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ABSTRACT

Four oval craters, the largest 115 feet by 85 feet, were found near Cummins Range in the Kimberley Region of Western Australia; they are up to 115 feet long by 85 feet wide, and four feet deep, and they have rims up to two feet high, composed of fragments of bedrock.

The craters cannot be sinkholes, and a volcanic origin can be discounted. Though no meteorite fragments were found in the vicinity it is thought that they could have been formed by impact of meteorites.

INTRODUCTION

Four oval depressions, the largest 115 feet by 85 feet, in flat, sandy country in the Kimberley Region of Western Australia were recognised as probable meteorite craters several years ago by B. Taylor, of Lamboo cattle station, who showed them to D. Dow in June, 1964. They are situated at approximately 18°53'S, and 127°22'E, about four miles east of the Cummins Range, near the divide between the Margaret River watershed and the inland drainage of the Canning Desert. They can be reached from Lamboo Homestead by a good vehicle track, a drive of about two and a half hours.

The area in which the craters were found is one of the very low relief on the northern fringe of the Canning Desert. Broad, subdued ridges rise above wide floodplains with widely scattered and generally stunted Eucalypts (Fig. 1). The annual rainfall of the region is less than ten inches, but as most of this falls during short desert storms, runoff is rapid, and there is no permanent water in the area.

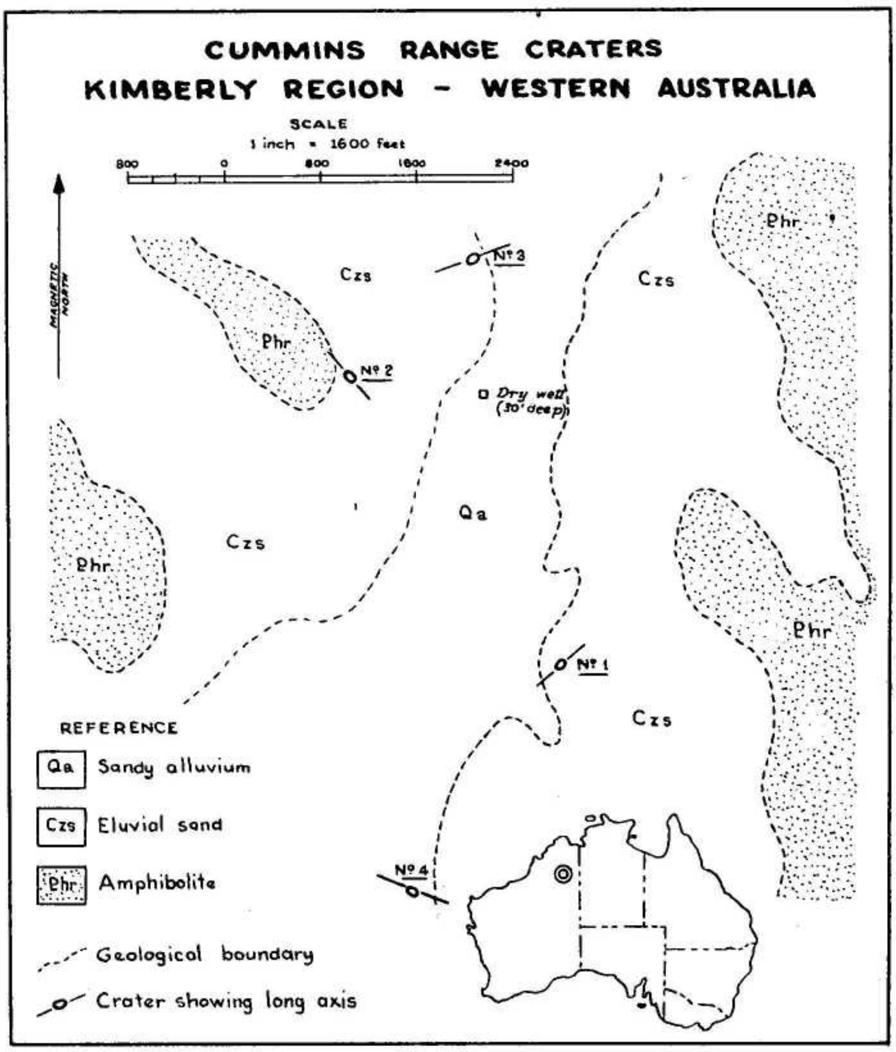
Figure 1:
Crater Number One. Photo taken looking towards the north-east, almost parallel to the long axis.

The rocks in the vicinity of the craters are Lower Proterozoic or Archaean amphibolite and minor mica schist, intruded by quartz veinlets and reefs, and small pods of dolomite which rarely exceed six inches in width. The floodplains and eluvial slopes are composed of consolidated sand between two feet and four feet thick, and there is an apparently continuous layer of calcrete six inches to twelve inches thick between the sand and the amphibolite.

DESCRIPTION

The craters are symmetrical, oval depressions in the valley floor; the largest is 115 feet long by 85 feet wide, and the smallest 70 feet long by about 50 feet wide. They occur within an area of about one mile long by about half a mile wide, and their long axes have no common orientation: The craters were mapped by chain and compass and are shown in Figure 2.

Figure 2



They are surrounded by fragments of amphibolite and calcrete up to three inches across, which have built up the rims of the craters one foot to two feet above the plain level. The crater floors are flat or slightly dished, one to two feet below plain level, and are composed of very fine sand at least three feet deep. The sand within the craters is unconsolidated, and contains considerable amounts of carbonaceous vegetable matter, in contrast with the surrounding sand, which is coarser, better sorted, and commonly cemented.

Calcrete exposed in two of the crater walls appears to have been upturned at least 12 inches to its present position, and it is apparent that the original crater penetrated some distance into the amphibolite bedrock.

ORIGIN

The craters were probably caused by impact of meteorites. They cannot be sinkholes because they all have built-up margins, and any bodies of carbonate rock seen in the area are far too small to have given rise to the craters by solution and collapse. In all the craters the fragments constituting the rims show that the bedrock is almost entirely amphibolite; outcrops surrounding Crater No. 3 are good, and preclude the possibility of the presence of a carbonate body even as large as the crater.

Human agencies and volcanic eruptions can be discounted as causes of the craters. It has been suggested that the craters could be collapsed mine shafts or wells, but they have an entirely different surface expression to collapsed mine shafts in the Mount Dockerell Goldfield 12 miles to the north-west, and the dry well shown in Figure 1 sunk by a previous owner of Lamboo Station, though 30 feet deep, has a spoil heap only about 15 feet across. The only post-Cambrian volcanic rocks known within a radius of thousands of miles are Jurassic leucite lamproites found 130 miles to the north-west (Prider, 1959).

Despite a search of several hours, no fragments of possible meteoritic origin were found. In the absence of a suitable magnet to use in the search for small magnetic particles, the sand surrounding Crater No. 1 was panned, but no anomalous fragments were located. Compass traverses across the crater detected no magnetic anomalies. A small pit about three feet deep, sunk in the floor of Crater No. 1, showed only fine sand and rare angular blocks of amphibolite up to six inches across.

The craters are apparently too small to have been formed by the explosion and vaporisation of high energy meteorites (Mason, 1962). Small impact craters are known to have been formed by the burial of meteorites, but it seems unlikely that a meteorite could bury itself in the hard amphibolite bedrock without shattering. The meteorite crater at Dalgaranga in Western Australia (Nininger and Huss, 1960), which was probably formed by a low energy meteorite shattering on impact, is very similar in size and shape to the Cummins Range craters, but is more symmetrical.

Similar craters were formed by a fall of meteorites near Vladivostock in 1947. They were apparently formed by the impact of meteorites which rebounded after digging the craters (Struve, 1950). Though such a mechanism would explain the apparent absence of meteorite fragments close to the Cummins Range craters, it is unlikely that deep craters could be dug in amphibolite bedrock in this way.

AGE

We found little evidence of the age of the craters, but they do not appear to be of great antiquity, for the following reasons:

Their state of preservation indicates that they are about the same age: Crater No. 2 is the least well preserved, because it has walls of friable calcrete which have been burrowed by animals. Crater No. 4 is situated in the floodplain, and is regularly inundated. It has walls of fairly unconsolidated sandy alluvium, and would be expected to be obliterated fairly quickly by infilling, but it is in fact well preserved.

A tree about four inches in diameter grows on the side of Crater No. 4, but it is doubtful, in view of the irregular seasons in the area, whether a count of its rings would be of much value as an indicator of age.

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