DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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SIMPSON DESERT SAND COLOUR - NOTE

GEOLOGICAL SURVEY

by

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REGIONAL GEOLOGY

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ABSTRACT

Colour of mobile Simpson Desert dune sands varies from light brown in the playa region north of the Kallakoopah, to dark red brown and red to the northwest and west, confirming previous less detailed observations. A source in younger (largely Holocene) material from the Kallakoopah - Warburton River system is suggested for the younger dunes, and older reddened sediments for the darker dunes.

INTRODUCTION AND PREVIOUS WORK

Wasson (1982), from a limited number of dune sand samples, suggested among other conclusions that there was a distinct difference in colour between dunes of the playa region of the Simpson Desert and those of the western and northwestern part of the desert. Sands in the playa region appeared to be lighter than those in the area dominated by dunes, previously empirically noted by Krieg and Callen (1980). Observations by Callen (Krieg and Callen, 1980) showed thicker sand cover and more closely spaced dunes in the west and northwest compared with the playa region. Among the playas, outcrops of more indurated dune cores and gypsified fluvial and lacustrine(?) sediments are commoner, and these are generally of 8-10 hue on the Munsell chart (yellowish brown). Thus more extensive exposure of lighter coloured source materials is the norm in the playa region. Wasson accounted for the colour differences in terms of greater iron content for dunes in the dunefield proper, as against the playa region and areas near watercourses. He concluded that "reddening of dune sand in the Simpson -

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Strzelecki Dunefield largely occurred prior to dune construction. The red dunes are built of pre-reddened sediments while the pale dunes are built of pale sediments. Both bodies of sediments were derived from different sources, so that dune colour ultimately reflects source sediment provenance." Higher content of clay pellets in the lighter dunes could also be a factor.

METHODS

Samples were collected by C.Mills (see acknowledgements) from sand dunes and some interdune material from the southern Simpson Desert between Purni Bore and the Poeppels Corner track. These were colour coded by one of us (M.G.F.), using the Munsell soil colour chart, in the same manner as described by Wasson (1982). Locations were plotted on 1:50 000 and 1:100 000 base maps with accurate dune topography.

RESULTS (Fig. 1)

The sampling demonstrates that hue is clearly differentiated between the playa region and the dunefield proper (Fig. 1), being 6-10 YR for the playa region and 2.5 to 6 YR for the dunefield. This applies to both interdune and dune crest samples. Value also differs, with a tendency towards 6-7 (lighter) in and near the playa region and 4-5 (darker) to the west. Chroma is constant around 5-6. Thus colours trend from dark red to reddish brown in the dunefield proper through to light brown in the playa region dunes. The interdune areas are less reddish and paler in colour. Overall, the change seems gradational from the lighter and browner sands near the Kallakoopah to the redder and darker sands of the northwest dunefield. There appears to be some intermixing of colour types

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between the western margin of the playa region and the dunefield proper further north and west, which is physically clearly defined. More detailed sampling in this area is needed; it is not known whether individual dunes change colour gradually along their lengths across this boundary, or whether light and red dunes are distinct but intermixed. One of us (RAC) and other geologists who have worked in this area have not noticed any obvious colour differences between adjacent parallel dunes. Observations by RAC at Lake Frome in the Strzelecki Desert, however show dune colour can change rapidly along a dune.

A selection (6 samples) of pale coloured dune and interdune sediments was examined in refractive index oils for clay pellets, but none could be found. Hence it is assumed colour differences result essentially from the presence or absence of iron coatings, as described by Wasson (1982).

DISCUSSION

The paler and browner sand colour in the playa region can be quite readily related to the substrate together with the contribution of sand from the former watercourses of the Kallakoopah/Warburton system which produced the playas. (Wells & Callen 1986, pp. 50-55).

The origin of the redder sand is more difficult to determine as there is little outcrop between the dunes in the dunefield proper. Wasson (1982) implies the sediments from which this red sand was derived must be redder than those of the playa region. Perhaps there is a greater preponderance of iron crusts in the Cainozoic sediments beneath this part of the desert. Southerly migration of the Kallakoopah/Warburton system across this area could have eroded these crusts from the playa region, alternatively they could be buried beneath more recent sediment deposited by the streams. The latter is more likely in view of the suggested structure (Krieg & Callen 1980, Fig.3)1 and downwarping in the playa region. The suggestion, therefore, is that the dunes in the playa region are derived from more recently deposited lighter coloured sediment.

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The rapidity of the colour change between dunefield and playa region is not clear. Dunes in the western dunefield area appear to remain uniformly dark red to reddish brown until close to the edge of the playa region, but this may be caused by lack of ability of the human eye to distinguish the darker red colours (the eye is known to be insensitive in this range) and/or the sample line in the western desert being oriented roughly parallel to hue contours.

The older, redder source-sediments may now be found either beneath the red dunes or to the south of the playa region. Such sediments are found at Lake Pirriepatchillie (Krieg & Callen 1980)1 in the lower parts of cliffs along the Warburton River (Tedford, Williams & Wells, in Wells & Callen 1986) and at Lake Palankarinna. At Lake Pirriepatchillie a bright red brown ferruginous stain is developed in the top of white sands. At the other localities red Tirari Formation (Stirton et al.1961), a Pleistocene fluvial unit deposited under arid conditions, is well developed, though this is fine-grained. These sediments are now extensively gypsified.

It is useful to compare these red dunes with an area of red dunes much further south where substrate geology is better known. In the Olympic Dam - Stuart Creek area of Andamooka and Curdimurka sheet areas, red dunes are very prominent. A source of red sand is readily available in the friable, intensely ferruginised Tertiary sandstones (Watchie Sandstone, Ambrose & Flint 1981) which form a thin sheet underlying most of the area. Perhaps a similar source could have produced the red sand of the Simpson Desert. Reddish gravels (Pedirka Formation), and silicified sand of the type associated with such Tertiary sediments, is found near the western edge of the Simpson Desert (Krieg 1985) near Purni Bore. Possibly this may extend further east.

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Superimposed on colour differences inherited from diverse source materials are local and contemporary processes which may reinforce the differences. Upward movement of iron-bearing groundwater solutions by capillary action would tend to deposit ferric oxides in the highly oxidising environment of the dunes. The older the dune, the more intense the colour is likely to be. In the playas and, to a lesser extent, in the interdune swales, the iron may remain in soluble form owing to a more reducing and more acid environment and to the presence of sulphate ions in the gypsiferous horizons. Sand ablated from these areas and incorporated in dunes would slowly acquire coatings of oxidised iron compounds,thus accounting for shades of colour between neutral and deep red. Presence or absence of clay pellets does not seem to be a prominent cause of colour variation.

Shallow drilling within the southern margin of the red dunefield is needed and a better knowledge of the distribution of red source sediments, together with trace element comparisons between the red coats on the grains and the sediments, and more standardised colour information on the playa region borders.

The relative age of red and yellow dunes is unknown at present - the dunes could all be of the same age, and owe their differences to substrate, or the red dunes could have formed first on older sediment. The former possibility is the least complex in terms of origin and implied associated processes, hence is accepted for the present as the more parsimonious solution.

CONCLUSIONS

Within the Simpson Desert, dunes of the playa region north of Lake Eyre and the Kallakoopah are lighter and browner than those of the desert to the west and northwest, which are darker and redder. Chroma remains constant. The lighter coloured dunes are probably derived from the pale Late Quaternary fluvial

sediments deposited by the Kallakoopah - Warburton system, but the source of the sand in the iron rich redder dunes is obscure. Possibilities considered are the Pedirka Gravel, ferruginized Tertiary sands, and the Tirari Formation. No definite evidence on the relative age of darker and lighter dunes is available.

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CAPTION FOR ILLUSTRATION.

Fig. 1. Munsell Colour of Simpson Desert dunes with approximate hue contours.

SIMPSON DESERT – S.A.

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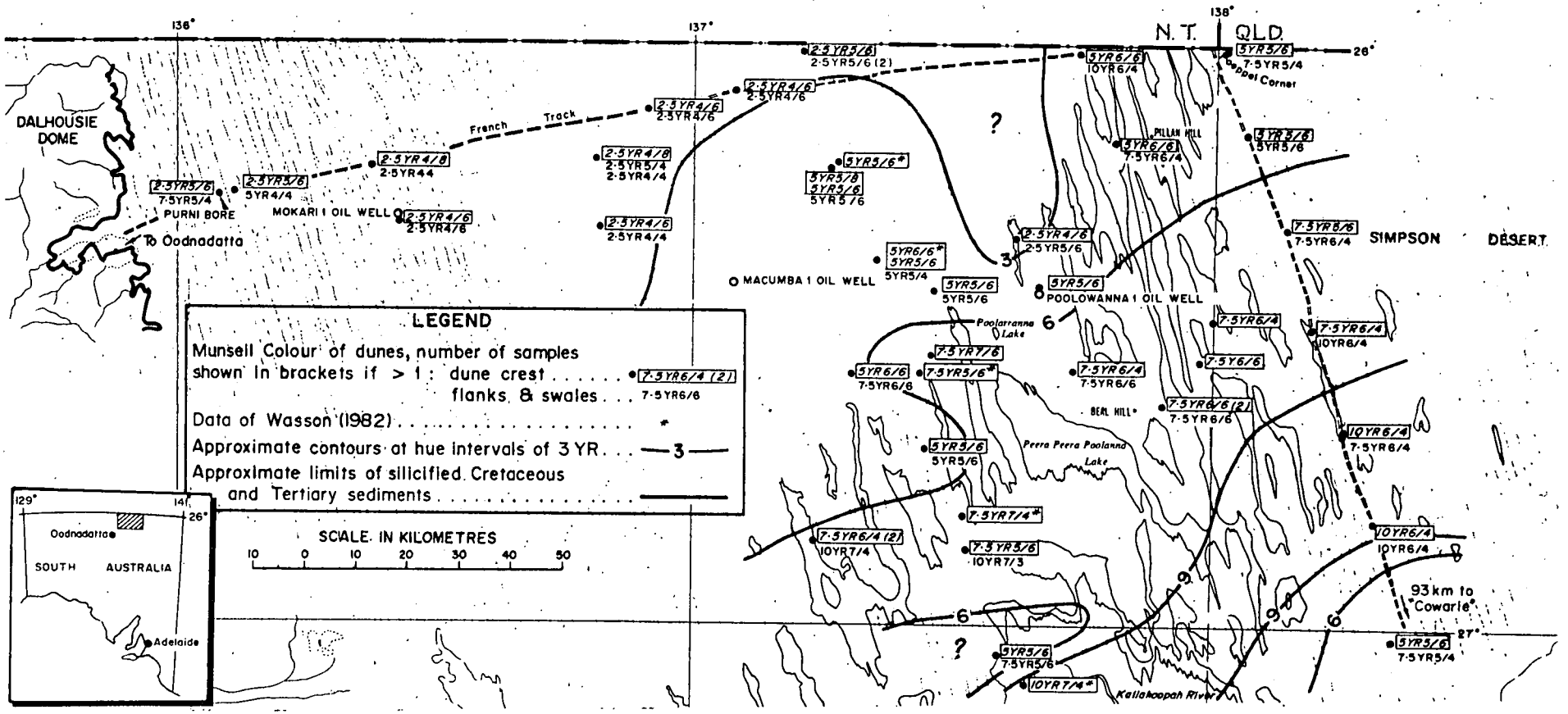

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