

## A new species of *Brachyachne* (Poaceae: Chloridoideae: Cynodonteae) from semi-arid Northern Territory and Western Australia, and additional notes on the genus

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### Abstract

Albrecht, D.E. & McLay, T.G.B. A new species of *Brachyachne* (Poaceae: Chloridoideae: Cynodonteae) from semi-arid Northern Territory and Western Australia, and additional notes on the genus. *Nuytsia* 33: 263–274. *Brachyachne anisocarpa* Albr. is described and illustrated, with notes on distribution, habitat and relationship with similar species. New distribution records of other *Brachyachne* (Benth.) Stapf species are provided, along with a key to *Brachyachne* species in Australia. The status of the genus is discussed based on an analysis of pre-existing and new molecular data.

### Introduction

Until recently, the grass genus *Brachyachne* (Benth.) Stapf (subfamily Chloridoideae, tribe Cynodonteae) was considered to comprise approximately 11 species, dispersed throughout parts of Africa, tropical Asia and Australia. However, molecular studies published recently (Peterson *et al.* 2010, 2015) have proposed a disintegration of the genus, with the African species transferred to a new genus *Micrachne* P.M.Peterson, Romasch. & Y.Herrera, and the five remaining species (*Brachyachne s. str.*), all of which occur in Australia, subsumed into *Cynodon* Rich. Currently the proposed merger of non-African *Brachyachne* species with *Cynodon* has been formally adopted by only some Australian herbaria. The most comprehensive contemporary treatment of *Brachyachne s. str.* by Nightingale *et al.* (2005) recognises five species for Australia – four native (*B. ciliaris* (Kuntze) C.E.Hubb., *B. convergens* (F.Muell.) Stapf, *B. prostrata* C.A.Gardner & C.E.Hubb. and *B. tenella* (R.Br.) C.E.Hubb.) and one introduced from Asia (*B. ambigua* Ohwi).

In the mid to late 1990s, two populations of an apparently undescribed *Brachyachne* species were found whilst undertaking fieldwork in the Tanami bioregion of the Northern Territory. Collections made from these sites matched a specimen from the eastern Kimberley region of Western Australia collected in 1980 by John Petheram and housed at the Alice Springs Herbarium (NT). A colour photograph of the Western Australian plants *in situ* appears in Petheram and Kok (1983: 68–69) under the name *B. ciliaris*. Recent field work in the Northern Territory, coupled with cultivation of plants grown from soil seed bank samples, has confirmed the distinctiveness of these populations, which are described here as the new species *Brachyachne anisocarpa* Albr.

## Methods

**Morphology.** This study was based on an examination of plants in their wild occurrence, cultivated plants and dried specimens housed at CANB, NT and BRI. Obtaining sufficient material of the new species from the field at the right developmental stage for comparative study, description and typification proved to be difficult. To overcome this problem, soil seed bank samples were collected at two sites in the Northern Territory during May 2017 in the vicinity of disintegrating dead plants of the new species. The soil samples were laid on trays in a greenhouse at the Australian National Botanic Gardens (ANBG) nursery in Canberra and watered over the summer of 2017–2018. Germinants were potted up and grown on until spikelets showed signs of having mature caryopses. To facilitate reliable comparison between the new species and other *Brachyachne* species, some numerical characters previously used in the genus, and one new character, needed to be measured in a consistent way. Inflorescence branch axis width was measured at an internode approximately halfway along its length. Glume wing width was measured at its widest point, as the distance between the outer edge of the green midvein and the outer wing edge. The distance separating palea keels was assessed on fruiting specimens.

**DNA extraction, PCR amplification, and phylogenetic analysis.** DNA was extracted from samples of *Brachyachne anisocarpa* (including the type specimen) and *B. prostrata* (see Table 1 for sample details) using the Plant/Fungi DNA isolation kit (Sigma-Aldrich) or Invisorb Plant Mini Kit (Strattec). ITS1 and ITS2 amplicons were amplified separately using universal plant primers (see Chen *et al.*

**Table 1.** Details of the newly sequenced *Brachyachne* samples.

Species	Collector ID (herbarium accession number)	Locality	GenBank sequence ID
<i>Brachyachne anisocarpa</i> <i>sp. nov.</i>	D.E. Albrecht 15234 (CANB 905223 – type)	Cultivated Australian National Botanic Gardens nursery, ex Northern Territory, Stuart Hwy 25.5 km due SSE of Renner Springs roadhouse	OK380945
	D.E. Albrecht 15238 (CANB 905227)	Cultivated Australian National Botanic Gardens nursery, ex Northern Territory, Stuart Hwy <i>c.</i> 1.9 km N of intersection with Mary Ann Dam Road, N of Tennant Creek	OK380946
<i>Brachyachne prostrata</i>	D.E. Albrecht 14631 & P.K. Latz (CANB 892239)	Western Australia, Kiwirrkurra Indigenous Protected Area; <i>c.</i> 800 m S of the Gary Junction Road, <i>c.</i> 31.7 km due WNW of the NT/WA border on the Gary Junction Road	OK380944
	P.K. Latz 3962 (CANB 244479)	Northern Territory, Coomarie Spring	OK380947

2010), and the amplicons were sequenced using Sanger sequencing on an ABI 3730xl DNA Analyser (Macrogen, South Korea). Sequences were imported into Geneious Prime for editing, and the two amplicons were merged using Ns to fill a missing portion of the 5.8S region. To determine the closest relative of *B. anisocarpa* and assess the validity of the genus, the five-locus alignment from Peterson *et al.* (2015) was imported into Geneious, and the new sequences were incorporated. To reduce the size of the alignment, taxa were removed so that only species of *Cynodon* and *Brachyachne*, plus species from closely related genera *Stapfochloa* H.Scholz, *Chrysochloa* Swallen, *Eustachys* Desv., and *Micrachne* were retained, with *Oxychloris scariosa* (F.Muell.) Lazarides serving as an outgroup (based on the topology of Peterson *et al.* 2010). To reduce the impact of missing data on the supermatrix phylogeny, samples that were represented by a single locus were removed from the dataset (except for the new *Brachyachne* sequences), and the alignment was realigned. The final alignment included 79 samples, was 4,133 bp long, and was partitioned into seven loci (*rpl32*, *ndhA*, *rps16* intron, *rps16* gene, ITS1, 5.8S, ITS2) for phylogenetic analysis. The alignment was analysed using RAxML v. 8 (Stamatakis 2014), with 10 maximum likelihood searches under the GTRCAT model, and with bootstrap support values from 1000 rapid bootstraps then mapped onto the best tree as defined by likelihood scores.

## Taxonomy

### ***Brachyachne anisocarpa* Albr., *sp. nov.***

*Typus*: Cultivated Australian National Botanic Gardens nursery, 28 February 2018, D.E. Albrecht 15234 (*holo*: CANB 905223; *iso*: AD, BRI, DNA, K, MEL, NSW, NT, PERTH).

Tufted annual, sometimes producing adventitious roots at the lower nodes. *Flowering culms* erect or geniculately ascending to *c.* 16 cm high, usually branching near or occasionally above the base; internodes wiry, 0.2–1.0 mm diameter,  $\pm$  maroon tinged; nodes glabrous. *Leaves* basal and cauline, the uppermost cauline leaf usually bladeless or with a reduced blade. *Leaf sheaths* glabrous abaxially or with a few hairs to *c.* 2 mm long concentrated on the distal margins/sub-margins near the ligule,  $\pm$  maroon tinged. *Ligule* a minutely ciliolate membrane; membrane 0.2–0.5 mm long; cilia to *c.* 0.15 mm long. *Leaf blades* lanceolate, 5–56 mm long, 1–4 mm wide, flat *in vivo*, sometimes folded about midvein when dry, narrowly acute, adaxially with short hairs to 0.1 mm long and sparse spreading longer hairs to *c.* 2.5 mm long or rarely glabrous, abaxially glabrous or scaberulous particularly in the distal half; margin serrulate-scabrous; collar conspicuous,  $\pm$  maroon tinged,  $\pm$  with few long hairs on adaxial and/or abaxial side near margin. *Inflorescence* well exerted from uppermost leaf sheaths; branches (1–)2(–3), 9–25 mm long, long-persistent but finally disarticulating, initially straight to slightly curved and diverging (thus inflorescence and culm apex collectively appearing Y- or T-shaped), later deflexing as spikelets fall, finally strongly decurved, each with a minutely hairy basal pulvinus to 1 mm long; axis 0.5–0.8 mm wide, flattened, with a prominent usually zig-zagged central nerve and several parallel finer nerves on the wing-like portion on either side of the central nerve. *Spikelets* arranged secundly on the underside of the inflorescence branches in 2 rows, 13–33 per inflorescence branch, sessile, strongly laterally compressed, elliptic or narrowly obovate, 2.3–3(–3.2) mm long, disarticulating below the glumes; barren rachilla extension 0.8–1.2 mm long, terminated by a minute tuft of hairs. *Glumes* 2.3–3(–3.2) mm long, subequal or the upper or lower slightly longer, obtuse,  $\pm$  minutely notched, with a green midnerve and maroon tinged sides, finally turning stramineous; lower glume curved in profile, carinate with keel wingless or with a very narrow wing <0.05 mm wide, inconspicuously scaberulous on nerve or wing; upper glume  $\pm$  straighter than the lower glume in profile, round on back but with central nerve becoming raised in dried material, smooth on central nerve. *Callus* rather indistinct, to 0.2 mm long, shortly hairy, acute. *Lemma* narrowly elliptic in dorsal view, oblanceolate in profile, 2.1–2.4 mm long, 0.6–0.85 mm wide in profile, obtuse to truncate, entire, muticous or

midvein exerted <0.1 mm long, firm-textured, folded about the midnerve, with a dense sericeous band of short hairs along the midnerve and along both marginal nerves, glabrous between the nerves, the sericeous bands reaching to *c.* two-thirds of the way up the lemma from the base and terminating in a tuft of erect hairs 0.5–1 mm long, glabrous beyond each hair tuft. *Palea* 1.5–2 mm long, 0.2–0.3 mm wide in profile, curved in profile, narrowly truncate apically,  $\pm$  notched, the two keels well separated, each with a narrow sericeous band extending *c.* two-thirds their length from the base, sericeous band terminating in a tuft of erect hairs, glabrous beyond each hair tuft. *Lodicules* 2, 0.15–0.25 mm long, 0.15–0.25 mm wide, fleshy, truncate. *Anthers* 3, 0.4–0.8 mm long, 0.2–0.35 mm wide, pale yellowish cream. *Caryopsis* narrowly elliptic (dorsal view), 1.1–1.4 mm long, acute apically, very finely striate, light brown, subglossy, unequally 3-angled in cross-section with acute dorsal angle; medial faces 0.5–0.6 mm wide, flat to slightly convex; ventral face 0.35–0.45 mm wide, slightly concave; embryo 40–65% the length of the caryopsis. (Figure 1)

*Diagnostic characters.* *Brachyachne anisocarpa* is readily distinguished from all other species in the genus by the combination of small erect stature, glabrous to scaberulous leaf sheaths and abaxial surface of blades, two (very rarely three or one) short inflorescence branches, small spikelets falling whole with enclosed floret, keeled lower glume but dorsally rounded upper glume with a raised central nerve, well separated palea keels and acute caryopses that are unequally 3-angled in cross-section.

*Specimens examined.* WESTERN AUSTRALIA: [locality withheld for conservation reasons], Feb. 1980, [R.]J. Petheram 573B (NT). NORTHERN TERRITORY: Granites Goldmine Lease, *c.* 1 km from Tanami Hwy on road to Ivy Camp, 29 Apr. 1999, D.E. Albrecht 8935 (NT); Cultivated Australian National Botanic Gardens nursery, 6 Mar. 2018, D.E. Albrecht 15238 (CANB, NT, PERTH) ex Northern Territory, Stuart Hwy *c.* 1.9 km N of intersection with Mary Ann Dam Road, N of Tennant Creek, 13 May 2017, D.E. Albrecht 15036 & R.W. Jobson (CANB); Stuart Hwy *c.* 25.5 km due SSE of Renner Springs roadhouse, 14 May 2017, D.E. Albrecht 15125 & R.W. Jobson (CANB); 40 km S of Tennant Creek and 4 km E of Stuart Hwy, 21 Apr. 1996, D.E. Albrecht 7504 & P.K. Latz (NT).

*Distribution and habitat.* *Brachyachne anisocarpa* is presently known from very few dispersed sites in the northern arid/semi-arid regions of the Northern Territory and Western Australia (Figure 2). Within the Northern Territory, collections have been made from the central Tanami between Tennant Creek and Renner Springs, and in the western Tanami near the Granites Goldmine. Only a single collection has been made from Western Australia, east of Halls Creek. Areas of suitable habitat for the species occur in the intervening areas between known sites, although they are patchy and frequently small. It is possible that the species occurs further west of Halls Creek and may extend eastward toward or into Queensland, though no collections from Queensland were located at BRI.

*Brachyachne anisocarpa* occurs on flat to gently undulating terrain with a distinctive stony surface layer usually with conspicuous quartz fragments (Figure 3). Soil pH in the rooting zone at one site in the central Tanami was 6.5 and at another site 7–7.5. Further study of soil chemistry may reveal elevated salinity levels as has been found at sites with a similar appearance in central Australia (Kennedy 1999). In the Northern Territory, the stony pavements supporting populations of *B. anisocarpa* occur as small islands within more widely distributed hummock grassland dominated by *Triodia longiceps*, *T. inutilis* or *T. bitextura*, with or without mallees such as *Eucalyptus normantonensis*. The vegetation on these stony pavements has low biomass/cover. Chenopods such as *Atriplex vesicaria*, *Sclerolaena cuneata*, *S. intricata* and *S. minuta* may be present, however the most frequently occurring species include *Trianthema triquetrum s. lat.*, *Polycarpaea ?breviflora*, *Eriachne pulchella*, *Sporobolus australasicus*, and *S. actinocladus*. *Brachyachne convergens* may occur in the vicinity. In Western Australia, *Brachyachne anisocarpa* has been recorded growing amongst *Triodia intermedia* in a bare stony area.

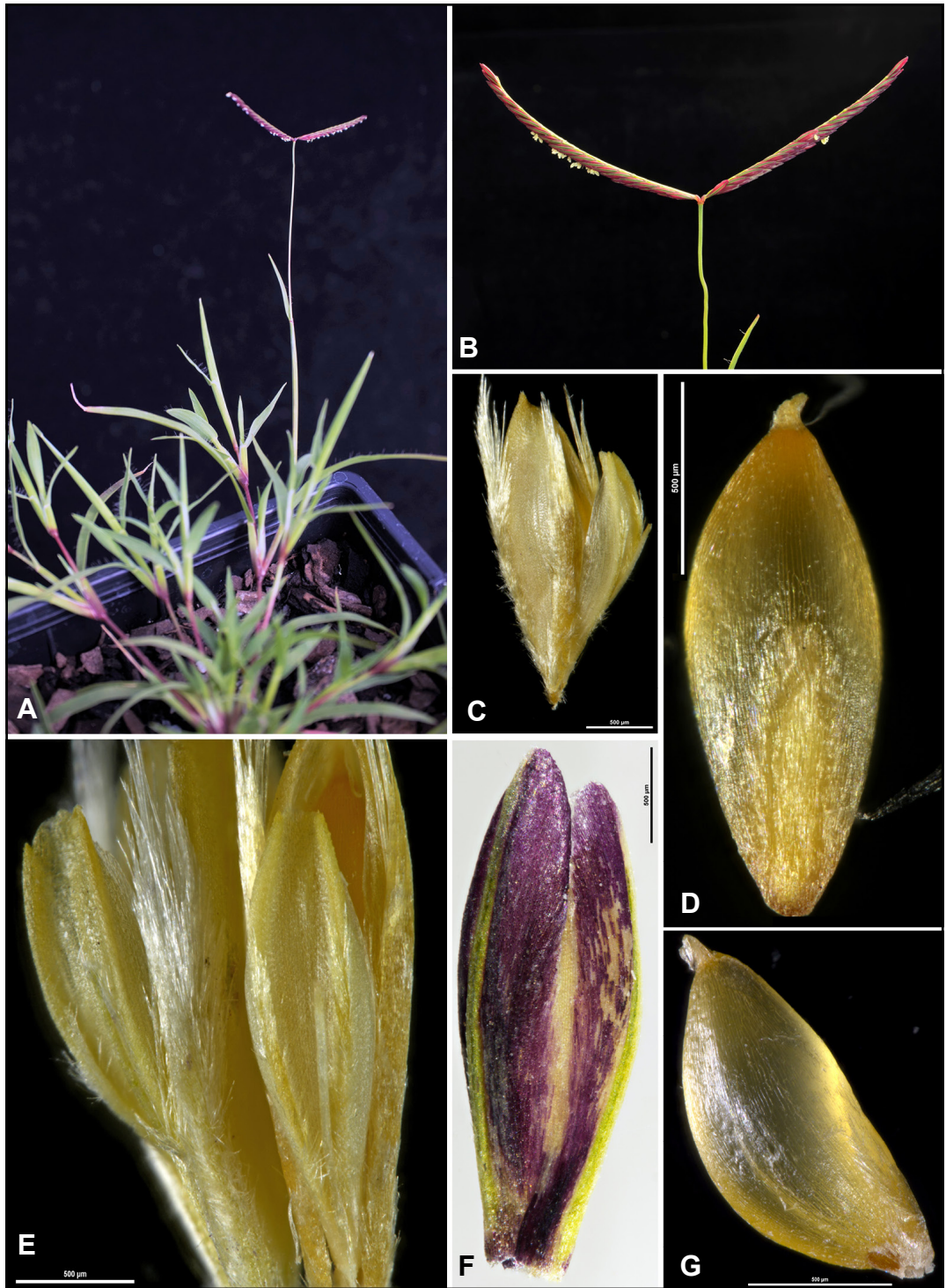


Figure 1. *Brachyachne anisocarpa*. A – habit in cultivation at ANBG; B – inflorescence; C – floret in profile; D – caryopsis dorsal view; E – florets (x2) ventral view showing well separated palea keels; F – spikelet, showing dorsally keeled lower glume (RHS) and dorsally rounded upper glume with raised central nerve (LHS); G – caryopsis oblique view showing narrower, slightly concave ventral face. A–G from D.E. Albrecht 15234; credits: M. Fagg (A–B); B. Clinton (C–G).

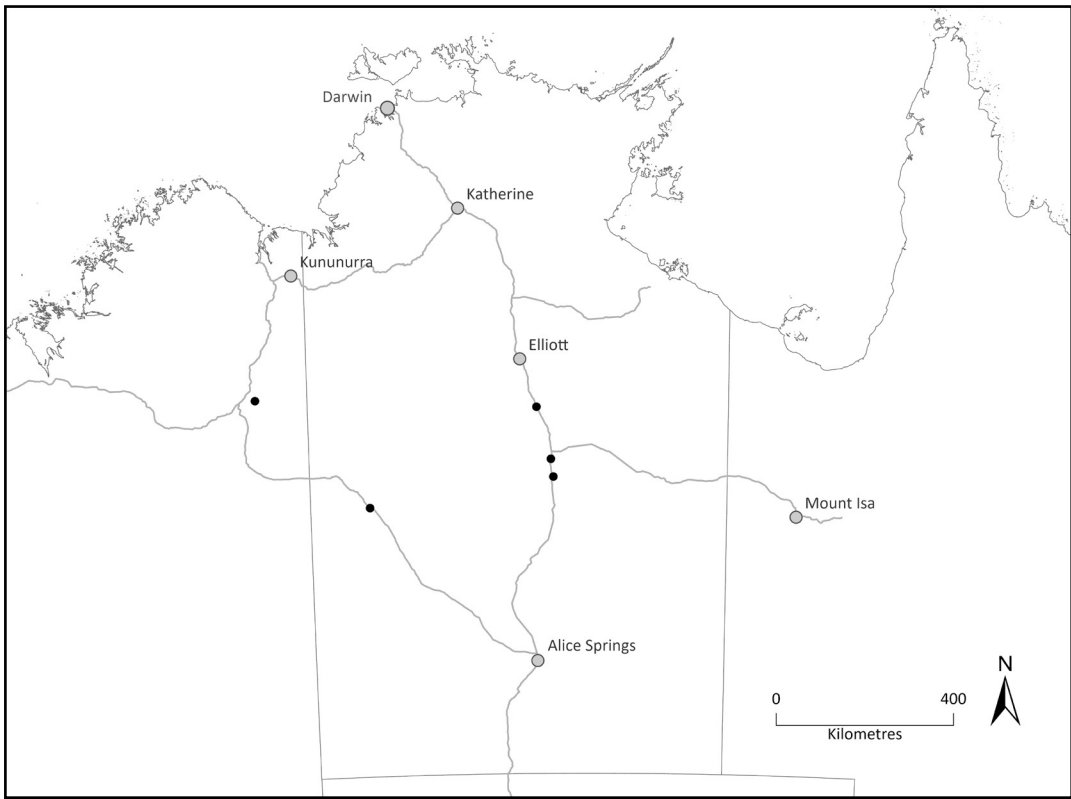


Figure 2. Distribution of *Brachyachne anisocarpa* in northern Australia based on all available specimens in Australian herbaria as of 24 May 2022. Major roads are shown.



Figure 3. Habitat at type locality.

*Phenology.* Germination, vegetative growth and subsequent flowering and fruiting are driven by significant rainfall events. Using Tennant Creek climatic data as indicative of the greater Tanami region, sufficient rainfall to trigger germination may occur between the months of (November–) December–February (–March). At this time of the year, the mean maximum temperature is approximately 35–38°C and mean minimum 23–25°C (Bureau of Meteorology 2022), though the maximum temperatures may drop as much as 5°C during and for a few days after significant rainfall events.

Although field-based information on growth rates is unavailable, proxy data was collected for plants grown in cultivation at the ANBG over the summer of 2017–2018. In this nursery-based trial, several seeds in a soil seedbank sample germinated in late December 2017 and the resulting seedlings were pricked out into tubes in early January 2018. These plants commenced flowering at seven weeks and began producing fully developed caryopses at 10 weeks.

*Etymology.* The specific epithet is derived from the Greek *an-*, not, *-iso-*, equal, *-karpos*, fruit, in reference to the unequal faces of the caryopses.

*Conservation status.* Due to the paucity of collections, a coding of data deficient is suggested. Given the vast tracts of country that could support the species, it is probable that further fieldwork will reveal that this taxon is neither rare nor threatened. Although known populations are highly localised, plants within a population can be locally abundant. For Western Australia, it will be listed as Priority One under Conservation Codes for Western Australian Flora (Tanya Llorens, pers. comm.).

*Affinities.* Based on the molecular phylogeny, *Brachyachne anisocarpa* is sister to *B. ciliaris*, and *B. prostrata* is sister to both species (Figure 4). The molecular data is congruent with morphological data, as all three species share a similar glume morphology. *Brachyachne ciliaris* most closely resembles *B. anisocarpa* on account of their similar habit and inflorescence form. However, *B. ciliaris* is readily distinguished by the presence of tubercle-based hairs on the abaxial leaf sheath and abaxial leaf blade surfaces (*cf.* glabrous in *B. anisocarpa*, except for a few hairs sometimes on the distal leaf sheath margins/sub-margins near the ligule), longer inflorescence branches ((18–)20–60 mm long, *cf.* 9–25 mm long in *B. anisocarpa*), longer glumes (3.1–4 mm long, *cf.* 2.3–3(–3.2) mm long in *B. anisocarpa*), the spikelets disarticulating above the glumes (*cf.* below the glumes in *B. anisocarpa*), the presence of a subapical transverse fringe of hairs on lemma and palea (hairs only in longitudinal bands in *B. anisocarpa*), and the obtuse obovate grain that is slightly laterally compressed and non-angular (oval) in cross-section (*cf.* acute, narrowly elliptic and unequally 3-angled in cross-section in *B. anisocarpa*). In the central Tanami north of Tennant Creek, *B. ciliaris* occurs in the vicinity of *B. anisocarpa*. However, on current knowledge, the two are not known to co-occur, the former preferring less extreme edaphic conditions (typically ironstone) and often associated with Mulga (*Acacia aneura* F.Muell. ex Benth. and allied species). This habitat distinction may be of some value in the Tanami region but it is unreliable in the broader arid region where *B. ciliaris* occurs over a greater range of habitats.

*Brachyachne anisocarpa* occurs within a region where *B. convergens* is the most frequently occurring species in the genus and reduced forms of the latter could possibly be confused with it. *Brachyachne convergens* is readily distinguished by its longer ((15–)20–80 mm long, *cf.* 9–25 mm long in *B. anisocarpa*) and more numerous inflorescence branches ((2–)3–4(–6), though rarely, if ever wholly 2 on a plant, *cf.* 2, rarely 1 or 3 in *B. anisocarpa*), lanceolate (*cf.* elliptic or narrowly obovate in *B. anisocarpa*) spikelets that generally disarticulate above the glumes (*cf.* below the glumes in *B. anisocarpa*), longer acute glumes ((2.7–)3.2–6.5 mm long, *cf.* 2.3–3(–3.2) mm long in *B. anisocarpa*) both of which are keeled (*cf.* only lower glume keeled in *B. anisocarpa*) and more prominently winged (wing 0.05–0.2 mm wide, *cf.* wing absent or <0.05 mm wide in *B. anisocarpa*), palea keels touching

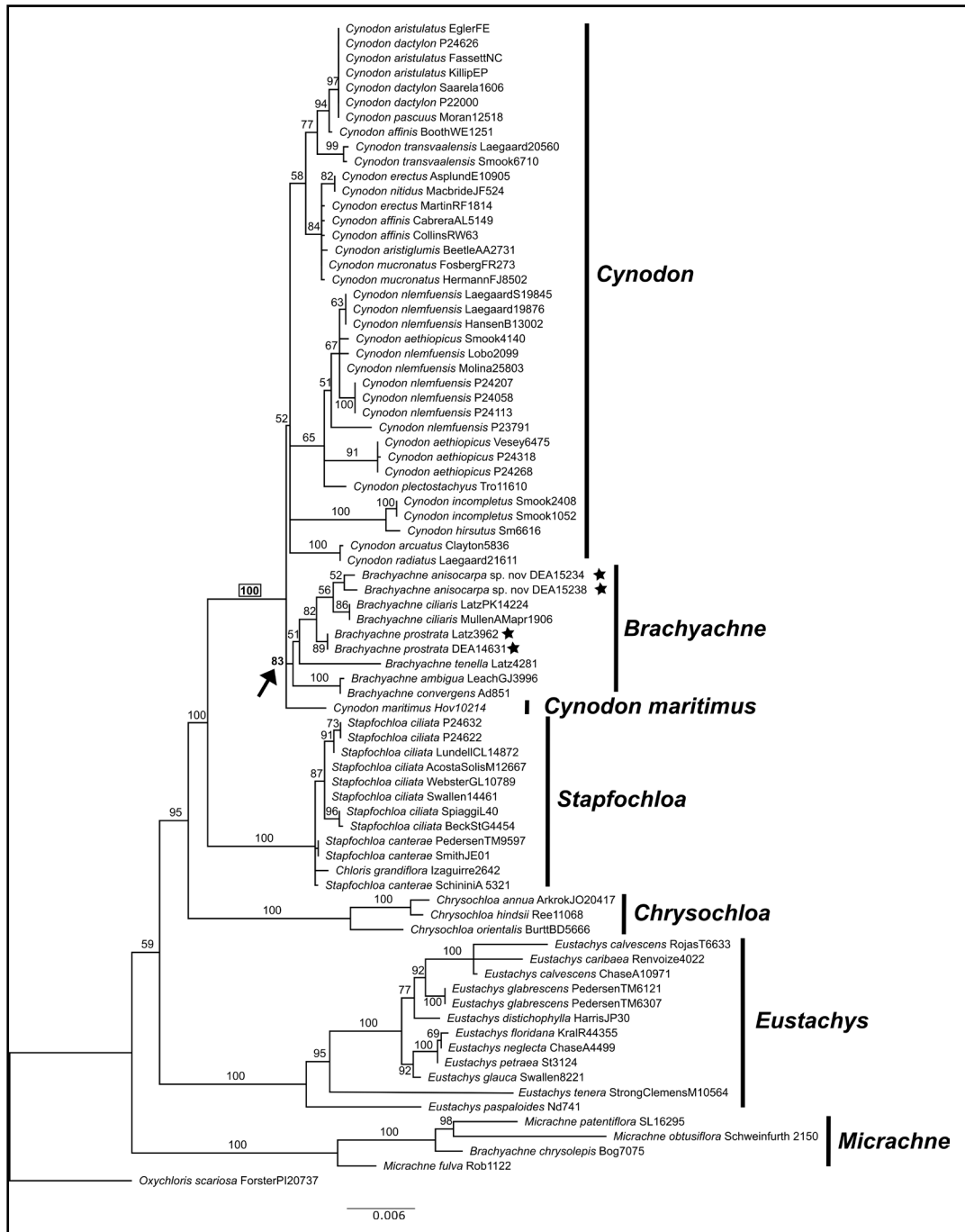


Figure 4. Maximum likelihood phylogeny of *Brachyachne* and *Cynodon*, with closely related genera. Newly added samples (compared with Peterson *et al.* 2010, 2015) are indicated with a star. Numbers on nodes represent bootstrap support (BS), and nodes with less than 50% BS support are collapsed. The branch support leading to *Cynodon* + *Brachyachne* is boxed, and the branch support for *Brachyachne* is indicated with an arrow.



or close together (*cf.* well separated in *B. anisocarpa*) and usually larger caryopses (1.1–)1.3–2 mm long, *cf.* 1.1–1.4 mm long in *B. anisocarpa*) that are obtuse apically, strongly laterally compressed and narrowly elliptic in cross-section (*cf.* acute apically and unequally 3-angled in cross-section in *B. anisocarpa*).

*Notes.* Type specimens were collected from plants raised in cultivation from a soil seed bank sample associated with *D.E. Albrecht* 15125 & *R.W. Jobson*. Cultivated plants were broader in diameter than field-gathered specimens, with more extensive branching at the lower nodes. Inflorescence branch length was also slightly longer in some cultivated plants than in field-gathered specimens, and whereas only 2-branched inflorescences had been seen in field-gathered specimens, rare 1- or 3-branched inflorescences were observed in cultivated plants.

The species is atypical in the genus in having spikelets that disarticulate below the glumes, a character state that is at odds with published descriptions of *Brachyachne s. str.* (e.g. Lazarides 1972: 41–48; Nightingale *et al.* 2005).

Although *B. anisocarpa* is known to occur in Western Australia (based on the Petheram specimen in NT) there are currently no specimens of the species in the Western Australian Herbarium (R. Barrett, pers. comm.).

Due to the difficulty of incorporating *B. anisocarpa* into the *Brachyachne* key in the *Flora of Australia* (Nightingale *et al.* 2005: 295), a revised key to species of *Brachyachne* occurring in Australia is presented below:

### Key to species of *Brachyachne* in Australia

1. Lower glume strongly laterally compressed and keeled, upper glume rounded on back with a raised central nerve.....2
- 1: Both glumes strongly laterally compressed and keeled .....4
2. Plants prostrate and frequently branching at the nodes including those well above base; peduncle not or very shortly exceeding subtending spathe at maturity; inflorescence branches 3–5, each 4–15 mm long, usually not long-persistent ..... **B. prostrata**
- 2: Plants erect or ascending but culms sometimes geniculate towards base, unbranched or mostly branching at lower nodes; peduncle distinctly exceeding subtending spathe at maturity; inflorescence branches 2(–4), each 9–60 mm long, long-persistent .....3
3. Leaf sheaths and abaxial surface of blades villous with tubercle-based hairs; inflorescence branches (18–)20–60 mm long; florets falling with or after the upper glume, lower glume at least briefly persistent; glumes 3.1–4 mm long; lemmas with a subapical transverse fringe of hairs in addition to hairs on keel and nerves; caryopsis obtuse apically, more or less oval-shaped in cross-section ..... **B. ciliaris**
- 3: Leaf sheaths and abaxial surface of blades (excluding margins and collar) glabrous to scaberulous; inflorescence branches 9–25 mm long; whole spikelet falling as a unit; glumes 2.3–3(–3.2) mm long; lemmas lacking a subapical transverse fringe; caryopsis acute apically and unequally 3-angled in cross-section ..... **B. anisocarpa**
4. Spikelets asymmetrically elliptic or obovate; lemmas 1.2–1.8 mm long, with hairs on keel and margins and also in a longitudinal (sometimes very sparse) band between keel and margins; palea keels well separated; caryopsis 0.8–1 mm long, not or very weakly compressed (broadly elliptic to circular in cross-section) ..... **B. tenella**

- 4: Spikelets lanceolate to almost elliptic; lemmas 1.6–2.8 mm long, with hairs on keel and margins but glabrous between; palea keels touching or close together (c. 0.1 mm apart); caryopsis 1–2 mm long, strongly compressed (narrowly elliptic in cross-section).....5
5. Inflorescence branch axes 0.4–0.6 mm wide; glumes 2–3 mm long, wingless or with a narrow wing rarely exceeding 0.05 mm wide; lemmas 1.6–2.1 mm long, less than 1 mm shorter than the longest glume; caryopsis 1–1.3 mm long..... **B. ambigua**
- 5: Inflorescence branch axes (0.5–)0.6–1.1 mm wide; glumes (2.7–)3.2–6.5 mm long, with a wing 0.05–0.2 mm wide; lemmas (1.7–)2.2–2.8 mm long, at least 1 mm shorter than the longest glume; caryopsis (1.1–)1.3–2 mm long..... **B. convergens**

### Notes on other *Brachyachne* species

#### *Brachyachne ambigua*

Limited molecular and morphological data suggest *B. ambigua* is sister to *B. convergens*. Further detailed study is required to determine whether *B. ambigua* should be recognised or included within *B. convergens*. They are extremely similar in terms of ITS sequences, only differing at two sites. The type specimen of *B. ambigua* is poor and further collections from Asia and Australia are required, including those that focus on population variability. *Brachyachne ambigua* is included in the key presented herein but due to limited available material the features used to distinguish it from *B. convergens* are tentative and may be unreliable. Specimens that blur the distinction between the two taxa include some from the Humpty Doo area in the Northern Territory. A sample currently assigned to *B. convergens* from the Pilbara region (*M.E. Trudgen* 11682 & *S. Maley*) has atypically small glumes, lemmas and caryopses that are well within the range of *B. ambigua*. The glume, lemma and caryopsis measurements for this specimen are included as extreme lower values (in parentheses) in the *B. convergens* lead of couplet 5 in the key above.

The type of *B. ambigua* was collected in East Java, and the species has also been recorded from Lesser Sunda Island, New Guinea, the Northern Territory and north-eastern Western Australia (Nightingale *et al.* 2005). The occurrence in New Guinea requires further checking as CANB specimens previously determined as this species have been redetermined to *B. tenella* (see below). If *B. ambigua* is maintained as distinct from *B. convergens*, then the former also occurs in Queensland based on the following specimen: 1.2 km south of Princess Charlotte Bay coastline, 7 Apr 1992, *V.J. Neldner* 3725 & *J.R. Clarkson* (BRI).

#### *Brachyachne tenella*

Although *B. tenella* is reported to be endemic to Australia (Nightingale *et al.* 2005), the following three specimens from Papua New Guinea have been redetermined by the principal author from *B. ambigua* to *B. tenella*: Kajabit mission, 25 July 1939, *M.S. Clemens* 10473 (CANB); Near Kwikila, Rigo Sub district, 8 July 1962, *R. Pullen* 3234 (CANB); Tavai Creek Area, c. 43 miles SE of Port Moresby, 7 May 1967; *R. Pullen* 6937 (CANB).

### Notes on the generic status of *Brachyachne*

Phylogenies presented in Peterson *et al.* (2010) and Peterson *et al.* (2015) showed the group of *Brachyachne* species occurring in Australia, Melanesia and Indonesia (i.e. *Brachyachne s. str.*,

hereafter *Brachyachne*) as nested, or partially nested within *Cynodon* (*n.b.* the African species of *Brachyachne* included in these phylogenies are now recognised as species of *Micrachne* and will not be considered further). Peterson *et al.* (2010) produced three phylogenies based on ITS1 & 2 (their Figure 1), six plastid loci (their Figure 2), and a combined analysis of ITS + plastid (their Figure 3), that included two samples of *Brachyachne* and 10 samples of *Cynodon*. In each phylogeny, the clade including both genera was well-supported (bootstrap support from 89 to 100; posterior probability of 1.0), but the relative position of the *Brachyachne* species to the *Cynodon* species differed. In their ITS phylogeny, the two *Brachyachne* samples were not monophyletic, with *B. tenella* sister to *Cynodon* (with *B. convergens* nested in *Cynodon* with moderate support). Their plastid phylogeny had the two *Brachyachne* samples as sister (74% BS, 1.00 PP) but also had *C. maritimus* Kunth as sister to *Brachyachne* rather than within the rest of *Cynodon* (though with no support). Their combined analysis had another topology, with *Brachyachne* + *C. maritimus* as sister to *Cynodon*, though again with no support. No taxonomic decisions were made for *Brachyachne* based on this tree.

The Peterson *et al.* (2015) phylogeny had denser taxon sampling of *Cynodon* (46 samples) and *Brachyachne* (five samples), and used four plastid regions and ITS1 & 2, but only performed a combined analysis (and thus does not present any potential conflict in the different loci sets relating to *Brachyachne*). The clade including both genera was again well-supported (100% BS, 1.00 PP). The five *Brachyachne* samples formed a poorly supported group (no BS, 0.68 PP). However, *Cynodon maritimus* (now represented by two samples, albeit one sample only had sequence for one plastid locus, *rpl32-trnL*, i.e. missing ~80% data) was resolved as sister to all remaining *Cynodon* species + *Brachyachne* (i.e. no longer sister to just *Brachyachne*), although no support values were shown along this part of the tree, indicating that this topology was not well-supported. Based on this poorly supported topology, Peterson *et al.* (2015) suggested that *Brachyachne* arose within *Cynodon*, and the morphological characters that were used to originally separate the genera (glumes longer than the floret and lemmas that are long-hairy on the veins or all over in *Brachyachne*, versus at least one glume shorter than the floret and lemmas that are hairy or not only along the midvein in *Cynodon*) were not synapomorphies. Where required, new combinations for species of *Brachyachne* were made in *Cynodon*. To date the proposal to synonymise *Brachyachne* under *Cynodon* has not received universal acceptance within Australia.

The phylogeny presented in this paper (Figure 4) has the same topology as the Peterson *et al.* (2015) phylogeny, except we have collapsed any branch with less than 50% BS support. Based on this topology, *Brachyachne* is nested within *Cynodon* due to a sample of *C. maritimus*. This species is treated as a synonym of *C. dactylon* (L.) Pers. (Clayton *et al.* 2022), but according to the various phylogenetic analyses including this sample, it is distinct from any samples of *C. dactylon*. Resolving the taxonomic status of *C. maritimus* is important, not only for understanding its position in the phylogeny, but also for understanding the generic relationships between *Cynodon* and *Brachyachne*. Regardless, with the data available currently and considering only well-supported nodes (>75% BS), *Cynodon* and *Brachyachne* can only be resolved as part of the same polytomy.

*Cynodon* and *Brachyachne* are clearly closely related. However, given that the two genera are readily separated morphologically, their native ranges are geographically separated, and the relationship between them is poorly resolved on available molecular data, we feel that it is premature to accept the new classification outlined in Peterson *et al.* (2015) and have chosen to name this new taxon as a species of *Brachyachne*. Phylogenomics, especially target capture methods, with increased sampling of species and genetic data will be vital to clarify the status of *Brachyachne* relative to an expanded *Cynodon* that includes *Brachyachne*.

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