

THE ECOLOGICAL SIGNIFICANCE OF ROADS IN A NATIONAL PARK

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The necessity of a road network in National Parks or Nature reserves for the purpose of developing tourism, or for controlling the detrimental effect of wild fires, is universally accepted. The considerable ecological significance which such roads or graded surfaces may have on the well-being of the plant and animal communities protected in such reserves, is much less well documented, and is all too often overlooked by the very officials responsible for their construction.

It is the purpose of this paper to elucidate some of the influences, good as well as bad, which roads may have on wild ecosystems, with practical examples which have been recorded in the Kruger National Park over a period of many years.

Apart from the obvious immediate destructive effect of road construction, when rare species of trees and shrubs are often uprooted by ignorant bulldozer drivers (vide the kiat trees along the Tshokwane and Napi roads), graded roads in National Parks or nature reserves have a lasting and binding influence on the biological ecosystem in which they are laid down.

This influence may be detrimental to some members of the community, and then again, may be distinctly beneficial to others.

In addition to the plant life being destroyed, many animals are also killed by the construction machinery during the initial phases of road building. This includes, particularly, burrowing forms such as the purple glossed snake, *Calamelaps unicolor miolepis*; shield snake, *Aspidelaps scutatus*; blind snakes, *Typhlops* spp.; thread snakes, *Leptotyphlops* spp.; northern file snake, *Mehelya nyassae*; Pygmy sand snake, *Psammophis angolensis*; shovel-nosed snakes, *Prosyma* spp.; quill-nosed snake, *Xenocalamus bicolor bicolor*; white-lipped snake, *Amblyodipsas microphthalmia*; centipede eaters, *Aparallactus* spp.; De Coster's garter snake, *Elapsoidea sundevallii decosteri* and burrowing viper, *Atractaspis bibronii*; the lizards — *Acontias*, *Monopeltis* spp., *Amphisbaena* spp., *Typhlosaurus* spp., *Agama hispida*, *Eremias*, *Ichnotropis*, *Nucras* spp., *Gerrhosaurus* spp., and *Cordylus jonesii*;

the frogs — *Hemisus marmoratum*, *Breviceps adspersus*, *B. mossambicus* and *Pyxicephalus marmoratus*; the golden moles — *Amblysomus (Chryso-tricha) obtusirostris limpopoensis* and *A. (Chlorotalpa) sclateri montanus*; as well as legions of insects and other invertebrate forms. Many termitaria, which constitute micro-habitats in themselves, are also destroyed.

Mortality amongst the animal species mentioned is unavoidable during road construction, and have to be accepted as such. In fact, the construction of roads often offer unique opportunities for field biologists to collect sub-terrestrial forms of animal life which are otherwise rarely encountered. Many of the rare burrowing lizards, snakes and frogs in the Skukuza museum collection were obtained in this manner.

On the other hand, roads which are badly planned or poorly drained may, in a surprisingly short time, lead to serious erosion and shocking degradation of the habitat. This is certainly a state of affairs which can be avoided or rectified. Examples in question here are the old tourist roads along the Crocodile and Nsikazi Rivers, portions of the tourist roads along the Shingwidzi and Letaba Rivers and at Pafuri, the new loop road along the Sabi River at Lubyelubyel, the roads along the border fences between beacons A and D, north of Nwanedzi and along the western boundary of Kingfisherspruit section, and various fire-break roads such as that along the Mtjulu, Machuluane, Mlambane and Phaben spruits, the Mphongolo River, between Mlanganywane and Panamana, Timbavati-Mshatu-Western boundary, between Shangoni and Mahlangene, and others.

It is an unquestionable fact that by far the major proportion of erosion occurring in the Kruger Park is man-made, and more usually than not, associated with some road-building activity in the past.

The mere presence of a road may have a significant influence on the adjoining vegetation in view of its curbing effect on wild, accidental fires. One may only compare the state of the woody growth to the east and west of the road from Olifants bridge to Gudzane, and that between Shingwidzi and the Tsende, as well as to the north and south of the Satara-Nwanedzi road, to appreciate the immense effect on the vegetation of a man-made fire-break.

Roads are often constructed in National Parks such as in the Kruger Park for the express purpose of controlling fires — both accidental and deliberate, and form part of a grazing management plan. Significant changes in the habitat may be brought about because of such policies, and with the aid of roads. A seven year period of strict control of wild fires in the Pretoriuskop area and the total prohibition of controlled burning, has been held mainly responsible for the present woodland-encroached aspect of the habitat. Similarly, control of naturally-occurring fires as well as an indiscriminate veld-burning regime must be the most important factors contributing to the change of the erstwhile open tree savanna of the Lebombo flats to its relatively dense scrub woodland or savanna-woodland aspect of today.

During actual fires, roads afford a means of escape to many animals and hosts of insects. The latter again attract the attention of insectivorous birds, and during the burning of fire-breaks for instance, birds such as yellow-billed kites, swallows, rollers, bee-eaters and white storks, find an abundance of insect food on the open roads adjoining the burning area.

It has also been noticed that some ground-nesting birds such as Temminck's coursers, crowned and blackwinged plovers, are found frequenting and nesting in greater abundance in burnt areas along the main tourist roads than further afield. This may again be due to a lower rate of predation in such well-frequented (by man) areas.

Roads are often utilised by large animals as routes of communication between favourite grazing areas or watering points. Elephants particularly favour such means of communication and may become a serious threat to the continued existence of rare plant species en route, and in areas which they infrequently visited prior to the construction of such roads. There is considerable suggestive evidence that elephants destroy more trees and shrubs in the narrow strip adjoining roads than in the surrounding country. This is merely a matter of expediency, with the animals not moving far from the beaten track when feeding en route from point A to point B.

The droppings of elephants are particularly visible on roads and attract large numbers of grey-footed squirrels, *Paraxerus cepapi cepapi*, particularly during the marula season, to the kernels of *Sclerocarya caffra* and other wild fruits to be obtained from the dung. Large numbers of birds such as francolins and yellow-billed hornbills are also attracted to the elephant droppings but in their case the sought-after tidbits are a variety of dung beetles and grubs which are extracted from the droppings.

In other respects, roads also create favourable feeding grounds for a large variety of birds such as francolins (Swainson's, Natal, Shelley's and crested), double banded sand grouse, African and harlequin quail, chestnut-backed finch-larks and other larks, rock buntings, korhaans (rufous crested and black-bellied), doves (turtle, laughing and Namaqua), bee-eaters, rollers, Burchell's starlings, long-tailed shrikes, drongos, hornbills (ground, grey, yellow- and red-billed), guinea-fowl, etc.

Also in the case of night birds such as night-jars, the spotted eagle owl, dikkops and bronze-winged coursers, their prey is much more readily spotted on open roads than in the surrounding overgrown country. One invariably encounters a much larger population of these night birds on roads than in the rest of their habitat — particularly during the dry winter months, when food is relatively scarce.

On the deficit side however, roads are often the death traps of such birds which are attracted to them for feeding or other activity, as many are blinded and killed by transport vehicles travelling at night.

Rodents are also more visible on the roads at night and are more easily run down here by mammalian predators than in overgrown areas.

Roads therefore also attract such nocturnal predators as civet cats, genets, white-tailed mongoose, side-striped jackal, saddle-backed jackal, wild cats, serval and hyaenas.

Porcupines use roads as fast routes of communication to feeding grounds.

Large herbivorous mammals such as impala and even wildebeest, are often attracted to roads at night and sleep there, or lie up in the open space, particularly during the rainy season when the grass becomes soggy and wet.

During very favourable wet seasons, when the vegetation becomes long and rank, hunting conditions for the larger predators deteriorate very rapidly. Dense vegetation impedes their sight and movements and lions particularly, but also hyaenas, hunt along the roads by night, and wild dog and cheetah by day. Lions have even learnt to use rows of tourist cars as decoys or cover, behind which they stalk prey animals such as impala returning from drinking places. There is little doubt, therefore, that during such times roads have considerable survival value for the predators in question.

Culverts and drainage pipes provide convenient warrens as well as good breeding sites for species such as warthog, jackal, hyaenas and banded mongooses.

The rubble and litter left along the road edges after construction work, again provide favourable shelters for ground-nesting birds, rodents such as *Mastomys*, *Lemniscomys*, *Aethomys*, *Mus minutoides*, shrews such as *Crocidura* spp., as well as for Transvaal red and dwarf mongooses. Bats which feed on the wing, find roads convenient and unobstructed avenues for hunting their prey at night.

Animals which develop begging traits are naturally attracted to roads with heavy tourist traffic. Here they may beg from tourist cars in large numbers and become a serious nuisance. The main culprits here are baboons and vervet monkeys, but begging individuals have also been recorded amongst warthog, saddle-backed jackal, spotted hyaenas, steenbok and ground hornbills.

The graded surface of roads and road edges only sustain growth of pioneer grasses and a variety of herbs — many of which are favourite dietary items of steenbok and scrub hares. These animals are consequently attracted to roads in considerable numbers for this reason, and also for the sense of security provided. Roads have obvious survival value to these species. Unfortunately many hares which flock to the roads, where they feed in large numbers (particularly in winter) on the short green grasses which grow on the moisture-retaining curbs and drainage furrows, are killed by night driving vehicles. This also applies to the predators feeding on them. The carcasses thus left on the roads, again provide

food in the early mornings for such scavenging and predatory birds as bateleurs and tawny eagles.

Slow-moving lizards such as chamaeleons, and snakes such as the blind, burrowing *Typhlops* and *Leptotyphlops* spp., are particularly vulnerable when crossing roads and fall easy prey to such birds as dark chanting goshawks, African grey hornbills, pallid harriers, grey-headed bush shrikes and lilac breasted rollers.

During the rainy season, when flying termites leave their nests in great hordes, the exodus of these insects from their subterranean abodes, is more visible along the graded roads, and attracts a large number of predating species to the roads, such as birds of prey (Wahlberg's and tawny eagles and even white-headed vultures), monkeys, baboons, frogs such as *Pyxicephalus adspersus*, and others, lizards such as *Agama atricollis*, *Gerrhosaurus nigrolineatus*, *Cordylus jonesii* and others, mongooses, antbears, scaly anteaters and many invertebrate predators such as solifugids, scorpions, etc.

Many lizard species such as *Gerrhosaurus nigrolineatus*, *G. flavigularis*, *Ichnotropis squamulosa*, *Eremias lugubris*, *Nucras* spp., *Agama hispida*, and others, find the built-up edges of roads favourable for purposes of surveying their territories and for digging their shelters. Because of better visibility, they also customarily hunt their prey in the roads. Tortoises utilise roads as unimpeded routes of communication — particularly during the summer months.

Puff adders and other snakes bask on open roads — particularly tarmac surfaces, which retain some warmth after dark. Unfortunately, again, many are killed here by passing vehicles.

The surface of tarmac roads becomes smooth with use, and fleeing antelope, in attempts to clear the road, have been seen to slip and fall heavily on the hard surface — even breaking legs.

Road bridges across faunal barriers such as the large perennial rivers, may afford access to opposite banks to animals such as baboons, etc., which would find the rivers impassible under normal conditions. They may even provide the initial routes for colonization of new areas by species not occurring there, or which have become extinct there during former times.

Gravel pits dug along the roads, and left uncovered, are not only particularly unsightly from an aesthetic point of view, but may also have other detrimental effects. Some of these excavations hold water for a considerable period, and act as unwanted reservoirs of water in traditional summer grazing areas. This may lead to continued grazing pressure in such areas and serious range regressing in the habitat. This is a phenomenon which has been forcibly brought to attention in the trampled area of Kingfisherspruit section, and is also responsible for heavy overgrazing in the vicinity of the Lindanda experimental plots.

Some of these gravel pits which have not been filled in, are quite deep and when they become overgrown, they act as pitfalls to stampeding game herds, which often spill down these depressions, and may break limbs or necks in the process.

The steep embankments along deeply-rutted roads (such as many of our firebreak roads) are absolute physical barriers to such animals as tortoises which stray onto them. In attempting to climb up these steep inclines, they are often overturned on their backs and left helpless, to die a miserable death. (In one afternoon three tortoises were found on their backs along a half-mile stretch of the Stungwane firebreak). Ostrich chicks and the young of animals such as warhogs (and even baby elephants) find these steep embankments along roads or drainage furrows, impossible to negotiate and become separated from their mothers when put to flight. Such separation from parental care can only end fatally in the case of very young animals, and in their present condition roads must be regarded as an important mortality factor in the population history of such animals, as well as of ostriches.

Roads play an important educational role in National Parks. Many lead to places of particular biological, geomorphological or historical interest. It is also customary to number outstanding specimens of the different trees and shrubs along our roads and at resting places along the roads.

On the other hand, heavy tourist traffic along certain roads is a definite limiting factor to the movements and daily routines of timid species and breeding herds of other species. The limits thus imposed on available grazing areas or favourite watering points, may be so severe that the animals may be forced into adjoining areas, which may not be entirely suitable to their needs or which are already heavily utilised by resident herds. This is particularly true of the large breeding herds of elephant in the northern district of the Kruger Park, where the opening of new tourist roads is fraught with danger, unless they are very carefully planned. Timid species, such as eland and sable antelope, are extremely conscious of tourist activity and shun such areas — even to the extent of leaving the Park!

All things considered, it should be abundantly clear that the planning of all roads (particularly new ones) in National Parks and Nature reserves, must be conducted with the closest co-operation of the conservation staff, in view of their extensive knowledge of local conditions, and the possible effects of roads on the game and vegetation in the habitat. It is sad to reflect that this is all too often not done.

Bearing in mind the disastrous consequences which may follow, the aim in our National Parks should be at all times at limiting disturbance during road construction to an absolute minimum. Paralleling such a code of conduct, should be the realization by all concerned that wherever a road is built through wild country, this area can never again be the same, and whether the influence of such a road is beneficial or detrimental to the ecosystem, it is bound to be profound!