https://doi.org/10.1071/BT20164_AC

Supplementary material

Comparing data subsets and transformations for reproducing an expert-based vegetation classification of an Australian tropical savanna

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Table S1. Floristic groups and diagnostic species for the numerical classification and vegetation community number, number of sites, NVIS sub-association vegetation community descriptions (dominant strata) and landscape position for the combination of numerical and intuitively classified vegetation communities.

Diagnostic species	Community number	Number of sites	NVIS Sub-association - Vegetation Community Description (dominant stratum)	Landscape position
Eucalyptus tectifica	1	55	*Eucalyptus tectifica* ± *Corymbia foelscheana, Erythrophleum chlorostachys, Corymbia grandifolia* Low Woodland	Extensive on variety of landforms
Corymbia dichromophloia	2	43	*Corymbia dichromophloia* ± *Erythrophleum chlorostachys, Terminalia latipes* Medium Low Open Woodland	Extensive on sandstone
Corymbia bella	3	21	*Corymbia bella* ± *Gyrocarpus americanus, Adansonia gregorii, Corymbia polycarpa* Mid Woodland	Relict levees
Lophostemon grandiflorus	4	8	*Lophostemon grandiflorus* ± *Adansonia gregorii, Celtis philippensis* Mid Woodland	Riparian
Eucalyptus pruinosa	5	12	*Eucalyptus pruinosa* ± *Brachychiton diversifolius, Corymbia confertiflora* Low Open Woodland	Lowland plains/relict levees
Eucalyptus miniata	6	35	*Eucalyptus miniata* ± *Erythrophleum chlorostachys, Corymbia bleeseri, Terminalia latipes, Corymbia dichromophloia* Mid Open Woodland	Variable habitats
Corymbia grandifolia	7	7	*Corymbia grandifolia* ± *Corymbia foelscheana, Corymbia polycarpa, Melaleuca viridiflora* Mid Open Woodland	Lowland plains
Dichanthium fecundum	8	9	*Dichanthium fecundum, Ludwigia perennis, Melochia corchorifolia, Nelsonia campestris, Eleocharis acutangula* Mid Tussock Grassland	Grasslands on alluvium
Melaleuca acacioides	9	4	*Melaleuca acacioides* ± *Vachellia farnesiana, Bauhinia cunninghamii* Low Woodland	Marginal salt flats
Eucalyptus phoenicea	10	46	*Eucalyptus phoenicea* ± *Corymbia dichromophloia, Erythrophleum chlorostachys, Corymbia ferruginea, Terminalia latipes* Low Open Woodland	Extensive on sandstone
Corymbia polycarpa	11	27	*Corymbia polycarpa* ± *Grevillea pteridifolia, Gyrocarpus americanus* Mid Open Woodland	Drainage depressions
Buchanania obovata, Terminalia latipes	12	7	*Buchanania obovata, Terminalia latipes* ± *Corymbia polysciada, Owenia vernicosa, Xanthostemon paradoxus* Low Open Woodland	Scarps/fault lines
Corymbia ptychocarpa	13	5	*Corymbia ptychocarpa* ± *Melaleuca leucadendra, Pandanus spiralis, Banksia dentata* Mid Woodland	Isolated spring fed pockets
Eucalyptus tetrodonta	14	10	*Eucalyptus tetrodonta* ± *Eucalyptus miniata* Mid Open Woodland	Variable habitats
Eucalyptus brevifolia	15	7	*Eucalyptus brevifolia* ± *Corymbia dichromophloia, Eucalyptus phoenicea, Erythrophleum chlorostachys* Low Open Woodland	Low hills
Melaleuca sericea	16	9	*Melaleuca sericea* ± *Cochlospermum fraseri, Erythrophleum chlorostachys, Melaleuca minutifolia* Low Open Woodland	Low hills, distinct geology
Corymbia ferruginea	17	10	*Corymbia ferruginea* ± *Erythrophleum chlorostachys, Eucalyptus phoenicea* Low Open Woodland	Extensive on sandstone
Corymbia foelscheana	18	8	*Corymbia foelscheana* ± *Corymbia confertiflora, Corymbia grandifolia, Brachychiton diversifolius, Bauhinia cunninghamii* Mid Woodland	Adjacent to relict levees on plains
Melaleuca minutifolia	19	6	*Melaleuca minutifolia* ± *Terminalia platyphylla, Cochlospermum fraseri* Low Woodland	Adjacent to relict levees on alluvial plains
Melaleuca viridiflora	20	6	*Melaleuca viridiflora* ± *Petalostigma pubescens, Acacia difficilis, Corymbia polycarpa* Low Woodland	Drainage depressions
Melaleuca leucadendra	21	9	*Melaleuca leucadendra* ± *Terminalia platyphylla, Ficus coronulata, Nauclea orientalis* Mid Woodland	Riparian and swamps
Mixed	22	18	Mix of *Acacia* spp., *Grevillea* spp., *Gardenia* spp., *Terminalia latipes, Buchanania obovata* Tall Sparse Shrubland	Extensive on broken sandstone
Excoecaria parviflora	23	9	*Excoecaria parviflora* ± *Bauhinia cunninghamii, Terminalia volucris, Melaleuca acacioides* ssp. *acacioides* Low Open Woodland	Marine plains and floodplains
Avicennia marina, Excoecaria ovalis	24	4	*Avicennia marina, Excoecaria ovalis* ± *Ceriops australis, Bruguiera parviflora, Lumnitzera racemosa* Low Open Woodland	Mangroves
Melaleuca argentea	25	3	*Melaleuca argentea* ± *Lophostemon grandiflorus* Mid Woodland	Riparian and swamps
Xerochloa imberbis, Sporobolus virginicus	26	4	*Xerochloa imberbis, Sporobolus virginicus, Tecticornia halocnemoides, Suaeda arbusculoides, Aristida latifolia* Low Open Tussock Grassland	Tidal salt flats
Eucalyptus brachyandra	27	4	*Eucalyptus brachyandra* ± *Terminalia latipes, Xanthostemon paradoxus* Low Open Woodland	Broken sandstone
Pouteria sericea, Ziziphus quadrilocularis	28	13	*Xanthostemon paradoxus, Pouteria sericea, Acacia lamprocarpa, Ziziphus quadrilocularis, Alstonia spectabilis* Mid Woodland	Gully head and scarp dry vine thicket
Eucalyptus microtheca	29	1	*Eucalyptus microtheca* Mid Open Woodland	Alluvium fringing swamps
Eleocharis sphacelata, Oryza australiensis	30	5	*Eleocharis sphacelata, Oryza australiensis* ± *Pseudoraphis spinescens, Whiteochloa cymbiformis, Eleocharis acutangula* Low Closed Sedgeland	Sedgelands
Corymbia cliftoniana	31	6	*Corymbia cliftoniana* ± *Terminalia latipes* Low Open Woodland	Broken sandstone

Vegetation community descriptions for Bullo River Station, and notes on landscape position

The most common and widespread vegetation community was 1 – *Eucalyptus tectifica* dominated Low Woodland with other common species present or absent including *Corymbia foelscheana, Erythrophleum chlorostachys, Corymbia grandifolia*. This community occurred across a range of landform patterns and substrates, the most extensive was on plains and rises, and hill slopes of low hills and hills. Another vegetation community that intergraded on the plains, on imperfectly drained soils and generally adjacent to water courses, was community 7 – *Corymbia grandifolia* Mid Open Woodland and occurred with or without *Corymbia foelscheana*, *Corymbia polycarpa* and *Melaleuca viridiflora*. Canopies were more spaced on the aerial photography than community 1. This is the characteristic that differentiates between the two, plus the latter rarely occurred on hill slopes.

Other vegetation communities that were extensive across Bullo River Station included 22 which was characteristic of broken and pavement sandstone plateaus and hills across the northern and north-west portions of the study area. This community was very mixed and formed mosaic polygons with other communities including 2, 10, 27 and 31. Community 22 was a mix of *Acacia* spp., *Grevillea* spp., *Gardenia* spp., *Terminalia latipes* and *Buchanania obovata* Tall Sparse Shrubland, and was dominated by Spinifex in the ground stratum including mainly *Triodia bitextura, Triodia bynoei* and various tussock grasses. The communities contributing to mosaics with community 22 that were not mapped as discrete units included 27 – *Eucalyptus brachyandra* Low Open Woodland generally with *Terminalia latipes* and *Xanthostemon paradoxus*. Community 31 was also sporadic on the sandstone plateaus and common on broken sandstone dominated by *Corymbia cliftoniana* Low Open Woodland. These two communities were not distinctly discernible on the aerial photography mosaic; therefore, they were mapped as mosaics. However, from the multivariate analysis they were indeed discrete vegetation communities floristically.

Communities 10 and 6 appeared similar in terms of aerial photography colour and texture and also occurred on plateaus across the Pinkerton and Spencer ranges (to the south, south-west and south-east of the study area). Community 10, dominated by *Eucalyptus phoenicea* Low Open Woodland, sometimes occurring with *Corymbia dichromophloia*, *Erythrophleum chlorostachys*, *Corymbia ferruginea* and *Terminalia latipes*, also occurred on the plateaus and hills to the north and north-west. It was also common on rises and plains adjacent to the alluvial plains of the Bullo River. Community 2 was also common across similar landforms to communities 10 and 6.

Community 6 was dominated by *Eucalyptus miniata* Mid Open Woodland with species present or absent including *Erythrophleum chlorostachys*, *Corymbia bleeseri*, *Terminalia latipes* and *Corymbia dichromophloia*. Due to an influence of substrate and landform, this community occurred as three forms. The typical form occurred on the plateaus across the Pinkerton and Spencer ranges sometimes with *Corymbia bleeseri*. A second form occurred on rugged sandstone hill slopes. The third form occurred on heavier soils usually adjacent to drainage lines on the alluvial plains.

Communities associated with stream channels, drainage depressions and swamps were various. The stream channels on the plains and alluvial plains were usually mapped as mosaics dominated by community 21 – *Melaleuca leucadendra* Mid Woodland and associated species *Terminalia platyphylla*, *Ficus coronulata* and *Nauclea orientalis*. This community can also form significant swamps. Community 4 also occurred on stream channels but predominantly across plains, rises, low hills, hills and plateaus, usually in association with community 21. Community 25 may or may not occur in the same polygons as community 21. This community, dominated by *Melaleuca argentea* and *Lophostemon*

grandiflorus Mid Woodland, also occurred in swamps across the study area. Other swamps were dominated by either tussock grasses or sedges and included communities 8 and 30 respectively.

On the drainage depressions, communities 11 and 20 were discrete or intergraded. These communities were dominated by either *Corymbia polycarpa* or *Melaleuca viridiflora* and were usually adjacent to the relict levees of the Bullo River and its tributaries. Community 20 – *Melaleuca viridiflora* Low Woodland was characterised by its fine pattern on the aerial photography whereas community 11 – *Corymbia polycarpa* Mid Open Woodland was distinguished by its very sparse tree canopies. On the alluvial plains, relict levee systems were dominated by community 3 – *Corymbia bella* Mid Woodland with associated species *Gyrocarpus americanus*, *Adansonia gregorii* and *Corymbia polycarpa*. Adjacent to this community on the plains was community 18 dominated by a mix of *Corymbia foelscheana*, *Corymbia confertiflora*, *Corymbia grandifolia*, *Brachychiton diversifolius* and *Bauhinia cunninghamii* Mid Woodland. Community 5 was quite common on the levee systems as well as plains, and was dominated by *Eucalyptus pruinosa* Low Open Woodland.

Community 12 was restricted to the Victoria River fault line and very common on scarps and hill slopes of escarpments, plateaus and hills. It was a very mixed community primarily dominated by *Buchanania obovata*, *Terminalia latipes* and sometimes *Corymbia polysciada*, *Owenia vernicosa* and *Xanthostemon paradoxus* Low Open Woodland. Also common on scarps and the heads of gullies on plateaus, escarpments and hills was community 28. This community was a vine thicket dominated by *Xanthostemon paradoxus*, *Pouteria sericea*, *Acacia lamprocarpa*, *Ziziphus quadrilocularis* and *Alstonia spectabilis* Mid Woodland.

Less extensive communities that occurred on hills and plateaus especially to the north and north-west of the study area included 13 – *Corymbia ptychocarpa* sometimes with *Melaleuca leucadendra*, *Pandanus spiralis* and *Banksia dentata* Mid Woodland. This community generally occurred in pockets on permanent springs. Confined to the hills in the north-west corner of the study area on siltstone were communities 15 and 16. Community 15 was represented by *Eucalyptus brevifolia* Low Open Woodland and 16 dominated by *Melaleuca sericea* and commonly *Cochlospermum fraseri*, *Erythrophleum chlorostachys* and *Melaleuca minutifolia* Low Open Woodland.

Along the tidal fringes, supratidal flats and floodplains of the Bullo and Victoria rivers, several communities existed. The most widespread was community 26 comprising salt flats dominated by samphire shrubs and/or tussock grasses including *Xerochloa imberbis*, *Sporobolus virginicus*, *Tecticornia halocnemoides*, *Suaeda arbusculoides* and *Aristida latifolia* Low Open Tussock Grassland. Along the tidal creeks and tidal flats were mangroves dominated by *Avicennia marina* and *Excoecaria ovalis* Low Open Woodland (community 24). Communities adjacent to the supratidal flats, generally on marine plains or floodplains included 23 and 9. Community 23 usually occurred as monospecific stands of *Excoecaria parvifolia* Low Open Woodland. Other species that were common included *Bauhinia cunninghamii* and *Terminalia volucris*. Community 9 generally existed as linear fringes of *Melaleuca acacioides* subsp. *acacioides* Low Woodland to the samphire shrublands/tussock grasslands.

A community that was under sampled was community 29 – *Eucalyptus microtheca* Mid Open Woodland. This community occurred on heavy soils fringing swamps. It was only recorded once on the study area.

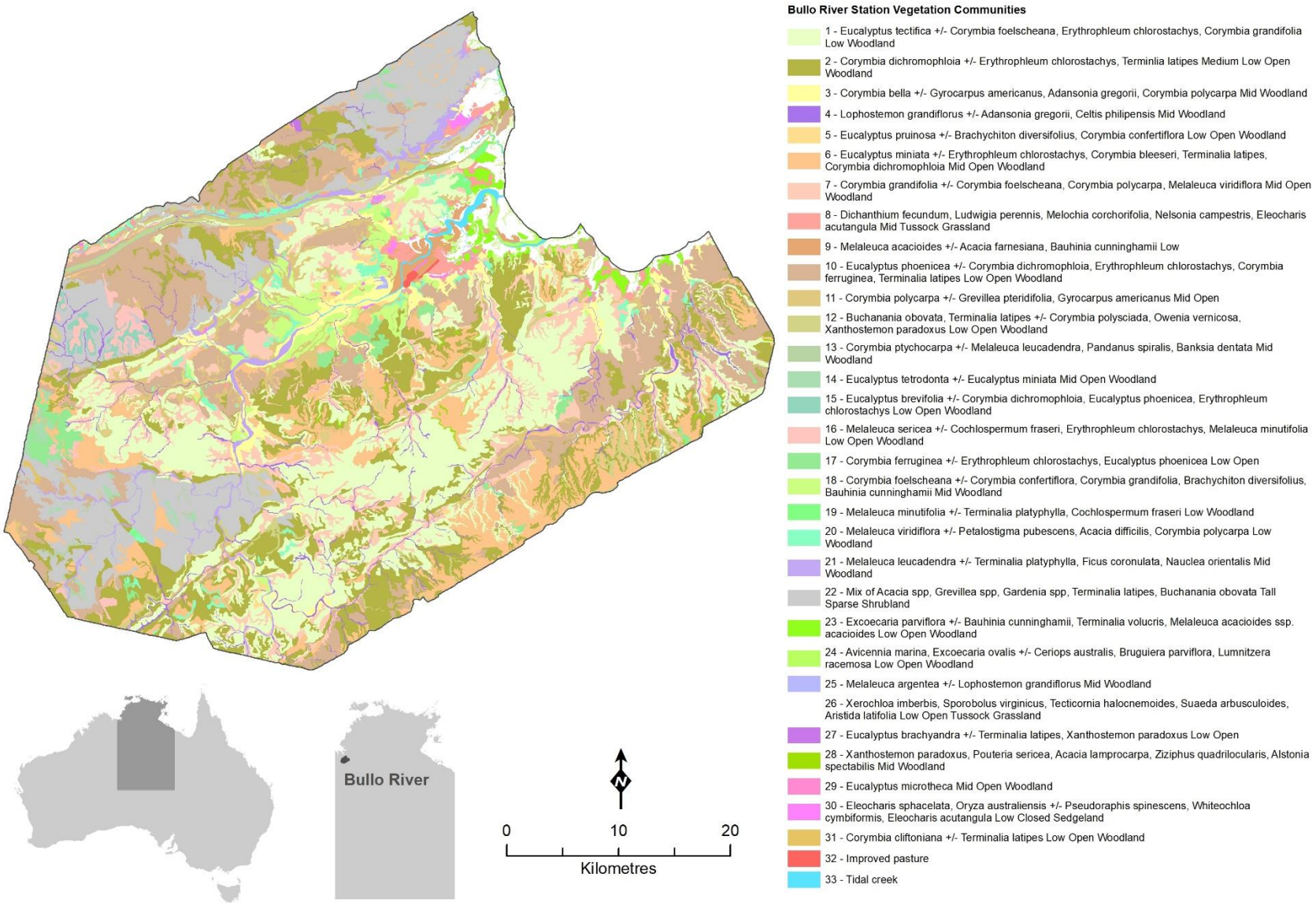

Figure S1. Vegetation community distribution on Bullo River Station (1:25 000 scale vegetation map). Vegetation community descriptions are provided in in the 'Vegetation community descriptions for Bullo River Station, and notes on landscape position' section.

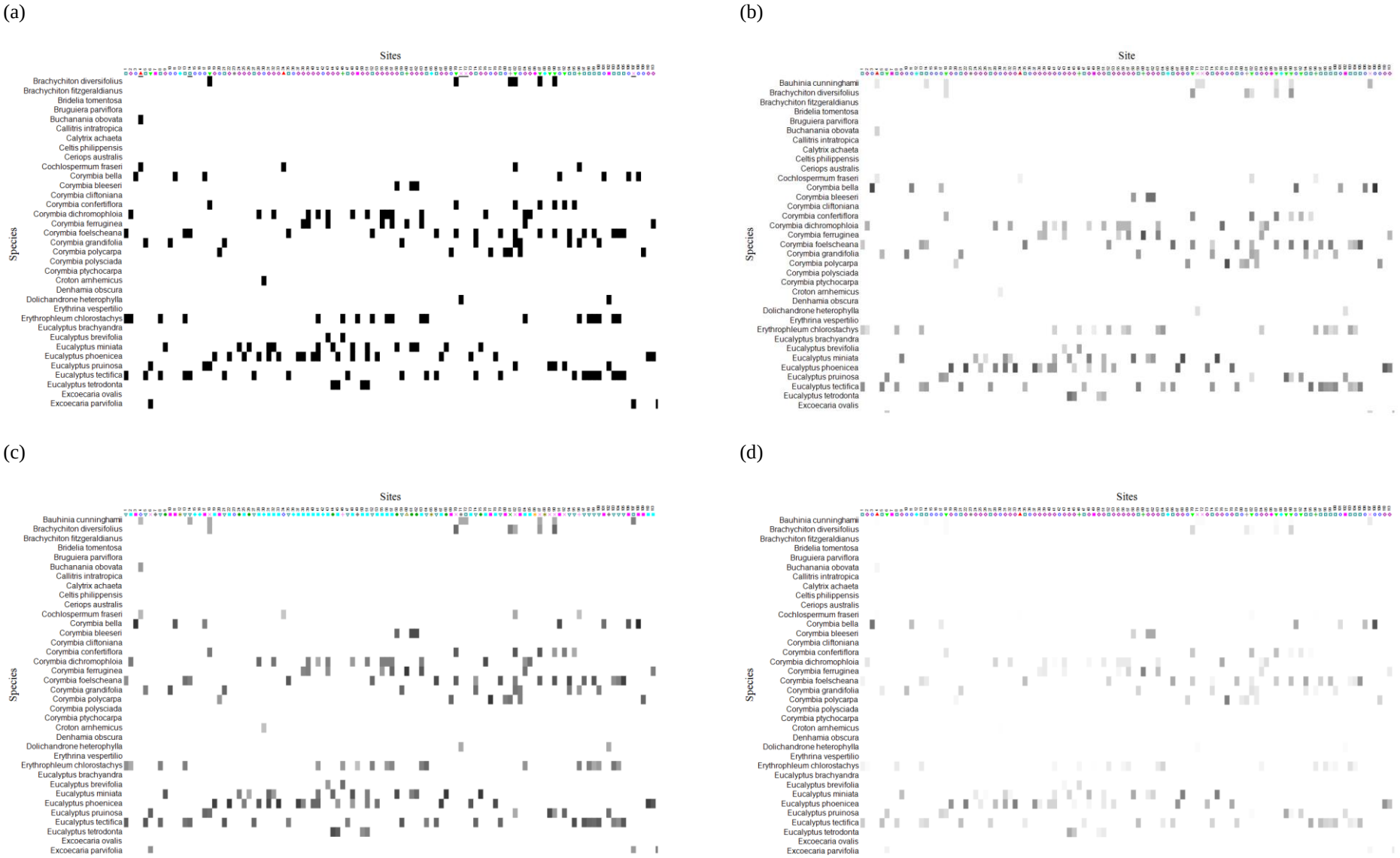

Figure S2. Shade plots illustrating the data matrix for a subset of the upper strata data in alphabetical order (for illustrative purposes) for the three pre-treatments (a) presence or absence, (b) square root, (c) fourth root, and (d) no transformation. The abundance for each species is represented by a grey scale, from white (absent) to black, with darker shades in each cell of the array representing higher abundances, and thus greater influence in the results of subsequent multivariate analysis.