

Three grass species recently recognised as naturalised in New South Wales, Australia

Phillip G. Kodela

National Herbarium of New South Wales, The Royal Botanic Gardens & Domain Trust, Mrs Macquaries Road, Sydney, NSW 2000
AUSTRALIA

Abstract: Information is provided on three exotic species of Poaceae, *Alopecurus aequalis*, *Dichanthium aristatum* and *Sporobolus coromandelianus*, recently recognised as naturalised or at a stage of naturalising in the state of New South Wales, Australia. These species are superficially similar in appearance to related native species, hence the need for being aware of their possible presence and weed potential.

Cunninghamia (2015) 15: 143–151
doi 10.7751/cunninghamia.2015.15.007

Introduction

Information is provided on three species of Poaceae recently recorded or recognised (including cases where herbarium specimens have existed for some time) as naturalised or naturalising in New South Wales. This paper follows a format similar to that used by Hosking et al. (2011) for such species. These records were established while investigating specimen collections for the *Australia's Virtual Herbarium* (AVH), *Flora of Australia* and vegetation survey projects, leading to the preparation of treatments for *Alopecurus aequalis*, *Dichanthium aristatum* and *Sporobolus coromandelianus* for the *New South Wales Flora Online* (Kodela 2010, 2012a, 2012b).

This study is mainly based on investigations of herbarium specimen collections, assisted by assessing records in AVH (CHAH 2015). AVH (<http://avh.chah.org.au/>), the *Atlas of Living Australia* website (<http://www.ala.org.au/>) and *AusGrass2* (<http://ausgrass2.myspecies.info/>) provide further details on specimens, species and distributions in Australia.

Results

Alopecurus aequalis Sobol.

Orange Foxtail, Short-awned Foxtail, Short Awn Foxtail

Description: tufted perennial or sometimes annual grass to 0.6 m (or more) high, with erect to decumbent or spreading stems; often aquatic with partly submerged stems (Fig. 1). See Hubbard (1968), Walsh (1994), Holm et al. (1997), Doğan (1999), Sharp & Simon (2002), Jessop et al. (2006), Kodela et al. (2009), Kodela (2010) and Simon & Alfonso (2011).

Region of origin: mainly temperate Northern Hemisphere; Eurasia, northern Africa and North America.

New South Wales distribution/habitats: Southern Tablelands, South Western Plains, South Far Western Plains; occurs in the Kosciuszko area (where first collected on the Cooleman Plain in 1969) and probably extending west to the far south-western part of the state (see Kodela et al. 2009). Most specimen records of naturalised collections from western New South Wales (e.g. Yenda–Hay–Barham and



Fig. 1. *Alopecurus aequalis* specimen from Cooleman Plain, Kosciuszko National Park.

Wentworth regions) occur from 1945 onwards. Intriguingly, there are collections at the National Herbarium of Victoria from the late 19th century, viz. western interior of New South Wales, *C. Moore s.n.*, 1880, and Murrumbidgee [?River], *G.P. Day s.n.*, [probably from 1870s–1890s when Day was active], that would represent the earliest records. In Victoria, where *Alopecurus aequalis* appears to be more common, records go back to 1900. *Alopecurus aequalis* grows in wet places such as swampy areas, bogs, shallow pools, poorly drained areas (including ponded or depressed areas on plains in woodlands or shrublands), along streams, creeks and irrigation channels; to high altitudes (records to c. 1280 m in New South Wales).

Notes: this grass had previously been cited as occurring in New South Wales by Walsh (1994) but was only added to the *NSW Census of Plants* following its treatment in the *Flora of Australia* (Kodela et al. 2009). It should especially be checked against other species of *Alopecurus* in the Southern Tablelands to South Far Western Plains regions. *Alopecurus aequalis* is similar to, and has been confused with, the more common *Alopecurus geniculatus* (Marsh Foxtail, Knee-jointed Foxtail), but distinguished from it by having glumes about equal or slightly shorter than the lemma, lemma margins connate for at least of their length and the lemma awn usually 2 mm long or less, not conspicuously protruding beyond glumes and more or less straight.

Variation in specimens of *Alopecurus* 'aequalis' is described by Kodela et al. (2009) and Kodela (2010). Specimens from the Cooleman Plain have awns to 2 mm long attached just below the middle of the lemma at c. 2/5 of the lemma length from the base (similar to what occurs in *Alopecurus aequalis* specimens from overseas). Specimens from the Yanco-Berrigan-Hay-Barham area (South Western Plains) probably extending west to the Wentworth area (South Far Western Plains) also have inconspicuous lemma awns, however, in these specimens the straight to slightly recurved or outswept awns are often shorter (to 1.5 (–2) mm long), attached in the upper half of the lemma near the apex (to c. 0.5 mm or sometimes to 0.7 mm below the apex) and usually more conspicuously exceed the apex of the glumes (i.e. extend further), and the folded glumes are characteristically slightly sigmoid in shape (Fig. 2). This latter group of specimens includes the collections of Moore and Day from the late 19th century. It appears to be a distinct form or variant, but may represent another taxon; the specimens have not been able to be matched with any other species of *Alopecurus*. Alternatively, it may simply reflect variation in *Alopecurus aequalis* where the lemma awn can be inserted from c. midway to subapical. This variation also occurs in Victoria, where specimens with awns inserted higher on the lemma (as in most south-western New South Wales specimens) mainly come from the north-west of the State, *vide* N.G. Walsh (pers. comm.). There is also the possibility for hybrids between *Alopecurus aequalis* and *Alopecurus geniculatus* (= *Alopecurus xhaussknechtianus* Asch. & Graebn.). Further investigation, including confirmation of specimen identifications, is required to determine the extent of distribution of *Alopecurus aequalis* in New South Wales.

Weed issues: *Alopecurus aequalis* is spread mainly by seed. Overseas it is a weed of crops, particularly in rice fields where it is a floating weed seed species (the seeds being dispersed by irrigation waters) (Li & Qiang 2009), and cereals such as wheat, barley and oats (Holm et al. 1997). It is a serious winter annual weed in both lowland and upland crops in Japan, and a major rice weed in Nepal (to 1900 m altitude) and the Philippines, as well as infesting rice in China, Taiwan and Hungary, and vegetables and vineyards (Holm et al. 1997). As a competitive weed *Alopecurus aequalis* can reduce cereal yields. The presence of this grass in the Murrumbidgee–Murray irrigation area and Riverina could indicate a potential for further spread and weed issues. *Alopecurus aequalis* is also an environmental weed, having been recorded in damp or ponded areas in eucalypt



Fig. 2. Spikelets of *Alopecurus aequalis* showing glume shape a lemma awn position: (a) Cooleman Plain specimens with awn inserted on the lemma just below the midpoint; (b) western New South Wales specimens representing a possible 'variant' with awn on lemma inserted near apex and glumes more distinctly sigmoid.



NSW
LOAN:



0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved

NATIONAL HERBARIUM OF NEW SOUTH WALES (NSW)
Royal Botanic Gardens, Sydney

Dichanthium aristatum (Poir.) C.E.Hubb.

Det.: D. Moore 20 Jan 2011

POACEAE

Loc.: Ermington, junction of Spurway Street and Victoria Road.

AUSTRALIA NSW Central Coast

Lat: 33°48'S Long: 151°04'E Alt.:

Coll.: V. Klaphake s.n.

Date: 27 Jun 2010

Notes: Common on nature strip for 25 m on side of road. Plant with horizontal stems, then erect to ca 1 m tall. Specimen brought in for identification a smaller specimen. New Record for CC, third record for NSW.

Dups. to:

Assoc:



NSW883257



Fig. 3. *Dichanthium aristatum* specimen from Ermington, near Parramatta.



Fig. 4. *Dichanthium annulatum* specimen from near Kempsey.

woodlands and on saltbush plains in New South Wales (based on herbarium records) and mallee bioregions in Victoria (The State of Victoria Department of Sustainability and Environment 2009), as well as creeks in a boggy subalpine area in Kosciuszko National Park. It is able to infest shallow aquatic habitats. *Alopecurus aequalis* is non toxic.

Alopecurus species in Australia are normally considered exotics that have been introduced and become naturalised. However, early records and the possibility for wetland plants to be dispersed long distances by agents such as migratory waders warrants questioning the status of *Alopecurus* taxa or some populations of *Alopecurus* in Australia; many wetland species have widespread cosmopolitan or disjunct distributions.

***Dichanthium aristatum* (Poir.) C.E.Hubb.**

Angleton Grass

Description: tufted perennial, with stolons; prostrate to semi-erect, becoming erect to 1 (–1.8) m high at maturity (Fig. 3). See Gould (1975), Bisset & Sillar (1984), Skerman & Riveros (1989), Sharp & Simon (2002), Cook et al. (2005), Simon & Alfonso (2011), Kodela (2012a) and Pastures Australia (undated).

Region of origin: India to south eastern Asia.

New South Wales distribution/habitats: North Coast (records in far north-eastern part of the State) and Central Coast: uncommon, with isolated records from a rural area outside Tyalgum (near a house), a roadside near Kyogle where it was possibly planted (also possibly at nearby Rukenvale in a mown lawn), and common on a nature strip at Ermington (a Sydney suburb near Parramatta). The earliest records in New South Wales are from the Kyogle area collected in 1993, however with uncertain status regarding degree of naturalisation. In Queensland it grows in urban areas (e.g. footpaths, lawns), roadsides (often mown or slashed), grasslands, scrub, woodlands, riverbanks, grassy plains, floodplains, damp ground and coastal dunes; usually disturbed sites.

Notes: partly introduced in Australia as a fodder plant in pastures in tropical areas (more common and widespread in Queensland, largely due to natural spread/naturalisation; scattered records from Western Australia and the Northern Territory). The first record in Australia is from a plant cultivated in the Sydney Botanic Gardens in 1912, with the earliest naturalised occurrences recorded in Queensland where it was also grown in nurseries and introduced to paddocks (Bisset & Sillar 1984). Other possible sources of introduction, such as straw packing from India, are described by Bisset and Sillar (1984). Occurrences in New South Wales include roadsides, indicating *Dichanthium aristatum* may have been planted in these areas or has spread (or could spread) via roadways which are effective weed corridors. It is grown at Tamworth and has been used in pasture trials in northern New South Wales (John Hosking, pers. comm. 2012; also Lodge & Harden 2009, Lodge et al. 2010, McGufficke & McCormick 2010, Harris et al. 2014).

Differs from native species of *Dichanthium* occurring in New South Wales by having the base of its racemes bare without spikelets (natives have sessile or subsessile racemes bearing spikelets to the base). This can cause confusion when identifying specimens using some keys and floras, i.e. when *Bothriochloa* is separated from *Dichanthium* by having racemes bare at the base (however this occurs in both genera), or when *Dichanthium* is described as having an “inflorescence of sessile or subsessile racemes bearing spikelets to the base” (Jacobs et al. 2008: 206) when this is not the case in *Dichanthium aristatum* (which can be distinguished by its raceme bases and upper part of peduncles being silky-hairy). *Bothriochloa* can generally be separated by having pedicels with a longitudinal depression or groove either side (dumb-bell-shaped in cross-section) while in *Dichanthium* the pedicels are without a longitudinal depression (they are circular or elliptical in cross-section).

Dichanthium annulatum (Forssk.) Stapf (Sheda Grass), also apparently recently introduced in New South Wales (Perkins undated), has been recorded as spreading in a roadside strip of gravel along Plummers Lane, E of the Pacific Highway, c. 11 km NNE of Kempsey (North Coast; Fig. 4) and possibly along a roadside at Gravesend (North Western Slopes), also has bare raceme bases (i.e. spikelets not to base) but differs from *Dichanthium aristatum* by the raceme axis below the basal spike being glabrous (hairy in *Dichanthium aristatum*; illustrated in Anon. 2011) and having longer hairs on its glumes especially in upper parts. Previous confusion has occurred between the species (e.g. in White 1930), and differences are described by Bisset and Sillar (1984). While more common in Queensland, the status of *Dichanthium annulatum* in New South Wales regarding degree of adventive spread or naturalisation requires further investigation.

Weed issues: *Dichanthium aristatum* spreads by seed and expands slowly by stolons (Cook et al. 2005, Pastures Australia undated). It has the potential to invade degraded native pasture (e.g. competitive advantage in speargrass pastures), heavily grazed paddocks, old cultivation areas and roadsides (e.g. disturbed by grading) and other disturbed areas (Bisset & Sillar 1984, Pastures Australia undated). While seen as a potential useful plant it also is a possible weed as it will colonise natural woodlands and grasslands, particularly in cracking clay soils. *Dichanthium aristatum* is non toxic.

***Sporobolus coromandelianus* (Retz.) Kunth**

Small Dropseed, Madagascar Dropseed

Description: annual or ephemeral tufted grass to 30 cm high, culms erect or geniculately ascending (Fig. 5). See Cope (1982), Simon & Jacobs (1999), Sharp & Simon (2002), Simon (2005), Wu & Phillips (2006), Simon & Alfonso (2011), Kodela (2012b) and Pathak & Singh (2013).

Region of origin: Old World Tropics, including Africa and SW Asia.



NSW
LOAN:

Duplicate
← at BRI

NATIONAL HERBARIUM OF N.S.W.
Sporobolus coromandelianus (Retz.) Kunth
CONF. B.K. Simon, (BRI) Oct 2009
per email based on det. of duplicate specimen

NATIONAL HERBARIUM OF N.S.W.
Sporobolus coromandelianus (Retz.) Kunth
New record for N.S.W. (weed alert)
tentative
DET. P.G. Kodela 4 Jun 2009

NATIONAL HERBARIUM OF NEW SOUTH WALES (NSW)
Royal Botanic Gardens, Sydney

Sporobolus
seems better match for the native *S. scabridus*
Det.: S.W.L. Jacobs Jul 2009

POACEAE
Loc.: c. 150 m W of Holdfast Road and c. 115 m from W boundary of Dhinna Dhinawan Nature Reserve.
AUSTRALIA NSW North Western Plains
Lat: 28°45'44"S Long: 150°43'24"E Alt.: 231 m
Datum: GDA94
Coll.: J.S. Benson 2720 & S. Waller
Date: 14 Nov 2007
Notes: Outwash pan/scald. Intermittantly inundated wetland. Substrate-parent material: Sandstone. Soil: ironstone surface on clay. Swamp Paper-bark sodic scald wetland. Disturbed. Herb. NSW Vegetation Classification and Assessment project (NSW VCA), field trip 10, site 14; ID363.
Dups. to: BRI
Assoc:


NSW791009

Fig. 5. *Sporobolus coromandelianus* specimen from near Yetman.

New South Wales distribution/habitats: North Western Plains: Yetman area; first collected 2007 from near Dthinna Dthinnawan Nature Reserve from an outwash pan/scald of an intermittently inundated wetland. This is the only known record in New South Wales to date. Usually grows in disturbed sites, pasture areas, grassland, woodland, in clay to sandy soils; weed of gardens and roadsides; appears to be spreading (Simon 2005).

Notes: mostly isolated occurrences in subtropical and tropical Australia (Simon 2005) with most records in Australia from Queensland; first record for New South Wales resulted from a specimen collected during a regional vegetation survey in 2007. *Sporobolus coromandelianus* differs from the superficially close native *Sporobolus australasicus* Domin by the spikelets being arranged towards the apices of the panicle branches (Simon 2005, Simon & Alfonso 2011). Also similar to *Sporobolus caroli* Mez. which has all spikelets distinctly pedicellate.

Weed issues: *Sporobolus coromandelianus* is spread by seed (and vegetatively). Mainly a weed of disturbed areas, but noted by Simon (2005) that it appears to be spreading, and this includes occurrences in natural areas.

Discussion

All three species, *Alopecurus aequalis*, *Dichanthium aristatum* and *Sporobolus coromandelianus*, are recognised weeds (Randall 2002), and have the potential to spread in New South Wales. The above findings demonstrate the value and need of being alert for new records while undertaking vegetation surveys, herbarium curation and specimen-based research, especially in groups like grasses where introduced taxa can superficially look similar to native species. The findings also demonstrate the need to monitor for the possible escape, spread, and naturalisation of exotic species planted in pastures, parks, gardens and along roadsides.

Acknowledgements

Bryan Simon (formerly BRI) kindly confirmed identification of the *Sporobolus*, Val Stajic and Neville Walsh (both MEL) provided details and useful comments on the *Alopecurus*, and Andrew Perkins (formerly NSW) contributed to our knowledge of *Dichanthium* in New South Wales. MEL helpfully provided access to their herbarium collections. I am grateful for useful comments on the manuscript by Doug Benson and John Hosking. The figure of the *Alopecurus* specimen sheet is based on a digital photo by Harry Brian, and images of the spikelets were taken with the assistance of Andrew Orme. I wish to take this opportunity to acknowledge the significant scientific contributions of Bryan Simon who sadly passed away in 2014. He generously shared his knowledge, ever helpful in addressing my inquiries about grasses over the years.

References

- Anon. (2011) Sheda grass *Dichanthium annulatum*. *Weeds of Australia* fact sheet. http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Dichanthium_annulatum.htm
- Bisset, W.J. & Sillar, D.I. (1984) Angleton grass (*Dichanthium aristatum*) in Queensland. *Tropical Grasslands* 18(4): 161–174. http://www.tropicalgrasslands.asn.au/Tropical%20Grasslands%20Journal%20archive/PDFs/Vol_18_1984/Vol_18_04_84_pp161_174.pdf
- CHAH - The Council of Heads of Australasian Herbaria (2015) *Australia's Virtual Herbarium* (AVH). <http://avh.chah.org.au>
- Cook, B.G., Pengelly, B.C., Brown, S.D., Donnelly, J.L., Eagles, D.A., Franco, M.A., Hanson, J., Mullen, B.F., Partridge, I.J., Peters, M. & Schultze-Kraft, R. (2005) *Tropical Forages: an interactive selection tool*. CD-ROM (CSIRO, DPI&F (Qld), CIAT and ILRI, Brisbane, Australia). http://www.tropicalforages.info/key/Forages/Media/Html/Dichanthium_aristatum.htm
- Cope, T.A. (1982) *Sporobolus coromandelianus*. *Flora of Pakistan* 143: 142; 134, fig. 15 (5 & 6). http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=250070966
- Doğan, M. (1999) A concise taxonomic revision of the genus *Alopecurus* L. (Gramineae). *Turkish Journal of Botany* 23: 245–262. <http://dergipark.ulakbim.gov.tr/tbtkbotany/article/viewFile/5000019397/5000019637>
- Gould, F.W. (1975) *The grasses of Texas* (Texas A & M University Press, Texas).
- Harris, C.A., Boschma, S.P., Murphy, S.R. & McCormick, L.H. (2014) *Tropical perennial grasses for northern inland New South Wales* 2nd edn. (Future Farm Industries Cooperative Research Centre, Perth) www.futurefarmonline.com.au/LiteratureRetrieve.aspx?ID=173105
- Holm, L., Doll, J., Holm, E., Pancho, J. & Herberger, J. (1997) *World Weeds* (John Wiley & Sons, New York).
- Hosking, J.R., Conn, B.J., Lepschi, B.J. & Barker, C.H. (2011) Plant species first recognised as naturalised or naturalising for New South Wales in 2004 and 2005. *Cunninghamia* 12(1): 85–114. http://www.rbg Syd.nsw.gov.au/_data/assets/pdf_file/0020/116372/cun121hos085.pdf
- Hubbard, C.E. (1968) *Grasses*. 2nd edn (Penguin Books, Harmondsworth).
- Jacobs, S.W.L., Whalley, R.D.B. & Wheeler, D.J.B. (2008) *Grasses of New South Wales*. 4th edn (The University of New England, Armidale).
- Jessop, J., Dashorst, G.R.M. & James, F.M. (2006) *Grasses of South Australia* (Wakefield Press, Kent Town).
- Kodela, P.G., Weiller, C.M. & Thompson, I.R. (2009) *Alopecurus*. *Flora of Australia* 44A: 253–256.
- Kodela, P.G. (2010) *Alopecurus aequalis*. *New South Wales Flora Online*, in PlantNET – The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2.0). <http://plantnet.rbg Syd.nsw.gov.au> accessed February 2015.
- Kodela, P.G. (2012a) *Dichanthium aristatum*. *New South Wales Flora Online*, in PlantNET – The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2.0). <http://plantnet.rbg Syd.nsw.gov.au> accessed February 2015.
- Kodela, P.G. (2012b) *Sporobolus coromandelianus*. *New South Wales Flora Online*, in PlantNET – The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2.0). <http://plantnet.rbg Syd.nsw.gov.au> accessed February 2015.

- Li, R.H. & Qiang, S. (2009) Composition of floating weed seeds in lowland rice fields in China and the effects of irrigation frequency and previous crops. *Weed Research* 49(4): 417–427.
- Lodge, G.M., Brennan, M.A. & Harden, S. (2010) Field studies of the effects of pre-sowing weed control and time of sowing on tropical perennial grass establishment, North-West Slopes, New South Wales. *Crop and Pasture Science* 61(2): 182–191.
- Lodge, G.M. & Harden, S. (2009) Effects of depth and time of sowing and over-wintering on tropical perennial grass seedling emergence in northern New South Wales. *Crop and Pasture Science* 60(10): 954–962.
- McGufficke, B.R. & McCormick, L.H. (2010) Tropical perennial grasses for northern inland NSW. *PRIMFACT* 1051. State of New South Wales through Department of Industry and Investment. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/352807/tropical-perennial-grasses-for-northern-inland-nsw.pdf
- Pathak, S. & Singh, P. (2013) *Sporobolus coromandelianus* (Retzius) Kunth [Poaceae] - a new record for north-eastern India. *Pleione* 7(1): 282–285. http://www.ehsst.org/37%20Saumasree%20Sporobolus_Final.pdf
- Pastures Australia (undated) Angleton grass fact sheet. http://www.pasturepicker.com.au/Html/Angleton_grass.htm accessed August 2012.
- Perkins, A. (undated) *Dichanthium annulatum*. New South Wales Flora Online, in PlantNET – The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2.0). <http://plantnet.rbgsyd.nsw.gov.au> accessed February 2015.
- Randall, R.P. (2002) *A global compendium of weeds* (R.G. & F.J. Richardson, Melbourne).
- Sharp, D. & Simon, B.K. (2002) *AusGrass: Grasses of Australia*. CD-ROM. Version 1.0 (Australian Biological Resources Study, Canberra and Environmental Protection Agency, Queensland).
- Simon, B.K. (2005) *Sporobolus*. *Flora of Australia* 44B: 324–346.
- Simon, B.K. & Alfonso, Y. (2011) *AusGrass2*, <http://ausgrass2.myspecies.info/> accessed February 2015.
- Simon, B.K. & Jacobs, S.W.L. (1999) Revision of the genus *Sporobolus* (Poaceae, Chloridoideae) in Australia. *Australian Systematic Botany* 12(3): 375–448.
- Skerman, P.J. & Riveros, F. (1989) *Tropical grasses* (FAO, Rome).
- The State of Victoria Department of Sustainability and Environment (2009) *Advisory list of environmental weeds of the Mallee bioregions of Victoria*. Victorian Government Department of Sustainability and Environment, Melbourne. http://www.dse.vic.gov.au/__data/assets/pdf_file/0005/107195/RankingMalleeweedsrev4a.pdf
- Walsh, N.G. (1994) *Alopecurus*. *Flora of Victoria* 2: 498–501.
- White, C.T. (1930) Alton Downs blue grass (*Andropogon nodosus*). *Queensland Agricultural Journal* 34: 208–209.
- Wu, Z. & Phillips, S.M. (2006) *Sporobolus coromandelianus*. *Flora of China* 22: 482. http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=250070966

