 200m N of Herb Plot 3467, 19/03/2003, *J.A. Risler 2104* (DNA); Gregory National Park, SE corner, 08/05/2003, *J.A. Risler 2119* (DNA); Victoria River District, Pigeon Hole, 04/05/2003, *J.A. Risler 2120* (DNA); Victoria River District, Pigeon Hole, 03/05/2003, *J.A. Risler 2122* (DNA); Victoria River District, Pigeon Hole, 03/05/2003, *J.A. Risler 2124 & A.J. Fisher* (DNA); Victoria River District, Pigeon Hole, 04/05/2003, *J.A. Risler 2125 & A.J. Fisher* (DNA); Victoria River District, Pigeon Hole, 08/05/2003, *J.A. Risler 2129* (DNA); Victoria River District, Pigeon Hole, 05/05/2003, *J.A. Risler 2132* (DNA); Victoria River District, Pigeon Hole, 05/05/2003, *J.A. Risler 2133* (DNA); Victoria River District, Pigeon Hole, 10/05/2003, *J.A. Risler 2134* (DNA) Pigeon Hole Stn, Villiers Pdk, 04/05/2003, *J.A. Risler 2640* (DNA); Gorrie Stn, 15/05/2001, *P.S. Short 5102* (DNA); Roper Rr, *R. Stott s.n.* (MEL); c. 3 km SW Borrooloola, Cape Crawford Rd, 13/05/1983, *K.L. Wilson 5347* (DNA, NSW, BRI).

Queensland

Windeyers Hill (Rolfe Creek Rd), 40-60 km NE/N of Middlemount, 15/04/1997, *G. Bahnisch 19* (BRI); Hughenden, 19/05/1936, *S.T. Blake 1155* (BRI); Mt Coolon Rd, 1.3 km E of power line, 11/03/1995, *I.G. Champion 1185 & A.B. Pollock* (BRI); Within 10 km N of Clermont, within 2-3 km of the Charters Towers turnoff from the Peak Downs Hwy, 01/03/1997, *J.A. Elsol 9* (BRI); Mitchell District, Terrick Terrick Stud, about 40 mls SW of Blackall, 04/04/1990, *S.L. Everist 2097* (BRI); 125km WNW of Mt Coolon, 19/02/1996, *R.J. Fensham 2262* (BRI); 19 km NNW of Clermont, 09/03/1995, *R.J. Fensham 2568* (DNA); 23 km N of Clermont, 12/03/1995, *R.J. Fensham 2675* (BRI); Longreach district, 01/03/1997, *R.J. Fensham 3072* (BRI); c. 1 ml W of Emerald, 17/02/1960, *R.W. Johnson 1322* (BRI); 4 km NE of Felspar Homestead, Felspar Cattle Stn, 03/05/2002, *C. Kahler TH6698 & R. Allison* (BRI, NSW); About 40 km NW of Burke and Wills roadhouse along Wills Development Rd, 01/05/1995, *J. Kemp 874 & R. Fairfax* (BRI); 4 km W of Carandotta Homestead, 01/11/1986, *V.J. Neldner 5678 & K.P. Nicolson* (DNA); Lydia Downs c. 45 mls NW of Maxwelton, 28/01/1966, *L. Pedley 1961* (BRI); 22 km by road E of Musselbrook Mining Camp on road to Ridgepole Waterhole, 175 km N of Camooweal., 27/04/1995, *M.B. Thomas 354B & R.W. Johnson* (BRI).

Fig. 5.16. The holotype of *Polygala crassitesta*. Victoria Hwy, Bullo River Stn turnoff, 09/03/2006, R.A. Kerrigan 103 (DNA, BRI, PERTH, CANB, K, NSW)



Fig. 5.17. Flower, seed, alae and capsule of *Polygala crassitesta* (R.A. Kerrigan 1032). a) flower with fimbriate floral appendages; b) seed with thickened testa; and c) alae and winged capsule

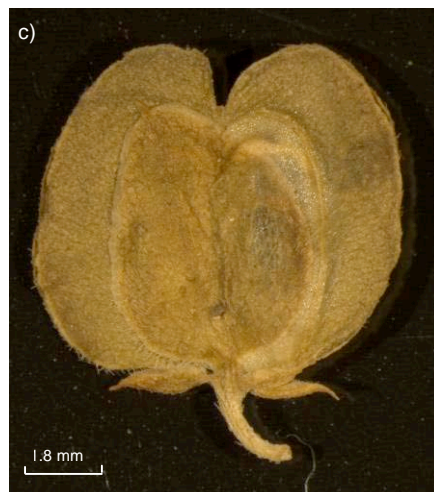
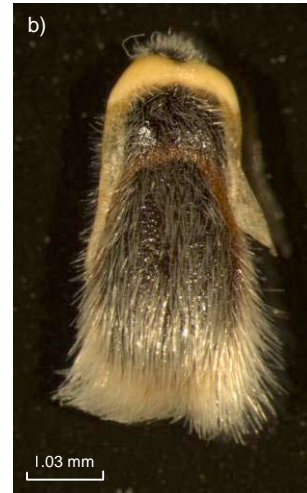
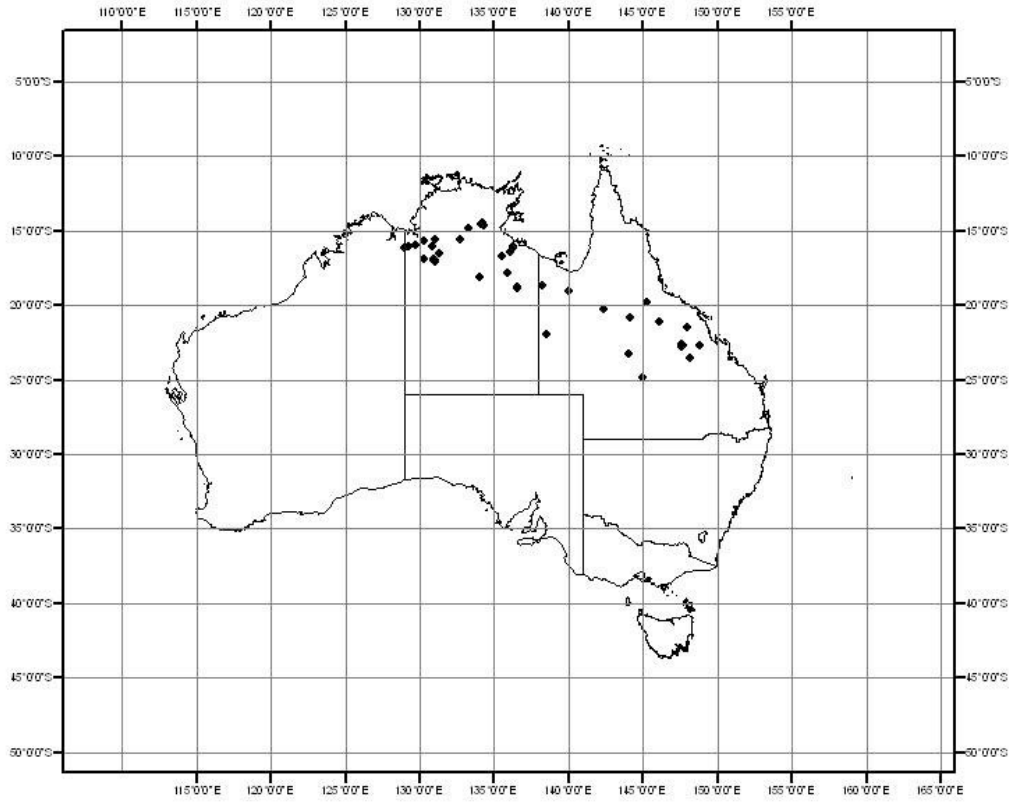


Fig. 5.18. The distribution of *Polygala crassitesta* based on available collection data.



Polygala dependens R.A.Kerrigan, *sp. nov.*

Polygala exsuarrosae similis, sed ab ea aliis parvioribus, stylo uncatō et inflorescentiis brevioribus distinguitur.

Type: Buchanan Hwy, 2 km from Stuart Hwy turnoff, S side of road, 12.ii.2004, R.A.Kerrigan 738 & P.S. Short; holo: DNA 161700!; iso: BRI, PERTH

Polygala sp. Davenport Ranges (C.R.Dunlop 6042) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, rounded to compact, erect to 12 cm; indumentum of curved hairs; whole plant often maroon tinged. Leaves narrowly oblong to oblanceolate, obovate, 6–30 mm long, 2–10 mm wide; petiole 0–2 mm. Inflorescence an axillary or supra-axillary raceme to 5 (-20) mm long, rarely with a solitary flower on internode proceeding raceme. Pedicel to 0.5 (-1) mm. Alae herbaceous, lanceolate, oblanceolate; falcate to narrowly dimidiate, 2.0–3.9 mm long, 0.8–1.8 mm wide. Corolla recorded as purple (fresh material not seen); floral appendages unknown. Stamens terminate at stigma, stamen arrangement unknown. Style hooked, stigma flat on inner surface of style. Capsule lacking wing, symmetrical, oblong, 2.5–4.0 mm long, 2.6–3.7 mm wide. Seed ovoid, 2.5–3.3 mm long, 1.2–1.8 mm wide; indumentum with fine white or ferruginous hairs, often extending beyond seed and becoming shorter towards aril. Aril head reduced to an acute point with short hairs, brown where reduced to seed testa, and white where appendages originating, 0.4–0.6 mm long. Aril appendages 3, linear rarely spatulate or cuneate, 1–2.3 mm long. (Fig. 5.20)

Distribution

Australia (NT, QLD). In the NT occurs south of Katherine to the Dulcie Ranges, west to Wave Hill in the Victoria River District (VRD) and east to Lake Nash on the Barkly Tablelands. In QLD extends across the border into Lawn Hill, N of Mount Isa. (Fig. 5.21)

Habitat

Found in a variety of habitats including open woodlands and *Acacia* shrublands, often with *Triodia* spp., on sand, clay loam, laterite silt or in skeletal soils on stony hill slopes.

Notes

Fresh flowers of this specimen have not been observed and floral appendage type, corolla colour and the arrangement of the staminal column is too difficult to observe from dried material.

Etymology

Latin *dependens* (hanging down) because of the way the capsules are suspended in this species.

Specimens examined: (25)

Northern Territory

c. 144 km due E of Lajamanu, 05/05/2004, *D.E. Albrecht 10892 & K.G. Brennan* (NT); c.1.5 km upstream Gibson Ck crossing on Stuart Hwy, c. 50 km N Tennant Creek, 16/05/1996, *D.E. Albrecht 7593 & P.K. Latz* (NT); 26km ESE Mt Ultim, Dulcie Ranges, 10/04/2001, *D.E. Albrecht 9790* (NT); 51 M S Hooker Creek Settlement, 14/07/1956, *G.M. Chippendale 2323* (DNA); Sturt Plateau, Buchanan Hwy; c. 1 km W of Stuart Hwy, 24/02/1999, *I.D. Cowie 8187* (DNA); Sturt Plateau, Stuart Hwy, c. 51 km N of Daly Waters turnoff, 25/02/1999, *I.D. Cowie 8215 & C.P. Mangion* (DNA); Supplejack Stn, 30/04/2004, *D.J. Dixon 1127 & D.L. Lewis* (DNA); Tennant Ck; Warrego, 31/03/1993, *J.L. Egan 1877* (DNA); Barkly Hwy, 02/05/1993, *J.L. Egan 2238* (DNA); Mary Ann Dam, 03/05/1993, *J.L. Egan 2278* (DNA); 24 km S of Soudan, 12/05/1977, *T.S. Henshall 1789* (DNA); Powell's Creek, Central Australia, *M. Holtze 120* (MEL); 95 km S of Larrimah along Stuart Hwy, 12/02/2004, *R.A. Kerrigan 740 & P.S. Short* (DNA); 45km ENE Murray Downs, Davenport Ranges, 07/05/1995, *P.K. Latz 14429* (DNA); McLaren Ck, Davenport Ranges, 02/06/1975, *P.K. Latz 6042* (BRI, NT, DNA); West of Nicholson Bore c. 25 km, Cattle Creek Stn, 04/05/2004, *D.L. Lewis 161 & C.P. Mangion* (DNA); Cattle Creek Stn, c. 70 km W of Nicholson Bore, Tanami Desert, 05/05/2004, *C.P. Mangion 1680 & D.L. Lewis* (DNA); Walhallow Stn, 22/02/1998, *C.R. Mitchell 1163 & R.B. Carrow* (DNA); Wave Hill Stn, 17/03/1997, *C.R. Mitchell 628 & C.P. Mangion* (DNA); Wave Hill Stn, near Hooker creek, 19/03/1997, *C.R. Mitchell 647 & C.P. Mangion* (DNA); Neutral Junction Stn, 04/07/1974, *A.S. Mitchell 56* (CANB); 14 km S Barkly Homestead, Alyawarr Desert Survey, Site 19, 08/04/1993, *D.J. Parsons 458* (NT, DNA); Wakaya Desert, c.100km E Epenara, 13/05/1993, *D.J. Parsons 574* (NT,DNA); Lake Nash Stn, 28km W of Homestead along the Sandover Hwy, 21/07/2000, *J.A. Risler 462 & R.A. Kerrigan* (DNA, NT).

Queensland

98 km NNW of Mt Isa, 16/03/1991, *P. Harris 665* (BRI).

Fig.5.19. The holotype of *Polygala dependens*. Buchanan Hwy, 2 km from Stuart Hwy turnoff, S side of road, 12/02/2004, R.A. Kerrigan 738 & P.S. Short (DNA, BRI, PERTH)

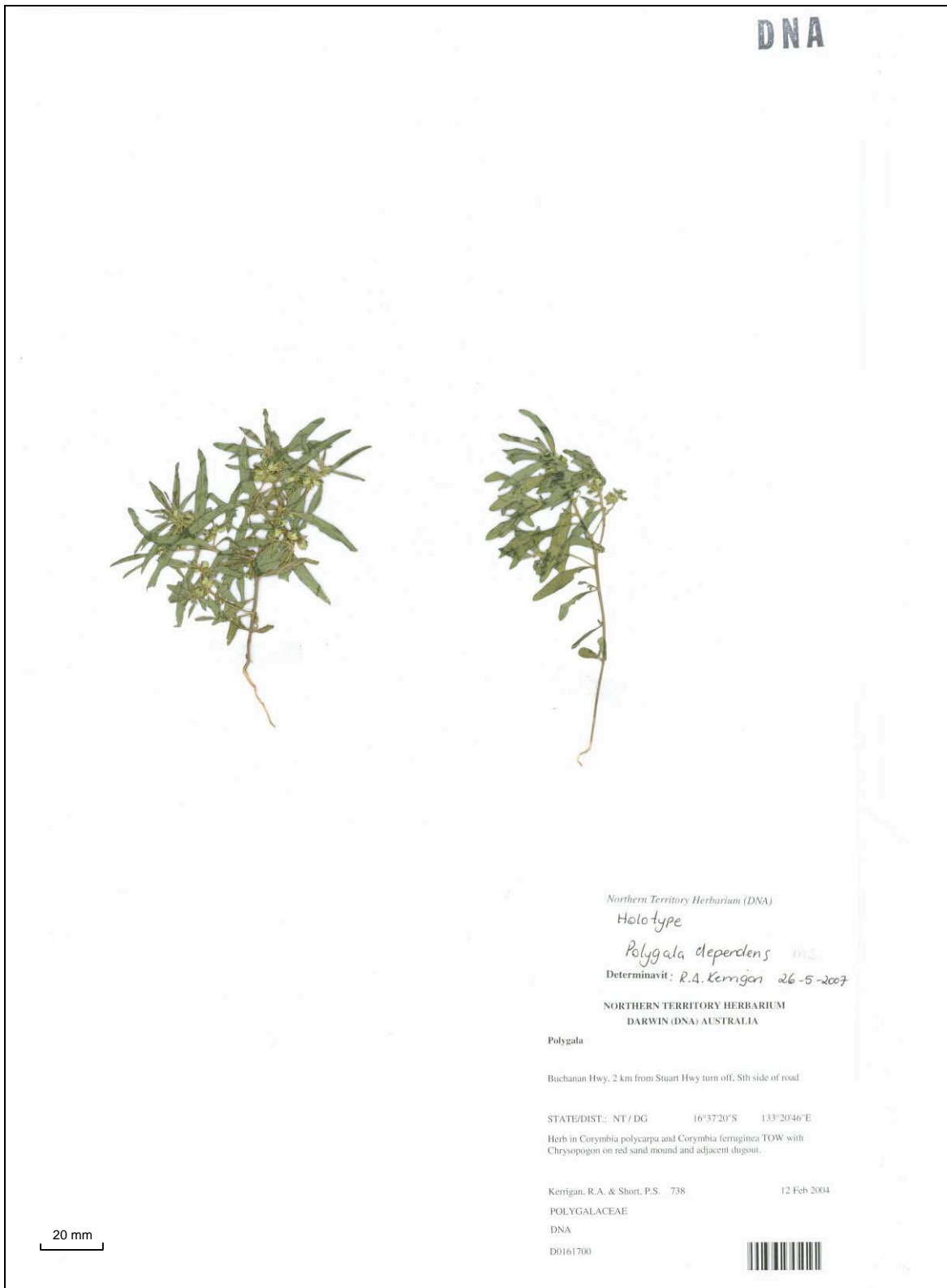


Fig. 5.20. Habit and seed of *Polygala dependens* (R.A. Kerrigan 738). a) habit with pendulous capsules; and b) seed with reduced aril head.

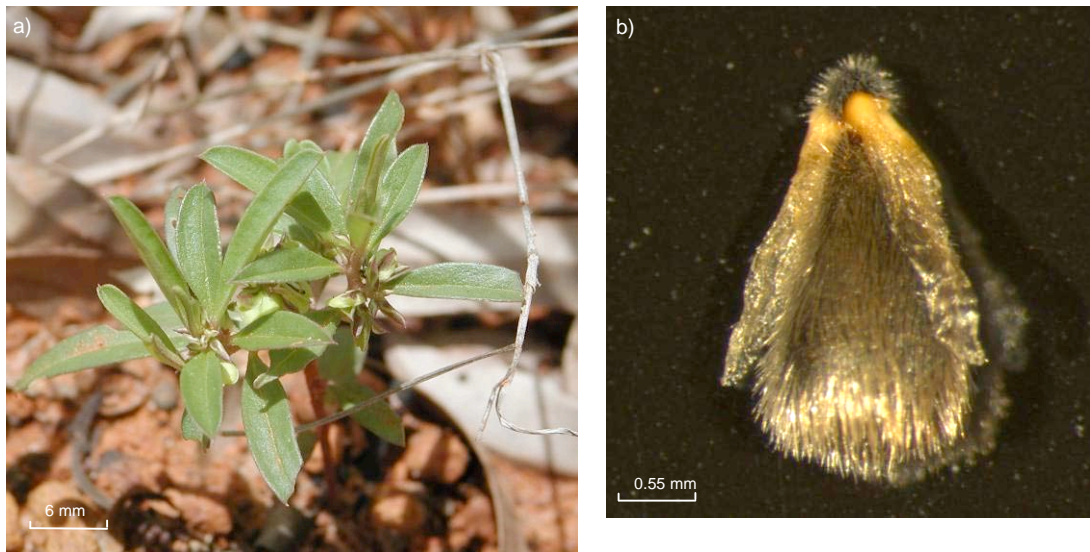
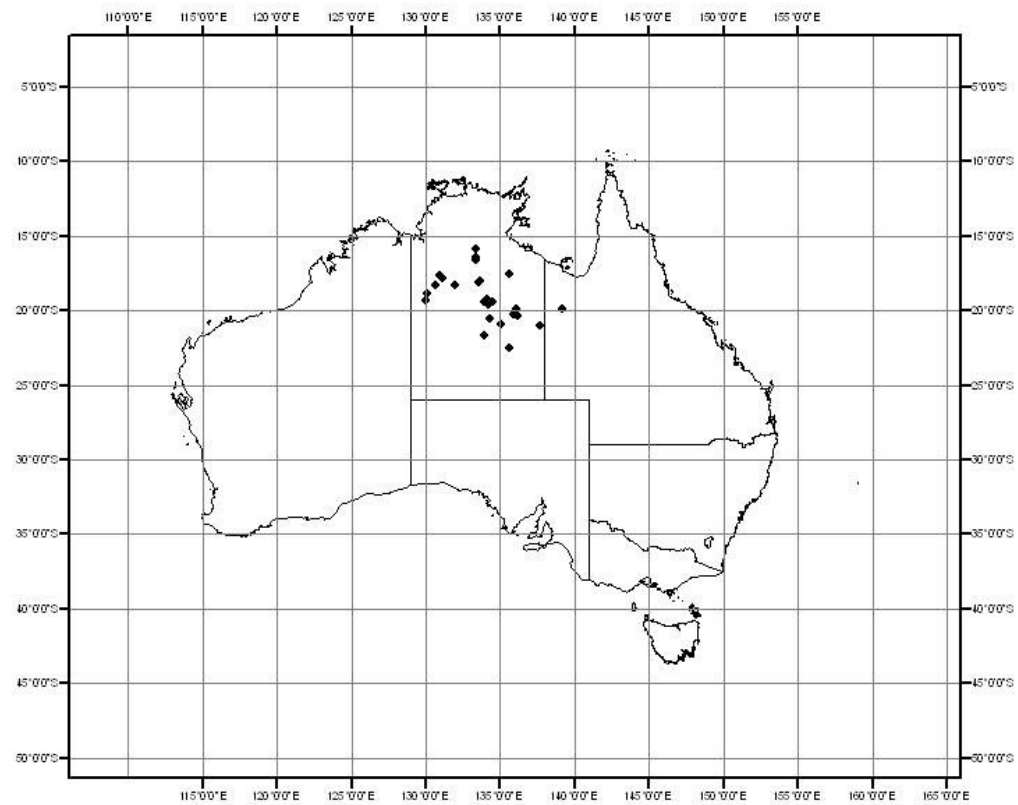


Fig. 5.21. The distribution of *Polygala dependens* based on available collection data.



Polygala difficilis R.A.Kerrigan, *sp. nov.*

Polygala pycnophyllae affinis, a qua pilis carinae differt.

Type: 33.6 km S of Tennant Creek, 01.v.2007, R.A. Kerrigan 1253 & D.J. Dixon; holo: DNA180895! iso: AD, BRI, CANB, K, NSW, NT, PERTH

Polygala sp. Tennant Creek (J.L. Egan 2299) R.A.Kerrigan & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2007)

Annual herb, erect with ascending lateral branches to 30 cm; indumentum of short curved and long straight or bent hairs. Leaves linear to narrowly oblong, rarely oblanceolate or obovate, occasionally conduplicate, 3.5–29 mm long, 1–6 mm wide; petiole 0–2 mm. Inflorescence a supra-axillary or axillary raceme to 17 mm long. Pedicel to 2 mm. Alae herbaceous, narrowly ovate, usually falcate to dimidiate, asymmetrical; 4.6–7.0 mm long, 1.4–2.4 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous, keel petal with few strigose hairs along keel. Style hooked; stigma flat against inner bend of hook. Capsule lacking wing, oblong to ovate, 3.5–4.5 mm long, 2.25–3.15 mm wide. Seed ovoid-oblong, 3–3.9 mm long, 1.25–1.5 mm wide; indumentum with fine hairs over whole seed becoming shorter towards seed apex. Aril head narrowly helmet shaped, 0.75–1.0 mm long, white or white and brown, with fine short hairs over whole of aril head. Aril appendages 3, oblong and short, 0.5–0.75 mm long. (Fig. 5.23)

Distribution

Australia (QLD, NT). In the NT this species is known from latitudes between Renner Springs and Ti-Tree and extends east along the Barkly Hwy to Camooweal in Queensland. In Queensland it is recorded from Lawn Hill National Park in the N and is mostly collected along the Kennedy Hwy from Camooweal to White Mountains National Park, excluding the Mitchell Grass Plains. (Fig. 5.24)

Habitat

Usually found in a variety of Eucalypt woodlands including *Eucalyptus crebra*, *E. pruinosa*, *Eucalyptus leichhardtii* and *Acacia* shrublands on sand and sandy loam.

Notes

This species is very similar to *P. pycnophylla* and *P. isingii*, but differs to the former by the hairs on the keel and to the latter by the clustered inflorescence. Specimens of this species from Queensland tend to have longer conduplicate leaves with a more acute apex.

Etymology

Latin *difficilis* (difficult) referring to the difficulty in penning an available and suitable latin name for this taxon.

Specimens examined: (16)

Northern Territory

Vacant land on E-side of Tennant Creek Outback Camping Ground, Peko Rd, 10/07/2003, D.E. Albrecht 10355 (NT); Stuart Hwy 14.5 km W of Renner Springs, 01/07/1947, G.W. Carr 2593 & A.C. Beauglehole (MEL); Phillip Creek Stn, 03/05/1993, J.L. Egan 2299 (DNA); Phillip Creek Stn, Tennant Creek, 19/08/1993, J.L. Egan 2585 (DNA); 100 km NW of Mount Isa, 1.5 km E of Inca Creek, 09/04/1992, P.

Harris 680 (BRI); N of Threeways E side of road, 01/05/2007, *R.A. Kerrigan 1252 & D.J. Dixon* (DNA); 29.6 km E of Threeways on Barkly Hwy, 01/05/2007, *R.A. Kerrigan 1254 & D.J. Dixon* (DNA); 103.2 km E of Barkly Homestead on Barkly Highway, 02/05/2007, *R.A. Kerrigan 1257 & D.J. Dixon* (DNA); 120 km E of Barkly Homestead on Barkly Highway, 02/05/2007, *R.A. Kerrigan 1260 & D.J. Dixon* (DNA).

Queensland

Richmond-Croydon Road, 123.2 km from Richmond, 01/07/1998, *A.R. Bean 13412* (BRI); 106.8 km E of Camooweal on Barkly Highway, 02/05/2007, *R.A. Kerrigan 1261 & D.J. Dixon* (DNA, BRI); 39.1 km E of Hughenden on Flinders Hwy, 03/05/2007, *R.A. Kerrigan 1262 & D.J. Dixon* (DNA, BRI); 23.4 km E of Hughenden on Flinders Hwy, 03/05/2007, *R.A. Kerrigan 1263 & D.J. Dixon* (DNA, BRI); 31.6 km E of Hughenden on Flinders Hwy, 03/05/2007, *R.A. Kerrigan 1264 & D.J. Dixon* (DNA, BRI); 9.4 km E of Torrens Ck, Flinders Hwy, 04/05/2007, *R.A. Kerrigan 1266 & D.J. Dixon* (DNA, BRI); Gibson Ck, 50 km N Tennant Creek, 16/05/1996, *P.K. Latz 14861* (NT); 13.5 km by road S of Warang Homestead site, White Mountains towards Torrens Creek, Wishaw holding, 15/04/2000, *M.B. Thomas 1738 & R.J. Cumming* (BRI, NSW).

Fig. 5.22. The holotype of *Polygala difficilis*. 33.6 km S of Tennant Creek, 01/05/2007, R.A. Kerrigan 1253 & D.J. Dixon (DNA)

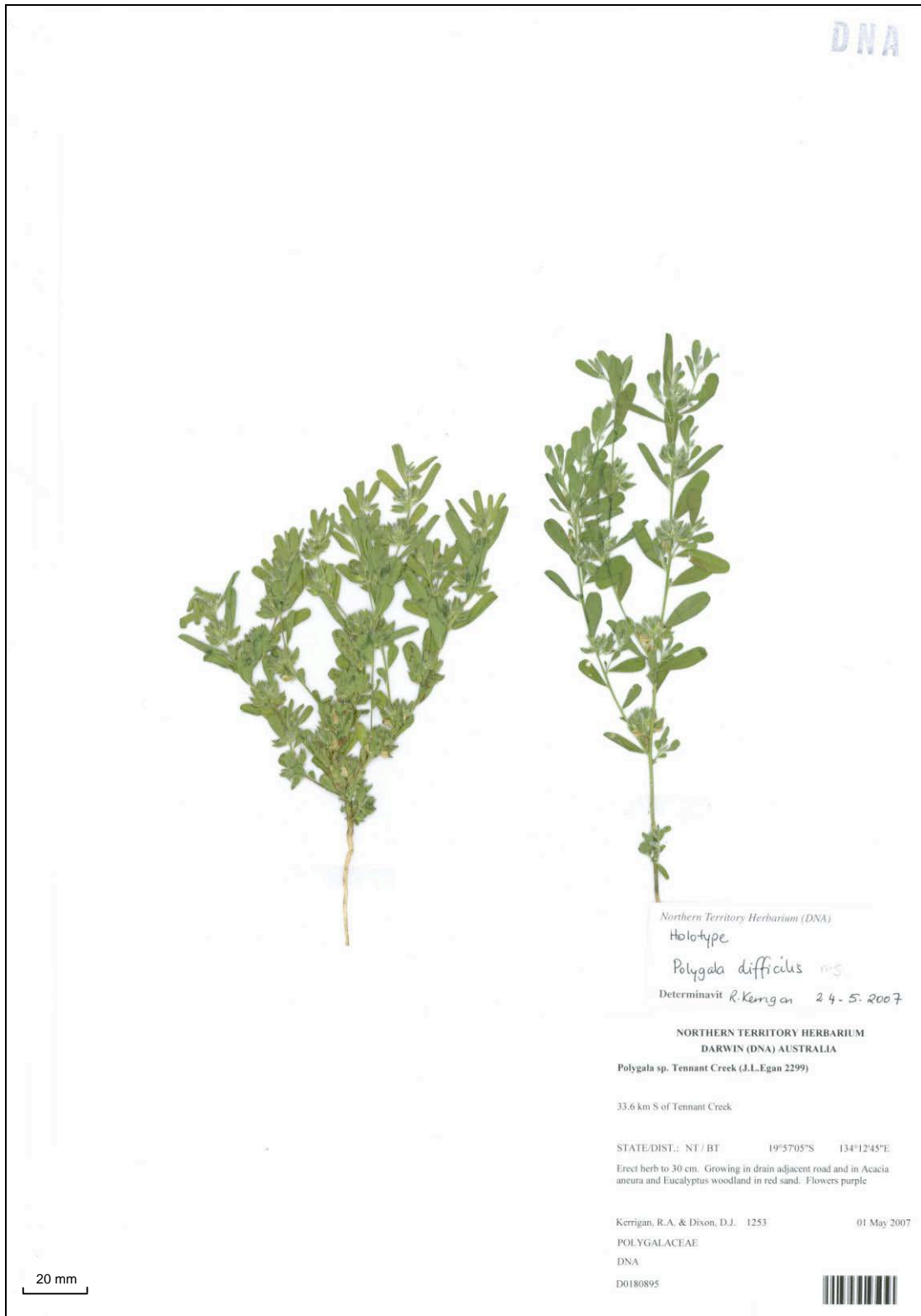
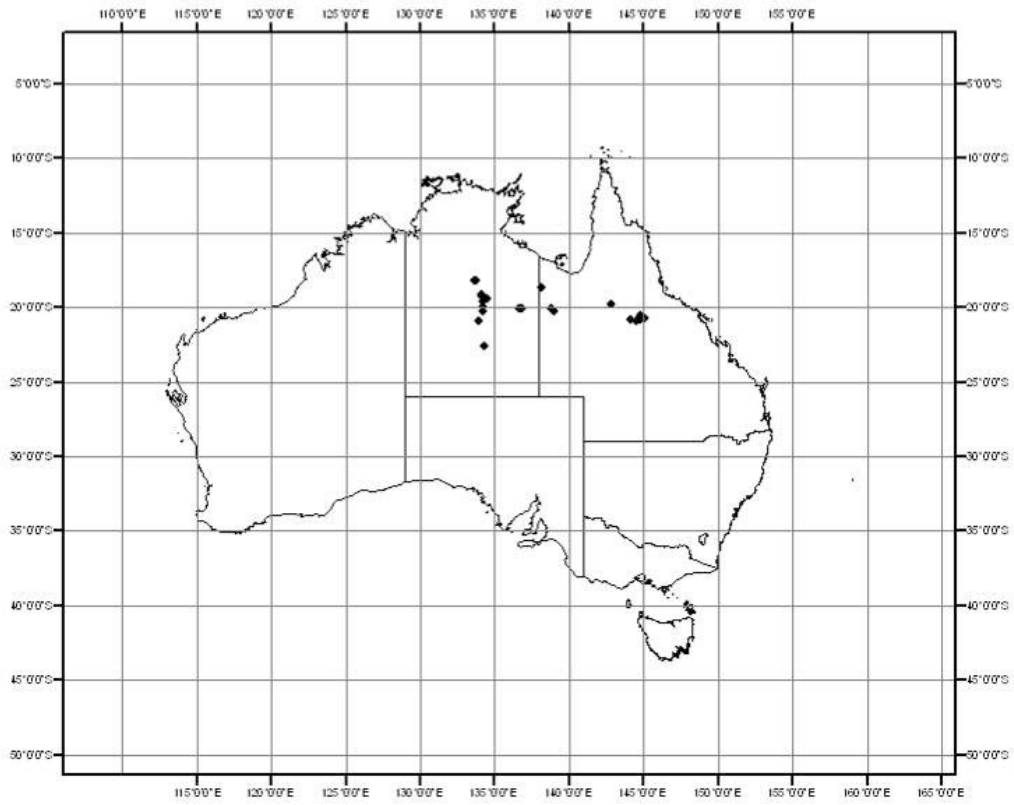


Fig.5.23. Flower, seed, and keel petal of *Polygala difficilis* (R.A. Kerrigan 1253). a) flower with fimbriate floral appendages ; b) seed with narrowly helmet shaped aril head; and c) keel petal from spirit with hairs.



Fig. 5.24. The distribution of *Polygala difficilis* based on available collection data.



Polygala dimorphotricha R.A.Kerrigan, *sp. nov.*

Polygala barbatae similis, a qua tubo stamineo margines extimos petalorum lateralium conjugenti et foliis magis obverse-ovatis differt.

Type: Bullo River Stn, 09.iii.2006, *R.A. Kerrigan 1028*; holo: DNA 176650!; iso: BRI, CANB, K, MEL, NSW, NT, PERTH

Annual herb, erect to 50 cm, single stemmed or with erect and spreading branches; indumentum of curved and straight hairs, sometimes only sparsely present. Leaves usually obovate or oblanceolate, 5–46 mm long, 5–18 mm wide; petiole 0–2 mm. Inflorescence an axillary or supra-axillary raceme to 20 mm long. Pedicel to c. 3 mm. Alae herbaceous, ovate to lanceolate, usually somewhat dimidiate, 5–9 mm long, 2.0–3.5 mm wide. Corolla purple, floral appendages spatulate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat along inner bend of hook. Capsule lacking wing, more or less symmetrical, very widely ovate to widely elliptic, 4.7–5.8 mm long, 3.7–4.6 mm wide. Seed ovoid-oblong 3–4.5 mm long, 1.3–2 mm wide; indumentum with fine white or ferruginous hairs present, becoming shorter towards seed apex. Aril head rounded-hooked, 0.5–0.8 mm long, white or white and brown, indumentum of fine short hairs. Aril appendages 3, linear to triangular 0.45–1.8 mm long. (Fig. 5.26)

Distribution

Australia (NT, WA). This species occurs west of the Victoria Rr in the NT to Beverley Springs in the Kimberley, WA. (Fig. 5.27)

Habitat

Mostly found in eucalypt woodlands amongst broken sandstone rubble on slopes or plains.

Notes

This species is very similar to *P. obversa*, *P. barbata* and *P. kimberleyensis*. Distinguished from *P. kimberleyensis* by the more obovate leaves and from *P. obversa* by the broader appendages and the presence of straight hairs. Differs to *P. barbata* by the presence of a flap created by the fusion of the staminal tube to the upper petal (Fig. 2.4 a, pg 25) and the more obovate leaves. Two atypical specimens from Jasper Gorge Gregory National Park (K.G. Brennan 4381 and R. Booth & N. Woodward 1556) have either very few straight hairs or straight hairs are absent.

Etymology

Latin *dimorpho-* (having two forms) and *-tricha* (hairs) referring to the two hair types on this species curved and straight.

Specimens examined: (15)

Western Australia

Sandy Creek Gorge, Leopold Range, 24/4/1988, *R.J. Cranfield 6574* (PERTH); Ord River Stn, 18/04/1977, *Hj. Eichler 22353* (MEL); Kimberley, 7.6 km E along Gibb River Rd from Beverley Springs turnoff, 12/05/2006, *R.A. Kerrigan 1108* (DNA, PERTH); 6 km NW of Rosewood Homestead and 40 km SE of Ord River Dam, NE Kimberleys, 10/3/1978, *M. Lazarides 8463* (PERTH); Near Cambridge Gulf, *W.J. O'Donnell 1887* (MEL)

Northern Territory

Gregory National Park, Jasper Ck, 12/04/1996, *R. Booth 1556 & N. Woodward* (DNA); Jasper Gorge, 31/3/2000, *K.G. Brennan 4352* (DNA); Gregory National Park, Jasper Gorge, 02/04/2000, *K.G. Brennan 4381* (DNA); Mt Napier Gravels, 29/04/1974, *C.R. Dunlop 4068* (DNA); Bullo River Stn, 07/06/2006, *R.A. Kerrigan 948* (DNA); Bullo River Stn, 08/06/2006, *R.A. Kerrigan 947* (DNA); Timber Creek, *C.R. Michell 1249*, 17/03/1998, (DNA); Victoria Highway, Desmond's Passage, 19/03/1998, *C.R. Michell 1280* (DNA); Gregory National Park, Bullock Paddock Ck valley, 13/04/1996, *G.J. O'Neill 25* (DNA, MO); On slope of range to west of Bullock Paddock, 13/04/1996, *M. Woodward 60 & R. Booth* (DNA).

Fig. 5.25. The holotype of *Polygala dimorphotricha*. Bullo River Stn, 09/03/2006, R.A. Kerrigan 1028 (DNA, BRI, PERTH, CANB, MEL, K, NSW)

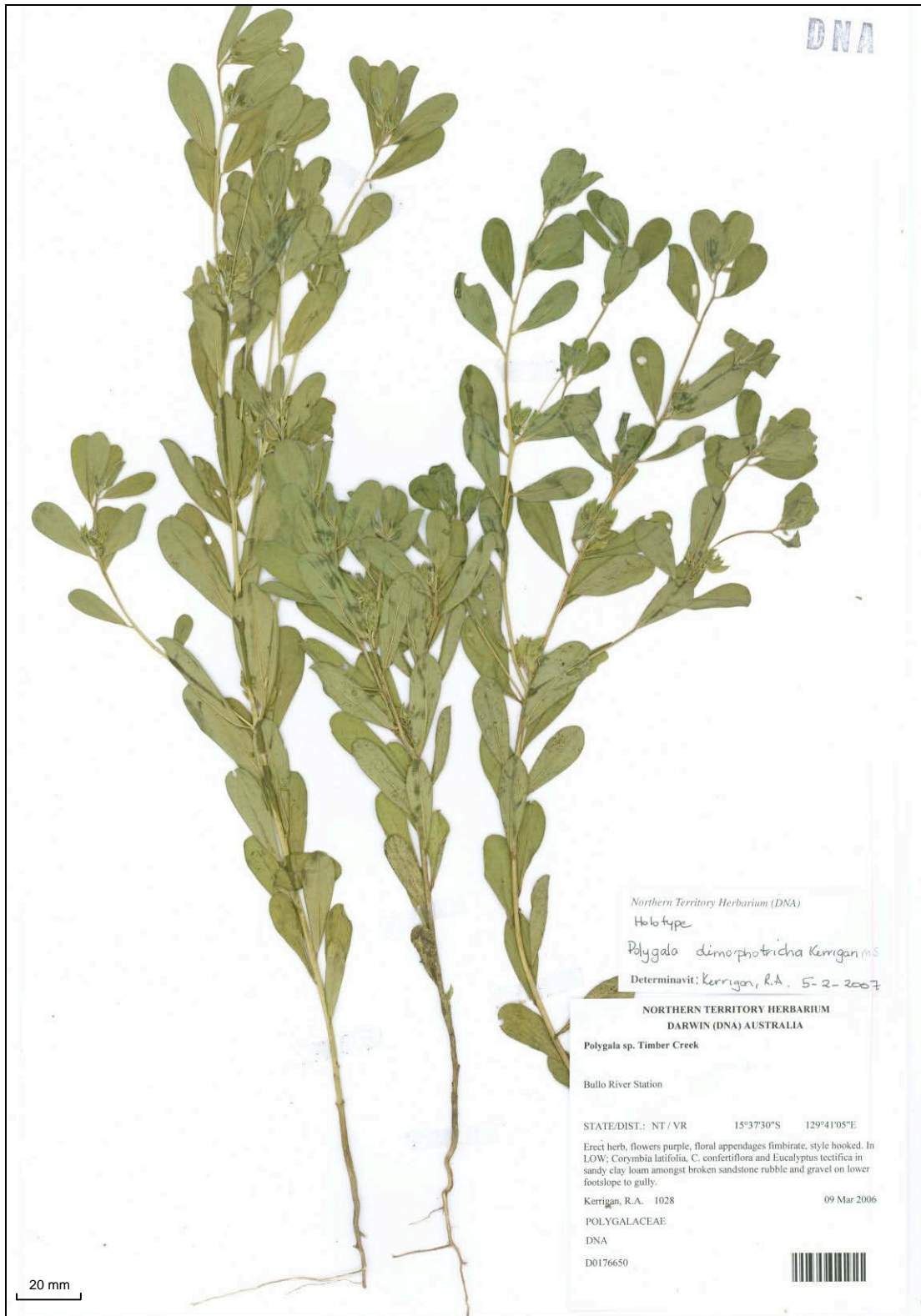
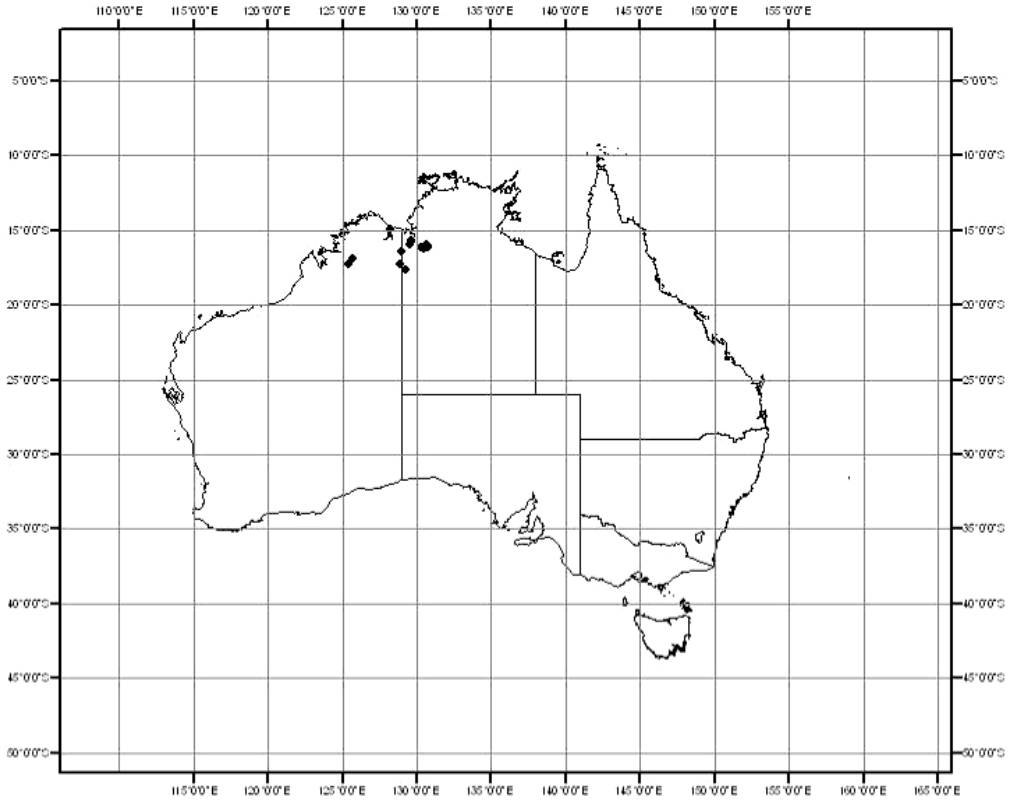


Fig. 5.26. Flower, habit and seed of *Polygala dimorphotricha*. a) flower with spatulate floral appendages (R.A. Kerrigan 947); b) habit (R.A. Kerrigan 947); and c) seed with round to skewed aril head (Hj Eichler 22353).



Fig. 5.27. The distribution of *Polygala dimorphotricha* based on available collection data.



Polygala eriocephala F.Muell ex Benth., *Fl. Austral.* 1:139 (1863)

Type: N. Australia. Upper Victoria River, *F.Muell.*; holo: K 279777 (photo DNA!)

Polygala sp. Larrimah (M.O. Rankin 1932) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, erect to 40 cm, indumentum of curved and straight hairs. Leaves linear, or oblanceolate, 7–74 mm long, 1.0–8.0 mm wide; petiole 0–1 mm. Inflorescence supra-axillary, a congested raceme to 30 mm long. Pedicel more or less sessile. Alae herbaceous, ovate, dimidiate, 6.4–9.8 mm long, 3.3–4.5 mm wide. Alae densely villous. Corolla purple, floral appendages horned, offset to one side of keel. Stamens terminate at stigma, monadelphous. Style curved, cleft into a short stalk perpendicular to main axis with globular stigma, and longer stalk persistent past stigma and sterile. Capsule lacking wing, more or less symmetrical, widely ovate, oblong to widely obovate, 4.5–6.1 mm long, 3.5–4.5 mm wide. Seed oblong-ovoid, 4.0–4.6 mm long, 1.5–2 mm wide, indumentum with fine white and ferruginous hairs, with very short erect hairs at apex of seed. Aril head hooked-helmet shaped, 0.6–1 mm long, white, or brown and white, with a tuft of hairs. Aril appendages 3, short and oblong to linear, 0.2–0.65 mm long. (Fig. 5.29)

Distribution

Australia (NT, WA). Recorded from the Cockburn Range to the Ord Rr in WA and from Dunmarra to the WA border in the NT. (Fig. 5.30)

Habitat

Found in woodlands on sandy soils often adjacent to creek lines. Predominantly occurs in red sand on flats in open woodland although also recorded in sandy clay loam adjacent gullies, in riparian situations and on rocky slopes.

Notes

This species is very easily distinguished by the forked appendages and cleft style.

Nomenclatural notes

The specimen K 279777 is considered the type as it was the only specimen at K or MEL which matched the type citation.

Specimens examined: (27)

Western Australia

39 mls SW Gibb River Stn, 22/05/1967, *E.M. Bennett 1863* (PERTH); 1.5 km W of Lake Argyle turnoff, 06/07/1974, *G.W. Carr 3080* (PERTH); Upper slopes of Cockburn Range, 16/03/1978, *T.G. Hartley 14631* (PERTH, CANB); Kimberley, 6.3 km E from Barnett Rr crossing on Gibb River Road, 14/5/2006, *R.A. Kerrigan 1117* (DNA, PERTH); Kimberley, 11.8 km E from Barnett River Gorge on Gibb River Road, 14/5/2006, *R.A. Kerrigan 1121* (DNA, PERTH); Kimberley, 163.6 km E from Kalumburu turnoff on Gibb River Road, 16/5/2006, *R.A. Kerrigan 1132* (DNA, PERTH, BRI, CANB, MEL); Near the Ord Rr, 1886, *H.J. O'Donnell s.n.* (MEL); 6 km S of Gibb Rr crossing, 03/06/1974, *D.E. Symon 7147a* (PERTH).

Northern Territory

60 km WSW of Dunmarra, on railway corridor, 07/05/2004, *D.E. Albrecht 10913 & P.K. Latz* (DNA, NT); Jasper Gorge, 31/03/2000, *K.G. Brennan 4331* (DNA); Sturt Plateau, Buchanan Hwy, c. 31 km W of Stuart Hwy, 24/02/1999, *I.D. Cowie 8203 & P.S. Short* (DNA); 6 km N of Dunmarra, 30/03/1993, *J.L. Egan 1852* (DNA); 6 km N of Dunmarra, 04/05/1993, *J.L. Egan 2329* (DNA); Big Horse Ck, Gregory National Park,

08/05/1995, *J.L. Egan 4886* (DNA); Auvergne Stn, plot 1060, 18/03/1998, *R.K. Harwood & P.S. Brocklehurst 491* (DNA); 6 km N of Larrimah, 11/02/2004, *R.A. Kerrigan 733 & P.S. Short* (DNA); Gregory National Park, 42.7 km from Victoria Hwy on Jasper Gorge Rd, 25/03/2005, *R.A. Kerrigan 922* (DNA); Bullo River, at gate to Stn, 7/3/2006, *R.A. Kerrigan 955* (DNA); Bullo River, Aboriginal Art site off main road to Homestead, 8/3/2006, *R.A. Kerrigan 982* (DNA); Bullo River, on road to Homestead, 8/3/2006, *R.A. Kerrigan 998* (DNA); Yambarran Range; 19km NE Mt Millikmonmir, 14/05/1994, *G.J. Leach 4481* (DNA, MEL); Sturt Plateau S c.29 km of Warloch Ponds Stuart Hwy, 23/02/1999, *C.P. Mangion 830 & C.R. Dunlop* (DNA); Victoria Highway, East Mathison Stn, 08/03/1998, *C.R. Mitchell 1100* (DNA); Bradshaw Stn, fire plot 19, 23/02/1999, *C.R. Mitchell & C. Yates 2295* (DNA); Depot Creek, Upper Victoria River, 1/4/1856, *Mueller, F.J.H. s.n.* (MEL); 35 km N Larrimah, 14/04/1979, *M.O. Rankin 1932* (DNA, BRI); 2 km S of Larrimah, 25/02/1999, *P.S. Short 4965 & C.P. Mangion* (DNA).

Fig. 5.28. The holotype of *Polygala eriocephala*. N Australia Upper Victoria River, F. Mueller. (K) © copyright the Board of Trustees of the Royal Botanic Gardens, Kew

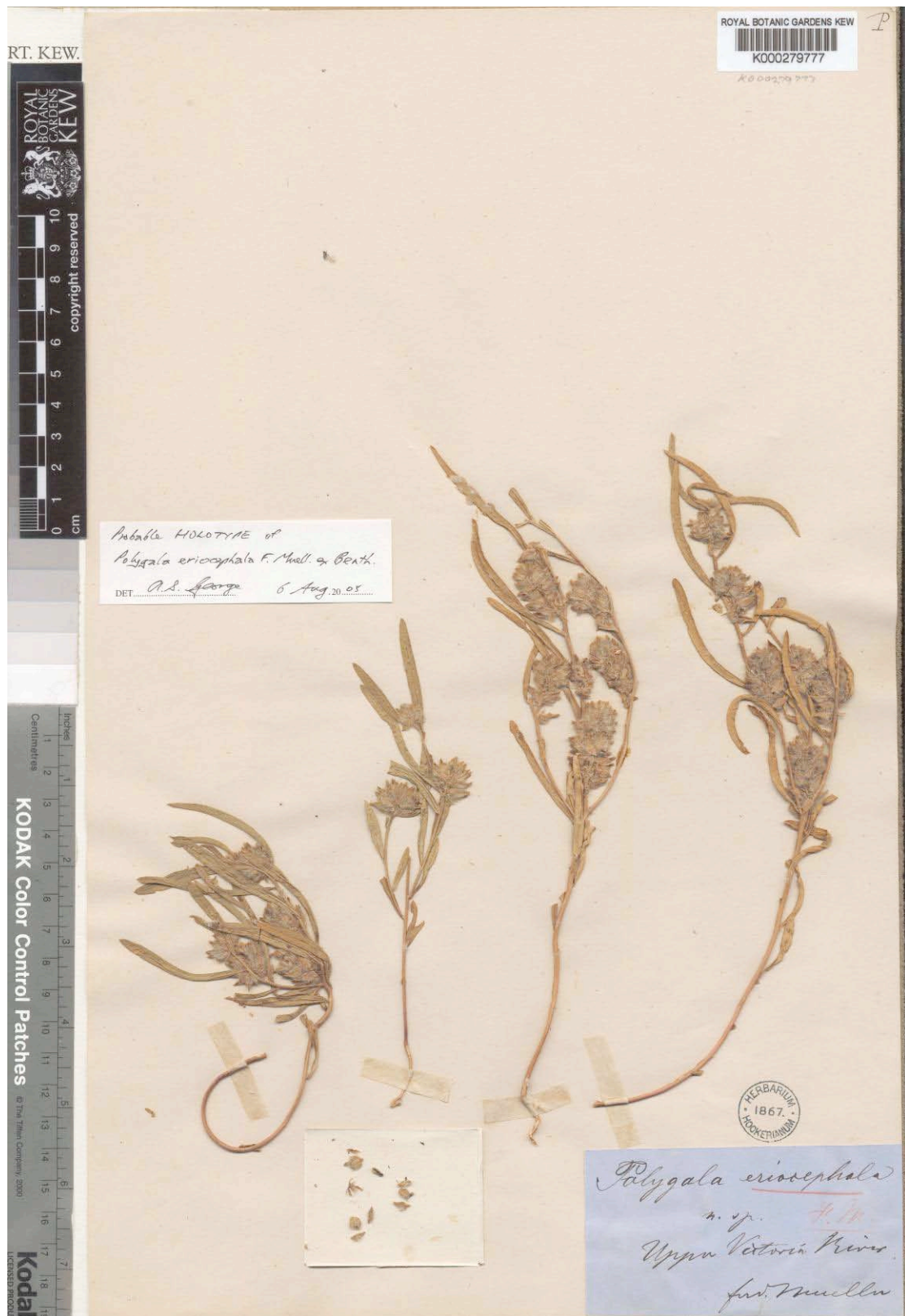
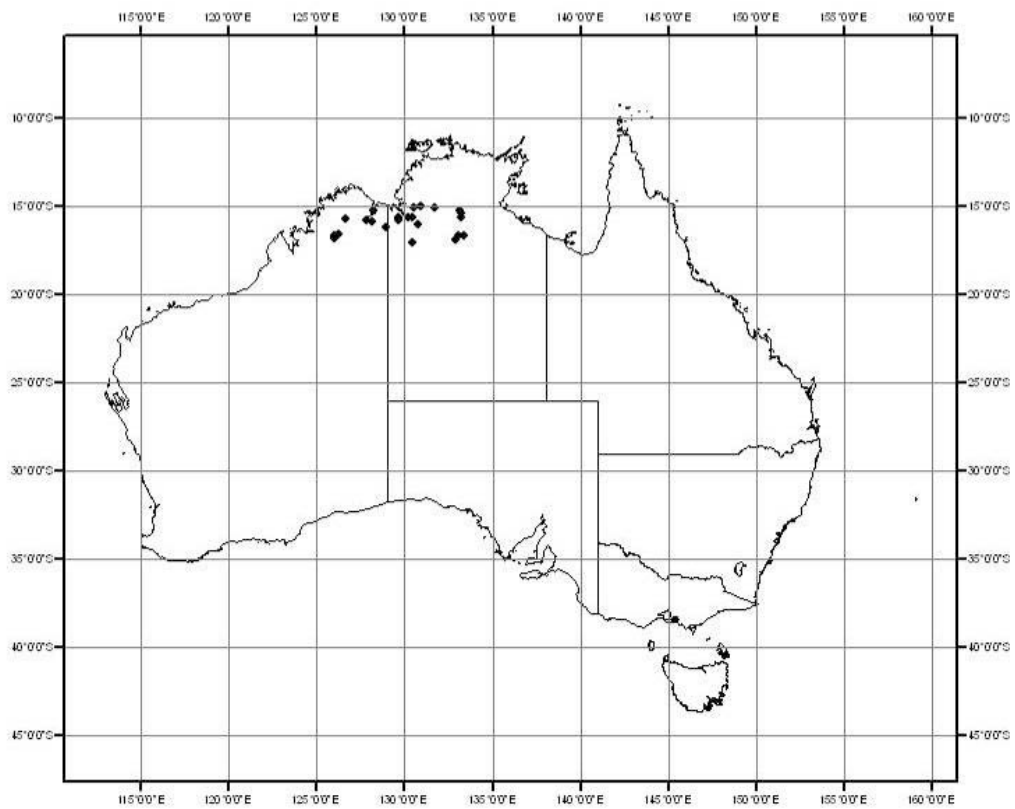


Fig. 5.29. Seed of *Polygala eriocephala* (R.A. Kerrigan 922).



Fig. 5.30. The distribution of *Polygala eriocephala* based on available collection data.



Polygala exsuarrosa Adema, *Blumea* 14(2): 268 (1967); *Polygala arvensis* var. *suarrosa* Benth., *Fl. Austral.* 1: (1867); *Polygala chinensis* var. *suarrosa* Domin, *Biblioth. Bot.* 89(4): 857 (1930)

Lectotype (for later publication): Endeavour R., *R. Brown*; lecto: BM 566301!; iso: BRI 391425! , CANB 900371219!; syntype: Upper Victoria R.; *F. Muell.*, syn- K 356710!; excluded syntype: Upper Victoria R.; *F. Muell.*, syn-K 356709!.

Polygala sp. Cahill (K.G. Brennan 1968) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2005)

Annual herb, erect to 40 cm; indumentum of mostly curved and straight hairs. Stems, leaves and alae often tinged maroon. Leaves linear to narrowly oblong or oblanceolate, 4–33 mm long, 1–5 mm wide; petiole 0–1 mm. Inflorescence supra-axillary or axillary, occasionally leaf opposed, rarely terminal; a raceme to 200 mm long. Pedicel to 1 mm. Alae herbaceous, narrowly elliptic to oblanceolate, dimidiate or falcate, 4–7.8 mm long, 1–2.2 mm wide. Corolla purple, floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style curved and prominently grooved above stigma, stigma globular. Capsule lacking wing, usually asymmetric, ovoid, 1.8–2.8 mm long, 1.4–2.5 mm wide. Seed ovoid, 1.7–2.8 mm long, 0.7–1.4 mm wide; indumentum of fine white and ferruginous hairs. Aril head reduced sometimes to an acute point, 0.2–0.5 mm long, brown where reduced to seed testa and white where appendages originate, with hairs. Aril appendages 3, linear, 0.35–1.5 mm long. (Fig. 5.31)

Distribution

Australia (WA, NT, QLD), Malesia and New Guinea. In Australia this species is widely distributed north of 15°S in WA, NT and QLD. (Fig. 5.32)

Habitat

Usually found in eucalypt woodland on rocky hillslopes or in *Melaleuca* shrublands, sedgelands or herbfields, often associated with sandy soils.

Nomenclatural notes

Adema (1966) did not see the Mueller specimen “Upper Victoria Rr” from K when he renamed *P. arvensis* var. *suarrosa*, he does however cite a specimen with the same collection details from BM which I have not been able to locate via the ABLO. Adema (1966) failed to lectotypify in this instance, perhaps because he did not see all the syntypes. Specimen K000356709 is a different taxon *P. bifoliata* and thus is excluded.

There must be an error in Bentham’s citation of collections as ‘Endeavour Rr, Brown’, since the Flinders expedition did not land there. They were most likely Banks specimens from the ‘Endeavour’ voyage that Brown had on the ‘Investigator’ as a working set (*pers comm.* Alex George)

Notes

This taxon is highly variable, floral appendage divisions vary from once to many times divided (Fig 5.34 a & b, pg 128) and gross morphology varies from single stemmed specimens with short linear leaves to multi-stemmed specimens with longer and broader leaves. They also occur in two main habitats, stony hillslopes or wet swamps. Despite efforts to sort this taxon further, based on habit, habitat and geography, no

consistent combination of characters has allowed further differentiation. Specimens distributed in a very small area within Kakadu National Park, including Kapalga, Mardugal campground and Nourlangie have a much more compact habit, longer leaves, and a more reduced aril head (Fig 5.34 d & e, pg 128). *Polygala exsuarrosa* is most similar to *P. petraphila*, but can be distinguished from it by the smaller capsule and seed, and the narrower alae.

Specimens examined: (81)

Western Australia

300 m ESE of Beverley Springs Stn Homestead, W Kimberley, 01/02/1996, *R.L. Barrett* 788, (PERTH, MEL, NSW); El Questro - Gibb River Rd, 7.6 km E of Bindoola Creek, 50 km SW of Wyndham, 26/05/1974, *A.C. Beauglehole* 51333 (PERTH); Gibb Rr - Kalumburu Mission road, 15.3 km N of Doggan Rr, about 195 km W of Wyndham, 31/05/1976, *A.C. Beauglehole* 51802 (PERTH); Gibb Rr - Kalumburu Mission road, McDonald Creek 185 km W of Wyndham, 04/06/1976, *A.C. Beauglehole* 52180 (PERTH); 30 km NW of Drysdale Rr crossing, 12 km W of Gibb Rr - Kalumburu Mission road, 200km W of Wyndham, 05/06/1976, *A.C. Beauglehole* 52246 (PERTH); King Edward Rr, 50 km NE of Mitchell River Homestead, 22/08/1978, *A.C. Beauglehole* & *E.G. Errey* 58855 (PERTH); Kimberley Region; Kalumburu Rd, 5km E King Edward Rr, 21/05/1993, *I.D. Cowie* 4192 & *L.A. Craven* (DNA, PERTH, CANB); 2 km N of Silent Grove Homestead, 26/01/1988, *R.J. Cranfield* 6557 (PERTH); Orchid Crk below Carson Escarpment, Drysdale River National Park, 09/08/1975, *A.S. George* 13594 (PERTH); 10 km SE of Mitchell Plateau Mining camp, North Kimberley WA, 23/04/1977, *A.S. George* 14510 (PERTH); Dog Leg Swamp, 35 km SE of Amax Campsite on Theda Stn Rd, 20/05/1978, *K.F. Kenneally* 6725 (PERTH); Airstrip, 5 km NW of mining campsite, Mitchell Plateau, Kimberley, 14/01/1982, *K.F. Kenneally* 7717 (PERTH); W Kimberley, 15km NNW Beverley Springs Homestead, 06/06/1995, *K.F. Kenneally* 11554 (DNA, PERTH).

Northern Territory

Adelaide Rr, 30/04/1983, *R.M. Barker* 365 (DNA, AD); Old Edith Falls track, 18/03/1987, *D.M.J.S. Bowman* 466 (DNA); Kakadu National Park, hills 14.6 km S along Kakadu Hwy from Old Darwin road turnoff, 02/03/1991, *K.G. Brennan* 1078 (DNA); Kakadu National Park, Gimbat, low hills 2 km SE Fisher airstrip, 05/03/1991, *K.G. Brennan* 1111 (DNA); Kakadu National Park, along road from Gimbat Homestead to Fisher Airstrip, 06/03/1991, *K.G. Brennan* 1137 (DNA); Kakadu National Park, Ranger Uranium Lease, 22/03/1991, *K.G. Brennan* 1246 (DNA); Kakadu National Park, Ranger Uranium Lease, 26/03/1991, *K.G. Brennan* 1528 (DNA); Kakadu National Park, Ranger Uranium Lease, 27/03/1991, *K.G. Brennan* 1529 (DNA); Kakadu National Park, Ranger Uranium Lease, 24/04/1991, *K.G. Brennan* 1530 (DNA); Kakadu National Park, Gimbat, along road from Homestead to Fisher airstrip, 11/03/1992, *K.G. Brennan* 1904 (DNA); Kakadu National Park, Ranger Uranium Lease, 26/03/1992, *K.G. Brennan* 1968 (DNA); Along Kakadu Hwy, 24/03/1994, *K.G. Brennan* 2042 (DNA); Kakadu National Park, along Arnhem Hwy, 31/03/1993, *K.G. Brennan* 2131 (DNA); Along Kakadu Hwy, 7km toward Mary Rr from Stage 3 entrance Stn, 10/04/1993, *K.G. Brennan* 2190 (DNA); Kakadu National Park, along Arnhem Hwy, 29/04/1993, *K.G. Brennan* 2296 (DNA); Marrawal Plateau, near Bloomfield Springs, 07/02/1996, *K.G. Brennan* 3212 (DNA); Kakadu National Park, fire plot 76, Mt Basedow, 18/03/1999, *K.G. Brennan* 3755 (DNA); Kakadu National Park, fire plot 157, road to Nourlangie Rock, 26/03/1999, *K.G. Brennan* 3894 (DNA); Jasper Gorge Road, 11 km SW., 05/04/2000, *K.G. Brennan* 4418 (DNA); Kakadu National Park, 09/03/2000, *K.G. Brennan* 4822 (DNA); Kakadu National Park, 02/03/2000, *K.G. Brennan* 4853 (DNA); Kakadu National Park, fire plot 30, 03/03/2000, *K.G. Brennan* 4881 (DNA); Kakadu National Park, fire plot 21, 10/02/2000, *K.G. Brennan* 4888 (DNA); Nitmiluk National Park, 25/03/2000, *K.G. Brennan* 4987 (DNA); Nitmiluk National Park, 21/03/2000, *K.G. Brennan* 5019 (DNA); Nitmiluk National Park, Marrawal Plateau, 200 m WSW fire plot 19, 14/05/2005, *K.G. Brennan* 6525 (DNA) Gregory National Park, 13 km SSW of Revolver Yard, 17/04/1996, *C.A. Coles* 160 & *I.D. Cowie* (DNA, MEL, CANB); Kapalga, 09/02/1977, *R. Collins* 241 (DNA); Kakadu National Park, Upper Gimbat Ck, 19/04/1990, *I.D. Cowie* 1136 & *G.J. Leach* (DNA); Gregory National Park; Victoria Hwy, 15/02/1992, *I.D. Cowie* 2458 & *P.S. Brocklehurst* (DNA); Litchfield National Park, 15km WSW of Adelaide Rr township, 05/03/1996, *I.D. Cowie* 6208 & *R. Booth* (DNA); Near Guyuyu Crk, c.115 km SE Maningrida, Arnhem Land, 14/04/2000, *I.D. Cowie* 8860 (DNA, CANB, MEL); c. 5 km SE of Lake Bennett, 02/04/2003, *I.D. Cowie* 9689 (DNA); Kakadu National Park, 4.5 km E of main West Alligator Rr crossing, 07/04/2003, *I.D. Cowie* 9728 & *D.J. Dixon* (DNA); Munmarlary, 27/03/1982, *C.R. Dunlop* 6241 (DNA); Port Bradshaw, 17/09/1993, *C.R. Dunlop* 9759 & *G.M. Wightman* (DNA, CANB); Fitzmaurice Rr basin, 13/05/1994, *C.R. Dunlop* 9997 & *P.K. Latz* (DNA); Nth of Hayes Creek, 05/04/1995, *J.L. Egan* 4638 (DNA); Nitmiluk National Park, 05/04/2005, *J.L. Egan* 5673 (DNA); Melville Is, 24/04/1986, *R.J. Fensham* 156 (DNA); Bathurst Is, near Rangku, 22/02/2001, *R.K. Harwood* 1022 (DNA, CANB); Auvergne Stn, plot 994, 15/03/1998, *R.K. Harwood* 465 & *P.S. Brocklehurst* (DNA); 80 km S of Maningrida, Arnhem Land,

13/04/2000, *R.K. Harwood 804* (DNA, CANB); 13 ml S-SW of Bingbong Homestead, 09/06/1971, *N.M. Henry 158* (DNA); Between Oepelli turnoff from Arnhem Hwy and Mudginberri Homestead, 20/03/1981, *K.F. Kenneally 7550* (PERTH); Litchfield National Park, 23/04/2003, *R.A. Kerrigan 704 & D.J. Dixon* (DNA); Litchfield National Park, 23/04/2003, *R.A. Kerrigan 705 & D.J. Dixon* (DNA); Adelaide Rr area, ridge opposite race course, 24/04/2003, *R.A. Kerrigan 706 & D.J. Dixon* (DNA); Adelaide Rr hills c. 7 km along Scenic Route, 24/04/2003, *R.A. Kerrigan 708 & D.J. Dixon* (DNA); c. 800 m N of Daly River Rd, 24/04/2003, *R.A. Kerrigan 710 & D.J. Dixon* (DNA); 16.9 km N of Kakadu Hwy turnoff, 13/02/2004, *R.A. Kerrigan 745 & P.S. Short* (DNA); Kakadu National Park, Northern Outliers c.13 km NE of Jabiru Airfield, 18/03/2004, *R.A. Kerrigan 773* (DNA); Leupin Road, Darwin area, 08/03/2004, *R.A. Kerrigan 813* (DNA); Adelaide Rr area, Dorat Rd, opposite race course clubhouse, 23/03/2005, *R.A. Kerrigan 901* (DNA); Kakadu National Park, near fire plot 157, adjacent road to Nourlangie Rock, 08/04/2005, *R.A. Kerrigan 926* (DNA); Cox River Stn, 04/07/1977, *P.K. Latz 7221* (DNA); Bathurst Is, road between Ranka & Nguuiu, 23/03/2001, *C.P. Mangion 1031 & K.G. Brennan* (DNA); Gunn Point, 24 ml NE Darwin, 13/02/1973, *J.L. McKean 953* (DNA); Nitmiluk National Park, 20/04/2001, *C.R. Mitchell 3133* (DNA); Nitmiluk National Park southern boundary, 01/05/2002, *C.R. Mitchell 3602* (DNA, NT); Nabarlek, 14/04/1979, *B.L. Rice 3124* (DNA); Big River Stn, 18/03/2003, *J.A. Risler 2112* (DNA); Kakadu National Park, behind Mardugal Campground, 30/03/2003, *J.A. Risler 2138* (DNA); Kakadu National Park, Kakadu Hwy N of Mardugal Campground turnoff, 30/03/2003, *J.A. Risler 2142* (DNA); Kakadu National Park, Kakadu Hwy near Cooida, 29/03/2003, *J.A. Risler 2144* (DNA); 2 ml E Tortilla, 16/02/1965, *C.S. Robinson 1189* (DNA); Kakadu National Park, Wildman Rr, 18/02/1995, *J. Russell-Smith 9537 & D. Lucas* (DNA); Litchfield National Park, 14/03/1995, *I.D. Cowie 5271 & S.M. Taylor* (DNA); c. 25 km NNW of Jabiru, 19/05/1988, *J.Z. Weber 9782* (AD, DNA); Yapilika, Melville Is, 20/04/1987, *B.G. Wilson 52* (DNA).

Queensland

Tate Rr? [possibly QLD], *W.E. Armit 570* (MEL); Queensland Endeavour Rr, *J. Banks s.n. & D. Solander* (CANB); Thursday Is. Milman Hill, 09/04/1986, *J.R. Clarkson 6416* (BRI, MBA); 0.9 km W of Marmoss Ck, 24.1 km E of Kerr Point, Weipa, 21/04/1991, *J.R. Clarkson 9020 & V.J. Neldner* (BRI, DNA, K, MBA); Off Peninsula Rd, 57.8 km along main Weipa Rd, 11/04/1988, *P.I. Forster 4060 & D.J. Liddle* (BRI); Trevethan Ck, Cooktown Development Rd, 05/05/1998, *R.L. Jago 4763 & B.S. Wannan* (BRI); Cape York Peninsula, 8 km SE of Laura on Peninsula Development Rd, 21/05/2004, *R.A. Kerrigan 840 & R.K. Harwood* (DNA, BRI); Between Cobra and Levison Cks, about 4 mls E of Mareeba, 10/04/1953, *R. Melville & W. Pont 3730* (BRI, MEL, K); CSIRO Tobacco Research Institute, 3 mls E of Mareeba, 02/05/1959, *R.F. Thorne & W.T. Jones 21027* (BRI, RSA); c. 21.2 km directly SSE of Normanton on dirt road to shady lagoon camping grounds, 13/05/2001, *G. Turpin GPT391 & E.J. Thompson* (BRI).

Fig. 5.31. Flowers, floral appendages, style and seed of *Polygala exsuarrosa*. a) flowers with many divided floral appendages (R.A. Kerrigan 745) and b) with few divided floral appendages (R.A. Kerrigan 926); c) style with groove above stigma (R.A. Kerrigan 901) and d) with pollen in groove above stigma (R.A. Kerrigan 926); and e) seed with reduced aril head (R.A. Kerrigan 705) and f) with aril head variation (C.R. Dunlop 6241)

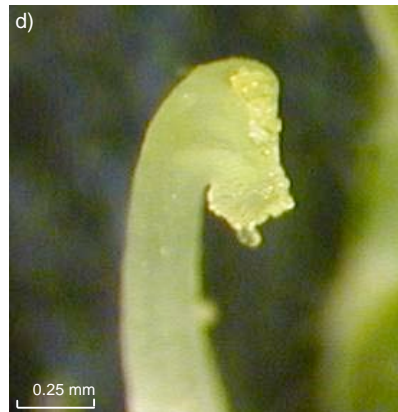
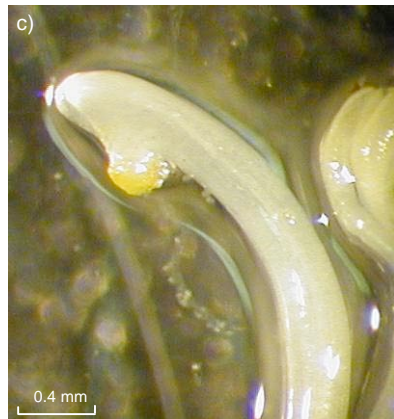
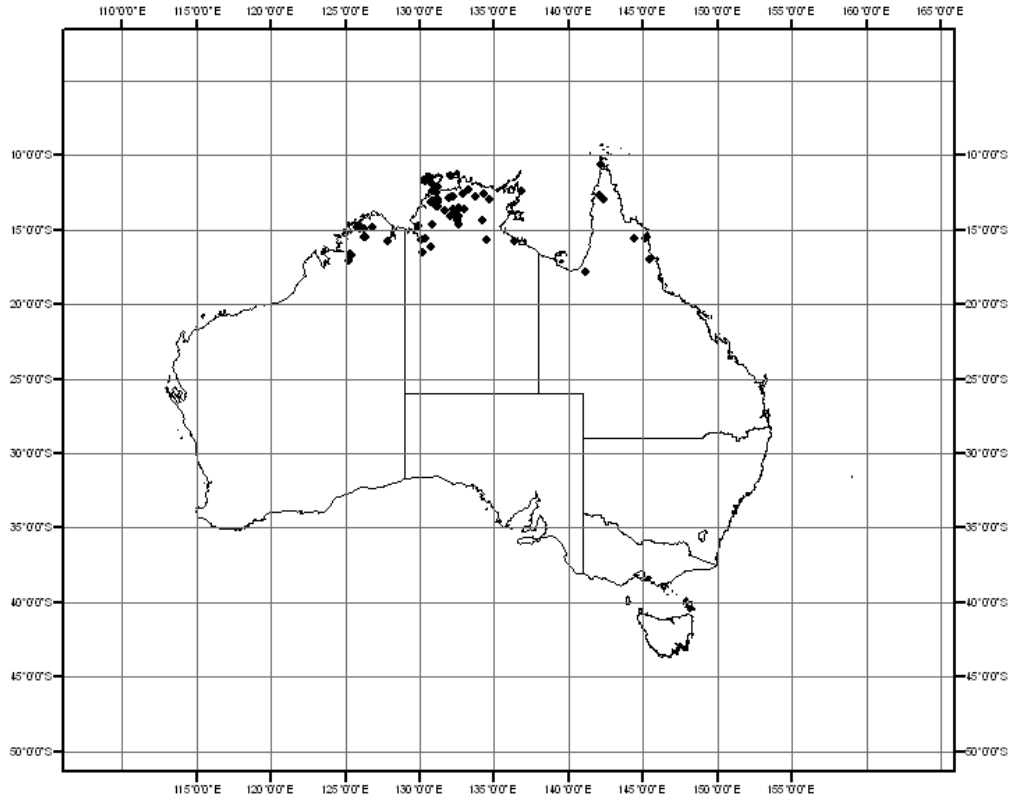


Fig. 5.32. The distribution of *Polygala exsuarrosa* based on available collection data.



Polygala gabrielae Domin, *Biblioth. Bot.* 89(4): 858 (1930)

Type citation: Nord-Queensland: auf halbfreien Stellen in den Savannenwäldern bei Chillagoe in Gesellschaft zahlreicher Annuellen *K. Domin* 5697 (DOMIN. II. 1910);
Type details: locis subnudis in xerodrymis prope opp. Chillagoe; holo: PR 528257!

Annual herb, erect to 40 cm; indumentum of curved hairs, rarely with a few straight hairs. Leaves linear, 12–66 mm long, 1.5–5 mm wide; petiole 0–1 mm. Inflorescence supra-axillary or leaf opposed, a raceme to 90 mm long. Pedicel 3 mm long. Alae herbaceous, elliptic to ovate, slightly dimidiate to falcate, 3.5–6 mm long, 1.0–3.9 mm wide, becoming pendulous. Corolla purple, floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style distinctly hooked, with flat stigma on inner surface of hook. Capsule lacking wing, more or less symmetrical, oblong to squarish, 4.25–5.0 mm long, 3–4 mm wide. Seed oblong-ovoid, 3.75–4.0 mm long, 1.5–1.65 mm wide, indumentum with fine white hairs becoming shorter towards apex of seed. Aril head hooked to rounded, 0.5–0.65 mm long, white or white and brown with a tuft of hairs. Aril appendages 3, oblong to linear, 1.0–1.5 mm long. (Fig. 5.34)

Distribution

Australia (QLD). This species is only known from a restricted distribution around Chillagoe and Undara lava tubes, in Far North Queensland. (Fig. 5.35)

Habitat

Only known from a few collections where it is recorded growing in eucalypt woodlands.

Notes

In Australia this taxon is very similar to *P. scorpioides* and *P. macrobotrya*. It differs from *P. macrobotrya* by the larger capsules and shorter inflorescence. From *P. scorpioides* it differs by the erect, single stemmed rather than multi-stemmed sprawling to ascending habit and the indumentum mostly lacking straight hairs. The above differences notwithstanding, there are no discrete character states separating *P. gabrielae*, *P. macrobotrya* and *P. scorpioides*. *P. gabrielae* and *P. macrobotrya* are both geographically restricted and known from few collections. They occur on the southern edge of *Polygala scorpioides* which is distributed throughout Cape York Peninsula. While on the available evidence *P. gabrielae* and *P. macrobotrya* appear to be distinct species, it is recognised further collecting may reveal they represent extremes of one variable species complex within *P. scorpioides*. Domin published the names *P. gabrielae* and *P. macrobotrya* in 1910 and until additional evidence is accumulated to support their merging I am compelled to maintain them. *Polygala macrobotrya* is not a synonym of *Polygala wightiana* as reported by Adema (1969).

Nomenclatural notes

The specimen PR 528257 is considered the type as it was the only specimen at PR which best matched the type citation.

Specimens examined: (4)

Queensland

Rookwood Stn, near old mango farm on north bank of Walsh Rr, 29/03/2007, *R.A. Kerrigan* 1187 (DNA, BRI); Mt Kalkani, adjacent carpark, Yaramula National Park, 78 km SE of Mt Garnet, 30/03/2007, *R.A. Kerrigan* 1190 (DNA); Mt Kalkani, an extinct crater on Yaramula Stn, 78 km SE of Mount Garnet, 30/04/1989, *V.J. Neldner* 2774 (BRI)

Fig. 5.33. The holotype of *Polygala gabrielae*. Nord-Queensland: auf halbfreien Stellen in den Savannenwäldern bei Chilligoe in Gesellschaft zahlreicher Annuellen, 1910, K. Domin 5697 (PR)



Fig. 5.34. Flower and seed of *Polygala gabrielae*. a) flower with fimbriate floral appendages (R.A. Kerrigan 1190); and b) seed with rounded aril head (R.A. Kerrigan 1187)

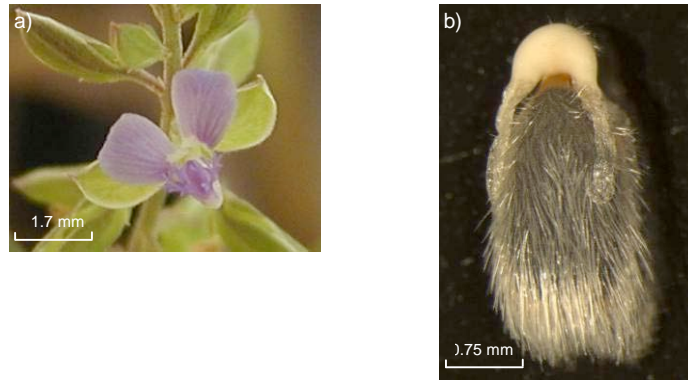
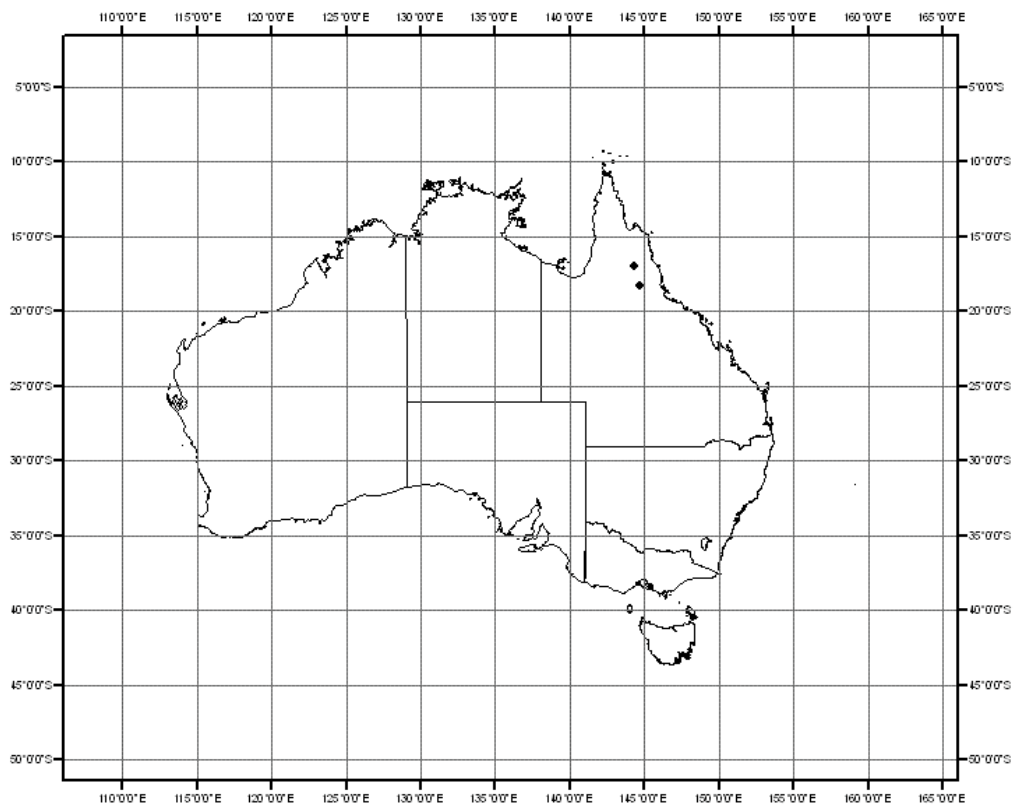


Fig. 5.35. The distribution of *Polygala gabrielae* based on available collection data.



Polygala galeocephala R.A.Kerrigan, *sp. nov.*

Polygala pendulinae similis sed ab ea indumento pilis curvis non nisi, arillo galeiformi, crista florali lobis spathulatis, stylo uncatu et foliis ellipticis, lanceolatis et obverse-ovatis distinguitur.

Type: Bullo River, on road to homestead, 07.iii.2006, *R.A. Kerrigan 949*; holo: DNA 177025!; iso: BRI, CANB, K, MEL, NSW, PERTH

Polygala sp. Gregory (G.M. Wightman 2823) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb erect to 20 cm; indumentum of curved hairs. Occasionally leaves and alae red tinged. Leaves variable, linear to elliptic, lanceolate to ovate, rarely obovate, 6–46 mm long, 2.5–14.0 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary or axillary raceme to 70 mm long, sometimes solitary along internodes. Pedicel to 3 mm. Alae herbaceous, ovate, elliptic or obovate, dimidiate, 4.95–8.0 mm long, 1.9–4.2 mm wide. Corolla purple, floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat along inner surface of hook of style. Capsule lacking wing, oblong to obovate, 4–5 mm long, 2.7–3.5 mm wide. Seed oblong-ovoid 3.4–4.2 mm long, 1.1–1.5 mm wide; indumentum with fine white or ferruginous hairs, becoming shorter towards aril. Aril head helmet shaped, 0.6–1.0 mm long, white, or white and brown rarely all brown, with short erect hairs. Aril appendages 3, linear 0.4–2.0 mm long. (Fig. 5.37)

Distribution

Australia (NT, WA). This species occurs throughout the Kimberley in WA and the western half of the NT, as far south as Supplejack Stn (northern Tanami) and north to Bradshaw Stn (Victoria River District). Although the identification of B.G. Thomson 589 from Mallapunyah Stn, Kilgour Gorge, has been confirmed as *P. galeocephala* it has not been recollected E of Gregory National Park and it may be incorrectly labelled. (Fig. 5.38)

Habitat

Found in a variety of habitats mostly in woodlands on rocky sandstone hill slopes.

Notes

When in bud, keel and floral appendages look larger than lateral flag petals, however this is not the case when fully mature. One specimen from WA Warralong Station, Burbidge NT 737 (PERTH) has affinities with this species but has a more open inflorescence similar to *P. gabrielae*. Further collecting in the area is required to determine the extent of this variation.

Etymology

Latin *galea*- (helmet) and Greek *-cephala* (head) because of the helmet shape of the aril.

Specimens examined: (50)

Western Australia

Gibb River Rd, 72.1 km by road W of Wyndham to Kununurra Rd, 28/04/1985, *T.E.H. Aplin & R.J. Cranfield 627* (PERTH); 1 km NE of Beverley Springs Stn Homestead, 10/02/1996, *R.L. Barrett 838* (PERTH); Camden Sound, 01/05/1931, *J.S. Beard s.n.* (PERTH); Prince Regent Rr, *J. Bradshaw s.n. & W. Allen* (MEL); Mt Anderson, 01/02/1953, *H.F. Broadbent 631* (PERTH); 3 km N of Silent Grove Homestead, 25/04/1988, *R.J. Cranfield 6516* (PERTH); Base of Mt Eliza, 01/05/1905, *W.V. Fitzgerald 700* (PERTH); Adcock Rr near Mt House, 01/05/1905, *W.V. Fitzgerald 977* (PERTH); May Rr near Poulton's Yard, 01/05/1905, *W.V. Fitzgerald 469* (PERTH); On small Is near Koolan Is, 01/05/1983, *P.A. Fryxell & L.A. Craven 3911* (CANB); Prince Regent Rr, Kimberley, 01/07/1921, *C.A. Gardner 1004* (PERTH); 10 km S of Jeffries Field, 04/07/1981, *W.K. Harris 3* (PERTH); Southern slopes of the Weaber Range, 11/03/1978, *T.G. Hartley 14473b* (CANB); Quartzitic sandstone plateau above the headwaters of the Helby Rr, 27/03/1978, *T.G. Hartley 14811* (CANB); Gibbings Is, Buccaneer Archipelago, W Kimberley coast, 21/06/1982, *K.F. Kenneally 8435* (PERTH); 1.5 km SE Granny's Soak, N Tanami Desert, 09/05/1998, *K.F. Kenneally 12026* (PERTH); 20 km N Drysdale River Stn on Kalumburu Rd, N Kimberley, 18/05/1998, *K.F. Kenneally 12062* (PERTH); Vicinity of Kimberley Research Stn, near Kununurra, East Kimberleys, 01/01/1969, *D.H. MacKenzie 690315-3* (CANB); Port George; behind Paspaley pontoon, 06/04/1992, *A.A. Mitchell 2338* (DNA, PERTH); Mitchell Rr Homestead, 10/06/1979, *R.J. Petheram 411* (DNA); Mt Anderson, 10/03/1967, *Y. Power 167* (PERTH); Along haul road hill crest, about 4 km from Camp Nicholas, Smoke Creek, SW of Lake Argyle, 04/05/1980, *A.S. Weston 12255* (PERTH).

Northern Territory

Mana Range, western Tanami, 01/05/2004, *D.E. Albrecht 10713 & M.G. Harris* (NT); Gregory National Park, Jasper Creek, 12/04/1996, *R. Booth 1552 & M. Woodward* (DNA); Jasper Gorge, 31/03/2000, *K.G. Brennan 4333* (DNA); Jasper Gorge, 02/04/2000, *K.G. Brennan 4367* (DNA); Jasper Gorge Road, 11 km SW, 05/04/2000, *K.G. Brennan 4419* (DNA); 11 km SW Jasper Gorge on sandsheet on sandstone plateau, 05/04/2000, *K.G. Brennan 4429* (DNA); Jasper Gorge area on sandstone plateau, 11 km SW Jasper Gorge, 05/04/2000, *K.G. Brennan 4434* (DNA); 11 km SW Jasper Gorge, 05/04/2000, *K.G. Brennan 4437* (DNA); Gregory National Park; track to Telecom Tower, 15/02/1992, *I.D. Cowie & P.S. Brocklehurst 2440* (DNA); Gregory National Park, S of Wickham Rr, 30/06/1998, *I.D. Cowie 7832* (DNA); Ware Range, 01/05/2004, *D.J. Dixon 1163 & B. Crase* (DNA); Gregory National Park, Kuwang Lookout, 09/04/1990, *M. Evans 3066* (DNA); 50 km NNW Suplejack Stn Homestead, Mana Range, Western Tanami, 02/05/2004, *M.G. Harris 285 & D.E. Albrecht* (NT); Gregory National Park, 11 km SW of Bullita Homestead, 13/04/1996, *G.J. Jones 51 & I.D. Cowie* (MEL); Gregory National Park, 16/04/1996, *M. Jones 16 & R. Booth* (DNA); Gregory National Park, Jasper Gorge, 500 m N along road from Jasper Creek, 08/04/2003, *R.A. Kerrigan 617* (DNA); Gregory National Park, Victoria Rr Sector, Joe Creek campground behind picnic area, 24/03/2005, *R.A. Kerrigan 919* (DNA); Gregory National Park, Victoria Rr Sector, Joe Creek walk, bottom of cliff at top of scree slope, 24/03/2005, *R.A. Kerrigan 921* (DNA); Gregory National Park, opposite Jasper Gorge campground, 25/03/2005, *R.A. Kerrigan 925* (DNA); 36 km SSE Birrindudu Stn Homestead, Birrindudu Range, 01/05/2004, *P.K. Latz 19871 & K.G. Brennan* (NT, DNA); Mt Kukpalli, 08/03/1989, *G.J. Leach 2352 & C.R. Dunlop* (DNA); Jasper Gorge, 15/3/1998, *C.R. Michell 1226 & R.B. Carrow* (DNA); Timber Creek, 16/03/1998, *C.R. Michell 1235* (DNA); Bradshaw Stn; near fire plot 24, 19/02/1999, *C.R. Michell 2197* (DNA); 5 km W. of Timber Ck, 11 km S of Victoria Hwy, 05/02/1988, *T.M. Orr 23* (DNA); Kilgour Gorge, Mallapunyah Stn, 19/05/1984, *B.G. Thomson 589* (NSW); 4 km E of Victoria River Inn, Gregory National Park, 8/3/1986, *B.G. Thomson 1276* (DNA, NT); Victoria Rr, Gregory National Park, 28/02/1986, *G.M. Wightman 2823* (DNA).

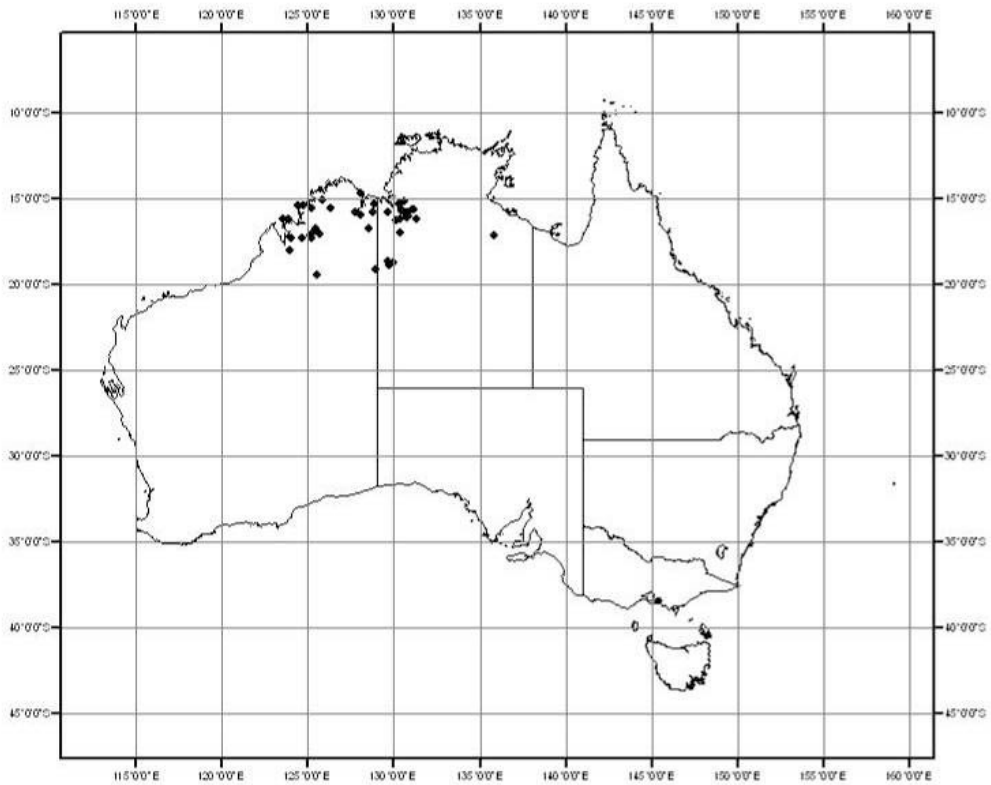
Fig. 5.36. The holotype of *Polygala galeocephala*. Bullo River, on road to homestead, 07/03/2006, R.A. Kerrigan 949 (BRI, PERTH, CANB, MEL, NSW, K)



Fig. 5.37 Habit and seed of *Polygala galeocephala*. a) habit (R.A. Kerrigan 949); and b) seed with narrowly helmet shaped aril head (M. Harris 285)



Fig. 5.38. The distribution of *Polygala galeocephala* based on available collection data.



Polygala geniculata R.A.Kerrigan, *sp. nov.*

Polygala clavistylae affinis, a qua stigmatibus plano et stylo uncatō differt.

Type: c. 5 km SE of Lake Bennett, 02.iv.2003, I.D. Cowie 9688; holo: DNA 157569!; iso: BRI, CANB, K, MEL, NSW, PERTH

[*Polygala glaucoides* [NT material] *auct. non.* L.: I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)]

Annual herb, erect to 20 cm; indumentum of curved hairs. Stems and leaves often tinged maroon. Leaves obovate, 5–30 mm long, 3–12 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary, axillary or terminal raceme to 33 mm long. Pedicel to 2.5 mm. Alae herbaceous, ovate, strongly dimidiate, 4–8 mm long, 2–4 mm wide. Corolla purple, floral appendages spatulate, rarely approaching corolline. Stamens terminate at stigma, monadelphous. Style hooked, with flat stigma along inner surface of hook. Capsule lacking wing, more or less symmetrical, ovoid, 3.5–4.3 mm long, 3.5–4.3 mm wide. Seed ovoid, 2.7–3.4 mm long, 1.5–1.9 mm wide; indumentum with fine white hairs present. Aril head reduced to an acute point, 0.4–0.5 mm long, brown where reduced to seed testa and white where appendages originating, with short hairs. Aril appendages 3, spatulate, 1.5–2.5 mm long. (Fig. 5.40)

Distribution

Australia (NT). This species is endemic to the NT and is only known from a restricted area from Hayes Creek, Litchfield National Park, outer Darwin and the Mary Rr with an outlier specimen recorded from Bradshaw Field Training Area (I.D. Cowie 11469). (Fig. 5.41)

Habitat

Found in woodlands, usually on stony hill slopes amongst laterite, quartzite or shale rubble.

Notes

This species is very similar to *P. clavistyla* but can be distinguished from that species by the hooked style and flat stigma. The outlier specimen I.D. Cowie 11469 differs from typical *P. geniculata* by the narrowly elliptic leaves and more corolline floral appendages. With further collecting in the area it may prove to be a separate taxon.

Etymology

Latin *geniculate* (hooked or bent) because of the hooked style rather than club shaped style.

Specimens examined : (10)

Northern Territory

Stuart Hwy, 19/03/2000, K.G. Brennan 4288 (DNA); Mary Rr, 10/12/1986, M.J. Clark 1739 (DNA); Litchfield National Park, 16/03/1995, I.D. Cowie 5321 & S.M. Taylor (DNA); Litchfield National Park, 15 km WSW of Adelaide River township, 05/03/1996, I.D. Cowie 6209 & R. Booth (DNA); Bradshaw Field Training Area, c. 63 km NNE of Timber Creek; near Fire Plot 4, 30/03/2007, I.D. Cowie 11469 & B.M. Stuckey (DNA; BRI, PERTH); Hayes Creek, 05/04/1995, J.L. Egan 4637 (DNA); Litchfield National Park, 06/03/2006, J.L. Egan 5727 (DNA); Litchfield National Park, 23/04/2003, R.A. Kerrigan 702 & D.J. Dixon (DNA); Litchfield National Park, 23/04/2003, R.A. Kerrigan 703 & D.J. Dixon (DNA); Adelaide Rr area, ridge opposite race course, 24/04/2003, R.A. Kerrigan 707 & D.J. Dixon (DNA); Lake Bennett area, 4.8 km

on Owen Lagoon Rd, 04/03/2005, R.A. Kerrigan 863 (DNA); Adelaide Rr area, Dorat Rd, opposite race course clubhouse, 23/03/2005, R.A. Kerrigan 902 (DNA).

Fig. 5.39. The holotype of *Polygala geniculata*. c. 5 km SE of Lake Bennett, 02/04/2003, I.D. Cowie 9688 (DNA, BRI, PERTH, CANB, NSW, MEL, K)



Fig. 5.40. Flower and seed of *Polygala geniculata*. a) flower with spatulate floral appendages (R.A. Kerrigan 863); and b) seed with broad spatulate papery appendages (I.D. Cowie 6209).

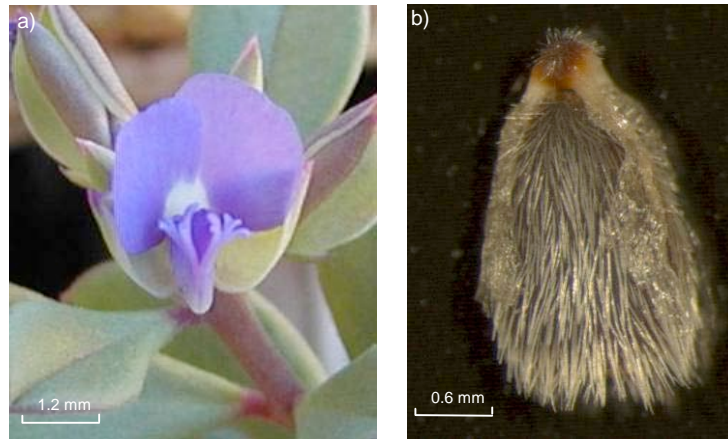
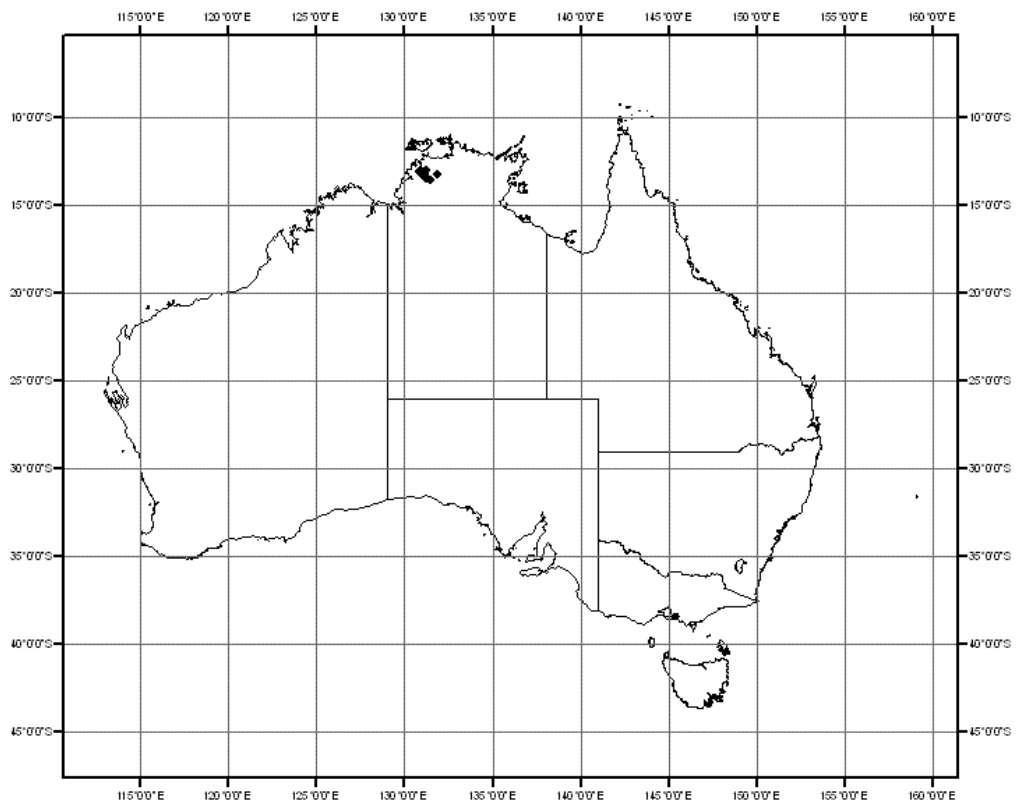


Fig. 5.41. The distribution of *Polygala geniculata* based on available collection data.



Polygala glaucifolia Kerrigan, *sp. nov.*

Polygala isingii similis, a qua habitu rotundato, foliis glaucis, arillo redacto et pilis mollioribus differt.

Type: 70 km N of Newman on main road to Port Headland, Hamersley Ranges, 06.v.2006, R.A. Kerrigan 1093; holo: DNA 177046!; iso: AD, BRI, CANB, PERTH

Polygala sp. Prostrate (P.K. Latz 4900) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual rounded herb to 11 cm, with decumbent branches spreading to 20 cm; indumentum of curved and soft straight hairs. Leaves obovate, oblanceolate, 2.5–21.0 mm long, 1–10 (–14) mm wide; petiole to 5 mm. Inflorescence axillary, in leaf and branch axils, a raceme to 11 mm long. Pedicel to 2 mm. Alae herbaceous, ovate to lanceolate, dimidiate, 2.0–5.2 mm long, 1.2–2.5 mm wide. Corolla light blue to purple, floral appendages fimbriate, keel rarely with one to a few pilose hairs. Stamens terminate at stigma, monadelphous. Style hooked, beaked at apex, stigma flat along inner surface of hook. Capsule lacking wing,; symmetric, elongated ovoid, 3.0–5.5 mm long, 2.5–4.0 mm wide. Seed elongated ovoid, 3.5–4.25 mm, 1.25–1.65 mm wide; indumentum with fine white or ferruginous, shorter towards apex. Aril head reduced to an acute point, 0.5–1.0 mm long, brown where reduced to seed testa, and white where appendages originate, with short erect hairs. Aril appendages 3, linear, 0.7–1.0 (–2.8) mm long. (Fig. 5.43)

Distribution

Australia (NT, QLD, WA, SA). Occurs in the arid zone regions of NT, QLD, WA and SA, from coastal regions in WA to near the borders of NT, QLD and SA, possibly also present in the arid zone of north western NSW. (Fig. 5.44)

Habitat

Found in a variety of habitats including *Acacia* shrublands and *Triodia* grasslands, generally associated with gravelly or rocky slopes and foot hills but also found in drainage lines, flats and sub-saline conditions, often on loam, sandy loam or clay.

Notes

This species is similar to *P. isingii* and *P. difficilis* but can be distinguished from both by the prostrate to spreading compact habit, greyish colour of the foliage when fresh and the reduced aril head. Four specimens J. Devitt 171, M.E. Trudgeon 15945 & 6995 & 1155 from Mt Skinner (NT), Hamersley National Park (WA) and Yampire Gorge are considered atypical specimens of this species. They share many of the same characters particularly seed characters but have strikingly narrow and longer leaves and in gross morphology appear similar to *P. dependens*, they are not included in the description provided here.

Etymology

Latin *glauci-* (blue grey) and *-folia* (leaves) because of the blue-grey colour of the leaves.

Specimens examined: (54)

Western Australia

Mt Harris, 32 mls N of Agnes, on road to Wiluna, 19/08/1963, *T.E.H. Aplin 2382* (PERTH); Carey Downs, 26/04/1982, *R.J. Cranfield 2159* (PERTH); 09/05/1995, *R.J. Cranfield 9737* (PERTH); Near Nickol Bay, *W.H. Cusack s.n.* (MEL); Fortescue Rr, *W.H. Cusack 202* (MEL); Loran Glen Stn, 150 km ENE of Wiluna WA, LGS 13, 13/03/2003, *D.J. Edinger 3265 & G. Marsh* (PERTH); 22 mls S of Wongawol Homestead, 28/07/1963, *A.S. George 5591* (PERTH); 25 mls N of Cordabia Stn Homestead, 04/09/1970, *A.S. George 10215*(PERTH); c. 13 km by track SW of well 35, Canning Stock Route, 07/05/1979, *A.S. George 15652* (PERTH, NT); Rear Bullgarra cell, Karratha, 01/04/1984, *K. Glennon 254* (PERTH); Telfer, *E.M. Goble-Garrat 180* (PERTH); Rudall Rr Region, 01/06/1987, *R.P. Hart 669* (PERTH); 9.8 km E of Mardathuna Homestead on the N side of the road to Binthalya Homestead, 19/08/1994, *G.J. Keighery 1499 & N. Gibson* (PERTH); 32 km NNW of Mt Windarra, Eristoun Stn, 29/09/1992, *G.J. Keighery 13866* (PERTH); 70 km from Great Northern Hwy on Newman road, 06/05/2006, *R.A. Kerrigan 1091* (DNA, PERTH); Amelia Stn Edmund, 13/05/1978, *A.A. Mitchell 600* (PERTH); About 20 km NNW of Newman, reference site for *Astrebla elymoides* grassland, 04/09/1995, *A.A. Mitchell 657* (PERTH); WA, Little Sandy Desert, 22/04/1979, *A.S. Mitchell 486* (PERTH); 18 km NE of Mt Marsh, c. 95 km E of Wittenoon, 28/06/1984, *K. Newbey 10232* (PERTH); 7 km NW of Quarry Hill, c. 130 km W of Tom Price, 09/08/1984, *K. Newbey 10789* (PERTH); 10 m S of Googhenama Creek on RPF, 18/05/1947, *R.D. Royce 1780* (PERTH); 0.7 mls along track to Hamersley Gorge from turnoff, then 200 m E, 23/01/1976, *M.E. Trudgen 1581* (PERTH); 4 km along the track to Mindi Springs from the Marandoo to Juna Downs Road, 29/01/1976, *M.E. Trudgen 1630* (PERTH); 4.4 km S of Hamersley Gorge track on Wittenoon to Nanutarra road, 02/09/1991, *M.E. Trudgen 10592* (PERTH); 5.2 km NW of Mt Montagu, Millstream-Chichester National Park, Fortescue Botanical District, 08/04/1997, *M.E. Trudgen 18141* (PERTH); 5.6 km S of Packsaddle Hill, 9.5 km SSE of Packsaddle Camp, 15.3 km E of Mt Meharry, Hamersley Range, 12/09/1991, *S. van Leeuwen 999* (PERTH); Karijini National Park, 12 km S of Mt Meharry, 13 km WNW of West Angela Hill, 26.6 km W of the Governor, 17/09/1998, *S. van Leeuwen 4005* (PERTH); 21.4 km E of W Angela Hill, 21.4 km SSW of Mt Meharry, 36.6 km WNW of Mt Ella, 53.4 km ENE of Mt Channar, 29/09/1998, *S. van Leeuwen 4129* (PERTH); Meentheena Stn Conservation Reserve, 16.7 km SE of Bullgarina Hill, 10.9 km ESE of King Rock Hole, 26/05/2000, *S. van Leeuwen 4513* (PERTH).

Northern Territory

c. 1.5 km ESE Stuart Well, Owen Springs Stn, 31/03/2000, *D.E. Albrecht 9151 & P.K. Latz* (NT); 8 km NNE Alcoota Homestead, 28/07/2000, *D.E. Albrecht 9242* (NT); 6km SW Huckitta Homestead, 30/07/2000, *D.E. Albrecht 9313 & P.K. Latz* (NT); Mt Harris, 32 mls N of Agnes, on road to Wiluna, 19/08/1963, *T.E.H. Aplin 2382* (PERTH); Harts Range, Mt Riddoch area, 26/05/1974, *A.C. Beauglehole 44561* (MEL); Mt Connor, c. 220 km SW of Alice springs, 17/06/1974, *G.W. Carr & A.C. Beauglehole 1883* (MEL); Tarlton Downs Stn, Mt Guide, 25/05/1972, *C.R. Dunlop 2608* (BRI); Near Alice Springs, *E. Giles s.n.* (MEL); 1.4 km West Emma Bore to Baystone Bore, Umbeara Stn, 10/08/2000, *P. Horsfall 902* (NT); Mt Olga, 24/8/1973, *P.K. Latz 4137* (NT); Alcoota Stn, 27/03/1974, *P.K. Latz 4735* (DNA, L, NT); Simpsons Gap National Park, 18/4/1974, *P.K. Latz 4900* (NT); James Range, 23/04/1974, *P.K. Latz 4917* (BRI, NT); 32 km S Alice Springs, 02/03/1976, *P.K. Latz 6421* (BRI); NW Simpsons Desert, 29/8/1977, *P.K. Latz 7590* (NT); 13 km SW Todd River Downs Homestead, Arookara Range, 16/03/1995, *P.K. Latz 14176* (DNA); 28 km E Santa Teresa, 01/09/1995, *P.K. Latz 14528* (NT, DNA); 13 km NE Mt Dare Homestead, S Andado Stn, 30/04/1997, *P.K. Latz 15201* (DNA, MEL, NT); 25 km ESE Eridunda Homestead, 26/06/2000, *P.K. Latz 16372* (NT, MEL); 37 km NW Maryvale Homestead, 18/09/2000, *P.K. Latz 16782* (NT); 22 km East Horseshoe Bend Homestead, 22/07/2000, *P.K. Latz 17489* (NT, CANB); 1.5mls Nth Kunoth Well, Hamilton Downs, 10/02/1974, *D.J. Nelson 2341* (NT, DNA); 2.5 mls W Stuart Hwy, 36 mls N Alice Springs, 30/03/1962, *R.F. Swinbourne s.n.* (NT).

South Australia

Wintinna Creek, between Coober Pedy and Welbourn Hill, 21/05/1974, *A.C. Beauglehole 44380* (MEL).

Queensland

Walus VI, Site S80, c. approximately 47 km WSW of Glenormiston, 14/09/1978, *R.W. Purdie 1365* (BRI).

Fig. 5.42. The holotype of *Polygala glaucifolia*. 70 km N of Newman on main road to Port Headland, Hamersley Ranges, 06/05/2006, R.A. Kerrigan 1093 (DNA, PERTH, BRI, AD, CANB)

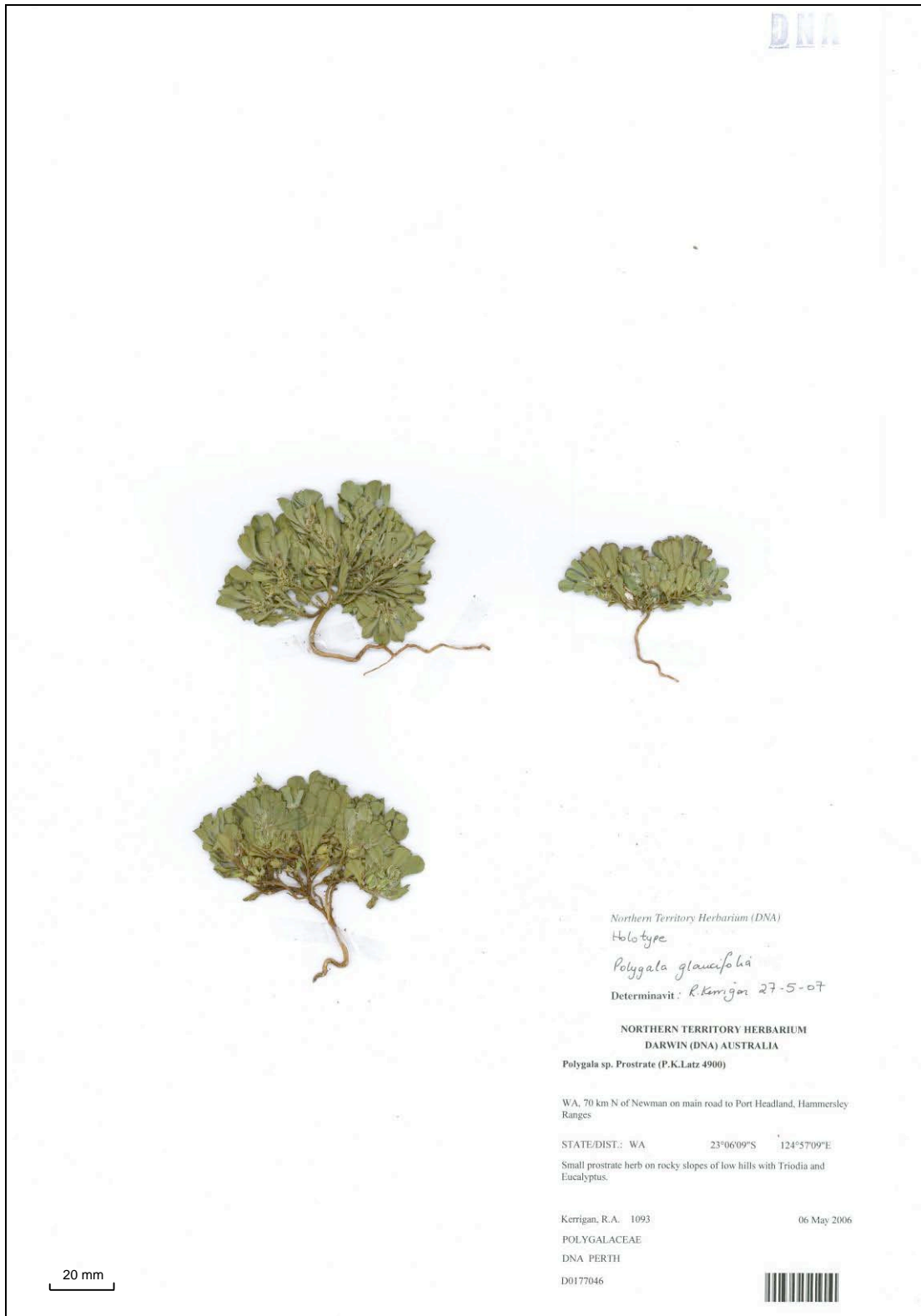


Fig. 5.43. Habit and seed variation of *Polygala glaucifolia*. a) habit (non-vouchered photograph); and seed variation b) (R.A. Kerrigan 1093) & c) (D.E. Albrecht 9313)

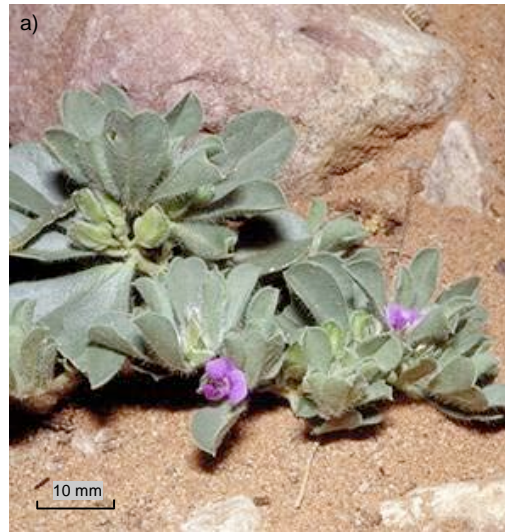
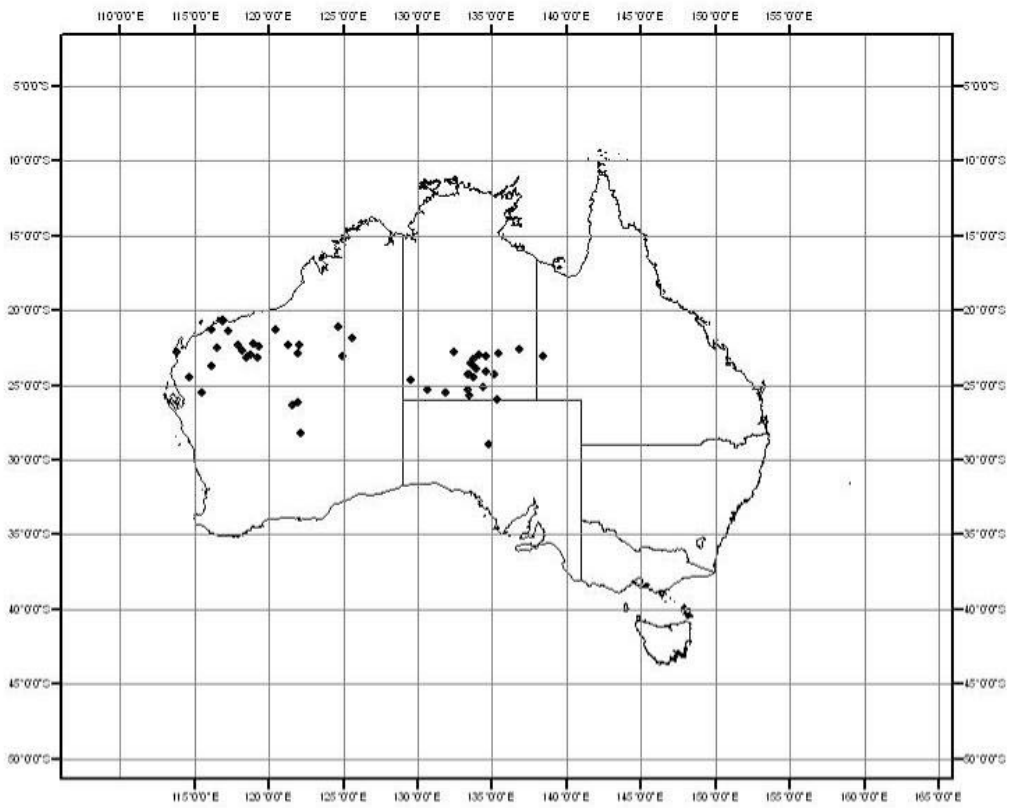


Fig. 5.44. The distribution of *Polygala glaucifolia* based on available collection data.



***Polygala glaucoides* L., Sp. Pl. 1. (1753) 705.**

Type: " Habitat in Zeylona; Fl. Zey. 270"; holo: BM (photo DNA!) *vide* R.van der Meijden, *Fl. Malesiana* I (10): 480 (1988)

Polygala sp. Kennedy (L.S. Smith 3173) R.J.F.Henderson (ed.), *Names Distr. Queensland Pl., Algae Lichens* 16(2002)

Annual herb, prostrate or erect with spreading branches to 20 cm; indumentum of curved hairs. Leaves oblanceolate, narrowly elliptic or narrowly oblong, 4–30 mm long, 2–8 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary raceme to 2 mm long. Pedicel to 0.5 mm. Alae herbaceous, ovate to lanceolate, falcate or dimidiate, 4.3–5.8 mm long, 2.0–2.4 mm wide. Corolla yellow (from dried material only), floral appendages fimbriate. Stamens terminate at stigma, 8, monadelphous. Style hooked, stigma more or less flat, inside bend of style. Capsule lacking wing, more or less symmetrical, widely elliptic to widely ovoid, 4.0–4.5 mm long, 2.75–3.2 mm wide. Seed ovoid-oblong, 3.0–3.5 mm long, c. 1.5 mm wide; indumentum with fine white hairs becoming shorter towards apex. Aril head round, 0.55–0.8 mm long, white, with short erect hairs. Aril appendages 3, short and linear, to 0.8 mm long. (Fig. 5.46 & Fig. 5.47)

Distribution

A very widespread species distributed from Sri Lanka to continental SE Asia to Australia (QLD). In Australia it is known from only a few collections from Rockingham Bay near Cardwell, South Molle Is and the Herbert Rr. Attempts to relocate the populations near Cardwell in March 2007 failed. (Fig. 5.48)

Habitat

With so few collections it is difficult to determine the habitat of this species in Australia. van der Meijden (1988) reports this species occupies grassy places at low altitudes. The few collections may reflect that much of the accessible coastal lowland savanna is under cultivation.

Notes

This species is very similar to *P. polifolia* and *P. triflora* but is easily distinguished from the former by the fusion of stamens in a bundle of eight rather than three (3, 2, 3) and a hooked style rather than a curved style with an apical point; and from the latter by the absence of straight hairs on the capsule margin. With so few collections of this species in Australia and such a poor type it is difficult to unequivocally assign this taxon to *P. glaucoides*, particularly as there are no additional specimens cited. Using the description of van der Meijden (1988) there is little evidence to suggest it is not *P. glaucoides*. Issues regarding synonymy of this species and other taxa mentioned by van der Meijden (1988) cannot be fully resolved until a monograph of the group is completed and specimens throughout the range are examined. Reports on flower colour using dried material should be treated with caution.

Specimens examined: (3)

Queensland

Herbert Rr, 6/5/1869, *F.J.H. Mueller s.n.* (MEL); Rockingham Bay, 3/5/1890, *F.J.H. Mueller s.n.* (MEL); South Molle Is, 06/07/1962, *L. Pedley 1036* (BRI); Kennedy, N of Cardwell, 30/07/1947, *L.S. Smith 3173* (BRI).

Fig. 5.45. The holotype of *Polygala glaucoides* Habitat in Zeylona; Fl. Zey. 270.
Photo courtesy of Herbarium Linnean Society of London

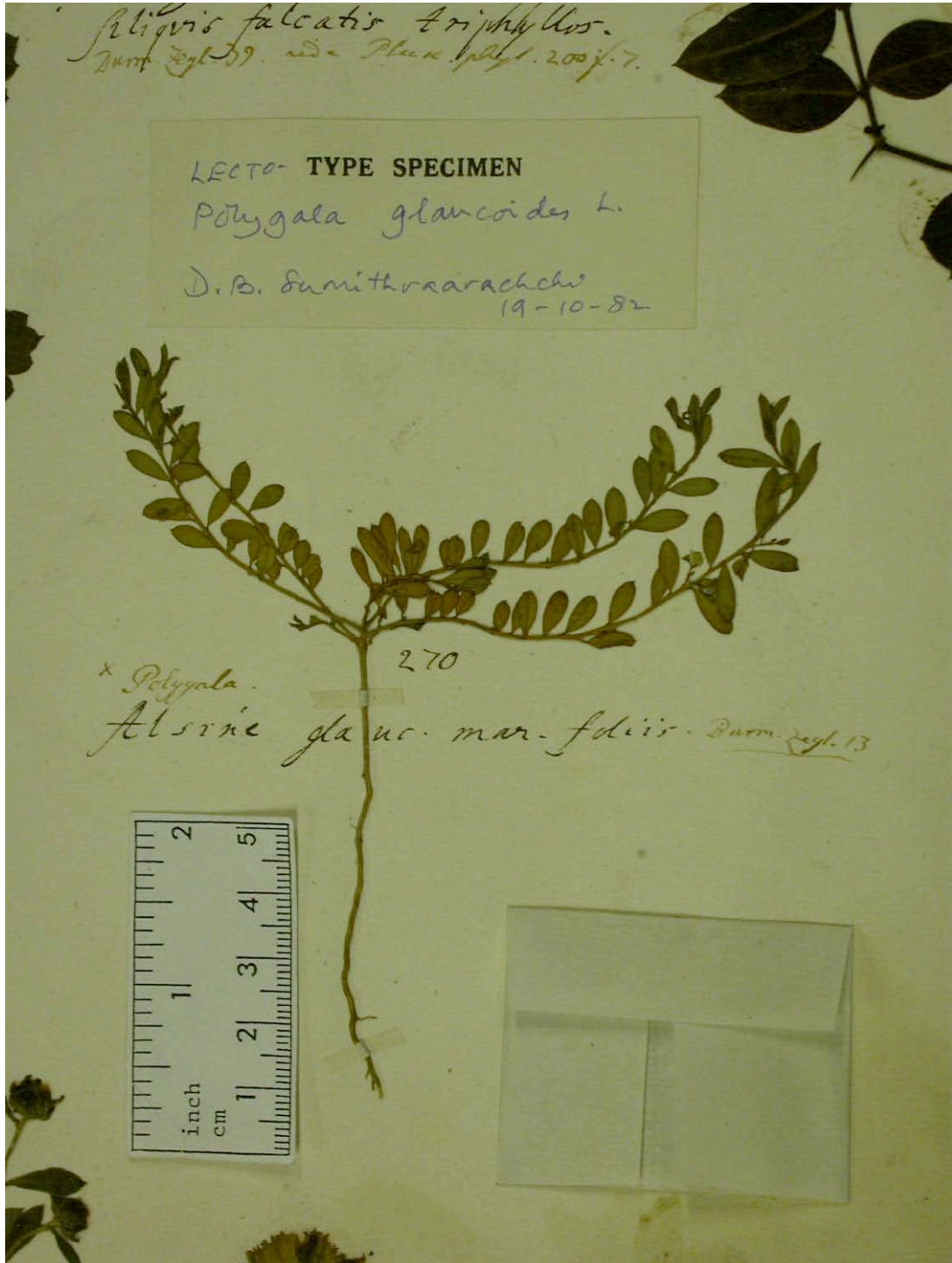


Fig. 5.46. Habit of *Polygala glaucoides* (F.J.H. Mueller MEL 2244586).

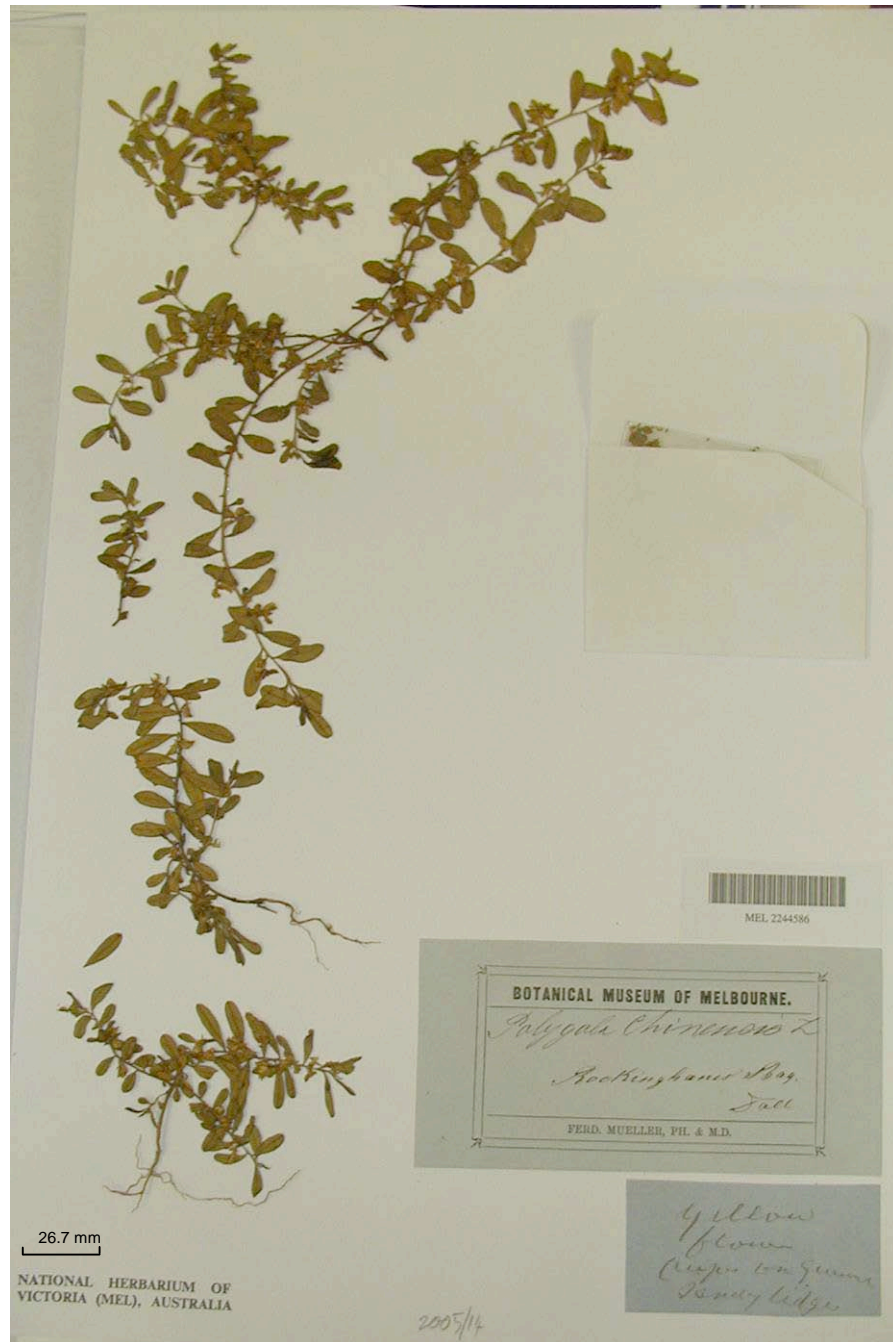


Fig.5.47. Style, stamens and seed of *Polygala glaucoides*. a) style, b) stamens (L. Pedley 1036); and c) seed with rounded aril head (F.J.H. Mueller MEL 2244583).

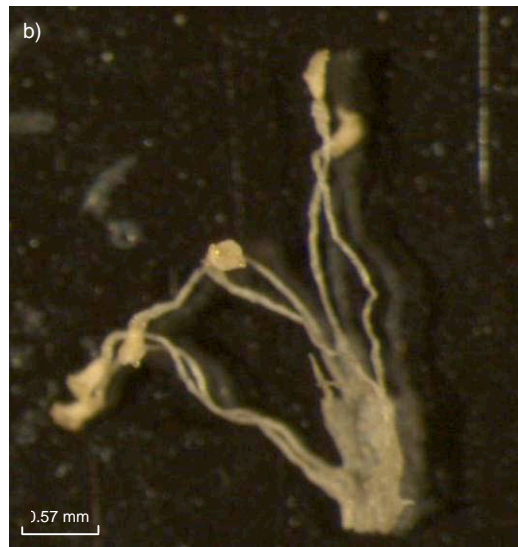
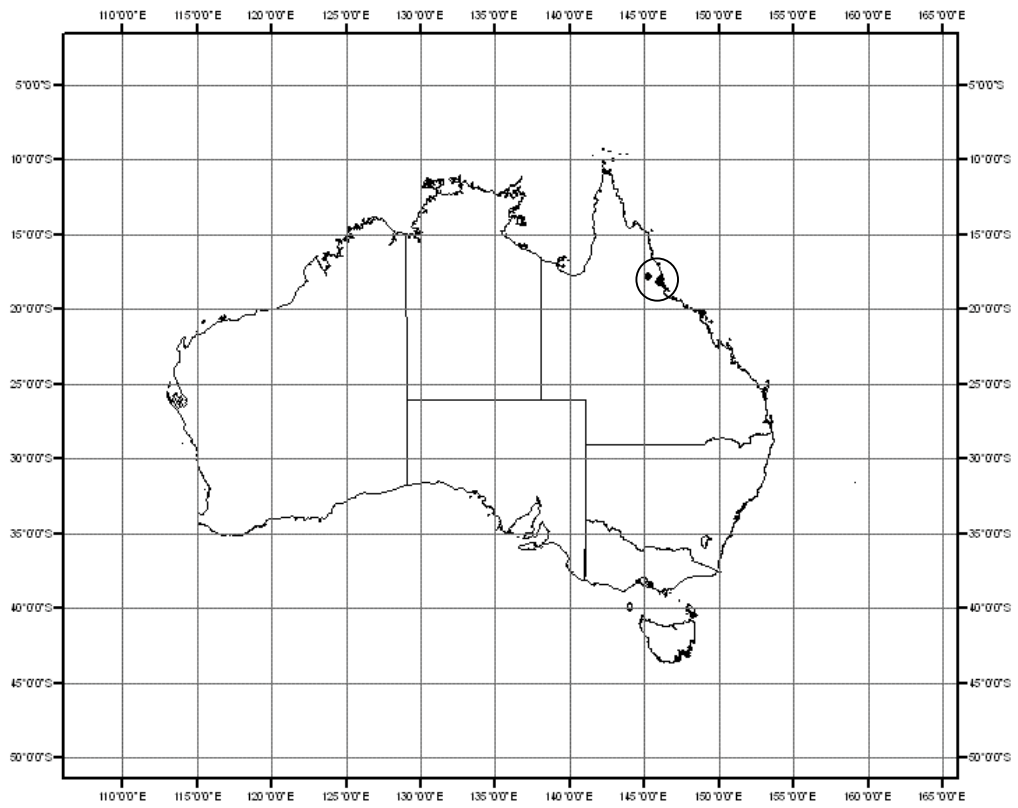


Fig. 5.48. The distribution of *Polygala glaucoides* based on available collection data.



Polygala integra R.A.Kerrigan, *sp. nov.*

Polygala incrassatae et *P. pterocarpae* affinis, a quibus crista florali integra et stigmate plano ad apicem styli differt.

Type: 250 m NE along Green Ant Ck towards East Springs, off Adelaide R. Scenic Hwy, 02.ii.2004, R.A. Kerrigan 725 & R.K. Harwood; holo: DNA 161692!; iso: BRI, CANB, NT, PERTH

[*Polygala eriocephala* [NT material] *auct. non* F.Muell ex Benth.: I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)]

Annual herb, erect to 80 cm, rarely decumbent; indumentum of curved and straight hairs. Base of stem often tinged red or maroon. Leaves linear to oblong, narrowly elliptic or lanceolate, 8–70 mm long, 1–7 mm wide; petiole 0–1 mm. Inflorescence supra-axillary or leaf opposed, a raceme to 60 (-80) mm long. Alae herbaceous, ovate, dimidiate, 3.5–7.0 mm long, 2–5 mm wide. Corolla purple or blue; floral appendages entire and bent at right angles to form a horizontal platform. Stamens terminate well below stigma, monadelphous. Style curved, slightly capitate at apex, with flat stigma on inner surface immediately below apex. Capsule wing present, usually widest at apex of locules or capsule lobes, 0.2–1.4 mm wide; more or less symmetrical, very widely ovate to very widely obovate, or orbicular to squarish, 3.2–4.4 mm long, 3.5–4.0 mm wide. Seed ovoid, 3.0–3.5 mm long, 1.5–1.9 mm wide; indumentum with fine hairs present. Aril head round, c. 0.5 mm long, brown cap on white, with a tuft of hairs. Aril appendages 3, spatulate, rarely linear, 0.75–2.3 mm long. (Fig. 5.50)

Distribution

Australia (NT). Endemic to the NT this species is widely distributed across the Top End, occurring mostly north of and including Nitmiluk National Park and extending to NE Arnhem Land and offshore islands. (Fig. 5.51)

Habitat

Found in open woodlands on a variety of substrates or often along riparian or wetland margins.

Notes

This species has been previously misidentified as *P. eriocephala*, *P. rhinanthoides* and *P. triflora* but is easily distinguishable by the entire reflexed floral appendages and the straight style and flat stigma.

Etymology

Latin *integra* (entire) referring to the undivided entire floral appendages.

Specimens examined: (52)

Northern Territory

Litchfield National Park, 15 km WSW Adelaide River township, 05/03/1996, R. Booth 1509 & I.D. Cowie (CANB, DNA); Berry Springs, 14/05/1984, D.M.J.S. Bowman 4 (DNA); Kakadu National Park, road to Coronation Hill near second gate, 27/03/1990, K.G. Brennan 115 (DNA); Kakadu National Park, about 500m from Nangalor gallery on walking track, 16/02/1991, K.G. Brennan 962 (DNA); Kakadu National Park, hills 18.6km S along Kakadu Hwy from Old Darwin road turnoff, 02/03/1991, K.G. Brennan 1084 (DNA); Kakadu National Park, Gimbat, near SE end of Fisher airstrip, 05/03/1991, K.G. Brennan 1101

(DNA); Near Motor Car Creek Falls, 10/04/1993, *K.G. Brennan 2201* (DNA); Arnhem Land, Tin Camp Creek, 15/04/1993, *K.G. Brennan 2227* (DNA); Kakadu National Park, Stage 3, Goodparla, 01/03/2000, *K.G. Brennan 4773* (DNA); Kakadu National Park, fire plot 36, 29/02/2000, *K.G. Brennan 4866* (DNA); Kakadu National Park, fire plot 1, 24/02/2000, *K.G. Brennan 4938* (DNA); North Coast, Is y2, Pobasso Is, *R. Brown s.n.* (DNA, BRI); 59 mls Stuart Hwy, 31/01/1967, *N.B. Byrnes 163* (DNA); Tipperary Rd, Mary Rr area, 16/03/1987, *M.J. Clark 776* (DNA); 5 km N of South Alligator Rr, Kakadu Hwy, 08/04/1987, *M.J. Clark 894* (DNA); Site 43, Mary Rr, 11/05/1989, *M.J. Clark 1799* (DNA, BRI); Arnhem Hwy, 2 km E of Bark Hut, 08/02/1991, *I.D. Cowie 1374 & R. Booth* (DNA); Near Glenluckie Creek, Stuart Hwy, 15/03/1991, *I.D. Cowie 1571 & P.F. Munns* (DNA, MEL); Pobasso Is, 24/4/1996, *I.D. Cowie 6538* (DNA, BRI, CANB); Inglis Is, N side, 30/04/1996, *I.D. Cowie 6815* (DNA, CANB); Dalywoi Bay, c 10 km SSE of Nhulunbuy, 23/05/1996, *I.D. Cowie 7021* (DNA, MEL); Western Arnhem Land, c.63km SE of Oenpelli, 19/03/2000, *I.D. Cowie 8660* (DNA); Jalboi Rr catchment; c. 16.5 km E by N of Crown Hill, 18/03/2003, *I.D. Cowie 9681* (DNA, MEL); Mudginberri, 16/03/1982, *C.R. Dunlop 6326 & J.A. Taylor* (DNA, CANB); Arnhem Land, Mitchell Range, 02/04/1999, *C.R. Dunlop 10266 & N.G. White* (DNA); Gunn Point, 13/03/1993, *J.L. Egan 2517* (DNA); Hayes Creek, 05/04/1995, *J.L. Egan 4639* (DNA); Charles Darwin National Park, Darwin, 17/04/2000, *R.K. Harwood 806* (DNA, CANB); Melville Is, near mouth of Maclear Ck, 13/04/1986, *R.W. Johnson 4192* (DNA, BRI); Adelaide Rr, 24/04/2003, *R.A. Kerrigan 711 & D.J. Dixon* (DNA); Stuart Hwy, 134 km Bridge, 24/04/2003, *R.A. Kerrigan 712 & D.J. Dixon* (DNA); Stuart Hwy, 134 km Bridge, 24/04/2003, *R.A. Kerrigan 713 & D.J. Dixon* (DNA); Douglas Daly Area, approximately 200m upstream of Green Ant Creek crossing, 23/03/2005, *R.A. Kerrigan 903* (DNA); c. 39 mls NE of Pine Creek Township, 12/3/1965, *M. Lazarides 198 & L.G. Adams* (DNA, CANB, NT, NSW, MEL, BRI); Bathurst Is West of Nguuu, 31/03/2001, *C.P. Mangion 1052 & I.D. Cowie* (DNA, L); 10 mls NW El Sharana, Pine Creek Rd, 22/01/1973, *P. Martensz 466 & R. Schodde* (DNA, CANB); 11 mls S of Katherine, 15/02/1961, *H.S. McKee 8481* (BRI, NSW); Plum Tree Ck Crossing, Kakadu Stage 3, 25/02/1989, *K.A. Menkhorst 262* (DNA, MEL); Bradshaw Stn; fire plot 19, 23/02/1999, *C.R. Mitchell 2311* (DNA); Nitmiluk National Park, 01/03/2001, *C.R. Mitchell 3131 & S. Boyce* (DNA); Nitmiluk National Park, 01/04/2001, *C.R. Mitchell 3132 & B. Deichmann* (DNA); Nitmiluk National Park; south east corner of park, 13/03/2002, *C.R. Mitchell 3603* (DNA, NT); Upper Victoria Rr, *F.J.H. Mueller s.n.* (K); Bynoe Rd, 11/04/1963, *J.S. Muspratt 429* (DNA); Humpty Doo, Solar Village, 03/03/2002, *J.A. Risler 1744 & J.C.Z. Woinarski* (DNA); Big River Stn, NW corner, 18/03/2003, *J.A. Risler 2105* (DNA); Yinberrie Hills, Junction Transect, 09/04/1999, *J.A. Risler 2493 & C.R. Mitchell* (DNA); 0.5M E Stuart Hwy, 60 Mile, 29/04/1964, *C.S. Robinson 344* (DNA); Charles Darwin National Park, 26/02/1998, *P.S. Short 4653 & C.R. Dunlop* (DNA, BRI); Kakadu National Park, Snake Plain, 07/01/1995, *J. Russell-Smith 9158* (DNA); Elizabeth Rr Crossing, Channel Is Rd, 20/03/1989, *N.M. Smith 1431* (DNA); Katherine, Kintore Caves Reserve, 05/03/1996, *S.M. Taylor 360 & D.J. Liddle* (DNA).

Fig. 5.49. The holotype of *Polygala integra*. 250 m NE along Green Ant Ck towards East Springs, off Adelaide Rr Scenic Hwy, 02/02/2004, R.A. Kerrigan 725 & R.K. Harwood (DNA, BRI, PERTH, CANB, NSW, MEL, K)

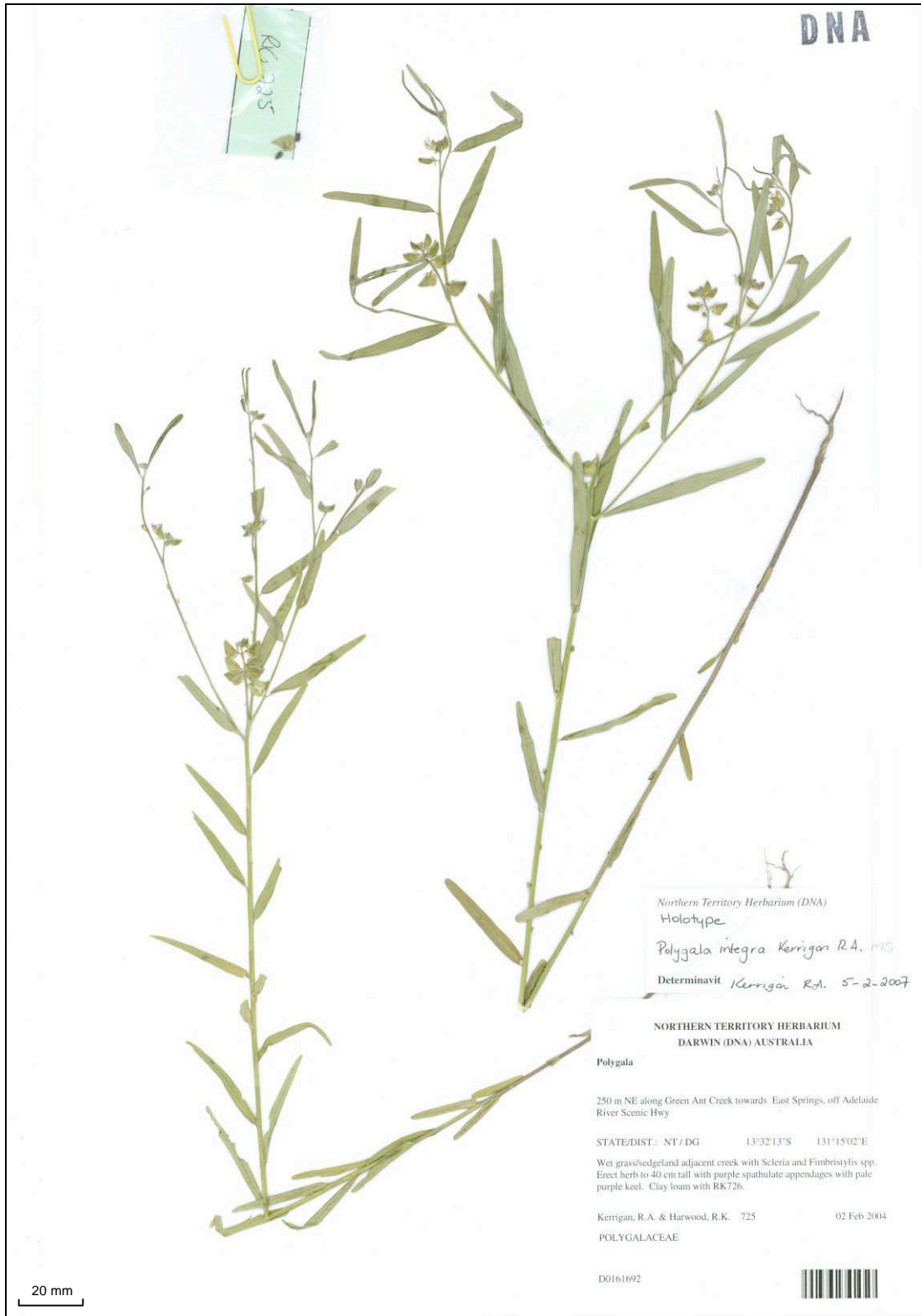


Fig. 5.50. Flower showing, style and seed of *Polygala integra*. a) fresh flower with entire floral appendages (R.A. Kerrigan 725); b) style with flat stigma at apex (R.A. Kerrigan 903); and c) seed with round aril head and black apical dot (R.A. Kerrigan 725).

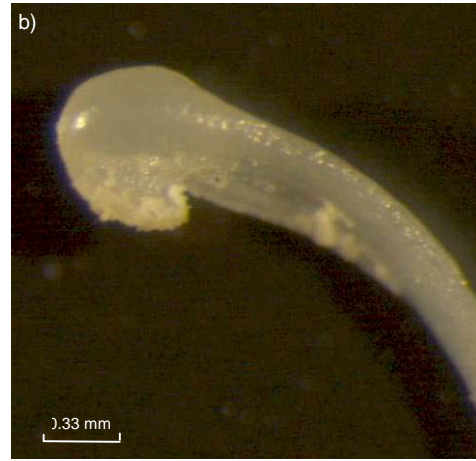
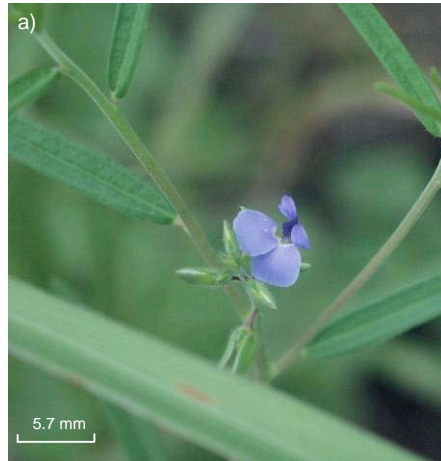
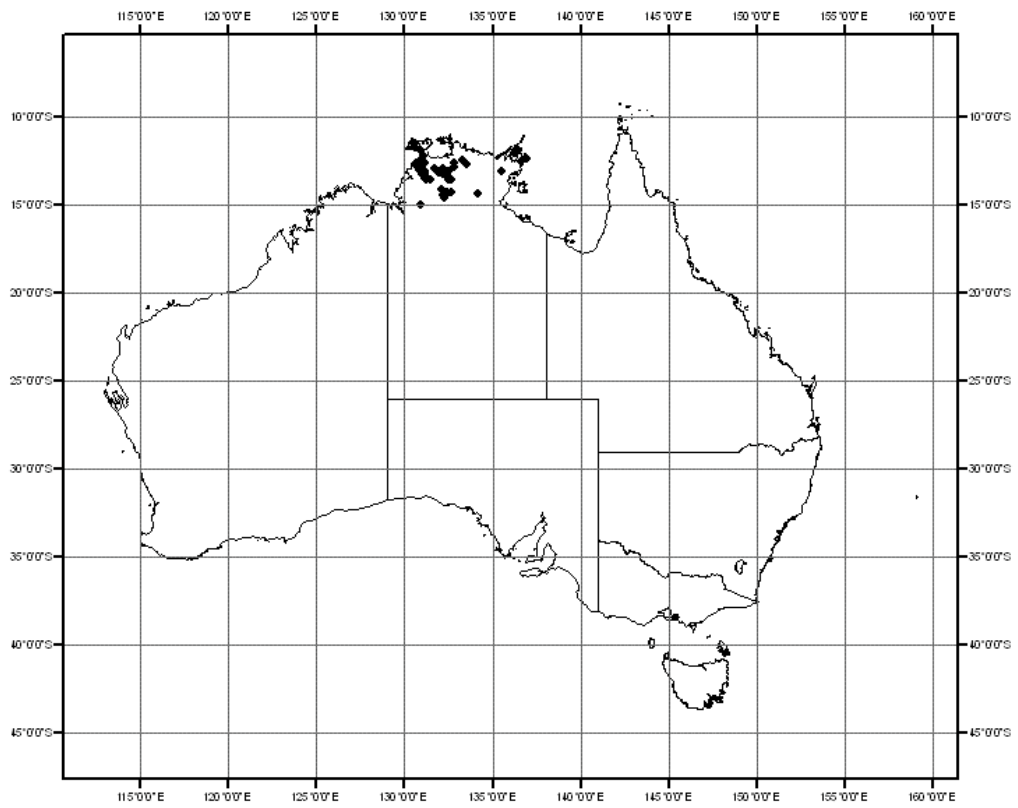


Fig. 5.51. The distribution of *Polygala integra* based on available collection data.



Polygala isingii Pedley, *J. Adel. Bot. Gardens* 3 (1): 128 (1981)

Type: 5 mls S of Mt Barkly, "Barkly" Stn, 14/1/1971, *P.K. Latz 1224*; holo: BRI 118100!; iso: NT

Polygala sp. Western Tanami (D.E. Albrecht 10660) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2005)

Tufted annual or short-lived perennial with a well developed tap root to 13 cm; indumentum of curved and stiff straight hairs. Leaves narrowly oblong, oblanceolate or obovate, 5–22 mm long, 2–10 mm wide; petiole to 1 mm. Inflorescence axillary, solitary or apparently fasciculate, rarely short racemes to 4 mm long. Pedicel to 3 mm. Alae herbaceous, elliptic to spatulate, 3.5–5.0 mm long, 1.5–2.7 mm wide. Corolla purple, floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, beaked at apex, stigma flat along inner surface of hook. Capsule lacking wing, more or less symmetrical, ovoid, 4.2–5.2 mm long, 2.5–4.1 mm wide. Seed shape elongated ovoid, 3.6–4.7 mm long, 1.2–1.7 mm wide; indumentum with fine white or ferruginous hairs present, becoming shorter towards apex, or shorter for ½ to 2/3 of the seed. Aril head helmet shaped with central groove, 0.9–1.0 mm long, white and brown where reduced to seed testa, with short erect hairs. Aril appendages 3, linear 0.7–1.0 mm long. (Fig. 5.53)

Distribution

Australia (NT, WA). This taxon is widely distributed across the arid zone regions of NT and WA, in the Tanami, Gibson, Great Sandy and Little Sandy Deserts. (Fig. 5.54)

Habitat

Found growing in gravelly, sandy or shallow soils on hills in hummock grasslands.

Notes

Two specimens from western Tanami (D.E. Albrecht 10887 & K.G. Brennan, D.E. Albrecht 10660) and one from the Great Sandy Desert (A.S. George 14705) included in this description are distinguished by their thicker tap root, more robust perennial habit; and seed indumentum, with short hairs extending across more of the testa. Further survey and more specimens may result in their recognition as a separate taxon in the future, however it appears they represent longer lived individuals which may have escaped fire or had greater access to water.

This species can be difficult to distinguish from *P. glaucifolia* and *P. triflora*. From the former it can be recognised by the indumentum which appears to be shorter and more hispid in *P. isingii*; the colour, which is generally grey-green in *P. glaucifolia*, and also by the more erect habit and the more developed aril head on the seed. Unlike *P. glaucifolia* which, with some sympatry, generally lies to the east and west of *P. isingii*'s distribution, *P. triflora* is geographically disjunct from *P. isingii*. It can generally be distinguished by the longer inflorescences, however the only specimen E of 135°, D.E. Albrecht 9789, from the Dulcie Ranges is difficult to place as it has longer inflorescences approaching *P. triflora*. A depauperate specimen, it is tentatively placed under *P. isingii* and further collecting in the area is required.

Specimens examined: (34 specimens)

Western Australia

Gibson Desert Reserve, 20/07/2001, *T.B. Bragg 2001-20* (PERTH); Patience Well area, Gibson Desert, 29/04/2001, *A. Campbell 1773* (PERTH); Drill site named Missing, northern Great Sandy Desert, 06/10/2001, *A. Campbell 4155* (PERTH); Camp 1 at Townsend Ridges, 42 km SE of Warburton, Central Ranges, 06/05/2000, *D.J. Edinger 1875* (PERTH); 81 mls SW of Warburton Mission, 26/08/1961, *A.S. George 2898* (PERTH); Gibson Desert, 4 mls W of Dovers Hills, 27/07/1967, *A.S. George 9008* (PERTH); McLarty Hills, Great Sandy Desert, 07/08/1977, *A.S. George 14705* (PERTH); 13 km (by track), SW of Well 35, Canning Stock Route, 07/05/1979, *A.S. George 15652* (PERTH); WA, between Sandfire and Pardoo road houses, 05/05/2006, *R.A. Kerrigan 1090* (DNA, PERTH); Pilbara, about 50 km from Newman on Marble Bar Road, 05/05/2006, *R.A. Kerrigan 1092* (DNA, PERTH); Pilbara, 164.5 km from Port Headland on Great Northern Hwy, 08/05/2006, *R.A. Kerrigan 1094* (DNA, PERTH); Maruwa, 50 km NNE Kiwirrkurra, 19/10/2000, *P.K. Latz 16983* (NT, PERTH); Plot 3, Spinifex Track, Gibson Desert, WA, 06/09/1998, *G.D. Liddleow 46* (PERTH); Little Sandy Desert, 23/04/1979, *A.S. Mitchell 568* (DNA, BRI, PERTH, NT); On the Jigalong, Lake Disappointment track, and about 40 km E of Jigalong (200 km E of Newman), 26/06/1996, *A.A. Mitchell 1238* (PERTH).

Northern Territory

Granites Goldmine, c.0.5 km East entrance to Dead Bullock Soak lease, 25/05/1999, *D.E. Albrecht 8950* (NT); 26 km ESE Mt Ultim, Dulcie Ranges, 10/04/2001, *D.E. Albrecht 9789* (NT); c. 50 km ESE of Lake Buck, Western Tanami, 29/04/2004, *D.E. Albrecht 10660* (NT); c. 144 km due E of Lajamanu, 05/05/2004, *D.E. Albrecht 10887 & K.G. Brennan* (NT); Between the Tanami and The Granites, 01/07/1948, *A.W. Banks 191* (DNA); Willis rockhole about 30 mls E of Sandy Blight Junction, 01/05/1967, *W.H. Butler 97* (PERTH); Lander Rr, 12/03/1973, *N.M. Henry 648* (BRI, DNA); 24 mls south of Mongrel Downs Homestead, 03/08/1970, *P.K. Latz 743* (DNA); 10 mls S Rabbit Flat, 21/07/1973, *P.K. Latz 4060* (DNA, BRI); 14 km SE Sangsters Bore, Tanami Desert, 29/05/1991, *P.K. Latz 11927* (NT, MEL); 52 km NE of Kintore, 15/10/1992, *P.K. Latz 13013* (DNA, NT, MEL); 9 km West Newhaven Homestead, 01/03/2001, *P.K. Latz & D.E. Albrecht 17611* (NT); 20 km ENE of NE corner of Lake Mackay, 04/10/2001, *P.K. Latz 18149* (NT, PERTH); 20 km WNW of Green Swamp Well, N Tanami Desert, 24/09/2003, *P.K. Latz 19235* (NT); SE corner of entry to Lake Surprise, Lander Rr, 09/03/1973, *J.R. Maconochie 1670* (K); Tanami desert, 17/09/1997, *C.R. Mitchell 1080 & D.S. Calliss* (DNA); 12 mls N Aileron, 03/08/1962, *R.F. Swinbourne 390* (DNA, MEL, NT).

Fig. 5.52. The holotype of *Polygala isingii*. 5 mls S. of Mt Barkly, "Barkly" Stn, 14/1/1971, P.K. Latz 1224 (BRI, NT)

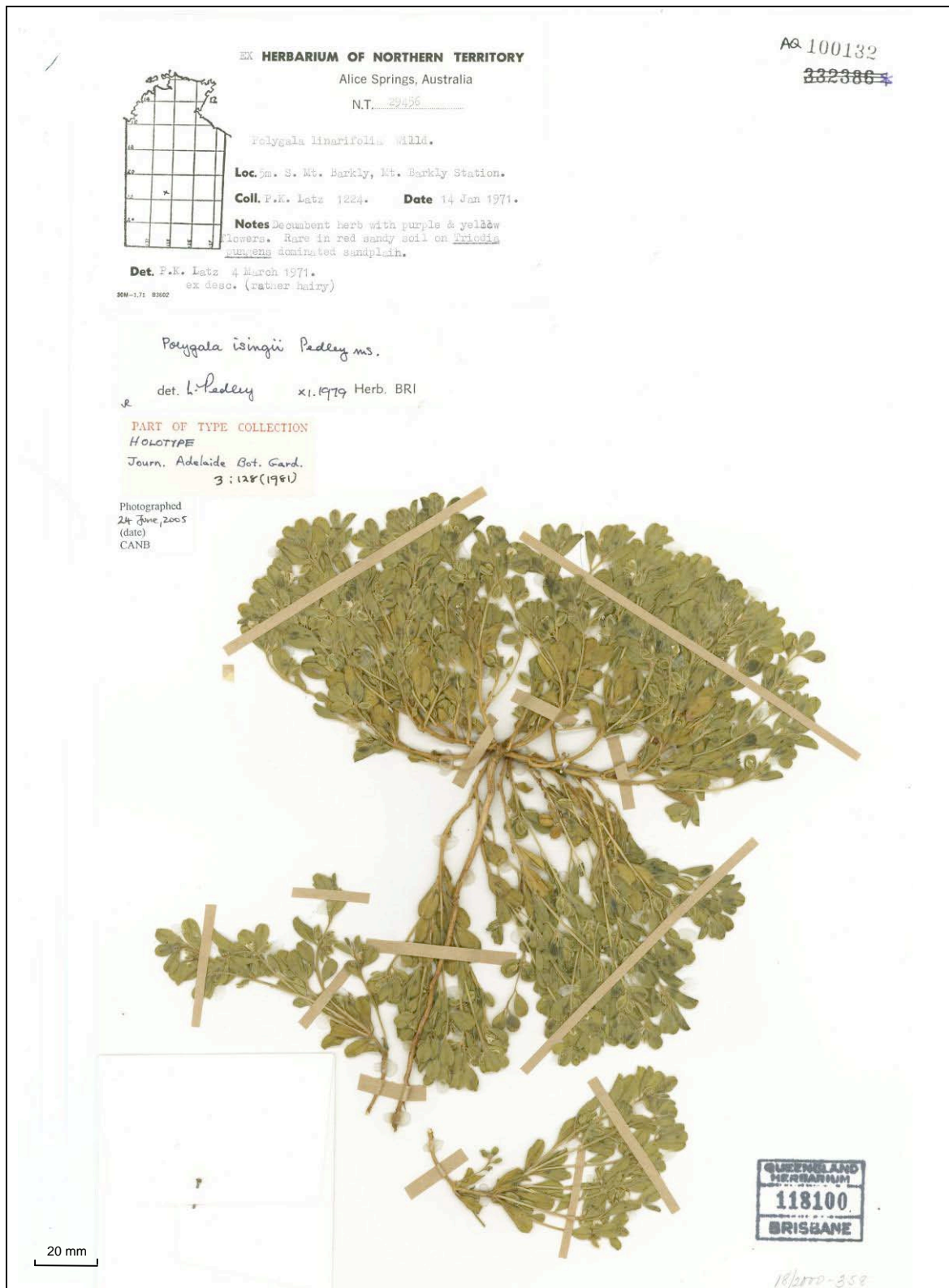
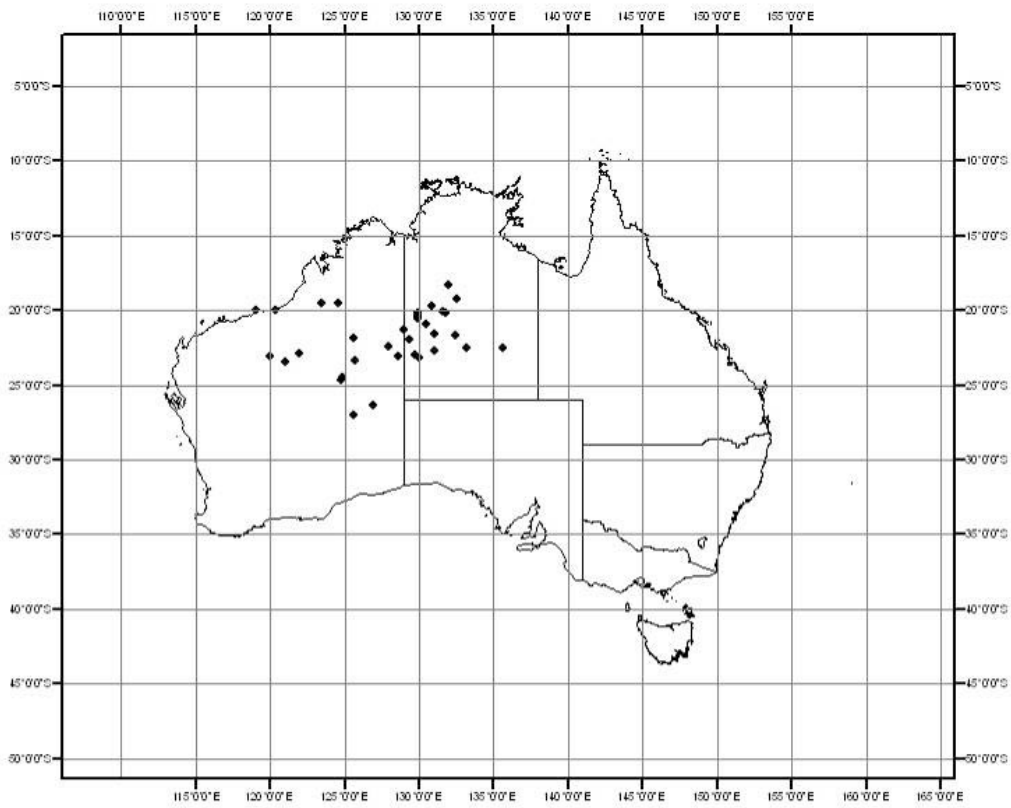


Fig. 5.53. Habit and seed variation of *Polygala isingii*. a) Habit (D.E. Albrecht 8950) and seed with b) long hairs persistent over most of seed (*P.K. Latz* 16983); and c) short hairs persistent over half of seed (D.E. Albrecht 10660).



Fig. 5.54. The distribution of *Polygala isingii* based on available collection data.



Polygala japonica Houtt., *Handl. Plant Kruidk.* 10: 89, t. 62, fig. 1 (1779)

Type: not mentioned; from Japan *n.v. fide* Adema, *Blumea* 14: 263 (1966)

Polygala veronicea F.Muell., *Transactions and Proceedings of the Victorian Institute for the Advancement of Science* 1: 117-118 (1855); *Polygala veronicifolia* Chodat, *Monogr. Polygal.* 2:355 (1893), *nom. illeg. syn*: *Type citation*: In grassy or gravelly places from the King River to the Goulburn River; *Type detail*: In pratis ad flumen Goulburn juxta Wararegarwan, *F.Muell.*?, *syn-* MEL 2263627!, King River, *F.Muell.*?, *syn-* MEL 22636261!; King River, *F.Muell.*, *syn-* K (photo DNA!); *fide* R.van der Meijden, *Fl. Malesiana* I (10): 472 (1988)

[*Polygala sibirica* non L.: Ewart, *Fl. Victoria* 715 (1931)]

Perennial herb or subshrub, diffuse to about 30 cm; indumentum of curved hairs throughout. Leaves elliptic to ovate, 5–20 mm long, 3–10 mm wide, more or less sessile, prominently veined. Inflorescence leaf opposed or supra-axillary, sometimes solitary, usually a short raceme to 30 mm. Pedicel to 2–6 mm. Alae mauve to blue, ovate to obovate, 4–6 mm long, 1.5–2.5 mm wide. Corolla purple and cream, floral appendages much divided. Stamens terminate at stigma, nearly connate to apex, monadelphous. Style more or less straight becoming hooked at apex, stigmas 2, globular, spaced, 1 apical, the other lateral. Capsule with wing *c.* 0.5 mm wide, orbicular to broadly obcordate, 3–8 mm long, 3–8 mm wide. Seed shape ovate, *c.* 2.5–3.0 mm long, *c.* 2 mm wide; indumentum with fine white or ferruginous hairs. Aril head skewed, *c.* 0.6 mm long, white, with short hairs. Aril appendages 3, linear-oblong, *c.* 1 mm long.

Distribution

Australia (QLD, VIC, NSW, ACT), India, Burma, Sri Lanka, Indochina, Japan, Korea, Siberia, China, Malesia, Philippines and New Guinea. This species is widespread along the east coast from southern Queensland to Victoria. (Fig. 5.55)

Habitat

Found in woodlands in loam and clay loam.

Notes

This species was not revised in this study but it needed to be included to provide an account of all Australian natives. The species concept of van der Meijden (1988) has been followed here as it was possible to examine only a small number of specimens. The above description has been augmented where necessary from Flora of NSW, Flora of Victoria, Adema (1966) and van der Meijden (1988) and the species concept *sensu* van der Meijden (1988) is maintained. For a full list of synonymy see van der Meijden (1988), as only Australian synonyms are listed above. Typification follows Adema (1966).

Specimens examined: (5)

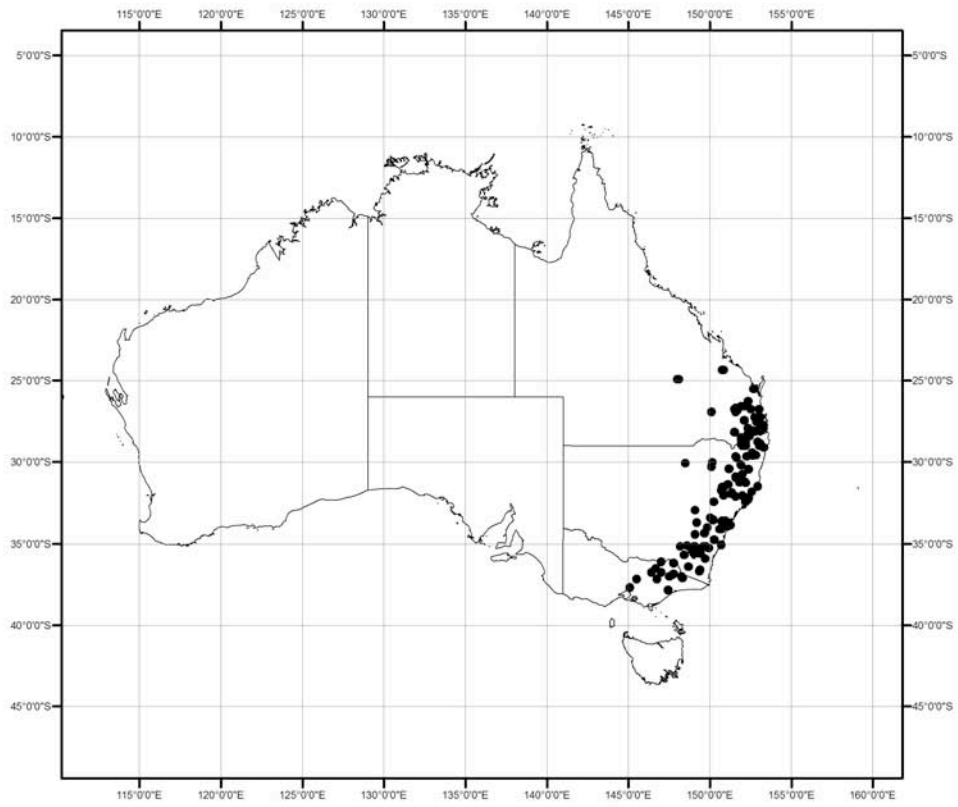
New South Wales

Slope north of Chaffey Dam, 12/11/1993, *J.R. Hosking* 867 (TARCH, CBG, MEL, NSW, UNE); Bungwahl-road, Bulladelah, 7/1923, *A. Rupp s.n.* (MEL); Myall Rr above Bulladelah, 9/1923, *H.M.R. Rupp s.n.* (MEL); Southern Tablelands, Kosciusko National Park, Yarrangobilly Caves Reserve, foot-track to thermal spring, 23/2/1992, *N.G. Walsh* 3341 (MEL).

Australian Capital Territory

Gungahlin 500 m ENE of Gungahlin Hill, 25/1/1997, *I. Crawford* 4233 (MEL).

Fig. 5.55. The distribution of *Polygala japonica* based on available collection data.



Polygala kimberleyensis R.A.Kerrigan, *sp. nov.*

Polygala barbatae similis, a qua arillo galeiformi differt.

Type: Kimberley, 3.8 km E of Adcock Gorge turnoff on Gibb River Rd, 13.v.2006, R.A. Kerrigan 1111 (Fig. 5.56)

holo: DNA 176670!; iso: BRI, CANB, PERTH

Annual herb, erect to 30 cm, often with spreading branches or prostrate; indumentum of curved and straight hairs. Leaves variable from very widely ovate, obovate to depressed obovate, or orbicular, 3–38 mm long, 4–25 mm wide; petiole 0–3 mm. Inflorescence axillary, supra-axillary, usually on a short raceme to 10 mm long or solitary. Pedicel to 0.5 mm. Alae herbaceous, ovate, usually somewhat dimidiate, 3.8–5.0 mm long, 1.5–2.5 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat along inner surface of hook. Capsule lacking wing (if present c. 0.5 mm), more or less symmetrical, very widely ovate to widely oblong or squarish, 3.7–5.5 mm long, 3.5–4.9 mm wide. Seed ovoid, 3.15–5.0 mm long, 1.6–2.5 mm wide; indumentum with fine white or ferruginous hairs, hairs becoming shorter towards seed apex, or mostly glabrous. Aril head helmet shaped or rounded but skewed, 0.5–1.0 mm long, white or white and brown, with short hairs. Aril appendages 3, shortly linear, 0.9–1.5 mm long. (Fig. 5.57)

Distribution

Australia (WA). Endemic to WA this species is only known from a few collections scattered across the Kimberley and extending to coastal islands. (Fig. 5.58)

Habitat

Found in eucalypt woodlands associated with sand amongst sandstone.

Notes

This species is very similar to *P. barbata*, it is readily distinguished by the helmet shaped aril head.

Etymology

In reference to the geographic region where this taxon is found.

Specimens examined: (5)

Western Australia

2 km N of Beverley Springs Stn Homestead, 03/05/1988, R.J. Cranfield 6683 (PERTH); Kimberley, 1 km E of Adcock Gorge turnoff on Gibb River Road, 13/05/2006, R.A. Kerrigan 1110 (DNA, PERTH); Lachlan Is, Buccaneer Archipelago, NE of Derby, 10/04/1997, J. Martin 117 (PERTH); Near Willie Reids camp, King Anna S end Vansittar Bay, 24/03/1993, A.A. Mitchell 2902 (PERTH); 6 km from Kalumburu road towards King Edward Rr crossing along Mitchell Rr Stn track, 02/05/1992, I.R.H. Telford 11653 (CBG, PERTH)

Fig. 5.56. The holotype of *Polygala kimberleyensis*. Kimberley, 3.8 km E of Adcock Gorge turnoff on Gibb River Rd, 13/05/2006, R.A. Kerrigan 1111 (DNA, PERTH, BRI, CANB)

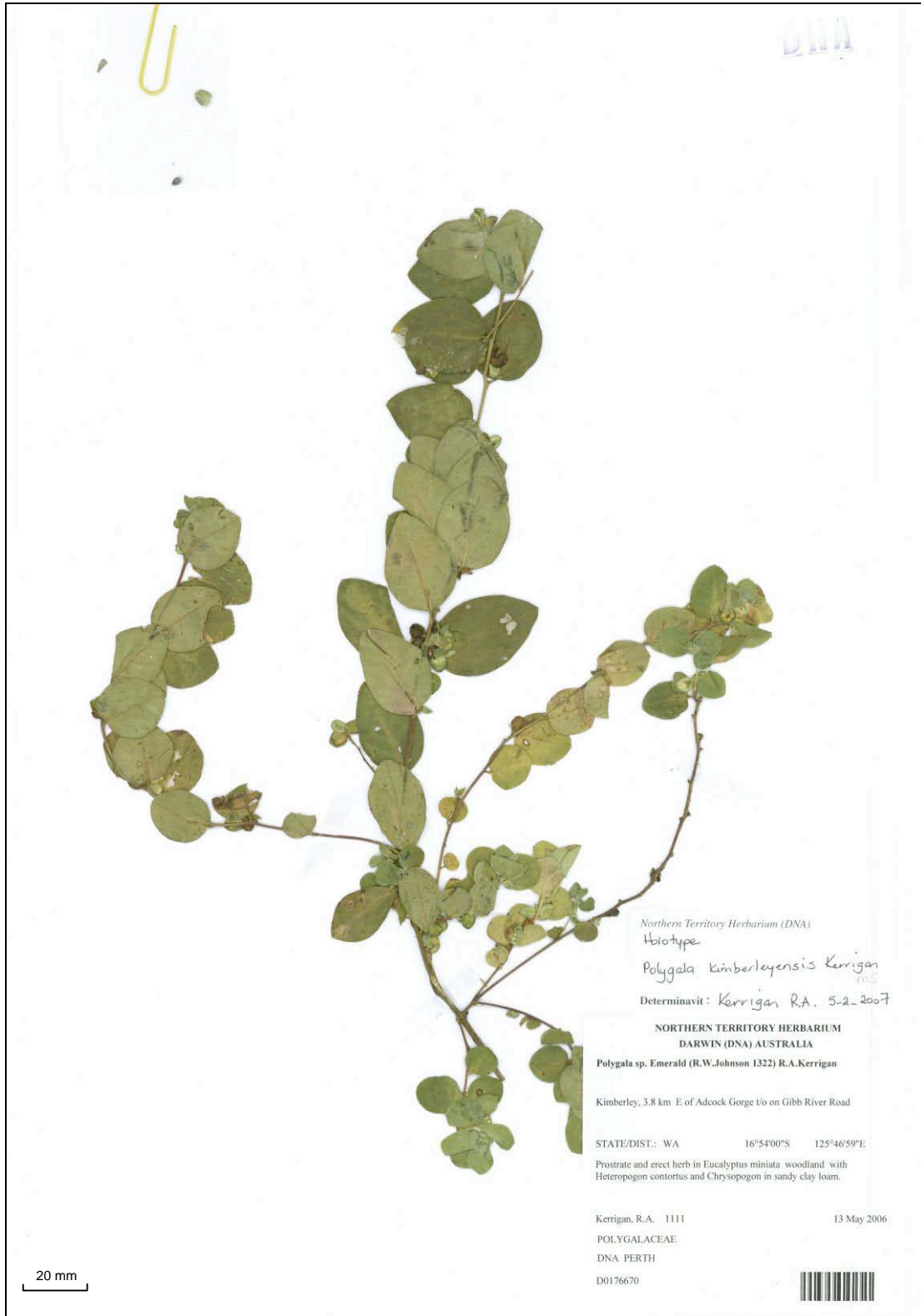
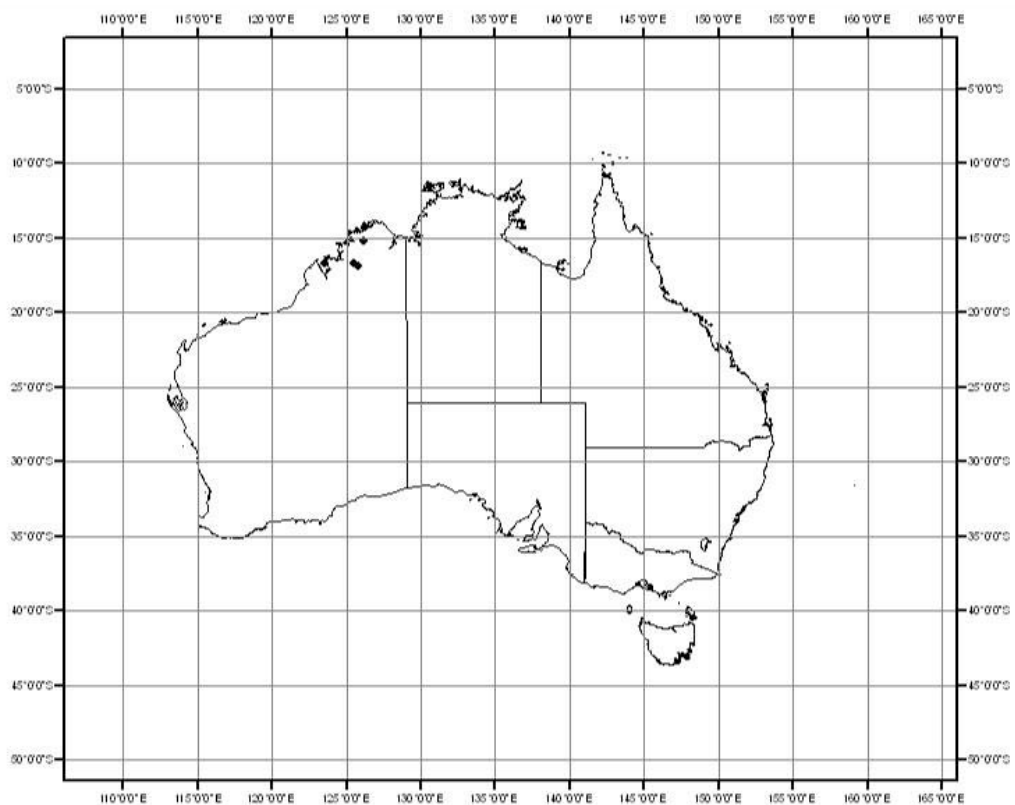


Fig. 5.57. Seed of *Polygala kimberleyensis* (A.A. Mitchell 2902)



Fig. 5.58. The distribution of *Polygala kimberleyensis* based on available collection data.



Polygala linearis R.A.Kerrigan, *nom. nov.*

P. stenoclada var. *stenosepala* Benth. *Fl. Austral. Benth.*, 141 (1863)

Type: Carpentaria, Point T and Point S Arnhem Bay [Cape Shield and Point Blane], 26.i.1803, *R. Brown s.n.*; holo: BM 566304!

[*Polygala stenoclada* auct. non Benth.: I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004). (1863)]

Annual herb, erect to 35 cm, single stemmed or multi-stemmed with erect arching branches, rarely decumbent or prostrate throughout; indumentum of mostly curved and rarely straight hairs. Stems often tinged maroon. Leaves linear, occasionally narrowly elliptic or lanceolate, 2.5–58.0 mm long, 0.5–4.0 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary or axillary raceme to 170 mm long. Pedicel to 8 mm. Alae herbaceous, occasionally with red stripe, lanceolate, narrowly elliptic, oblanceolate; slightly dimidiate to falcate, length 3.6–7.6 mm long, 1.0–2.4 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, with flat stigma on inner surface of hook. Capsule lacking wing, usually strongly asymmetrical, rhomboid in shape, rarely squarish, 2.5–5.0 mm long, 2.0–4.5 mm wide. Seed ovoid-oblong, 2.2–3.5 mm long, 1.1–2.0 mm wide; indumentum with two hair types present, fine white hairs throughout and thick hollow hairs strongly recurved below aril. Aril round to hooked, 0.3–0.8 mm long, white, with hairs, rarely glabrous. Aril appendages 3, linear, 0.3–1.5 mm long. (Fig. 5.60)

Distribution

Australia (NT, WA). This species is mainly distributed across the top end of the NT from NE Arnhem Land to the Victoria Rr. Only one specimen has been collected from WA (M.D. Barrett 188), on Beverley Springs Stn, and although it is curious that no other specimens have been collected for this species in WA there are no reasons to doubt the locality. M.D. Barrett lived for some time on Beverley Spings Stn and made a number of valuable collections from the area. (Fig. 5.61)

Habitat

Usually found in seasonally inundated situations, often in *Melaleuca* woodlands, sedge or herb fields, on sand, silt or clay loam.

Notes

This species is very similar to *P. bifoliata*, *P. stenoclada* and *P. scorpioides*, distinguishing characters are discussed under those species. Three outlier specimens C.R. Dunlop 9464 & I.D. Cowie, I.D. Cowie 9490 and K.G. Brennan 6962 found in NE Arnhem Land are treated here under *P. linearis* but are possibly hybridise with another species. They tend to have longer inflorescences, leaves, flowers and seeds than typical, with further material they may be considered a distinct taxon.

Typification

There are two specimens labelled *R. Brown* 4971, BM566304 and K279794. The BM specimen 566304 is the only specimen with a hand written label matching that of *Flora Australiensis* "Carpentaria Point and Arnhem Bays". Specimen K279794 is simply labelled Carpentaria and it is difficult to establish if it is part of the same gathering. The number is known to have been added some time later (Orchard 1999). Because it

does not match the location description cited in Bentham (1863) it is not considered a syntype here and therefore lectotypification is not required.

The name *P. stenosepala* was not used in this case as the taxon was previously misapplied to *P. stenoclada*. Given the similarity of this name and the existence of a *P. stenophylla* and *P. stenopetala* a new name was coined to avoid possible confusion following ICBN (2006) Recommendation 23A.3.g .

Etymology

Latin *linearis*- referring to the linear leaves.

Specimens examined: (36)

Western Australia

c. 500 m E of Beverley Springs Stn Homestead, W Kimberley, 10/02/1993, *M.D. Barrett 188* (PERTH)

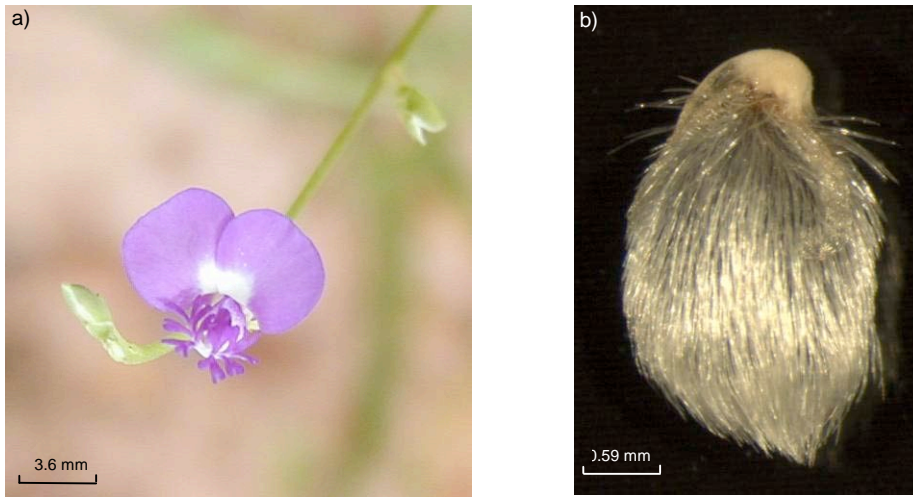
Northern Territory

Boggy Plain Creek, near Jabiru, 21/02/1973, *L.G. Adams 3043* (BRI, CANB); Ja Ja lease near Magela Ck, 20/12/1978, *R. Bolus s.n.* (DNA); Holmes Jungle, 06/01/1995, *R. Booth 246* (DNA); Kakadu National Park, Jabiru town on walking track to Kakadu Park HQ, 15/01/1991, *K.G. Brennan 847* (DNA); Arnhem Land, near track from Nabarlek to Tin Camp Creek, about 11 km SE Nabarlek, 19/02/1992, *K.G. Brennan 1868* (DNA); Between Milikapiti and Turracumbi Falls, 24/12/2000, *K.G. Brennan 4631* (DNA); Along Bulman track within 10 km of Cape Arnhem road intersection, 12/5/2006, *K.G. Brennan 6962* (DNA); Carpentaria, *R. Brown s.n.* (MEL); Bullita Stn, Gregory National Park, 06/02/1986, *M.J. Clark 255* (DNA); Gregory National Park, Victoria Hwy, 15/02/1992, *I.D. Cowie 2463* & *P.S. Brocklehurst* (DNA); Arnhem Land, c. 19 km ESE of Ramingining, 25/06/2001, *I.D. Cowie 9490* (DNA); Cobourg Peninsula, S of Danger Point, 01/02/2005, *I.D. Cowie 10407* (DNA); Kakadu, 19/02/1973, *L.A. Craven 2306* (CANB); Kapalga, Kakadu National Park, 26/02/1988, *C.R. Dunlop 7663* (DNA, BRI); Cape Shield, 04/05/1993, *C.R. Dunlop 9464* & *I.D. Cowie* (DNA); Howard Springs, Gunn Point Rd, 27/12/1993, *J.L. Egan 2922* (DNA); Black Jungle, 30/12/1993, *J.L. Egan 2928* (DNA); Stuart Hwy, Edith Rr, 17/12/1990, *M. Evans 3503* (DNA, K); Melville Is, 16/11/1986, *R.J. Fensham 376* (DNA); Litchfield National Park, almost opposite Buley Rockhole turnoff, 28/03/2003, *R.K. Harwood 1270* (DNA); Port Darwin, *M. Holtze 391* (MEL); Port Darwin, *M. Holtze 443* (DNA); Howard Springs, Girraween road, 27/01/2005, *R.A. Kerrigan 861* & *J.L. Egan* (DNA); Melville Is, 1km N 9 mls waterhole, Snake Bay Rd, 20/01/1992, *G.J. Leach 2912* & *I.D. Cowie* (DNA); Cape Shield, Blue Mud Bay, 03/05/1993, *G.J. Leach 3619* & *I.D. Cowie* (DNA, BRI, L); Douglas Daly Research Farm, 21/01/1998, *C.R. Mitchell 533* & *K.J. Nicholl* (DNA); Nitmiluk National Park, Marrawal Plateau, 19/04/2002, *C.R. Mitchell 3608* (DNA); Nabarlek Airstrip, 21/04/1979, *B.L. Rice 3089* (DNA); Koongara, 02/05/1981, *B.L. Rice 3342* (CANB); Cobourg Peninsula, c. 2-5 km N of Aararu turnoff on road to Black Point, 04/03/2003, *J.A. Risler 2392* (DNA); 12.5 km W of Corroboree Park along Arnhem Hwy, 19/02/2003, *P.S. Short 5145* (DNA); Termite mounds about 6.5 km E of Corroboree Park along Arnhem Hwy, 19/02/2003, *P.S. Short 5146* (DNA); Kapalga, 25/02/1981, *J.A. Taylor 252* (DNA, NT); Howard Springs, 05/01/1995, *S.M. Taylor 252* & *J.L. Egan* (DNA); 2km W Bullita Out-Stn, Gregory National Park, 06/02/1986, *B.G. Thomson 1204* (NT); Livingstone Rd Reserve, 27/01/1994, *D.C. Van Kerckhof 7* (DNA).

Fig. 5.59. The holotype of *Polygala linearis*. Carpentaria Point and Arnhem Bay, 26/1/1803, R. Brown s.n. BM566304 (BM). © The Natural History Museum, London



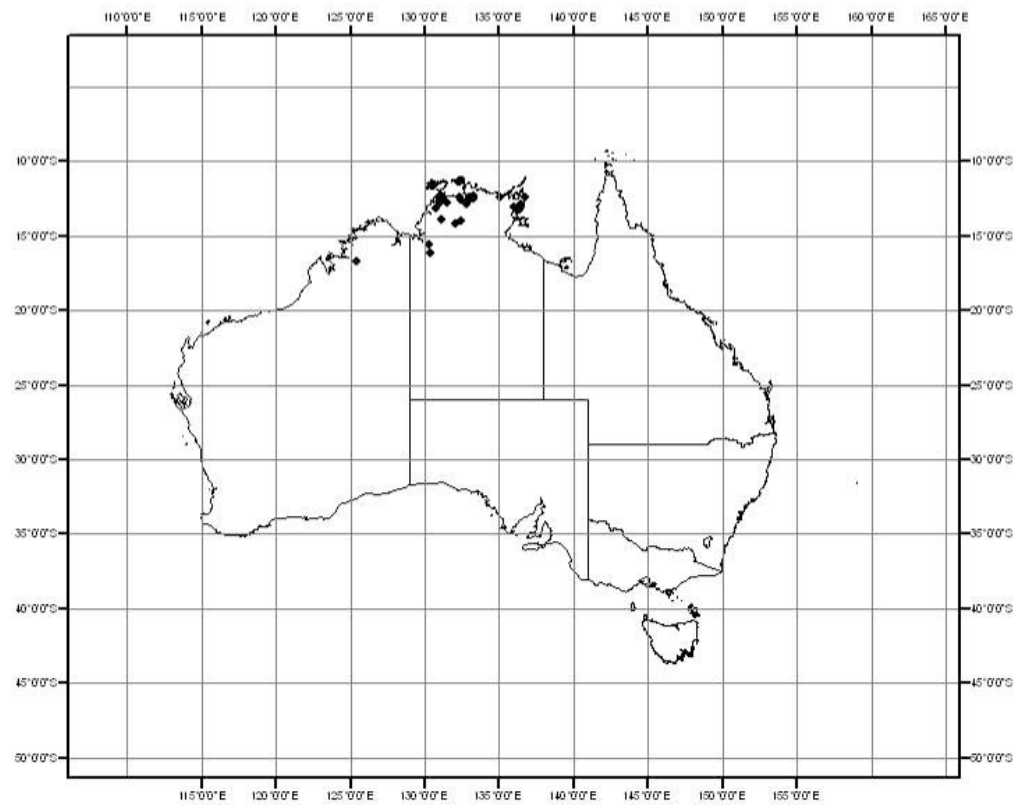
Fig. 5.60. Flower and seed of *Polygala linearis* (R.A.Kerrigan 861). a) Flower with fimbriate floral appendages and b) seed with two hair types.



a) 1 mm = 0.36 mm

b) 1 mm = 0.059 mm

Fig. 5.61. The distribution of *Polygala linearis* based on available collection data.



Polygala longifolia Poir., *Encyclopedie Methodique, Botanique* 5: 501 (1804)

Type: Cette plante a été rapportée par Commerson de l'île de Java (v.s. in herb. Lamarck)

holo: P-LA *n.v.*; iso: FI *n.v.*, *fide* F. Adema, *Blumea* 14:266 (1966)

Polygala leptalea DC., *Prodr.* 1:325 (1824). *Type:* 'in Napaulia. Wallich'. holo: G-DC (photo DNA!).

Polygala leptalea var. *australiensis* Domin *Biblioth. Bot.* 89(4): 855 (1930); *Type:* 'Nord-Australien: Port Darwin, F. Schultz. No. 276'; holo: MEL37310!

Polygala abyssinica var. *intercedens* Domin *Biblioth. Bot.* 89(4): 855 (1930) *Type:* Nord-Australien: Port Essington, *Armstrong* No. 365, syn- K (photo !); Upper Victoria River, *F.Muell.*, syn- K (photo!); *fide* A.M.Monro, *Systematics of the Australian Polygalaceae and Xanthophyllaceae*. Unpublished Thesis. ANU (2003)

[*Polygala abyssinica* [Australian material] *auct. non* Fresen: K. Domin, *Biblioth. Bot.* 89:301 (1927)] *fide* A.M.Monro, *Systematics of the Australian Polygalaceae and Xanthophyllaceae*. Unpublished Thesis. ANU (2003)

Annual herb, erect to 120 cm; indumentum of curved hairs, glabrescent. Stems and leaves often red or maroon tinged especially at base of plant. Leaves more or less caducous, plant often leafless or with only a few leaves; linear to lanceolate, sometimes oblanceolate to obovate leaves towards the very base of plant, 5–32 mm long, 0.5–7.0 mm wide; petiole 0–0.5 mm. Inflorescence a terminal raceme to 200 mm long. Pedicel to 2 mm. Alae petaloid, pink or white with maroon veins, obovate, oblanceolate, 3.0–6.4 mm long, 1.6–3.3 mm wide. Corolla white to pink; fimbriate. Stamens more or less terminate at stigma, monadelphous. Style curved, stigma flat at apex of style. Capsule lacking wing or present to 0.5 mm wide, more or less symmetrical, obovate, 3–5 mm long, 1.5–2.8 mm wide. Seed oblong, 1.8–3.3 mm long, 0.6–1.0 mm wide; indumentum with fine white hairs becoming shorter towards seed apex and recurved, often extending beyond seed, rarely ending at seed base. Aril head horseshoe shaped, 0.3–0.5 mm long, white with brown groove where reduced, short hairs present and often concentrated along the groove. Aril appendages 3, absent or much reduced triangular projections, 0.25 mm long. (Fig. 5.62 & Fig. 5.63)

Distribution

Australia (NT, WA, QLD), SE Asia and Malesia. This species is very widely distributed across WA, NT and QLD, generally north of 19° S. A specimen held at CANB, which places this species in Alice Springs in 1974 (D. Verdon 778A), is treated as dubious. (Fig. 5.64)

Habitat

Found in a variety of habitats including eucalypt woodlands, *Acacia* and *Melaleuca* shrublands, drainage depressions and seepage areas. Grows in a variety of substrates including laterite, sandstone, skeletal soils, sandy loam, basalt, quartzite and clay.

Notes

Readily distinguished by the petaloid obovate alae, small flowers and erect terminal raceme.

Specimens examined: (107)

Western Australia

Rocky Ck, Kalumburu Rd, 129.1km by road N of junction with Gibb River and Ellenbrae Rd, 30/04/1985, *T.E.H. Aplin 749* (PERTH); Camp Creek Valley below the crushing plant, Mitchell Plateau, 15/05/1979, *J.S. Beard 8508* (PERTH); Gibb Rr - Kalumburu Mission Rd, 15.3 km N of Doggan Rr, 195 km W of Wyndham, 31/05/1976, *A.C. Beauglehole 51792* (PERTH); 1 km NE of Carson Rr Crossing, Gibb Rr - Kalumburu Mission Rd, 175 km W of Wyndham, 03/06/1976, *A.C. Beauglehole 51987* (PERTH); Gibb Rr - Kalumburu Mission Rd, McDonald Creek, 185 km W of Wyndham, 04/06/1976, *A.C. Beauglehole 52198* (PERTH); Meda - Oobagooma Rd, 80 km by road N of Gibb River Rd, 70 km NE of Derby, 13/06/1976, *A.C. Beauglehole 52769* (PERTH); King Edward Rr, 50 km NE of Mitchell Rr Homestead, 23/08/1978, *A.C. Beauglehole 58849 & E.G. Errey* (PERTH); Kimberley Region; Kalumburu Rd; 5 km E King Edward Rr, 21/05/1993, *I.D. Cowie 4189 & L.A. Craven* (DNA, CANB, PERTH); Mitchell Plateau, c. 3.5 km NW of Mitchell Plateau Mining Camp, 22/4/1977, *Hj. Eichler 22421* (DNA, CANB, PERTH); Base of Mt Broome, 01/05/1905, *W.V. Fitzgerald 808* (PERTH); Mitchell Plateau mining camp, in disturbed woodland between camp and airstrip, on laterite, 10/05/1983, *P.A. Fryxell 4014 & L.A. Craven* (CANB, PERTH); Between McDonald and Glenelg Rr, 06/07/1950, *C.A. Gardner 9586* (PERTH); Headwaters of Packsaddle Creek, Northern Carr Boyd Ranges, 08/03/1978, *T.G. Hartley 14382* (CANB, PERTH); Airfield Swamp, Mitchell Plateau, NW Kimberley, 14/06/1976, *K.F. Kenneally 4849* (PERTH); Black Mud Swamp, 24 km from Amax camp on Mitchell River Stn Rd, Mitchell Plateau, 24/06/1976, *K.F. Kenneally 5313* (PERTH); Dog Leg Swamp, 35 km SE of Amax campsite, on Theda Stn Rd, 20/05/1978, *K.F. Kenneally 6726* (PERTH); Adjacent Theda Stn Homestead, N Kimberley, 21/05/1998, *K.F. Kenneally 12130* (PERTH); 24 km WSW of Ord Rr Dam, NE Kimberley, 13/03/1978, *M. Lazarides 8531* (PERTH, CANB); 8 kms NW of Beverley Springs Homestead, 26/05/1979, *B.G. Muir 661* (PERTH).

Northern Territory

Kakadu National Park, Gimbat, near SE end of Fisher airstrip, 05/03/1991, *K.G. Brennan 1103* (DNA); Kakadu National Park, Gimbat, 05/04/1990, *K.G. Brennan 134* (DNA); Kakadu National Park, along Kakadu Hwy, 7km toward Mary Rr from Stage 3 entrance Stn, 10/04/1993, *K.G. Brennan 2191* (DNA); 11 km Sth Gove Airport terminal, 24/02/1994, *K.G. Brennan 2636* (DNA); Kakadu National Park, Ranger Uranium Lease, 13/03/1996, *K.G. Brennan 3218* (DNA); Kakadu National Park, fire plot 2, 24/02/2000, *K.G. Brennan 4933* (DNA); 3 km N of Adelaide Rr bridge on Stuart Hwy, 03/05/1983, *J.D. Briggs 816* (CANB, MEL); Cobourg Peninsula, 07/05/1987, *M.J. Clark 1058* (DNA); Mary Rr, 10/12/1986, *M.J. Clark 1741* (DNA); Mount Gardiner Ridge, 18/03/1987, *M.J. Clark 801* (DNA); Pine Creek Rd, N of Bowerbird Ck, 18/03/1987, *M.J. Clark 813* (DNA, BRI, MEL); Kapalga, 10/03/1977, *R. Collins 315* (DNA, K, CANB); Kapalga, 27/04/1977, *R. Collins 371* (DNA); Daly Rr Rd, N of Silver Mine Ck, 11/04/1993, *I.D. Cowie 3347* (DNA); Litchfield National Park, 15km WSW of Adelaide Rr township, 05/03/1996, *I.D. Cowie 6211 & R. Booth* (DNA); Gregory National Park, c.13km SSW of Revolver Yard, 17/04/1996, *I.D. Cowie 6496 & C.A. Coles* (DNA, MEL); Inglis Is, N side, 30/04/1996, *I.D. Cowie 6817* (DNA, MEL); Ramingining area, Djapidi Djapin Ck, 26/07/1998, *I.D. Cowie 7883 & C.R. Dunlop* (DNA); Kakadu National Park, Arnhem Highway near W branch of West Alligator Rr, 09/04/2003, *I.D. Cowie 9949 & D.J. Dixon* (DNA, BRI, MEL, MO); McArthur Rr area, 4/6/1976, *L.A. Craven 4129* (DNA); Kapalga, 09/03/1982, *C.R. Dunlop 6052 & J.A. Taylor* (DNA); Tabletop Range, Florence Ck, 20/05/1985, *C.R. Dunlop 6817* (DNA); Carpentaria Hwy, 30/03/1994, *J.L. Egan 3506* (DNA); Rren Stn, 30/07/1994, *J.L. Egan 3889* (DNA); Bunda Stn, 09/06/1994, *J.L. Egan 4157* (DNA); Stuart Hwy, 134 km Bridge, 05/04/1995, *J.L. Egan 4632* (DNA); Limmen - Tawallah Range, 25/05/1996, *J.L. Egan 5371 & C.R. Mitchell* (DNA); Melville Is, 08/04/1987, *R.J. Fensham 504* (DNA); Gregory National Park, 100 km SSW of Bullita Ranger Stn, on Midnight Ck, 13/04/1996, *D. Foreman 2219 & M.F. Duretto* (DNA); 3 km NE Mary Rr crossing, on road from Pine Ck to Oenpelli, 20/05/1983, *P.A. Fryxell 4226 & L.A. Craven* (DNA, CANB); Big River Stn, N central area, 18/03/2003, *R.K. Harwood 1308* (DNA); South of Maningrida, Arnhem Land, 11/04/2000, *R.K. Harwood 801* (DNA, CANB); Nhulunbuy, Gove Peninsula, 13/04/1982, *R.C. Hinz 104* (DNA); Nabarlek, 28/04/1989, *R.C. Hinz 521* (DNA); Litchfield National Park, 23/04/2003, *R.A. Kerrigan 701 & D.J. Dixon* (DNA); S of Larrimah along Stuart Hwy, 11/02/2004, *R.A. Kerrigan 732 & P.S. Short* (DNA); 9km W Tanumbirini turnoff Carpentaria Hwy, 03/05/1995, *P.K. Latz 14699* (DNA); c. 12 mls NE of Edith Rr Siding, 09/03/1965, *M. Lazarides 119 & L.G. Adams* (CANB, NT, K, L, US); 5 km NNW Koongarra, 18/05/1980, *M. Lazarides 8812* (DNA, CANB); Fitzmaurice Rr, 20/02/1994, *G.J. Leach 4062* (DNA, BRI, MEL); Litchfield National Park Bamboo Ck Cycad site 17, 09/04/2001, *D.T. Liddle 2642 & R.K. Harwood* (DNA); Litchfield National Park, Sandy Ck Falls, Tjaynera, 01/05/2001, *D.T. Liddle 2668* (DNA); 12 mls S Adelaide Rr township, 14/02/1972, *J.L. McKean 346* (DNA); Billiard Ck Rd, Kakadu Stage 3, 04/03/1989, *K.A. Menkhorst 272* (DNA, MEL); Limbunya, 26/04/1995, *C.R. Mitchell 24* (DNA); Edith Rr area, 09/04/1999, *C.R. Mitchell 2489 & J.A. Risler* (DNA); Nitmiluk National Park, 19/03/2001, *C.R. Mitchell 3130* (DNA); Near Bing Bong, Caranbirini Waterhole area, 11/05/1996, *D.E. Murfet 2425* (DNA); Wildman Rr, 15 km E West Arm, Arnhem Highway, 14/05/1976, *J. Must 1362* (DNA); c. 27 km SW Calvert Hills, Rd to Cresswell Downs, 15/05/1974, *R. Pullen 9256* (CANB, DNA, BRI, PERTH); Berry Springs, 27/04/1978, *M.O. Rankin 1212* (DNA); Nabarlek area, near water supply dam, 21/04/1979, *M.O. Rankin 2063* (DNA); Between Surprise Crk and Barney Crk, 19/02/1976, *B.L. Rice 2253* (CANB); Koongarra, 22/04/1981, *B.L. Rice 3285* (CANB); Nitmiluk National Park, site 348, 23/03/2001, *J.A. Risler 1447 & M. Waetke* (DNA); Nitmiluk National Park, site 453, 05/04/2001, *J.A. Risler 1448 & M. Waetke* (DNA); Big River Stn, NE corner of property,

18/03/2003, *J.A. Risler 2099* (DNA); 3 mls E Stuart Hwy, 60 mile, 30/04/1964, *C.S. Robinson 340* (DNA); Yarra Ck, Macadam Range, 03/03/1989, *J. Russell-Smith 7529* (DNA); Kakadu National Park, 4 km SW of Bloomfield Springs, 05/01/1995, *J. Russell-Smith 9107* (DNA); Charles Darwin National Park, 09/04/1998, *P.S. Short 4760 & C.R. Dunlop* (DNA, MEL); 51 km S Adelaide Rr; Stuart Hwy, 12/04/1990, *A.V. Slee 2469 & L.A. Craven* (DNA, CANB); Galiwinku Community, Elcho Is, 28/04/1987, *N.M. Smith 565* (DNA); c. 3 km E of No.38 bore, Benamara Stn, 06/05/1984, *B.W. Strong 236* (DNA); 10 km NE of Munmarlary Homestead, 01/06/1990, *S.M. Taylor 21* (DNA); 62 km SE of Torrens Ck, 23/10/1997, *E.J. Thompson 3* (BRI); c. 25 km SW of Murgeneella, 03/06/1988, *J.Z. Weber 10055* (DNA, AD); Virginia, 25 km SE of Darwin, 28/04/1987, *G.M. Wightman 3654* (DNA); Arnhem Land, 3 km SE of Ramingining, 19/06/1987, *G.M. Wightman 3868 & N.M. Smith* (DNA); Bing Bong Stn, 07/06/1986, *P.L. Wilson 53* (DNA); 84 km SE Duncan Hwy, 07/02/1988, *P.L. Wilson 913* (DNA); 80 mls S of Darwin on road to Alice Springs, 30/03/1946, *A.E. Wynne 292 & W. Hartley* (CANB).

Queensland

Lizard Is, Cook's Look, Queensland, 18/07/1990, *G.N. Batianoff 12105* (DNA, BRI); Smugglers track, Cape Melville National Park, N of Cooktown, 19/07/1998, *A.R. Bean 13677* (MEL, BRI); Near Cooktown, 17/05/1970, *S.T. Blake 23358* (BRI); Lawn Hill National Park, Musselbrook Section, Stockmans Yard, 14/04/2003, *R. Booth 3254* (BRI); Jardine Rr, 20/05/1948, *L.J. Brass 18881* (CANB); Portland Rds, 01/06/1948, *L.J. Brass 19001* (CANB); Iron Range, 11/06/1948, *L.J. Brass 19136* (CANB); Iron Range, 17/06/1948, *L.J. Brass 19229* (CANB); Tozer Gap, Tozer Range, 06/07/1948, *L.J. Brass 19508* (CANB); 7 km NN Kennedy Rr; Peninsula Development Rd, 28/04/1983, *J.R. Clarkson 4799* (DNA, CANB, MO, PERTH, QRS, BRI, K); Codroy Ck, 5.3 km N of the Hann Rr on the Laura to Musgrave Rd, 01/06/1989, *J.R. Clarkson 8033 & V.J. Neldner* (BRI); 4.3 km N of Batavia Downs on the Peninsula Development Rd, 20/04/1990, *J.R. Clarkson 8347 & V.J. Neldner* (BRI, MBA); Skardon Rr Cape York, in vicinity of Venture mining barge landing, 11/04/1994, *A. Gunness 2334* (BRI); 7.5km (by road) NE of Musselbrook Mining Camp on Musselbrook Ck, 175km N of Camooweal- Lawn Hill National Park, 29/04/1995, *R.W. Johnson 511 & M.B. Thomas* (DNA, BRI, NSW); Cape York Peninsula, 5.9 km N from Kennedy Ck on Peninsula Development Rd, 22/5/2004, *R.A. Kerrigan 826 & R.K. Harwood* (DNA, BRI); c. 46 km NW of old Corinda outstation, on the Doomadgee - Wologorang road, 09/05/1974, *R. Pullen 9158* (BRI, CANB); Lizard Is, 01/06/1973, *R.L. Specht 33* (BRI); Kennedy Hwy W of Kuranda, 0.3 km W of Owens Ck, 14/05/1972, *I.B. Staples 140572/2* (CANB, BRI, US); c. 2.3 km N of Maggieville on road to Delta Downs, 07/06/2001, *G. Turpin 580 & E.J. Thompson* (BRI); c. 47 km directly SE of Banrook Homestead near tributary of Sandy Creek, 12/07/2001, *G. Turpin 564 & E.J. Thompson* (BRI); Horn Is, Torres Strait, 19/05/1999, *B.M. Waterhouse 5342* (BRI, MBA); Cape York Peninsula, 01/06/1972, *J. Wrigley & I.R.H. Telford 45728* (CANB).

Fig. 5.62. Habit of *Polygala longifolia* (K.G. Brennan 6561)



Fig. 5.63. Flowers and seed of *Polygala longifolia*. a) flowers with petaloid alae (R.A. Kerrigan 732) and b) oblong seed with horseshoe shaped aril head (K.G. Brennan 6561)

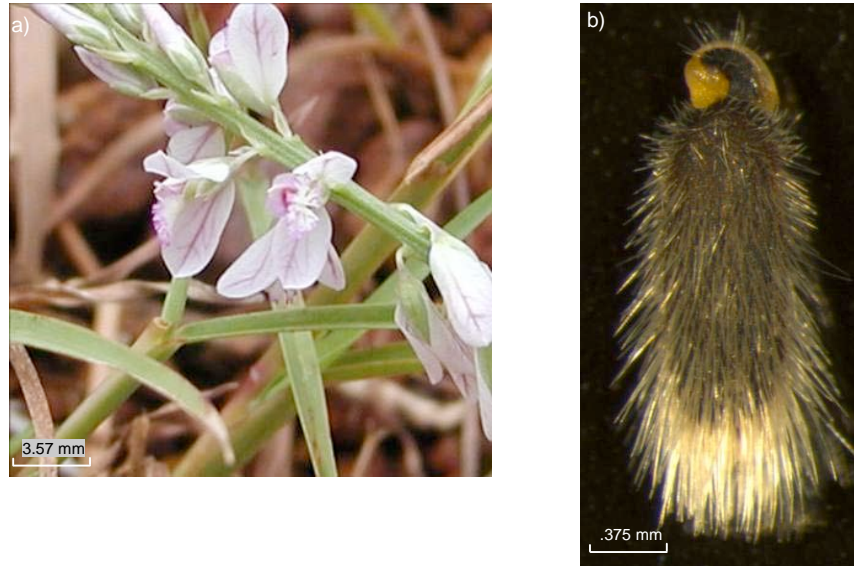
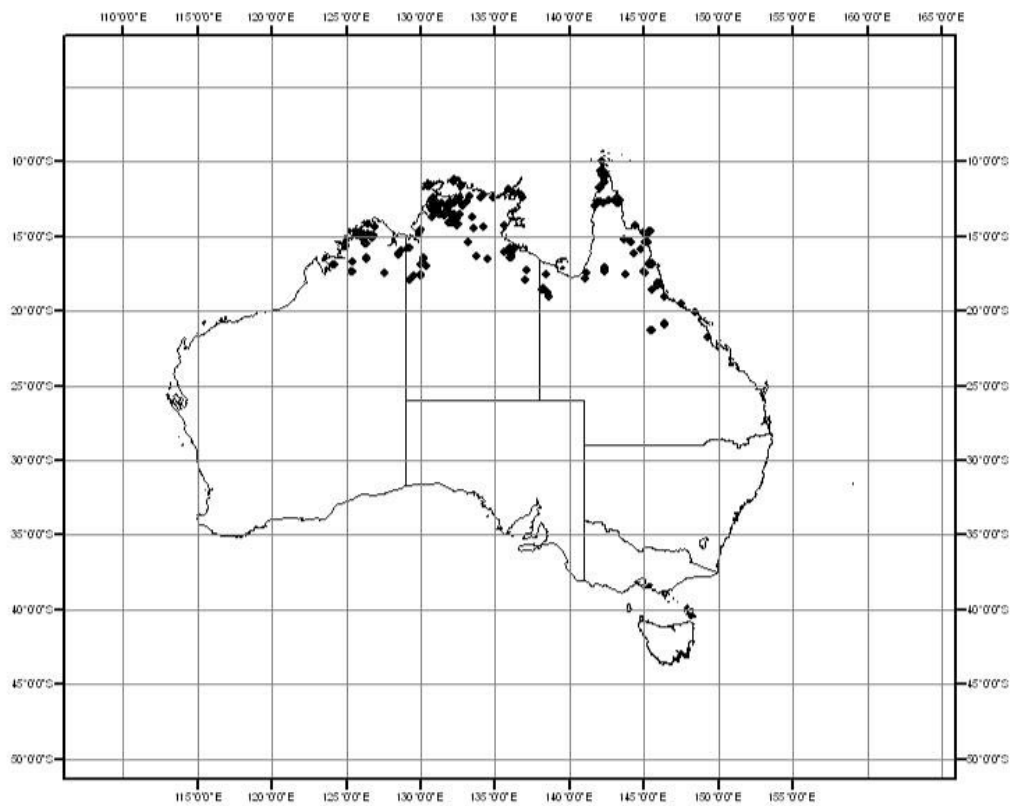


Fig. 5.64. The distribution of *Polygala longifolia* based on available collection data.



Polygala macrobotrya Domin, *Biblioth. Bot.* 89(4): 856 (1930)

Type citation: "Nord-Queensland: Savannenwälden am Walsh R. nördlich von Chillagoe (DOMIN II. 1910), *K. Domin 5690.*"; *Type details*: in xeryodrymiis apud Walsh River situ septendr. ab. opp Chillagoe; holo: PR 528251! (photo CANB, DNA!)

Annual herb, erect to 40 cm; indumentum of curved hairs. Leaves linear, 12–58 mm long, 1–5 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary or leaf opposed raceme to 200 mm long. Pedicel 2 mm long. Alae herbaceous, narrowly elliptic to oblanceolate, slightly dimidiate to falcate, 3.0–4.5 mm long, 1–2 mm wide, becoming pendulous. Corolla purple, floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style distinctly hooked, with flat stigma on inner surface of hook. Capsule lacking wing,; more or less symmetrical, oblong to squarish, 3.5–4.5 mm long, 2.65–3.35 mm wide. Seed oblong-ovoid, 3.5–4.0 mm long, 1–2 mm wide, indumentum with fine white hairs becoming shorter towards apex of seed. Aril head hooked, 0.6–0.8 mm long, white and brown with a tuft of hairs. Aril appendages 3, short and oblong to linear, 0.8–0.9 mm long. (Fig. 5.66)

Distribution

Australia (QLD). This species is only known from a restricted distribution around Chillagoe in Far North Queensland. (Fig. 5.67)

Habitat

Found in eucalypt woodland (ironbark) associated with outcropping granite.

Notes

In Australia this taxon is very similar to *P. stenoclada* and *P. gabriellae* (see notes under this species). It differs from *P. stenoclada* by the shape of the aril head (helmet shaped in *P. stenoclada*), the centralised tuft of hairs on the aril head, the smaller capsules and narrower leaves.

Nomenclatural Notes

According to Domin (1930) this taxon is apparently very similar to *P. elongata* from India. I have seen a photograph of the type of *P. elongata*, as determined by van der Meijden (1988) and unlike *P. macrobotrya*, which has a single erect stem, the type specimen of *P. elongata* has spreading to ascending lateral branches. Domin (1930) indicates that compared to *P. elongata*, *P. macrobotrya* differs by : longer racemes; dull not shiny leaves; corolla colour; capsule shape (not dilating at the apex); and by the longer aril appendages. Interestingly van der Meijden (1988) synonymises *P. elongata* under *P. glaucoides* but does not determine the specimen at BWilld. as *P. glaucoides*. Both van der Meijden (1988) and Bennett (1872) record flower colour as yellow for both *P. glaucoides* and *P. elongata* respectively.

Specimens examined: (4)

Queensland

4 km E of Almaden on the road to Petford, 10/03/1980, *J.R. Clarkson 3039* (BRI, QRS); Walsh Rr, Chillagoe area, 01/02/1910, *K. Domin 5690* (PR); 26 km from Petford towards Almaden on N side of the road, 29/03/2007, *R.A. Kerrigan 1182* (DNA); Almaden Ck, picnic area on western bank of ck, N side of road, 29/03/2007, *R.A. Kerrigan 1183* (DNA).

Fig. 5.65. The holotype of *Polygala macrobotrya* Domin. Nord-Queensland: Savannenwälden am Walsh Rr nördlich von Chillagoe (DOMIN II. 1910), K. Domin 5690 (PR)

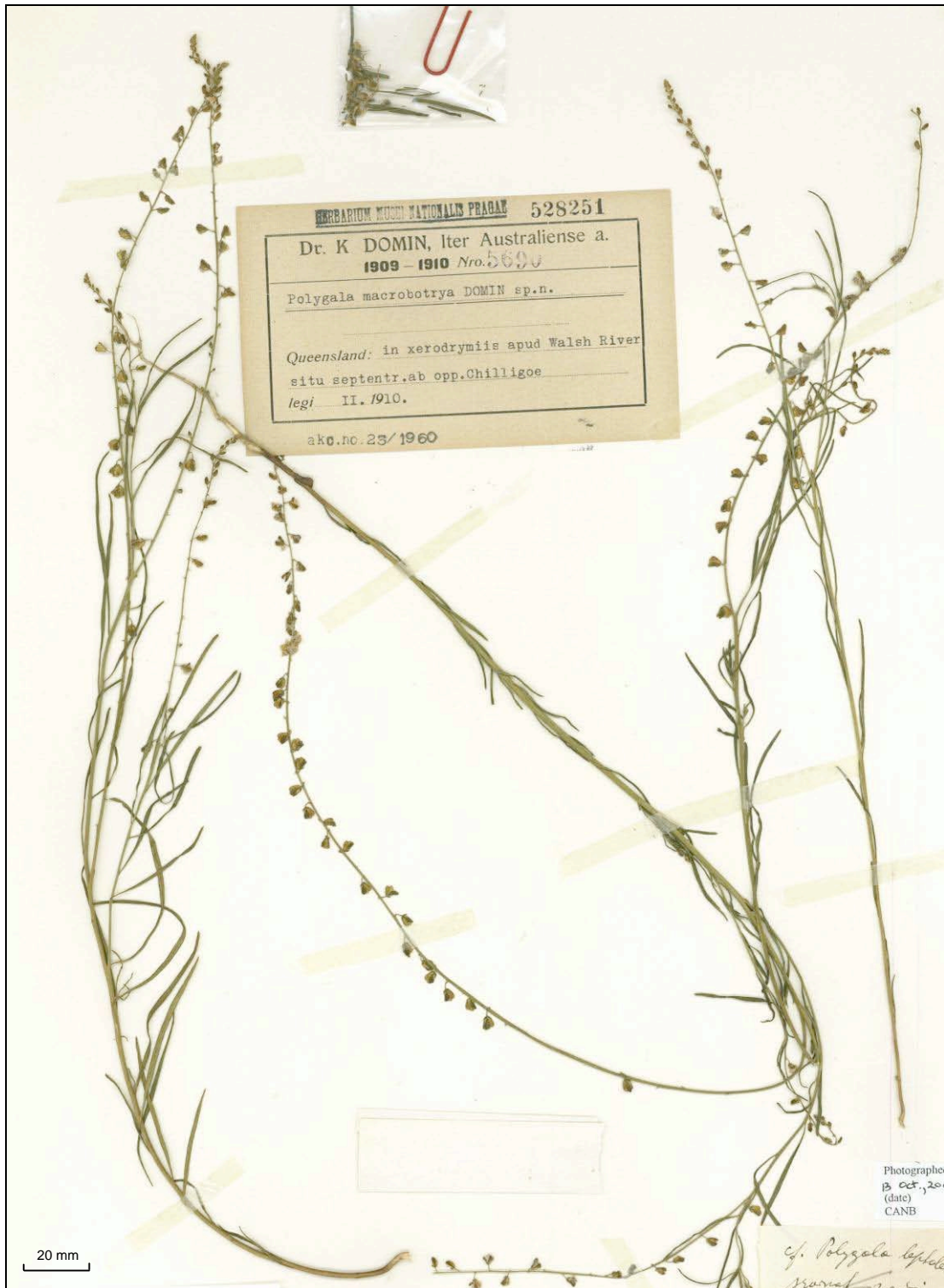


Fig. 5.66. Flower and seed of *Polygala macrobotrya*. a) flower with fimbriate floral appendages (R.A. Kerrigan 1182); and b) seed with hooked aril head (Clarkson, J.R. 3039)

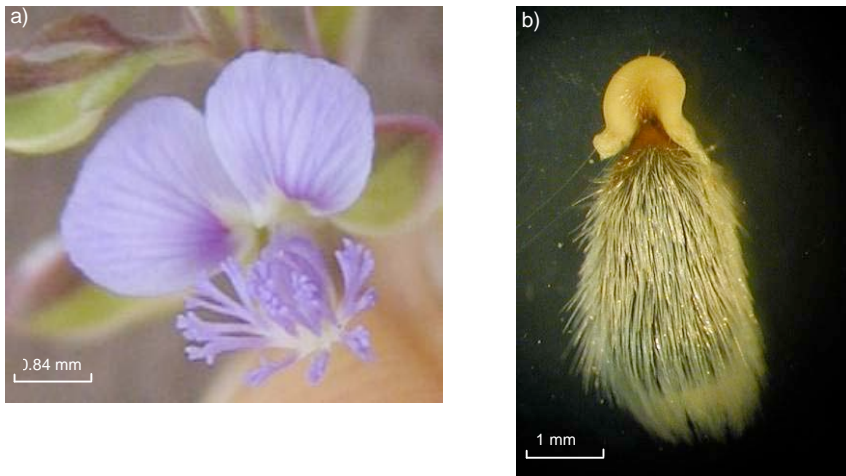
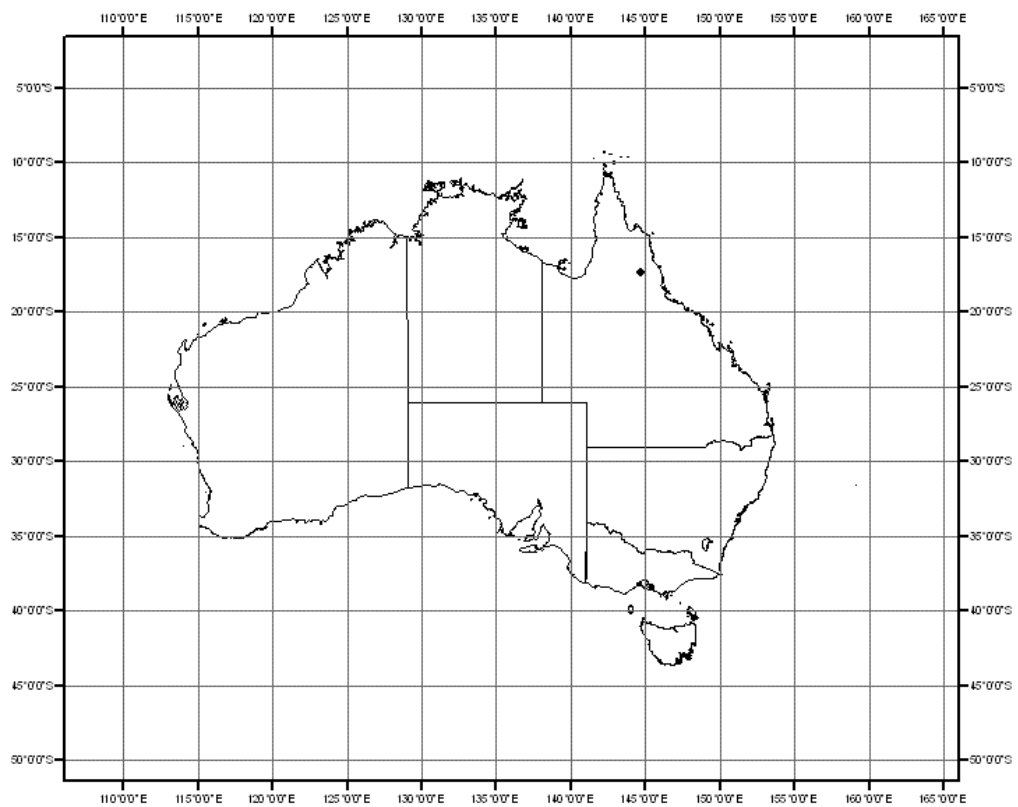


Fig. 5.67. The distribution of *Polygala macrobotrya* based on available collection data.



Polygala obversa R.A.Kerrigan, *nom. nov.*

P. arvensis var. *obovata* Benth., *Fl. Austral.* 1:141 (1863), *Polygala chinensis* var. *normalis* subvar. *obovata* (Benth.) Domin, *Biblioth. Bot.* 89(4): 857 (1927).

Type: Cavern Is, Carpentaria, R. Brown 4972; holo: BM 929061!

Polygala orbicularis var. *obovate* leaves (C.P. Mangion 900) R.A.Kerrigan & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2007)

Annual herb, erect to 15 cm, often with spreading branches or prostrate to 23 cm; indumentum of curved hairs. Leaves obovate, varying to very widely obovate or depressed obovate, occasionally orbicular, 2.5–29.0 mm long, 2–24 mm wide; petiole 0–4 mm. Inflorescence a axillary or supra-axillary raceme to 15 mm long or solitary. Pedicel to 2.5 mm. Alae herbaceous, ovate, usually somewhat dimidiate, 2.9–6.8 mm long, 1.6–4.0 mm wide. Corolla purple; floral appendages fimbriate and curved. Stamens terminate at stigma, monadelphous. Style hooked and stigma flat along inner edge of hook. Capsule lacking wing,; more or less symmetrical, very widely ovate to depressed ovate and widely elliptic, 3.0–4.7 mm long, 3.0–5.5 mm wide. Seed shape ovoid, 2.2–4.2 mm long, 1.2–2.4 mm wide; indumentum mostly glabrous or with fine white or ferruginous hairs becoming shorter towards apex. Aril head round to hooked, 0.2–0.7 mm long, white or white and brown, with fine short hairs. Aril appendages 3, linear 0.6–2.6 mm long. (Fig. 5.69)

Distribution

Australia (NT, QLD). Occurs from Kakadu National Park to Cobourg Peninsula and coastal regions of north east Arnhem Land in the NT and known from three collections around Mt Molloy and Cooktown in QLD. (Fig. 5.70)

Habitat

Mostly found in eucalypt woodlands on sand, sandy loam, or sandstone, occasionally in coastal vine thickets on coastal sands or laterite.

Notes

This species is similar to *P. barbata* and *P. coralliformis* and distinguishing characters are discussed under those species.

Nomenclatural notes

A sheet of *P. arvensis* var. *obovata* at K, barcoded as two entities K 279789 and K 279790, has the same number (4972) as the holotype at BM. The specimen K 279789 from Carpentaria is the same taxon as K 279790, and may or may not be the same collection. It is unclear whether the K material is the same gathering as the BM material and they are not included as isotypes here. The epithet *obovata* could not be elevated to species rank in this instance as it was already in use under *Polygala*.

Etymology

Latin *obversus* (broader at or towards the top then towards the base) because the leaves of this taxon are obovate.

Specimens seen: (37)

Northern Territory

Gove Peninsula, turnoff to Daliwuy Bay, Bulman Rd, 10/03/1995, *M.J.A. Barritt 1878* (DNA); McCleure Is, 23/04/1995, *R. Booth 278* (DNA); Sth Goulburn Is, barge landing, 24/04/1995, *R. Booth 692* (DNA); 13 km SW Cape Arnhem, site D7, 21/02/1994, *K.G. Brennan 2592* (DNA, OSS); Kakadu National Park, fire plot 202, Jabiluka Outlier, 17/03/1999, *K.G. Brennan 3751* (DNA, NY); Kakadu fire plot 76, Euc Woodland on Mt Bradshaw, 18/03/1999, *K.G. Brennan 3765* (DNA); Groote Eylandt, GE110, 07/03/2005, *K.G. Brennan 6392 & I.D. Cowie* (DNA, B); Gove, Alcan mine lease, 13/03/2006, *K.G. Brennan 6822* (DNA); Gove, Alcan mine lease, 15/03/2006, *K.G. Brennan 6831* (DNA); Carpentaria, *R. Brown s.n.* (MEL); Groote Eylandt, 9.9km ESE Emerald Rr Crossing, 14/04/1992, *I.D. Cowie 2677* (DNA, CANB); Wigram Is, N end, 02/05/1996, *I.D. Cowie 6909 & N. Scullion* (DNA, MEL); Western Arnhem Land, c. 24 km E of Myra Falls, 17/03/2000, *I.D. Cowie 8581* (DNA); Arnhem Land, E of Mann Rr, c. 64 km SSW of Maningrida, 21/03/2000, *I.D. Cowie 8691* (DNA, MEL); Sir Edward Pellew Group, 09/02/1976, *L.A. Craven 3744* (CANB); 24Km SSW Cooida, Pine Ck Rd, 19/05/1980, *L.A. Craven 5616* (DNA, CANB); Goulbourn Is, *A. Cunningham s.n.* (MEL); Groote Eylandt, near Umbakumba, 08/03/2005, *D.J. Dixon 1360* (DNA); Cobourg Peninsula; Caiman Ck, 01/02/1994, *Egan, J.L. 3093 & G.J. Leach* (DNA); Kakadu National Park, S end of Northern Outliers, 11.5 km ENE of Jabiru Airfield, 18/03/2004, *R.A. Kerrigan 771* (DNA); Kakadu National Park, near fire plot 157, adjacent to road to Nourlangie Rock, 08/04/2005, *R.A. Kerrigan 928* (DNA); NE Arnhem Land, Alcan Gove mine site, rehab monitoring site G2, 11/07/2006, *R.A. Kerrigan 1141* (DNA); Near Mt Basedow, c. 16 mls SSE of Nourlangie Safari Camp, 27/02/1973, *M. Lazarides 1973* (CANB); Mt Basedow, c. 16 mls SSE of Nourlangie Safari Camp, 27/02/1973, *M. Lazarides 7885* (BRI, CANB); Eastern Arnhem Land, Gulf of Carpentaria, Groote Eylandt, Near Alyungula Golf Course, 11/02/1998, *C.P. Mangion 900* (DNA); 1.5 mls SW Cannon Hill, 02/02/1973, *P. Martensz 686* (DNA, CANB); Cannon Hill Airstrip, 06/02/1973, *P. Martensz 722* (DNA); North Coast of Arnhem Land, *J. McKinlay s.n.* (MEL); Cobourg Peninsula, Smith Point, 02/03/2003, *J.A. Risler 2393 & R.S.C. Firth* (DNA); Cobourg Peninsula, Sterwart Point, 02/03/2003, *J.A. Risler 2395 & R.S.C. Firth* (DNA); Cobourg Peninsula, Black Point, 07/03/2003, *J.A. Risler 2381* (DNA); Kakadu National Park, Kakadu Hwy near Cooida, 30/03/2003, *J.A. Risler 2143 & R.S.C. Firth* (DNA); Little Lagoon, Groote Eylandt, in the Gulf of Carpentaria, 20/04/1948, *R.L. Specht 257* (CANB, MEL, PERTH); Bennet Bay, Crabbers Camp, 13/05/1994, *B.M. Waterhouse 3220* (DNA); Cobourg Peninsula, Black Point, 29/03/1988, *G.M. Wightman s.n.* (DNA).

Queensland

S of Cooktown, Annan Gorge, 19/05/1970, *S.T. Blake 23393* (BRI, CANB); Font hills, c. 15 km W of Mount Molloy, 18/04/1989, *J.R. Clarkson 7898 & R.J.F. Henderson* (DNA, MBA, US, QRS, L); Mt Mulligan Stn, half way between gully in escarpment and dam at campsite, 21/05/2004, *R.A. Kerrigan 817 & R.K. Harwood* (DNA, BRI).

Fig. 5.68. The holotype of *Polygala obversa*. Cavern Is, Carpentaria, R. Brown s.n. (BM)
 © The Natural History Museum, London



Fig. 5.69. Flowers and seed variation of *Polygala obversa*. a) flowers with fimbriate floral appendages (K. G. Brennan 6392) and seed with b) hairy (R. Booth 278) and c) glabrous seed coats (R. Booth 692).

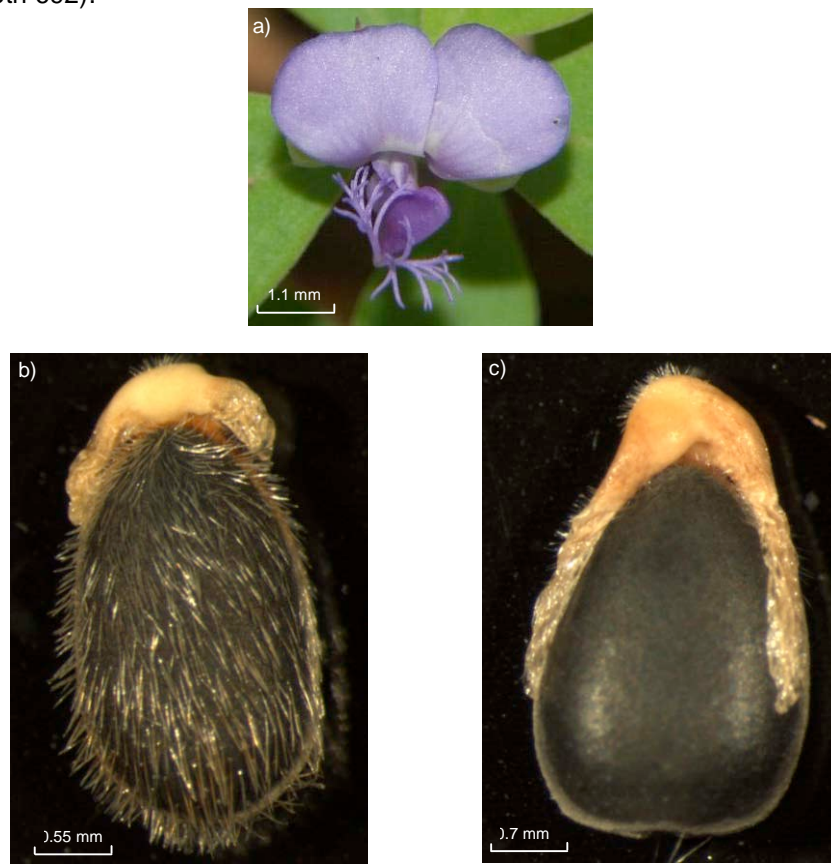
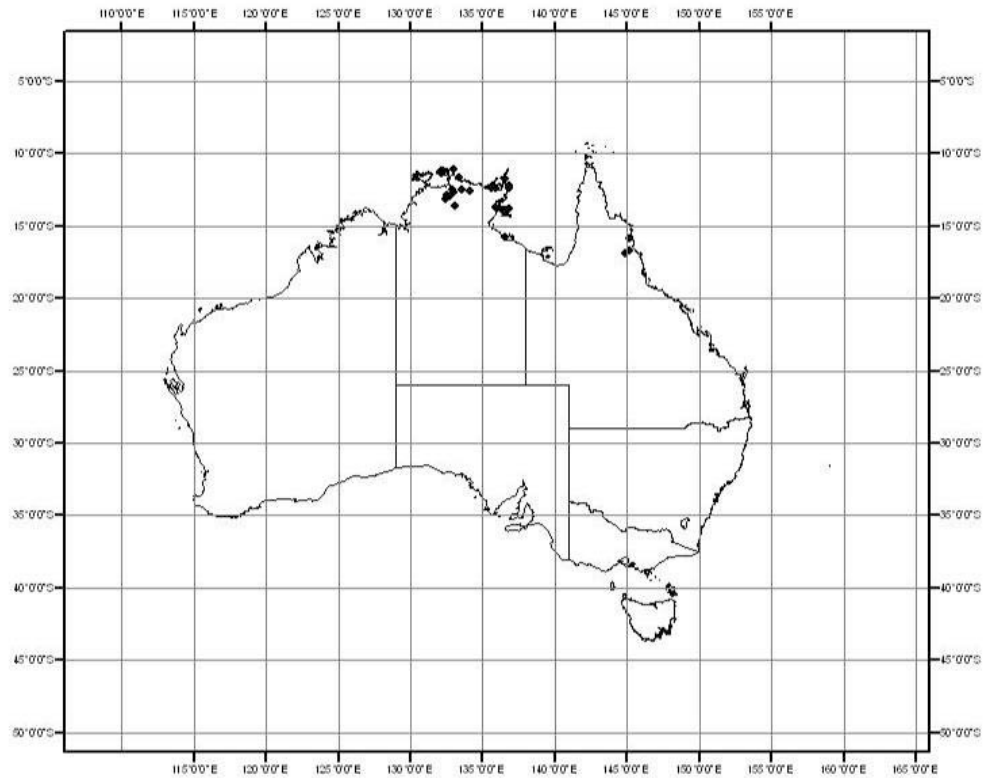


Fig. 5.70. The distribution of *Polygala obversa* based on available collection data.



Polygala orbicularis Benth., *Fl. Austral.* 1:140 (1863)

Polygala chinensis subvar. *orbicularis* (Benth.) Domin, *Biblioth. Bot.* 89(4): 856 (1927).

Lectotype (for later publication): Melville Is, *Fraser 244* lecto: K 000279783 & K 000279784 (photo DNA !); syntype: N. Coast, *Armstrong* = *P. orbicularis*; syn- K 000279787 (photo DNA!, CANB); excluded syntypes: South Goulburn Is, *A. Cunningham* K 000279786!, K 000279788! (photo DNA); BM 929046! (photo DNA)

Annual herb, erect to 10 cm with decumbent branches spreading to 20 cm; indumentum of curved hairs, leaves mostly glabrescent. Leaves and alae often tinged deep purple, usually strongest on lower leaf surface. Leaves orbicular, depressed orbicular, very widely ovate or very widely obovate, 4–42 mm long, 3–48 mm wide; petiole to 2.5 mm. Inflorescence supra-axillary, rarely axillary or leaf-opposed but often appearing terminal, usually a raceme to 25 mm long, rarely solitary. Pedicel to 3 mm. Alae herbaceous, ovate, somewhat dimidiate, 4.2–7.8 mm long, 2.0–4.6 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat on inner surface of hook. Capsule lacking wing, or wing present to 0.45 mm wide, widely ovoid, 2.8–4.0 mm long, 3.2–4.3 mm wide. Seed shape ovoid, 2.7–3.2 mm long, 1.5–2.0 mm wide; indumentum with white or ferruginous hairs becoming shorter towards seed apex and often patchily distributed across testa. Aril head round, 0.5–0.6 mm long, white with short hairs or glabrous. Aril appendages 3, linear 1.2–2.5 mm long. (Fig. 5.72)

Distribution

Australia (NT). This species is endemic to the NT and is distributed across the NE part of the Top End from Litchfield to Kakadu National Park, Cobourg Peninsula and the Tiwi Islands. (Fig. 5.73)

Habitat

Found in eucalypt woodlands or *Melaleuca* shrublands mostly on lateritic or sandy soils.

Nomenclatural notes

Excluded syntypes are now determined as *Polygala obversa*. The collector of the lectotype in this instance is likely to be John Richardson as there is no record of Charles Fraser having visited Melville Is (Short 2002). There is no evidence to suggest that K279783 & 784 are not part of the same gathering and they are consequently treated here as one collection. A specimen from MEL 2244771 from Goulburn Island collected by Cunningham may be an isosyntype of the excluded syntypes at K and BM as it is apparent an element from the sheet has been removed.

Specimens examined: (56)

Northern Territory

Camp area, near Darwin, 12/05/1944, *R.F. Black* 78.035 (MEL); Jabiru, Arnhem Hwy, Jabiru Drive turnoff, east side of Jabiru Drive, 02/04/1993, *K.G. Brennan* 2136 (DNA); Kakadu National Park, 18/02/2000, *K.G. Brennan* 4782 (DNA); Kakadu National Park, 07/02/2000, *K.G. Brennan* 4825 (DNA); Southport-Mt. Finnis Rd, S of Darwin, 22/04/1956, *N.T. Burbidge* 5269 (CANB); 39 mls S of Darwin, 19/03/1961, *G.M. Chippendale* 7799 (MEL); Coburg Peninsula, 850 m S on road from Aruru Point, 01/05/1987, *M.J. Clark*

955 (DNA); Port Essington, S of Wangewanga Cove, 13/04/1993, *I.D. Cowie* 3363 (DNA); Litchfield National Park, Tabletop Range, 23/03/1995, *I.D. Cowie* 5344 & *S.M. Taylo*, (DNA); Bathurst Is, Runku, 27/03/1995, *I.D. Cowie* 5425 (DNA); Bathurst Is, c. 2 km N of Nguuu town bores B 16, 14/03/2001, *I.D. Cowie* 9082 & *K.G. Brennan* (DNA); Kakadu National Park, 50 km W of Jabiru, 19/03/1981, *L.A. Craven* 7723 & *G.H. Whitbread* (CANB); Kapalga, 10/03/1982, *C.R. Dunlop* 6083 & *J.A. Taylor* (DNA); Kakadu National Park, Kapalga C plot, 04/04/1994, *J.L. Egan* 3675 (DNA); Three Ways, Melville Is, 07/12/1995, *J.L. Egan* 5190 (DNA); Melville Is, 12/04/1986, *R.J. Fensham* 3 (DNA); Port Darwin, 1883, *P. Foelche* s.n. (MEL); Holmes Jungle, 06/01/1995, *R.K. Harwood* 12 (DNA); Charles Darwin National Park, Darwin, 17/04/2000, *R.K. Harwood* 805 (DNA, CANB); Bathurst Is, road to Cape Helvetius, 23/02/2001, *R.K. Harwood* 1025 (DNA); Port Darwin, 1847, *N. Holtze* s.n. (MEL); Port Darwin, 1885, *M. Holtze* 537 (MEL); Berrimah, Foundation Road, 17/04/2004, *A.M. Hope* 55 (DNA); Melville Is, 12/04/1986, *R.W. Johnson* 4110 (DNA, BRI); Melville Is, 12/04/1986, *R.W. Johnson* 4139 (BRI); Risler Residence, Lot 29 Melaleuca Road Howard Springs, 04/03/2004, *R.A. Kerrigan* 752 & *J.A. Risler* (DNA); Melville Is, 1 km N 9 mls waterhole, Snake Bay Rd, 20/01/1992, *G.J. Leach* 2916 & *I.D. Cowie* (DNA); c. 4.5 mls NNE of Cannon Hill, 28/02/1973, *M. Lazarides* 7903 (CANB, DNA, MEL); Melville Is, Yapilika tributary of Maxwell Ck, 22/01/1992, *G.J. Leach* 2950 & *I.D. Cowie* (DNA); Melville Is, Between Tinganoo Bay & Queenimpiri Bay, 11/04/2000, *C.P. Mangion* 934 & *G.M. Wightman* (DNA); Grolls Farm, Noonamah, 25/03/1965, *C.J. McCormack* 50 (DNA); Gunn Point, 124 M NE Darwin, 13/02/1973, *J.L. McKean* 947 (DNA); Bathurst Is, Wurankuru Plantation, 30/04/1998, *C.R. Michell* 1404 & *R.K. Harwood* (DNA); Bathurst Is, 01/05/1998, *C.R. Michell* 1410 & *R.K. Harwood* (DNA); Melville Is, E side mouth of Jessie Ck, Plot 2799, 15/04/2000, *J.A. Risler* 328 & *C.P. Mangion* (DNA); Melville Is, creek W of Tinganoo Bay, Plot 2777, 10/04/2000, *J.A. Risler* 399 (DNA); Cobourg Peninsula, Bremer Bay, 15/03/2002, *J.A. Risler* 1887 & *R.S.C. Firth* (DNA); Cobourg Peninsula, Stewart Point, 02/03/2003, *J.A. Risler* 2396 & *R.S.C. Firth* (DNA); 22 mls Stuart Hwy, 18/03/1964, *C.S. Robinson* 13 (DNA); Port Darwin, 1847, *F. Schultz* 11 (MEL); Elizabeth Rr Crossing, Channel Is Rd, 20/03/1989, *N.M. Smith* 1432 (DNA); Delissaville, Cox's Peninsula, 29/03/1948, *R.L. Specht* 141 (CANB, MEL); Melville Is, Karlake plots, 27/04/1966, *G.C. Stocker* 136 (DNA); Near Angularli Creek crossing along the road Oenpelli-Murgenella, 28/05/1988, *J.Z. Weber* 9933 (DNA, AD); 15 km S Snake Bay, Melville Is, 31/01/1984, *G.M. Wightman* 1009 (DNA); Melville Is, Paru, 09/04/1987, *G.M. Wightman* 3594 (DNA); Melville Is, Yapilika, 03/09/1986, *B. Wilson* 21 (DNA).

Fig. 5.71. The lectotype of *Polygala orbicularis* Benth. Melville Is, Fraser 244 (K)

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Fig.5.72. Flower and seed of *Polygala orbicularis* (R.A. Kerrigan 752). a) flower with fimbriate floral appendages in compressed inflorescence and b) seed of with round aril head.

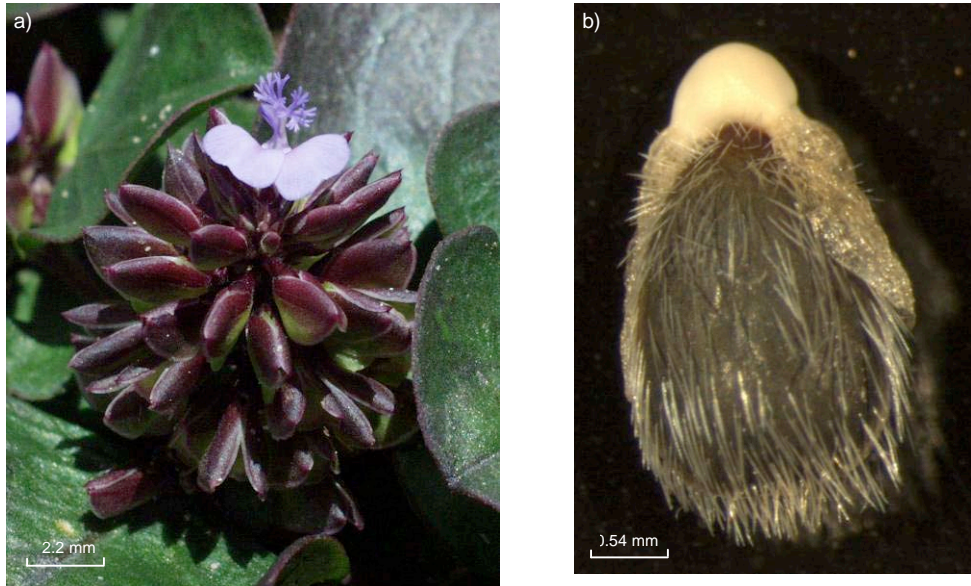
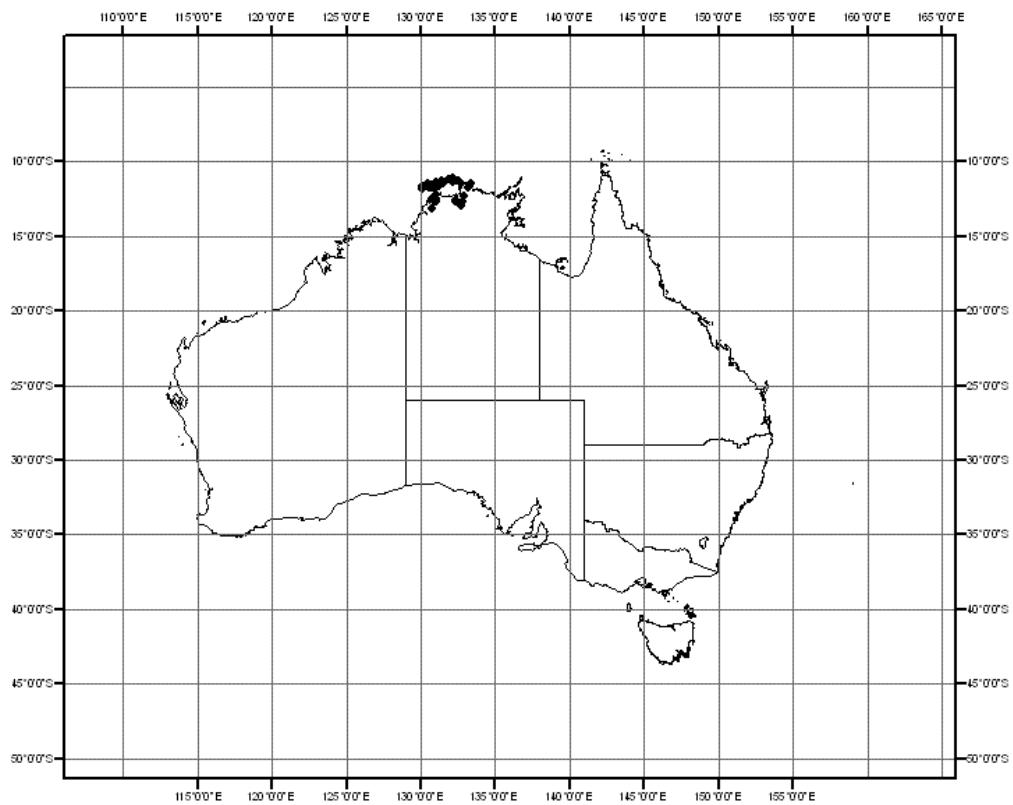


Fig.5.73. The distribution of *Polygala orbicularis* based on available collection data.



Polygala paniculata L., *Syst. Nat.* 10th edn, 1154 (1759)

Type: Brown. Jam. 287. n. 1; lecto: *Patrick Browne*, Linn 882.9 LINN (photo LINN !), *vide* F.Fawcett & A.B.Rendle, *Fl. Jamaica* 4: 242 (1920)

Annual herb, erect many-branched, 10-50 cm high. Indumentum hispidulous on stems and/or minutely glandular hairy. Leaves narrowly elliptic, 2–5 mm long, 6–20 mm wide, more or less sessile, usually glabrous. Inflorescence a raceme to 60 mm, terminal or leaf-opposed. Pedicel < 1 mm. Alae white with pink flush to purple, elliptic, 0.7–2.0 mm long. Corolla white to rose-pink to purple, floral appendages bifid to much divided. Stamens terminate above stigma, nearly connate to apex, monadelphous. Style more or less straight becoming hooked at apex, stigma globular, well developed pocket above globular stigma with tuft of hair. Capsule wing absent, obovate to elliptic oblong, 2–4 mm long, 1–3 mm wide. Seed shape oblong, c. 1.25 mm long, c. 0.5 mm wide; indumentum sparse with fine white hairs. Aril head reduced, c. 0.6 mm long, white, with short hairs. Aril appendages 2, linear-oblong, c. 0.5 mm long.

Distribution

Australia (QLD, NSW). A native of tropical America, naturalised as a weed in Africa, southeast Asia, Malesia, Australasia and the Pacific. In Australia, found on the east coast from northern NSW to Wet Tropics in N Queensland.

Habitat

In Australia grows along roadsides and in disturbed sites on a variety of soils.

Notes

This species is not considered problematic and was not revised in this treatment as only a small number of specimens were seen. The above description has been augmented where necessary from Flora of NSW, Monro (2003), and van der Meijden (1988). For a full list of synonymy see van der Meijden (1988). Type details as reported by Monro (2003) are that of F.Fawcett & A.B.Rendle, *Fl. Jamaica* 4: 242 (1920) who state “The type, a specimen from Browne, is in Herb. Linn.” It must be considered a legitimate lectotype as it is reported as such by the Linnean Typification project.

Specimens examined: (5)

Queensland

Windsor Tableland, N Mt Carbine, 07/06/1992, *A.R. Bean* 4560 (BRI, DNA); 8km SSW of Atherton, 19/04/1989, *J.R. Clarkson* 7912 & *R.J.F. Henderson* (BRI, DNA, MBA, QRS, L); Masons property, behind Cape Tribulation shop, 29/04/2003, *L. Hucks* LAH085 (DNA, MEL, BRI, CANB); Along road to Mission Beach, at Carmoo Creek, 31/03/2007, *R.A. Kerrigan* 1191 (DNA, BRI); Goolagan Creek - Henrietta Creek junction, Wooroonooran National Park, 17/10/2003, *K.R. McDonald* KRM1611 (DNA)

***Polygala parviloba* Kerrigan, sp. nov.**

Polygala succulentae similis, a qua semine ovoideo, crista florali integrae lobis parvutis et stylo hirsuto differt.

Type: Cox Peninsula, 25.iii.2003, I.D. Cowie 9691 & R.K. Harwood; holo: DNA 157571!; iso: BRI, CANB, K, MEL, PERTH

Polygala chinensis var. *normalis* subvar. *linearifolia* Domin., *Biblio. Bot.* 89(4): 857(1930). *Type:* Goulburn Island, A. *Cunningham* IV. 1818 No. 258, syn- MEL 2057353! (photo DNA!, BM!, K!); Port Darwin, F. *Schultz* No. 786, syn- K (photo!); *Type citation:* halbnackte Stellen in den Savannenwäldern bei Chillagoe in Gesellschaft zahlreicher Annuellen. *Type details:* locis subnudis xerodrymiisprope opp Chillagoe, K. *Domin* 5692 syn- PR! (photo BRI !)

[*Polygala triflora* [NT material] *auct. non* L.: I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004) (1753)]

[*Polygala arvensis* *auct. non* Willd.: Benth. *Fl. Austral.* 1 140 (1963) p.p. as to Goulburn Island, A. *Cunningham* MEL 2057353; A.J.Ewart & O.B.Davies, *Fl. N. Terr.* 160 (1917); I.D. Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004) (1802)]

Annual herb, erect to 30 cm, often with spreading branches; indumentum of curved and straight hairs throughout. Occasionally leaf margins and alae red tinged. Leaves linear to lanceolate, 3–46 mm long, 1–9 mm wide; petiole to 1 mm. Inflorescence a supra-axillary or axillary raceme to 32 mm long, sometimes solitary. Pedicel to 2 mm. Alae herbaceous, ovate, often slightly dimidiate, apex often with pink mucro, 4.6–6.9 mm long, 1.6–3.8 mm wide. Corolla purple; floral appendages jagged. Stamens terminate at stigma, monadelphous. Style straight or curved with hispid hairs just below globular stigma. Capsule lacking wing, asymmetric, widely ovoid to rhomboidal, 3.0–3.6 mm long, 2.2–3.2 mm wide. Seed ovoid, 2.65–3.2 mm long, 1.0–1.8 mm wide; indumentum with white or ferruginous hairs, shorter towards seed apex. Aril head reduced, 0.35–0.4 mm long, white and brown or black where reduced to seed testa, with short erect hairs. Aril appendages 3, linear, 0.75–1.25 mm long, collapsed cellular or turgid. (Fig. 5.75)

Distribution

Australia (WA, NT, QLD). This species is very widely distributed across WA, NT and QLD north of about 18°S. (Fig. 5.76)

Habitat

Found in a variety of habitats including eucalypt woodlands, *Acacia* and *Melaleuca* shrublands, drainage depressions and seepage areas. Grows on a variety of substrates.

Notes

The level of division of appendages and inflorescence density is quite variable across this species but the ascending alae and capsules, and the pink acute apex of the alae, make it readily identifiable in the field.

Etymology

Latin *parvi-* (small) and *-loba* (lobes), in reference to the shallowly lobed floral appendages.

Specimens examined: (149)

Western Australia

Mitchell Plateau, Palm/eucalypt woodland, 15/06/1976, *K.F. Kenneally 4891* (PERTH); Mt Elizabeth Track to Munja, Kimberley, 28/07/1996, *K.F. Kenneally 11817* (PERTH).

Northern Territory

Shoal Bay, Darwin, 07/02/1979, *M.H. Andrews 329* (DNA); Lawson Is, 22/04/1995, *R. Booth 612* (DNA); Sth Goulburn Is, rd to airport, 24/04/1995, *R. Booth 730* (DNA); Nth Goulburn Is, 25/04/1995, *R. Booth 775* (DNA); Nth Goulburn Is, 26/04/1995, *R. Booth 834* (DNA); Stapleton Park, 20/05/1985, *D.M.J.S. Bowman 201 & B.A. Wilson* (DNA); Kakadu National Park, Ranger Uranium Lease, 26/03/1991, *K.G. Brennan 1523* (DNA); Kakadu National Park, Ranger Uranium Lease, 27/03/1991, *K.G. Brennan 1524* (DNA); Kakadu National Park, Ranger Uranium Lease, 27/03/1991, *K.G. Brennan 1525* (DNA); Kakadu National Park, Ranger Uranium Lease, 26/03/1991, *K.G. Brennan 1526* (DNA); Kakadu National Park, Ranger Uranium Lease, 22/03/1991, *K.G. Brennan 1527* (DNA); Kakadu National Park, hill beside Kakadu Hwy, Spring Peak, 13/03/1992, *K.G. Brennan 1942* (DNA); Along Arnhem Hwy about 50km West of Kakadu Hwy turnoff, 08/03/1993, *K.G. Brennan 2027* (DNA); Along Kakadu Hwy, 09/03/1993, *K.G. Brennan 2043* (DNA); At old Jabiru East townsite, 12/03/1993, *K.G. Brennan 2101* (DNA); On Jabiluka outlier, 14/03/1993, *K.G. Brennan 2122* (DNA); Arnhem Land, at Nabarlek, 07/04/1993, *K.G. Brennan 2166* (DNA); Arnhem Land, Tin Camp Ck, 16/04/1993, *K.G. Brennan 2252* (DNA); Arnhem Land, Tin Camp Creek, 4km SW Myra Falls, 10/03/1994, *K.G. Brennan 2705* (DNA); Kakadu National Park, fire plot 143, Northern outliers, 16/03/1999, *K.G. Brennan 3726* (DNA); Kakadu Fire Plot 157, 26/04/1999, *K.G. Brennan 3897* (DNA); Kakadu National Park, Koongarra Saddle, 300m NW of saddle on road to Baroalba Spring, 04/04/1999, *K.G. Brennan 3928* (DNA); Jasper Gorge area, 11 km SW of gorge, 04/04/2000, *K.G. Brennan 4407* (DNA); Kakadu National Park, 02/03/2000, *K.G. Brennan 4794* (DNA); Kakadu National Park, 24/02/2000, *K.G. Brennan 4797* (DNA); Kakadu National Park, 09/03/2000, *K.G. Brennan 4821* (DNA); Kakadu National Park, 07/02/2000, *K.G. Brennan 4827* (DNA); Kakadu National Park, 02/03/2000, *K.G. Brennan 4851* (DNA); Kakadu National Park, 10/03/2000, *K.G. Brennan 4854* (DNA); Nitmilik National Park, veg site 538, 19/04/2001, *K.G. Brennan 5612* (DNA); Upper Koolpin Creek, 28km SW Jim Jim Falls, 18/02/2004, *K.G. Brennan 6055* (DNA); Kakadu National Park, Jabiru, along walking track between town and Park HQ, 14/02/1991, *K.G. Brennan 953* (DNA); Stewart Catching Camp, 5 km S, 19/05/1987, *P.S. Brocklehurst 83* (DNA); Cobourg Peninsula, 06/05/1987, *M.J. Clark 1053* (DNA); Arnhem Land, Maningrida Area, 26/07/1987, *M.J. Clark 1335* (DNA); Cobourg Peninsula, 3/5/1987, *M.J. Clark 980* (DNA); Melville Is, Rdto Paru, 1.5 km below jump up, 21/01/1992, *I.D. Cowie 2184 & G.J. Leach* (DNA); Grootte Eylandt, N.Bank of Angurugu Ck, 11/04/1992, *I.D. Cowie 2592* (DNA); Grootte Eylandt, 12.5km ESE Emerald Rr Crossing, 14/04/1992, *I.D. Cowie 2666* (DNA); Cape Hotham Reserve, Escape Cliff, 30/3/1993, *I.D. Cowie 3308* (DNA); Port Essington, Wangewanja Cove, 13/04/1993, *I.D. Cowie 3372* (DNA); Melville Is, Snake Bay airstrip, 28/06/1994, *I.D. Cowie 4692* (DNA, MEL); Bathurst Is, Runka, 27/03/1995, *I.D. Cowie 5420* (DNA, MEL); Gregory National Park, c.25 km NNE Humbert Rr Stn, 16/04/1996, *I.D. Cowie 6453 & R. Baker* (DNA); Gregory National Park, c.13.5 km SSW of Revolver Yard, 17/04/1996, *I.D. Cowie 6494 & C.A. Coles*, (DNA); Near Ranger Stn, c.13km S of Maningrida, Arnhem Land, 06/04/2000, *I.D. Cowie 8764* (CANB, DNA); Marlow's Lagoon, Palmerston, 25/04/1986, *C. Cox 35* (DNA); Kakadu National Park, c. 4 km E of Jabiru, 27/03/1981, *L.A. Craven 7724 & G.H. Whitbread* (CANB); Headwaters of the Liverpool Rr, Sandstone plateau, 02/04/1984, *L.A. Craven 8401 & G.M. Wightman* (MEL, CANB); Grootte Eylandt, 06/03/2005, *D.J. Dixon 1318* (DNA); Ramingining area, Djapidi Djapin Ck, 23/07/1998, *C.R. Dunlop 10125 & I.D. Cowie* (DNA); 22 mls SSW of Borroloola, 10/06/1971, *C.R. Dunlop 2284* (DNA); Elcho Is, 07/07/1975, *C.R. Dunlop 3964* (DNA); King Rr Valley Rd, 10/03/1993, *J.L. Egan 1819* (DNA); Katherine Gorge, 10/03/1993, *J.L. Egan 1821* (DNA); Gunn Point, 13/03/1993, *J.L. Egan 2518* (DNA); Litchfield National Park, Lost City Rd, 24/01/1993, *J.L. Egan 2519* (DNA); Litchfield National Park, on road to Lost City, 24/01/1994, *J.L. Egan 3062* (DNA); Cobourg Peninsula, near Observation Cliffs, 03/02/1993, *J.L. Egan 3125 & G.J. Leach* (DNA); Litchfield National Park, Lost City Rd, 24/03/1994, *J.L. Egan 3364* (BRI, DNA); King Rr Valley Rd, 01/04/1994, *J.L. Egan 3555* (DNA); Gunn Point, 05/04/1994, *J.L. Egan 3652* (DNA); Three Ways, Melville Is, 07/12/1995, *J.L. Egan 5189* (DNA); Eva Valley Stn, 05/03/1991, *M. Evans 3646* (DNA, K); Melville Is, 13/4/1986, *R. Fensham 67* (DNA); Port Darwin, *P. Foelsche s.n.* (MEL); Big Rr Stn, 18/03/2003, *R.K. Harwood 1237* (DNA); Big Rr Stn, N east corner, 18/03/2003, *R.K. Harwood 1309* (DNA); Kakadu National Park, 20 km E of Jim Jim Camp Ground, 16/02/2004, *R.K. Harwood 1339* (DNA); Kakadu National Park, 43 km SE of Mary Rr Ranger Stn, 24/02/2004, *R.K. Harwood 1379* (DNA); Kakadu National Park, southern end of Jabiluka sandstone outcrop, 03/03/2004, *R.K. Harwood 1411* (DNA); Kakadu National Park, 25 km SSE of Jabiru, 04/03/2004, *R.K. Harwood 1417* (DNA); Charles Darwin National Park, 20/02/1998, *R.K. Harwood 305* (DNA); Charles Darwin National Park, Plot 698, 20/03/1998, *R.K. Harwood 330* (DNA); Bathurst Is, west coast, Plot 1789, 18/05/1999, *R.K. Harwood 666* (DNA); South of Maningrida, Arnhem Land, 11/04/2000, *R.K. Harwood 802*

(DNA, CANB); c. 12 km north of Korlobidahda, Plot 2242, 23/03/2000, *R.K. Harwood 858* (DNA); Port Darwin, *M. Holtze 1346* (MEL); Port Darwin, *M. Holtze 538* (MEL); Port Darwin, *M. Holtze 790* (MEL); Berrimah, Foundation Road, 17/04/2003, *A.M. Hope 54 & C.P. Mangion* (DNA); Melville Is, 12/04/1986, *R.W. Johnson 4126* (BRI); Gregory National Park, 12.5 km W on main road from Jasper Gorge campground, 08/04/2003, *R.A. Kerrigan 618* (DNA); Central Arnhemland turnoff, 11/02/2004, *R.A. Kerrigan 731 & P.S. Short* (DNA); Lot 3208 Edith Farms Road, Katherine Region, 02/03/2004, *R.A. Kerrigan 750* (DNA); Risler Residence, Lot 29 Melaleuca Road Howard Springs, 04/03/2004, *R.A. Kerrigan 754 & J.A. Risler* (DNA); Kakadu National Park, 8 km SE of Jim Jim Falls, 19/03/2004, *R.A. Kerrigan 781* (DNA); Cape York Peninsula, 8 km SE of Laura on Peninsula Development Road, 21/05/2004, *R.A. Kerrigan 821 & R.K. Harwood* (DNA, BRI); Gregory National Park, Vic Sector, Joe Creek campground behind picnic area, 24/03/2005, *R.A. Kerrigan 920* (DNA) Fitzmaurice Rr Headwaters, 12/05/1994, *P.K. Latz 13870* (DNA, BRI, NT); 66 km N of Timber Creek, 14/05/1994, *P.K. Latz 13927 & C.R. Dunlop* (DNA); Munmarlay Stn, 10/05/1973, *P.K. Latz 3792* (DNA); Fitzmaurice Rr, 20/2/1994, *G.J. Leach 4063* (DNA); Head of Koolendong Valley, 12/05/1994, *G.J. Leach 4447* (DNA); Litchfield Shire, Cycad survey site 8, transect 2, 07/04/1997, *D.T. Liddle 1851* (DNA); Melville Is, West side of Brenton Bay, 14/04/2000, *C.P. Mangion 996 & J.A. Risler* (DNA); Cox Peninsula, 21/04/1988, *K.M. Manning 400* (DNA); Noonamah; Grolls Farm, 26/02/1965, *C.J. McCormack 61* (DNA); Gunn Point, 24 mls NE Darwin, 13/02/1973, *J.L. McKean 953* (BRI, DNA, CANB, NT, MO); Blain, 19 mls S of Katherine, 15/02/1961, *H.S. McKee 8437* (BRI, NSW); McArthur Rr Stn, 25/02/1998, *C.R. Michell 1355 & R.B. Carrow* (DNA); Victoria Highway, East Mathison Stn, 08/03/1998, *C.R. Michell 1398* (DNA); Bradshaw Stn, fire plot 2, 22/02/1999, *C.R. Michell 2227 & C. Yates* (DNA, MO); Bradshaw Stn, fire plot 21, 21/02/1999, *C.R. Michell 2277 & C. Yates* (DNA); Nitmiluk National Park, 21/03/2001, *C.R. Michell 3135 & B. Deichmann* (DNA); Nitmiluk National Park, 04/04/2001, *C.R. Michell 3136 & S. Boyce* (DNA); Nitmiluk National Park - Eastern boundary, 19/03/2002, *C.R. Michell 3585* (DNA); Howard Rr, Gunn Point, 1/5/1996, *C.R. Michell 75* (DNA); 22 km W of Murganella on track to Cobourg Peninsula, 04/06/1988, *A.A. Munir 6112* (DNA, AD); Berry Springs, 19/04/1977, *J. Must 1388* (DNA, CANB); 23 mls S Darwin, 22/02/1972, *J. Must 936* (NSW, L, K, DNA, CANB); Nabarlek airstrip, 22/4/1979, *B. Rice 3113* (DNA); Brown's Prospect, Rum Jungle, 13/04/1967, *W.F. Ridley 7* (DNA); Nitmiluk National Park, Site 348, 23/03/2001, *J.A. Risler 1450 & M. Waetke* (DNA); Mt McMin Stn, 2.4 km S Roper Hwy, 26/04/2002, *J.A. Risler 1833 & A.J. Fisher* (DNA, NT); Kakadu National Park, 2.7km N of Jim Jim Ranger Stn turnoff, 07/03/2002, *J.A. Risler 1834* (DNA); Cobourg Peninsula, W side of Bremer Bay, 15/03/2002, *J.A. Risler 1888 & R.S.C. Firth* (DNA); Big Rr Stn, 18/03/2003, *J.A. Risler 2107* (DNA); Big Rr Stn, N Jalboi Rr, 19/03/2003, *J.A. Risler 2108* (DNA); Big Rr Stn, 19/03/2003, *J.A. Risler 2109* (DNA); Kakadu National Park, behind Mardugal Campground, 30/03/2003, *J.A. Risler 2139 & R.S.C. Firth* (DNA); Kakadu National Park, Kakadu Hwy N of Mardugal Campground turnoff, 30/03/2003, *J.A. Risler 2141 & R.S.C. Firth* (DNA); Kakadu National Park, Kakadu Hwy near Cooida, 29/03/2003, *J.A. Risler 2145 & R.S.C. Firth* (DNA); Pukitjarra Point, Bathurst Is, 18/04/2000, *J.A. Risler 360 & C.P. Mangion* (DNA); Kakadu National Park, Kapalga G-plot, 16/02/1995, *J. Russell-Smith 9586 & D. Lucas* (DNA); Kakadu National Park, West Alligator Head, 22/02/1995, *J. Russell-Smith 9697 & D. Lucas* (DNA); Kakadu National Park, Lower Djirrinbal, 05/03/1995, *J. Russell-Smith 9904* (DNA); Charles Darwin National Park, 03/04/1998, *P.S. Short 4734 & C.R. Dunlop* (DNA); Howard Rr, west of; Girraween Road (dirt), 21/03/2001, *P.S. Short 5064* (DNA); Kakadu National Park, Coonjimba Billabong, 04/05/1995, *N.M. Smith 3337* (DNA); Delissaville, Cox's Peninsula, 27/03/1948, *R.L. Specht 92* (MEL, DNA, BRI); 20km N Victoria River Inn, Gregory National Park, 28/02/1986, *B.G. Thomson 1227* (NT); Groote Eylandt Mirrijija, 19/04/1977, *J. Waddy 660* (DNA); Daly Rr Aboriginal Reserve, Beside Allia Ck, c. 70 km S from Daly Rr Mission settlement, 10/05/1994, *N.G. Walsh 3676* (MEL); 5km W of Giddy Rr, Nhulunbuy area, 25/05/1989, *G.M. Wightman 4705* (DNA); Melville Is, Yapilika, 10/09/1986, *B. Wilson 16* (DNA); Nathan River Stn, 10/06/1986, *P.L. Wilson 43* (DNA).

Queensland

15 km W of Bluewater, NW of Townsville, 25/04/1992, *A.R. Bean 4391* (BRI, DNA); Lockerbie, 10 mls WSW of Somerset, 26/04/1948, *L.J. Brass 18451* (CANB); 13.3 km N of the Hann Rr on the Laura to Musgrave Rd, CYP, 01/06/1989, *J.R. Clarkson 8048 & V.J. Neldner* (BRI, MBA); NW side of Mutalunga Range, SE of Townsville, 13/04/1996, *R.J. Cumming 14527* (BRI); Toomulla, c. 40 km NW of Townsville, 07/08/1998, *R.J. Cumming 17723* (BRI); Pannikin Springs area, Blackdown Stn, 12/05/1999, *P.I. Forster 24382 & R. Booth* (BRI); Mt Mulligan Stn, halfway between gully in escarpment and dam, 21/05/2004, *R.A. Kerrigan 816 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, Peninsula Development Road, 46.5 km N of Hann Rr Roadhouse, 22/05/2004, *R.A. Kerrigan 828 & R.K. Harwood* (DNA); Cape York Peninsula, 6 km E of Wenlock Rr Crossing along road to Iron Range, 23/05/2004, *R.A. Kerrigan 832 & R.K. Harwood* (DNA, BRI); c. 15 km SW of Normanton along the road to Mogoura Stn, 24/04/1974, *R. Pullen 8871* (CANB, NSW); Cobra Creek between Tinaroo Falls and Malone Road turnoff on Cairns Rd, near Mareeba, 27/02/1962, *L.J. Webb & G.J. Tracey 5896* (BRI).

Fig. 5.74. The holotype of *Polygala parviloba*. Cox Peninsula, 25/03/2003, I.D. Cowie 9691 & R.K. Harwood (DNA, CANB, MEL, PERTH, BRI, K)



Fig. 5.75. Flower, seed and style of *Polygala parviloba*. a) flower with jagged floral appendages (R.A. Kerrigan 731); b) seed with reduced aril head; and c) style with apical hairs (R.A. Kerrigan 920)

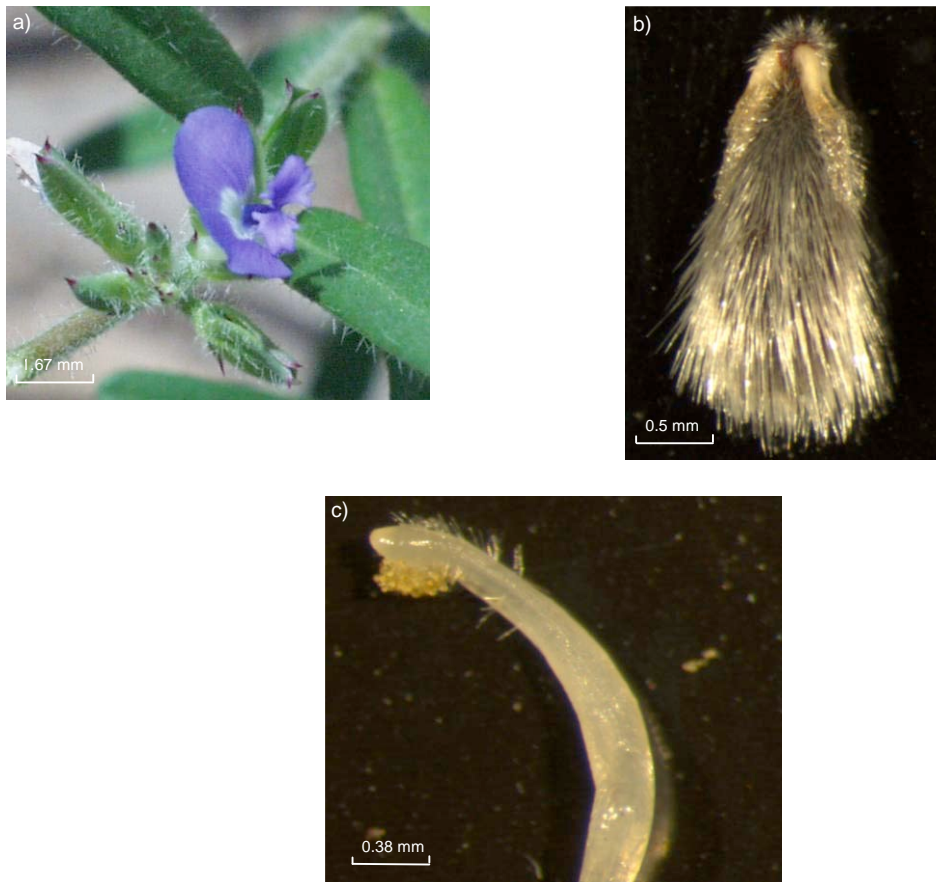
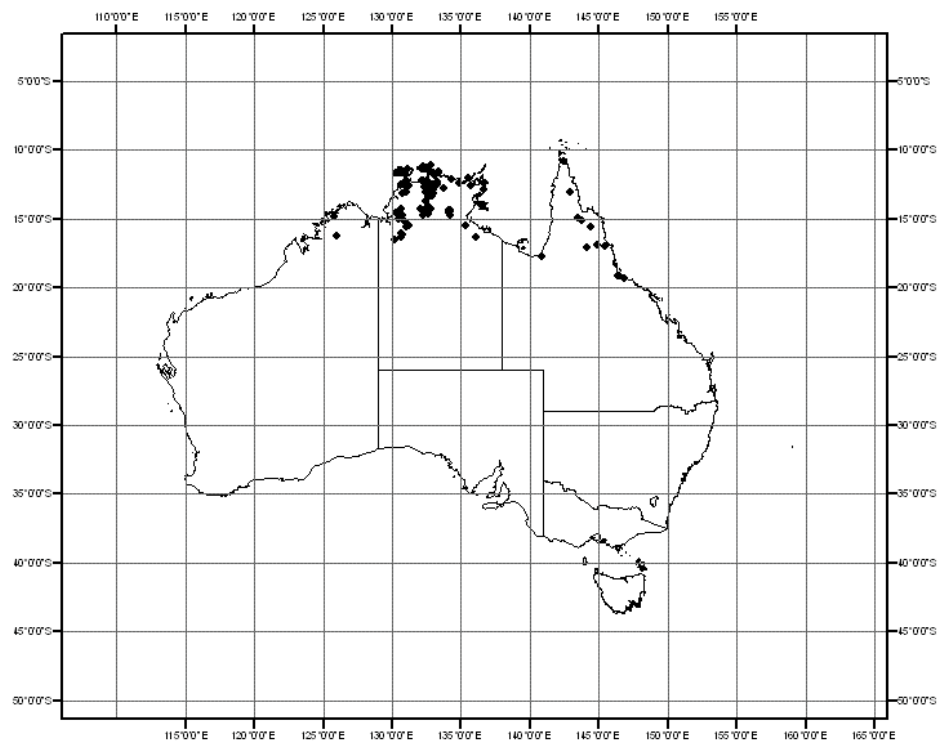


Fig. 5.76. The distribution of *Polygala parviloba* based on available collection data.



Polygala pendulina R.A.Kerrigan, *sp. nov.*

P. gabrielae capsulis pendulinis et foliis angustioribus, et semine parvo differt; a speciebus affinis allis inflorescentiis congestis etiam differt.

Type: Cape York Peninsula, Bromley Stn, 6.9 km along track from Bromley homestead and Wattle Hill, 24.v.2004, *R.A. Kerrigan 834 & R.K. Harwood*; *holo:* DNA 162317!; *iso:* BRI, CANB, K, PERTH

Annual herb, erect to 45 cm, usually single stemmed, occasionally with spreading lateral branches; indumentum of curved and straight hairs or rarely with curved hairs only. Leaves linear, oblanceolate, 7–35 mm long, 1–3 mm wide; sessile. Inflorescence supra-axillary, usually a dense raceme to 125 mm long. Pedicel to 4 mm. Alae herbaceous, becoming pendulous, ovate, elliptic, dimidiate to falcate, 5.0–7.8 mm long, 1.4–3.3 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat along inner surface of hook. Capsule lacking wing, if present only to 0.25 mm, more or less symmetrical, obovate 3.0–5.5 mm long, 2.0–2.75 mm wide. Seed ovoid-oblong, 2.5–2.85 mm long, c. 1 mm wide; indumentum with fine white hairs becoming shorter towards apex. Aril head hooked to helmet shaped, 0.5–0.6 mm long, white or white and brown, with hairs. Aril appendages 3, short and linear, c. 0.5 mm long. (Fig. 5.78)

Distribution

Australia (QLD). This species is only known from Cape York Peninsula, Queensland, currently recorded between Strathmore and Bromley Stn. (Fig. 5.79)

Habitat

Often found in sandy soil in *Melaleuca* shrublands or eucalypt woodlands.

Notes

This taxon is most similar to *P.gabrielae*, *P. macrobotrya*, *P. scorpioides* and *P. stenoclada*. Distinguished from all four species by the mostly smaller seed and the very congested infructescences and pendulous capsules. *P.gabrielae*, *P. macrobotrya*, *P. scorpioides* tend to have wider leaves and *P. stenoclada* has an indumentum of curved hairs only.

Etymology

Latin *pendulina* (hanging down) because of the pendulous nature of the capsules.

Specimens examined: (9)

Queensland

5.3 km SE of Hann Rr on Laura-Coen Rd, 07/07/1998, *A.R. Bean 13534* (BRI); Lakefield National Park 5 km SE Morehead R Musgrave-Lakefield Rd, 08/05/1987, *J.R. Clarkson 7036 & B.K. Simon* (BRI, DNA, QRS, PERTH, L, K, MBA); Bulleringa National Park, 80 km NW of Mt Surprise, 25/04/1998, *P.I. Forster 22641 & R. Booth* (BRI); Cape York Peninsula, 8 km SE of Laura on Peninsula Development Rd, 21/05/2004, *R.A. Kerrigan 820 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, 200 m towards Laura from Little Laura Rr crossing about 22 km along Jowalbinna Rd, 22/05/2004, *R.A. Kerrigan 823 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, Laura to Quinkan Reserve (Jowalbinna) road, 8.4 km from Laura, 22/05/2004, *R.A. Kerrigan 825 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, 15.4 km N of Batavia Downs turnoff, Peninsula Development Rd, 23/05/2004, *R.A. Kerrigan 833 & R.K. Harwood* (DNA, BRI); c. 54 km N of Strathmore Homestead on track near tributary of Echo Ck, 11/07/2001, *G. Turpin 607 & E.J. Thompson* (BRI).

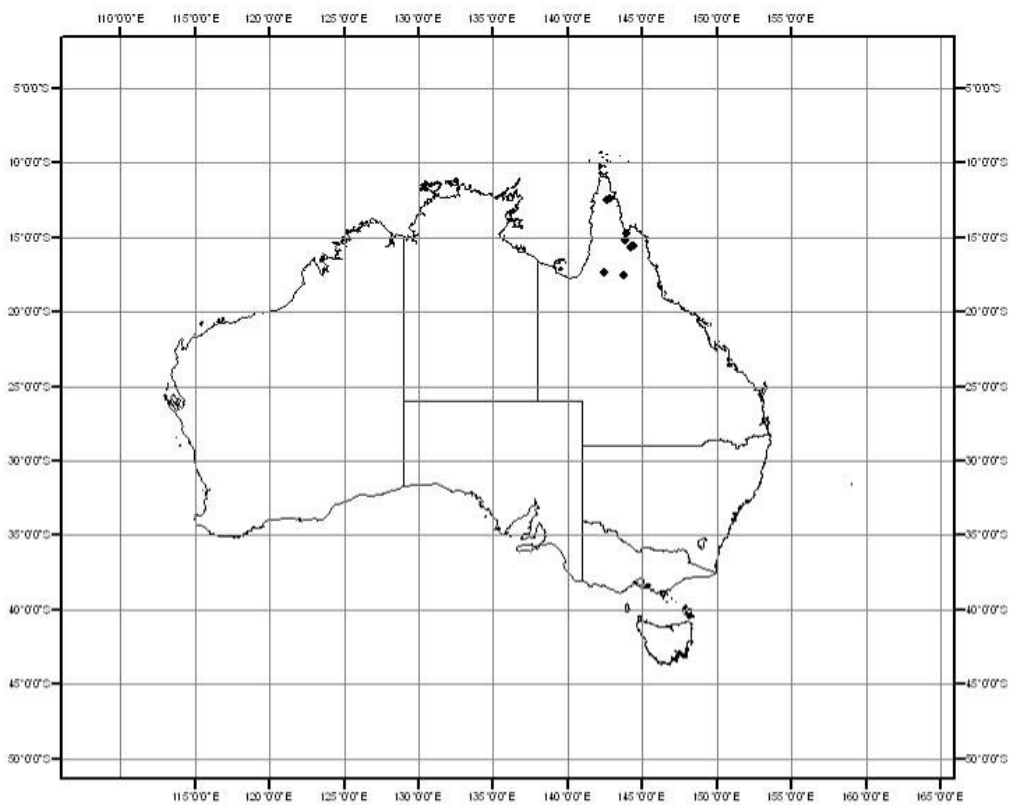
Fig. 5.77. The holotype of *Polygala pendulina*. Cape York Peninsula, Bromley Stn, 6.9 km along track from Bromley homestead and Wattle Hill, 24/05/2004. R.A. Kerrigan 834 & R.K. Harwood (DNA, BRI, PERTH, CANB, K)



Fig. 5.78. Seed of *Polygala pendulina* (R.A. Kerrigan 834)



Fig. 5.79. The distribution of *Polygala pendulina* based on available collection data.



***Polygala persicariaefolia* DC., *Prodromus* 1: 326 (1824)**

Type: in Nepauliâ. *Wallich*; holo?: G-DC (photo G-DC!), K, PR; *fide* A.M.Monro, *Systematics of the Australian Polygalaceae and Xanthophyllaceae*. Unpublished Thesis. ANU (2003)

Annual herb, erect to 50 cm; indumentum of curved hairs on stems, rarely straight on stems and inflorescence, and scaberulous on leaves, particularly veins, midrib and leaf margins. Leaves strongly discolorous. Leaves narrowly elliptic, lanceolate to ovate, 14–60 mm long, 4–14 mm wide; petiole 0–1.5 mm. Inflorescence supra-axillary, or axillary in leaf or branch axils, a raceme to 90 mm long, or rarely solitary. Pedicel to 5 mm. Alae petaloid white to pale green, widely elliptic, 4.0–6.7 mm long, 2.4–5.5 mm wide. Corolla pink to purple; floral appendages fimbriate. Stamens terminate at apical stigma, monadelphous. Style straight at base and bent in second half, stigmas 2, globular, one apical, one lateral. Capsule lacking wing, sometimes with small wing at apex, to 0.4 mm; widely ovoid to obovoid, 4.8–5.0 mm long, 4.0–4.3 mm wide. Seed shape oblong-ovoid, 3.0–3.6 mm long, 1.3–1.7 mm wide; indumentum with fine white ferruginous hairs. Aril head horseshoe shaped, 0.5–0.65 mm long, white, glabrous, with hairs in grooved where aril reduced to seed testa. Aril appendages 3, short, 0.25–0.35 mm long. (Fig. 5.80 & 5.81)

Distribution

Australia (QLD), Africa, SE Asia and Malesia. In Australia only recorded from a few isolated collections around Mareeba, Mt Molloy and the Endeavour Rr. (Fig. 5.82)

Habitat

In Australia found in eucalypt woodlands associated with granite, often close to creeks.

Notes

This taxon is readily distinguished from most other northern species by the distinct horseshoe shaped aril and petaloid alae. Style characters from dried material need confirmation with fresh material.

Nomenclatural notes

This species was not revised in this study and was included here to provide an Australian account. Typification of this species remains unresolved. Adema (1966) cites the type for this species as Wallich 4185 (L!, G!, CGE *n.v.*) while Monro (2003) cites a specimen from G-DC. The only L specimen, catalogued, and available to view online, labelled 4185 is also separately labelled as a Hooker JD and Thomson T collection. Annotations on the 4185 label are indecipherable and although it cannot be excluded as a Wallich specimen there is no Adema det. slip indicating its type status. The specimen cited by Monro (2003) could refer to one of two specimens at G-DC, one with an annotated typed label 'in Napaulia, Mr Wallich' matching Candolle's citation and the other with a handwritten label annotated Mr Wallich but with no locality details. Again there are no det. slips from Adema and neither may be the G specimen he cites. Also the ABLO confirms that a Wallich specimen matching the type details "in Napulia" is housed in Wallich's collection at K. Apparently a full set of his collections is deposited in the Central National Herbarium of the Botanical Survey of India in Calcutta (CAL). I agree with Monro (2003) that a G-DC specimen is a more likely candidate for the

holotype because of access for the author but one of the two specimens there requires lectotypification and the status of potential isolectotypes needs verification.

Specimens examined: (8)

Queensland

Daintree National Park, Adeline Creek headwaters, 14/05/1999, *P.I. Forster 24432 & R. Booth*, (BRI); Mareeba, near junction of Granite and Spring Creeks, 19/03/1960, *D.W. Goodall s.n.* (BRI); The Jump-up, c. 20 km S of Mareeba on road to Atherton, 01/03/1977, *R.J.F. Henderson 2466* (BRI); Mt Molloy, 16/04/1962, *H.S. McKee 9110* (BRI); Endeavour Rr, Queensland, *W.A. Persieh 958* (MEL); Endeavour Rr, Queensland, *W.A. Persieh 344* (MEL); Endeavour Rr, Queensland, *W.A. Persieh 372* (MEL); N of Adeline Creek, Windsor Tableland, 14/05/1999, *B.S. Wannan 1257* (BRI, CANB, NSW).

Fig. 5.80. Habit of *Polygala persicariaefolia* (P. I. Forster 24432)

Fig.5.81. Style and seed of *Polygala persicariaefolia* (P. I. Forster 24432). a) style with apical and lateral stigmas and b) seed with horseshoe shaped aril head.

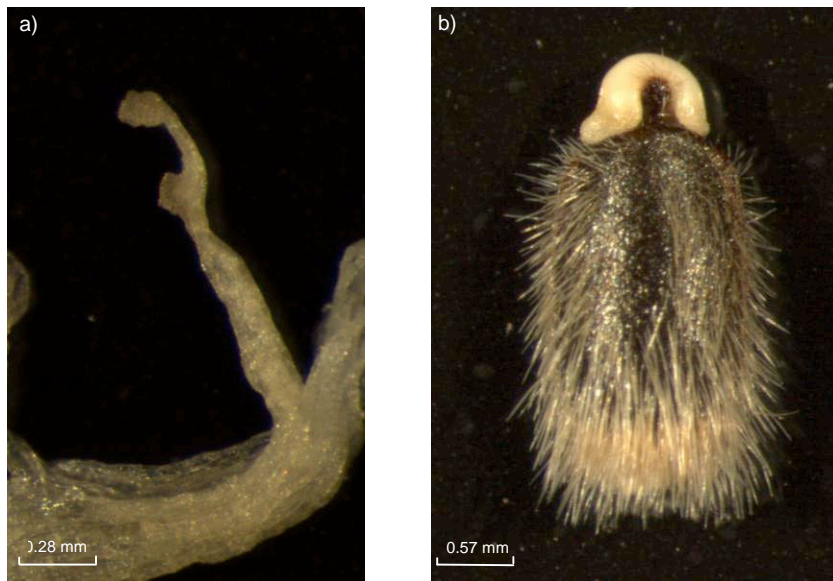
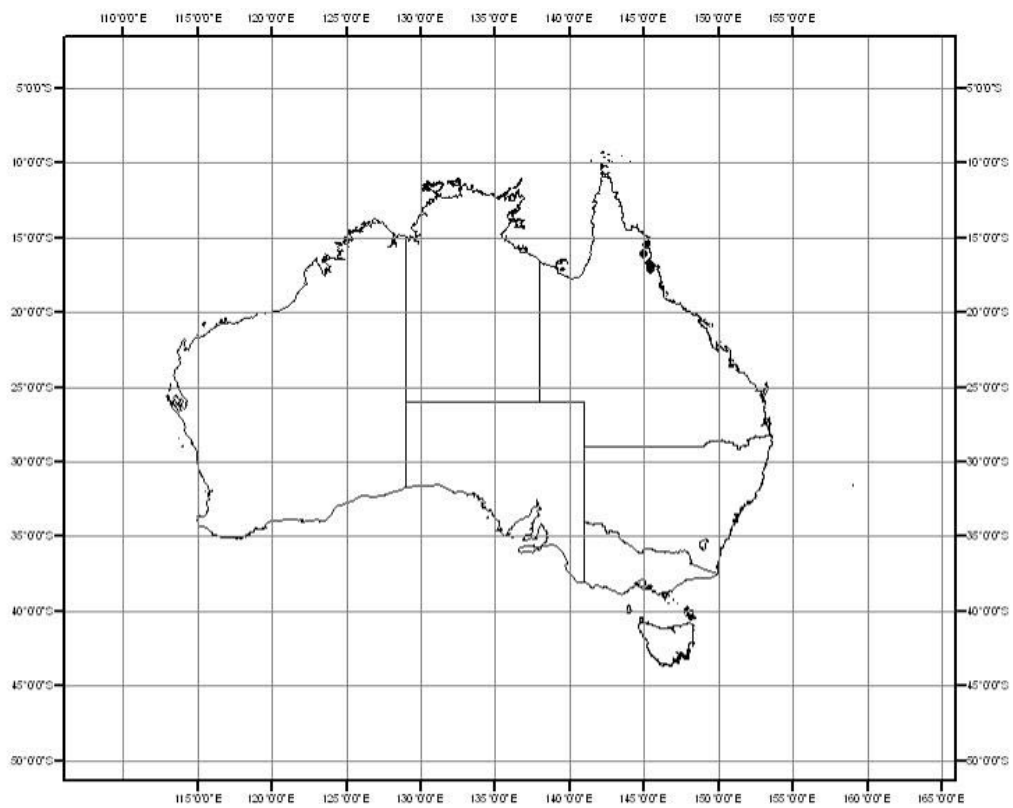


Fig. 5.82. The distribution of *Polygala persicariaefolia* based on available collection data.



Polygala petraphila R.A.Kerrigan, *sp. nov.*

Polygala succulentae similis, a qua semine ovideo et stylo canaliculato differt.

Type: Kimberley, 7.6 km E along Gibb River Road from Beverley Springs turnoff, 12.v.2006, R.A. Kerrigan 1107; holo: DNA 176666!; iso: BRI, CANB, K, PERTH

Polygala sp. ciliate alae (C.R. Michell 615) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, erect to 30 cm; indumentum of curved and straight, pubescent to hispidulous hairs. Leaves linear to oblanceolate, elliptic or obovate, 6–55 mm long, 1.5–11 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary or rarely axillary raceme to 40 mm long, sometimes with a solitary flower on internode proceeding raceme. Pedicel to 2.5 mm. Alae herbaceous, lanceolate; falcate, 5.0–7.5 mm long, 1.3–2.4 mm wide. Corolla purple, floral appendages succulent, bifid to three to four times forked. Stamens terminate at stigma, monadelphous. Style straight to slightly curved, often hairy at base and always prominently grooved above globular stigma. Capsule lacking wing, orbicular or widely ovate, 3.0–4.0 mm long, 3.0–3.8 mm wide. Seed shape ovoid 2.7–3.3 mm long, 1.6–1.9 mm wide; indumentum with fine white or ferruginous hairs, often extending beyond seeds at base and becoming shorter towards apex. Aril head reduced, 0.3–0.6 mm long, brown or black where reduced to seed testa, or brown and white, with short hairs. Aril appendages 3, linear, 1–2 mm long. (Fig. 5.85)

There are two varieties which can be distinguished as follows:

- | | | |
|----|---|--|
| 1. | Leaves 1.5–7.0 mm wide, flowers not overlapping in inflorescence..... | <i>P. petraphila</i> var. <i>angustifolia</i> |
| 1: | Leaves 6–11 mm wide, flowers dense to overlapping in inflorescence..... | <i>P. petraphila</i> var. <i>petraphila</i> |

Distribution

Australia (NT, WA). Occurs between 15° and 18°S from the Kimberley region of WA to Roper River in the NT. (Fig. 5.86)

Habitat

Found mostly in eucalypt woodland amongst rubble on rocky sandstone scree slopes and rises.

Notes

Polygala petraphila is quite variable in habit and hairiness. *Polygala petraphila* var. *angustifolia* is easily distinguished by its ovoid seed from *P. succulenta* but can be difficult to distinguish when mature seeds are not available. A flowering specimen from around Roper River (J.A. Risler 2146) is easily confused with *P. succulenta*, but is recognised as *P. petraphila* by the presence of a groove in the style above the stigma.

Etymology

Greek *petra-* (rock) and *-phila* (loving), rock lover because this species is always found amongst sandstone/laterite rubble on scree slopes.

Polygala petraphila* var. *angustifolia R.A.Kerrigan, var. nov.

Differt var. *petraphila* foliis angustioribus

Type: Jalboi R. catchment; 16 km E by N of Crown Hill, 18.iii.2003, I.D. Cowie 9674; holo: DNA 160389!; iso: BRI, CANB, K, MEL, PERTH

Plants usually erect and tall to 30 cm. Leaves 6–55 mm long, 1.5–7 mm wide, narrowly elliptic, lanceolate to linear. Inflorescence to 40 mm long, flowers loose not overlapping.

Distribution

Australia (NT). From the Roper River to the Victoria River.

Notes

Intermediates between the two varieties exist, R.A. Kerrigan 916 to R.A. Kerrigan 918 are placed with *angustifolia* because of their leaf dimensions however they share the stature and shorter inflorescence of var. *petraphila*.

Etymology

Latin *angusti* – (narrow), latin *-folia* (leaves) in reference to the fact that this variety has narrow leaves.

Specimens examined: (12)

Northern Territory

Jalboi Rr catchment; c 20.9 km E by N of Crown Hill, 18/03/2003, I.D. Cowie 9947 (DNA); Big River Stn, N central area, 18/03/2003, R.K. Harwood 1307 (DNA); Victoria Hwy, 15.2 km W of Scott Creek Stn turnoff, at base of hill near fence line, 24/03/2005, R.A. Kerrigan 915 (DNA); Victoria Hwy, 15.2 km W of Scott Creek Stn turnoff, at base of hill near fence line, 24/03/2005, R.A. Kerrigan 916 (DNA); Victoria Hwy, 9.88 km E from Victoria Rr Crossing, 24/03/2005, R.A. Kerrigan 918 (DNA); Big River Stn, 18/03/2003, J.A. Risler 2097 (DNA); Cave Creek Stn, 20/03/2003, J.A. Risler 2110 (DNA); Cave Creek Stn, NE corner, 20/03/2003, J.A. Risler 2146 (DNA); Big River Stn, 18/03/2003, J.A. Risler 2299 (DNA); Bauhinia Stn, 24/04/1986, P.L. Wilson 41 (DNA); Roper Valley area, 17/04/1991, B.A. Wilson 527 (DNA).

P. petraphila R.A. Kerrigan var. ***petraphila***

Plants erect but spreading, usually to 9 cm (-21cm). Leaves 22 – 30 mm long, 6 – 11 mm wide, elliptic, obovate or oblanceolate, linear. Inflorescence to 35 mm long. Flowers dense to overlapping.

Distribution

Australia (NT, WA). Distributed around 18°S in NT and WA from Victoria Rr to Windjana National Park.

Notes

The easterly specimen of this variety, K.G. Brennan 5920 & K. Metcalfe, is approaching the leaf dimension of *angustifolia* but has the stature and compressed inflorescence of var. *petraphila*.

Specimens examined: (9)

Western Australia

Kimberley, 47 km E along Gibb River Rd from Windjana turnoff., 11/05/2006, *R.A. Kerrigan 1101* (DNA, PERTH); Kimberley, 50.2 km E from Windjana turnoff on Gibb River Rd, 11/05/2006, *R.A. Kerrigan 1103*, (DNA, PERTH); 4 km SE of Beverley Springs, 26/05/1979, *B.G. Muir 678* (PERTH).

Northern Territory

Jasper Gorge, 30/03/2000, *K.G. Brennan 4304* (DNA); 5 km ESE MacArthur Rr Mine, 03/04/2003, *K.G. Brennan 5920 & K. Metcalfe* (DNA); Gregory National Park, 42.7 km from Victoria Hwy on Jasper Gorge Rd, 25/03/2005, *R.A. Kerrigan 924* (DNA); Limbunyah Stn, 15/03/1997, *C.R. Michell 615 & C.P. Mangion* (DNA); Bradshaw Stn, near Fire Plot 9, 23/02/1999, *C.R. Michell 2249 & C. Yates* (DNA).

Fig. 5.83. The holotype of *Polygala petraphila* var. *angustifolia*. Jalboi Rr catchment; 16 km E by N of Crown Hill, 18/03/2003, I.D. Cowie 9674 (DNA, BRI, MEL, PERTH, CANB, K)

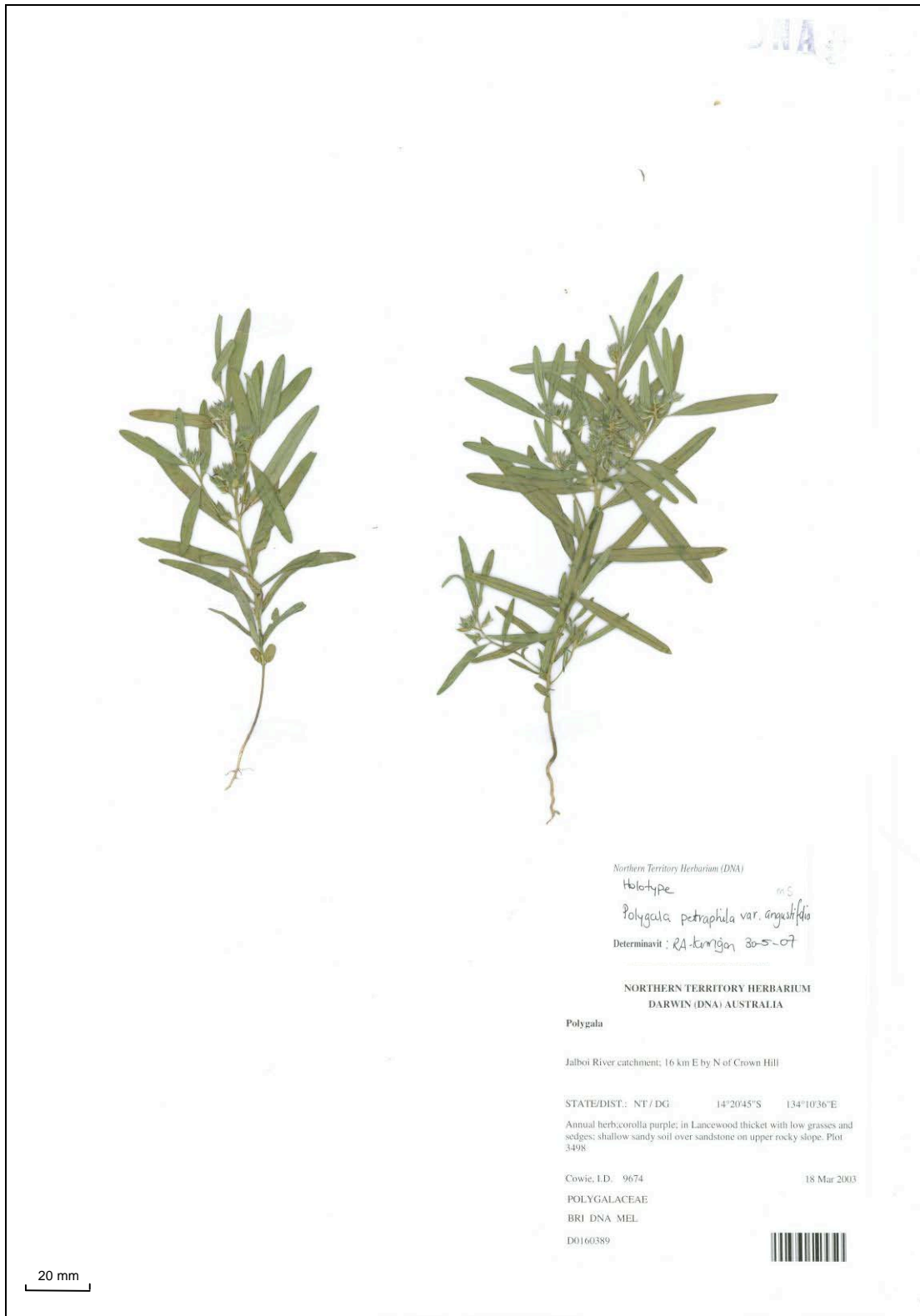


Fig. 5.84. The holotype of *Polygala petraphila* var. *petraphila*. Kimberley, 7.6 km E along Gibb River Rd from Beverley Springs turnoff, 12/05/2006, R.A. Kerrigan 1107 (DNA, PERTH, BRI, CANB, K)

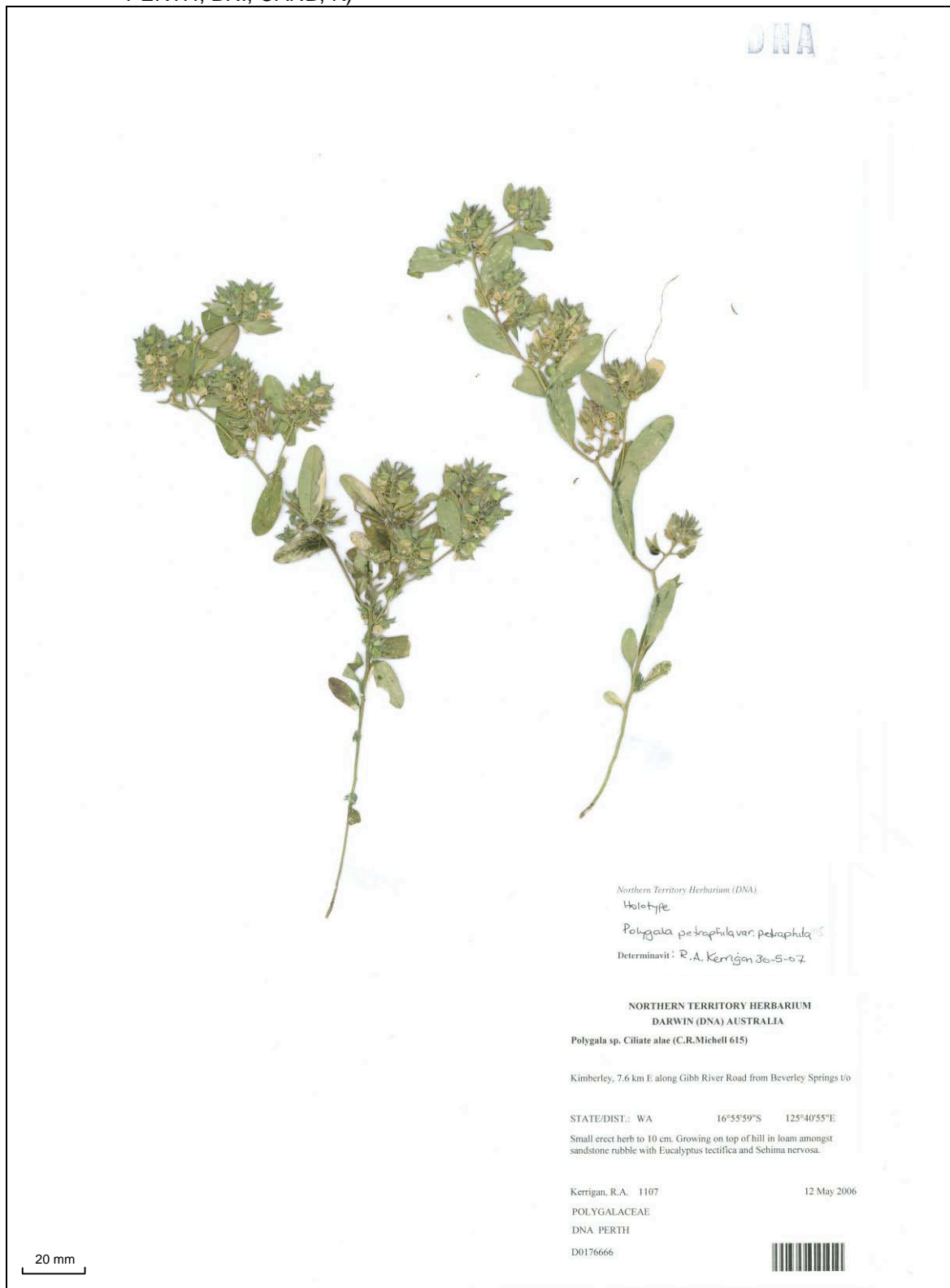
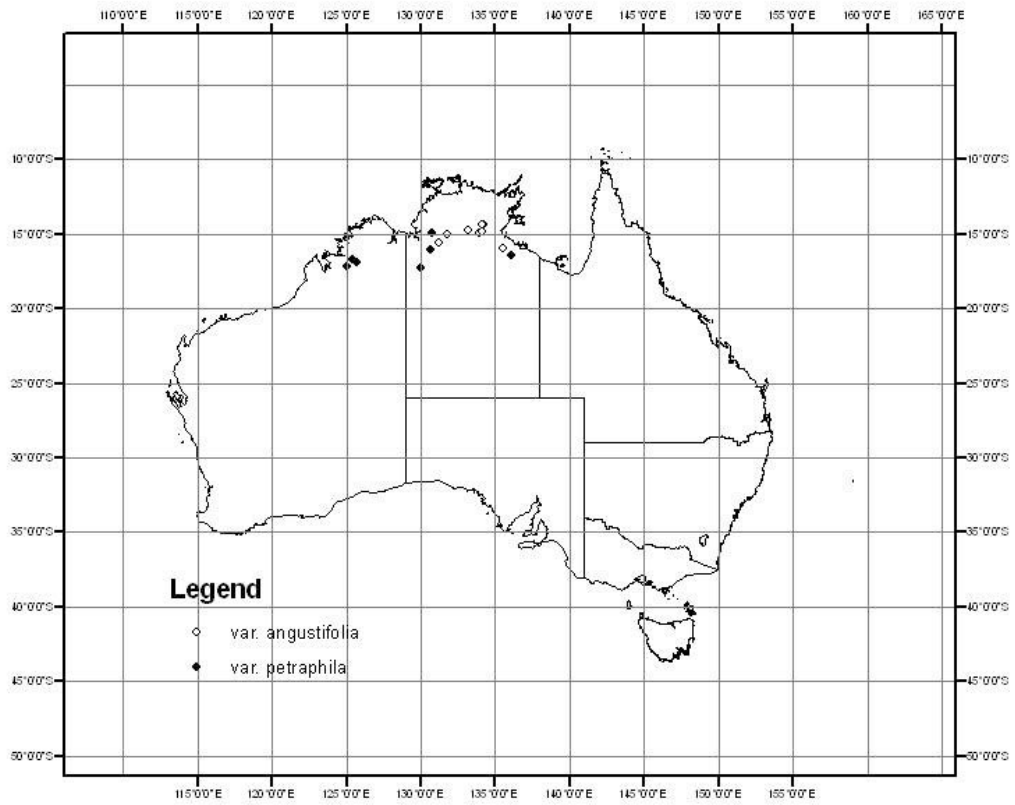


Fig. 5.85. Flower, seed and style of *Polygala petraphila* (R.A. Kerrigan 916). a) flower with succulent floral appendages; b) seed with reduced aril head; c) style with globular stigma; and d) groove above stigma.



Fig. 5.86. The distribution of *Polygala petraphila* based on available collection data.



Polygala polifolia C.Presl, *Reliquiae Haenkeanae*. ii. 101. [1831-1835]

Type: "Habitat in insula Luzon." (Fig. 5.87) holo: PR 375755 (photo DNA!)

[*Polygala chinensis* [Australian material] *auct. non* L.: Adema, *Blumea* 14 (2) (1966), 269]

Annual herb, erect to 20 cm; indumentum of curved hairs. Leaves oblanceolate, narrowly elliptic or narrowly oblong, 4–22 mm long, 2–8 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary raceme to 2 mm long. Pedicel to 0.5 mm. Alae herbaceous, ovate to lanceolate, falcate or dimidiate, 2.4–2.95 mm long, 1.0–1.3 mm wide. Corolla purple, white or yellow (from dried material only), floral appendages fimbriate. Stamens terminate at stigma, 8, triadelphous (fused as 3, 2, 3). Style curved in apical half, truncate at apex with sterile tip distal to stigma and narrow groove for pollen collection, stigma more or less globular, just below end of style. Capsule lacking wing, more or less symmetrical, widely ovoid to orbicular, 2.1–2.5 mm long, 1.9–2.2 mm wide. Seed ovoid to elliptic, 1.9–2.1 mm long, 0.9–1.15 mm wide; indumentum with fine white hairs becoming shorter towards apex. Aril head hooked-rounded, 0.2–0.4 mm long, white, with short erect hairs. Aril appendages 3, short and linear, 0.25–0.6 mm long. (Fig. 5.88 & Fig. 5.89)

Distribution

A very widespread species distributed from Pakistan to China and from the Philippines to Australia (QLD). In Australia it is known from only a few collections from Rockingham Bay near Cardwell, Uningan Nature Reserve at Weipa and a dubious collection from central Queensland. Attempts to relocate the populations near Cardwell and Weipa in March 2007 failed. A BRI collection from Carmoo Creek (N.B. Byrnes 209), on QLD's eastern coastline, is not mapped or listed, it seems it may be mislabelled as only *P. paniculata* was found at the precise location. (Fig. 5.90)

Habitat

With so few collections it is difficult to determine the habitat of this species in Australia. Van der Meijden (1988) indicates this species occupies roadsides, grasslands and waste places. The few collections of this species may reflect that much of the accessible coastal lowland savanna is under cultivation.

Notes

This species is very similar to *P. glaucoides*, but is easily distinguished from it by the fusion of staminal filaments into three bundles (3, 2, 3) rather than one bundle of eight, and the style with the apical point rather than a hook.

Nomenclatural notes

While Van der Meijden (1988) discusses difficulties with the synonymy of this species the application of the name *P. polifolia* to this taxon is relatively straight forward. Flower colour for this species needs to be treated with caution, Forster 6484 records flower colour as white and Mueller records flower colour as yellow and blue, yet Van der Meijden (1988) describes the species as having light to deep violet flowers. It has been my experience in the field that dark blue flowers fade to white with age, both Mueller and Forster collections are of mature fruiting specimens and it is likely that any flowers present were faded at the time of collection.

Specimens examined: (3)

Queensland

Uningan Nature Reserve, Weipa, Queensland., 04/03/1990, *P.I. Forster 6484 & M. O'Reilly* (DNA, BRI);
Preston, 01/01/1927, *N. Michael 940* (BRI); Rockingham Bay, *F.J.H. Mueller s.n.* (MEL)

Fig. 5.87. The holotype of *Polygala polifolia*. Habitat in insula Luzon. (PR) Scale not provided.



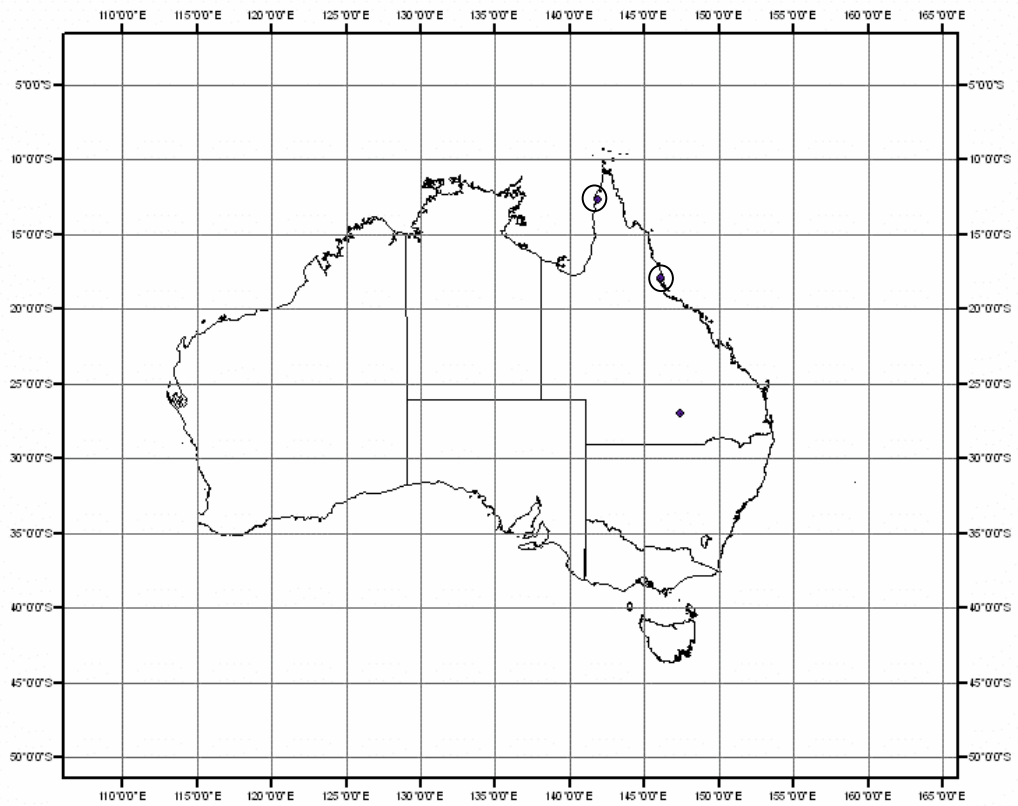
Fig. 5.88. Habit of *Polygala polifolia* (P.I. Forster 6484).



Fig.5.89. Style, stamens and seed of *Polygala polifolia*. a) style with apical point (N. Michael 940); and b) seed with hooked aril head (P.I. Forster 6484).



Fig. 5.90. The distribution of *Polygala polifolia* based on available collection data.



Polygala praecox R.A.Kerrigan, *sp. nov.*

Polygala pendulinae affinis, a qua capsulis alatis differt; a speciebus aliis alatis capsulis asymmetricis et sepalis lateralibus angustioribus distinguitur.

Type: Kalumburu Road, 85.6 km by road N from junction with Gibb River and Ellenbrae Rd, 29.iv.1985, *T.E.H. Aplin 715 & R.J. Cranfield*; holo: PERTH 1854550!

Polygala sp. B. (T.E.H. Aplin et al. 715) J.R. Wheeler (ed), *Fl. of Kimb.*: 644 (1992)

Annual herb, erect to 55 cm; indumentum of curved hairs only. Leaves linear, narrowly elliptic, 10–55 mm long, 1.5–3.5 mm wide; sessile. Inflorescence a supra-axillary or axillary raceme to 50 mm long. Pedicel to c. 3 mm. Alae herbaceous, becoming pendulous, variable, lanceolate, narrowly elliptic, slightly dimidiate to falcate, 7–9 mm long, c. 2.4–3.0 mm wide. Corolla purple; floral appendages reduced, more or less entire. Stamens terminate below stigma, monadelphous. Style shallowly hooked with small beak or protrusion on outer edge of bend, stigma somewhat flat. Capsule with wing, wing uneven, c. 0.5 mm on one side, 1–2 mm the other, strongly asymmetrical, obovate or rhomboidal, 5–6 mm long, 2–3 mm wide. Seed oblong, 2.0–3.5 mm long, c. 1.5 mm wide; indumentum with fine white hairs becoming shorter towards apex. Aril shape domed or rounded, c. 0.6 mm long, white, with hairs. Aril appendages linear to narrowly triangular, c. 0.75 mm long. (Fig. 5.92)

Distribution

Australia (WA). This species is only known from the Kimberley region of WA, along the Kalumburu road. Two unvouchered specimens listed below were intact and rooted in the ground at the time of survey but had completely senesced and were too brittle to collect. (Fig. 5.93)

Habitat

Apparently restricted to a specific habitat of *Eucalyptus tectifica* and *Corymbia grandifolia* woodlands growing on red clay loam, with *Heteropogon* and *Sehima*, possibly associated with basalt.

Notes

This species is similar to *P. pendulina* but can be distinguished by the asymmetrical capsule and the presence of capsule wings. Capsules are irregularly winged per individual, sometimes absent or with one locule winged only. Flower characteristics are described from one depauperate specimen and further material is required.

Etymology

Latin *praecox* (developing early) because this species senesces well before other species in the area.

Specimens examined: (3)

Western Australia

King Edward Rr, old CRA campsite, 1 km S of ford crossing by track to abandoned Mitchell River Homestead, 05/06/1987, *D.J. Edinger 249* (PERTH); Gibb Rr, 24/05/1951, *C.A. Gardner 9993* (PERTH); **Unvouchered localities** 46.5 km N on Kalumburu road from Gibb Rr crossing, 15/05/2006, 8.2 km S of Drysdale Rr Stn on Kalumburu road, 15/05/2006

Fig. 5.91. The holotype of *Polygala praecox*. Kalumburu Road, 85.6 km by road N from junction with Gibb Rr and Ellenbrae Rd, 29/04/1985, T.E.H. Aplin 715 & R.J. Cranfield (PERTH)



Fig. 5.92. Rehydrated floral appendages and style; and seed of *Polygala praecox*. a) floral appendages (D.J. Edinger 249); b) stigma and style apex with apical point; (D.J. Edinger 249) and c) seed (unvouchered specimen).

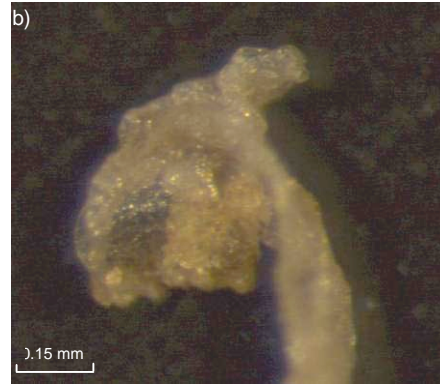
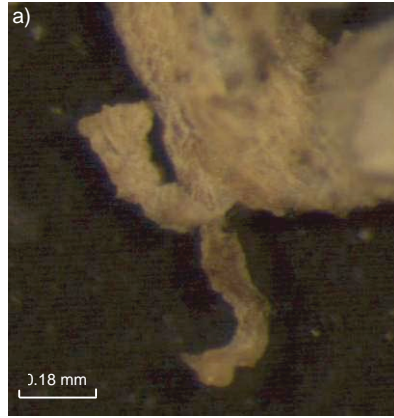
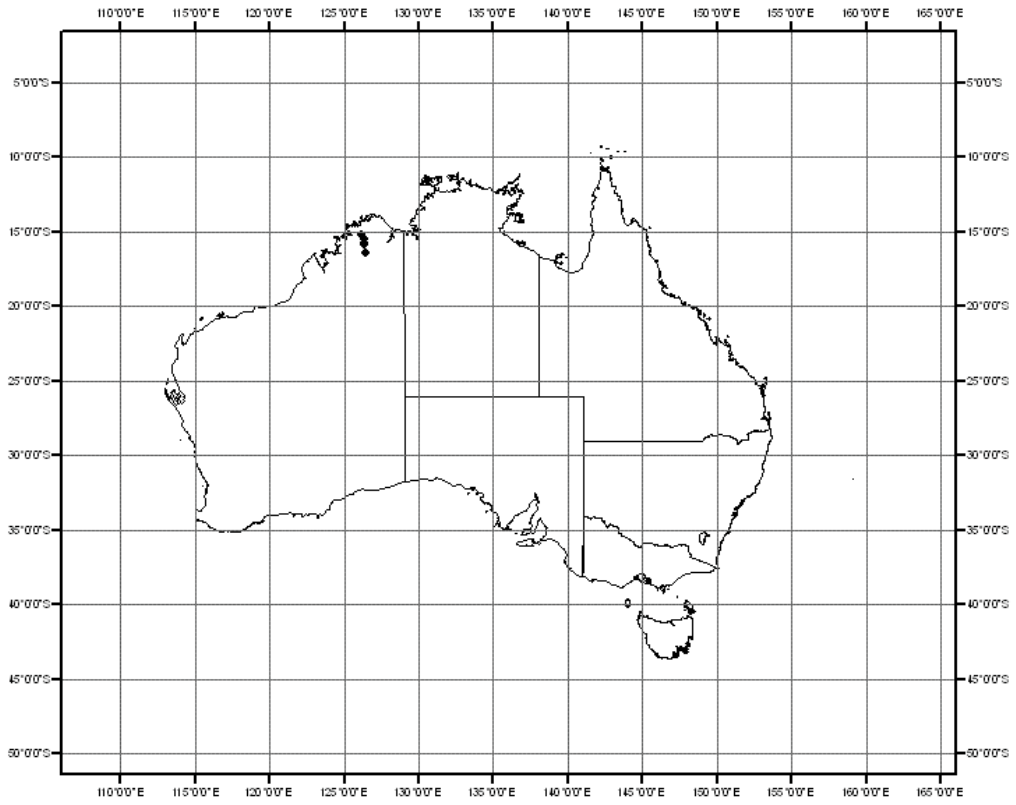


Fig. 5.93. The distribution of *Polygala praecox* based on available collection data.



Polygala pterocarpa* R.A.Kerrigan, *sp.nov.

Polygala crassitestae simillimus a qua testa non incrassata differt.

Type: Gregory National Park, 3.8 km from Bullita road turnoff, on Limestone Gorge Rd, 11.iv.2003, R.A. Kerrigan 621; holo: DNA 169062!; iso: BRI, CANB, K, PERTH

[*Polygala rhinanthoides* auct. non Sol. ex Benth.: A.J.Ewart & O.B.Davies, *Fl. Of the N Terr.* 160 (1917) p.p., as to N.T. specimens; J.R. Wheeler, *Fl. Kimberley* 643 (1992); I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004) p.p., as to western N.T. specimens.]

Annual herb, erect to 90 cm tall often with spreading branches; indumentum of curved and straight spreading hairs. Leaves variable, linear, narrowly elliptic to oblanceolate, elliptic or obovate, 3–77 mm long, 1–11 mm wide; petiole to 0–2.5 mm. Inflorescence an axillary or supra-axillary raceme to 53 mm long or rarely solitary; Pedicel to 3 mm. Alae herbaceous, very widely to widely ovate and elliptic, 3.6–7.6 mm long, 2.1–6.2 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, stigma flat, style often with beak on outer edge of bend visible in dried material. Capsule with wing, 1.06–3.86 mm wide,; symmetrical, widely elliptic, very widely ovate, orbicular to depressed orbicular, 3.5–5.5 mm long, 2.2–4.1 mm wide. Seed shape ovoid-oblong, 3.06–4.55 mm long, 1.31–2.1 mm wide; indumentum with fine white hairs often extending beyond seed at base, becoming shorter towards apex. Aril head round-hooked, 0.4–0.8 mm long, white and brown or black, with short hairs. Aril appendages 3, linear, 1.1–3.3 mm long. (Fig. 5.95)

Distribution

Australia (NT, WA, QLD). In the NT occurs as far N as Katherine, S to the Tanami Desert and E to the Barkly Tablelands, and occurs as far E as Chillagoe in QLD and W to the Napier Range in WA. (Fig. 5.96)

Habitat

Found mostly in open woodland habitats with a grassy understorey, typically with *Eucalyptus patellaris*, *E. pruinosa*, *Corymbia terminalis* or *Acacia* spp, occasionally in vine thickets or bulwaddy thickets (*Macropteranthes kekwickii*) over *Aristida*, *Astrebula* or *Triodia* spp. Found growing in a variety of substrates including limestone, sandy soil and clay loam.

Notes

This species is very similar to *P. crassitesta* and *P. rhinanthoides*. It is distinguished from the former by the absence of the thickened testa and from the latter by the size of the wing capsule relative to the alae.

Etymology

Greek *ptero-*(winged), *-carpa* (fruit), in reference to the prominently winged capsules.

Specimens examined: (73)

Western Australia

18.3 km NE of Mary Rr Crossing, 84 km SW of Halls Creek, Great Northern Highway, 19/06/1976, A.C. Beaglehole 53275 (PERTH); Near Christmas Creek, 01/04/1927, Ewart, A.J. s.n. (PERTH); Napier Range, 26/04/1951, C.A. Gardner 10103 (PERTH); Near Kelly Creek, Ord River Stn, E Kimberley, 19/04/1977, A.S. George 14442 (PERTH); Along roadside 400 m N of Piccanniny Ck tee road, Bungle Bungle National Park, 09/04/1993, I.A. Solomon 709 (PERTH).

Northern Territory

24 km E of Cattle Creek Stn Hmsd, 04/05/2004, *D.E. Albrecht 10827* (NT, DNA); Near (E) Mataranka, 28/04/1947, *S.T. Blake 17508* (BRI, DNA, MEL); About 35 m N of Anthony Lagoon, 15/05/1947, *S.T. Blake 17789* (DNA, BRI); Carrara Waterhole, Mt Drummond pastoral lease, 24/03/2004, *P.K. Latz 19611 & M.G. Harris* (NT); Talbot Well, 27/04/2004, *K.G. Brennan 6244* (DNA); 18 km E of Bradshaw Stn Homestead, 04/06/1999, *C.P. Brock 99* (DNA); 50M W Highway, Dunmarra, 06/05/1969, *N.B. Byrnes 1593*, (DNA); Mallapunyah Stn, near Doreen Yard, 30/04/1991, *I.D. Cowie 1686 & B.A. Wilson* (DNA); Mataranka, Elsey National Park, 16/02/1994, *I.D. Cowie 4581 & J.L. Egan* (DNA, CANB, BRI, MEL); Cave Creek Stn, 1.5 km WSW of Mataranka Resort, 21/03/2003, *I.D. Cowie 9938* (DNA, BRI, MEL, MO); Cattle Creek Stn, N of Camerons Bore, 04/05/2004, *I.D. Cowie 10100 & P.S. Brocklehurst* (NT, MO); Cattle Creek Stn, 200 m W Nicholson's Bore, 05/05/2004, *I.D. Cowie 10108* (NT, MO); Cattle Creek Stn, NE portion, 06/05/2004, *I.D. Cowie 10144 & L.S. Coleman* (NT, BRI); Wave Hill Stn, 43.6 km from Nicholson Bore on 195 degree bearing from N, 04/05/2004, *D.J. Dixon 1258 & B. Crase* (DNA); 30 km N of Elliott, 30/03/1993, *J.L. Egan 1862* (DNA); Mataranka, Elsey National Park, 18/02/1994, *J.L. Egan 3242 & I.D. Cowie* (DNA); Carpentaria Hwy, 30/03/1994, *J.L. Egan 3519* (DNA); Birrindudu Stn, 15/06/1994, *J.L. Egan 3796* (DNA); Cave Creek Stn, 21/03/2003, *R.K. Harwood 1320* (DNA); Gregory National Park, between Von Mueller waterhole and Humbert entrance, 09/04/2003, *R.A. Kerrigan 619* (DNA); Victoria Hwy, W Katherine, 24/03/2005, *R.A. Kerrigan 917* (DNA); Tooganginie Ck, 28km WSW Balbirini Homestead, 30/01/1989, *P.K. Latz 11288* (NT, DNA); Talbot Lake area, 50 km Nth Tanami Mine, 30/04/2004, *P.K. Latz 19800 & D.E. Albrecht* (NT, DNA); 33 km E of Cattle Creek Hmsd, 04/05/2004, *P.K. Latz 19960 & K.G. Brennan* (NT, DNA); 1 km E of Fishers Bore, Cattle Creek Stn, 05/05/2004, *P.K. Latz 19973* (NT, DNA); Cattle Creek Stn, between Nicholson and Mistake Bores to the N, 04/05/2004, *D.L. Lewis 175 & C.P. Mangion* (NT, BRI); NE of Cattle Creek Outstation, 06/05/2004, *D.L. Lewis 205 & C.P. Mangion* (NT, B); S of Cattle Creek Homestead, Cattle Creek Stn, Tanami Desert, 06/05/2004, *C.P. Mangion 1698 & D.L. Lewis* (DNA); Elsey Stn, 09/04/1993, *K.A. Menkhorst 1170* (DNA); Wave Hill, 19/03/1997, *C.R. Michell 646 & C.P. Mangion* (DNA); Flora Rr Reserve, 08/04/1997, *C.R. Michell 751 & D.S. Calliss* (DNA); Brunette Downs, 20/02/1998, *C.R. Michell 1350 & R.B. Carrow* (DNA); Brunette Downs, 21/02/1998, *C.R. Michell 1340 & R.B. Carrow* (DNA); Bradshaw Stn; fire plot 9, 23/02/1999, *C.R. Michell 2247 & C. Yates* (DNA); Cave Creek Stn, NE corner of Property, 20/03/2003, *J.A. Risler 2100* (DNA); Cave Creek Stn, 21/03/2003, *J.A. Risler 2106* (DNA); Tanami 3 km E of Kellmans Bore, 06/05/2004, *P.S. Short 5370 & R.K. Harwood* (DNA); Access road to Mallapunyah Stn, 17/05/1984, *B.G. Thomson 734* (DNA); 4 km E Victoria River Inn, Gregory National Park, 08/03/1986, *B.G. Thomson 1276a* (NT, DNA); Gregory National Park, S of ford at Bullita Homestead on E Baines Rr, 11/04/1996, *N.G. Walsh 4205* (DNA, MEL); Gregory National Park. c. 3 km SE from Bullita outstation, 1.5km WSW from Stn Hill, 14/04/1996, *N.G. Walsh 4302* (DNA, MEL); Victoria Rr, Gregory National Park, 25/02/1986, *G.M. Wightman 2785* (DNA); 60 km N Top Springs, Delamere Rd, 12/02/1988, *P.L. Wilson 1074* (DNA); Roper Rr, 22/03/1988, *P.L. Wilson 1115* (DNA); Daly Waters, 27/05/1991, *B.A. Wilson 525* (DNA).

Queensland

Riversleigh, 20/04/1935, *S.T. Blake 8649A* (BRI); Mt Kukpalli, 6kms S., 08/03/1989, *C.R. Dunlop 8188 & G.J. Leach* (DNA); Kamilaroi, about 100 mls NNW of Cloncurry, Leichardt Rr, 13/04/1954, *S.L. Everist 5267* (BRI); Robertson Rr 200 m E of Cabbold Gorge Camp ground, 21/04/1996, *M.D. Godwin s.n.* (BRI); Lost City 2.7 km S of Ridgepole Waterhole, 27 km E of Musselbrook Mining Camp, 175 km N of Camooweal, 26/04/1995, *R.W. Johnson 265 & M.B. Thomas* (BRI); 21 km E of Musselbrook Mining Camp on road to Ridgepole Waterhole, 175 km N of Camooweal-Lawn Hill National Park, 27/04/1995, *R.W. Johnson 394 & M.B. Thomas* (BRI); Lost City, 2.7 km by road S of Ridgepole Waterhole, which is 27 km E of Musselbrook Mining Camp, 175 km N of C, *R.W. Johnson 763 & M.B. Thomas* (DNA, BRI); c. 82 km SSE of Burketown, 01/05/1995, *J. Kemp 878 & R. Fairfax* (DNA, BRI); 0.8 km NNE of Magazine Hill, 10.4 km N of Silver Star Mine, 17/04/1991, *P. Jones 176* (BRI); 6.2 km E of Chillagoe on road towards Almaden, 20/05/2004, *R.A. Kerrigan 815 & R.K. Harwood* (DNA, BRI); Between Doomadgee Aboriginal Stn and old Corinda on the Burketown Wollogorang road, 05/05/1974, *R. Pullen 9079* (CANB, BRI); 22 km E of Musselbrook Mining Camp on road to Ridgepole Waterhole, about 175 km N of Camooweal, *M.B. Thomas 710 & R.W. Johnson* (BRI)

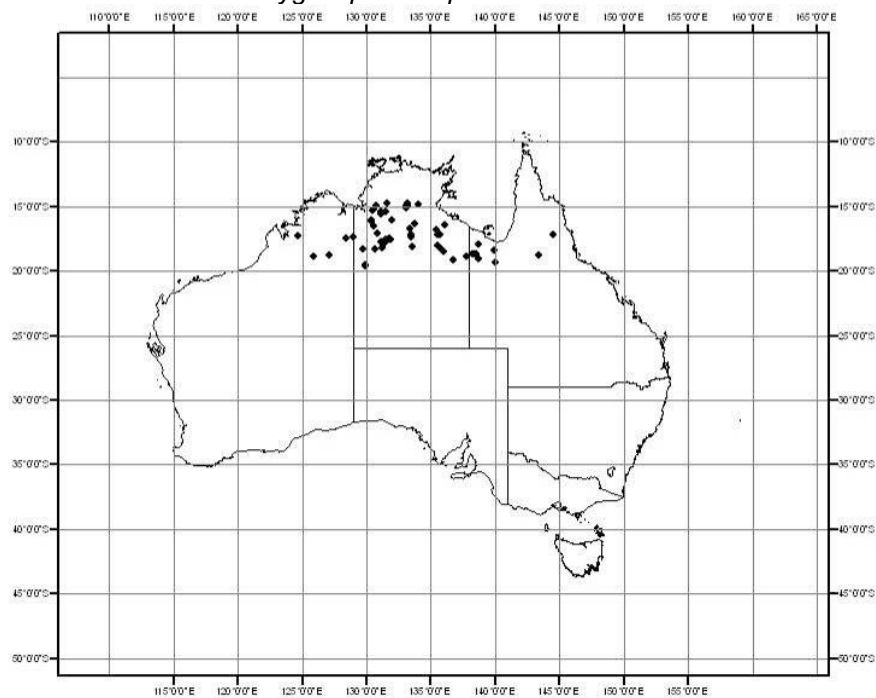
Fig. 5.94. The holotype of *Polygala pterocarpa*. Gregory National Park, 3.8 km from Bullita road turnoff, on Limestone Gorge Road, 11/04/2003, R.A. Kerrigan 621 (DNA, PERTH, BRI, CANB, K)



Fig. 5.95. Flower, seed, alae and capsule of *Polygala pterocarpa* (R.A. Kerrigan 917). a) flower with fimbriate floral appendages; b) seed with round to hooked aril head; and c) alae and winged capsule.



Fig. 5.96. The distribution of *Polygala pterocarpa* based on available collection data.



Polygala pycnophylla Domin, *Biblioth. Bot.* 89(4): 858 (1930)

Type citation: "Queensland: Savannenwälder bei Pentland (DOMIN III. 1910). K. Domin 5695"; *Type detail:* in xerodrymiis prope opp. Pentland. holo: PR 528255! (photo CANB, DNA!)

Annual herb, erect with ascending lateral branches to 15 cm, or spreading; indumentum of short curved and long straight hairs. Leaves linear, narrowly elliptic, lanceolate, oblanceolate, or obovate, occasionally with linear and obovate leaves on same plant, 5–46 mm long, 2–10 mm wide; petiole 0–1 mm. Inflorescence a supra-axillary or axillary raceme to 30 mm long. Pedicel to 2 mm. Alae herbaceous, ovate, usually falcate to dimidiate (asymmetrical); 5–8 mm long, 2.5–3 mm wide. Corolla poorly known, yellow in bud with purple tinges in material seen; floral appendages spatulate. Stamens terminate at stigma, monadelphous. Style hooked; stigma flat against inner bend of hook. Capsule lacking wing,; oblong, 4–5 mm long, 2.8–3.6 mm wide. Seed ovoid to oblong, 3.7–4.25 mm long, 1.35–1.5 mm wide; indumentum with fine hairs over whole seed becoming shorter towards seed apex. Aril head helmet shaped, 0.7–0.85 mm long, white or white and brown, with fine short hairs in central groove. Aril appendages 3, oblong, 0.8–1 mm long. (Fig. 5.98)

Distribution

Australia (QLD). This species is only known from small area around Charters Towers and Pentland and a few collections in the Gulf of Carpentaria east of Karumba. (Fig. 5.99)

Habitat

Usually found in a variety of Eucalypt woodlands including *Eucalyptus crebra* and *Eucalyptus leichhardtii* on sandy soil and loam, occasionally in seasonally inundated situations with *Melaleuca* spp.

Notes

This species is very similar to *P. difficilis*, it is distinguished by the densely hairy alae with long spreading hairs, the restriction of hairs to the groove of the aril head rather than the across the whole aril head and the absence of strigose hairs on the back of the keel petal.

Nomenclatural Notes

A collection number is not cited in the protologue of this species, however there seems to be little doubt that K. Domin 5695 is the holotype based on the close match on locality details and the n. sp. (new species?) annotation on the label.

Etymology

Greek *pycno-* (close dense) and *-phylla* (leaves), dense or crowded leaves.

Specimens examined: (7)

Queensland

34.5 km E of Torrens Creek on Flinders Hwy, 04/05/2007, R.A. Kerrigan 1268 & D.J. Dixon (DNA, BRI); 5.2 km E of Pentland on Flinders Hwy, 04/05/2007, R.A. Kerrigan 1270 & D.J. Dixon (DNA, BRI); 10.5 km E of Pentland on Flinders Hwy, 04/05/2007, R.A. Kerrigan 1272 & D.J. Dixon (DNA, BRI); Wambiana, 70 km S of Charters Towers, 01/07/1998, P.J. O'Reagain s.n. (BRI); c. 72 km SW of Charters Towers, 22/06/1998, E.J. Thompson 439 & G. Turpin (BRI); On a track c. 15 km directly N of Glencoe (site 95), 12/06/2001, G. Turpin 605 (BRI); c. 54 km N of Strathmore Homestead on track near tributary of Echo Ck, 11/07/2001, G. Turpin 611 & E.J. Thompson (BRI).

Fig. 5.97. The holotype of *Polygala pycnophylla*. Queensland: Savannenwälder bei Pentland (DOMIN III. 1910) K.R. Domin 5695 (PR, CANB, DNA)



20 mm

Fig. 5.98. Flower bud, seed and floral appendages of *Polygala pycnophylla*. a) yellow flower bud (R.A. Kerrigan 1268); b) seed with helmet shaped aril head; and c) more or less fimbriate floral appendages.

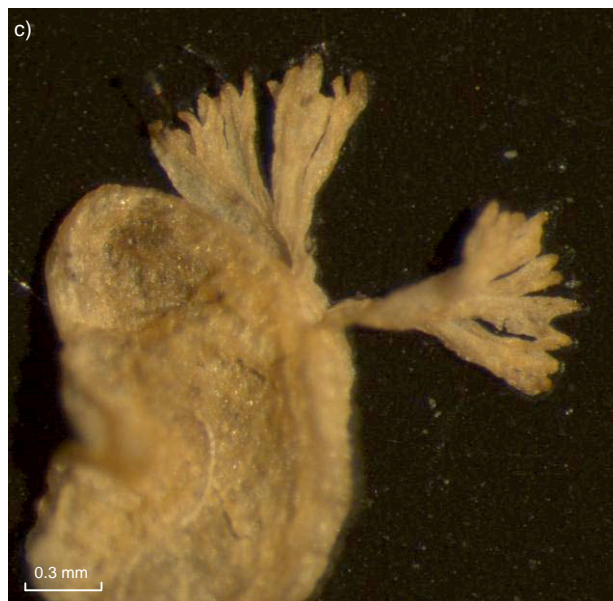
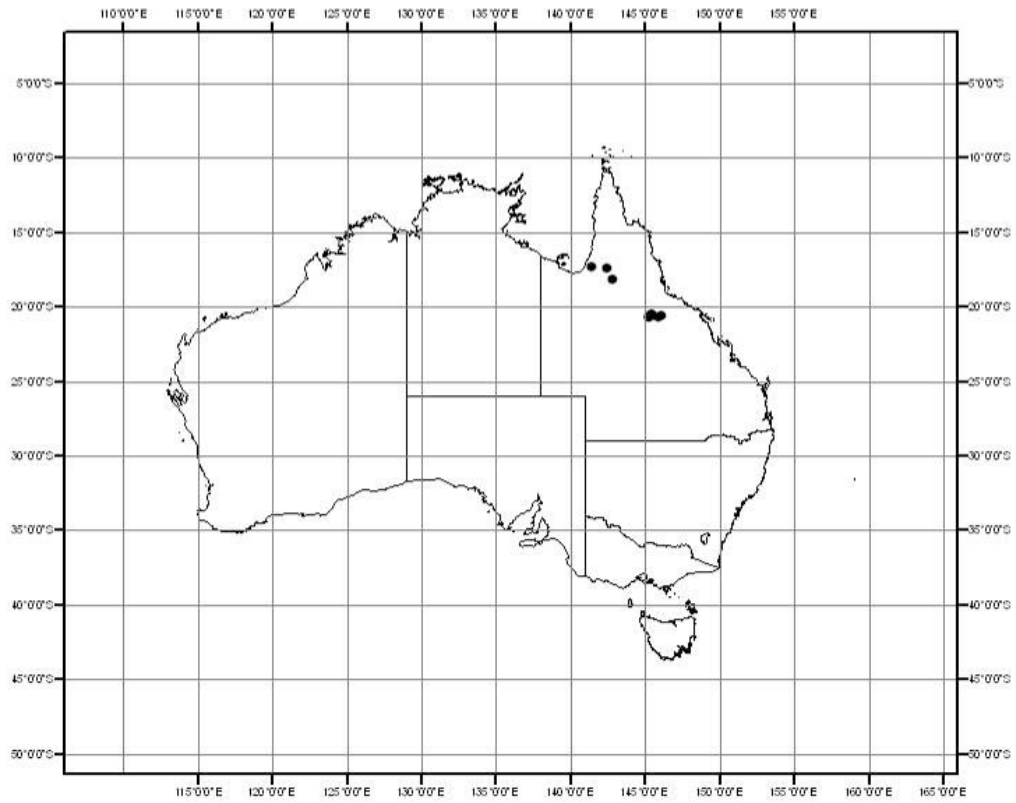


Fig. 5.99. The distribution of *Polygala pycnophylla* based on available collection data.



Polygala rhinanthoides Sol. ex. Benth., *Fl. Austral.* 1:140 (1863)

Lectotype (for later publication): Endeavour R., R. Brown BM 566299! (photo DNA!); *isolectotype*: BM 566300!; *Excluded syntypes*: Upper Victoria R., F.Muell., syn-Mel 226369 a! and b!; Upper Victoria R., F.Muell., syn-K 00279781!

Polygala sp. Portland Roads (L. Pedley 2757) R.J.F.Henderson (ed.), *Names Distr. Queensland Pl., Algae Lichens* 16(2002)

Annual herb, erect to 60 cm, rarely with short lateral branches; indumentum of curved and straight hairs, sometimes with curved hairs only. Stems occasionally red tinged. Leaves linear to lanceolate, 6–83 mm long, 1.5–7.0 mm wide. Inflorescence supra-axillary, a raceme to 110 mm long; petiole to 0–2 mm. Pedicel to 5 mm. Alae thinly herbaceous, ovate to widely ovate, more or less symmetrical, 4.8–7.7 mm long, 2.5–7.1 mm wide. Corolla purple; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked, with beak on curve of bend, stigma flat on inner surface of curve. Capsule with wing, 0.7–3.0 mm wide, widely ovoid to orbicular (including wing), 3.3–5.5 mm long, 3.0–3.5 mm wide. Seed ovoid-oblong 2.7–4.0 mm long, 1.3–1.8 mm wide; indumentum with fine white or ferruginous hairs becoming shorter towards seed apex. Aril head round, 0.5–0.75 mm long, white or white and brown, with short erect hairs. Aril appendage 3, narrowly oblong, 1.0–2.3 mm long. (Fig. 5.101)

Distribution

Australia (QLD), Papua New Guinea. This species is known from Cape York Peninsula from Cooktown to Thursday Is in the Torres Strait. (Fig. 5.102)

Habitat

Found in eucalypt woodlands on sandy soils, loam and in seasonally inundated situations.

Notes

This species is very similar to *P. pterocarpa*, it is distinguished by habit, inflorescence and alae size. *P. rhinanthoides* is usually always a single stemmed erect herb as opposed to the more branching and spreading habit in *P. pterocarpa*. *Polygala rhinanthoides* generally has a longer inflorescence which is less congested and has a finer textured alae. The alae tends to cover the capsule and capsule wing in *P. rhinanthoides* but is usually prominently exerted past the alae in *P. pterocarpa*. There must be an error in Bentham's citation of collections as 'Endeavour Rr, Brown', since the Flinders expedition did not land there. They were most likely Banks specimens from the 'Endeavour' voyage that Brown had on the 'Investigator' as a working set (*pers comm.* Alex George)

Nomenclatural notes

There are four sheets which could be considered syntypes of *P. rhinanthoides*, two from the "Endeavour R., R. Brown" housed at BM -BM 566299 : BM566300 and two from "Upper Victoria R., F.Muell." housed at MEL -Mel226369 and K - K00279781. See note under *P. exsuarrosa* regarding Brown specimens from Endeavour R.

The two collections from the Upper Victoria R., F.Muell. Mel226369 (MEL) and (K) K00279781 are excluded as they are a different taxon and K00279781 appears to be

one part of a mixed gathering. The Melbourne material bears Bentham's initial (B) and is separated into two subcollections "a" and "b". Specimen "a" can be identified as *P. pterocarpa* but specimen "b" is too incomplete to allow identification, although the shrivelled area below the aril may develop into the thickened collar of *P. crassitesta*.

Specimens examined: (23)

Queensland

Thursday Is, Torres Strait, *W. Baeuerlen* 97 (MEL); New Holland, *J. Banks s.n.* & *D. Solander* (MEL, BM); Cooktown, SE end of air field, 15/05/1970, *S.T. Blake* 23236 (BRI); Near Cooktown, 17/05/1970, *S.T. Blake* 23365A (BRI, DNA); Portland Rds, 31/05/1948, *L.J. Brass* 18972 (BRI); Thursday Is, Torres Strait, *J. Chalmers s.n.* (MEL); 6.8 km S of Batavia Downs on PDR, 19/04/1990, *J.R. Clarkson* 8267 & *V.J. Neldner* (BRI); 0.4 km NNW of Beagle North Cmp, c. 38 km NNE of Aurukun, 26/05/1982, *J.R. Clarkson* 4311 (BRI); c. 24 km SSE of the mouth of the Olive Rr, c. 3 km S of Mosquito Point, CY mapping site 698, 23/04/1993, *J.R. Clarkson* 9992 & *V.J. Neldner* (BRI, DNA, L, K, MBA); Cook District, Portland Rds, 09/04/1944, *H. Flecker* 8580 (BRI); Unigan Nature Reserve, Weipa, 04/03/1990, *P.I. Forster* & *M. O'Reilly* 6489 (DNA, BRI, QRS); Fred's Creek, 2.5 km SE of Kennedy Hill, 09/07/1991, *P.I. Forster* 8861 (BRI); Peninsular Development Rd, 20 km S of Coen, 04/02/1999, *R.L. Jago* 5139 & *B.S. Wannan* (BRI); Cape York Peninsula, savanna around new Weipa subdivision, 23/03/2007, *R.A. Kerrigan* 1168 (DNA); Cape York Peninsula, 64 kms on road to Weipa from intersection with Peninsula Development Rd, 24/03/2007, *R.A. Kerrigan* 1169 (DNA, MO, BRI); Cape York Peninsula, at intersection of Peninsula Development Rd with Weipa road, 24/03/2007, *R.A. Kerrigan* 1170 (DNA, MO, PERTH, BRI); Cape York Peninsula, 15 km N along Peninsula Development road from intersection with Weipa road, 24/03/2007, *R.A. Kerrigan* 1172 (DNA, BRI); Cape York Peninsula, 6.3 km S along Peninsula Development road from intersection with Weipa road, 24/03/2007, *R.A. Kerrigan* 1173 (DNA, MO, BRI); Cape York Peninsula, at Trunding Creek swimming hole on way to pistol club, Weipa, 25/03/2007, *R.A. Kerrigan* 1175 (DNA); Weipa, Unigan Nature Reserve, 25/03/2007, *R.A. Kerrigan* 1176 (DNA, BRI); Cape York Peninsula, Weipa adjacent road to Red Beach, 26/03/2007, *R.A. Kerrigan* 1177 (DNA, BRI). Weipa, Trunding Creek at Herring haulroad Palm Crossing, 31/03/1982, *A.G. Morton* 1635 (BRI, MEL); Herring oil slot, Weipa area, 29/01/1990, *M.R. O'Reilly* 655 (BRI); Portland Rds, 03/07/1968, *L. Pedley* 2757 (BRI, CANB, MO).

Fig. 5.100. The holotype of *Polygala rhinanthoides* Endeavour Rr, R. Brown. (BM) © The Natural History Museum, London



Fig. 5.101. Flower and seed of *Polygala rhinanthoides* (R.A. Kerrigan 1170). a) flower with fimbriate floral appendages; and b) seed with rounded aril head.

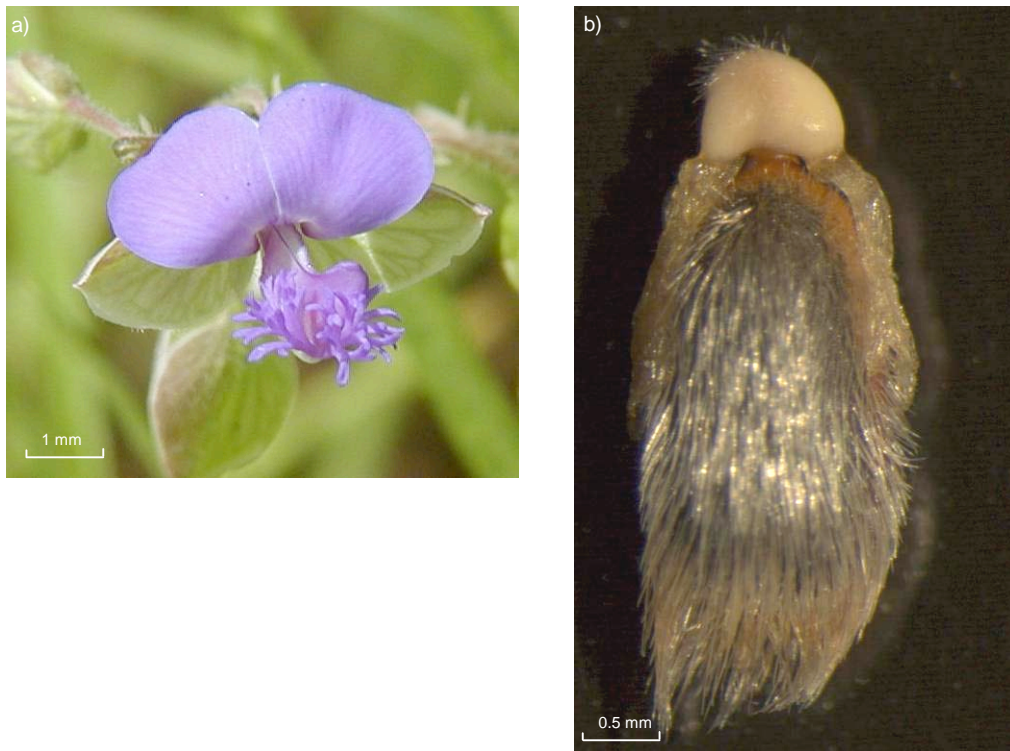
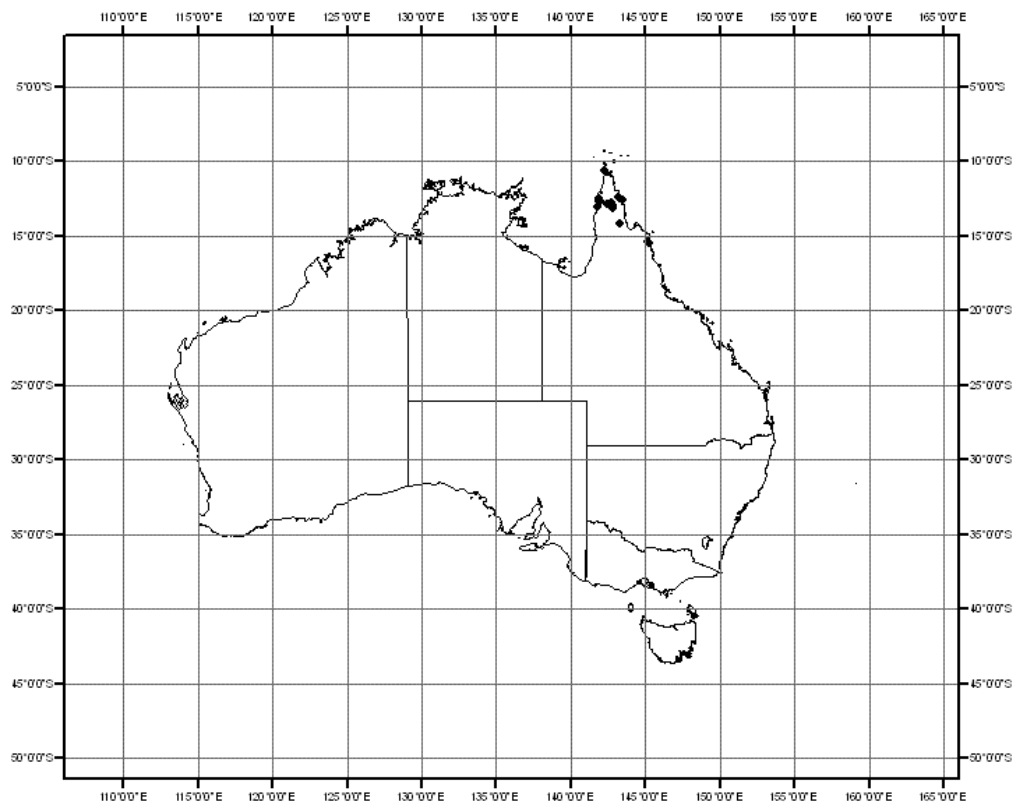


Fig. 5.102. The distribution of *Polygala rhinanthoides* based on available collection data.



Polygala rhynchocarpa R.A.Kerrigan, *sp. nov.*

P. canaliculatae affinis, a qua lobis capsulae apicibus acutis differt.

Type: Kimberley, George's Jump-up, 125.3 km E of Kalumburu turnoff on Gibb River Rd, 15.v.2006. *R.A. Kerrigan 1129*; holo: DNA 176688!; iso: BRI, CANB, PERTH

Polygala sp. A. (K.F. Kenneally 7752) J.R. Wheeler (ed), *Fl. of Kimb.*: 644 (1992)

Annual herb, erect to 55 cm, rarely with spreading and erect branches. Indumentum of curved hairs throughout. Leaves sparse and caducous; more or less sessile. Lamina linear, 22–75 mm long, 0.75–1.5 mm wide. Inflorescence a supra-axillary or axillary raceme, loose to 300 mm long. Pedicel to 5 mm. Alae herbaceous; lanceolate, narrowly elliptic, or oblanceolate; dimidiate to falcate, 4.9–7.0 mm long, 1–2 mm wide. Corolla purple; floral appendages two shortly divided appendages, bifid. Stamens terminate at stigma, monadelphous. Style slightly curved and twisted, truncated into a narrow hammer head above stigma, stigma somewhat flattened. Capsule lacking wing, symmetrical, obovate or squarish, emarginate with acute apex to capsule lobes, 5.75–7.0 mm long 3.1–3.4 mm wide. Seed oblong, 4.0–4.75 mm long, *c.* 1.5 mm wide; indumentum of fine hairs, often shorter at apex. Aril head an elongated helmet shape, 1.0–1.3 mm long, white, sometimes pale brown, hairy, often obscurely so. Aril appendages short and narrow, 0.5–0.9 mm long. (Fig. 5.104)

Distribution

Australia (WA). This species is only known from the Kimberley in WA N of and including the Gibb River Road. (Fig. 5.105)

Habitat

Usually growing in sandy soil often associated with sandstone.

Notes

This taxon is very similar to *P. stenoclada*, *P. macrobotrya*, *P. pendulina*, and *P. canaliculata*. Distinguished from the former three by the curved rather than hooked style and the size of the leaves, and from the latter by the absence of the groove on the end of the broad truncated style, and the obtuse apex of the capsule.

Etymology

Greek *rhyncho-* (beak) and *-carpa* (fruit), because of the acute or beaked apex of the lobes of the capsule.

Specimens examined: (6)

Western Australia

Ck crossing of Kalumburu Rd, 174.4 km N by road from junction with Gibb Rr to Ellenbrae road, 30/04/1985, *T.E.H. Aplin 790* & *R.J. Cranfield* (PERTH); 2 km N of Kalumburu Mission, 17/05/1983, *P.A. Fryxell 4183* & *L.A. Craven* (CANB); Near Dromaius Creek near S end of Ashton Range, Drysdale River National Park, 04/08/1975, *A.S. George 13234* (PERTH); 9 km NW of Mitchell River Falls, N. Kimberley, 15/01/1982, *K.F. Kenneally 7752* (PERTH); 7.8 km NNE of old Mitchell Rr Stn Rd intersection, travelling along Gibb Rr - Kalumburu Road ca 400, 09/06/1987, *B.L. Koch 578* (PERTH); S side of Savage Hill, SE Bigge Is, 25/05/1991, *T. Willing 407* (PERTH).

Fig. 5.103. The holotype of *Polygala rhynchoarpa*. Kimberley, George's Jump-up, 125.3 km E of Kalumburu turnoff on Gibb River Road, 15/05/2006, R.A. Kerrigan 1129 (DNA, BRI, PERTH, CANB)

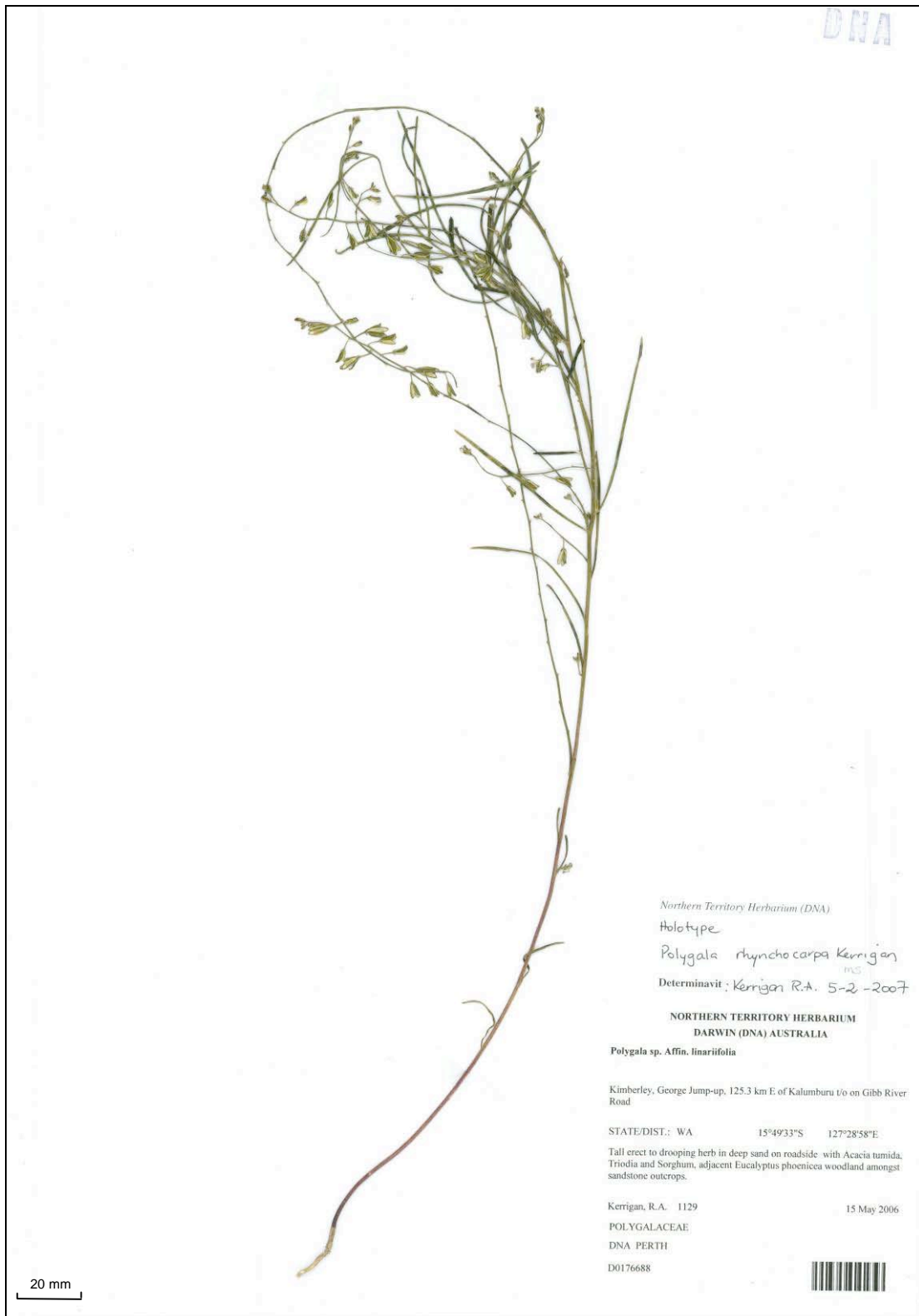


Fig. 5.104. Capsule and style of *Polygala rhynchoarpa*. a) capsule with beaked apex (B.L. Koch 578); and b) twisted style with truncated apex (R.A. Kerrigan 1129).

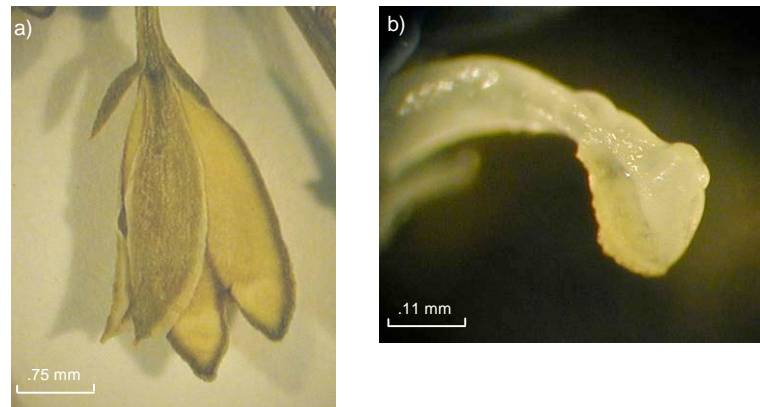
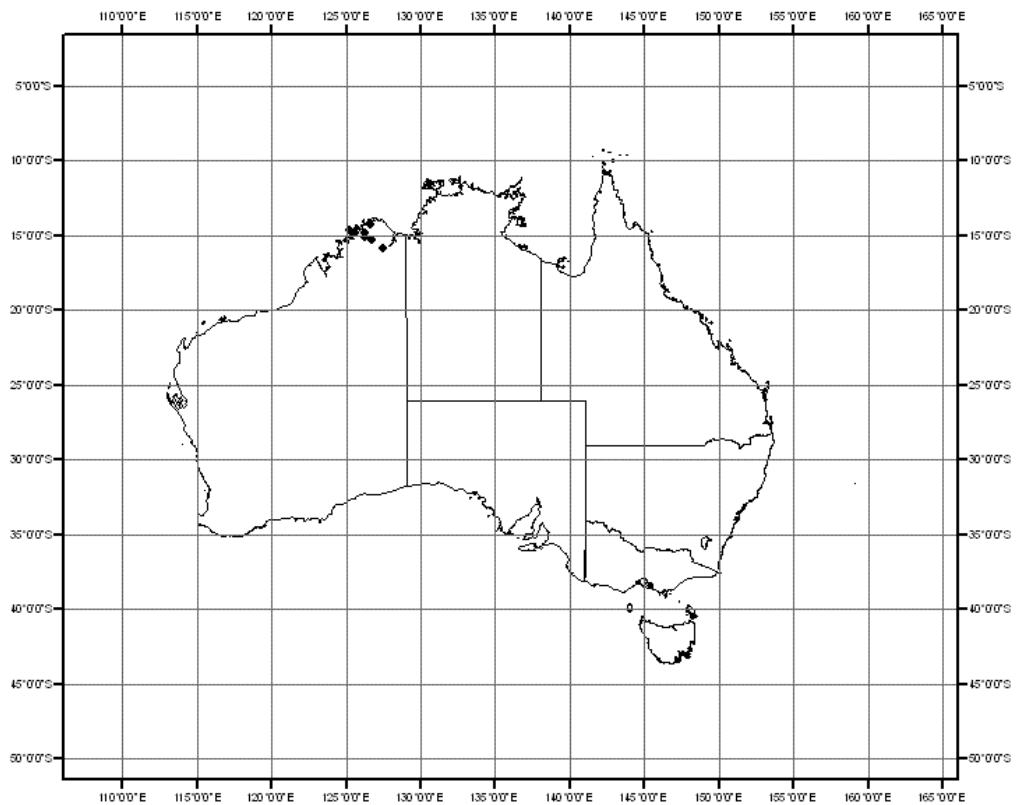


Fig. 5.105. The distribution of *Polygala rhynchoarpa* based on available collection data.



Polygala saccopetala R.A.Kerrigan, *sp. nov.*

Polygala scorpioides similis, a qua carina magis saccata indumentio et pilis curvis non nisi differt.

Type: Bullo River Stn, N from Bullo Homestead, 12.iii.2006, *R.A. Kerrigan 1083*; holo: DNA 176651!; iso: BRI, CANB, K, L, MEL, PERTH

Polygala sp. Bradshaw (C.R.Michell 2113) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, erect to 40 cm, single stemmed or with spreading or decumbent branches; indumentum of curved hairs, leaves often glabrescent. Leaves linear, narrowly elliptic to oblanceolate, elliptic to ovate, rarely obovate, 2–53 mm long, 1.4–12.0 mm wide; petiole 0–1.5 mm. Inflorescence a supra-axillary raceme to 150 mm long, usually loose (flowers not overlapping) and often scorpioid. Pedicel to 3 mm. Alae herbaceous, ovate, elliptic or obovate, slightly dimidiate, 3.7–5.7 mm long, 2.0–2.8 mm wide. Corolla purple, floral appendages fimbriate; keel petal with well developed pockets on both lower flaps. Stamens terminate at stigma, monadelphous. Style very hooked, stigma flat, along inner surface of hook of style. Capsule lacking wing, more or less symmetric, widely ovoid, 4.2–5.0 mm long, 3.3–4.3 mm wide. Seed oblong-ovoid, 3.5–4.4 mm long, 1.5–1.8 mm wide; indumentum with fine white hairs, shorter towards seed apex. Aril head hooked or helmet shaped, 0.6–0.9 mm long, white or brown and white, with minute short erect hairs, inconspicuous even under magnification. Aril appendages 3, shortly linear to narrowly oblong, 0.8–1.5 mm. (Fig. 5.107)

Distribution

Australia (NT, WA). This species is found W of the Victoria Rr in the NT and extends to King Leopold National Park in WA. (Fig. 5.108)

Habitat

Found in woodlands growing amongst sandstone rubble.

Notes

This species is very similar to *P. scorpioides* and is distinguished by the absence of straight hairs and the much more developed pockets on the keel petal.

Etymology

Latin *sacco-* (pouched) and *-petala* (petal) because of the well developed pockets on the keel petal.

Specimens examined: (15)

Western Australia

c. 500 m E of Beverley Springs Stn Homestead, 10/02/1993, *M.D. Barrett 187* (PERTH); Walgamungum Creek, 500 m ESE of Beverley Springs Stn Homestead, 01/04/1995, *R.L. Barrett 1078* (PERTH); 400 m NNE of Beverley Springs Stn Homestead, W Kimberley, 05/02/1996, *R.L. Barrett 802* (PERTH); Walgamungum Creek, 1.5 km ESE of Beverley Springs, 10/02/1996, *R.L. Barrett 845* (PERTH); Carson Rr, *J. Bradshaw 1891* & *K.M. Allan* (MEL); Remote Weather Stn, 29 km N of mining camp, Mitchell Plateau, 25/01/1982, *K.F. Kenneally 7951* (PERTH); Bent Orchid Falls (non-gazetted name), 4 km due E of mining camp site, Mitchell Plateau, 27/04/1982, *K.F. Kenneally 8148* (DNA, PERTH); Kimberley, 50.2 km E from Windjana turnoff on Gibb River Road, 11/05/2006, *R.A. Kerrigan 1104* (DNA); Kimberley, Fern Creek 9 km past Lennard Gorge turnoff, 11/05/2006, *R.A. Kerrigan 1105* (DNA); Kimberley, Beverley

Springs Stn, c. 500 m NNE of Paradise Pools, 12/05/2006, *R.A. Kerrigan 1106* (DNA); Kimberley, 7.6 km E along Gibb River Road from Beverley Springs turnoff, 12/05/2006, *R.A. Kerrigan 1109* (DNA); Kimberley, George Jump-up, 125.3 km E of Kalumburu turnoff on Gibb River Road, 15/05/2006, *R.A. Kerrigan 1130* (DNA, PERTH).

Northern Territory

Bradshaw Stn, near fire plot 17, 16/02/1999, *C.R. Michell 2068 & J. Russell-Smith* (DNA); Bradshaw Stn, 20/02/1999, *C.R. Michell 2113 & C. Yates* (DNA); Bradshaw Stn, near fire plot 3, 18/02/1999, *C.R. Michell 2170* (DNA, BRI, NSW).

Fig. 5.106. The holotype of *Polygala saccopetala*. Bullo River Stn, N from Bullo Homestead, 12/03/2006, R.A. Kerrigan 1083 (DNA, BRI, PERTH, CANB, K, MEL, L)

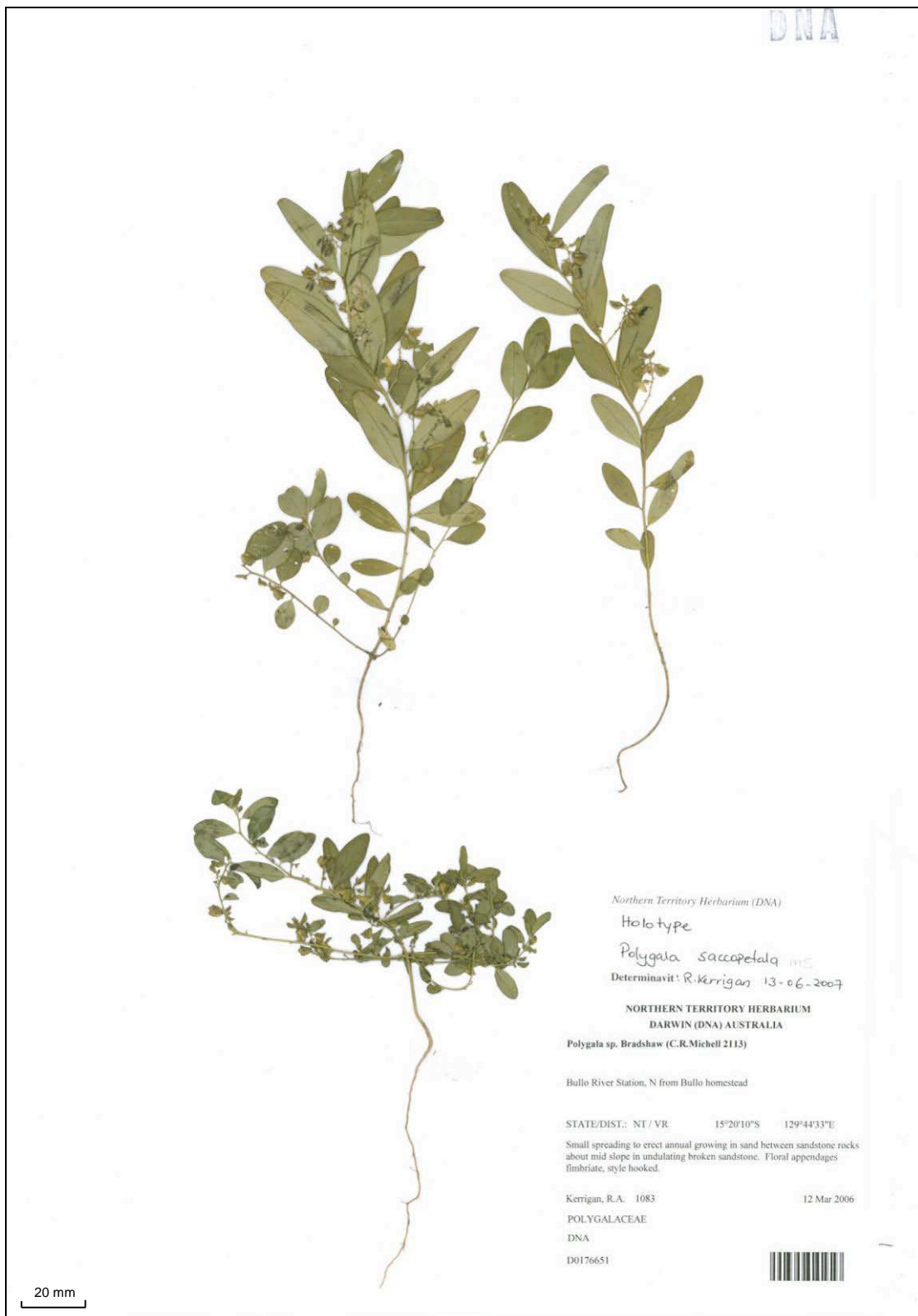


Fig. 5.107. Flower, keel petal, and seed of *Polygala saccopetala* (R.A. Kerrigan 1083). a) flower with fimbriate floral appendages; b) keel petal with lateral pouch; and c) seed with hooked aril head.

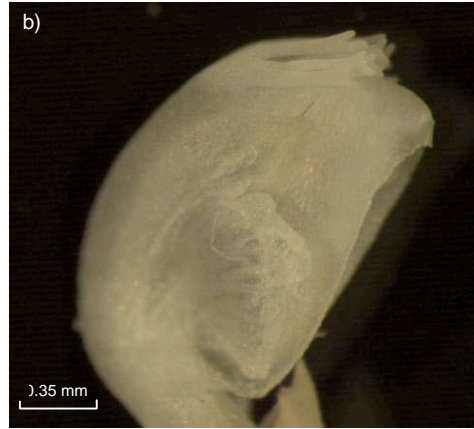
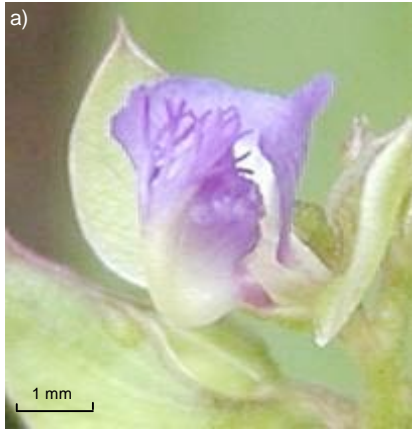
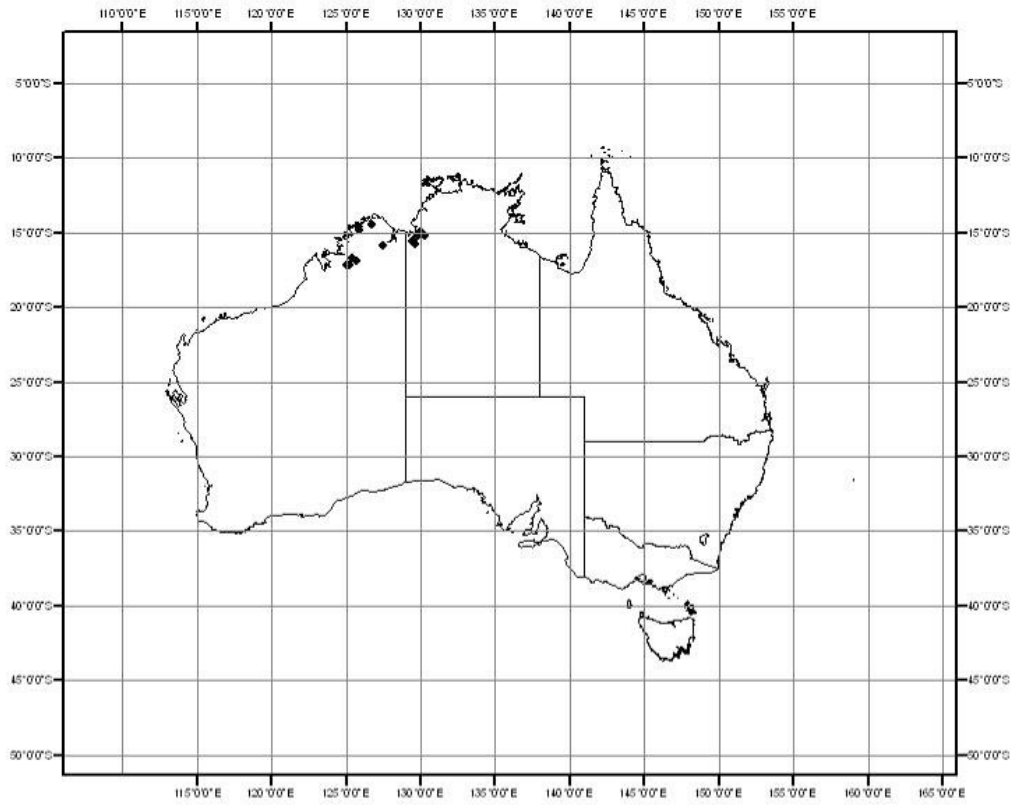


Fig. 5.108. The distribution of *Polygala saccopectala* based on available collection data.



Polygala scorpioides R.A.Kerrigan, *sp. nov.*

Polygala saccopetalae affinis, a qua pilis rectis indumentorum et carina parvulis saccata differt.

Type: Rookwood Stn, near old mango farm on N bank of Walsh R., 29.iii.2007, R.A. Kerrigan 1185;

holo: DNA 180131! iso: BRI, CANB, PERTH

Annual herb, erect with ascending lateral branches to 30 cm, rarely sprawling; indumentum of curved and straight hairs. Stems and leaves occasionally tinged maroon. Leaves linear, narrowly elliptic, ovate or elliptic, 4.5–65.0 mm mm long, 2.5–9.0 mm wide; petiole 0–2 mm. Inflorescence a supra-axillary or axillary raceme to 160 mm long, usually loose and scorpioid. Pedicel to 3.5 mm (4.5 mm in capsule). Alae herbaceous, lanceolate, or narrowly elliptic to elliptic, usually dimidiate (asymmetrical); 3.6–6.4 mm long, 1.2–2.6 mm wide. Corolla purple; floral appendages fimbriate (slightly developed pocket on keel petal). Stamens terminate at stigma, monadelphous. Style hooked; stigma flat against inner bend of hook. Capsule lacking wing, widely elliptic to widely oblong, 4.35–5.5 mm long, 2.5–3.5 mm wide. Seed ovoid-oblong, 3.25–4.2 mm long, 1.1–1.8 mm wide; indumentum with fine hairs over whole seed becoming shorter towards seed apex. Aril head hooked to helmet shaped, 0.5–1.0 mm long, white or white and brown, with fine short hairs. Aril appendages 3, oblong and short, 0.5–1.0 mm long. (Fig. 5.110)

Distribution

Australia (QLD). This species is known from Cape York Peninsula from Somerset to the N and the Lamb Range and the Walsh Rr near Chillagoe to the S. (Fig. 5.111)

Habitat

Usually found in a variety of eucalypt woodlands on sandy soil and loam.

Notes

This species is very similar to *P. saccopetala*, *P. gabriellae* (see notes under this species) and *P. triflora*. From *P. saccopetala*, it is immediately distinguished by the presence of straight hairs and the much reduced pocket development on the keel. *Polygala triflora* is generally distinguished by the more thickened taproot, often multi-stemmed sometimes woody habit and the absence of pocket development on the keel petal. *Polygala scorpioides* tends to have bigger seeds and bigger alae than *Polygala triflora*. *Polygala scorpioides* is a variable species, varying from slender, low spreading to ascending, few-flowered specimens (RW Johnson 5078) to more robust, erect specimens with scorpioid inflorescences (RA Kerrigan 1185). While these extremes are easily distinguished many specimens that share characters from both extremes (e.g. RA Kerrigan 1174 & 822) make it difficult to differentiate this species further.

Nomenclatural Notes

Specimens in this group have generally been identified in the past as *P. linariifolia* following Adema (1969). Adema recognised that specimens attributed to this name in Australia differed in flower colour and size, and shape of seed to Malesian material. The naming and synonymy of this taxon is quite confused and discussed under *P. triflora*.

Etymology

Latin *scorpioid*-referring to the inflorescence with the main axis coiled like the tail of a scorpion.

Specimens examined: (24)

Queensland

Walsh, 00/3/1981, *T. Barclay-Millar s.n.* (BRI); Newcastle Range, 01/03/1907, *A.H. Blackman s.n.* (BRI); Newcastle Bay, 2.5 mls S of Somerset, 10/05/1948, *L.J. Brass 18746* (CANB); 3 km W of the St George Rr crossing on the Fair View to Kimba Rd, 20/04/1980, *J.R. Clarkson 3169* (MO, BRI, NT, QRS); Mushroom Rock, 5.3 km E of the Peninsula Development Rd on an IWS track leaving the main road 0.5 km, 26/04/1983, *J.R. Clarkson 4706* (BRI); 4 km from St George Rr Bridge on the old road to Kimba, 20/01/1984, *J.R. Clarkson 5113* (DNA, BRI, K, QRS, MO, PERTH); 0.8 km S of the Laura Rr crossing on the Peninsula Development Rd, 07/03/1987, *J.R. Clarkson 6797 & W.J.F. McDonald* (BRI, QRS, MBA); 1.5 km W off Battle Camp Rd, 2.9 km past Laura airstrip, 10/04/1988, *P.I. Forster 4010* (BRI); 0.8 km S of Laura Rr crossing on Peninsula Development Rd, 20/04/2005, *R.K. Harwood 1524* (DNA); Jowalbinna, c. 20 mls SW of Laura, 1/2/1978, *W. Hinton 14* (BRI); 8.8 km S of New Rd turnoff, on Peninsula Development Road, near microwave tower, 03/03/1992, *R.W. Johnson 5078* (DNA, BRI, L); Dalhenty Rr, at crossing, on Telegraph Line road, 06/03/1992, *R.W. Johnson 5123* (DNA, BRI, L, K, AD); Cape York Peninsula, 200 m towards Laura from Little Laura Rr crossing about 22 km along Jowalbinna Road, 22/05/2004, *R.A. Kerrigan 822 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, 21.9 km from Laura along Jowalbinna Rd, 22/05/2004, *R.A. Kerrigan 824 & R.K. Harwood* (DNA, BRI); Cape York Peninsula, savanna around new Weipa subdivision, 23/03/2007, *R.A. Kerrigan 1167* (DNA, BRI); Cape York Peninsula, 40 km Sth of Weipa turnoff towards Archer Rr on Peninsula Development Rd, 24/03/2007, *R.A. Kerrigan 1174* (DNA, BRI, PERTH); Cape York Peninsula, Weipa on road to Red Beach, 26/03/2007, *R.A. Kerrigan 1178* (DNA, BRI, NSW); Cape York Peninsula, Weipa, on road to Red Beach, 26/03/2007, *R.A. Kerrigan 1179* (DNA, BRI, NSW, CANB, MO); 5.7 km along Davies Ck Rd, E of Kennedy Hwy, 29/03/2007, *R.A. Kerrigan 1181* (DNA); Rookwood Stn, near old mango farm on north bank of Walsh Rr, 29/03/2007, *R.A. Kerrigan 1185* (DNA, BRI, PERTH, CANB); Heathlands Pastoral Stn between Homestead and Captain Billy road turnoff, 13/05/1980, *A.G. Morton 916* (BRI); Mapoon Reserve, between Cullen Point and Janie Creek, 03/05/1982, *A.G. Morton 1713* (MEL); Community Farm, Old Mapoon, 21/04/2004, *B.M. Waterhouse 6861* (BRI, CANB, MBA).

Fig. 5.109. The holotype of *Polygala scorpioides*. Rookwood Stn, near old mango farm on N bank of Walsh Rr, 29/03/2007, R.A. Kerrigan 1185 (DNA, BRI, PERTH, CANB)

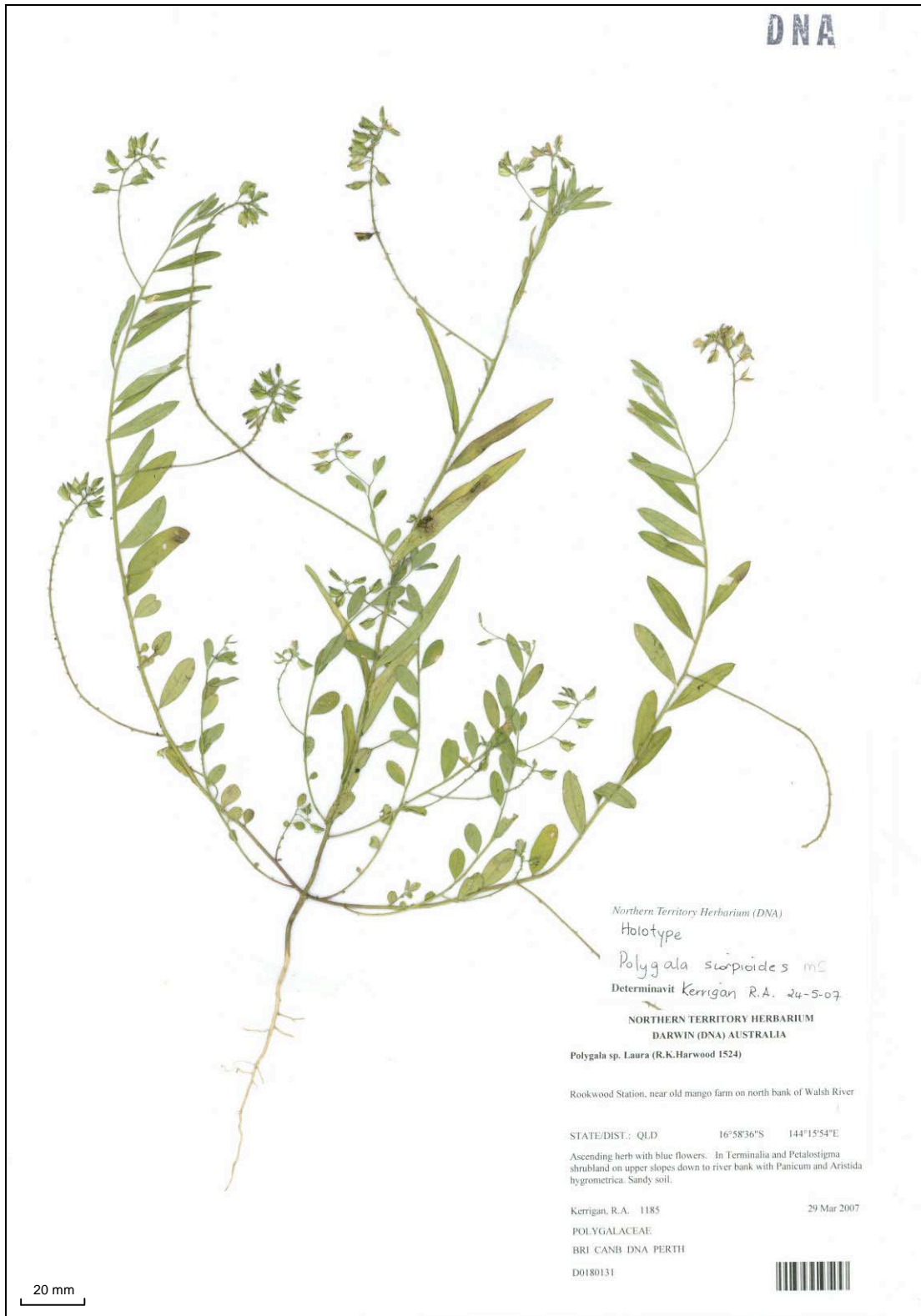
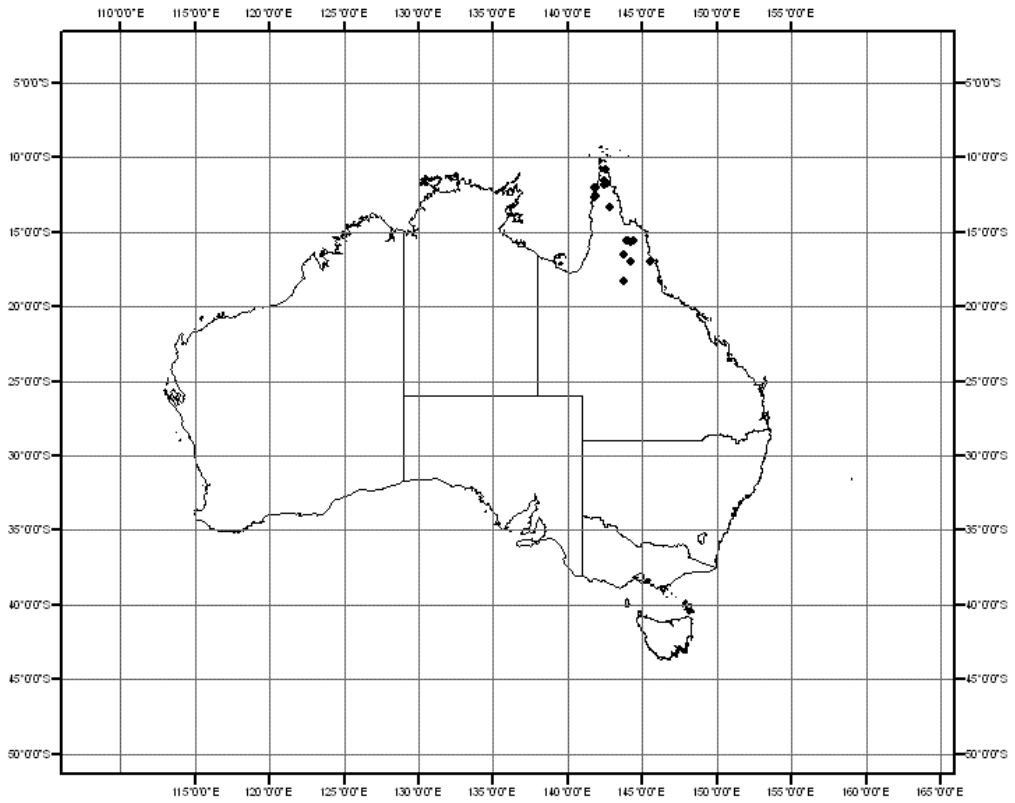


Fig. 5.110. Flower, seeds and keel petal of *Polygala scorpioides* (R.A. Kerrigan 1185). a) flower with fimbriate floral appendages; b) seeds with hooked to helmet shaped aril heads; and c) keel petal with underdeveloped lateral pouches.



Fig. 5.111. The distribution of *Polygala scorpioides* based on available collection data.



***Polygala stenoclada* Benth., *Fl. Austral.* 1:141 (1863)**

Lectotype (for later publication): Upper Victoria R., *F.Muell.* 5/1856; holo; MEL 37322!; excluded syntype, Upper Victoria R. *F.Muell.*, syn -K 279792!

Polygala stenoclada var. *typica* (Benth.) Domin *nomen invalidum*, *Biblioth. Bot.* 89(4): 857 (1927).

Annual herb, erect to 60 cm, single stemmed; indumentum of curved hairs only. Leaves linear, 10–70 mm long, 0.5–2.5 (4) mm wide; more or less sessile. Inflorescence a supra-axillary or rarely leaf opposed raceme to 200 mm long. Pedicel to 4.5 mm. Alae herbaceous, becoming pendulous, lanceolate, narrowly elliptic and oblanceolate, often dimidiate to falcate, 4.3–6.3 mm long, 1.0–2.6 mm wide. Corolla purple; floral appendages spatulate. Stamens terminate at stigma, monadelphous. Style hooked, with a flat stigma on inner surface of hook. Capsule lacking wing, somewhat asymmetrical, obovate, 4.7–6.0 mm long, 2.5–3.3 mm wide. Seed oblong, 4.0–5.5 mm long, 1.0–1.8 mm wide; indumentum with fine white hairs, becoming shorter towards apex. Aril head helmet shaped, 0.65–1.2 mm long, white, with hairs. Aril appendages 3, linear often shortly so, 0.45–1.0 mm long, collapsed and clear. (Fig. 5.114)

Distribution

Australia (NT, QLD). This species is mainly distributed from the Gulf of Carpentaria in Qld to the W coast of the Top End of the NT. (Fig. 5.115)

Habitat

Usually growing in sandy soil in savanna, on sandy plains or amongst sandstone outcrops.

Notes

This taxon is very similar to *P. linearis* and *P. macrobotrya*. Compared to *P. linearis*, *P. stenoclada* has broader ovate to obovate outer sepals usually with darkened tips, has a more erect longer habit and has only looped hairs. *Polygala linearis* has a more candelabra-like habit, lanceolate to subulate outer sepals and mostly curved hairs with a few straight hairs. None of these characters, however, are exclusive and the taxa are best distinguished from each other by the size of the seeds and absence of thick hairs below the aril head on *P. stenoclada*. From *P. macrobotrya* it is distinguished by the helmet shaped aril head and the presence of hairs over most of the aril, rather than just a central tuft. Further material of *P. macrobotrya* and *P. stenoclada* around Chillagoe and generally in Queensland may result in the merging of these two taxa.

Nomenclatural Notes

The specimen chosen as the lectotype of this epithet is labelled twice with two different names, apparently in Mueller's hand, *P. arvensis* var. *linearis* and *P. stenoclada* "typical". The top left hand corner of the label *P. arvensis* var. *linearis* is folded over and annotated with a "B" accepted as a symbol that it has been sighted by Bentham.

The excluded syntype, Upper Victoria R. *F.Muell.*, (Kew K279792) has no capsules and as such cannot be unequivocally assigned to one of two species, this one and *P. linearis*. Both can exhibit similar habits, reach similar lengths and have compatible distributions.

Specimens examined: (25)

Northern Territory

Mandorah Rd, Charlotte Rr tributary, 26/02/2006, *K.G. Brennan 6747* (DNA); Sturt Plateau, Buchanan Hwy, c. 31 km W of Stuart Hwy, 24/02/1999, *I.D. Cowie 8206 & R.K. Harwood* (DNA); Near Palmerston, S of Channel Is Rd, 25/02/2001, *I.D. Cowie 9042* (DNA); Spirit Hills area, Keep Rr National Park, ca. 41 km WNW of Bullo Homestead, 17/04/2007, *I.D. Cowie 11672 & B.M. Stuckey* (DNA); Auvergne Stn, plot 947, 13/03/1998, *R.K. Harwood 442 & P.S. Brocklehurst* (DNA); Mt McMinn Stn, 13/03/2002, *R.K. Harwood 1206* (DNA); Roper Hwy, E of Mt McMinn Stn, 20/03/2002, *R.K. Harwood 1177* (DNA); Big River Stn, 19/03/2003, *R.K. Harwood 1245* (DNA); Mittiebah Stn, 26/03/1981, *T.S. Henshall 3482* (BRI, NT); Port Darwin, *M. Holtze 1034* (MEL); Spirit Hills, ca. 28.6 km NW (318 deg), of Bullo Rr Homestead, 18/04/2007, *R.A. Kerrigan 1244 & B.M. Stuckey* (DNA); c.18 km NW of Seven Emu, 10/05/1985, *G.J. Leach 647* (NT); 12 kms NW of Twins Mount, 08/03/1989, *G.J. Leach 2367 & C.R. Dunlop* (DNA, BRI); Mitchebo Waterhole, Mittiebah Stn, 27/03/1981, *J.R. Maconochie 2581* (NT); Tipperary, 1.5M W Mudspring, 18/05/1963, *J.S. Muspratt 535* (DNA); c. 27 km W of Wollgorang near the Redbank airstrip along the road to Calvert Hills, 12/05/1974, *R. Pullen 9215a* (CANB, DNA, BRI, PERTH); c. 27 km W Wollgorang, 12/05/1974, *R. Pullen 9215* (DNA, CANB); Billabong on east side McArthur Rr, 12/05/1976, *B.L. Rice 2251* (CANB); Ryan Bend, 18/05/1976, *B.L. Rice 2252* (CANB); Mt McMinn Stn, SW Hodgson Rr Crossing, 01/05/2002, *J.A. Risler 1830 & A.J. Fisher* (DNA); Boomerang Ck, Gulf country; Merlin mining lease, 01/04/1996, *N.M. Smith 3674* (DNA).

Queensland

25 ml Hut on Glenore Stn, Normanton growing in Tea Tree forest, consolidated sand, 09/01/1967, *H.G. Bishop s.n.* (BRI); c. 20 km N of Lawn Hill Gorge, 11/06/1998, *R.J. Cumming 17375* (BRI); c. 30 km SE of Westmoreland, 48 km E of Queensland/NT Border, far NW QLD, 10/05/1974, *R. Pullen 9186* (BRI, CANB).

Fig. 5.112. Lectotype Upper Victoria Rr, F. Mueller 5/1856 MEL 37322 (MEL)

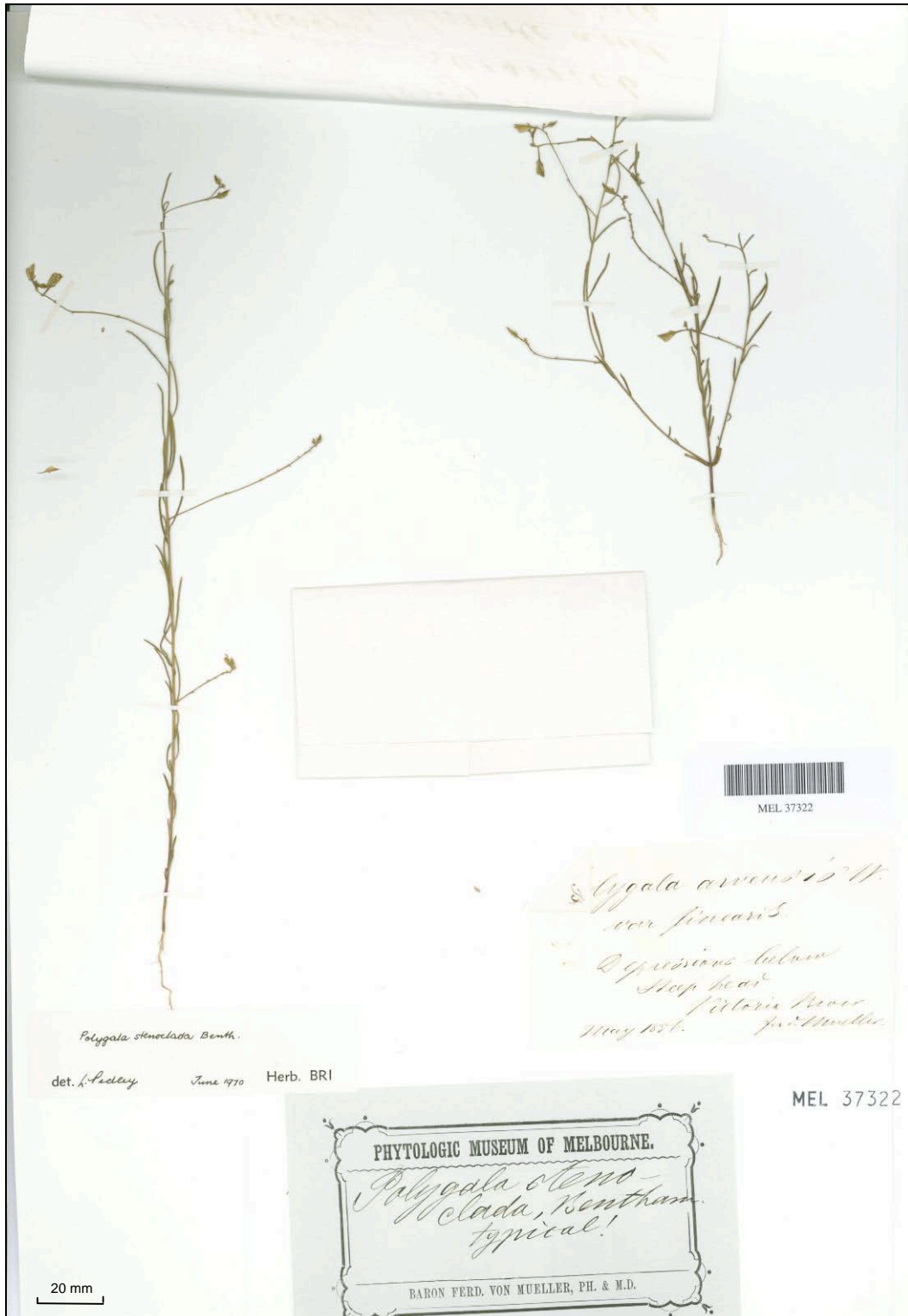


Fig. 5.113. Excluded syntype: Upper Victoria Rr F. Mueller, (Kew K279792). © copyright the Board of Trustees of the Royal Botanic Gardens, Kew

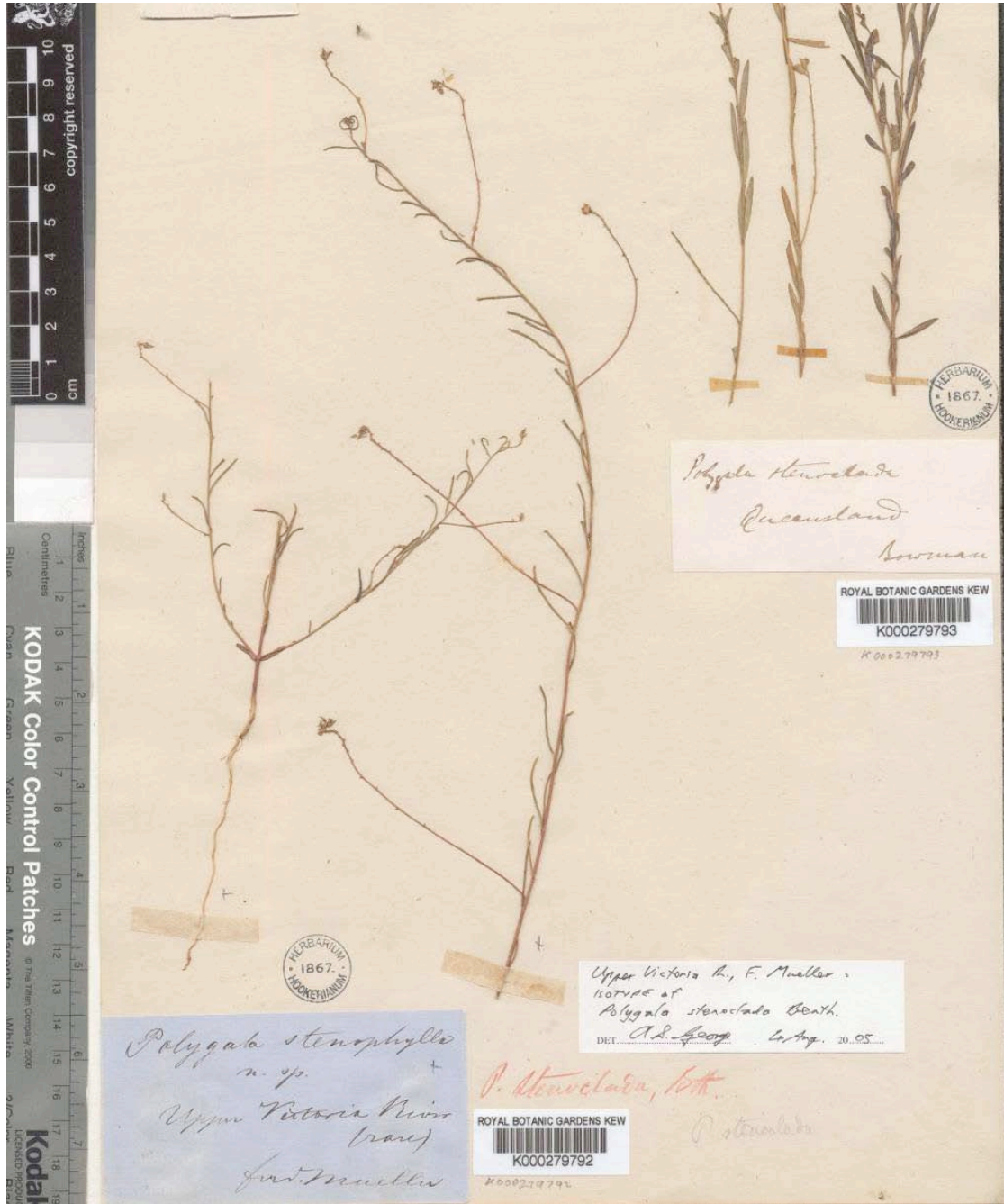
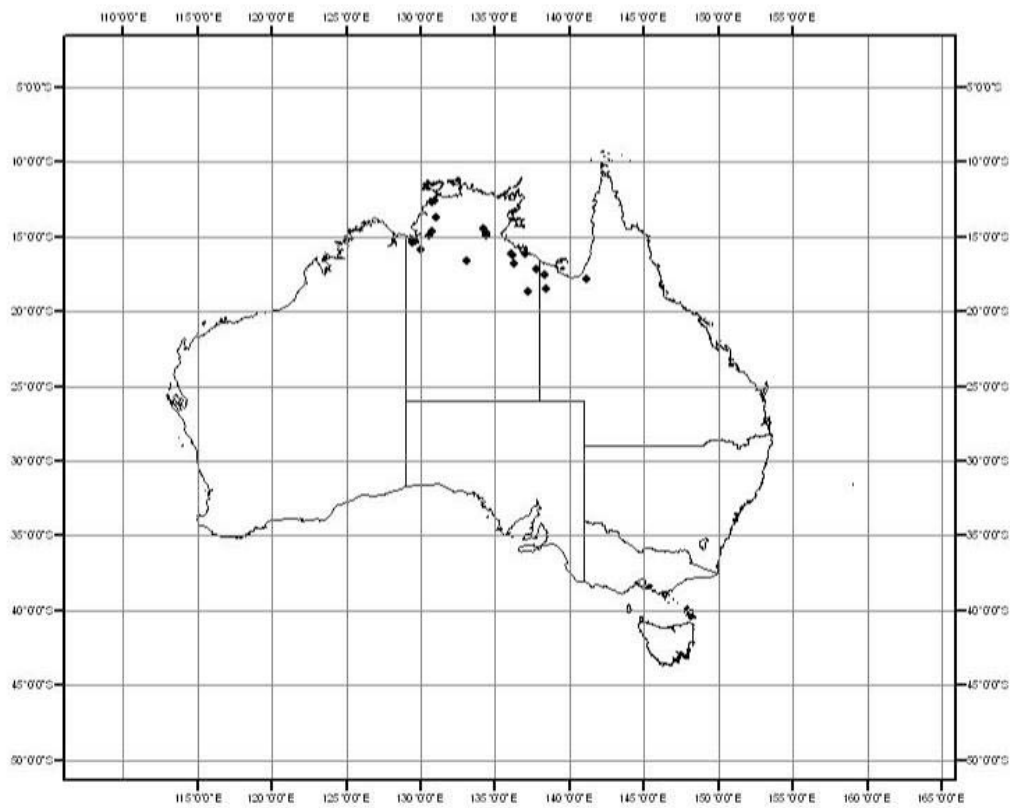


Fig. 5.114. Seed of *Polygala stenoclada* (B.M. Stuckey 5). a) oblong seed and b) helmet shaped aril head.



Fig. 5.115. The distribution of *Polygala stenoclada* based on available collection data.



***Polygala succulenta* R.A.Kerrigan, sp. nov.**

Polygala parvilobae et *Polygala petraphilae* affinis, a qua stylo recto planato et arillo appendiculato luteo et albo differt.

Type: 780 m NE along Green Ant Ck towards East Springs, off Adelaide R. scenic Hwy, 02.ii.2004. R.A. Kerrigan 727 & R.K. Harwood; holo: DNA 161693!; iso: BRI, CANB, PERTH

[*Polygala arvensis* auct. non Willd.: Benth. *Fl. Austral.* 1: 140 (1963) p.p. as to Upper Victoria river F. Muell. MEL 2244589; A.J. Ewart & O.B. Davies, *The Fl. Of the Northern Territory*. 160 (1917); I.D. Cowie & D.A. Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004) (1802)]

Annual herb, erect to 40 cm; indumentum of curved and straight spreading hairs. Whole plant occasionally maroon tinged on stems and alae. Leaves linear, narrowly elliptic to oblanceolate, 10–77 mm long, 1.5–10.0 mm wide; petiole to 1.5 mm long. Inflorescence an axillary or supra-axillary raceme to 70 mm long, rarely a solitary flower on internode preceding raceme. Pedicel to 3 mm. Alae herbaceous, lanceolate, straight to falcate or narrowly dimidiate, 4.1–9.4 mm long, 1.1–2.9 mm wide. Corolla colour recorded as purple. Floral appendages, succulent, bifid to three to four times forked. Stamens terminate at stigma, monadelphous. Style straight to slightly curved, broadly flattened and extended beyond globular stigma. Capsule wing absent. Capsule asymmetrical, oblanceolate, 3.5–4.5 mm long, 2.0–2.75 mm wide. Seed oblong-ovoid, 2.75–3.75 mm long, 0.9–1.5 mm wide. Seed indumentum with fine white or ferruginous hairs often extending beyond seed base and becoming shorter towards seed apex. Aril head domed, 0.4–0.6 mm long, white, with short hairs. Aril appendages 3, short linear, 0.3–1 mm long sometimes yellow. (Fig. 5.118)

There are two varieties which can be distinguished as follows:

- | | | |
|----|---|--|
| 1. | Inflorescence compact, flowers overlapping..... | <i>P. succulenta</i> var. <i>congesta</i> |
| 1: | Inflorescence loose, flowers not overlapping..... | <i>P. succulenta</i> var. <i>succulenta</i> |

Distribution

Australia (WA, NT). In the NT distributed between Kakadu National Park and Nitmiluk National Park, the Victoria River District and Barkly Tablelands, in WA several specimens are recorded along the Gibb River Road. (Fig. 5.119)

Habitat

Found mostly in woodland habitats on a variety of soils.

Notes

Two varieties are apparent, *P. succulenta* var. *succulenta* and *P. succulenta* var. *congesta*. *Polygala succulenta* var. *succulenta* is generally larger than *P. succulenta* var. *congesta*, has longer less congested inflorescences and bigger flowers and occurs mostly in Kakadu and Nitmiluk National Park. Similarities to *P. petraphila* are discussed under that species.

Etymology

Latin *succulentus* (succulent) referring to the succulent floral appendages.

Polygala succulenta* var. *congesta R.A. Kerrigan, var. nov.

var. *succulentae* et inflorescentiis congestis differt.

Type: Bullo River, on road to Homestead, 08/03/2006, R.A. Kerrigan 989 (Fig. 5.116)
Holo: DNA; Iso: PERTH, BRI, CANB

Inflorescence compact, flowers overlapping.

Etymology

Latin *congestus* (crowded together) because of the congested nature of the inflorescence.

Specimens examined: (39)

Western Australia

2 km N of Silent Grove Homestead, 26/04/1988, R.J. Cranfield 6558 (PERTH); Kimberley, 11.9 km E along Gibb River Rd from Windjana turnoff, 11/05/2006, R.A. Kerrigan 1098 (DNA, PERTH); Kimberley, 47 km E along Gibb River Rd from Windjana turnoff, 11/05/2006, R.A. Kerrigan 1100 (DNA, PERTH); Kimberley, 26.4 km E from Barnett Rr Crossing on Gibb River Rd, 14/05/2006, R.A. Kerrigan 1119 (DNA, PERTH); Kimberley, The Grotto, 17 km from Gibb River Rd turnoff on way to Wyndham, 16/05/2006, R.A. Kerrigan 1136 (DNA, PERTH).

Northern Territory

Kakadu National Park, hill beside Kakadu Hwy, Spring Peak, 13/03/1992, K.G. Brennan 1940 (DNA); Arnhem Land, Tin Camp Creek, 17/03/1992, K.G. Brennan 1953 (DNA); Near Gimbat airstrip, 10/03/1993, K.G. Brennan 2053 (DNA); On Kapalga, 12/03/1993, K.G. Brennan 2094 (DNA); Along walking track to Motor Car Creek Falls, 10/04/1993, K.G. Brennan 2204 (DNA); Arnhem Land, Tin Camp Creek, 14/04/1993, K.G. Brennan 2224 (DNA); 1.5 km upstream from Barramundi Falls, 04/04/1994, K.G. Brennan 2765 (DNA); Kakadu National Park, 13/04/1999, K.G. Brennan 3964 (DNA); Nitmiluk National Park, fire plot 7, 21/03/2000, K.G. Brennan 5027 (DNA); Nitmiluk National Park, fire plot 5, 21/03/2000, K.G. Brennan 5037 (DNA, NY); MacArthur Rr Mine lease, 08/04/2003, K.G. Brennan 5887 & K. Metcalfe (DNA); West Timber Creek, 500 m W Kennedy Ck, Victoria Hwy, 10/06/1999, C.P. Brock 101 (DNA); West of Timber Creek, near information bay Gregory National Park, 06/10/1999, C.P. Brock 104 (DNA); Gregory National Park, Victoria Hwy, 15/02/1992, I.D. Cowie 2458 (DNA); Cave Creek Stn, 7.4 km E of Moray Hill, 20/03/2003, I.D. Cowie 9899 (DNA); VRD Stn, Jasper Gorge, 10/05/1995, J.L. Egan 4929 (DNA); Kakadu National Park, 5 km ESE of Cooida, 15/05/1980, L.A. Craven 5502 (DNA); 3.8 km along Edith Falls Rd, 13/02/2004, R.A. Kerrigan 742 & P.S. Short (DNA); 16.9 km N of Kakadu Hwy turnoff, 13/02/2004, R.A. Kerrigan 743 & P.S. Short (DNA); Ferguson Rr crossing, off Old Stuart Hwy on cutting, 23/03/2005, R.A. Kerrigan 905 (DNA); Edith Falls area, 1.7 km from Stuart Hwy on Edith Falls road, 23/03/2005, R.A. Kerrigan 908 (DNA); Victoria Hwy, W of Katherine, 24/03/2005, R.A. Kerrigan 911 (DNA); Kakadu National Park, near fire plot 157, adjacent road to Nourlangie Rock, 08/04/2005, R.A. Kerrigan 927 (DNA); Spirit Hills, c. 65.4 km SW (238 deg) of Bullo Rr Homestead, 19/04/2007, R.A. Kerrigan 1247 (DNA); c. 15 km W of Borroloola, 25/04/1998, C.P. Mangion 877 (DNA); Edith Falls area, Finch City Transect, 4/2/1999, C.R. Mitchell 2055 (DNA); Nitmiluk National Park, 15/02/2001, C.R. Mitchell 3127 & S. Boyce (DNA); Nitmiluk National Park, 03/04/2001, C.R. Mitchell 3128 & R. Hope (DNA); Nitmiluk National Park, 04/04/2001, C.R. Mitchell 3129 & S. Boyce (DNA); Nitmiluk National Park, site 368, 25/03/2001, J.A. Risler 1451 & M. Waetke (DNA); Nitmiluk National Park, site 388, 03/04/2001, J.A. Risler 676 (DNA); Cave Creek Stn, 20/03/2003, J.A. Risler 2111 (DNA); Mt Bunday area, 25/05/1988, G.M. Wightman 4408 (DNA).

Polygala succulenta* R.A. Kerrigan var. *succulenta

Inflorescence loose, flowers not overlapping.

Specimens examined: (21)

Northern Territory

Coronation Hill, Kakadu National Park, 15/05/1986, *D. Backshall* 22 (DNA); Kakadu National Park, Jabiru town, at start of walking track to Park HQ, 06/02/1991, *K.G. Brennan* 916 (DNA); Kakadu National Park, fire plot 16, 09/02/2000, *K.G. Brennan* 4897 (DNA); Kakadu National Park, fire plot 2, 24/02/2000, *K.G. Brennan* 4934 (DNA); Kakadu National Park, fire plot 33, 29/02/2000, *K.G. Brennan* 4872 (DNA); Kakadu National Park, fire plot 32, 01/03/2000, *K.G. Brennan* 4876 (DNA); Kakadu National Park, fire plot 8, 01/03/2000, *K.G. Brennan* 4906 (DNA); Kakadu National Park, Waterfall Ck, 28 km NE Mary Rr Ranger Stn, 25/02/2004, *K.G. Brennan* 6106 (DNA); Kapalga, 09/02/1977, *R. Collins* 1015 (DNA); Kapalga, 10/02/1977, *R. Collins* 262 (DNA, CANB); Kakadu National Park, Arnhem Hwy near W branch of West Alligator Rr, 09/04/2003, *I.D. Cowie* 9948 & *D.J. Dixon* (DNA, BRI, MEL); Kakadu National Park, c. 50 km W of Jabiru, 19/03/1981, *L.A. Craven* 7725 & *G.H. Whitbread* (CANB); Kakadu National Park, c. 50 km W of Jabiru, 19/03/1981, *L.A. Craven* 7726 & *G.H. Whitbread* (CANB); Kapalga, Kakadu National Park, 24/02/1988, *C.R. Dunlop* 7639 (DNA); Edith Falls area, 1.7 km from Stuart Hwy on Edith Falls road, 23/03/2005, *R.A. Kerrigan* 909 (DNA); Northern Territory, Kakadu National Park, Black Jungle, 21/02/1995, *J. Russell-Smith* 9630 (DNA); Douglas Daly Research Farm, 21/01/1998, *C.R. Mitchell* 534 & *K.J. Nicholl* (DNA); Nitmiluk National Park, SE corner of Park, 14/03/2002, *C.R. Mitchell* 3584 (DNA); Stuart Hwy, 169 mls, 05/01/1964, *C.S. Robinson* 1088 (DNA); Kakadu National Park, Wildman Rr catchment, 20/02/1995, *J. Russell-Smith* 9652 (DNA).

Fig. 5.116. The holotype of *Polygala succulenta* var. *congesta*: Bullo River, on road to Homestead, 08/03/2006, R.A. Kerrigan 989 (DNA, PERTH, BRI, CANB)

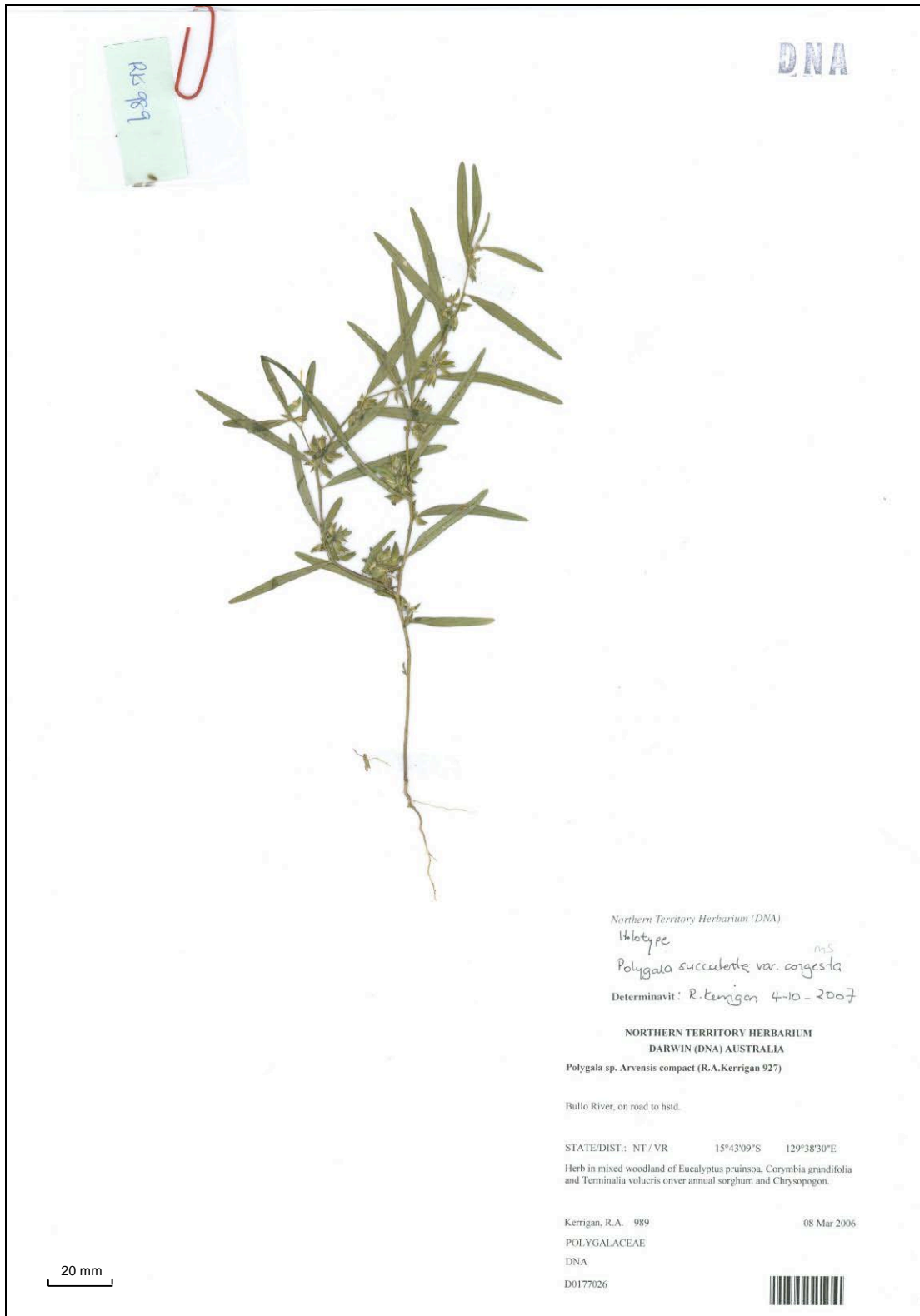


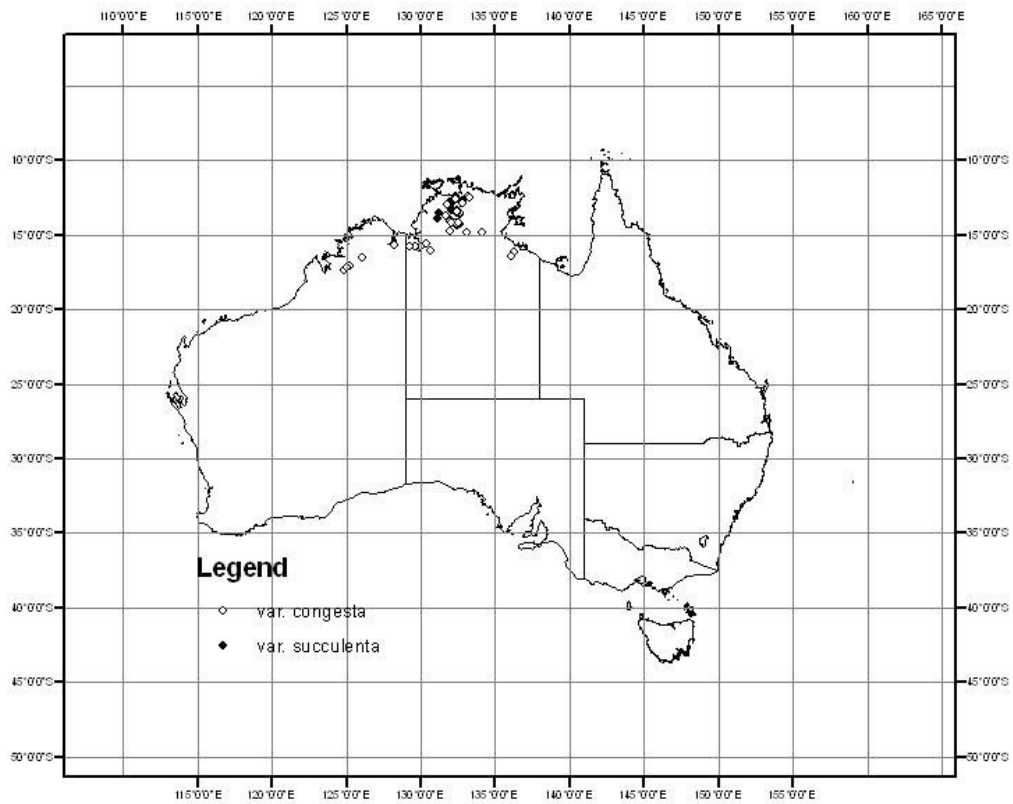
Fig. 5.117. The holotype of *Polygala succulenta* var. *succulenta*. 780 m NE along Green Ant Creek towards, East Springs off Adelaide Rr Scenic Hwy, 02/02/2004, R.A. Kerrigan 727 & R.K. Harwood (DNA, CANB, BRI, PERTH)



Fig. 5.118. Flower, style and seed of *Polygala succulenta* (R.A. Kerrigan 727). a) flower with succulent floral appendages; b) flattened style with globular stigma; and c) seed with domed aril head.



Fig. 5.119. The distribution of *Polygala succulenta* based on available collection data.



Polygala tepperi F.Muell., *The Victorian Naturalist* 7: 38(1890)

Type: Roebuck-Bay; *W. Tepper*. s.n.; holo: MEL 2263628! iso: K! (photo DNA), PERTH!

Polygala arvensis var. *stenosepala* Benth., Fl. Austral. 1: 141 (1863): *Lectotype* (here designated): Upper Victoria River, F.Muell., syn- K 279791!, excluded syntypes: Arnhem Bays, R. Brown

Polygala chinensis var. *stenosepala* (Benth.) Domin, Biblioth. Bot. 89(4): 303 (1927): *Lectotype* (here designated): Upper Victoria River, F.Muell., K 279791!, syntypes: Roebuck Bay, *Tepper* 1 1890, syn- MEL 2263628!, K! (photo DNA), PERTH!

Robust annual herb, erect to 65 cm; indumentum of curved hairs throughout, rarely with short straight appressed to spreading hairs, or glabrescent. Leaves more or less caducous, plant often leafless or with only a few leaves; linear, 5–35 mm long, 1.0–2.5 mm wide; petiole 0–0.5 mm. Inflorescence axillary or supra-axillary, solitary or a short few-flowered raceme to 5 mm long. Pedicel to 3 mm. Alae herbaceous, oblanceolate, 3.6–6.2 mm long, 1.2–2.0 mm wide. Corolla purple; floral appendage fimbriate. Stamens terminate at stigma, monadelphous. Style hooked and stigma flat on inner surface of style. Capsule lacking wing, more or less symmetrical, oblong, locule apex acute rarely obtuse, 4.0–6.5 mm long, 2.3–3.5 mm wide. Seed oblong, 3.0–4.5 mm long, 1.0–1.8 mm wide; indumentum with fine white or ferruginous hairs, often extending beyond seed at base and flaring out, and becoming shorter towards seed apex and curling up. Aril head helmet shaped, 0.8–1.0 mm long, white, brown where reduced to seed testa, with short hairs, often concentrated along groove. Aril appendages absent or 3 much reduced triangular projections, 0.25–0.9 mm long. (Fig. 5.121)

Distribution

Australia (NT, WA). Widely distributed across WA and the NT mostly between 20° S and 15° S. (Fig. 5.122)

Habitat

Found in eucalypt woodlands and *Acacia* shrublands mostly with a *Triodia* understorey on sandy soils.

Nomenclatural notes

As a F.Muell name the MEL specimen is considered the holotype as it is the authors host institution. The excluded syntype for *P. arvensis* var. *stenosepala* Benth. is a different taxon, *P. parviloba*.

Specimens examined: (33)

Western Australia

CSIRO Kununurra, new cockatoo sand site, 09/07/1978, M.H. Andrews 108 (DNA); Near Derby Airport, 8 km S of Derby, 18/01/1985, T.E.H. Aplin 4 (PERTH); 8.8 km by road from Kununurra on road to Lake Argyle, 27/04/1985, T.E.H. Aplin 559 (PERTH); Mangel Ck - Mowla Bluff Rd, 14.8 km S of Great Northern Hwy, 62 km SSW of Derby, 16/06/1976, A.C. Beauglehole 53008 (PERTH); 67 km NE of Lagrange Aboriginal Mission turn-off, Great Northern Hwy, 01/09/1978, A.C. Beauglehole 59170 & E.G. Errey (PERTH); E Branch of Wolf Ck about 60 km S of Halls Creek, 13/07/1974, G.W. Carr 3547 (PERTH); 50 km SW of One Arm Point along Broome Rd just N of Pender Bay turnoff, Dampierland Peninsula, 22/08/1987, B.J. Carter 68 (PERTH); One Arm Point, N. Dampier Peninsula, Kimberley Coast, 13/03/1989, B.J. Carter 360 (PERTH); 5.3 km S of Billy More Yard, Napier Range, 04/05/1988, R.J. Cranfield 6717 (PERTH); Yeeda, 28 m SE of Derby, 01/04/1927, A.J. Ewart s.n. (MEL); Christmas Ck, 01/05/1927, A.J. Ewart s.n. (PERTH); Goody Goody, 01/04/1905, W.V. Fitzgerald 285 (PERTH); Broome cemetery,

Dampier land Peninsula, W. Kimberley, 25/04/1985, *P.R. Foulkes 136* (PERTH); Roebuck Plains, 25/06/1991, *T. Handasyde 16/3* (PERTH); 1 km SW of Beagle Bay Mission, Dampier Peninsula, 31/03/1985, *J.B. Martin 5* (PERTH); 10 km N of Alistairs Bore at gate near main road, 29/01/1992, *A.A. Mitchell 1989* (PERTH).

Northern Territory

19 km (NT) N of Elliott, 19/04/1996, *D.E. Albrecht 7453* (NT); 45 km NW of Mt Winnecke, S-side of Mana Range, 02/05/2004, *D.E. Albrecht 10762 & M.G. Harris* (NT); c. 144 km due E of Lajamanu, 05/05/2004, *D.E. Albrecht 10845 & K.G. Brennan* (DNA, NT); c. 144 km due E of Lajamanu, 05/05/2004, *D.E. Albrecht 10884 & K.G. Brennan* (DNA, NT); Paradise and Depot Creek, *J. Bradshaw s.n. & W. Allen* (MEL); 14.2 kms N Lajamanu, 08/10/2003, *K.G. Brennan 5989* (DNA); 9 m SW Hooker's Ck, 11/07/1956, *G.M. Chippendale 2226* (NT, MEL); Floodout of Hooker Ck, c. 20 km E of Lajamanu, 03/05/2004, *I.D. Cowie 10074* (NT); 5 km N of Elliott, 02/04/1993, *J.L. Egan 1926* (DNA); Barkly Hwy, 02/05/1993, *J.L. Egan 2230* (DNA); 57 km WNW of Green Swamp Well, (NT), N-Tanami Desert, 26/09/2003, *P.K. Latz 19315* (DNA, NT); West of Nicholson Bore c. 25 km, Cattle Creek Stn, 04/05/2004, *D.L. Lewis 150 & C.P. Mangion* (DNA); Cattle Creek Stn, c. 70 km W of Nicholson Bore, 05/05/2004, *D.L. Lewis 185 & C.P. Mangion* (DNA); Wave Hill, 19/03/1997, *C.R. Mitchell 644 & C.P. Mangion* (DNA); Between Beswick and Mianoru Stns c. 10 km from Beswick, 21/05/1974, *R. Pullen 9337* (CANB); Ivanhoe Stn, IVA F2 (fire site), 15/04/2003, *A. Williams 323* (PERTH).

Fig. 5.120. The holotype of *Polygala tepperi*, Roebuck-Bay; W. Tepper. (K) © copyright the Board of Trustees of the Royal Botanic Gardens, Kew



Fig. 5.121. Flower and seed of *Polygala tepperi* (R.A. Kerrigan 1097). a) flower with fimbriate floral appendages and b) seed with helmet shaped aril head.

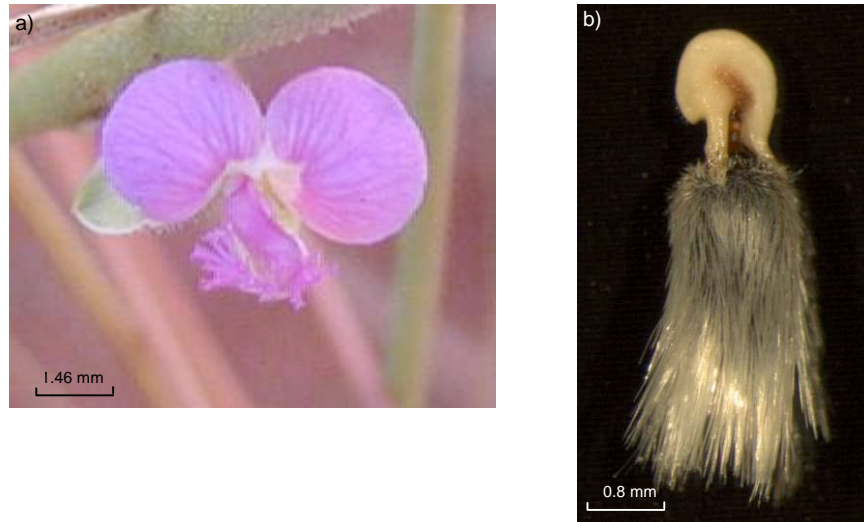
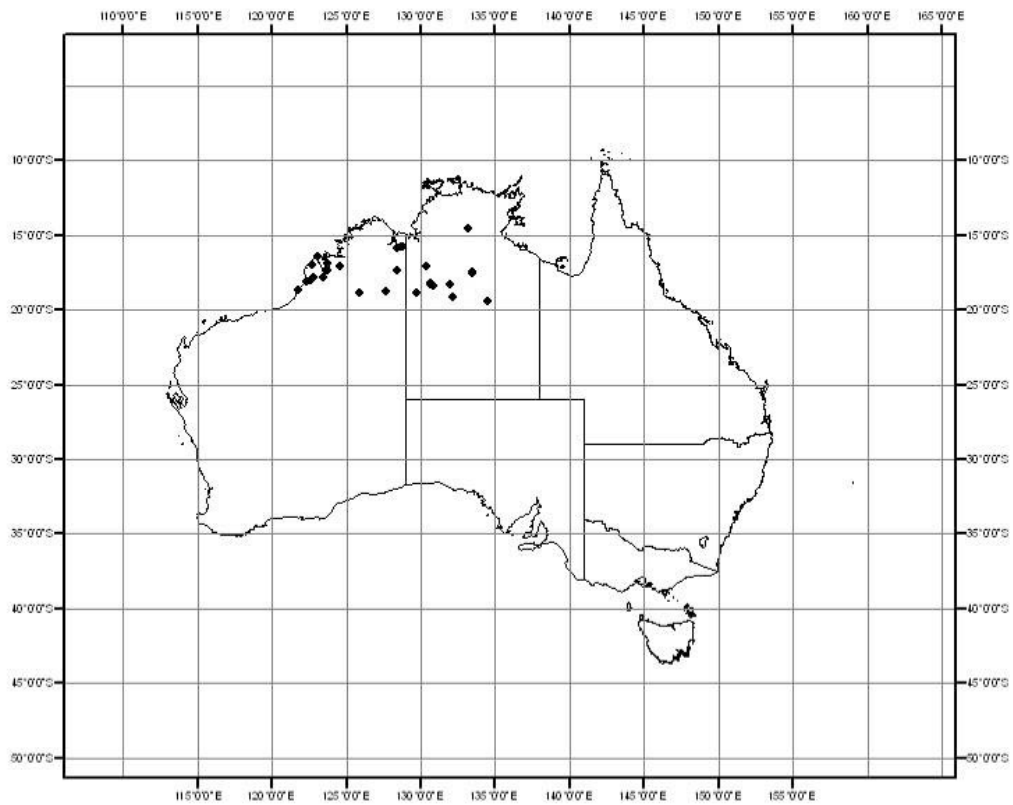


Fig. 5.122. The distribution of *Polygala tepperi* based on available collection data.



Polygala triflora L., *Sp. Pl.* 1. (1753) 705.

Type: "in Zeylona" lecto: Hermann Herbarium, Mus. Zeyl. 31: "linaria minima seylanica" fol. 10 of volume 3. 269; holo: BM 621828 (photo DNA!) *fide* D.B.Sumithraarachchi, *Rev. Hanb. Fl. Ceylon* 6:310 (1987).

Polygala chinensis var. *dissitiflora* Domin, *Biblioth. Bot.* 89(4): 857 (1927). *Type citation*: Queensland: Sandsteinhügel der Dividing Range bei Pentland (Domin 1910); *Type detail*: in collibus arenaceis Dividing Range dictis pr. opp. Pentland, K. Domin 5693 holo: PR 528253! (photo BRI!)

[*Polygala linariifolia* [Australian material] *auct. non* Willd.: Adema, *Proc. R. Soc. Qld.* 80 (9) 126 (1969); *fide* Van der Meijden, *Fl. Males.* 1: 10: 481(1988)]

Herb, annual or ± perennial, often with thickened tap root, erect with ascending lateral branches or multi-stemmed to 30 cm, sometimes woody at base; indumentum of curved hairs only or with straight and curved hairs. Leaves linear to oblanceolate or obovate, 7–48 mm long, 2–7 mm wide; petiole 0–1 mm. Inflorescence supra-axillary or axillary, usually a loose raceme up to 90 mm long. Pedicel to 2 mm. Alae herbaceous, lanceolate, usually falcate (asymmetrical); 3.3–4.4 mm long, 1.0–1.8 mm wide. Corolla not seen fresh, colour recorded as purple, light purple to yellow or white; floral appendages fimbriate. Stamens terminate at stigma, monadelphous. Style hooked; stigma flat against inner bend of hook. Capsule lacking wing, widely ovate to widely oblong to elliptic, 3.2–4.5 mm long, 2.5–3.25 mm wide. Seed ovoid-oblong, 3–4 mm long, 1.0–1.4 mm wide; indumentum with fine hairs over whole seed becoming shorter towards seed apex. Aril head helmet shaped, 0.5–0.8 mm long, white, with brown groove where reduced to testa, fine short hairs along groove. Aril appendages 3, oblong and short, 0.3–0.75 mm long. (Fig. 5.124)

Distribution

Australia (QLD, SA, NSW), Sri Lanka, SE Asia, N Sumatra, N Borneo, Celebes, Molluccas, Philippines, New Guinea.. This species is widely distributed in Queensland extending from Mt Fox, near Ingham, to as far south as Warialda in NSW with the bulk of the distribution extending inland along the lower western slopes of the Great Dividing Range. A few collections are also known further W near Cunnamulla, Currawinya National Park, Lake Eyre in NE South Australia and the Diamantina National Park. Despite these disjunctions these specimens are included in this broad concept, however further collecting in the area is required. The sole collection of Mueller's from NT is treated as dubious with no specimens of this species collected from the NT or WA since. (Fig. 5.125)

Habitat

Usually found in a variety of eucalypt woodlands on sandy soil and loam.

Notes

This taxon is widespread and variable with annual and more perennial forms. While two entities exist, those with curved hairs only and those with curved and straight hairs they have overlapping distributions and no additional evidence supports treating them as separate taxa. This species is very similar to *P. glaucoides*, and is distinguished in this treatment by habit, erect and ascending compared to spreading or creeping, and flower colour, purple versus yellow. This species is also very similar to *P. scorpioides*, differences are discussed under that species, some specimens approaching *P. scorpioides* may be integrades e.g. IG Champion 1284, PI Forster 14881.

Nomenclatural Notes

The application of the name for this taxon has proved difficult as it relates to the group of taxa which have a difficult nomenclatural history. This taxon is quite variable in Australia and has generally been treated under the name *P. linariifolia* Willd. following Adema (1969), who indicated that the Australian material differed in flower colour and capsule shape to the Malesian material. van der Meijden (1988) synonymises *P. linariifolia* Willd. (non Adema) under *P. triflora* and *P. linariifolia* non Willd. Adema under *P. glaucoides* in his Flora Malesiana treatment. However, he confusingly determines Australian material previously identified as *P. linariifolia* non Willd. Adema as *P. triflora*. This is confounded further in that the illustrations used are replicated from Adema, yet don't match the descriptions, i.e. *P. triflora* is described as having long hairs on the capsule margin yet the illustration shows curved hairs and is the same as that used by Adema to illustrate his concept for *P. linariifolia*.

The synonymy, types and circumscription of *P. glaucoides* and *P. triflora* needs further examination before the assignation of this name to Australian material can be verified. I have seen a photograph of the type of *P. triflora* and it is not clearly attributable to Australian material, however it is a relatively poor specimen. In this instance I have deferred to van der Meijden's (1988) description, treatment and annotated specimens as he is likely to have seen the type and is likely to have had access to more material throughout the taxon's global distribution.

Within the Australian group two inconsistencies with van der Meijden's treatment can be found, flower colour and indumentum. Flower colour recorded from dry material in this instance is problematic and unreliable. *Polygala* flowers which are yellow with purple tinges have been recorded by collectors as either yellow or purple only, also purple flowers often fade to white with age or can fade to yellow with drying. van der Meijden described this taxon as having yellow flowers. I have only seen one fresh flower (shown), it was light purple in colour, however in Australia, collections record white, yellow and purple. The indumentum is equally unreliable, van der Meijden described *P. triflora* as having curved hairs throughout, with straight and curved hairs on the capsule margin, Pendry (2001) however records *P. triflora* as having curved or rarely straight hairs throughout, with curved and straight hairs on the capsule margin. It is difficult with Australian material to separate specimens with straight and curved hairs on any other character from specimens with curved hairs only.

The nomenclatural and taxonomic issues relating to this group are clearly unresolved. To avoid complicating things further this treatment follows van der Meijden (1988) and acknowledges the need for much more work across the global distribution of this taxon and *P. glaucoides* before the status of the Australian material can be verified.

There appears to be no formally lectotypification in D.B.Sumithraarachchi, *Rev. Hanb. Fl. Ceylon* 6:310 (1987). The lectotype must be considered legitimate however as it is reported as such by the Linnean Typification project.

Specimens examined: (46)

Northern Territory

Depot at upper Victoria Rr, F.J.H. Mueller s.n. (MEL)

South Australia

Lake Eyre Marqualpie Paddock Innamincka Regional Reserve, 26/07/1991, *J. Gillen 112 & P. Canty* (BRI, AD)

Queensland

Herbert Rr, *W.E. Armit 173* (MEL); Site 7 Ramilles Block, Marlborough, 09/12/1998, *G.N. Batianoff 9812106 & V.J. Neldner* (BRI); State Forest 114, site 2 near Fairview Homestead, Rockhampton, 08/12/1998, *G.N. Batianoff 981267 & V.J. Neldner* (BRI); Atkinsons Road, Canoona, 25 km from Bruce Hwy, 01/03/1994, *A.R. Bean 7530 & P.I. Forster* (BRI); *A.B. Pollock* (BRI); 13.6 km N (by road) of Pikedale, towards Warwick, 20/02/1996, *A.R. Bean 9787* (MEL); Epsilon LA, State Forest 840, SW of Bundaberg, 15/10/1996, *A.R. Bean 10992* (BRI); Bucca Range, 30 km W of Bundaberg, 12/11/1996, *A.R. Bean 11168* (BRI); Nudley State Forest (SF 93), c. 20 km NNW of Jandowae, 06/12/1997, *A.R. Bean 12668* (MEL); Stanleigh SE of Springsure, 10/10/1998, *A.R. Bean 14075* (BRI); 54 km W of Westmar, 27/12/1998, *A.R. Bean 14451* (BRI); Ellangowan Rd, near Tatham turnoff, S of Casino, 26/09/1999, *A.R. Bean 15454* (BRI); Oppossum Ck, Springfield Ipswich, 07/01/1996, *L.H. Bird s.n.* (BRI); Rockhampton, *E.M. Bowman s.n.* (MEL); Herbert Ck and Meerkool Ck [?], *E.M. Bowman 20* (MEL); Capricornia, *E.M. Bowman 72* (MEL); Suttors Rr, Leichhardt Range on the Bowen and Suttors Rr, *M. Bowman 129* (BRI); Glen Geddes, between Bruce Hwy and Rail Siding, 02/03/1992, *I.G. Champion 592* (BRI); Mt Coolon - Collinsville Rd 0.9 km E of Deception Ck W side of road, 20/01/1996, *I.G. Champion 1284 & A.B. Pollock* (BRI); Mt Fox Stn, 17/09/1948, *M.S. Clemens s.n.* (CANB, BRI); 9 km SE of Springsure, 16/03/1995, *R.J. Fensham 2674* (BRI); Great Basalt Wall, 09/04/1995, *R.J. Fensham 2160* (BRI); Humboldt Stn, S of Blackwater, 08/01/1997, *R.J. Fensham 2945* (BRI); Lords Table Mountain 45 km NE of Clermont, 17/04/1997, *R.J. Fensham 3180* (BRI); 78 km from Collinsville on Mt Coolon Rd, 23/02/1994, *P.I. Forster 14881 & A.R. Bean* (BRI); Currawinya National Park, boundary track S of Salt Bore, 21/03/1997, *P.I. Forster 20539 & M. Watson* (BRI); Palmgrove National Park, NW of Taroom, Bigge Range, 03/11/1998, *P.I. Forster 23693 & R. Booth* (BRI); Blackdown Tableland, c. 32 km SE of Blackwater (campsite on Mimosa Ck), 18/04/1971, *R.J.F. Henderson 642 & P.R. Sharpe* (MEL, BRI); 5.1 km E of Torrens Creek, Flinders Hwy, 04/05/2007, *R.A. Kerrigan 1265 & D.J. Dixon* (DNA, BRI); 34.5 km E of Torrens Creek on Flinders Hwy, 04/05/2007, *R.A. Kerrigan 1267 & D.J. Dixon* (DNA, BRI); 39.8 km E of Torrens Creek on Flinders Hwy, 04/05/2007, *R.A. Kerrigan 1269 & D.J. Dixon* (DNA, BRI); 5.2 km E of Pentland on Flinders Hwy, 04/05/2007, *R.A. Kerrigan 1271 & D.J. Dixon* (DNA, BRI); 4 km W of Hunters Gorge, Diamantina National Park, 22/04/1995, *C. Mitchell 954* (BRI); Rockhampton, *F.J.H. Mueller s.n.* (MEL); Expedition Ranges, 14/02/1947, *F.J.H. Mueller 63* (MEL); 19.7 km W of Oxenhope Outstation, at Charlie Creek crossing, 11/05/1991, *V.J. Neldner 3192 & E.J. Thompson* (BRI); c. 50 km WNW of Charters Towers, 05/01/1982, *L. Pedley 4806* (CANB, BRI); Rockhampton, *P. O'Shanesy s.n.* (MEL); Near Biloela, 24/10/1947, *L.S. Smith 3510* (BRI); Mt Wheeler (N spur), near Rockhampton, 01/01/1989, *R.L. Specht 56* (BRI); 7.5 km NE of Miriam Vale, 23/10/1995, *E.J. Thompson 2 & G. Turpin* (BRI); About 20 km E of Armac, 26/11/1997, *E.J. Thompson MUT59* (BRI); 20 km SE of Miriam Vale, 23/07/1996, *E.J. Thompson 130 & G. Turpin* (BRI); 5 km W of Lennox Homestead 75 km N of Jericho, 17/03/1993, *E.J. Thompson 158 & R.J.F. Henderson* (BRI); c. 35 km S of Charters Towers, 21/06/1998, *E.J. Thompson 508 & G. Turpin* (BRI); c. 86 km SSE of Charters Towers, 19/06/1998, *E.J. Thompson 530 & G. Turpin* (BRI); c. 32 km SE of Hughenden, 01/04/1998, *E.J. Thompson 568 & G. Turpin* (BRI); c. 118 km SW of Charters Towers, 23/06/1998, *E.J. Thompson 668 & G. Turpin* (BRI); Rockhampton, *A. Thozet s.n.* (BRI); 18 km NE of Jochmus Homestead, 20/03/2002, *G. Turpin 639 & E.J. Thompson* (BRI).

New South Wales

Warialda, NSW, 01/01/1906, (MEL);

Fig. 5.123. The lectotype of *Polygala triflora* L. "in Zeylona" (BM) © The Natural History Museum, London

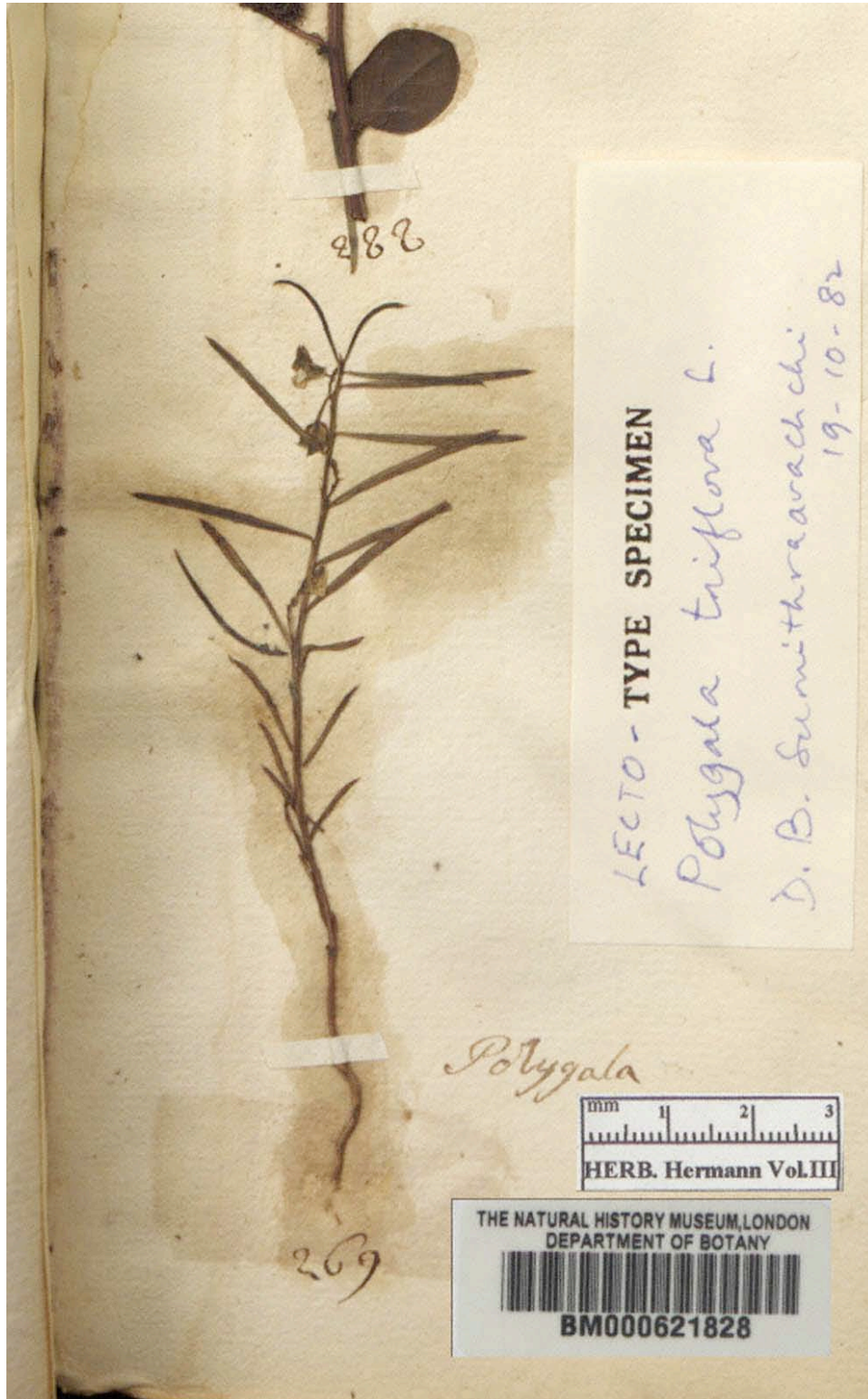


Fig. 5.124. Flower and seed of *Polygala triflora* (R.A. Kerrigan 1269). a) flower with fimbriate floral appendages; and b) seed with helmet shaped aril head.

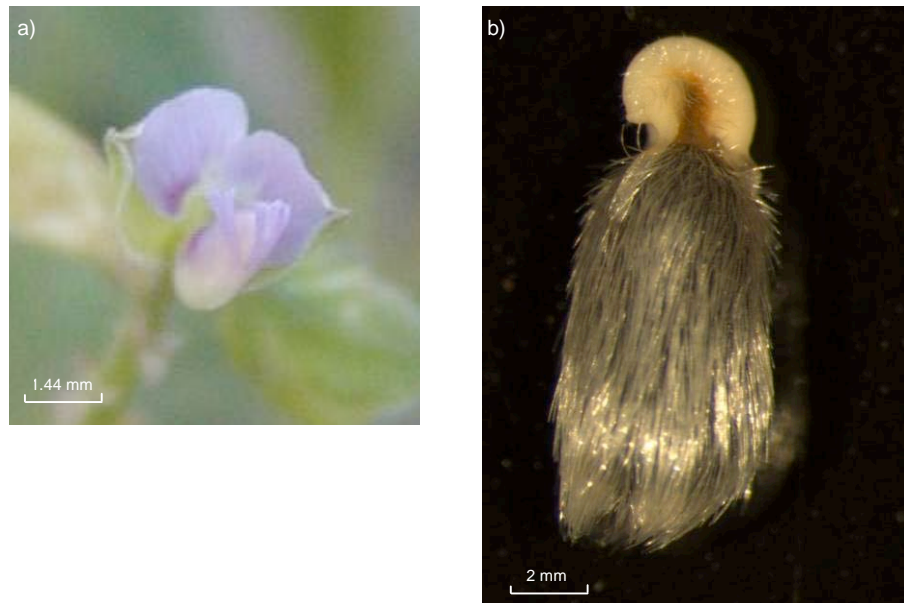
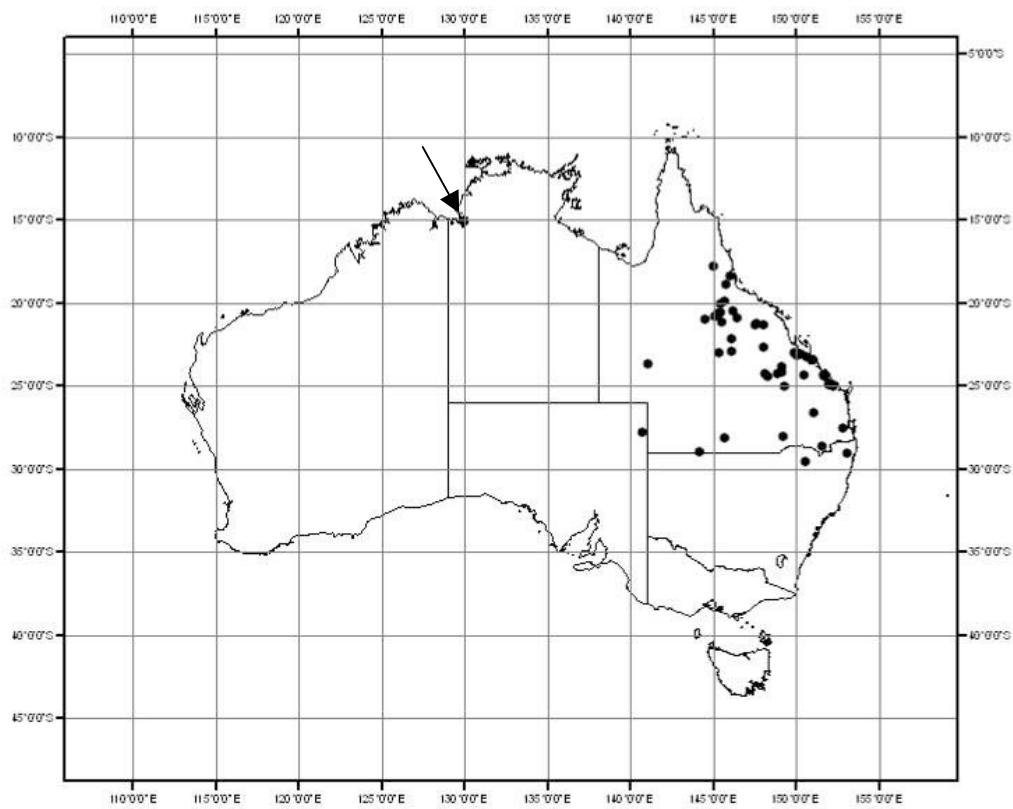


Fig. 5.125. The distribution of *Polygala triflora* based on available collection data.



Polygala validiflora R.A.Kerrigan, *sp. nov.*

Specierum affinium sepalis late ovatis conspicuis distinguenda.

Type: 250 m NE along Green Ant Ck towards East Springs, off Adelaide R. Scenic Hwy, 02.ii.2004, *R.A. Kerrigan 726 & R.K. Harwood*; holo: DNA 161694!; iso: BRI, CANB, L, PERTH

Polygala sp. Tipperary (C.S.Robinson 297) I.D.Cowie & D.A.Albrecht (eds), *Checklist N. Terr. Vasc. Pl. Sp.* (2004)

Annual herb, decumbent or erect to 20 cm; indumentum of curved and straight hairs. Leaf margins and alae occasionally red tinged. Leaves variable, lanceolate, elliptic to obovate 9–95 mm long, 3–23 mm wide; petiole 0–2 mm. Inflorescence supra-axillary, axillary, raceme to 27 mm (-40) long. Pedicel sessile to 1.5 mm. Alae herbaceous, ovate, 7.7–12.0 mm long, (2.8–) 4.5–9.0 mm wide. Corolla pale purple; floral appendages spathulate. Stamens terminating at stigma, staminal arrangement unknown. Style hooked, stigma flat along inner surface of hook. Capsule with wing, 0.25–0.4 (-1.5) mm wide; more or less symmetrical, oblong or obovate, 4.5–5.3 mm long, 2.7–3.7 mm wide. Seed oblong, 3.5–4.4 mm long, 1.3–2.0 mm wide; indumentum with fine white hairs throughout, becoming shorter and reflexed at seed apex. Aril head round-hooked 0.5–0.7 mm long, white, or brown and white, with hairs. Aril appendages 3, linear, 0.8–1.8 mm long. (Fig. 5.127)

Distribution

Australia (NT). Endemic to the NT, distributed from Tipperary Waters in the Daly Region to Katherine and southern Kakadu. (Fig. 5.128)

Habitat

Found in woodland on a variety of substrates, often on drainage flats or seasonally wet areas.

Notes

This species is easily distinguished by its large alae and generally more robust form.

Etymology

Latin *valida* – (robust) and *-flora* (flower) because of the large alae.

Specimens examined: (25)

Northern Territory

Kakadu National Park, Gimbat, along depression behind the shed at Fisher airstrip, 13/02/1992, *K.G. Brennan 1822* (DNA); Kakadu National Park, Gimbat, behind shed at Fisher airstrip, 12/03/1992, *K.G. Brennan 1914* (DNA); Kakadu National Park, near Gimbat airstrip, 10/03/1993, *K.G. Brennan 2080* (DNA); Kakadu National Park, fire plot 32, 01/03/2000, *K.G. Brennan 4875* (DNA); Nitmiluk National Park, 25/03/2000, *K.G. Brennan 4960* (DNA); King Rr Valley Rd, 03/01/1993, *J.L. Egan 790* (DNA); King Rr Valley Rd, 14/02/1993, *J.L. Egan 1472* (DNA); Mt Todd Mine site, 17/03/1995, *J.L. Egan 4442* (DNA); 134 km Bridge, Stuart Hwy, 05/04/1995, *J.L. Egan 4635* (DNA); Edith Rr, 28/03/1996, *J.L. Egan 5318* (DNA); Edith Falls, 12 km from Stuart Hwy, 28/01/1991, *M. Evans 3558* (DNA); Along Green Ant Ck, Douglas Stn, about 1 km from crossing on Honeymoon House road, 09/01/2004, *R.A. Kerrigan 695 & R.K. Harwood* (DNA); Stuart Hwy, 134 Km Bridge, 24/04/2003, *R.A. Kerrigan 714 & D.J. Dixon* (DNA); Lot 3208 Edith Farms Rd, Katherine Region, 01/04/2004, *R.A. Kerrigan 796* (DNA); Stuart Hwy, 134 km Bridge, 04/03/2005, *R.A. Kerrigan 864* (DNA); Victoria Hwy, roadside stop about 24 km W of Katherine, 24/03/2005, *R.A. Kerrigan 910* (DNA); Victoria Hwy, W of Katherine, 24/03/2005, *R.A. Kerrigan 912*

(DNA); Douglas Daly Research Farm, 21/01/1998, *C.R. Michell 535 & K.J. Nicholl* (DNA); Edith Rr Area, 11/04/1999, *C.R. Michell 2333 & J.A. Risler* (DNA); Edith Rr Area, 12/04/1999, *C.R. Michell 2334 & J.A. Risler* (DNA); Edith Rr Area, 09/04/1999, *C.R. Michell 2346 & J.A. Risler* (DNA); Nitmiluk National Park, Edith Falls, 09/05/2002, *C.R. Michell 3607* (DNA); Tipperary Stn, 07/03/1964, *C.S. Robinson 297* (DNA); Katherine Levee Farm 2 mls down from Low Level, 07/01/1965, *C.S. Robinson 1138* (DNA); c. 25 kms NE of Timber Creek, 02/04/2007, *P.S. Short 5409 & J.O. Westaway* (DNA).

Fig. 5.126. The holotype of *Polygala validiflora*. 250 m NE along Green Ant Ck towards East Springs, off Adelaide Rr Scenic Hwy, 02/02/2004, R.A. Kerrigan 726 & R.K. Harwood 726 (DNA, BRI, PERTH, CANB, L)

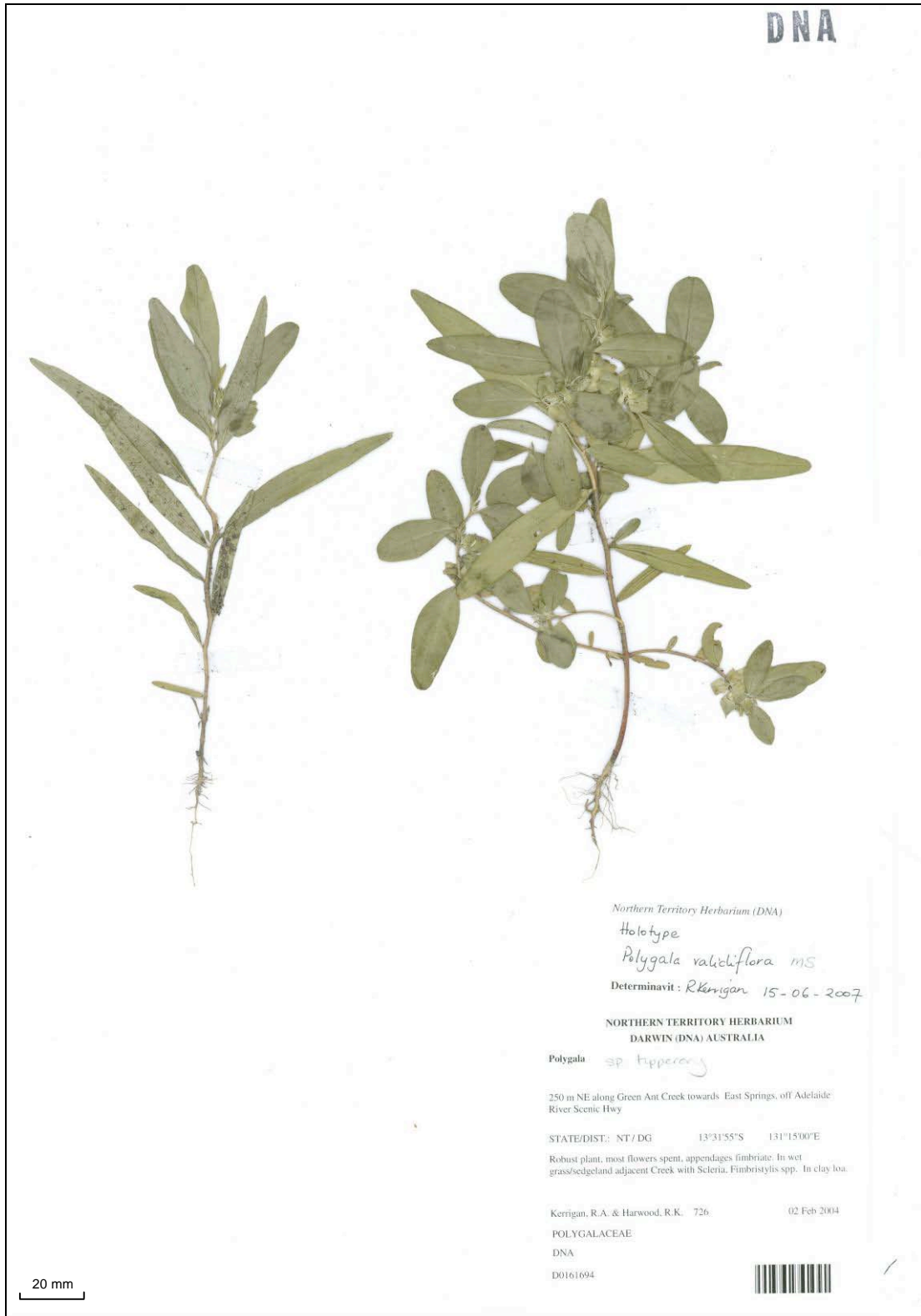
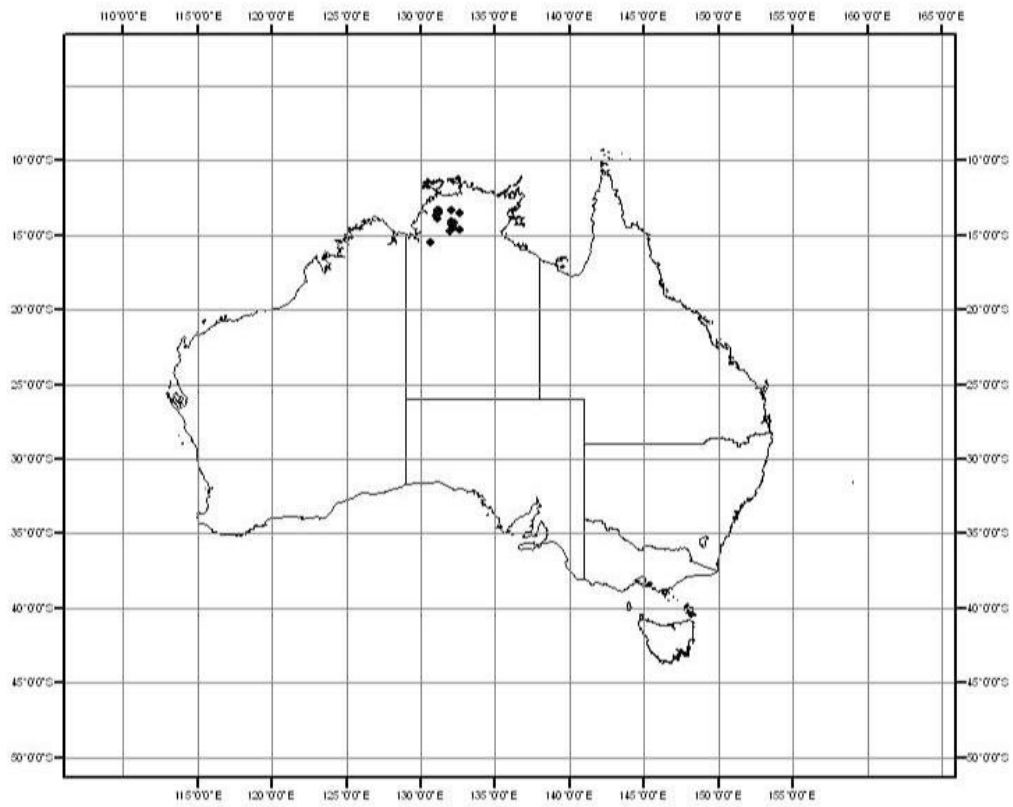


Fig. 5.127. Inflorescence, floral appendages and seed of *Polygala validiflora* (R.A. Kerrigan 726). a) inflorescence with purple flower bud; b) spatulate floral appendages from spirit and c) seed with rounded to skewed aril head (R.A. Kerrigan 726)



Fig. 5.128. The distribution of *Polygala validiflora* based on available collection data.



***Polygala wightiana* Wight & Arn., *Prod. Fl. Penin. Ind. Orient.*: 1: 38 (1834)**

Type citation: Dindygul. *Type details*: [no location details given] *Wallich 4190*, syn- CGE, E, L 16576! (photo), NY 2 (photo !), K; *Wight cat n. 134*, syn- CGE, E (photo E!)

Polygala stenoclada var. *queenslandica* Domin. *Biblo. Bot.* 89(4): 859 (1930). *Type citation*: Savannenwälder bei Chillagoe, Mareeba, Pentland und auf dem Castle Hill bei Townsville (Domin II-III 1910); *Type details*: in xerodrymiis apud opp. Chillagoe *K. Domin 5699*, Pentland *K.R. Domin 5698*, Mareeba *K.R. Domin 5700*, in collibus Castle Hill prope opp. Townsville *K.R. Domin 5701*. syntypes: PR 528258 to 528261! Photo; BRI! *Type citation*: ohne nähere Standortsangabe (English translation = without closer indication of location), BOWMAN. *Type detail*: Cape River, BOWMAN 274 Syn: MEL 37324!?

Annual herb, erect to 1 m, glabrous throughout. Stems and leaves glaucous. Leaves linear or narrowly oblong, 7–27 mm long, 1–3 mm wide; sessile. Inflorescence supra-axillary, rarely axillary or leaf-opposed, appearing terminal, usually a raceme to 285 mm long, rarely with solitary flower on internode proceeding raceme. Pedicel to 2 mm. Alae herbaceous, ovate to narrowly dimidiate, 3.0–4.8 mm long, 1.1–2.1 mm wide. Corolla yellow; floral appendages fimbriate. Stamens terminate at stigma, triadelphous, (3, 2, 3). Style hooked, stigma flat on inner surface of style, inner surface of style enlarged into flat fin like membrane just below end of hook. Capsule lacking wing, more or less symmetrical, oblong, 3.2–4.0 mm long, 2.2–2.6 mm wide. Seed shape oblong, 3.0–3.4 mm long, 1.0–2.4 mm wide; indumentum with fine white or ferruginous hairs, often extending beyond base and becoming shorter towards seed apex. Aril head helmet shaped, 0.6–0.9 mm long, white, with short hairs. Aril appendages 3, very shortly linear/oblong, 0.25–0.5 mm long. (Fig. 5.129)

Distribution

Australia (WA, NT, QLD), India, southeast Asia, and Malesia. In Australia distributed across the Kimberley in WA, the Top End of the NT and on Cape York Peninsula in QLD. (Fig. 5.130)

Habitat

Found in open woodlands on sandy, silt or clay soils.

Nomenclatural notes

Wight and Arnott cite two specimens in their protologue. The lower right hand element on sheet E0017413 (E) labelled Wight propr. 134 is the syntype cited by Wight and Arnott. Both Wallich 4190 and Wight 134 appear to fit the protologue and represent the same taxon. There is no clear evidence that Wight 134 is a paratype as stated by Adema (1966) and both are treated here as syntypes.

Specimens examined: (19)

Western Australia

250 m NE of Beverley Springs Stn Homestead, W Kimberley WA, 01/02/1996, *R.L. Barrett 785*, (PERTH); Lenard Rr, 10 mls above the junction of Baker Rr, 1/5/1905, *W.V. Fitzgerald 576* (PERTH); Kimberley, 6.3 km E of Barnett Rr crossing on Gibb River Road, 14/05/2006, *R.A. Kerrigan 1116* (DNA, PERTH); Kimberley, 62.2 km E of Barnett Rr Gorge turnoff on the Gibb River Road, 14/05/2006, *R.A. Kerrigan 1125* (DNA, PERTH); Kimberley, 26.4 km N of Gibb River Road and Kalumburu intersection on Kalumburu road, 14/05/2006, *R.A. Kerrigan 1126* (DNA, PERTH); Kimberley, 7.5 km S of Drysdale Rr Homestead on Kalumburu road, 15/05/2006, *R.A. Kerrigan 1127* (DNA, PERTH); Burke Development Rd, 8.2 km E of Chillagoe on southern side of road, 30/03/2007, *R.A. Kerrigan 1188* (DNA, BRI); Burke Development Rd, at Mt Garnet and Mt Surprise turnoff, south eastern side of intersection, 30/03/2007, *R.A. Kerrigan 1189* (DNA, BRI); Kimberley District, 1887, *C.W. Nyulasy s.n.* (MEL).

Northern Territory

c. 75 mls NE of Maranboy Police Stn, 05/03/1965, *M. Lazarides 88 & L.G. Adams* (CANB, NT, K, L, US, NSW, BRI); Flora Rr, 08/04/1997, *C.R. Michell 756 & D.S. Calliss* (DNA)

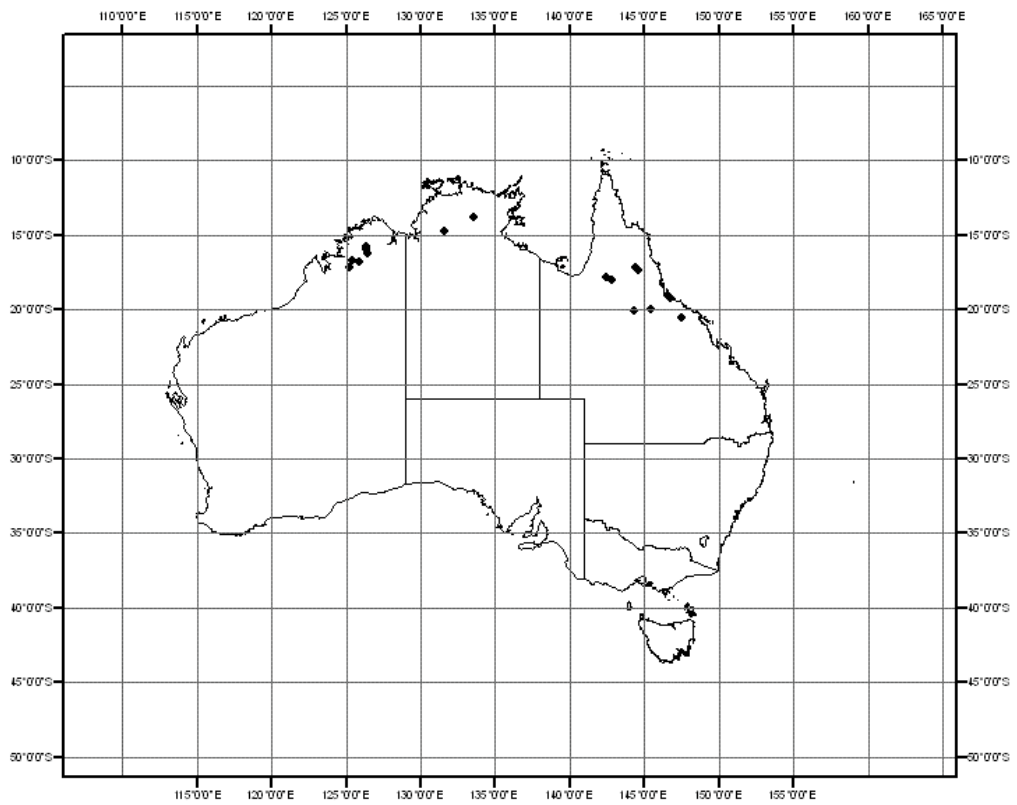
Queensland

Don Rr, Edgecomb Bay, 1886, *C.M. Birch s.n.* (MEL); Cape Rr, *Bowman*, (MEL); Castle Hill, Townsville, 24/06/1990, *R.J. Cumming 10264* (BRI); Herald Is, NW of Townsville, 13/03/1998, *R.J. Cumming 16996* (DNA, BRI); Chadshunt, Gilbert Rr, 05/05/1954, *S.L. Everist 5408* (BRI); Strathmore, 06/05/1954, *S.L. Everist 5422* (CANB, BRI); Great Basalt Wall, 03/04/1995, *R.J. Fensham 2132* (DNA, BRI); c. 89 km N of Hughenden, 01/04/1998, *E.J. Thompson & G. Turpin 526* (DNA, BRI)

Fig. 5.129. Flower and seed of *Polygala wightiana* (R.A. Kerrigan 1189). a) yellow flower and b) seed with helmet shaped aril head.



Fig. 5.130. The distribution of *Polygala wightiana* based on available collection data.



CHAPTER 6

Phylogeny and General Conclusions

Introduction

Investigation into the diversity of *Polygala* spp. in Northern Australia was prompted by both the observations of Monro (2003) and the number of putative new taxa published in the checklists of NT, Qld and WA, highlighting an apparent undescribed diversity. The abundance of new species described in this study has impeded further investigations into additional taxonomically and phylogenetically informative characters provided by molecular datasets. A major achievement of this research, however, has been to show a diversity of characters and character states within Australian *Polygala*, which have been cryptic in dried herbarium specimens, and may be useful for investigating phylogenetic lineages in global as well as Australian *Polygala*.

Phylogeny

In phylogenetic assessment of Polygalaceae Monro (2003) found that five of the endemic species of Northern Australian *Polygala* included in cladistic analyses formed a monophyletic clade based on morphological characters and that a subset of those species also formed a monophyletic clade using molecular data. When compared with Chodat's 1897 classification Monro (2003) concluded all members of the clade corresponded to Chodat's series *Chloropeterae*.

Allocating newly described Australian material to Chodat's (1896) subsectional and series classification is difficult. The definitions for nine of the 14 subsections are listed but not dichotomously and characters states defining each group are not always exclusive, see APPENDIX FOUR. Following Chodat's 1896

definition, all of the Australian *Polygala* used in the analysis, except for *P. longifolia* and *P. japonica*, can be placed in series *Chloropterae* based on green enlarged acute sepals. However, *Polygala wightiana* is listed by Chodat (1893) as belonging to *Leptelae* with *P. longifolia* based on the style and anthers. In fact in Monro's (2003) work *P. wightiana* is located in a separate clade to *P. longifolia* using morphological characters. Although taxonomically informative morphological characters are not necessarily phylogenetically informative Monro's (2003) monophyletic *Chloropterae* clade is supported by the character of green acute sepals. It is interesting therefore that *P. wightiana* is closely related to *P. longifolia* given that *P. wightiana* has small yellow flowers and green sepals while *P. longifolia* has showy petaloid sepals.

The polyphyly of *Polygala* overall indicates that significant changes in generic classification are required for Polygalaceae (Persson 2001; Monro 2003) and that Chodat's subgeneric classification fails both in this case and as well as in other published cases (Eriksen 1993a;1993b; Persson 2001).

Future work

A thorough cladistic investigation into phylogenetic relationships within Australian series *Chloropterae* was beyond the scope of this work but it has provided a broader suite of characters and characters states and has revealed more end-taxa to include in future investigations into the phylogeny of Australian *Polygala*. A phylogenetic divergence indicated by different stigma types is proposed. The relationship between the stigma and style in *Polygala*

and their capacity to enforce reproductive isolation provides a mechanism for promoting speciation and maintaining phylogenetic lineages. There are many methods by which breeding strategies can promote speciation (Grant 1981) and Sargent (2003) demonstrates that bilaterally symmetric lineages tend to be more species rich than their radially symmetrical sister lineages and proposes this is due to the higher speciation rates facilitated by pollinators. While the influences of reproductive structure on selection of pollinators has been shown in *Polygala* to facilitate reproductive isolation (Brantjes 1982) the level of autopolyploidy is unknown. Self pollination, is reported in *Polygala* and pollen is often observed on stigmas before flowers have opened (Ventakesh 1956; van der Meijden 1988; Kruger & Pretorius 1997). Autopolyploidy is being increasingly recognised as an overlooked mechanism for speciation (Solitis *et. al.* 2007) and further research is required to determine what barriers exist to prohibit self pollination in *Polygala*.

General Conclusions

Polygala diversity in Northern Australia has been documented and assigned to taxonomic ranks, 45 species are described including 28 new taxa comprising 26 new species and 4 varieties. A treatment of Australian material is provided, including a key to 50 species, as well as descriptions and nomenclatural notes for 45 native and non-native species found in Northern Australia. This treatment is now the most recent and comprehensive treatment for *Polygala* in Australia and uses morphological characters to define phylogenetic species. Outstanding issues, include the validity of the application of the names *P.*

glaucoides and *P. triflora* and the circumscription of the taxon described here as *P. triflora*. There is much scope for uncovering further diversity in *Polygala* world wide and a global taxonomic revision is warranted.

Index to taxa

Accepted names are in Roman, new names in bold and synonyms [including informal and misapplied names] in italics

- P. abyssinica* auct. non R.Br. ex Fresen. 171
P. abyssinica var. *intercedens* Domin 171
Polygala arvensis auct. non Willd. 87, 189, 247
Polygala arvensis var. *obovata* Benth. 180
Polygala arvensis var. *squarrosa* Benth. 127
Polygala arvensis var. *stenosepala* Benth. 254
P. barbata sp. nov. 80
P. barkleyensis sp. nov. 84
P. bifoliata sp. nov. 87
P. canaliculata sp. nov. 91
P. chinensis auct. non L. 208
P. chinensis var. *normalis* subvar. *linearifolia* Domin ..
..... 70, 189
P. chinensis var. *normalis* subvar. *obovata* Domin
..... 180
P. chinensis var. *dissitiflora* Domin 258
P. chinensis var. *orbicularis* (Benth.) Domin 184
P. chinensis var. *squarrosa* (Benth.) Domin 127
P. chinensis var. *stenosepala* (Benth.) Domin 254
P. clavistyla sp. nov. 94
P. coralliformis sp. nov. 98
P. crassitesta sp. nov. 104
P. crotalarioides DC. 71
P. dependens sp. nov. 109
P. difficilis sp. nov. 113
P. dimorphotricha sp. nov. 118
P. Duarteana A.St.-Hil. 72, 78
P. eriocephala F.Muell. ex. Benth. 123
P. eriocephala auct. non F.Muell. ex. Benth. 152
P. exsquarrosa Adema 127
P. gabriellae Domin 132
P. gabriellae auct. non Domin 104
P. galeocephala sp. nov. 135
P. geniculata sp. nov. 139
P. glaucifolia sp. nov. 142
P. glaucoides L. 147
P. glaucoides auct. non L. 139
P. integra sp. nov. 152
P. isingii Pedley 157
P. japonica Houtt. 162
P. kimberleyensis sp. nov. 164
P. leptalea DC. 171
P. leptalea var. *australiensis* Domin 171
P. liniifolia auct. non Willd. 71, 258
P. linearis nom. nov. 167
P. longifolia Poir. 171
P. macrobotrya Domin 176
P. monspeliaca L. 72, 78
P. myrtifolia L. 72, 78
P. obversa nom. nov. 180
P. orbicularis Benth. 184
P. paniculata L. 188
P. parviloba nom. nov. 189
P. pendulina sp. nov. 194
P. persicariaefolia DC. 197
P. petraphila var. *angusta* sp. nov. 202
P. petraphila var. *petraphila* sp. nov. 202
P. polifolia C.Presl 208
P. praecox sp. nov. 213
P. pterocarpa sp. nov. 217
P. pycnophylla Domin 221
P. pycnophylla auct. non Domin 87
P. rhinanthoides Sol. ex Benth. 225
P. rhinanthoides auct. non Sol. ex Benth. 217
P. rhinanthoides var. *minor* Benth. 71
P. rhynchocarpa sp. nov. 229
P. rosmarinifolia Wight & Arn. 71
P. saccopetala sp. nov. 232
P. scorpioides sp. nov. 237
P. sibirica auct. non L. 162
P. sp. (A Kimberley Flora K.F. Kenneally 7752) ... 229
P. sp. (B Kimberley Flora T.E.H. Aplin et al. 715). 213
P. sp. (Bifoliata N.B.Byrnes 2091) 87
P. sp. (Bradshaw C.R.Michell 2113) 232
P. sp. (Camooweal A.De Lestang 218) 78
P. sp. (Cahill K.G.Brennan 1968) 127
P. sp. (Ciliate alae C.R.Michell 615) 201
P. sp. (Davenport Ranges C.R.Dunlop 6042) 109
P. sp. (Edith Falls D.M.J.S.Bowman 468) 94
P. sp. (Emerald R.W.Johnson 1322) 104
P. sp. (Gregory G.M.Wightman 2823) 135
P. sp. (Kakadu R.Collins 205) 98
P. sp. (Kennedy L.S.Smith 3173) 147
P. sp. (Larrimah M.O.Rankin 1932) 123
P. sp. (Portland Roads L. Pedley 2757) 225
P. sp. (Mudginberri J.Russell-Smith 987) 80
P. sp. (*orbicularis* var. *Obovate leaves*
C.P.Mangion 900) 180
P. sp. (*Prostrate P.K.Latz 4900*) 142
P. sp. (*Rhinanthoides shoulders M.H.Andrews*
398) 104
P. sp. (*Tennant Creek J.L.Egan 2299*) 113
P. sp. (*Tipperary C.S.Robinson 297*) 263
P. sp. (*Top End L.A.Craven 5464*) 98
P. sp. (*Western Tanami D.E. Albrecht*
10660) 157
P. stenoclada Benth. 242
P. stenoclada auct. non Benth. 167
P. stenoclada var. *clementii* Domin 70
P. stenoclada var. *queenslandica* Domin 268
P. stenoclada var. *stenosepala* Benth. 167
P. stenoclada var. *typica* Domin 242
P. succulenta var. *congesta* sp. nov. 248
P. succulenta var. *succulenta* sp. nov. 249
P. tepperi F.Muell. 254
P. triflora L. 258
P. triflora auct. non L. 189
P. validiflora sp. nov. 263
P. veronicea F.Muell. 162
P. virgata Thumb. 72, 78
P. vulgaris L. 72, 78
P. wightiana Wight & Arn. 268

References

- Adema F (1966) A review of the Herbaceous species of *Polygala* in Malesia (POLYGALACEAE). *Blumea* **14(2)**, 253-356.
- Adema F (1969) Identities of the herbaceous Australian species of *Polygala* represented in the Brisbane Herbarium. *Proc. R. Soc. Qld.* **80(9)**, 125-130.
- APG (The Angiosperm Phylogeny Group) (1998) An ordinal classification for the families of flowering plants. *Ann. Missouri Bot. Gard.* **85**: 531-553
- Anon (1998-) FloraBase - The Western Australian Flora, Western Australian Herbarium. 2005.
- Anon (2002) Conservation Action Plan - Public Version, *Polygala smallii*, Fairchild Tropical Botanic Garden. 2006.
- Belbin L (1991) Semi-strong Hybrid Scaling, a New Ordination Algorithm. *Journal of Vegetation Science* **2(4)**, 491-496.
- Belbin L (2004) PATN: Pattern Analysis Package (for Windows Version 3.01). (Blatant Fabrications:Hobart)
- Belbin L, Faith DP, Milligan GW (1992) A comparison of two approaches to Beta-flexible clustering. *Multivariate Behavioural Research* **27**, 417-433.
- Bell A D (1991) 'Plant Form: An illustrated guide to flowering Plant Morphology'. (Oxford University Press: New York).
- Bennett (1872) *Polygala*. In 'The Flora of British India. Part 1'. (Eds JD Hooker) pp. 200-206. (L. Reeve & Co.: London)
- Bentham G. (1863). *Polygala*. In 'Flora Australiensis. Vol. 1'. pp. 138-141. (Lovell Reeve & Co.: London)
- Berg RY (1975) Myrmecochorous Plants in Australia. *Australian Journal of Botany* **23**, 475-508.
- Brantjes NBM (1982) Pollen placement and reproductive isolation between two Brazilian *Polygala* species (Polygalaceae). *Plant Systematics and Evolution* **141**, 41-52.
- Burt BL (1973) *Polygala arvensis*, *chinensis* and *glomerata*. *Notes from the Royal Botanic Garden Edinburgh* **32(3)**, 403-404.
- Chodat R (1893) Monographia polygalacearum. *Mem. Soc. Phys. Hist. Nat. Geneve* **31**, 1-500.
- Chodat R (1896) Polygalaceae. In 'Die Natürlichen Pflanzenfamilien Vol. 3'. (Eds A Engler, K Prantl) pp. 323-345. (Engelman: Leipzig).
- Claridge MF, Dawah HA, Wilson MR (1997) Practical approaches to species concepts of living organisms. In 'Species: The units of Biodiversity'. (Eds. HA Dawah, MF Claridge, MR Wilson) pp. 171-190. (Chapman & Hall: London)

-
- Cowie ID, Albrecht DA (2004) Checklist of NT Vascular Plants. Darwin, NT Herbarium, Department of Infrastructure Planning and Environment.
- Cowie ID, Albrecht DA (2005) Checklist of NT Vascular Plants. Darwin, NT Herbarium, Department of Infrastructure Planning and Environment.
- Cronquist A (1981) *Polygalaceae*. In 'An Integrated System of Classification of Flowering Plants'. pp. 775-778 (Columbia University Press: New York).
- Davis PH, Heywood, VH (1963) 'Principles of angiosperm taxonomy'. (Oliver and Boyd: London)
- Davis JI, Nixon KC (1992) Populations, genetic variation, and the delimitation of phylogenetic species. *Systematic Biology* **41**, 421-435.
- de Queiroz K, Donoghue MJ (1988) Phylogenetic systematics and the species problem. *Cladistics* **4**, 317-338.
- de Queiroz K, Donoghue MJ (1990) Phylogenetic systematics and species revisited. *Cladistics* **6**, 83-90.
- Domin K (1930) Beitrage zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* **89(4)**.
- Downing TL, Duretto MF and Ladiges PY (2004) Morphological analysis of the *Grevillea ilicifolia* complex (Proteaceae) and recognition of taxa. *Australian Systematic Botany* **17**, 327-342.
- Dover G (1995) A species definition: a functional approach. *Trends in Ecology and Evolution* **10**, 489-490.
- Eames AJ (1961) 'Morphology of the Angiosperms'. (McGraw-Hill: New York)
- Eriksen B (1993a) Floral anatomy and morphology in the Polygalaceae. *Plant Systematics and Evolution* **186**, 17-32.
- Eriksen B (1993b) Phylogeny of the Polygalaceae and its taxonomic implications. *Plant Systematics and Evolution* **186**, 33-36.
- Fawcett F, Rendle AB (1920) Polygalaceae. *Flora of Jamaica* Dicot. Pt. **2, 4**, 244.
- Gornall RJ (1997) Practical aspects of the species concept in plants. In 'Species: The units of Biodiversity' (Eds MF Claridge, HA Dawah, MR Wilson) pp. 171-190. (Chapman & Hall: London).
- Grant V (1971) Plant Speciation. (Columbia University Press: New York)
- Hartman SE (1988) Evaluation of some alternative procedures used in numerical systematics. *Systematic Zoology* **37(1)**, 1-18.
- Hedberg O (1958) The taxonomic treatment of vicarious taxa. *Uppsala Univ. Arssk.* **6**, 186-195.
- Henderson RJF (2002) Names and distributions of Queensland Plants, Algae and Lichens. Queensland Herbarium. (Queensland Herbarium, Department of Environment and Heritage: Indooroopilly).

-
- Henderson A (2006) Traditional morphometrics in plant systematics and its role in palm systematics. *Botanical Journal of the Linnean Society* **151**, 103-111.
- Hull DL (1997) The ideal species concept - and why we can't get it. In 'Species: The units of Biodiversity' (Eds MF Claridge, HA Dawah, MR Wilson) pp. 357-381. (Chapman & Hall: London).
- International Code of Botanical Nomenclature, Seattle 1972, Regnum Vegetabile.
- International Code of Botanical Nomenclature, Vienna, 2005. International Association for Plant Taxonomy (2005). Electronic version retrieved on 29-4-08
- Isaacs MJH, Weitz FM, Johnson CT (1993) Seed-coat characteristics of selected southern African species of *Polygala* L. (Polygalaceae). *South African Journal of Botany* **59(6)**, 592-596.
- Kajita T, Ohashi, Hiroyoshi, Tateishi, Yoichi, Bailey CD, Doyle JJ (2001). "rbcL and Legume Phylogeny, with Particular Reference to Phaseoleae, Millettieae, and Allies." *Systematic Botany* **26(3)**, 515-536.
- Kerrigan, Albrecht DA (2006) Checklist of NT Vascular Plants. Darwin, NT Herbarium, Department of Infrastructure Planning and Environment.
- Kitching IJ, Forey PL, Humphries CJ and Williams DM (1998) 'Cladistics' (2nd edn). (Oxford University Press: Oxford).
- Kruger H, Pretorius WE (1997) Notes on the structure of the stigma of *Polygala virgata* var. *virgata* (Polygalaceae). *South African Journal of Botany* **63(5)**, 261-266.
- Lack AJ, Kay QON (1987) Genetic structure, gene flow and reproductive ecology in sand-dune populations of *Polygala vulgaris*. *Journal of Ecology* **75**, 259-276.
- Lee M (2003) Species concepts and species reality: salvaging a Linnaean rank. *Journal of Evolutionary Biology* **16**, 179-188.
- Legendre P, Legendre L (1998) 'Numerical Ecology'. (Elsevier: Amsterdam).
- Linnaeus, C. (1753) *Species Plantarum*.
- Mauseth JD (1988) 'Plant Anatomy'. (The Benjamin/Cummings Publishing Company: California).
- Mayden RL (1997) A Hierarchy of Species Concepts: The Denouement in the Saga of the Species Problem. In 'Species: The units of Biodiversity' (Eds MF Claridge, HA Dawah, MR Wilson) pp. 381-424 (Chapman & Hall: London).
- Mayr, E. (1981). "Biological Classification: Toward a synthesis of opposing methodolgies." *Science* **214**: 510-516.
- McCusker A (1999) Glossary. In 'Flora of Australia. Volume 1 Introduction'. (Ed AE Orchard) pp. 585-636 (ABRS/CSIRO Publishing: Melbourne)

-
- Merlee Teresa MV, Jacob L (1999) Seed coat and strophliolar structure in *Polygala* L. in relation to taxonomy. *Geobios new Reports* **18**, 43-47.
- Monro A (2003) 'Systematics of the Australian Polygalaceae and Xanthophyllaceae'. Unpublished PhD thesis, Australian National University, Canberra.
- Nelson G (2003) Book Review: Species concepts and phylogenetic theory: a debate. *Cladistics* **19**, 274-275.
- Nixon KC, Wheeler, QD (1990) An amplification of the phylogenetic species concept. *Cladistics* **6**, 211-223.
- Nogrady T (1998) Numerical phenetic taxonomy and its heuristic aspects. *Hydrobiologia* **387/388**, 97-100.
- Oostermeijer JGB (1988) Myrmecochory in *Polygala vulgaris* L., *Luzula campestris* (L.) DC. and *Viola curtisii* Forster in a Dutch dune area. *Oecologia* **78(3)**, 302-311.
- Orchard AE (1999) *A history of systematic botany in Australia*. In 'Flora of Australia. Introduction Volume I' (eds AE Orchard, HS Thompson) pp. 29. (ABRS/CSIRO: Australia)
- Paterson EH (1993) 'Evolution and the recognition concept of species'. Collected writings. (John Hopkins University: Baltimore).
- Pendry CA (1999) A new combination in *Polygala* (Polygalaceae) for Southeast Asia. *Novon* **9**, 545.
- Pendry CA (2001) Polygalaceae. *Flora of Thailand* **7(3)**, 498-520.
- Persson C (2001) Phylogenetic relationships in *Polygalaceae* based on plastid DNA sequences from the *trnL-F* region. *Taxon* **50**, 763-779.
- Prenner G (2004) Floral development in *Polygala myrtifolia* (Polygalaceae) and its similarities with Leguminosae. *Plant Systematics and Evolution* **249**, 67-76.
- Quickie DLJ (1993) 'Principals and techniques of contemporary taxonomy'. (Blackie Academic and Professional: London)
- Sandvik H (2003) Book Review: Genes, categories, and species: The Evolutionary and Cognitive Causes of the Species Problem. Jody Hey 2001." *Systematic Biology* **52(4)**: 565-567.
- Sargent RD (2003) Floral symmetry affects speciation rates in angiosperms. *The Royal Society* **271**, 603-608.
- Short PS (2002) John Richardson, an early collector from Melville Island, Northern Territory. *Australian Systematic Botany Society Newsletter* **112**, 3-7.
- Sneath PH, Sokal, RR (1973) Numerical Taxonomy. The principles and Practice of Numerical Classification. (W.H. Freeman and Company: San Francisco).
- Snow N (1997) Application of the phylogenetic species concept; A botanical monographic perspective. *Austrobaileya* **5**, 1-8.

- Solitis DE, Solitis PS, Schemske DW, Hancock JF, Thomspson JN, Husband BC, Judd WS (2007) Autopolyploidy in angiosperms: have we grossly underestimated the number of species. *Taxon* **56** (1), 13-30.
- Stamos DN (2002) Species, languages, and the horizontal/vertical distinction. *Biology and Philosophy* **17**, 171-198.
- Stuessy TF (1990) 'Plant Taxonomy: The systematic Evaluation of comparative data'. (Columbia University Press: New York).
- Sumithra'arachchi DB (1988) *Polygalaceae*. In 'A Revised Handbook to the Flora of Ceylon Volume VI' (eds MD Dassanayake, FR Fosberg) pp. 301-317. (A.A. Balkema: New Delhi)
- Swofford DL (1998) 'PAUP* Phylogenetic Analysis Using Parsimony (*and Other Methods).' Version 4. Beta version documentation'. (Sinauer Associates: Sunderland, Massachusetts)
- Szalay FS (1993) Species Concepts. The tested, the untestable and the redundant. Species. In 'Species Concepts, and Primate Evolution' (eds WH Kimbel, LB Martin) pp. 21-41(Plenum Press: New York).
- van der Meijden R (1988) Polygalaceae. *Flora Malesiana* **10** (Series 1). 455-482
- Venkatesh CS (1956) The special mode of dehiscence of anthers of *Polygala* and its significance in autogamy. *Bulletin of the Torrey Botanical Club* **83**(1), 19-26.
- Verkerek W (1985) Ovules and seeds of the Polygalaceae. *Journal of the Arnold Arboretum* **66**, 353-394.
- Verkerek W, Bouman F (1980) Ovule ontogeny and its relation to seed-coat structure in some species of *Polygala* (Polygalaceae). *Botanical Gazette* **141**, 277-282.
- Weekley CW, Brothers A (2006) Failure of reproductive assurance in the chasmogamous flowers of *Polygala lewtonii* (Polygalaceae) an endangered sandhill herb. *American Journal of Botany* **93**(2), 245-253.
- Westerkamp C (1997) Keel flowers of the Polygalaceae and Fabaceae: a functional comparison. *Botanical Journal of the Linnaean Society* **129**(3), 207-221.
- Westerkamp C, Weber A (1997a) Keel flowers of Polygalaceae and Fabaceae: how far do similarities reach. In 'Scripta Bot. Belg. 15. 13th Symp. Morph. Anat. & Syst., Progr. & Abstr.' (eds E smets, LP Ronse Decraene, E Robbrecht) pp. 165. (Leuven: Belgium).
- Westerkamp C, Weber A (1997b) Secondary and tertiary pollen presentation in *Polygala myrtifolia* and allies (Polygalaceae, South Africa). *South African Journal of Botany* **63**(5), 254-258.
- Wheeler QD, Nixon KC (1990) Another way of looking at the species problem: a reply to De Queiroz and Donoghue. *Cladistics* **6**, 77-81.
- Williams DG (2002) *Study Guide: Classification and Ordination*. (Flexible Delivery Development Unit, Centre for the Enhancement of Learning. Teaching and Scholarhsip (CELTS) University of Canberra: Canberra)

APPENDICES

APPENDIX ONE: Data matrix of diagnostic morphological characters

A table showing the morphologically distinct taxa identified from the specimens examined and the diagnostic characters separating them.

Colour: p/b/m = purple blue or mauve; Floral appendage: b = bifurcate; f = fimbriate, e = entire, c = coralline, s = spathulate, cr = crenate, h = horned; Indumentum: c = curved, s = straight, glab = glabrous/glabrescent ; stigma: glob = globular.

OTU	Epithet	Alae colour	Flower colour	Floral appendage	Floral appendage texture	Seed shape	Aril shape	Seed hairs	Style	Style with pocket or grooves	Stigma	Indumentum	Leaf shape	Capsule wing	Misc.
1	<i>P. succulenta</i> var. <i>succulenta</i>	green and acute	p/b/m	b	ucculent	ovoid - oblong	domed	single	curved and flattened	absent	glob	c & s	linear, narrowly elliptic to oblanceolate	not winged	infl. Loose
2	<i>P. succulenta</i> var. <i>congesta</i>	green and acute	p/b/m	b	ucculent	ovoid - oblong	domed	single	curved and flattened	absent	glob	c & s	linear, narrowly elliptic to oblanceolate	not winged	infl. Congested
3	<i>P. pycnophylla</i>	green and acute	not known	s	retaloid	ovoid - oblong	helmet	single	hooked	absent	flat	c & s	linear to obovate	winged but narrowly	
4	<i>P. petraphila</i> var. <i>petraphila</i>	green and acute	p/b/m	b	ucculent	ovoid	reduced	single	slightly curved/groove	present	glob	c & s	elliptic to obovate, oblanceolate	not winged	lvs elliptic, obovate or oblanceolate
5	<i>P. petraphila</i> var. <i>angusta</i>	green and acute	p/b/m	b	ucculent	ovoid	reduced	single	slightly curved/groove	present	glob	c & s	linear, narrowly elliptic to lanceolate	not winged	lvs linear, narrowly elliptic to lanceolate
6	<i>P. dependens</i>	green and acute	p/b/m	nknown	retaloid	ovoid	reduced	single	hooked	absent	flat	c	narrowly elliptic to oblanceolate, obovate	not winged	
7	<i>P. clavistyla</i>	green and acute	p/b/m	c	retaloid	ovoid	reduced	single	curved t, club shaped	absent	glob	c	oblanceolate to obovate		
8	<i>P. integra</i>	green and acute	p/b/m	e	retaloid	ovoid	round	single	curved	absent	flat	c & s	linear, narrowly elliptic to lanceolate, oblong	small wing present	stigma on side of style at apex
9	<i>P. exsquamata</i>	green and acute	p/b/m	f	retaloid	ovoid	reduced	single	curved & grooved	present	glob	c & s	linear, narrowly oblong or narrowly elliptic, oblanceolate	no wing	
10	<i>P. crassitesta</i>	green and acute to obtuse	p/b/m	f	retaloid	oblong	round	single	hooked	absent	flat	c & s	linear, narrowly elliptic to oblanceolate, elliptic to	winged	thickened seed testa below aril forming
11	<i>P. geniculata</i>	green and acute	p/b/m	s	retaloid	ovoid	reduced	single	hooked	absent	flat	c	obovate	not winged	
12	<i>P. galeacephala</i>	green and acute	p/b/m	f	retaloid	ovoid - oblong	helmet	single	hooked	absent	flat	c	linear to elliptic, lanceolate to ovate, rarely obovate	not winged	
13	<i>P. isingii</i>	green and acute	p/b/m	f	retaloid	ovoid	helmet	single	hooked	absent	flat	c & s	narrowly oblong, oblanceolate or obovate	not winged	hispidulous, green
14	<i>P. coralliformis</i>	green and acute	p/b/m	h	retaloid	ovoid - oblong	helmet	two	hooked	absent	flat	c & s	elliptic to obovate to depressed obovate	not winged	thick hollow hairs below and on aril head
15	<i>P. eriocephala</i>	green and acute	p/b/m	e	urgid	ovoid - oblong	helmet - hooked	single	curved and cleft	absent	glob	c & s	linear, oblanceolate	not winged	alae & inflorescence villous.
16	<i>P. longifolia</i>	white to pink and obtuse	white to pink	f	retaloid	oblong	reduced	single	curved	absent	flat	c or glab	linear, narrowly elliptic to oblanceolate	not winged	
17	<i>P. stenoclada</i>	green and acute	p/b/m	s	retaloid	oblong	helmet	single	hooked	absent	flat	c	linear	not winged	
18	<i>P. barbata</i>	green and acute	p/b/m	s	retaloid	ovoid	round	single	hooked	absent	flat	c & s	elliptic to orbicular, oblanceolate to depressed	not winged	
19	<i>P. orbicularis</i>	green/purple and acute	p/b/m	f	retaloid	ovoid	round	single	hooked	absent	flat	c	orbicular to vw obovate	not winged	Inflo. appearing terminal
20	<i>P. obversa</i>	green and acute	p/b/m	f	retaloid	ovoid	round - hooked	single	hooked	absent	flat	c	obovate to orbicular	not winged	inflo. appearing axillary
21	<i>P. pendulina</i>	green and acute	p/b/m	f	retaloid	ovoid - oblong	helmet - hooked	single	hooked	absent	flat	c & s/c	linear to oblanceolate	not winged	Capsules pendulous
22	<i>P. glaucifolia</i>	green and acute	p/b/m	f	retaloid	ovoid	reduced	single	hooked	absent	flat	c & s	obovate to oblanceolate	not winged	Indumentum of fine spreading hairs, foliage somewhat glaucous
23	<i>P. pterocarpa</i>	green and acute	p/b/m	f	retaloid	ovoid - oblong	round - hooked	single	hooked	absent	flat	c & s	variable	winged	seed without thickened testa below aril
24	<i>P. saccopetala</i>	green and acute	p/b/m	f	retaloid	ovoid - oblong	hooked - helmet	single	hooked	absent	flat	c	linear to oblanceolate	not winged	keel petal with conspicuous pouches

OTU	Epithet	Alae colour	Flower colour	l o r a l ppendage	petaloid	Seed shape	aril shape	Seed hairs	style	style with pocket or grooves	Stigma	Indumentum	Leaf shape	capsule wing	Misc.
25	<i>P. linearis</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	round - hooked	two	hooked	absent	flat	c & s	linear to lanceolate	not winged	seed with thick hollow recurved hairs
26	<i>P. validiflora</i>	green and acute	p/b/m	s	petaloid	oblong	round	single	hooked	absent	flat	c & s	lanceolate to obovate	winged	robust, Alae larger than capsule
27	<i>P. dimorphotricha</i>	green and acute	p/b/m	s	petaloid	ovoid - oblong	round - hooked	single	hooked	absent	flat	c & s	obovate to oblanceolate	not winged	staminal column fused to upper petal to form flap
28	<i>P. tepperi</i>	green and acute	p/b/m	f	petaloid	oblong	helmet	single	hooked	absent	flat	c & s	linear	not winged	capsules solitary or on short rachis, held erect, apex acute
29	<i>P. parviloba</i>	green and acute	p/b/m	j	petaloid	ovoid	reduced	single	straight	absent	glob	c & s	linear, lanceolate to narrowly elliptic	not winged	hairs on style.
30	<i>P. wightiana</i>	green and acute	yellow	f	petaloid	oblong	helmet	single	hooked	absent	flat	glabrous	linear to narrowly oblong	not winged	stamens fused as 3,2,3
31	<i>P. difficilis</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	helmet	single	hooked	absent	flat	c & s	linear, narrowly oblong, lanceolate or oblanceolate	not winged	
32	<i>P. kimberleyensis</i>	green and acute	p/b/m	f	petaloid	ovoid	helmet - hooked	single	hooked	absent	flat	c & s	vw ovate, obovate, depressed obovate or orbicular	not winged	
33	<i>P. rhynchocarpa</i>	green and acute	p/b/m	b	petaloid	oblong	helmet	single	curved	absent	flat	c	linear	not winged	apex of capsule lobes acute, style twisted, truncated at apex into hammer head.
34	<i>P. canaliculata</i>	green and acute	p/b/m	f	petaloid	oblong	round - hooked	single	curved	present	glob	c	linear	not winged	shallow groove or notch in the truncated head of the style
35	<i>P. triflora</i>	green and acute	yellow/white/p/b/m	f	petaloid	ovoid - oblong	helmet - hooked	single	hooked	absent	flat	c & s/c	linear, narrowly elliptic to oblanceolate to obovate	not winged	
36	<i>P. persicariifolia</i>	white to green and obtuse	pink/purple	f	petaloid	ovoid - oblong	horseshoe shaped	single	curved	present	glob	c & s	narrowly elliptic, lanceolate to ovate	not winged	style truncate at apex and concave to grooved above stigma/ scaberulous hairs on leaves.
37	<i>P. rhinanthoides</i>	green and acute	p/b/m?	f	petaloid	ovoid - oblong	round	single	hooked	absent	flat	c & s/c	linear to lanceolate	winged	
38	<i>P. polifolia</i>	green and acute	white/yellow/purple	f	petaloid	ovoid - elliptic	round - hooked	single	curved	absent	glob	c	oblanceolate, narrowly elliptic or narrowly oblong rarely	not winged	
39	<i>P. glaucoides</i>	green and acute	yellow?	f	petaloid	ovoid - oblong	round	single	hooked	absent	flat	c	oblanceolate, narrowly elliptic, narrowly oblong	not winged	
40	<i>P. bifoliata</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	round - hooked	two	hooked	absent	flat	c & s/c	elliptic to ovate linear to lanceolate	not winged	seed with thick hollow recurved hairs
41	<i>P. barkleyensis</i>	green and acute	p/b/m	f	petaloid	ovoid	reduced	single	hooked	absent	flat	c	linear, narrowly elliptic, oblanceolate	not winged	
42	<i>P. scorpioides</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	hooked - helmet	single	hooked	absent	flat	c & s	linear, narrowly elliptic, ovate, elliptic	not winged	
43	<i>P. praecox</i>	green and acute	p/b/m	e	petaloid	oblong	round - hooked	single	hooked	absent	flat	c	linear, narrowly elliptic	unevenly winged	unevenly winged
43	<i>P. gabrielae</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	hooked - rounded	single	hooked	absent	flat	c & s	linear	not winged	
45	<i>P. macrobotrya</i>	green and acute	p/b/m	f	petaloid	ovoid - oblong	helmet	single	hooked	absent	flat	c	linear	not winged	
46	<i>P. japonica</i>	green and acute	Blue (from literature)	f	petaloid	ovoid	hooked	single	curved	unknown	glob	c	Elliptic to ovate	winged	
47	<i>P. paniculata</i>	white	white	b	petaloid	obloid	reduced	single	curved	present	glob	s	narrowly elliptic	Not winged	

APPENDIX TWO: Data matrix for morphometric analysis of OTUs for 25/40. Table shows holtze database (DNA) accession number and collector name and number for each OTU and values for 26 scored characters. Characters scored shown in Table 3.1.

OUT Accession Number	Collector	Coll.#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
D165019	Risler, J.A.	2392	13	2.5	2	3	15	4	27.20	2.10	13.70	4.00	35.00	1.00	2.50	50.00	80.00	3.00	4.40	1.50
D144193	Brennan, K.G.	1868	10	1	2	1	16	3	18.40	1.20	15.30	4.00	28.00	0.50	1.50	28.30	40.00	8.00	7.00	1.70
D169817	Brennan, K.G.	4631	10	0.5	2	4	9	4	16.50	0.50	6.20	6.00	20.50	0.50	0.50	9.00	9.00	7.50	6.40	1.40
D157522	Harwood, R.K.	1270	10	1	2	1	0	3	19.80	1.00	19.80	5.00	28.00	1.00	2.00	36.30	70.00	3.00	6.10	1.70
D43074	Dunlop, C.R.	7663	10	1.5	2	2	0	4	22.80	2.80	8.30	5.00	31.00	1.00	3.00	64.80	75.00	4.00	4.70	1.60
D144192	Brennan, K.G.	847	10	1	2	1	15	4	27.00	1.10	25.30	9.00	30.00	1.00	1.50	38.50	42.00	7.00	6.70	1.60
D66882	Cowie, I.D.	2463	8	2	2	3	20	4	33.80	2.00	17.60	8.00	40.00	1.50	2.50	78.30	115.00	4.00	5.70	1.30
D63279	Leach, G.J.	2912	12	1	2	1	16	4	21.00	1.00	21.00	4.00	28.00	1.00	1.50	28.70	36.00	5.00	6.40	1.40
D76813	Egan, J.L.	2922	13	1.5	2	1	11	3	23.60	1.40	17.90	4.00	33.00	1.00	1.50	69.00	69.00	6.00	6.00	1.90
D149374	Cowie, I.D.	9490	12	1.5	2	3	0	4	28.20	1.70	19.80	3.00	37.00	1.00	2.00	109.40	165.00	3.00	6.20	1.60
D151542	Michell, C.R.	3608	11	1	2	1	15	4	26.00	1.00	26.00	5.00	33.00	0.50	1.00	7.30	10.00	2.00	5.40	1.50
D161332	Short, P.S.	5146	8	0.5	2	1	25	4	19.60	1.10	18.30	3.00	27.00	0.50	1.00	27.00	34.00	5.50	5.90	1.40
D76905	Leach, G.J.	3619	12	2	2	1	0	4	26.80	1.70	15.60	9.00	34.00	1.00	2.50	115.00	170.00	8.00	6.60	2.00
D26076	Taylor, J.A.	252	8	2	2	1	11	4	15.60	1.90	9.20	5.00	29.00	1.50	2.50	17.80	30.00	5.00	3.80	1.50
D134157	Michell, C.R.	533	8	3	1	3	15	3	27.40	2.90	9.40	3.00	46.00	2.00	3.00	68.00	102.00	3.00	5.10	1.90
L9110	Craven, L.A.	2306	10	2	2	1	15	3	16.60	1.90	9.30	3.00	25.00	1.00	2.00	27.00	35.00	4.00	5.60	1.50
L9109	Rice, B.L.	3342	11	2	2	1	20	4	25.40	2.10	11.90	5.00	40.00	1.00	3.00	32.00	32.00	2.00	5.80	2.00
D168931	Kerrigan, R.A.	861	8	2	2	1	20	3	30.80	2.00	15.50	4.00	46.00	1.50	2.50	77.50	105.00	7.00	5.60	1.75
L9316	Dunlop, C.R.	7663	14	2	2	3	0	4	27.40	3.00	12.10	4.00	33.00	1.00	3.00	47.00	80.00	4.00	3.30	1.20
D76405	Egan, J.L. & Leach, G.J.	3117	13	2.5	1	3	14	4	22.40	2.90	7.70	4.00	32.00	1.00	4.00	50.00	60.00	2.50	4.60	1.40
A589518	Cowie, I.D.	6715	9	3		3	6	4	14.60	3.00	6.00	4.00	25.00	1.50	4.50	61.70	67.00	9.00	4.80	2.20
D161331	Short, P.S.	5145	10	2		1	13	4	20.40	2.00	10.20	1.50	21.00	1.00	2.50	40.80	60.00	4.00	4.90	1.80
D76073	Van Kerckhof, D.C.	7	10	1	2	1	21	3	31.60	1.60	20.70	2.50	34.00	0.50	2.00	64.00	80.00	6.00	3.00	6.50
D126391	Taylor, S.M	252	10	2	2	1	15	3	25.20	2.30	11.20	3.00	36.00	2.00	4.00	11.10	20.00	8.00	4.80	1.70
D140618	Cowie, I.D.	8892	15	5.5	1		0	4	18.40	5.60	3.18	3.50	29.00	2.50	5.50	53.20	65.00	2.00	4.50	1.50
D149037	Brennan, K.G.	4813	16	4	1	2	0	4	16.00	5.30	3.00	5.00	28.00	2.00	6.00	33.80	66.00	1.50	3.60	1.50
D126701	Cowie, I.D.	6125	12	5	1	3	0	4	16.60	5.80	2.80	2.00	34.00	2.00	5.50	6.25	8.00	2.00	4.00	1.83
D26914	Dunlop, C.R.	6794	11.5	4.5	1	2	0	4	17.80	3.70	5.00	3.00	30.00	2.00	4.00	23.40	30.00	1.50	3.20	1.20
D166107	Egan, J.L.	3045	13	3.5	1	3	0	4	24.40	4.40	6.40	3.00	42.00	3.00	7.00	26.70	32.00	2.00	4.50	1.50
D121770	Cowie, I.D.	5251	9	3.5	1	1		3	12.40	3.50	3.80	4.00	18.00	2.00	4.00	19.80	23.00	2.00	4.40	1.60
D144194	Brennan, K.G.	1829	13	5	1	3	6	4	16.20	2.60	6.90	2.50	23.00	2.00	4.00	60.00	80.00	4.00	5.30	1.90

Appendices

D127301	Cowie, I.D.	6715	11	5	1	3	0	4	22.60	5.60	4.10	4.00	31.00	1.50	7.00	75.00	120.00	6.00	5.40	2.30
D158684	Cowie, I.D.	9102	8	4	1	3	6	3	14.80	4.40	3.40	4.00	22.00	2.00	5.00	10.00	10.00	2.00	3.70	1.30
D24938	Dunlop, C.R.	3025	13	6	1	3	0	4	20.40	4.80	5.90	3.00	28.00	2.50	6.50	37.00	50.00	2.00	3.60	1.50
D160925	Brennan, K.G.	4469	13	6.5	1	3	0	4	16.50	6.40	2.70	2.50	22.00	1.50	7.50	38.40	50.00	2.00	3.90	1.20
D3417	Byrnes, N.B.	2091	6.5	4		2	0	3	12.90	5.70	2.30	2.00	20.00	2.00	7.00	27.00	53.00	2.00	3.80	1.50
D121885	Cowie, I.D.	5300	10	3	1	2	0	4	17.00	5.80	3.30	2.50	24.00	1.50	7.00	7.80	12.00	2.00	2.00	1.70
D139446	Michell, C.R.	2102	8.5	5	1	2	0	4	18.80	6.30	3.10	5.00	31.00	2.50	7.00	39.00	40.00	3.00	4.70	1.60
D149503	Russell-Smith, J.	9519	13	8	1	3	10	4	23.00	7.10	3.40	3.00	34.00	2.50	8.00	4.00	4.00	2.00	4.60	1.20
D162286	Kerrigan, R.A.	753	11	5	1	3	0	3	24.40	4.70	5.20	4.00	35.00	2.00	4.00	46.80	80.00	2.00	3.20	1.20
D160643	Harwood, R.K.	1319	13	4	1	3	7	4	17.60	5.10	3.50	6.00	20.00	4.00	6.50	23.50	42.00	1.50	4.40	1.50
D169132	Kerrigan, R.A.	914	6	4	1	3	4	4	16.80	3.30	5.60	5.00	29.00	2.50	4.00	18.00	23.00	1.50	4.40	1.30
D161913	Liddle, D.T.	1825	10	5	1	2	0	4	21.80	6.30	4.20	6.00	30.00	3.00	8.00	34.60	58.00	2.50	4.10	1.30
D67322	Egan, J.L.	1820	10	4	1	2	0	4	16.80	4.60	4.00	3.00	19.00	1.50	6.00	22.60	40.00	2.00	4.60	1.60
D2992	Robinson, C.S.	1067	10	4		2	0	4	21.00	5.00	4.50	2.00	28.00	2.00	6.00	40.60	63.00	1.00	5.20	1.60
D121886	Cowie, I.D.	5283	7	4	1	2	0	3	16.00	4.80	3.20	2.00	28.00	1.00	6.00	34.00	68.00	2.50	3.20	1.20
D68784	Egan, J.L.	263	9	4	1	1	7	4	17.00	2.50	9.20	4.00	26.00	1.50	4.00	11.00	11.00	2.00	5.00	1.60
D151540	Michell, C.R.	3606	13	3.5	1	3	0	4	17.10	2.30	8.20	4.00	30.00	1.50	3.00	20.70	33.00	2.00	3.60	1.30
D169142	Kerrigan, R.A.	923	10	3.5	1	2	10	4	19.00	3.70	5.20	5.00	27.00	2.00	3.00	30.70	55.00	2.00	4.40	1.10
D57824	Evans, M.	3559	10	4	1	1	7	3	21.40	2.80	7.70	4.00	23.00	2.50	3.00	47.00	56.00	4.00	6.25	2.30
D0071515	Dunlop, C.R.	9464	13	3	1	1.00	15	4	41.60	3.80	10.90	8.00	60.00	2.50	4.50	182.00	260.00	5.00	7.40	5.80

OTU			19	20	21	22	23	24	25	26
D165019	Risler, J.A.	2392	3.00	2.90	3.20	2.20	1.20	1.90	0.40	1.10
D144193	Brennan, K.G.	1868	4.20	3.75	3.25	3.25	1.68	1.94	0.50	0.68
D169817	Brennan, K.G.	4631	4.60	3.50	3.20	2.60	1.40	1.86	0.40	0.50
D157522	Harwood, R.K.	1270	3.60	3.65	3.53	3.08	1.52	2.03	0.57	0.87
D43074	Dunlop, C.R.	7663	3.00	3.00	3.25	2.43	1.38	1.77	0.33	0.90
D144192	Brennan, K.G.	847	4.30	3.68	3.03	3.00	1.67	1.80	0.48	0.57
D66882	Cowie, I.D.	2463	4.40	4.00	3.50	3.00	1.30	2.31	0.50	1.25
D63279	Leach, G.J.	2912	4.60	3.28	3.20	2.72	1.33	2.04	0.42	0.47
D76813	Egan, J.L.	2922	3.20	4.50	4.45	2.90	1.60	1.81	0.40	1.50
D149374	Cowie, I.D.	9490	4.10	3.75	2.88	2.90	1.20	2.42	0.40	0.80
D151542	Michell, C.R.	3608	3.50	3.68	3.42	3.00	1.47	2.05	0.47	0.50
D161332	Short, P.S.	5146	4.40	3.07	3.10	2.53	1.28	2.00	0.48	0.50

D76905	Leach, G.J.	3619	3.30	5.00	3.75	3.50	1.50	2.33	0.50	1.25
D26076	Taylor, J.A.	252	2.50	3.13	3.28	2.50	1.35	1.86	0.38	1.00
D134157	Michell, C.R.	533	2.70	3.58	3.19	3.01	1.42	2.13	0.37	1.58
L9110	Craven, L.A.	2306	3.80	3.38	3.28	2.83	1.28	2.22	0.45	0.60
L9109	Rice, B.L.	3342	2.90	3.90	3.65	3.00	1.70	1.76	0.50	0.75
D168931	Kerrigan, R.A	861	3.22	3.38	4.15	2.88	1.80	1.61	0.40	1.38
L9316	Dunlop, C.R.	7663	2.90	2.80	3.17	2.65	1.47	1.81	0.35	1.13
D76405	Egan, J.L.	3117	3.30	3.25	3.25	2.80	1.40	2.00	0.50	1.50
A589518	Cowie, I.D.	6715	2.20	4.50	3.50	3.20	1.60	2.00	0.40	1.00
D161331	Short, P.S.	5145	2.80	3.33	3.58					
D76073	Van Kerckhof, D.C.	7	1.70	3.63	3.00	2.94	1.41	2.13	0.55	0.69
D126391	Taylor, S.M. & Egan, J.L.	252	2.90	3.40	3.99	2.69	1.72	1.57	0.34	1.05
D140618	Cowie, I.D.	8892	2.97	3.48	3.45	3.05	1.55	1.98	0.30	1.40
D149037	Brennan, K.G.	4813	2.50	2.75	3.26	2.37	1.53	1.54	0.37	1.22
D126701	Cowie, I.D. & Booth, R.	6125	2.18	3.63	3.50	3.07	1.62	1.90	0.47	1.78
D26914	Dunlop, C.R.	6794	2.80	2.89	2.90	2.50	1.33	1.88	0.32	1.23
D166107	Egan, J.L.	3045	3.20	3.30	3.39	2.70	1.30	2.08	0.46	1.43
D121770	Cowie, I.D. & Taylor, S.M.	5251	2.80	3.20	3.10	2.50	1.50	1.67	0.30	1.25
D144194	Brennan, K.G.	1829	2.70	3.45	3.19	3.00	1.50	2.00	0.45	1.33
D127301	Cowie, I.D.	6715	2.40	4.50	3.31	3.55	1.60	2.23	0.45	0.93
D158684	Cowie, I.D. & Mangion, C.P.	9102	2.90	3.00	3.05	2.50	1.20	2.08	0.40	1.40
D24938	Dunlop, C.R.	3025	2.40	2.75	2.60	2.40	1.00	2.40	0.35	1.25
D160925	Brennan, K.G.	4469	3.40	3.29	3.06	2.87	1.37	2.11	0.39	1.35
D3417	Byrnes, N.B.	2091	2.60	3.14	3.00	2.70	1.33	2.03	0.34	1.08
D121885	Cowie, I.D.	5300	2.00	2.82	2.97	2.41	1.28	1.88	0.29	1.27
D139446	Michell, C.R	2102	2.90	3.55	3.00	2.83	1.03	2.76	0.40	1.43
D149503	Russell-Smith, J.	9519	3.80	3.20	3.15	2.70	1.50	1.80	0.40	1.70
D162286	Kerrigan, R.A	753	2.70	3.18	2.93	2.73	1.32	2.14	0.33	1.17
D160643	Harwood, R.K.	1319	3.10	3.80	3.34	3.15	1.48	2.13	0.49	1.44
D169132	Kerrigan, R.A.	914	3.40	3.92	3.50	3.37	1.65	2.04	0.35	1.57
D161913	Liddle, D.T.	1825	3.10	2.97	2.95	2.47	1.22	2.03	0.38	1.17
D67322	Egan, J.L.	1820	2.90	4.16	3.70	3.23	1.40	2.30	0.53	2.06
D2992	Robinson, C.S.	1067	3.37	3.00	3.00	2.50	1.40	1.79	0.30	0.80

D121886	Cowie, I.D.	5283	2.60	2.96	2.79	2.47	1.30	1.92	0.27	0.99
D68784	Egan, J.L.	263	3.10	3.65	3.15	2.75	1.35	2.04	0.50	1.10
D151540	Michell, C.R.	3606	2.90	3.72	3.18	3.10	1.36	2.30	0.50	1.44
D169142	Kerrigan, R.A.	923	4.10	3.84	3.00	3.15	1.43	2.22	0.48	1.50
D57824	Evans, M.	3559	2.70	3.50	3.65	2.80	1.48	1.91	0.50	1.03
D0071515	Dunlop, C.R.	9464	2.60	5.25	4.00	3.43	1.47	2.36	0.57	1.38

APPENDIX THREE: Glossary of terms

Alae:	wing, referring to the enlarged paired sepals either side of the laterally compressed capsules or flowers.
Aril:	see notes below genus description regarding the use and definitions of aril and caruncle in <i>Polygala</i> literature. For the short term use them interchangeably to indicate a fleshy outgrowth on the seed.
Bract:	a leaf-like structure, different in form from the foliage leaves and without an axillary bud, associated with an inflorescence or flower.
Bracteole:	a small bract-like structure borne singly or in pairs on the pedicel or calyx of a flower.
Caruncle:	see aril
Ciliate:	fringed with a row of hairs
Decumbent:	spreading horizontally but then growing upwards.
Diadelphous:	having the stamens formed in two groups, the members of each group having connate filaments
Dimidiate:	one margin more or less straight and the other margin clearly convex.
Falcate:	sickle-shaped
Hirsute:	bearing coarse longish hairs
Hispidulous:	short stiff bristly hairs
Monadelphous:	having the stamens united by their filaments into a closed or open tube
Pilose:	with soft clearly separated but not sparse hairs
Pubescent:	covered with short soft erect hairs.
Puberulous:	covered with minute, soft erect hairs.
Scaberulous:	finely rough to touch
Tridelphous:	having the stamens formed in three groups, the members of each group having connate filaments
Villous:	long soft more or less erect hairs moderately dense.

APPENDIX FOUR: Summary of Chodat's 1893 and 1896 *Polygala* classification

	Chodat 1893 Subsections	Chodat 1896 Subsections	Chodat 1896 Subsections	Chodat 1896 Series
1	Capsule without wing; upper stigma sheathing; with pilose tip; often crested or sub nude, seed with two appendages or without appendages. Species nearly all America, few flourishing in Western Africa	<i>Apterocarpace</i>	Capsule not winged. Upper stigma sheath forming, at point hairy and tufted, seed with 2 tailed aril, rarely without an aril America and Africa	
2	Capsule half winged; oblong; upper stigma sheathing, nude or hairy; anthers not in tube ? sessile; seed with 2 appendages; alae shorter and narrower than capsule. Few species in parts of South America and North America.	<i>Hemipterocarpace</i>	Capsule half winged, capsule extends, upper stigma sheathing, naked or brushlike, seed with 2 arils, alae shorter and narrower than fruit. Americas	
3	Capsule margins membranous; elliptic or suborbicular, stigmas horse-shoe shaped; not pilose nor crested nor sheathing; anthers not in sessile staminal tube; arils obsolete amongst 2 membranous elongated appendages. Brasil	<i>Brasilenses</i>	Capsule broadly elliptic, style short, stigma thick, swan like (curved?), anthers not sessile, aril appendages long and paperlike, capsule not longer but broader than wings. Brasil and Paraguay	
4	Capsule margin membranous; suborbicular or ovate; alae wings short, upper stigma not crested occasionally hairy, anthers not sessile. Seed with 2 appendages. Species all S. American, mainly Chile, Patagonia, Argentina and Peru.	<i>Australis</i>	Capsule broadly elliptic or egg-shaped, style just or usually curved, anthers not sessile; usually filiform and small. Argentina Chile Peru	
5	Capsule winged, stigma horse-shoe shaped; anthers not in sessile staminal tube, aril obtuse, head shaped, fleshy, appendages not prolonged, seed placed vertically above one another (check diagram) W. Africa and few in Southern Europe	<i>Rupestres</i>	Capsule broader than wings, style upright, upper stigma reduced lower stigma horizontal blunt. Aril not extending down seed, separate, leaves linear. Spain and southern France	
6	Capsule winged; upper style mid way between curved and horizontally thickened, stigmas projecting, anthers sessile, aril 3 lobed, lobe equal to 1/3 seed. Few species, Southern Asia?	<i>Buxiformes</i>	Capsule broader than wings; style curved, upper stigma little developed, Aril extended, at least 6 anthers, sessile. Ceylon and New Guinea	
7	Capsule winged, style long and filiform, stigma unequal, upper style resembling mildly sheathing, apex tuberculate, lower one obsolete, anthers not sessile. Species Asia of Africa.	<i>Migratores</i>	Capsule narrower and shorter than wings; style bent; threadlike or narrowly band shaped, stigma develops little. Anthers not sessile. Africa, Asia,	<i>Tinctoriae</i> <i>Sphenopterae</i> <i>Persicariaefoliae</i> <i>Arenariae</i> <i>Eriopterae</i> <i>Asiaticae</i>
8	Capsule winged, style ascending; 2 stigmas laterally rounded; anthers in sessile staminal tube or 2 lower filaments only sub-free. Species eastern Asia.	<i>Fortificate</i>	Capsule broadly elliptical, broadly winged, style narrow band-shaped; stigma on side constantly, few developed, anthers usually sessile. Japan, Himalayas	
9	Capsule winged, style filiform or band shaped, apex circular or barbed (?). Anthers not sessile, upper petals obliquely rectangular. Species Asia.	<i>Leptaleae</i>	Style threadlike or band-shaped at the point hook forming or recurved, Anthers not sessile. Himalayas, North Australia	
10	Capsule winged, style band-shaped; stigma apex recurved or often unequally membranous; anthers not?? sessile; upper petals triangular. α. 2 upper sepals connate β. Sepals not connate Asia and Africa	<i>Deltoidae</i>	Style narrow band formed, flattened in cross section (ribbon formed), bent, Stigma variable. Anthers not sessile; upper petals broadly triangular, mostly bigger and more colourful than the sepal wings. <i>Chloropterae</i> Two upper sepals not enlarged. Inflorescence axillary, mostly very short, only in <i>P. elongata</i> elongated; Flowers inconspicuous, sepal wing mostly green, acute. About 20 species Africa, North Australia, Himalayas	<i>Tetrasepalae</i> <i>Chloropterae</i> <i>Chromopterae</i>
11	<i>Chloropterae</i> Capsule winged, style cleft, shorter upper end stigma emarginated and curled, longer lower stigma, fleshy and pendulous. South Africa	<i>Virgatae</i>	Style narrowly band-shaped, curved upper stigma spoon shaped or notched, lower stigma longer, hanging. South Africa	
12	Capsules winged, sepals free, upper sepals unequally emarginated, style recurved, caruncle small, seed vertical on top of each other.	<i>Formosae</i>	Style narrowly band-shaped; turned; stigma recurved, upper sepals asymmetrically notched. South Africa	
13	Capsule winged, stigma horse-shoe shaped, like in <i>P. Chamaebuxus</i> , anthers sessile, leaves large. Species Africa.	<i>Macropterae</i>	Style threadlike and band-shaped turned, upper stigma, not longer than lower. Anthers sessile, wing large. Madagascar	
14	XIV. Capsule with membranous margin; winged; upper stigma sheathing erect; acute; apex not hairy not crested, lower papillose, lip like, short, anthers exactly sessile, rarely subsessile, aril trilobed. Species mainly south Europe, N. Africa, and eastern	<i>Vulgares</i>	Style upright, upper stigma upright, lower short, upper calyx tongue forming narrowly. I. Europe and North Africa.	<i>Vulgares</i> <i>Papilionaceae</i>
15	Unusual species of Europe and Africa			