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MUCHEA LIMESTONES - FLORISTICS

REPORT FOR ANCA NATIONAL RESERVES NETWORK

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INTRODUCTION

The Muchea limestones were first commented on by James Drummond, a colonial botanist, in a letter to Joseph Hooker (the Director of Kew) dated 15th January 1847. Current plant names are indicated in brackets.

" I visited Gingin a farm of Mr. W.L. Brockman's situated on a fine and ever running stream of purest water, a tributary of the Moore River. On the road to it I found an interesting species of *Genetyllis* (*Darwinia* sp "Muchea") with very small heath like leaves but with large heads of drooping flowers surrounded by ciliated bracts, an earnest or more important discovery twice made in this fine genus of Myrtaceae. I also found in the same locality an interesting plant belonging to the Scrophulariaceae (probably *Grattiola peruviana*) and a very distinct and showy species of *Grevillea* with linear leaves and scarlet flowers growing 12 or 15 feet high (*Grevillea evanescens - described* in 1994). On reaching the brook on which Mr. Brockman's farm is situated, I was delighted to find it in many places almost filled with a remarkable fern - a rare order in this part of New Holland. It resembled a good deal *Aspidium felixmas* (*Cyclosorus interruptus*, a normally tropical fern) but is a larger plant, bearing fructifications on the margins of the fronds. The stems creep mostly on the dead wood which is covered with the water of the brook. Mr. Brockman's farm consists mostly of remarkable hills of secondary limestone covered to a depth of several feet with rich black soil. Barley produces heavy crops on this soil, but for several years the wheat has suffered apparently from the ravages of fungus.

A Malvaceous plant, new to me, was abundantly in flower (probably *Alogyne huegelii*). These remarkable limestone hills abut on the common ironstone formation of the Darling Range."

Thus only 18 years after European settlement the uniqueness of this formation was recognised, but it was already being cleared for agriculture.

EXTENT OF THE FORMATION

McArthur and Bettenay (1960) in their landmark treatment of soils of the Swan Coastal Plain note

" Along the eastern section of the plain are sporadic deposits of limestone. These consist of soft porous, poorly bedded, clayey material often with a thin crust of travetine on the surface. The deposits occur as slight mounds a few feet above the surrounding country and are strongly suggestive of spring activity. The mounds may be seen from Muchea to Benger along a line parallel to the Darling Scarp and probably indicate the position of a fracture associated with the Darling Fault".(page 9)

These eastern side of the Plain limestone deposits or Muchea Limestones are mapped as discrete units in the Urban and Environmental Geology Map Series (Anon, 1976, a and b, 1977, 1978, Gozzard, 1982, a & b, 1983, a & b, 1986 and Jordan, 1986, a & b) occurring from north west of Gingin to north east of Forrestdale Lake. The greatest concentration of Muchea Limestone occurs to the north west of Gingin. The most westerly deposits occur along the Gingin Brook, a series of limestone mines indicating their presence.

Discrete units of Muchea Limestone are not mapped by Churchward and McArthur (1980) but the descriptions of the Yanga, Mungala and Bootine landform and soil units refer to the presence of marl (Muchea Limestone). The Mungala unit is predominantly 'plains dominated by shallow black clays on marl' and the area mapped under this unit has the greatest development of limestone (Map 1). Throughout this area today Muchea Limestone can be seen exposed in the cleared paddocks and is especially obvious in occasional limestone ridges and as large excavated boulders alongside drains and waterholes. Further south the surface expressions of the Limestones are progressively smaller in area and the deposits more isolated.

Vegetated areas of Muchea Limestone have been located from north of Gingin (31° 14' S and 115° 46' E) to the Passmore Street in the Gosnells area (System 6 Update, Department of Environmental Protection). While all of these occurrences are in the general area of mapped Muchea Limestones not all of them have been mapped.

All of the areas located are small in extent which is characteristic of vegetation remaining on the eastern side of the Plain (Keighery and Trudgen 1992, Gibson *et al.* 1994). It is estimated that 97% of the eastern side of the Swan Coastal Plain has been cleared (Department of Conservation and Land Management 1990). Drummond's 1847 letter comments on the early clearing for agriculture and many areas have been mined. No vegetated occurrences or obvious limestone areas have been located south of Gosnells. It is possible that all accessible deposits have been mined.

FLORISTICS AND STRUCTURE OF THE FORMATION

METHODS

This report is based on floristic and descriptive studies undertaken for the System Six Update (Department of Environmental Protection 1995), information gathered during the floristic survey of the Southern Swan Coastal Plain (Gibson *et al.* 1994) and species lists compiled for reserves under the National Reserves Network program (G.J. Keighery 1995).

Floristic sites have been placed in four locations on Beermullah West Road, Bootine Road, the Muchea townsite reserve and the Vines Estate in Guildford (Map 1). The occurrences of Muchea Limestone in Yurine Swamp Nature Reserve were too disrupted by mining to be used for site based studies. Site descriptions have been made on remnants along roads in the Gingin to Muchea area.

Additional flora data is derived from species lists for Yurine Swamp Nature Reserve (G.J. Keighery 1995), the Muchea townsite (B.J. Keighery 1995) and the locality in the Gosnells area (Trudgen and Keighery 1995, page 207 and 215).

STRUCTURAL VEGETATION FORMATIONS PRESENT

The vegetation of the Muchea Limestones does not appear to have been mapped previously as a distinctive vegetation unit on the large scale vegetation maps of the Swan Coastal Plain (Speck 1952 and 1958, Beard 1979a and b, Heddle *et al* 1980).

Speck (1952 and 1958) does not appear to have mapped this vegetation type. This possibly occurred as his 1952 study ended near Muchea, south of the most developed areas of Muchea

Limestone, detailed landform and soils maps were not yet available and because access to the poorly drained wet plains would have been difficult before the formation of all weather roads.

Beard (1979a and b) and Heddle *et al* (1980) map all known occurrences within broader units Beard (1979a and b)maps the occurrences as woodlands or wetland mosaic. Heddle *et al* (1980) maps them as part of the Bootine, Mungala, Yanga and Southern River Complexes. This is not surprizing as structural formations on the eastern side of the Coastal Plain vary greatly over very short distances, depending on the relief, type of soil, underlying soils and the degree of inundation (Keighery and Keighery 1991, Keighery and Trudgen 1992, Gibson *et .al.* 1994 and Trudgen and Keighery 1995).

The small Yurine Swamp Nature Reserve (Map 1) can be used to demonstrate this variation.. It is mapped either as wetland mosaic (Beard 1979a) or Bootine complex (Heddle *et al.* 1980), and is entirely within the Bootine soil unit of Churchward and McArthur (1983), but it contains at least seven distinct vegetation communities: the deep orange sand dunes which cover the limestone are clothed with *Banksia* woodland over heath, downslope a Marri (*Eucalyptus calophylla*) woodland occurs, this merges downslope to the remnants of a *Casuarina obesa* woodland over heath (this has been severely disturbed by mining for marl, the Muchea Limestone), *Melaleuca preissiana* low woodland, *Melaleuca rhaphiophylla* woodland around the lake, *Eucalyptus rudis* woodland, low heath on a clay flat, a lake with a western yellow sand dunes lunette with *Banksia prionotes* open woodland over *Chamelaucium uncinatum* . Most of these communities are affected by the presence of underlying limestone at various depths.

A series of structural formations are associated with the Muchea Limestones. These formations appear to be related to the depth and type of soil overlying the limestone and the degree of inundation.

The major structural formations on the best developed areas of Muchea Limestone are:
On rises with outcropping limestone:
Eucalyptus decipiens mallee over heath often dominated by *Melaleuca huegelii*
Melaleuca huegelii heath or shrubland over *Grevillea evansecens* and *Xanthorrhoea preissii*
On the wet flats:
Scattered *Casuarina obesa* over *Melaleuca lateriflora*, *Grevillea evansecens* and *Melaleuca viminea* shrubland and Herbs
Melaleuca huegelii, *Grevillea evansecens* and *Melaleuca* species shrubland and Herbs
Casuarina obesa open woodland over *Poa* grassland and Herbs
Creekline:
Eucalyptus rudis open forest over *Melaleuca rhaphiophylla* open low forest over shrubland over tall sedgeland and grassland.
Areas: Bootine Road, Beermullah West Road.

Where the limestone appears to be at greater depth, is more remote or the limestone area is geographically isolated from other limestone areas:
On sand dunes (often yellow or orange):
Banksia woodlands over heath
Acacia saligna shrubland over Herbs
Eucalyptus decipiens mallee
On damper sands over limestone:
Open Marri woodland over mixed shrublands usually containing *Melaleuca huegelii*, *Acacia saligna*, *Grevillea curviloba* and *Regelia ciliata.*
Areas: Yurine Swamp Nature Reserve , Bambun Road, Muchea, Vines and Gosnells

FLORISTICS

Species richness per 100 sq. metres varies from:

- 31 species on the drier rise to 40-58 on the wet flats in the Bootine and Beermullah West Road areas
- 31-41 species in the *Acacia* shrublands at Bambun and the Vines
- 47 - 57 species in the Marri woodlands from
- 74 species in the *Banksia* woodland at Yurine Swamp

Most sites have been only been sampled once.

Currently 160 taxa have been recorded from the 5 quadrats at the private land on Beermullah West and Bootine road, and 153 taxa from 4 quadrats at Muchea. This suggests that the vegetation formations characteristic of the Muchea Limestones have species richness more like the western Spearwood dunes (30-60 species per 100 square metres) than the uplands and clay wetlands of the eastern side of the Swan Coastal Plain (60-80 species per 100 square metres). However the combination of Muchea Limestones, clay based wetlands and *Banksia* woodlands greatly elevates local floral diversity as illustrated at Yurine Swamp with 299 taxa of vascular plant recorded from it.

HIGH FIDELITY PLANT SPECIES DEFINING THE MUCHEA LIMESTONES

There are 29 vascular plant species that are regularly associated with the occurrence of Muchea Limestones. These comprise one tree, two mallees, eighteen shrubs, six herbs and two grasses.

TREES
Casuarina obesa

MALLEES
Eucalyptus decipiens
Eucalyptus foecunda

SHRUBS
Acacia sp indet
Allocasuarina lehmaniana
Alogyne huegelii var *huegelii*
Baeckea robusta
Comesperma integerrimum
Darwinia sp "Muchea"
Diplopeltis huegelii
Dodonaea aptera
Exocarpus sparteus
Grevillea curviloba ssp. *curviloba*
Grevillea curviloba ssp. *incurva*
Grevillea evanescens
Hibbertia spicata ssp. *leptotheca*
Lechenaultia linearioides
Melaleuca acerosa
Melaleuca huegelii
Pimelea ferruginea
Stylobasium australe

HERBS
Apium annuum
Conostylis candicans
Halorhagis aculeolata
Senecio lautus ssp. *dissectifolius*
Thysanotus arenarius
Wilsonia humilis

GRASSES

Stipa flavescens
Poa s ? *porphyroclados*

Many of these taxa normally occur close to the coast on Tamala limestones, indeed most (*Allocasuarina lehmaniana*, *Baeckea robusta*, *Comesperma integerrimum*, *Dodonaea aptera*, *Eucalyptus decipiens*, *Eucalyptus foecunda*, *Exocarpus sparteus*, *Hibbertia spicata* ssp. *leptotheca*, *Lechenaultia linearioides*, *Melaleuca acerosa*, *Melaleuca huegelii* and *Pimelea ferruginea*) are listed as only occurring close to or on the the coast in the Flora of the Perth Region (Marchant *et al* , 1987). In several others (*Conostylis candicans*, *Halorhagis aculeolata* and *Alogyne huegelii*) there were scattered old collections, but their occurrence on this soil type was not documented (Keighery, 1990). It appears that several taxa (*Grevillea curviloba* ssp. *curviloba*, *Grevillea curviloba* ssp. *incurva*, and *Grevillea evanescens*) may be entirely or almost restricted to the Muchea Limestones.

Most of these taxa are endemic to the Swan Coastal Plain (Keighery, 1990), none are declared rare flora, but several are on CALM's priority list (CALM, 1995). The *Grevillea* taxa are all priority 1 and require urgent survey to determine if they should be declared rare.

It would seem likely that these species were able to colonise the Muchea Limestones by following the limestone cliffs found outcropping for considerable distances inland along the Moore (System six Update data), Swan (Keighery and Keighery, 1996) and possibly the Murray rivers (System six Update data).

CONCLUSIONS

The Muchea Limestones are a naturally uncommon geomorphic element of the Swan Coastal Plain. They have been poorly studied because of their size, access and absence from public lands. Occurrences are now critically rare because of destruction due to clearing for agriculture and mining. All known vegetated occurrences are on freehold land.

The best vegetated remnants in the most developed areas of the Muchea Limestones contain rises clothed with *Melaleuca huegelii* dominated shrubland or *Eucalyptus decipiens* mallee with adjacent wetlands dominated by *Casuarina obesa* woodland and/or mixed *Melaleuca* shrublands.

A series of vascular plants normally found on Tamala limestones close to the coast characterises these vegetation types. The species richness of these areas is also most similar to near coastal heathland communities.

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