

NOMENCLATURE OF CERTAIN TERTIARY SEDIMENTS NEAR MELBOURNE, VICTORIA

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Summary

In and around Melbourne are ferruginous sands and gravels popularly known as 'Red Beds', and for this lithological unit the formational name 'Sandringham Sands' is proposed. The bayside cliff at Red Bluff, Sandringham, is named as the type section. Palaeontologists have referred fossils from various parts of the formation to the Balcombian, Cheltenhamian, and Kalimnan Stages; the formation includes the type section of the Cheltenhamian Stage. To the north, these sands are covered by Newer Basalt, and to the south by fine grey aeolian sands.

Definition of Formation

Common in the geological literature of the Melbourne area are references to the 'Red Beds', so named by Hall, who nevertheless expressly stated that he was not thereby proposing a formational name (1909, p. 11). In any case, the name 'Red Beds' does not conform to the standard of stratigraphical nomenclature now being adopted (Glaessner *et al.* 1948), and so it is hereby proposed that the name 'Sandringham Sands' be employed.

The Sandringham Sands consist of a lithological unit readily recognized in the field, and are mapped herewith (Fig. 1).

The formation comprises clayey sands, sands, grit, and gravels stained and cemented to varying degrees by ferruginous infiltrations, hence the colour which suggested the name 'Red Beds'. The Sandringham Sands outcrop prominently along the north-eastern shore of Port Phillip Bay between Melbourne and Mordialloc, and in numerous road and rail cuttings and in quarries as far inland as Doncaster. The name is limited to the area mapped because more or less continuous sediments are present, so that there is no doubt about the deposits belonging to the one formation.

The type section for the Sandringham Sands is Red Bluff, Sandringham, where a shoreline cliff 80 feet high provides a greater exposure of stratigraphical thickness than anywhere else (Plate X). Selwyn's maps accompanying his earliest reports on the Melbourne area (1854, 1856) refer to this cliff, and Hart (1893, p. 157), Hall and Pritchard (1897, pp. 201-202), Daintree (1897, p. 3), and Hall (1909, p. 12) all refer to this conspicuous outcrop when describing or referring to the beds now called the Sandringham Sands. The base of the formation is not seen at Red Bluff, where an ironstone band occurs at sea level, but it is seen at a number of other places, the best known being the Royal Park railway cutting near Flemington. The Red Bluff cliff is capped with the younger fine grey aeolian sand which covers the whole terrain in this area.

On the Quarter Sheets of the Geological Survey of Victoria from 1858 to 1893 appear the names 'Flemington and Upper Brighton beds', 'Brighton beds' and

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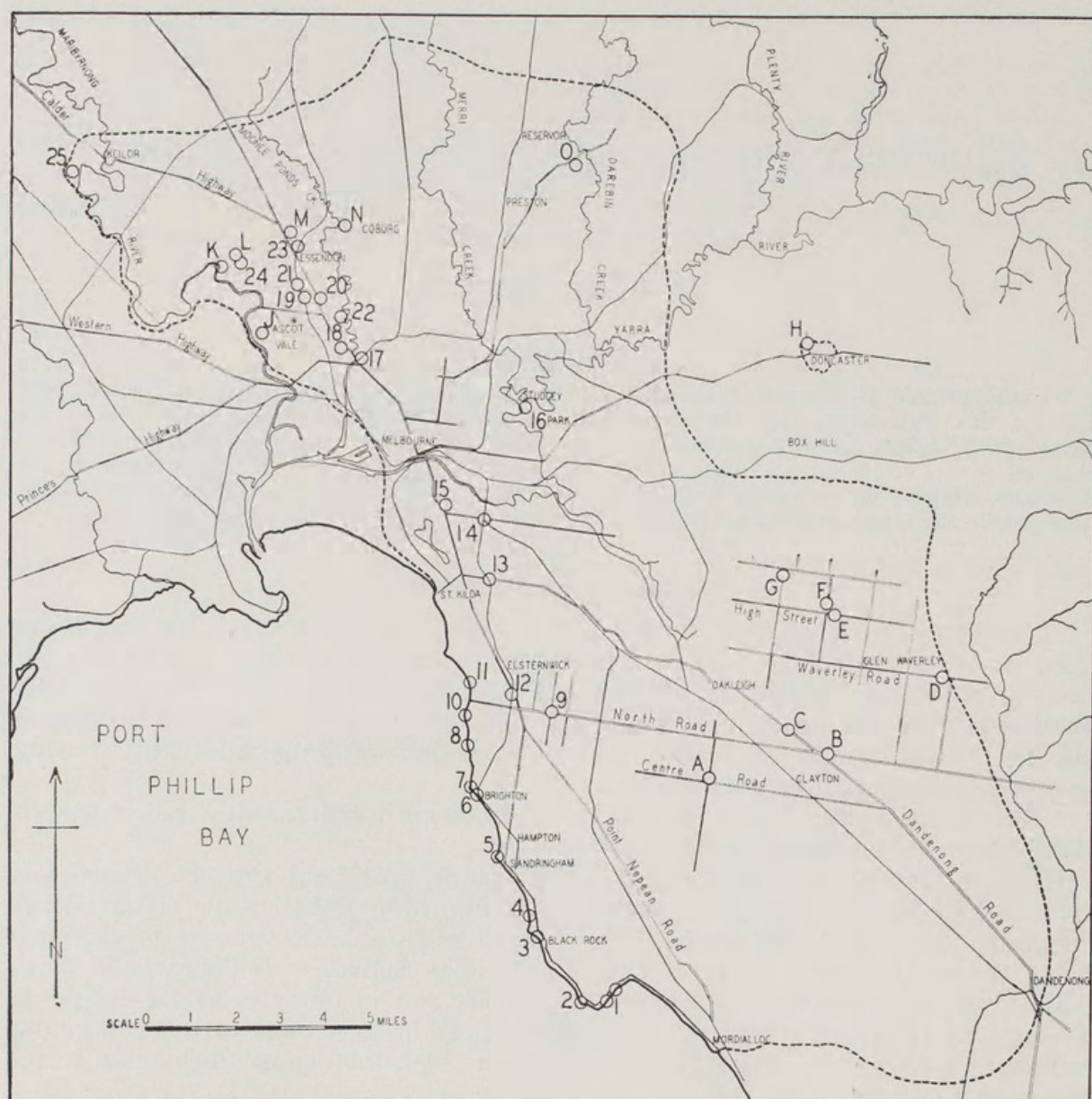


FIG. 1.—The dotted line shows the approximate limit of occurrence of the Sandringham Sands, as proved to exist below Newer Basalt and aeolian sands. The numbers 1-25 indicate the fossil localities as listed in the paper. Some of the main outcrops of the Sandringham Sands from which fossils have not been collected are indicated by letters as follows:

- A. Near intersection of Centre Road and Warrigal Road.
- B. Wellington Road, just east of Dandenong Road, Clayton.
- C. Dandenong Road, near Park Street, Oakleigh.
- D. Waverley Road, west of Lumm's Road, Glen Waverley.
- E. High Street, east of Stevenson's Road, Mt. Waverley.
- F. Stevenson's Road, north of High Street, Mt. Waverley.
- G. Box Hill Road, just south of Boundary Road, Burwood.
- H. Doncaster.
- J. Angler's Parade, Ascot Vale.
- K. Horseshoe Bend, Maribyrnong River, West Essendon.
- L. Hoffman's Road, 200 yards north of Buckley Street, West Essendon.
- M. Glen Street, Glenbervie.
- N. Reynard's Road, West Coburg.
- O. Plenty Road, North-East Preston.

Some of these localities have been mapped and described by Dr. D. E. Thomas (1947).

'Lower Brighton beds'. The names do not appear in the associated literature. For example, Selwyn, the Geological Surveyor of the Colony then, did not use it himself in his reports, or even in the section near Keilor published in the text of his 1856 report on the geology of the Port Phillip area. R. A. F. Murray (1887) wrote a book outlining the geology of Victoria when he was Geological Surveyor; it was published by the Government, but the above names were not used. As far as the writer can discover, the names have not appeared in press since 1893.

The Quarter Sheet covering Brighton was never published. It would appear that these names were used in a generalized manner, and not as strict formational names; it may be significant that the word 'beds' is always spelt with a lower case initial.

Early writers refer to the 'Brighton Cliff' (i.e., from Elwood to Mordialloc) with special mention of Red Bluff. The former was clearly the type section (as we would call it), and the latter the type locality. In those early days there was no name 'Sandringham', e.g., 'Brighton' and 'Moorabbin' are the only two names appearing in Selwyn's 1854 and 1856 maps of that area.

The type section and locality of the earlier writers are hereby adopted, and the name Sandringham Sands introduced for the beds underlying the grey sands, and overlying the limestone. The name 'Brighton Beds' could be conveniently retained in the term 'Brighton Group' to refer to all the beds outcropping in the cliff sections.

Literature

The Sandringham Sands have been widely referred to in literature, and so a selection is made relevant to the present purpose. Selwyn (1854, 1856) mapped 'horizontal stratified fossiliferous beds of red ferruginous mottled and chocolate coloured sand and sandstone commonly very soft and friable, often containing nodules and concretions of hard metallic-looking ironstone, and thick beds of very hard ferruginous quartz grit or fine conglomerate'. Thickness exposed in the Brighton Cliffs 50'-80'. Moreover, in the earlier paper, Selwyn also published in the text a section near Keilor showing:

Newer Basalt
Tertiary gravel (Sandringham Sands)
Palaeozoic Bedrock (Lowest).

When describing the rocks of the Brighton and Moorabbin districts, Hart (1893) distinguished the following:

Upper sand (loose, white)
Lower sand (compact, ferruginous)
Ironstone (lowest),

He held (erroneously) that there is an unconformity between the lower two units, and it is these which constitute the Sandringham Sands. Hall and Pritchard (1897, p. 190) pointed out that the supposed unconformity was cross-bedding. Notes on the lithology were given; 24 fossil localities (mostly in what are now called the Sandringham Sands) were listed, and palaeontological determinations provided. Hall (1890) and Grant (1901) described the exposures in the Royal Park railway cutting. Pritchard (1901) pointed out that different palaeontological horizons are present in the one formation.

It was Hall who in 1909 first used the name 'Red Beds' while setting out a systematic account for non-scientific readers of what is now called the Sandringham Sands. He drew a section from Picnic Point, Hampton, to Cotham Road, Kew, showing how these and other sediments rest on a sloping plain cut in the Silurian bedrock. Armitage (1910a) figured and described cross-bedded ferruginous sands on the Saltwater (Maribyrnong) River, and then later (1910b) described the deposits in greater detail, illustrating thin sections of the rocks.

Pritchard (1910) published an account of the geology of Melbourne, and showed outcrops of the Sandringham Sands in photographs of the Horseshore Bend on the Maribyrnong River (p. 78), Royal Park railway cutting (p. 86), Point Ormond (p. 152), maps showing this formation in the Studley Park (p. 132) and Botanical Gardens (p. 148) areas, and sections of the Maribyrnong River (p. 76) and the Royal Park cutting (p. 92). Hauser (1923) mapped at Studley Park sediments now referred to the Sandringham Sands, as also did Hills later (1940a), while Chapman (1923) claimed to determine a sea-urchin from there. Singleton (1923) likewise mapped the Royal Park area, and listed the fossils found in the Royal Park cutting.

Further north at Keilor are fossiliferous sands belonging to the new formation, and these were mapped and described by Miss Crespín (1926). Hills (1940b) figured (p. 274) sands at the West Essendon sand pits where they are covered with Newer Basalt and display strong current bedding in otherwise horizontal sediments. Hanks (1934) showed the extent of these sediments under Melbourne's northern suburbs.

Singleton (1941), in his account of the Tertiary geology of Australia, selected part of the exposure of the Sandringham Sands at Beaumaris (Pl. 2, fig. 2) as the type locality for a new stage which he termed the Cheltenhamian, and to which he ascribed an Upper Miocene age. In 1944 Mrs. Whincup published an account of the superficial sands which in the Melbourne-Frankston area overlie the Sandringham Sands.

ROCK UNIT	TIME UNITS		
SANDRINGHAM SANDS	PLIOCENE	Lower	KALIMNAN ↑
		Upper	CHELTENHAMIAN
	MIOCENE	Middle	BALCOMBIAN

FIG. 2

Age of the Formation

Although the Sandringham Sands are a lithological unit conforming with the requirements for the definition of a formation, these sediments were laid down over a considerable period of time, as is represented diagrammatically in Fig. 2. The Stage names and the ages attributed to them are after Singleton (1941).

Fossiliferous beds at the base of the formation at Royal Park have been referred to the Balcombian Stage. The Upper Beds at Royal Park and beds exposed at Beaumaris are of Cheltenhamian age. Fossil localities in intervening places have been referred to the Kalimnan Stage. The writer knows of no fossiliferous horizon at the top of any section, and so it is not known with accuracy how far up the time scale the formation extends, hence the arrow in the top right hand corner of Fig. 2.

Immediately under the Sandringham Sands at Keilor (Crespin 1926, Singleton 1941) are limestones of Batesfordian age, but ~~no~~ fossils of this or earlier time have been found in the Sandringham Sands. However, the fact that red sands at Greensborough occur under the Older Basalt and at Doncaster stand on the Nillumbik Peneplain (Jutson 1910, Gill 1949) indicates that they belong to the pre-Older Basalt cycle, which is generally regarded as Oligocene. It may prove that the more seaward deposits are re-distributed Oligocene sands.

The following fossil localities in the new formation have been, or are now, recorded:

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| 1. Beaumaris | Hall and Pritchard 1897, Singleton 1941 |
| 2. Rickett's Point | Hall and Pritchard 1897, Singleton 1941 |
| 3. Black Rock | Gill 1950 |
| 4. Red Bluff, Sandringham | Hart 1893, Hall and Pritchard 1897 |
| 5. Picnic Point, Hampton | Hall and Pritchard 1897 |
| 6. South of Brighton Beach | Gill 1950 |
| 7. Brighton Beach | Hall and Pritchard 1897 |
| 8. Park Street, Brighton | <i>Ibid.</i> , Hart 1893 |
| 9. North Road, Brighton | <i>Ibid.</i> |
| 10. Bay Street, Brighton | <i>Ibid.</i> |
| 11. Park Street, Elsternwick | <i>Ibid.</i> |
| 12. Asling Street, Elwood | <i>Ibid.</i> |
| 13. Dandenong Road, Windsor | <i>Ibid.</i> |
| 14. Near South Yarra railway station | <i>Ibid.</i> |
| 15. Domain road, South Yarra | <i>Ibid.</i> |
| 16. Studley Park (?) | Chapman 1923 |
| 17. Royal Park railway cutting | Hall and Pritchard 1897,
Pritchard 1910, Singleton 1941 |
| 18. West of Royal Park ('Flemington') | Hall and Pritchard 1897 |
| 19. South end Moonee Ponds railway station | Pritchard 1901 |
| 20. Corner Mt. Alexander and Pascoe Vale Roads (= Moonee Ponds Town Hall) | Armitage 1910b |
| 21. Corner Ardmillan Road and Taylor Street, Essendon | Armitage 1910b |
| 22. Brunswick Road, Moonee Ponds | Hall and Pritchard 1897,
Pritchard 1910 |
| 23. Near Essendon railway station | Hanks 1934 |
| 24. West Essendon | Armitage 1910b |
| 25. Green Gully, Keilor | Officer 1893, Hall and Pritchard 1897, Crespin 1926 |

Facies

The presence in places of coarse gravels, the poor sorting of the sediments as a whole, and the frequency of strong cross-bedding indicate a shore line deposit. They constitute a contrast with the clays, marls, and limestones which preceded them. In the large sand pit in Hoffman's Road, West Essendon, the sands and gravels are horizontal on the whole, but dips ranging up to 23° persist for distances up to 20 yards and to a stratigraphical depth of 10 feet. The finding of freshwater spicules and leaves (Hanks 1934, pp. 145, 148; Crespin 1926, p. 107) wood (Hart 1893; Crespin 1926, p. 106), and a freshwater shell (Crespin 1926) fits the interpretation of the Sandringham Sands as estuarine and near-shore in facies. Most of the fossils are marine, but they include shallow water forms like *Haliotis*, and the intertidal form *Patelloida*.

Fossils are common in the Sandringham Sands in certain limited horizons and localities, but taken as a unit the formation is not a very fossiliferous one. More often than not the fossils are found in pockets, which indicates that they were swept together into hollows in the sea-floor by currents, then covered by other sediments and so preserved. In other words, these fossil localities are thanatocoenoses and not biocoenoses.

Generalizing, it may be said that the formation possesses a smaller percentage of silica and a greater percentage of clay as one crosses it from the inland edge towards the sea, suggesting a normal gradation in facies. Some of the clays found to the south of the Sandringham Sands may well prove to be a formation contemporaneous at least in part with the former.

In most places the Sandringham Sands are covered with younger rocks, and so the map (Fig. 1) is largely a list of localities. The overlying deposits consist chiefly of Newer Basalts in the more inland areas (see the Mines Department Geological Map of Melbourne and Suburbs), and of aeolian sands in the bayside suburbs (Whincup 1944). The aeolian sands are probably derived from the Sandringham Sands, but are lithologically quite distinct.

Acknowledgment

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Figures 1-2 were drawn by Mr. J. J. Jenkin, of the National Museum, under the direction of the author.

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