

History of the taxonomy of the New Zealand native grass flora

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Abstract The New Zealand native grass flora comprises 187 species; the formal recognition of these grasses as worthy of taxonomic rank began with D. Solander's descriptions written in 1769–1770 during Cook's first voyage. The research of D. Solander, J. D. Hooker, J. Buchanan, T. Kirk, D. Petrie, E. Hackel, V. D. Zotov, and others in the history of taxonomy of the grass flora is analysed. Such an analysis is possible since the recent publication of our unified "Flora of New Zealand Vol. V Gramineae" (2000). Hooker in the 19th century and Petrie and Hackel into the 20th century emerge as the early dominant forces; Zotov and ourselves have added a significant number of taxa in the late 20th century. In 1853 Hooker warned of the possibility of Colonial systematic botanists describing an unduly large number of endemic species. We demonstrate that we have followed Hooker's proscriptive concepts despite a large increase in the number of taxa described in the last 40 years.

Keywords New Zealand; grasses; flora; species; history of recognition of taxa

INTRODUCTION

The history of the recognition of endemic and indigenous grasses of New Zealand cannot be gauged from a quick inspection of Edgar & Connor "Flora of New Zealand Vol. V Gramineae" (2000). However, from that quick inspection it will nevertheless be obvious that Hooker's name, as Hook.f., is frequent in the authorities for taxa, so too that of Petrie a generation later.

In this paper we outline in an historical way the taxonomic development of the grass flora and discuss periods of rapid recognition of taxa, analyse the contributions made by the pioneers J. D. Hooker, J. Buchanan, T. Kirk, E. Hackel, and D. Petrie, and assess their influence on the structure and composition of the New Zealand grass flora as interpreted by Edgar & Connor (2000).

THE GRASS FLORA

The native grass flora of New Zealand comprises 157 endemic and a further 30 indigenous species (Edgar & Connor 2000). Their recognition depended on the taxonomic judgements of botanists from Solander's first descriptions (D. Solander, unpublished MS 1769–1770) to those of modern times. We attempt here to show in a temporal way who first discerned the taxa we accepted at specific level in "Flora of New Zealand Vol. V Gramineae". In Table 1, arranged in tribes as in the "Flora", we present the genera and their endemic and indigenous species listed under (i) the species names used in Edgar & Connor; and (ii) the author who first formally discerned the taxon, in that genus or another genus, at that rank or another rank, either legitimately or illegitimately.

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Table 1 Genera and species of New Zealand grasses, endemic and indigenous, accepted by Edgar & Connor. Year of publication in brackets. †nom. nov.; ≡ homotypic synonym; = heterotypic synonym.

Tribes and genera	Endemic: Indigenous	Solander MS	Hooker f.	Buchanan	Kirk
Ehrharteae					
<i>Microlaena</i>	2:2	<i>avenacea</i> Raoul (1844) as <i>Diplax</i>	polynoda (1853)		
		<i>ensata</i> MS306			
<i>Zotovia</i>	3:0		colensoi (1853)		
Stipeae					
<i>Achnatherum</i>	1:0			petriei (1880)	
<i>Anemanthele</i>	1:0				
<i>Austrostipa</i>	0:1	<i>stipoides</i> Hook. f. (1853) as <i>Avena</i> <i>angustifolia</i> MS415			
Poeae					
<i>Austrofestuca</i>	0:1	<i>littoralis</i> Labill (1805) as <i>Festuca juncea</i> MS414			
<i>Festuca</i>	9:1				
<i>Poa</i>	37:1	anceps G. Forst. (1786) as <i>Poa</i> <i>anceps</i> MS413 imbecilla Spreng. (1807) as <i>P. imbecilla</i> MS412 cita Edgar (1986)† as <i>P. caespitosa</i> MS413	breviglumis (1845) buchananii <i>Zotov</i> (1943)† ≡ <i>anceps</i> var. <i>ε alpina</i> (1864) colensoi (1864) <i>cookii</i> (1846) foliosa (1845) incrassata Petrie (1902)† = <i>exigua</i> (1864) lindsayi (1864)	acicularifolia (1880) kirkii (1880) pygmaea (1880)	

(2000), arranged under the names of the authors who first discerned them. Endemics, bold; indigenous, italics.

Petrie and Petrie et al.	Hackel	Zotov	Edgar and Edgar et al.	Connor and Connor et al.	Others
					carsei Cheeseman (1915) <i>stipoides</i> Labill. (1805)
thomsonii (1880)			acicularis (1998)		lessoniana (Steud.) Veldk. 1985 [†] ≡ <i>Agrostis procera</i> A.Rich (1832)
coxii (1902) multinodis (1912)	matthewsii (1903) novae-zelandiae (1903)			deflexa (1998) luciarum (1998) madida (1998) ultramafica (1998)	actae Connor (1998) [†] ≡ <i>ovina</i> var. <i>grandiflora</i> Howarth (1928) <i>contracta</i> Kirk (1895) [†] = <i>F. erecta</i> d'Urv. (1825)
antipoda (1909) astonii (1906) aucklandica (1909) chathamica (1902) cockayneana (1913) dipsacea (1894) maniototo (1890) matthewsii (1902) tennantiana (1909)	subvestita (1903)		celsa (1986) hesperia (1986) intrusa (1986) maia (1986) schistacea (1999) senex (1986) spania (1999) sublimis (1986) sudicola (1986) tonsa (1986)	pusilla Bergg. (1878)	

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Table 1 *Continued*

Tribes and genera	Endemic: Indigenous	Solander MS	Hooker f.	Buchanan	Kirk
			litorosa Cheeseman (1906) [†] ≡ <i>Festuca scoparia</i> (1845) novae-zelandiae Hack. (1903) = <i>foliosa</i> var. β (1864) ramosissima (1845)		
<i>Puccinellia</i>	3:1		<i>stricta</i> (1853)		walkeri (1885)
Agrostideae					
<i>Agrostis</i>	8:2		<i>magellanica</i> Lam. (1791 = <i>multiculmis</i> (1845) <i>muelleriana</i> Vickery (1941) ≡ <i>canina</i> var. β (1864) muscosa Kirk (1881) [†] = <i>parviflora</i> var. <i>perpusilla</i> (1853) subulata (1845)		
<i>Amphibromus</i>	0:1				<i>fluitans</i> (1884)
<i>Deschampsia</i>	4:1		chapmanii Petrie (1891) [†] = <i>Catabrosa</i> <i>antarctica</i> (1845)		gracillima (1891)
<i>Deyeuxia</i>	4:1	avenoides Hook.f. (1864) as <i>Agrostis</i> <i>gracilentata</i> MS410	aucklandica (1845) youngii (1864)		
<i>Dichelachne</i>	1:3	<i>crinita</i> L.f. (1782) as <i>Agrostis barbata</i> MS410			
<i>Echinopogon</i>	0:1	<i>ovatus</i> G.Forst. (1786) as <i>Dactylis barbata</i> MS413			
<i>Hierochloa</i>	6:1	<i>redolens</i> Vahl (1791) as <i>Holcus dioneus</i> MS574	brunonis (1845)		

Petrie and Petrie et al.	Hackel	Zotov	Edgar and Edgar et al.	Connor and Connor et al.	Others
			xenica (1999)		
			raroflorens (1996)		macquariensis Cheeseman (1919)
dyeri (1890) imbecilla Zotov (1943) [†] ≡ <i>tenella</i> (1890)	palescens Cheeseman (1921) [†] ≡ <i>muelleri</i> var. <i>paludosa</i> (1906) personata Edgar (1991) [†] ≡ <i>dyeri</i> var. <i>delicatior</i> (1906) petriei (1903)		oresbia (1991)		
pusilla (1891) tenella (1891)					<i>cespitosa</i> (L.) P.Beauv. (1812) = <i>Aira australis</i> Raoul (1846) <i>quadriseta</i> Labill. (1805)
			lacustris (1999)		
	<i>inaequiglumis</i> (1906)		lautumia (1999)		<i>micrantha</i> Cav. (1799)
	recurvata (1906)	cuprea (1973) equiseta (1973) fusca (1973)			novae-zelandiae Gand. (1919)

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Table 1 *Continued*

Tribes and genera	Endemic: Indigenous	Solander MS	Hooker f.	Buchanan	Kirk
<i>Koeleria</i>	3:0				
<i>Lachnagrostis</i>	10:2	<i>billardierei</i> R.Br. (1810) as <i>Agrostis diffusa</i> MS412 <i>filiformis</i> G.Forst. (1786) as <i>A. variabilis</i> var. α <i>procera</i> MS411	leptostachys (1845) lyallii (1853)		
<i>Trisetum</i>	7:2	<i>arduanum</i> Edgar et Druce (1998) as <i>Avena flavescens</i> MS415	youngii (1864)		
<i>Simplicia</i>	2:0			buchananii Zotov (1971) [†] ≡ <i>Poa uniflora</i> (1880)	laxa (1897)
Hordeae					
<i>Australopyrum</i>	1:0				
<i>Elymus</i>	6:1	<i>multiflorus</i> Hook.f. (1853) as <i>Triticum multiflorum</i> MS420 solandri Steud. (1854) as <i>T. squarrosus</i> MS419		tenuis (1880)	
<i>Stenostachys</i>	3:0	gracilis Hook.f. (1853) as <i>T. languidum</i> MS419			
Danthonieae					
<i>Chionochoa</i>	22:0	flavicans Zotov (1963) as <i>Arundo flavicans</i> MS418	antarctica (1845) bromoides (1853) rubra Zotov (1963) = <i>antarctica</i> var. γ <i>minor</i> (1853)	australis (1872) ovata (1879)	crassiuscula (1885)
<i>Cortaderia</i>	5:0	fulvida Buchanan (1874) as			

Petrie and Petrie et al.	Hackel	Zotov	Edgar and Edgar et al.	Connor and Connor et al.	Others
glabra (1914)	cheesemanii (1903) littoralis (1906)		riguorum (1999) ammobia (1995) elata (1995) uda (1995)		novozelandica Domin (1907) pilosa Buchanan (1880) [†] ≡ <i>Agrostis pilosa</i> A.Rich. (1832) striata Colenso (1889) tenuis Cheeseman (1906)
tenellum (1912)	lasiorhachis (1906)		drucei (1998) lepidum (1998) serpentinum (1998)		antarcticum G.Forst. (1786) <i>spicatum</i> L. (1753)
enysii Kirk (1895) [†] ≡ <i>Asprella aristata</i> (1894)				calcis (1993) apricus (1982) falcis (1994) sacandros (1994)	
laevis (1895)				deceptorix (1994)	
juncea Zotov (1963) [†] = <i>raoulii</i> var. <i>teretifolia</i> (1923) oreophila (1895) ≡ <i>pallida</i> (1894) teretifolia (1914)	cheesemanii (1906)	acicularis (1963) beddiei (1963) flavescens (1963) macra (1970) pallens (1963) spiralis (1963)		defracta (1987) lanea (1987) vireta (1991)	conspicua G.Forst. (1786) rigida Raoul (1844)
				splendens (1971) turbaria (1987)	

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Table 1 *Continued*

Tribes and genera	Endemic: Indigenus	Solander MS	Hooker f.	Buchanan	Kirk
		Arundo lutescens MS417 richardii Endl. (1836) as A. conspicua MS417 toetoe Zotov (1963) as A. sericea MS416			
<i>Pyrrhanthera</i>	1:0				exigua (1882)
<i>Rytidosperma</i>	15:3	unarede Raoul (1844) Avena barbata MS416	buchananii (1864) [†] = semiannularis var. breviseta (1853) <i>gracile</i> (1853) nudum (1855) setifolium (1853)	clavatum Zotov (1963) [†] = pilosa var. stricta (1879) thomsonii (1879)	<i>pumilum</i> (1882)
Chlorideae <i>Zoysia</i>	2:0	pauciflora Mez (1921) as Nardus digyna MS409			
Leptureae <i>Lepturus</i>	0:1				
Paniceae <i>Cenchrus</i>	0:1				
<i>Oplismenus</i>	0:1	<i>hirtellus</i> subsp. <i>imbecillis</i> (R.Br.) U.Scholz 1981 as Panicum unguinatum var. glabrum MS410			
<i>Spinifex</i>	0:1	<i>sericeus</i> R.Br. (1810) as Ixalum inermis MS575			
Isachneae <i>Isachne</i>	0:1				
Andropogoneae <i>Imperata</i>	1:0				
	Total	24	31	10	7

Table 1 may be read in this way: the first entry is Ehrharteae, *Microlaena avenacea*, indigenous; Solander recognised it under the name *Diplax ensata* (MS306). It was formally described by E. F. L. Raoul as *Diplax avenacea* in 1844*, transferred to *Microlaena* by Hooker f. in 1864; but is entered in Table 1 under Solander's name because he was the first to discover it and to write its circumscription. Also in *Microlaena*, *M. polynoda*, endemic, was first recognised as distinct by J. D. Hooker in 1853 as *Diplax polynoda*; it is entered in Table 1 under Hooker's authorship.

Monotypic and endemic *Anemanthele*, Stipeae, erected by J. D. Veldkamp (1985), contains the taxon recognised by A. Richard in 1832 under the invalid names *Agrostis procera* and *A. rigida*; first recognition is thus attributed to Richard but the nomenclature to Veldkamp.

In *Festuca*, Poeae, E. Hackel (1903) described two subspecies of *F. ovina*, viz subsp. *matthewsii* and subsp. *novae-zelandiae*. Although both were later raised to specific rank by other authors, the taxa are in Table 1 under Hackel's authorship but at the rank we accept.

Full synonymy for all taxa is in Edgar & Connor (2000) where changes in rank and generic disposition are set out in detail.

This methodology demands some caveats. The first is that we are concerned with species as the chief outcome, and only those that are endemic or indigenous to New Zealand, not those naturalised here. The status of each species—endemic or indigenous—is set out in the grass "Flora". Endemic taxa have their natural range exclusive to the New Zealand Botanical Region; they are therefore native. Indigenous taxa have their natural range shared by the New Zealand Botanical Region and other Botanical Regions; they are native to New Zealand but not exclusively so.

The second is that Solander's MS is the exception to our rule of publication. He prepared descriptions of the grasses he considered to be worthy of specific or varietal rank. We re-emphasise, Solander discerned the taxa, but, although setting out to, he did not formally describe them as his work was never published and no nomenclatural status can be accorded them. Unpublished binomials on herbarium specimens and "tag names" are excluded in terms of International Code of Botanical Nomenclature (ICBN) Recommendation 23A. 3(i).

The third caveat is that some species were initially described from New Zealand specimens as New Zealand taxa, but are currently regarded as species indigenous to New Zealand and shared with Australia, or islands in the Pacific or Southern Oceans.

The fourth is that the rules of ICBN while being extraordinarily exact in most areas allow some leeway in others. In particular, we stress the freedom it allows for the use of *nomina nova et status novi* when varieties are promoted to species rank.

The third and fourth caveats are discussed below.

Indigenous species

Of the 30 indigenous species accepted for New Zealand by Edgar & Connor (2000), 9 were originally described from New Zealand plants and have holotypes, or lectotypes, originating here, and were thought by their authors to be endemic New Zealand taxa. This group is: *Amphibromus fluitans* Kirk, *Dichelachne crinita* (L.f.) Hook.f., *Echinopogon ovatus* (G.Forst.) P. Beauv., *Elymus multiflorus* (Hook.f.) Á.Löve et Connor, *Festuca contracta* Kirk, *Microlaena avenacea* (Raoul) Hook.f., *Rytidosperma australe* (Petrie) Connor et Edgar, *R. gracile* (Hook.f.) Connor et Edgar, *R. pumilum* (Kirk) Connor et Edgar. *Trisetum arduanum* Edgar et A.P.Druce is unusual in that it has only been admitted since 1998 in contrast to 18th and 19th century dates for most of the other indigenes.

*Dates are given here and elsewhere for historical balance. It is unnecessary to give references in full to these purely temporal matters; references are in Edgar & Connor (2000).

Nomina nova et status novi

We purposely exclude from this discussion two groups of names, viz comb. nov. and nom. nov., because neither is associated with the original discernment of grasses worthy of taxonomic recognition. The first deals with generic, specific, or infraspecific transfers, creates homotypic synonymy, and may or may not include a change in rank. The second usually concerns itself with corrective nomenclature such as the replacement of preoccupied names which precluded transfers as new combinations. An author's free choice not to effect a comb. nov. et stat. nov. but to elect an alternative nomenclatural route may give the appearance of the first recognition of a taxon. Thus, in the contemporary genus *Chionochloa*, Zotov (1963) chose to indicate *C. juncea* as sp. nov. even though it is more correctly a nom. nov. et stat. nov. deriving from Petrie's *Danthonia raoulii* var. *teretifolia* of 1923; Zotov designated a separate holotype in conformity with his opinion that he was describing a new species. Zotov's solution was to rename Petrie's taxon under the new rank and name *C. juncea* without changing the morphological entity. His *C. rubra* sp. nov. has a varietal name in Hooker's "Flora Novae-Zelandiae" which Zotov was not obliged to use in a new combination and new status. He chose a new holotype in effecting his decision.

Persisting still with *Chionochloa*, Zotov (1963) also described *C. flavicans* as sp. nov., indicating at the same time that Banks and Solander had collected it, and that the MS name in Solander was *Arundo flavicans*. Some nomenclaturists would have written *C. flavicans* Banks et Sol. ex Zotov, but Zotov, correctly following ICBN, was free to use *flavicans* as a new epithet; he indicated a holotype in his protologue. Hooker in "Flora Novae-Zelandiae" had given the name *Danthonia antarctica* var. *elata* to the same taxon. The history of the name *C. flavicans* is obscured by the simple entry *C. flavicans* Zotov.

It may, therefore, seem in the discussion below that some authors are disadvantaged when species of their authorship in accord with ICBN are allocated to other authors, because, for example, we attribute *C. flavicans* to Solander, and *C. juncea* to Petrie (Table 1) as the first to discern the taxa, and not to Zotov who provided the currently accepted correct nomenclature. The questions of generic placement, taxonomic rank, and nomenclature are for later discussion.

HISTORICAL PERIODS

It is convenient for us to divide the times of historical development of the New Zealand grass flora into three periods:

- (i) 1769–1880, the Colonial era, dominated by J. D. Hooker, his "Flora Antarctica" (1844, 1845), "Flora Novae-Zelandiae" (1853, 1855), and "Handbook of the New Zealand Flora" (1864, 1867), but begun by Solander's unpublished work, and culminated by J. Buchanan's "The Indigenous Grasses of New Zealand" published as an Imperial Quarto edition in 1880 and as a "Manual" in a Royal Octavo edition that same year;
- (ii) 1881–1925, the Dominion period, covering the time from Buchanan's book up to the second edition of T. F. Cheeseman's "Manual of the New Zealand Flora" in 1925;
- (iii) 1926–2000, the Modern period, representing the time from Cheeseman through H. H. Allan's "Introduction to the Grasses of New Zealand" (1936) and "Handbook of the Naturalised Flora of New Zealand" (1940), to the latest volume in the "Flora of New Zealand" series (Allan 1961; Moore & Edgar 1970; Healy & Edgar 1980; Webb et al. 1988; Edgar & Connor 2000).

The Colonial period 1769–1880

In this period Hooker's works were ascendant but the first interpretation of the New Zealand grasses was that of Solander.

Daniel Solander 1733–1782

On his first voyage of discovery (1768–1770) Lieut. James Cook RN was accompanied by Joseph Banks, and by Solander (also recorded as Daniel Carlsson Solander) one of the apostles of Carl Linnaeus. The history of their collections, the preparation of the manuscript “Primitiae Florae Novae-Zelandiae sive catalogus Plantarum in Eahai no Mauwe & T’avaai Poenamoo 8 Octobris–31 Martii 1769–1770”, and its failure to reach publication are all well established (see Barker & Barker 1990 for a recent account). Stearn (1984) concluded that the reasons for failure to publish “... are obscure” but the manuscript, copied by the amanuensis Sigismund Bacstrom from Solander’s slips (Diment & Wheeler 1984; Marshall 1984), was locally available as it and the collections were housed in London.

Solander drew up descriptions of 24 grasses; 12 of them we regard as indigenous species, and 12 as New Zealand endemics (Table 1). The descriptions were long and accurate and far exceeded the standards of the times; Hooker (1853) admired them. Eventually, formal recognition of all the taxa that Solander discerned was effected by several taxonomists among whom Joseph Hooker, Georg Forster, and Robert Brown are foremost.

Clearly, the very tall, 2–3 m toetoes attracted Banks and Solander; they collected three of the four species of *Cortaderia* found on the main islands, as well as the somewhat shorter, petrophilous, *Chionochloa flavicans*. Solander appropriately for the times included all four of them in *Arundo*.

Because he was the first botanist to see and write about those grasses his designations must be correct; there was no opposition.

Joseph Dalton Hooker 1817–1911

In “Flora Antarctica”, based on his collections during the voyage of southern discovery on *Erebus* and *Terror*, Hooker (1845) described 16 grass taxa as new from his own collections on the Campbell and Auckland islands, distributed among seven genera (Table 1). “Flora Novae-Zelandiae” (Hooker 1853, 1855), a further part of “The Botany of the Antarctic Voyage”, contains descriptions of 26 taxa as new among 12 genera; these taxa are based predominantly on material sent to him by Colenso. Later, Hooker described as new in his “Handbook of the New Zealand Flora” (1864) a further 15 grass taxa based on specimens from Colenso, Sinclair and Haast, Hector and Buchanan, together with those from Haast, Sinclair, and Lyall. By this time Hooker had described 58 grass taxa, 20 of them at varietal level, among the 17 genera he accepted.

Contemporary treatment of Hooker’s taxa is listed in Table 1 where 31 species in 12 genera are recognised as being first discerned by him. Five are indigenous species, the others are endemics. *Poa* remains his single major contribution but he was catholic in his taxonomic tastes.

Hooker made the greatest numerical contribution to the taxonomy of the New Zealand grasses directly through his own gatherings, but aided by the early resident collectors. Buchanan followed Hooker’s treatment in his books of 1880.

John Buchanan 1819–1898

Buchanan, author and illustrator of “The Indigenous Grasses of New Zealand” (1878, 1879, 1880a,b) described as new 19 grass taxa, 12 at species level, 6 as varieties, and surprisingly for the times, a subspecies in *Danthonia*. All Buchanan’s taxa were described in “The Indigenous Grasses”—four taxa in 1879 and 13 taxa in 1880—except *Arundo fulvida* (1874) and *Danthonia raoulii* subsp. *australis* (1872) in earlier years.

As judged by Edgar & Connor (2000), Buchanan discerned 10 species (Table 1). These are spread among five genera, but the most significant is his *Poa uniflora* because it described one member of the ditypic endemic genus *Simplicia* eventually erected by Kirk.

Although Buchanan’s recognition of 10 accepted species may seem a relatively small contribution to the taxonomy of New Zealand grasses in respect of his travels, and his alleged collections, “The Indigenous Grasses” deserves our praise especially because it illustrated 89 grasses, but also because it met the needs of the Colonial phase of New Zealand’s pastoral evolution.

Adams (1990) recorded that Augustus Hamilton, Director of the Colonial Museum, Wellington, from 1903 to 1913, “... found in a cupboard” at the museum, seven guard books of specimens prepared by Buchanan. One surviving, intact guard book is that of the grass specimens Buchanan had used in nature-printing plates for the fascicles of “The Indigenous Grasses”. Fortunately so; it contains holotypes or lectotypes for almost all of Buchanan’s taxa; these types, often lacking collecting data, as Adams noted, are mostly cited by taxonomists as in “Buchanan’s Folio”.

Other taxonomists

During this Colonial period six endemic species were discerned by four authors whose names are not presented as headings in Table 1, but are included under “Others”. Among them, G. Forster recognised *Trisetum antarcticum* and *Chionochoa conspicua*, E. F. L. Raoul had decided upon *C. rigida*, S. Berggren upon *Poa pusilla*, and A. Richard had erected taxa known now as *Anemanthele lessoniana* and *Lachnagrostis pilosa*.

A total of 50 endemic species had been discerned and described (though often at lesser rank) by 1880. Indigenous species were also recognised, and by the end of this period of taxonomic endeavour 25 of the 30 indigenous species of the New Zealand native grass flora had been identified largely, but not exclusively, through the efforts of R. Brown, G. Forster, J. D. Hooker, and J. J. H. de Labillardière (Table 2).

The Dominion period 1880–1925

For the grasses, this period is dominated by the taxonomic works of D. Petrie and E. Hackel, with a smaller contribution by T. Kirk. The taxa they described are included in the two editions of T. F. Cheeseman’s “Manual of the New Zealand Flora” (1906, 1925). Kirk and Petrie, both resident in New Zealand, were publishing simultaneously and independently in the 1890s, but Petrie, outliving Kirk, continued well on into the 20th century (Hamlin 1958).

Thomas Kirk 1828–1898

Kirk discerned five endemic and three indigenous species (Table 1), and provided the necessary nom. nov. for two endemes and the indigene *Festuca contracta*.

Table 2 Numbers of endemic and indigenous species first described (at any rank) during three historical periods of taxonomic research. Complete data in Table 1.

Species accepted by Edgar & Connor	Colonial period 1769–1880	Dominion period 1881–1925	Modern period 1926–2000	<i>n</i>
Endemic	50 (0.32)	53 (0.33)	54 (0.34)	157
Indigenous	25 (0.82)	4 (0.13)	1 (0.03)	30
Total	75	57	55	187

The special contribution made by Kirk was the recognition of *Simplicia* as a distinct endemic genus in 1897, and of *Triodia exigua* which later became the basis of the endemic monotypic *Pyrrhanthera* Zotov. Kirk (1895) immediately corrected Petrie's treatment of *Asprella aristata* (1894) by placing it in *Agropyron* as *A. ensyisii* nom. nov.; Petrie himself had expressed uncertainty about its generic placement. Yet the specimens Kirk cited were a mixture of *A. ensyisii* and *Australopyrum calcis* subsp. *optatum* (Connor 1994).

In one of the few disputatious exchanges in New Zealand grass taxonomy, both Kirk (1882a,b) and Petrie (1882) were convinced, but incorrectly, that *Stipa petriei* Buchanan of Otago was a naturalised Australian element. There, too, Kirk quite forcefully expressed his dissatisfaction with other of the interpretations in Buchanan's "Indigenous Grasses".

Donald Petrie 1846–1925

Petrie, who arrived in New Zealand in 1873, joined Buchanan (in New Zealand since 1852), and Kirk (here since 1863) in the wave of immigrant naturalists from the British Isles. Although untrained in botany, Petrie made the greatest individual local contribution to the taxonomy of the endemic grasses of New Zealand, and just equalled Hooker in terms of the number of endemic taxa we accepted at species level in "Flora of New Zealand Vol. V Gramineae" (see Table 1).

The first grass that Petrie described was *Ehrharta thomsonii* which he, together with G. M. Thomson, had collected on Stewart Island in 1878 (Petrie 1880). Its publication was too late for inclusion in Buchanan's "Indigenous Grasses" although Buchanan managed a reference to it in his Addenda et Corrigenda. Petrie's work contributed to Cheeseman's first edition of his "Manual of the New Zealand Flora" (1906), and substantially to Cheeseman's second edition of 1925. By 1919 Petrie's effective contribution to grass taxonomy was over; the names of taxa he described in subsequent years now reside in synonymy.

Among taxa deemed by us to be of specific or subspecific rank, Petrie discerned 27, of which only *Rytidosperma australe* is an indigene. The greatest concentration lies in *Poa* (9 spp.), followed by *Chionochloa* (3 spp.) and *Rytidosperma* (3 spp.), but there are species of his discernment in *Agrostis*, *Deschampsia*, and *Festuca*. In all, Petrie described 47 taxa; *Poa poppelwellii* and *Danthonia oreophila* var. *elata* are treated today as natural hybrids, and 18 others have been reduced to synonymy.

Of Petrie's interest in taxonomic botany Leonard Cockayne wrote to Sir Wright Smith, Regius Keeper, Royal Botanic Garden, Edinburgh, that he used him as a surrogate nomenclator for "... all my new species, since I dislike describing plants and he loves it above all things" (Smith 1938). This does not hold true for the grasses. Two-thirds of the holotypes or lectotypes for Petrie's taxa are based on his own collections; other taxa are based mostly on specimens from the subantarctic islands and the Chathams—neither of which he visited—and on gatherings made by B. C. Aston. *Festuca coxii* and *Poa chathamica*, both leg. L. Cockayne and F. A. D. Cox, and both Chatham Island endemics, are the only conformists to Cockayne's expressed habit.

Petrie encountered difficulty in deciding to which genera some of his collections belonged. His *Asprella aristata* (Petrie 1894) was corrected immediately to *Agropyron* by Kirk (1895). Petrie (1895) persisted with *Asprella* in *A. laevis*; this time there was no challenge from Kirk, nor was one required. Clearly this generic problem worried him because Hackel, in response to Petrie's enquiry, wrote to him in 1898 outlining the arrangement of spikelets in *Asprella* s.s. and *Agropyron* s.l. Nevertheless, the problem was incompletely resolved because Petrie (1902) described the Chatham Islands endemic *Festuca coxii* as a species of *Agropyron* defending its placement despite "... its branching rachis and pedicellate spikelets". Hackel corrected the classification in Cheeseman (1906).

Perhaps influenced by Stapf's assistance to Cheeseman in the question of *Microlaena carsei*, Petrie in 1920 sent a collection of grasses to Otto Stapf of the Royal Botanic Gardens, Kew, for his opinion and interpretation. The specimens were labelled x2 to Kew, x3 to Kew, et seq. There is no evidence of Stapf's responses; there is no comment on the duplicate specimens now in the Herbarium of the Museum of New Zealand Te Papa Tongarewa (WELT); Petrie's correspondence was destroyed when his house burned. However, specimens of Petrie's $x - xn$ are referred to by Howarth (1928) and Saint-Yves (1931) in their papers on *Festuca*.

Petrie, the most assiduous collector of grasses in the Dominion period, ranks with Hooker as the New Zealand grass taxonomist with the highest level of application and success (Table 1). Unlike Hooker, Buchanan, and Cheeseman, who mostly presented new taxa in their floras, Petrie described new grasses seriatim in papers in the *Transactions of the New Zealand Institute* (see Hamlin 1958 for list of papers). The only exception, and certainly his only regional work, was "The Gramina of the Subantarctic Islands of New Zealand" in Chilton's "Subantarctic Islands of New Zealand" (Petrie 1909). There he described three species of *Poa* as new, in an iteration of 29 species of grasses found on these islands.

Petrie's interests are evident in 11 genera, as broad an array as those of Hooker and Hackel.

Eduard Hackel 1850–1926

To Hackel of St Pölten, Austria, an agrostographer of European renown, is attributed the initial recognition of 13 taxa accepted by Edgar & Connor (2000) at species level (Table 1), but this greatly underestimates the service Hackel gave to New Zealand agrostology.

In 1901 Cheeseman sent 517 selected grass specimens to Hackel for his examination and opinion. As Edgar & Connor (1987) remarked, Hackel was quick and efficient in his replies. He provided Cheeseman with identifications and opinions on a wide range of genera, and wrote brief descriptions of infraspecific taxa, some in Latin and some in English, which he made available for Cheeseman's use as Cheeseman thought appropriate. Hackel (1903), in a paper introduced by Cheeseman, described seven new species, three of them in *Poa*, and two new subspecies of *Festuca ovina*. Cheeseman (1906) took advantage of Hackel's offer, and from Hackel's letters and notes Cheeseman accepted and published a further 19 of Hackel's names all at infraspecific level. Four Hackel names are in eponymy for Cheeseman. Edgar & Connor (1987) made a nomenclatural commentary on Hackel's contribution to the first edition of Cheeseman's "Manual of the New Zealand Flora".

In Hackel, whose incursion into New Zealand grass taxonomy was brief, Cheeseman had found a willing and co-operative colleague. Hackel never carried out a generic revision of any New Zealand grasses, but his breadth of experience resulted in the initial discernment of 13 species that Edgar & Connor accepted, 12 of them interpreted as endemics and currently dispersed among 9 genera. Cheeseman, clearly wanting help for the first edition of the "Manual of the New Zealand Flora", was generously assisted because Hackel, in addition to the novel taxa he generated, made new determinations for more than 100 specimens, and confirmed determinations for the 70% balance of the suite. Of the 517 specimens sent to Hackel, about 200 were Cheeseman's own and 200 were Petrie's. Hackel (in litt. 30 July 1902) asked Cheeseman to express "... my best thanks to M. Petrie for his ample contributions to the collection", a sentiment he repeated (in litt. 22 December 1902), and in the same letter included Cockayne in the appreciation. Petrie and Hackel jointly described *Festuca multinodis* citing specimens from B. C. Aston in the protologue (Petrie 1912).

At the generic level Hackel redirected Petrie's *Agropyron coxii* to *Festuca*, supported in litt. Kirk's *Simplicia* although he thought it imperfectly diagnosed, and agreed with Kirk's view that Petrie's *Asprella aristata* should be placed in *Agropyron*.

Other taxonomists

Beyond the efforts of Kirk, Hackel, and Petrie, few other grass taxa were discerned and described between 1881 and 1925. William Colenso, despite his long list of newly described species, rarely concerned himself with grasses; he usually sent his grass specimens to Hooker at Kew. Nevertheless, Colenso detected, and described, *Lachnagrostis striata* (Table 1). Endemic *Zoysia minima* took its origin in Colenso's *Gaimardia minima* (Centrolepidaceae); that he had actually described a grass went unnoticed until Allan (1935) reported it and Zotov (1943) effected a comb. nov. All else of Colenso's names for grasses are immured in synonymy.

T. F. Cheeseman discerned three species (Table 1), *Microlaena carsei* assisted by Stapf, *Puccinellia macquariensis* an extraterritorial endemic, and the basionym for *Lachnagrostis tenuis*. Mez (1921) defined *Zoysia pauciflora*, but Cheeseman was unaware of it for his 1925 edition of the "Manual"; Solander had noted it long since (Table 1).

In this period of 75 years duration 53 species were discerned and described although sometimes at lower rank.

The Modern period 1926–2000

Three New Zealand agrostographers have discerned 54 species as new endemics since Cheeseman's second edition of his "Manual" (1925). These lie, as in Table 1, among 17 genera with larger numbers in *Poa* (11 spp.), *Chionochloa* (9 spp.), *Rytidosperma* (7 spp.), *Festuca* (4 spp.), *Elymus* (3 spp.), *Lachnagrostis* (3 spp.), and *Trisetum* (3 spp.). One species, *Trisetum arduanum* Edgar et A.P.Druce, was first gathered here by Banks and Solander and given the MS name *Avena flavescens* (Table 1); it is also on Norfolk Island and thus is classified as indigenous (Edgar 1998). *Lepturus repens* var. *cinereus* of the Kermadec Islands, also regarded as indigenous, is elsewhere on islands in the Pacific.

This period is remarked by the erection of new genera and the revival of some from synonymy. Zotov (1963) introduced four new generic names for New Zealand danthonioids: *Chionochloa* for the tall tussocks until then included in *Danthonia*; *Notodanthonia* (= *Rytidosperma* Steud.) for the smaller danthonias; *Erythranthera* for two other austral small danthonioids; and *Pyrhanthera* a monotypic, endemic, small rhizomatous grass that Kirk had described in 1882 as *Triodia exigua*. In 1963 he restored *Cortaderia* Stapf for endemic toetoes, and later *Lachnagrostis* Trin. for species often included in *Deyeuxia* (Zotov 1965); in 1943 he transferred species to his invalid genus *Petriella* and his superfluous genus *Cockaynea* (Zotov 1943). Zotov erected more genera than any other New Zealand agrostographer.

Another endemic genus newly construed is *Zotovia* Edgar et Connor, Ehrharteae (1998), to encompass species once in *Microlaena* or *Ehrharta* or in the illegitimate genus *Petriella* Zotov. Veldkamp (1985) generated *Anemanthele*, Stipeae, for *A. lessoniana* whose nomenclatural history is a saga of placement in *Agrostis*, *Oryzopsis*, *Dichelachne*, *Apera*, and *Stipa*. Other influences gave rise to pooid *Austrofestuca* (Tzvelev) Alexeev (1976) for *A. littoralis* whose generic placement had variously been *Festuca*, *Schedonorus*, *Triodia*, *Arundo*, and *Poa*; and to *Austrostipa* S.W.L.Jacobs et J.Everett (1996), Stipeae; and to *Australopyrum* (Tzvelev) Á.Löve (1984), Hordeae. We did not accept *Austrodanthonia* H.P.Linder (1997), Danthoneiae, for segregates of *Rytidosperma*, nor the inclusion of *Microlaena* in *Ehrharta* s.l. as advocated by Willemse (1982). Because Schouten & Veldkamp (1985) were dissatisfied with Zotov's revision of *Hierochloe* (1973) they did not transfer any of the New Zealand endemics to *Anthoxanthum* as they would have preferred to do; a name in *Anthoxanthum*, *A. redolens*, is available for the sole indigenous species. We sustain *Hierochloe*.

By our criteria, V. D. Zotov (1906–1977) discerned 13 species (Table 1) viz *Hierochloa* (3 spp.), *Chionochloa* (6 spp.), *Rytidosperma* (4 spp. as *Notodanthonia*). Of the five genera he erected, *Chionochloa* and *Pyrghanthera* are in current use; his restorations of *Lachnagrostis* and *Cortaderia* are favoured.

It would be a novel event to pass judgement on the 40 species described as new by Edgar and Edgar et al., or by Connor and Connor et al., among 16 genera (Table 1). It should be noted that Edgar (1995) maintained *Deyeuxia* and *Lachnagrostis* against pressure from *Agrostis* and for *Calamagrostis*, and found in *Puccinellia* that "... problems with the genus have in no way abated" (Edgar 1996). Connor (1994) revived *Stenostachys* for species treated by Löve & Connor (1982) as *Elymus* but as *Cockaynea* by Zotov (1943).

There is a sameness to the interwar work of European taxonomists who described as new very few taxa that are given current support. Domin (1907) on *Koeleria*, Gandoger (1919) on *Echinopogon*, Howarth (1928) and Saint-Yves (1931) on *Festuca*, all generated names mostly reduced to synonymy.

Numerical data for taxa discerned and described in the three periods of taxonomic endeavour outlined above are in Table 2 which shows (i) that the numbers of described endemic taxa now treated as species is nearly identical in each period, (ii) that almost all of the indigenous species had been recognised by 1880, and (iii) that at the beginning of the 20th century preparatory phase of "Flora Vol. V", 70% of the grass flora had been discerned and the lineaments of the flora determined.

Cockayne & Allan (1934) in their annotated list of wild hybrids in New Zealand included 23 possible or probable interspecific hybrids among the grasses. Our list of natural hybrids is incongruent with theirs mostly because of difficulties of species alignment. We recognise natural interspecific hybrids among endemic species thus, *Poa* 11 combinations; *Chionochloa* 37 combinations; *Elymus* 2 combinations. *Poa* hybrids are sterile but those in *Chionochloa* are fertile; in *Elymus* interspecific hybrids between hexaploids are fertile but tetraploid \times hexaploids are not. *Elymus solandri* crosses with all species of *Stenostachys* but F_1 are sterile. Experimental support is documented for all except the *Poa* hybrids, and is available for endemic species unknown to cross in nature. The extensive literature for experimental crosses is included in Edgar & Connor (2000).

DISCUSSION

Hooker (1853) in his Introductory Essay to "Flora Novae-Zelandiae" (p. xxviii) observed "A paucity of Grasses, ..."; and his remarks on grasses in "Flora Tasmaniae" (Hooker 1860) were similar. He further commented that grasses were scantily represented in Australia as a whole for which he projected a total of 350 spp. As shown in Table 2 his observations were correct for New Zealand at the time of writing, but judged against the current estimates of Edgar & Connor (2000) for New Zealand and of Cope & Simon (1995) and Cope (2000) for Australia, Hooker grossly underestimated the size of the grass floras.

In the same Essay, Hooker (p. xxvi) cautioned "... that systematic botany is a far more difficult object than is generally supposed", and warned Colonial naturalists of the results of taking a "... contracted view of species, their variation and distribution". This latter is, of course, the problem that confronted the authors of "Flora of New Zealand Vol. V." Would we take a "contracted view" and thereby produce an increased level of endemism? One measure of our approach to the question might be through an assessment of the level of acceptance, at any taxonomic level, of taxa declared new by their authors and antedating Edgar & Connor and the preparatory work for the "Flora".

In the originating issue of the *New Zealand Journal of Botany*, Zotov (1963) presented the first major paper on grass taxonomy of this Modern period entitled "Synopsis of the grass subfamily Arundinoideae in New Zealand". This provides a suitable contemporary starting date against which to examine in some detail Hooker's expressed concern of the narrow view of variation and distribution. This 1963 date may seem in conflict with the period outlined in Table 2, 1926–2000, but is quite defensible because there have been only two revisions since 1926 dealing with endemic taxa: (i) Howarth (1928) on *Festuca*, of limited value, and (ii)

Table 3 Taxa of grasses described at particular ranks for New Zealand pre- and post-1963, relative to the numbers accepted by Edgar & Connor (2000).

	Species	Subspecies*	Varieties*	Form*
Proposed				
Pre-1963				
Endemic	129	4	57	6
Indigenous	34		8	
Post-1963				
Endemic	59	18	4	1
Indigenous	1	1		
Total	223	23	69	7
Accepted				
Endemic	157	23	1	1
Indigenous	30†	1	1	
Total	187	24	2	1

*Autonyms included in species. †In "Flora of New Zealand Vol. V Gramineae" p. xx, table 1, the number of indigenous species of Agrostideae is recorded as 15; the correct number is 14 in that tribe, and the number of naturalised species there is 36. The total number of naturalised species is thus 227.

Table 4 Taxonomic fate of species described for New Zealand pre-1963 ($n = 5$).

Author	Species described	Current rank						
		Endemic				Indigenous		
		Species	Sub-species*	Variety	Hybrid	In synonymy	Species	In synonymy
Forster	5	3					2	
Hooker f.	35	20	1			8	5	1
Steudel	8	2				4		2
Colenso	5	2				3		
Buchanan	12	8				4		
Kirk	13	7				1	3	2
Petrie	37	22	2		1	11	1	
Cheeseman	5	3	1			1		
Hackel	7	4	1			2		
Others	36	8				7	17	4
Total	163	79	5		1	41	28	9

*Autonyms included in species.

Allan & Jansen (1939) on the difficult genus *Puccinellia*, also without significant taxonomic effect.

Up to 1963 there were 129 spp., 4 subsp., 57 varieties, and 6 forms that had been described as endemic taxa in conformity with ICBN (Table 3). To these we could perhaps add a further 9 species which were originally described from New Zealand collections and have protologues with holotypes (or lectotypes) originating here, and thus might be seen as endemic, but are now included among the indigenous species for which there were 34 specific names available.

The taxonomic fate of 163 taxa described as species is shown in Table 4. The major contributors were Petrie, Hooker, Kirk, and Buchanan in that order, and the level of acceptance by Edgar & Connor is in the same order for Petrie and Hooker. Petrie’s specific names fall into synonymy more often than Hooker’s; perhaps Petrie was prone to the “contracted view”. Overall, and measured by reductions to synonymy, about one third of the specific names presented as endemic taxa are transferred into heterotypic synonymy.

We have not tabulated data on the taxonomic fate of four pre-1963 subspecies—two in *Festuca* and one each in *Chionochloa* and *Trisetum*. We supported their early elevation to specific rank.

From Table 5 it is evident that varietal names, especially those of Hooker, Hackel, and Petrie, have been rejected at that level and included in heterotypic synonymy, although a few were raised to species rank. Our actions are identical for taxa at both ranks, although, if anything, we treated the variety class more rigorously than species, and almost all of Hooker’s varieties were merged in the superior rank. Currently, two varieties are included in the native component of the flora (autonyms excepted) viz *Chionochloa rubra* var. *inermis* and *Lepturus repens* var. *cinereus*.

These analyses would tend to suggest that we have followed Hooker’s advice and taken an expanded view of many species by subsuming in them varieties so described. This apparent agreement with Hooker’s precautionary advice may appear to be offset by the description of 23 new endemic subspecies (autonyms excluded), and the reduction to that rank of some four older species. We interpret these taxonomic decisions in *Chionochloa* or *Poa* or *Festuca* as yielding species of broad amplitude divisible ecogeographically into units with morphological differentiation insufficient to warrant higher rank. We remain Hooker’s disciples and have adhered to his proscriptions.

Table 5 Taxonomic fate of varieties described for New Zealand pre-1963 (*n* = 5).

Author	Varieties described	Current rank						
		Endemic				Indigenous		
		Species	Sub-species*	Variety	Hybrid	In synonymy	Species	In synonymy
Hooker f.	20	1				17		2
Buchanan	6	1				5		
Petrie	10	2		1		7		
Hackel	21	5				10	1	5
Others	8	1				7		
Total	65	10		1		46	1	7

*Autonyms included in species.

Nevertheless, in post-1963 times we accept at species level 56 of the 59 described by Zotov, Edgar, Edgar et al., Connor, and Connor et al., a component just more than a third of all the species determined as endemic in our “Flora”. This estate may contradict our avowed Hookerian discipleship although the validity of our decisions is argued on each occasion. Acceptance by others, the test we applied to the taxonomists who are our predecessors, will be made on our taxonomic judgements. It would be vain to expect otherwise.

Despite these protestations on our part, another conclusion might be drawn embodying charges of unevenness in taxonomic approach. This unevenness may be described as the reduction to synonymy of 19th century and mid-20th century varieties, and the definition in the late 20th century of subspecies in some species of widespread distribution but not in others. Thus, *Chionochloa* with 33 specific and subspecific taxa (Connor 1991) and *Festuca matthewsii* with four subspecies (Connor 1998) compared with none in widespread *F. novae-zelandiae* or in *F. multinodis* might be seen as imbalance. The same might be said of some *Poa* spp. (Edgar 1986). Our only defence must be based on the morphological data assisted by ecological and geographic information that help determine the construction of a taxon.

CONCLUSIONS

New Zealand, despite ranging over 12 degrees of southern latitude, having both subtropical and subantarctic islands, and grasses growing to 2000 m above sea level, has a small endemic and indigenous grass flora of 187 species. Yet grasslands, whether old or relatively new, natural or induced or artificial, or mixed mosaics of grasses and scrub “... cover nearly 60% of New Zealand” (Wardle 1991). Only a few species are dominants in natural grasslands, and these are mostly species of *Chionochloa*, *Poa*, and *Festuca*, of which *Chionochloa* is an Australasian genus among cosmopolitan genera.

By the time Buchanan’s “Indigenous Grasses” was published in 1880, about a third of the endemic species had been recognised, primarily by Solander and Hooker. The indigenous element was known almost in its entirety. During the 45-year span between Buchanan’s book and the second edition of Cheeseman’s “Manual”, a further 52 species were discerned largely through the efforts of Petrie and Hackel. The lineaments of the grass flora were determined by then. The final period of our epoch, the 75 years since Cheeseman’s last account, has yielded 54 endemic species—another third of the total.

Taxonomic works on New Zealand grasses by European authors during the 20th century are not legion, Hackel excepted. The contributions by Domin (1907) on *Koeleria*, Gandoger (1919) in *Hierochloa* and *Echinopogon*, and Howarth (1928) and Saint-Yves (1931) on *Festuca*, are slight.

For Table 1 we had a quite explicit criterion: who first discerned an endemic or indigenous grass by publishing a name for it at any rank, legitimately or illegitimately; or in Solander’s case alone, discerned but unpublished under the binomials he had prepared. We list them in Table 1 under the specific names we accepted for the grass “Flora”. The emphasis there is on discernment; we credit at species level Solander with detecting 24, Hooker 31, Buchanan 10, Kirk 7, Petrie and Petrie et al. 26, Hackel 13, Zotov 13, other taxonomists 23, and ourselves with 40.

Translating these into the formal specific units of the grass “Flora” immediately has the effect of removing Solander’s name as an author, and a redistribution of the units he discerned. For corrective nomenclatural reasons some other changes were necessary, and the task of clearing up nomenclatural irregularities must not be confused with strict taxonomy. In modern terms, and very different from the main thrust of the discussion, Hooker’s name occurs in the authority for 27 species, Edgar’s for 26, Petrie in 25, Zotov in 21, Connor in 18, Hackel in 12, Buchanan in 10, Kirk in 10; these represent about 80% of the endemic and

indigenous species named in the “Flora”. The balance of authorities is spread widely but among those who were directly involved in studies of the New Zealand flora; Forster’s name is included in the authority for five species, and Cheeseman and Raoul for three species each.

The signal contributors to the taxonomy of endemic grasses are cl. auct. Hooker and Petrie, followed by our own late 20th century efforts. Buchanan, though the author and illustrator of the first book devoted entirely to New Zealand grasses, produced a modest taxonomic result. Hackel was incontrovertibly the greatest boon to Cheeseman for the grasses in the first edition of his “Manual” in 1906 and the largely unchanged second edition of 1925. Hackel’s generosity with his taxonomic judgements is unique to New Zealand agrostology, although our contemporary the late A. P. (Tony) Druce approached it. Nothing in Solander’s unpublished manuscripts was lost to New Zealand grass taxonomy because eventually every one of the species he outlined was accepted (Table 1), the last being *Trisetum arduanum* Edgar et A.P.Druce—230 years later. Zotov’s influence lies especially in the genera he erected or restored from synonymy. We proposed *Zotovia* gen. nov. in his honour (Edgar & Connor 1998).

The authors of “Flora of New Zealand Vol. V Gramineae” (2000) were dependent on the taxonomic endeavours of botanists during more than two centuries. Edgar & Connor’s conclusion was that to encompass adequately the grass flora they had to recognise a further 40 species, 18 subspecies, 1 variety, 1 form, and 1 new indigenous species, of their own formulation, to bring the total for the flora to 187 species, 24 subspecies, 1 variety, and 1 form. The mid to late 20th century collections of A. P. Druce, V. D. Zotov, M. J. A. Simpson, P. Wardle, B. P. J. Molloy, A. F. Mark, I. M. Ritchie, and H. D. Wilson, in particular, persuaded us of the reality of a grass flora of these proportions. Their names can often be found as collectors of holotypes in our protologues.

Despite our collective efforts in morphology and anatomy we have not enjoyed the benefits promised in Francis Thompson’s lines—

“One grass-blade in its veins
Wisdom’s whole flood contains:

but subsequent lines are the more easily met by endemic alpine species of *Poa*—

O little blade, now vaunt
Thee, and be arrogant!”

All Flesh (Francis Thompson, 1859–1907,
published posthumously in Meynell, 1913)

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