

Have Vegetation Rehabilitation Regimes At West Coast Fossil Park Effectively Restored Faunal Diversity? A Preliminary Analysis

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Rationale

About 25% of West Coast Strandveld (Fynbos/Dune Thicket mosaic) has been transformed by human activities that include urbanization, resort developments, alien plant invaders and especially mining for alluvial diamonds (in Namaqualand) and phosphate (Langebaan district). Only 6.8% of this veld type in the Cape Floristic Region is currently protected.

The old Chemfos phosphate mine (now West Coast Fossil Park), situated near Langebaanweg, was mined for phosphate by SAMANCOR (a division of Billiton) from the 1940's to 1993. Mining dramatically altered the landscape and vegetation of the area: removal of overburden to a maximum of 30 metres resulted in slopes of 1:3 gradients on some of the remaining sections; mine pits produced unnaturally deep depressions; large slimes dams were constructed of overburden to dispose of the fine material; a number of overburden dumps occur on the mine site; and woody aliens had invaded many of the distributed sites.

A rehabilitation programme was initiated in 1996, the general aim of which was to remove alien vegetation and re-establish Strandveld on the old mine to form a buffer reserve around the Fossil Park, later to be integrated in the West Coast Biosphere Reserve. The rehabilitation methodology involved alien removal, innovative hydro-seeding techniques, and planting of rooted cuttings and seedling mats, leading to the establishment of a nucleus of Strandveld vegetation with an evident increase in floral diversity. Differences in topography and rehabilitation methodologies have resulted in a mosaic of restored habitats that differ in age and plant community characteristics. While these rehabilitation regimes have resulted in an evident increase in botanical diversity, the effectiveness thereof at restoring faunal diversity has not yet been established.

Small mammals are important components of terrestrial ecosystems by virtue of their diversity, role as regulators of energy / nutrient transfers between producers, consumers and decomposers, and their often dramatic effects on the structure and dynamics of plant communities. Their high fecundity and short generation times allow them to respond rapidly to fluctuating environments and for these reasons they are ideal candidates for study when monitoring recovery of disturbed ecosystems. Various studies in a variety of rehabilitated or disturbed habitats (mostly outside of South Africa) have shown that small mammal communities show successional patterns that mirror those of vegetation, but also that pioneer small mammal species (usually r-selected rodents) may alter rehabilitation outcomes and lead to successional inertia of plant communities. Information on the recovery of small mammal communities, and their influence on rehabilitation success, in restored landscapes in South Africa is scarce, with only two studies (grassland and coastal forest) having been undertaken to date (Vermaak 2000).

This project will assess the diversity and community structure of the small mammal, reptile and ground-living beetle faunas in 6 rehabilitated habitats at West Coast Fossil Park, to establish:

- how effective rehabilitation methodologies have been at restoring diversity and ecologically viable populations, relative to the faunas in adjacent (relatively pristine) strandveld habitats;
- the ecological correlates of small mammal community structure; and
- if any of the common mammal pioneer species, particularly *Rhabdomys pumilio* and *Tatera afra*, are impeding or stimulating recovery of plant communities.

Methodology

Six rehabilitated sites and one adjacent unmined (natural) site will be surveyed twice, once in August 2005, and again in late September 2005, for 4 days and nights. All traps will be checked each dawn and dusk.

At each site, grids of 50 Sherman live-traps will be set for small mammals. Within each grid, 6 pitfall traps for ground-dwelling insects will be randomly placed, as will 3 pitfall traps (20l buckets) for reptiles and amphibians. Vertebrates will be released at capture sites immediately after traps are checked; any that die accidentally will be kept as voucher specimens and deposited in the South African Museum (Cape Town).

Analyses of data will include rarefaction to determine maximum potential species richness, and the computation of species richness and heterogeneity indices (Brillouin and Shannon-Wiener indices) for 3 replicated samples per site. By statistically comparing diversity and community parameters with those in the adjacent unnatural site, we shall be able to ascertain how effective these rehabilitation regimes have been at re-establishing diversity and community parameters that are usually encountered in strandveld.

Limited vegetation surveys (point-transects for cover and substrate density) and Landscape Functional Analysis will be undertaken at each site. These data will be explored using multivariate ordination techniques to better understand the habitat variables that play an important role in determining the composition of the resident small mammals.

A complete list of species recorded during surveys will be made available at the completion of the project, as will a copy of Ms. Nupen's project report.

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