

BLACK EAGLE *AQUILA VERREAUXII* PREDATION
ON ROCK HYRAX *PROCAVIA CAPENSIS* AND OTHER PREY
IN THE KAROO

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to my parents, and everybody else who has helped with this research



Black eagle *Aquila verreauxi* predation on rock hyrax *Procavia capensis* and other prey in the Karoo

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Pretoria

ABSTRACT

Damage to vegetation by ruminants in the Karoo is a major problem. The Karoo is a semi-arid environment where the Karoo ruminants are the main predators of the Karoo vegetation. The Karoo is a semi-arid environment where the Karoo ruminants are the main predators of the Karoo vegetation. The Karoo is a semi-arid environment where the Karoo ruminants are the main predators of the Karoo vegetation.

Key elements of the Karoo ecosystem were evaluated during a five-year field study in and around the Karoo National Park. The study, other relevant field research and Karoo simulation models were used to check the long-term action of predators. The modelling included the effects of the Karoo environment and a simple Karoo model to check the long-term action of predators. The modelling included the effects of the Karoo environment and a simple Karoo model to check the long-term action of predators.

The system differed from other typical predator-prey systems. Unlike cyclic prey, hyrax populations were not regularly destabilised by delayed specialist predation. They illustrate a unique response to climate, but not to other environmentally mediated predator systems. Hyrax populations do not naturally escape regulation by their predators. These characteristics can be attributed to a permanent, patchy refuge resource which confers a high degree of stability on the system. Hyrax are effectively protected within rocky habitat, and vulnerable to efficient predation beyond it.

to my parents, and everybody else who has helped with this research, especially Samburu

(i)

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and other prey in the Karoo

by

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ABSTRACT

Damage of important karoo grazing resources by 'irruptions' of rock hyrax *Procavia capensis* has been blamed on predator control, but many ecologists still cannot agree whether vertebrate predators limit/regulate vertebrate prey. A study of the highly specific predator-prey system involving black eagles *Aquila verreauxii* and rock hyrax was initiated to assess the demographic influence of these controversial predators on their prey, including livestock, in the Karoo.

Key elements in the system were comprehensively evaluated during a five year field study in and around the Karoo National Park. To escape the limitations of this field study, other relevant field research and karoo climatic data over the last century were used in a hyrax population model to characterise the long-term action of predation. This modelling included accurate measurement of the refuge environment and a simple lower trophic model to accommodate the profound influence of rainfall on hyrax demography in this water-limited environment.

The system differed from other typical predator-prey systems. Unlike cyclic prey, hyrax populations are not regularly destabilised by delayed specialist predation. They fluctuate irregularly in response to climate, but unlike other environmentally-modulated predation systems, hyrax populations do not naturally escape 'regulation' by their predators. These characteristics can be attributed to a permanent, patchy refuge resource which confers a high degree of stability on the system: hyrax are effectively protected within rocky habitat, and vulnerable to efficient predation beyond it.

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The 'safe feeding area' available to hyrax is fixed, and was evident as a distinct vegetation zone around rock outcrops. But the number of hyrax supported within this safe habitat varies with climate, and greater protection offered to growing populations after rains is another unusual feature of this system.

Unlike sympatric generalist predators, black eagles pursued hyrax prey despite low availability. By removing a substantial number of hyrax which were otherwise unlikely to die, black eagles limited hyrax population growth during the study period, and they exerted hard selection on adult hyrax. Coevolution between eagles and hyrax was indicated from certain reciprocal behavioural and morphological traits.

The population model indicated that a recent widespread decline in hyrax populations was caused by enrichment of hyrax food supplies during the 1970's, followed by sudden, severe drought. Exhaustion of pasture in arid environments may occasionally drive hyrax from their refuge habitat, and this behaviour change was probably perceived as population increases or 'irruptions' in the past.

The model demonstrated that the full complement of predators can remove surplus hyrax not supported by the refuge habitat, and 'regulate' hyrax numbers around the number of protected prey (this number varied stochastically with climate, so the predation response was 'availability dependent' not density dependent). Intense predator control probably severely hindered the removal of surplus hyrax during the 1940's drought.

The cost of hyrax surpluses predicted in the absence of predation by black eagles outweighed the overall cost of lamb-killing by black eagles by 150 times. Tolerance of such compatible predators should help restore the ecology on karoo farmland to some of its former diversity and stability.

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In 1986 I approached Professor John Skinner of the Mammal Research Institute at the University of Pretoria with the idea of initiating a study on the predation of rock hyrax in the Karoo. Prof. Skinner has helped me carry out this project unfailingly ever since, by endorsing, supervising and administrating the project and by contributing financially from his own private research funds at the University. I thank him for making this research possible, and for all the advice, friendship and interest that I received from him and from his wife Patsy.

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predator-prey interaction

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