What — no deserts?

In a dry and barren continent such as ours you might expect some record-breaking deserts. But, in fact, although many parts of central Australia can be defined as arid (receiving an annual rainfall of 250 mm or less), it has long been believed that we have no 'true' deserts — generally accepted as places receiving an average annual rainfall of less than 100 mm — such as the Sahara.

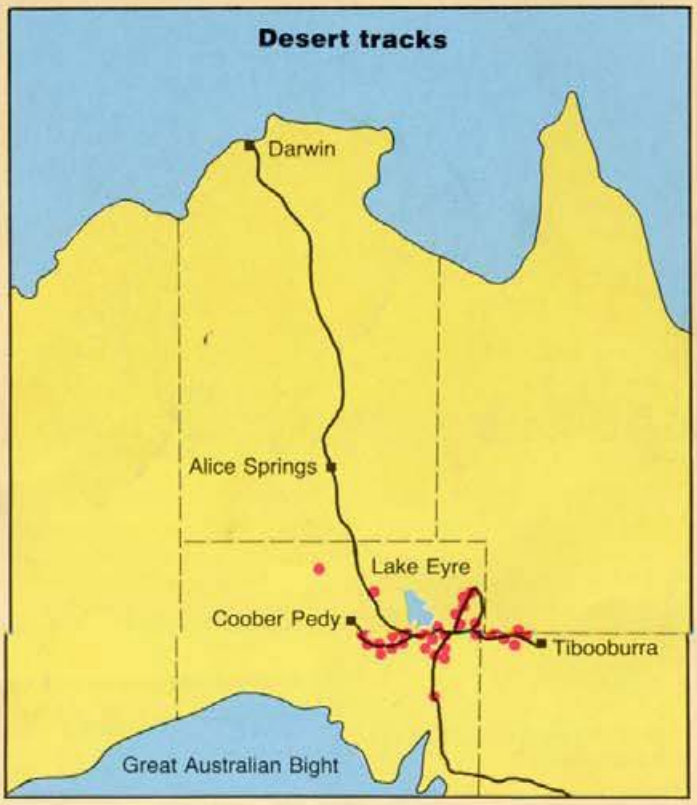
This established view is now being questioned by plant ecologist Dr Andy Gillison of the CSIRO Division of Wildlife and Ecology, with the help of data collected during a bicentennial outback expedition mounted by 24 women, led by Mrs Jean Whitla.

Dr Gillison and a botanical colleague, Dr Roger Hnatiuk of the Bureau of Flora and Fauna, journeyed from Adelaide to Darwin a few years ago, and sampled the flora along the way.

They found that certain kinds of plants occurred in a cluster mainly in the southern Lake Eyre region from about Leigh Creek to Oodnadatta. These plants possessed characteristics in common with other species growing in hot, very dry, and possibly saline regions elsewhere in the world, such as Israel's 'true' desert, the Negev.

The bicentennial expedition — from Coober Pedy to Tibooburra — sampled all the plants and animals in 78 measured sites every 40 km. Funded and organised by the Australian and New Zealand Scientific Expedition Society (ANZSES), it was in part designed to help Dr Gillison define more precisely the region in which these plants with desert attributes occur.

The women used the same field sampling method as Dr Gillison, but it had rained shortly before their expedition, which made their task more difficult because many ephemeral plant species had appeared in response, crowding out the desert plants of interest. This also caused problems during Dr Gillison's subsequent computer analysis of the data, but in the end all was resolved.



The routes of Dr Gillison (south–north track) and the women's expedition (west–east). Red dots indicate sites dominated by plants typical of dry, saline, sandy deserts.

Preliminary results show that, in an area of about 120 000 sq. km, plant types typical of hot, dry, sandy, and salinised places dominate the vegetation.

Many of them tend to be succulent, with waxy surfaces to reduce water loss. Their photosynthesis is biochemically modified so that they open their pores to take in carbon dioxide only at night — when it is cooler and more humid. They store the gas in the form of a simple organic compound, and it is then made available for true photosynthesis during the daylight hours, when the pores are kept firmly shut to conserve water.

Such adaptations are common among desert plants — like cacti — throughout the world. Although no cacti occur naturally in Australia, it seems that these plants are their functional equivalents, and that the core of their distribution, in the southern Lake Eyre area, is probably our patch of true desert.

Now, no weather station in Australia records a rainfall as low as the desert criterion of 100 mm or less per year, but in our vast continent weather stations are not thick on the ground. It could well be that in this region, where accurate average rainfall figures are not known, a small 'true' desert is present.

But even if the rainfall figures do not oblige, the high salinity makes it a 'physiological desert' — from the plants' point of view, good water is hard to obtain because of the high concentration of salt.

Furthermore, this putative desert corresponds with an area of high reflectivity, as measured by satellite imagery. At ground level the plants are exposed not only to the blazing sun, but also to the bright reflected light from the white salt-encrusted soil surface.

So, in terms of the harshness of this environment, only plants with particular functional attributes suited to the hotter and more saline deserts can survive.

Of course, the definition of a desert is really a matter of semantics and human preference. The real importance of this work lies not so much in establishing our credentials in a sort of 'desert-machismo' contest, but rather in creating a continent-wide data-base of vegetation types.

Dr Gillison is not principally mapping plant species, but is compiling lists of the functional features of plants and relating these to their distribution along environmental gradients.

This Lake Eyre assemblage of plants, with their features suggestive of desert-living, has not been thoroughly studied, although some of the individual species occur elsewhere in the country. It is by mapping whole plant assemblages — classified by the functional attributes of the plants within them — that scientists will be able to establish a baseline for future reference in case of climate change.

Dr Gillison and his colleagues are also examining mangroves and rainforests in a bid to cover all environmental extremes.

Vegetation types are sensitive indicators of climate and geography; if the 'greenhouse effect' does cause climate change, plants will be among the first to know about it.

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