A Brief Description of Soils from Gemco Wire-line Recovery Cores and from Deep Sand Auger Sampling in the Central Western Margin of the Cooloola Sandmass

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Introduction

The soils of the Cooloola dune systems (Thompson and Moore 1984) were described from samples to depths of up to 25 m using Dormer shell-type sand augers of 75 mm diameter. Good clean samples for laboratory analyses were obtained from the lower half of the shell auger, especially when the sands were moist but not saturated. The augers will not lift air-dry or saturated unconsolidated dune sands and in the latter case this reduced opportunities to procure clean samples of the Bh horizon of the giant humus podzols with perched watertables above the Bh.

While our practice was to refill auger holes immediately after sampling, we decided to plug one of the 18 m holes to perched water and continue drilling during the dry spring period. While this showed that the unlined holes were relatively stable for several months and drilling could be resumed by clearing out a metre or less of collapsed sand, the seasonal fall in perched water was insufficient to allow access to the Bh horizon. Also, there was a need for undisturbed samples of both Bh and Bhs horizons from the giant podzol forms for micro-morphological studies.

In late July 1975, a Gemco Wire-line Recovery drilling rig was obtained on loan from CSIRO Division of Soils, Adelaide to obtain cores for different projects in south-east Queensland, including the research at Cooloola. The rig was provided with auger flights for 10 cm diameter cores to about 20 m and 5 cm diameter cores to about 30 m depth. Five holes were drilled in the central western section of the Cooloola sandmass and nearby coastal plain, two in giant humus podzols, one in a giant podzol and two in humus podzols. Brief descriptions of these cores are provided here together with descriptions of two sand auger holes to depth in giant humus podzols.

Descriptions of cores and samples

Nilkan humus podzol:	B861 Nilkan Soil Landscape	28-07-1975
Location:	Noosa Plain, low gradient alluvial fan forming the interfluve between Teewah and Carland Creeks. Australia Topographic Survey 1:50 000 Cooloola 022 216	
Elevation:	25 m (map spot height)	
Vegetation:	Open *Melaleuca quinquenervia* woodland over wet heath	

Depth m	*10 cm wire-line cores*
0.0 – 0.45	Very dark brownish grey sand with diffuse organic

	matter, grading to brownish grey and light brownish grey sand
0.45 – 0.70	Very light brownish grey grading to white wet sand, perched organic stained water
0.70 – 0.75	Black cemented organic sand hardpan. Bh horizon of humus podzol cemented by organic aluminium complex (Farmer *et al*. 1983)
0.75 – 1.20	Brown with vertical black streaks cemented sand hardpan, proto-imogolite allophane complex cementation (Thompson *et al*. 1996)
1.20 – 1.90	Very light grey-brown with yellowish and brownish patches fine sandy clay loam with fine sandy clay bands at depth; very wet below 1.9 m
1.90 – 2.55	Black organic sandy loam; very wet (coarser sand than above >200µ) occasional very light grey-brown sand band 1 cm thick
2.55 -	Watertable
2.55 – 5.00	Grey-brown saturated sand (grain size >200µ), water stained with organic compounds (Bore G14 at 3.5 m, in Reeve *et al*. 1985), water under slight head flows up casing. Drill on with plug bit. Some clayey bands below 4.5 m
5.00 – 9.70	Wire-line cores in light grey wet sandy medium clay, few rusty rootlines and saturation along cleavages
9.70 – 11.00	Light grey sandy clay with yellow-brown mottling along cleavage lines
11.00 – 12.50	Light greenish grey, mottled with yellow-brown and grey, sandy clay loam of very weathered sandstone with some ?feldspar, greenish gleying in cleavages and yellow-brown mottling within peds. Continuing below 12.5 m

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Teewah Creek humus podzol: Noosa River Soil Landscape 30-07-1975

Location: Western bank of Teewah Creek at old Forestry bridge at about 25 m south of road. Australia Topographic Survey 1:50 000 Cooloola 039176

Elevation: 10 m (map spot height)

Depth m	*Material on auger flights*
0.0 – 0.40	Dark brownish grey sand with diffuse organic matter, grading to:
0.40 – 1.40	Very light grey-brown and off-white sand grading to wet sand with perched organic stained watertable at 0.70 m
1.40 – 2.00	Dark grey-brown wet sand stained with organic compounds (described from material on auger flights from below 1.4 m)
2.00 – 9.00	Very dark grey-brown wet sand stained with organic compounds (?Bh horizon of young humus podzol, some quartz grit and fine gravel (alluvium from sandstone) between 5 and 8 m depth
9.00 – 10.50	Very dark brown wet sand (probably Bh horizon of humus podzol). Continuing below 10.5 m but note that weathered sandstone rises to within 0.5 m of the soil surface on the plain about 500 m NE of this site

Milo giant humus podzol:	B862 Kabali Soil Landscape	05-08-1975
Location:	Gently sloping crest of broad whale-back sandhill about 450 m south-west of Camp Milo. Australia Topographic Survey 1:50 000 Wide Bay 074244	
Elevation:	About 70 m (deduced from map contours)	
Vegetation:	Disturbed shrubby woodland with *Eucalyptus signata, Banksia aemula, Allocasuarina littoralis*	

Depth m	*Sand auger/10 cm wire-line cores*
0.0 – 0.75	Dark brownish grey sand with diffuse organic matter, grading to brownish grey and light brownish grey unconsolidated sand
0.75 – 11.10	Off-white grading to white sand, unconsolidated weakly coherent moist aeolian sand grading to wet sand
10.50 -	Top of perched organic stained watertable
11.10 – 11.21	Light grey-brown to very light brown with few dark

	brownish grey organic enriched patches of clayey sand (10% clay, 20% silt size fractions) firm vesicular pan becoming firmer with depth (particle size compaction pan, e.g. see Thompson *et al*. 1996)
11.21 – 12.00	Black cemented organic sand hardpan, cemented by organic aluminium complex, Bh horizon of giant humus podzol
12.00 – 13.00	Dark brown (toffee brown) with black streaks cemented sand hardpan, (probably proto-imogolite allophane complex cementation)
13.00 – 23.75	Wire-line recovery will not latch. Plug bit in 5 cm wire-line auger flights through wet grey-brown sands with some harder dark grey bands as indicated by material on the retrieved auger flights. When the plug bit was pulled at 23.75 water and grey-brown sand rose rapidly up the coring barrel implying that we had entered the main aquifer. However, the bore was cased to 13.50 m and later sampling yielded organic stained water (Bore G7, Reeve *et al*. 1985). See also soil description Kabali 3, pp. 46-47, Thompson and Moore 1984)

Seary's giant humus podzol: Kabali Soil Landscape 07-08-1975

Location:	Crest of high whale-back sandhill about 2 km north-west of Camp Milo and 0.75 km south of bridge over Seary's Creek, Rainbow Beach Road and at junction with track to Poverty Point. Australia Topographic Survey 1:50 000 Wide Bay 070263
Elevation:	About 45 m (deduced from map contours)
Vegetation:	Shrubby woodland with *Eucalyptus signata, Banksia aemula,*

Depth m	*Sand auger/wire-line cores*
0.0 – 0.80	Dark brownish grey with diffuse organic matter, grading to brownish grey and light brownish grey unconsolidated sand
0.80 – 9.75	Off-white grading to white loose sand drilled by sand auger but will not lift from below 9.76 m. Gemco drilling from 9.8 m
9.80 – 14.70	White very loose sand becoming wet with organic

	stained water below 14.25 m
14.70- 14.90	Black to light brown saturated organic sand, coherent (?weakly cemented) Bh horizon of giant humus podzol
14.90 – 15.75	Dark brown (toffee brown) cemented sand hardpan (very firm to drill) probably proto-imogolite allophane complex cementation
15.75 – 17.50	Brown to dark brown pan materials separated by thin 1-2 mm thick black pans (Fe and ?Mn), saturated but apparently still firm and coherent sand layer, aeolian quartz grains including some rose quartz and what looks like feldspar. Continuing below 17.5 m

Warrawonga giant podzol: B849 Warrawonga Soil Landscape 31-07-1975

Location: Dune floor near apex of Pleistocene large parabolic dune. Australia Topographic Survey 1:50 000 Cooloola 088208

Elevation: 210 m

Vegetation: Very tall forest: *Eucalyptus pilularis, E. intermedia, Allocasuarina torulosa, Banksia aemula*

Depth m	*Sand auger/wire-line 10 cm cores*
0.0 – 1.20	Dark brownish grey sand with diffuse organic matter, grading to brownish grey and light brownish grey unconsolidated aeolian sand
1.20 – 4.60	Very light grey-brown to off-white loose sand drilled by sand auger. Gemco 10 cm wire-line cores below 4.6 m
4.60 – 5.50	Very light grey-brown with a few brownish and yellowish small patches unconsolidated sand Bhs1 of giant podzol
5.50 – 6.60	Yellowish brown with many dark brown and very dark brown organic patches, weakly coherent sand with organic compounds pipey Bhs2horizon of giant podzol
6.60 – 7.50	Light yellowish brown with some brown organic patches unconsolidated sand Bhs3 horizon of giant podzol
7.50 – 8.60	Light yellowish brown unconsolidated aeolian sand

8.60 – 8.70	Light yellowish brown with inclusions of white sand and sharp diagonal boundary
8.70 – 9.90	Black organic sand with white inclusions grading to black and yellow-brown weakly consolidated sand. Initially interpreted as truncated Bhs2 of a buried giant podzol with a few dead roots at 9.3 m but more likely an extension of the pipey Bhs below 5.5 m similar to that exposed at Sea Cliffs
9.90 – 11.00	Reddish brown, and brown sand with black organic patches grading to light yellow-brown sand with few brown patches
11.00 – 25.50	Light yellow-brown unconsolidated aeolian sand, continuing below 25.5 m

Dwarf Kabali giant humus podzol (?): Kabali Soil Landscape 29-02-1980

Location: Gently sloping crest of long sandridge in whale-back sandhills. Australia Topographic Survey 1:50 000 Cooloola 062203

Elevation: Above 60 m but probably slightly lower than Cooloola 065206 site

Vegetation: Dwarf shrubby woodland with multi-stem *Eucalyptus signata, E. intermedia, Banksia aemula* 2-4 m over heath

Depth m	*Sand auger samples*
0.0 – 0.45	Off-white sand with grey-brown diffuse organic matter grading to white unconsolidated aeolian sand
0.45 – 20.00	White unconsolidated aeolian sand, occasional fine root discolouration as yellowish or reddish spots between 10 and 16 m. Wet sand at 20 m will not lift; top of perched watertable; auger hole plugged at surface. Boring continued 11-09-1982
20.00 – 21.50	White moist sand becoming wet with depth and will not lift; top of perched organic-stained watertable at 23.5 m. Auger hole plugged and boring continued 05-09-1984
21.50 – 23.50	White moist sand grading to wet sand which will not lift; top of perched organic-stained water-table.

	Continuing below 23.5 m. Interpreted as organic stained water perched on black cemented organic sand hardpan (Bh horizon of giant humus podzol as seen elsewhere)

Dwarf Kabali giant humus podzol (?):	Kabali Soil Landscape 16-01-1986
Location:	Flat to gently sloping crest of long sandridge in whale-back sandhills. Australia Topographic Survey 1:50 000 Cooloola 065206
Elevation:	Above 65 m (deduced from map contours)
Vegetation:	Dwarf shrubby woodland with multi-stem *Eucalyptus intermedia, E. signata, Banksia aemula* 2-4 m tall over heath

Depth m	*Sand auger samples*
0.0 – 0.30	Light brownish grey sand with diffuse organic matter, grading to very light brownish grey unconsolidated aeolian sand
0.30 – 1.00	Off-white grading to white unconsolidated aeolian sand
1.00 – 14.50	White unconsolidated aeolian sand
14.50 – 24.35	White sand with occasional pale yellow spots (5-8 mm diameter), aeolian sand continuing to below 24.35 m. No evidence of perched water to this depth. White sand is as seen elsewhere in giant humus podzols and presumably overlies a black cemented organic sand hard pan (Bh horizon) at depth

Acknowledgements

I thank Mr J. Mc. Thompson, CSIRO Division of Soils, Adelaide, for operating and maintaining the Gemco drilling rig; Mr D.J. Ross, CSIRO Division of Soils, Brisbane, for the sand auger drilling and assistance during the Gemco drilling; and Mrs Kerrie Short, CSIRO Land and Water, for entering the manuscript on computer disc.

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