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SOIL-EATING BY CAPE MOUNTAIN ZEBRAS *EQUUS ZEBRA ZEBRA* IN THE MOUNTAIN ZEBRA NATIONAL PARK

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Abstract — Cape mountain zebra stallions, mares and foals ate soil at mineral licks, mainly during summer. Calcium was the only mineral with higher concentrations at the licks than in all surrounding soil samples. The influence of calcium on reproduction is discussed

Free-ranging ungulates frequently eat soil or visit mineral licks. This has also been reported in equids (Veselovsky & Volf 1965; Smuts 1972; Feist & McCullogh 1976). During an ecological and behavioural study of Cape mountain zebras *Equus zebra zebra* in the Mountain Zebra National Park (MZNP), Republic of South Africa, stallions, mares and foals were observed eating soil (Fig. 1). A number of licks was located throughout the Rooiplaat area of the Park. The licks, which were well defined and often up to 20 cm deep, were also utilised extensively by antelope and their droppings were frequently encountered in the vicinity.

The chemical composition of three of the licks and their surroundings was investigated. Soil samples were collected at each lick and at distances of 2 and 5 m north, south, east and west of the lick. The analyses were done in the laboratories of the Karoo Region, Department of Agriculture and Fisheries. In addition to pH, the calcium, magnesium, sodium, potassium and phosphorus concentrations of each sample were determined (Fig. 2).

The pH of the licks varied between 7,3 and 9,7 and that of the other samples between 5,9 and 9,1. The relatively high pH values at the licks could be due to a high concentration of ammonia from urine of the animals utilising the licks. Licks less acidic than the surrounding soil were also reported by Stockstad, Morris & Lory (1953) and by Henshaw & Ayeni (1971).

Calcium was the only mineral with higher concentrations at the licks than in all surrounding samples. At two licks magnesium had a greater concentration than in the surrounding samples, but the third lick had a low magnesium concentration. The sodium concentration of all three licks was less than that of most of the surrounding samples. Potassium and phosphorus had relatively high concentrations at one lick only.

Fig. 1. A Cape mountain zebra eating soil.

It is likely that the mineral sought by wildlife at a lick is lacking or insufficient in their diet. Rats with a specific nutritional deficiency choose a corrective diet if available (Biedler 1961).

No definite conclusions can be drawn from the MZNP licks, but it appears that calcium may have been the essential element. This may infer a shortage of calcium in the diet of Cape mountain zebras in the Park. Hill (1972) demonstrated a correlation between litter size of cottontail rabbits *Sylvilagus floridanus* and soil calcium. Calcium applied to the soil influences plant composition sufficiently to be manifest in the reproductive capacity of the animals, probably due to its secondary effect on the absorption of other elements (Smith & Hester 1948). Pituitary hypofunction is partly responsible for lower ovulation rates in cottontails in regions of lower soil fertility (Stevens 1962). Calcium is perhaps the soil mineral which is most generally associated with fertile soils because of its influence on the availability and absorption of nitrogen and minerals by plants (Hill 1972).

Van Niekerk (*in litt.*) suggested that phosphorus and/or copper could be deficient in the diet of Cape mountain zebras in the MZNP as shortages of both minerals were not unknown in the area. The detrimental effect of a chronic phosphorus deficiency is well known. A copper deficiency would be unlikely on doleritic soils which occur as post-Karoo intrusions in the MZNP (Toerien 1972).

In most investigations of mineral licks, sodium compounds are regarded as the essential minerals attracting wildlife to the licks. Knight & Mudge (1967) analysed mineral licks in Montana (USA) and found that sodium bicarbonate and sodium

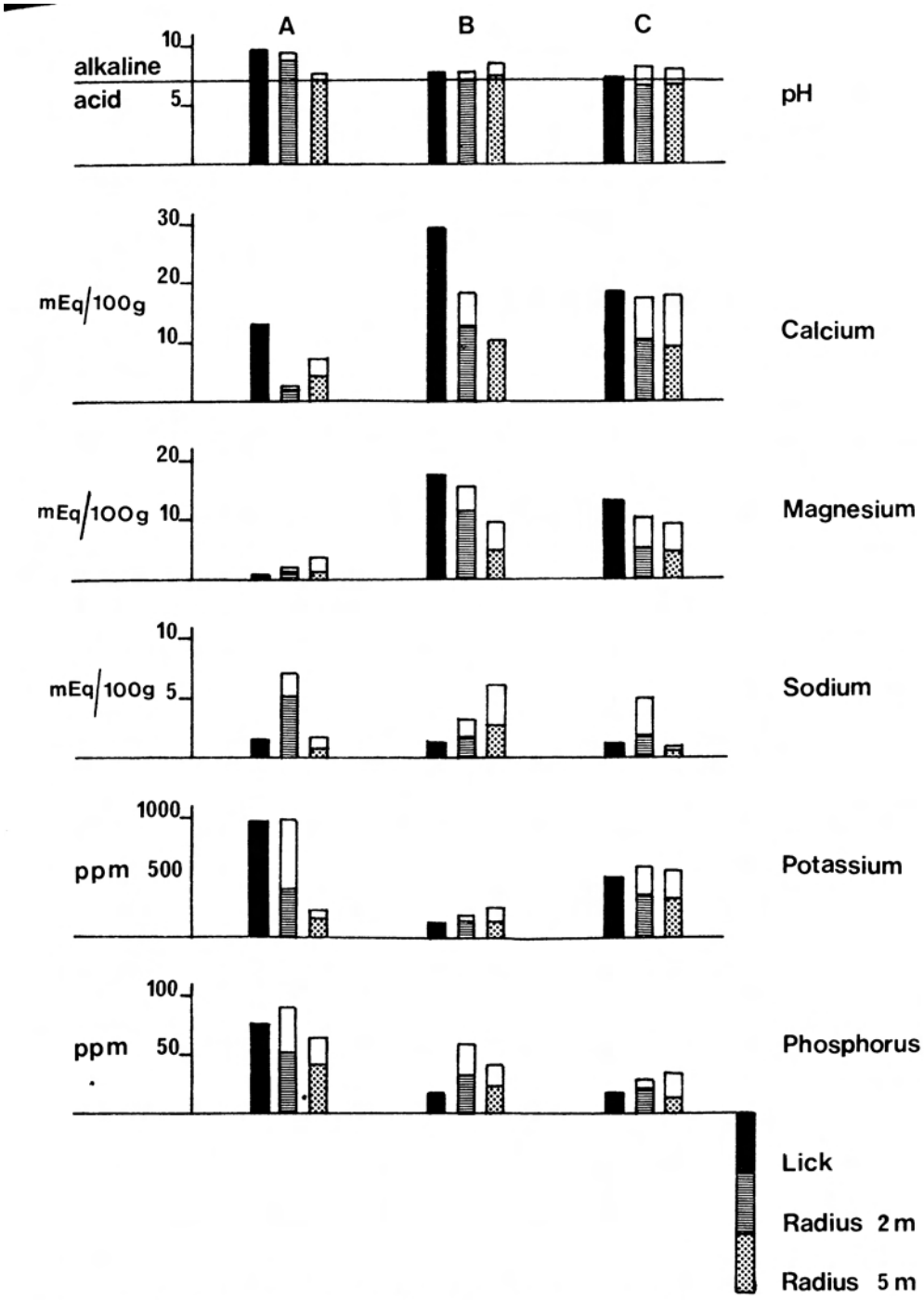

Fig. 2. Chemical composition and pH of three mineral licks (A, B and C) in the Mountain Zebra National Park. The values for each lick are shown by the black columns. Mean values of two sets of four samples taken at a radius of 2 m and 5 m from the lick respectively are shown by the shaded columns. Open columns indicate maximum values.

sulphate were the only compounds occurring in much greater quantities in the licks than elsewhere. Stockstad *et al.* (1953), also working in Montana (USA), reported sodium, calcium, magnesium and potassium in greater quantities in the licks than elsewhere. In a cafeteria study of 22 compounds, they found that sodium compounds, especially sodium bicarbonate, were preferred by four large ungulate species. In a survey in Idaho (USA), the amount of sodium was relatively constant in all lick waters and not exceeded by any other elements (Dalke, Beeman, Kindel, Robel & Williams 1965). Sodium was regarded as the element attracting game to the lick waters. Compounds of sodium were preferred by bighorn sheep *Ovis canadensis* and deer in cafeteria studies in Idaho (Smith 1954, *In:* Knight & Mudge 1967). Geist (1971 a and b) was able to attract free-ranging mountain sheep by offering them common salt. Mountain goats *Oreamnos americanus* were found eating earth to compensate for sodium deficiency (Hebert & Cowan 1971).

Cowan and Brink (1949) analysed licks in the Rocky Mountain parks in Canada and found fairly large amounts of sodium, magnesium, calcium and iron; phosphates and chloride occurred in small amounts. They concluded that sodium chloride was not necessarily the essential element, phosphorus was definitely not the essential element and trace elements may well have been the critical constituents. Dixon (1939) found sodium, iron and sulphur the predominant minerals in one lick in California (USA) and sodium chloride and calcium chloride at another, while calcium and iron phosphate were the most abundant minerals at a lick in Alaska (USA).

Licks created and used by elephants *Loxodonta africana* in Wankie National Park, Zimbabwe, are characterised by high concentrations of water-soluble sodium (Weir 1969). Soils with concentrations of calcium, magnesium and potassium in termite mounds, for instance, are used as licks only in regions where soluble sodium is not present in quantity in the soil. In this Park, Weir (1972) could demonstrate a correlation between elephant distribution and environmental sodium. In Kabalega National Park, Uganda, Weir (1973) found elephants attracted to soils characterised by localised high concentrations of water-soluble sodium, sometimes associated with calcium. Henshaw & Ayeni (1971) could demonstrate no single element as the factor attracting wildlife to licks in the Yankari Game Reserve, Nigeria.

During the present study a single observation was made of a Cape mountain zebra biting a chunk off a termite mound and eating it. Termite mounds are built from the subsoil and termites do not directly alter or affect the chemical characteristics of the soil (Hesse 1955).

Of the 21 observations of Cape mountain zebras eating soil, 19 occurred during the summer months (October to March). In Idaho (USA), elk *Cervus canadensis* develop salt hunger in spring (Dalke *et al.* 1965). Big game animals are commonly observed at mineral licks in Montana (USA) during the spring and autumn (Knight & Mudge 1967). In the Canadian Rockies, use of licks is generally confined to summer months (Cowan & Brink 1949). Geist (1971a) stated that mountain sheep were more eager to get at salt and visited salt licks primarily in late spring and early summer. He stated that the skeleton appeared to function as a reserve of mineral salts and that ungulates attempted to restore the lost deposits at the winter's end and also satisfy the now increased demands of the body. Mountain goat males begin

using mineral licks in April and females do so in early June, when they have given birth (Hebert & Cowan 1971). The change in diet at this time from twigs and sundried grasses to the lush new growths is accompanied by a change in faeces which is assumed to cause increased loss of sodium. Use of the licks therefore occurs when the animals are thought to be under sodium stress.

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