

Invasive alien plants in areas of the Namib Naukluft Park disturbed by man

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ABSTRACT

The occurrence of invasive alien plants in the Namib Naukluft Park in areas disturbed by the activities of man are listed. *Datura innoxia*, *Nicotiana glauca*, *Prosopis* spp. and *Ricinus communis* were the species which occurred most frequently. Most invasive plants were associated with an artificial supply of water. *Datura innoxia* was found primarily downstream of river fords suggesting that it has spread as a result of road building and maintenance activities. Equipment involved in such activities should therefore be thoroughly cleaned before moving between areas in different watersheds. Several alien species have been planted at homesteads for shade purposes. These are potential seed banks and should be replaced with indigenous trees. *D. innoxia* occurred in some river systems whose catchments were entirely within the park. Total eradication of alien plants within such systems is a realistic possibility and should be attempted.

INTRODUCTION

The Namib Naukluft Park is situated in the western arid region of South West Africa/Namibia. Most of the park receives less than 100 mm annual rainfall and as a result, modern man's activities have been restricted to extensive range farming in some of the eastern regions, mining and prospecting and conservation related activities.

There are two types of habitats into which invasive alien plants have become established in the Namib Naukluft Park. The first is the ephemeral river systems which originate in the Great Western Escarpment region and flow westwards into the Namib Desert, the second is those areas which have been disturbed by the activities of man, mainly constructions and roads, but also recreational areas such as campsites and hiking trails.

Boyer and Boyer (1989) have described the occurrence of alien plants in the river systems. This paper presents the results of a census conducted between November 1987 and July 1988 to determine the degree of infestation of invasive alien plants in areas disturbed by man in the Namib Naukluft Park.

The intention of this report is to serve as a baseline for future monitoring of alien plants and to indicate which species, and which areas, require immediate management action to eradicate or prevent further spread of these plants.

METHODS

Most of the areas of the Namib Naukluft Park subjected to disturbance by man were opportunistically visited (Figure 1). The areas not surveyed were the more remote water installations and some of the historical coastal settlements.

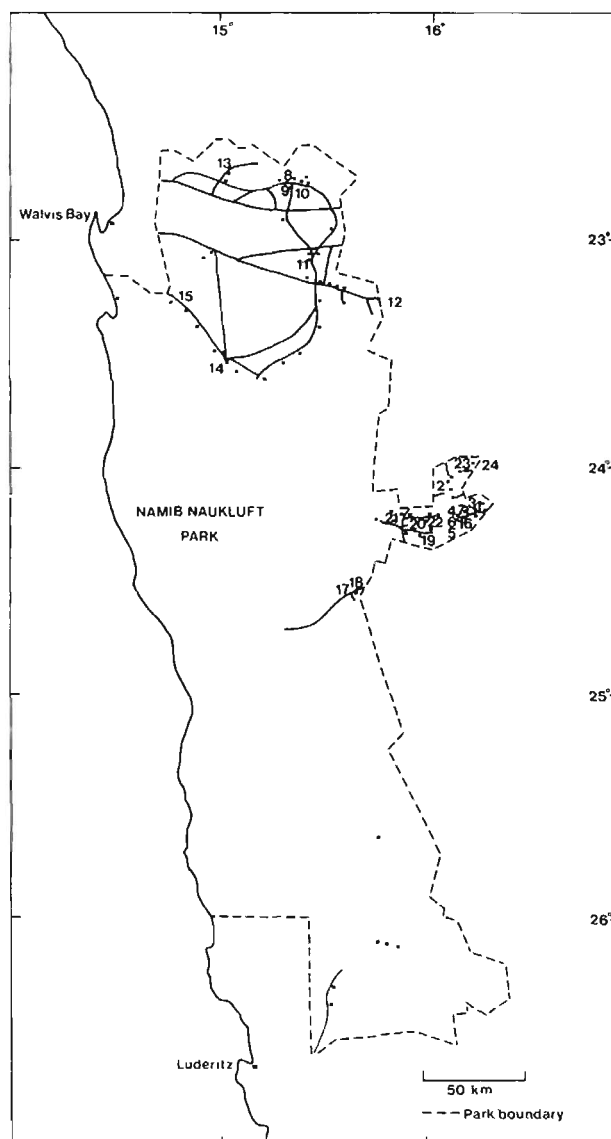


FIGURE 1: Map of the Namib Naukluft Park indicating the position of 24 stands of potentially invasive alien plants (see also Table 1). Roads (—) and other sites (●) censused, but free of invasive alien plants, are also indicated.

The areas visited were classified into four types:

- graded roads that are actively maintained and mostly open to public use,
- roads not regularly maintained, but which have been graded at some time in the past, and are generally not open to public use,
- rivers that are not negotiable by vehicles, but are used regularly, normally by hikers and
- all constructions including staff houses, restcamps, campsites, windpumps, dams, slaughtering areas, mines, gravel pits and rubbish dumps.

The presence or absence of alien plant species was determined, and in most instances the total number of each species present was counted.

The gardens of the occupied staff houses frequently contained many alien plant species. These were not included in this survey unless the species had previously been recognised as invasive (see Brown *et al.* 1985).

RESULTS

A total of 1039 km of maintained roads, 95 km of unmaintained roads, approximately 16 km of rivers and 79 constructions and other disturbed areas were visited (Figure 1). A full list of all areas surveyed is obtainable from the Nature Conservation Biologist at the Namib Research Institute.

Datura innoxia Mill. (White Thorn Apple) was the only invasive alien plant found along roadsides, while *D. innoxia* and *Ricinus communis* L. (Castor Oil Bush) occurred in all rivers surveyed (Table 1 & Figure 1).

Few invasive alien plants were found in association with man-made constructions with the exception of those constructions close to rivers and the water extraction scheme at Swartbank. In these regions *D. innoxia*, *R. communis*, *Nicotiana glauca* R.C. Graham (Wild Tobacco) and *Prosopis* spp. (Mesquite) were the most abundant alien plants.

TABLE 1: The alien plants which are either invasive or potentially invasive recorded in areas disturbed by the activities of man in the Namib Naukluft Park (length of roads and rivers surveyed is indicated in brackets).

Surveyed areas and sites	No. of plants of each species						
	**D	R	P	M	O	N	G
a) Maintained roads							
*1 Naukluft entrance road (13 km)	1						
2 Die Valle to Weltevrede (6 km)	27						
b) Unmaintained roads							
3 Naukluft Plateau to main road (8 km)	10						
c) Hiking rivers							
4 Naukluft River (to 4 km north of campsite)		4					
5 Naukluft River (to 4 km south of campsite)	31	1					
6 Gororosib River (to 2 km from Naukluft R.)	1						
7 Olive River trail (6 km)	31	51					
d) Constructions							
8 Langer Heinrich mine staff houses			1				
9 Bloedkoppies dam		9					
10 Bloedkoppies campsite		1					
11 Ganab African staff houses				2			
12 Kuiseb Bridge campsite	+	+					
13 Swakop River campsite			+				
14 Gobabeb Research Station						1	
15 Water extraction scheme at Swartbank	+						+
16 Naukluft Conservators' house and office	1						
17 Sesriem African staff houses			3				
18 Sesriem tourist restcamp			6				
19 Felsnek house			7		3		
20 Sukses house and office			1	14			
21 Elim houses			5				
22 Tsams West houses	25						
23 Zais houses	1		1				
24 Zais airfield and water installation			+				

*The localities of the alien plants are shown on Figure 1 using corresponding numbers.

**D = *Datura innoxia*

R = *Ricinus communis*

P = *Prosopis* spp.

M = *Melia azedarach*

O = *Opuntia* sp.

N = *Nerium oleander*

G = *Nicotiana glauca*

+ = more than 100 plants

DISCUSSION

Ecological aspects

Most of the invasive alien plants found were associated with a supply of water. In areas where water was absent, and has not been present for a number of years, no alien plants occurred.

Of the maintained roads, alien plants were present beside the entrance road to Naukluft and on the Die Valle road. These roads cross rivers in a number of places and it was always in the vicinity of these fords that alien plants were found. Only one *D. innoxia* was found beside a road and not in direct association with a river, but this plant was only 10 m from a river crossing. With the exception of one plant in the Gororosib River, *D. innoxia* only occurred in rivers on the downstream side of road crossings. All of the rivers surveyed that were crossed by a road contained this species of plant. The densest infestations usually occurred immediately downstream of road crossings, suggesting that the original infestation began at the road.

A number of *D. innoxia* plants were found on the road to the Naukluft Plateau. These all occurred in the vicinity of recent road construction or repair work in run-off channels or places where standing water had been present.

D. innoxia was also found at two of the staff houses at Naukluft and Tsams West. Both of these are situated alongside rivers and road-crossings. It seems likely that the points of origin of these infestations are the road crossings.

R. communis was found in the Olive and Naukluft Rivers in areas upstream of road crossings. Many other rivers in the Naukluft area, which do not have roads in their catchment areas, also contain plants of this species (A. Roodt pers. comm.). Seed distribution of this species must therefore be attributed to some cause other than road construction activities.

D. innoxia and *N. glauca* were found at three sites on the Gobabeb to Rooibank road in association with water spillage points from the water extraction scheme at Swartbank and almost certainly originated from the nearby Kuiseb River.

Prosopis spp., *Melia azedarach* L. (Syringa) and *Nerium oleander* L. (Oleander), all long-lived perennial species of alien plants, were found at some of the staff houses. These had been planted for shade or decorative purposes, but nonetheless represent potential dispersal points for the spread of these species into the natural ecosystem.

Management recommendations

The data collected during this survey indicates that the spread of *D. innoxia* is closely associated with roads and that the original infestation occurred during road building or maintenance activities.

While general traffic may disperse seeds, the occurrence of *D. innoxia* on roads rarely used, but recently built or repaired suggests that the machinery used to maintain the roads is the dispersal agent. Road building and maintenance equipment should be thoroughly cleaned before moving from one river system to another.

The various rivers associated with the Naukluft hiking trails, which are areas of high tourist visibility, should be cleared of all alien plants. The source of infestation of *D. innoxia* in these rivers is upstream, where they come into contact with roads. These river systems are entirely within the park borders and therefore total eradication of alien plants is a possibility. A control programme should be initiated immediately.

With the possible exception of the large *Prosopis* spp. trees at Sesriem restcamp and some of the *M. azedarach* at Sukkes, all alien plants at staff houses should be removed immediately. At Sesriem and Sukkes indigenous trees should be planted immediately so that in a few years time the alien species can be removed. During this period seed dispersal should be prevented, both by removal of seeds on the tree and clearing of fallen pods. Other alien species in the park, e.g. *Eucalyptus* sp. and *Schinus molle* at picnic sites, while not invasive in this area, should nevertheless be replaced by indigenous trees for aesthetic reasons.

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