

EFFECT OF CLIMATOLOGICAL AND GEOMORPHOLOGICAL GRADIENTS ON THE
BIOTA OF THE NAMIB DESERT

by M K Seely

The Namib is a long, narrow desert extending over 2000 km along the southwestern coast of Africa. In common with the western coastal deserts of Baja California in Mexico and the Atacama of Peru and Chile, it is a cool coastal desert controlled by a cold current along shore. Partly as a result of a complex of climatological and geomorphological gradients, past and present, the Namib supports a great variety of plants and animals in its various habitats. Of particular note is the fauna of the vegetationless dune crests and slipfaces, a habitat apparently unoccupied in other dune deserts.

From north to south sand dunes, gravel plains and dry river beds alternate. Each habitat type supports a distinct community with only a minimum of overlap. From north to south there is also a change of rainfall from predominantly summer to winter in occurrence. Fog, an important climatological and biological factor throughout the Namib, also shifts season from north to south. The driest area occurs on the coastal Central Namib where summer and winter rainfall are at a minimum. Thus, although there is a repetition of types of geographical units from north to south, the climate does not vary in a synchronous manner.

From west to east in the Central Namib the plains grade from gypsum to calcrete substrate, occasionally interrupted by inselbergs and dry washes. In the dune Namib a littoral belt of closely packed transverse dunes is replaced by a broad belt of linear dunes and, further east, a less extensive area of complex multicyclic dunes.

Over this same area only 100-140 km wide, a cool, foggy desert is located on the coast, a desert steppe inland and the most severe 'alternating fog desert' in the central zone. Precipitation from fog decreases while precipitation from rain increases from the coast inland. Total precipitation from either source is at a minimum mid-way across this west-east fog-rain gradient. In this central area daily amplitude of temperature and humidity are greatest also. Thus three zones of differing climatic-geomorphic processes and physiognomy lie approximately parallel to the coast across the Central Namib.

Superimposed on this general pattern are the influences of the inselbergs and dry water courses on the plains and of the individual dunes within the dune fields. These all cause deviation from the general overall pattern. Inselbergs and dry water courses concentrate and store moisture, cause accumulations of wind-borne sand and provide protected growing sites. The individual dunes vary from base to crest with respect to water-holding capacity, interception of fog moisture, degree of substrate compaction and grainsize distribution.

From north to south the flora changes from one having some affinities with the Tropical Flora to one with more affinity to the Karoo Flora. Over this same distance the smaller elements

From south to north in the Central Valley the climate changes from humid to semi-arid, and the vegetation from tropical forest to dry forest. The climate is characterized by high temperatures and high humidity, with frequent heavy rain. The vegetation is primarily tropical forest, with a variety of tree species and a dense canopy. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions.

Every day there are only 100-150 mm of rain, a small amount, but it is enough to keep the vegetation green. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions. The vegetation is primarily tropical forest, with a variety of tree species and a dense canopy. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions. The vegetation is primarily tropical forest, with a variety of tree species and a dense canopy. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions.

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It is difficult to predict the future changes that are likely to occur in the climate and the vegetation of the Central Valley. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions. The vegetation is primarily tropical forest, with a variety of tree species and a dense canopy. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions. The vegetation is primarily tropical forest, with a variety of tree species and a dense canopy. The climate is also characterized by a high degree of variability, with frequent changes in weather conditions.

of the fauna also change although the larger mammals are similar throughout.

On both the dunes and plains of the Central Namib a similar overall pattern of distribution of plants and animals obtains from west to east. Near the coast are the plant species which apparently use fog as a moisture source. On the plains these are mainly lichens and perhaps the several dwarf shrub species and on the inselbergs, succulents. In the dunes one succulent and one grass species grow near the coast and have been shown to use fog as at least a supplementary water source. Inland, where rainfall is more abundant, a greater number of plant species occur. In the dunes only the one grass species growing on the coast also occurs throughout, while on the plains only one shrub approaches such a very wide distribution. For animals the same three distribution patterns are observed, that is, coastal, inland and a very few species that occur across the Central Namib. The distribution of those animals and plants more dependent on rainfall and occurring predominantly in the east are most variable, expanding westwards and contracting within the Central Namib over distances of more than 50 km within any period.

The inselbergs and dry water courses support plants and animals specific to these habitats. In addition, species dependent on a sandy substrate or increased water availability occupy these habitats as extensions of their normal range. On individual dunes the dune base, plinth and crest areas each support a characteristic vegetation and group of animals. These distributions are primarily dictated by variable water holding

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capacity, stability and degree of compaction of the sandy substrate. Thus, as a result of the complex pattern of geomorphological and climatic gradients from north to south and west to east in the long, narrow Namib Desert, the vegetation and animals also exhibit complex distributional gradients. In the relatively well known Central Namib, substrate characteristics and moisture source (rain or fog) appear to be the dominant factors influencing distribution.

