

# Invasive alien organisms in central South West Africa/Namibia: Results of a reconnaissance survey conducted in November 1984.

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## ABSTRACT

Alien plants were surveyed from a moving vehicle along 2270 km of roads and 115 km in the courses of four rivers of central South West Africa/Namibia. Frequency of occurrence and abundance rating by 10 km road-lengths and 1 km river-lengths are presented for the 20 alien plant species observed. Although most species were infrequently recorded away from rivers, certain of the riverbeds held dense infestations of *Datura innoxia*, *Nicotiana glauca* and *Prosopis* sp.

The only alien bird species found to be widespread, the House Sparrow *Passer domesticus*, was recorded at 13 of the 21 areas of human habitation inspected.

## 1 INTRODUCTION

In South West Africa/Namibia, alien organisms invading natural and semi-natural ecosystems have received little attention from biologists. In order to collate the available information on the subject, a workshop meeting was held in November 1984 (Brown *et al.*, in press). In preparation for this meeting, the authors carried out a rapid survey of the central portion of South West Africa/Namibia during 20 — 26 November 1984. This paper presents the results of the survey.

## 2 METHODS

### 2.1 Alien plants

Infestations of alien plants were surveyed using the road transect method developed by the South African Botanical Research Institute, during their survey of alien plants in the Transvaal province of the Republic of South Africa (Henderson and Musil, 1984). The method used was to rate all infestations seen from a moving vehicle over each 10 km-section of road transect and over each 1 km-section of river bed traversed. The abundance ratings used were the modified ratings developed by Macdonald and Macdonald (in prep.) in South Africa (Table 1).

In total, 2 270 km of open road was traversed and rated in 10 km sections (Fig. 1) and 115 km of riverbed over four rivers was rated in 1 km sections (Fig. 1). In addition, 20 km of roads and firebreaks was traversed along the southeastern edge of the Waterberg Plateau Park.

For vegetation types, the frequency of occurrence (F) of species X in vegetation type i was computed as

$$F_{Xi} = \frac{\text{No. of 10 km-sections in vegetation type } i \text{ having species } X}{\text{Total No. of 10 km-sections in vegetation type } i} \times 100$$

The same approach was adopted using the 1 km-sections of each river transect. All frequencies were expressed as percentages, even though sample sizes were less than 100 (this is purely for facilitating comparison with other similar statistics, and the large error terms associated with these estimates should be borne in

mind). Mean abundance (A) for species X in vegetation type i was computed as

$$A_{Xi} = \frac{\text{Sum of abundance ratings for sp. X in vegetation type } i}{\text{No. of 10 km-sections in vegetation type } i \text{ having sp. X}}$$

The same approach was adopted in calculating the mean abundance ratings using the 1 km-sections of the river surveys. Mean abundance ( $A_{qd}$ ) for species X in a quarter degree grid area was computed as

$$A_{qd} = \frac{\text{Sum of abundance ratings for sp. X in a quarter degree grid area}}{\text{No. of 100 km-section in quarter degree grid area}}$$

The mean abundance ratings for vegetation types and rivers are thus not comparable with those for quarter-degree grid areas, the latter being a mean over all 10 km-sections regardless of whether or not the species was present.

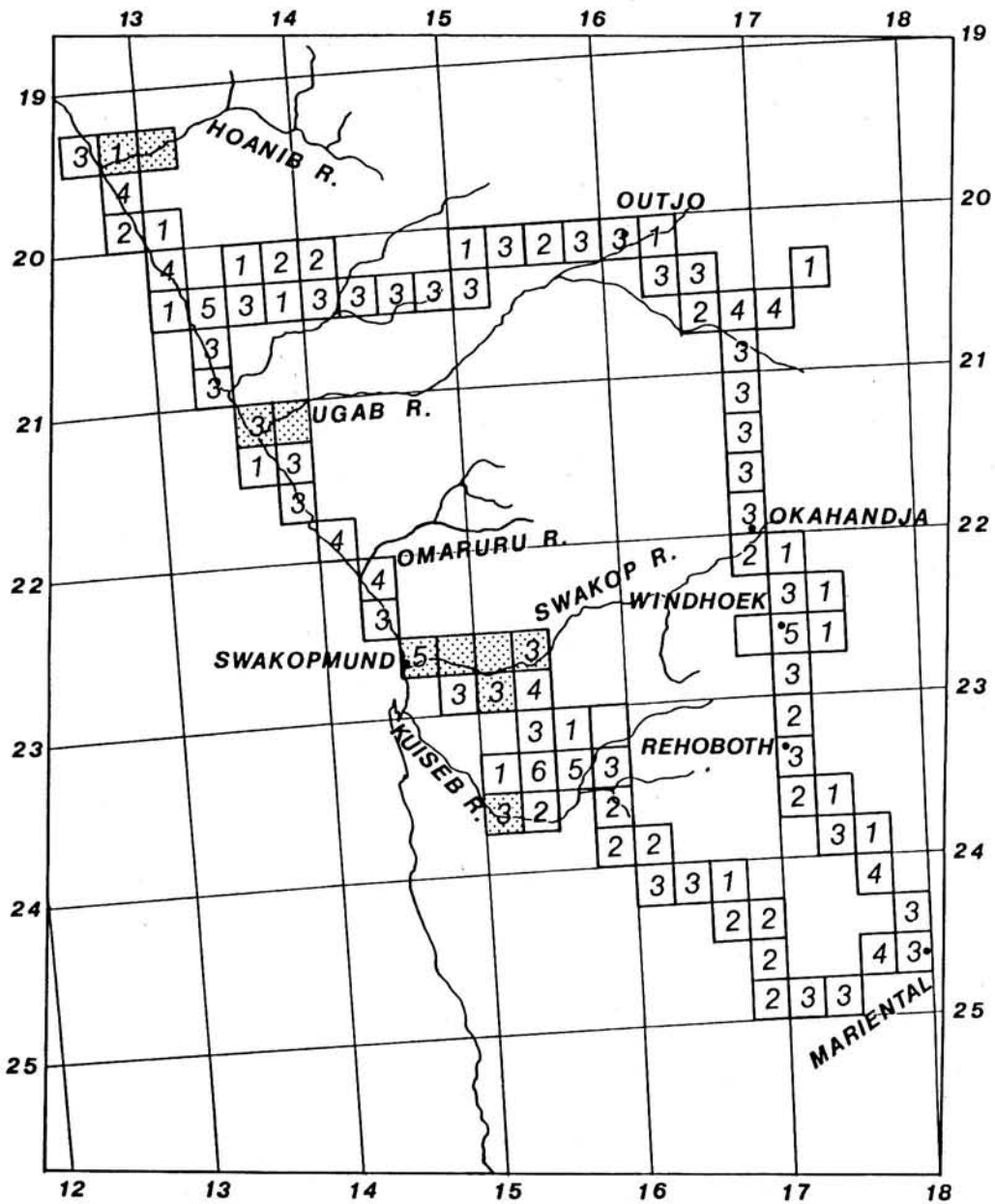


FIGURE 1: Route travelled showing number of 10 km transect sections surveyed per 1/4x1/4 degree area ( ) and 1 km sections censused along riverbeds ( ).

TABLE 1: Abundance ratings used for alien plant species in the survey.

RATING	DEFINITION	
9	Species forming a virtually continuous, almost monospecific stand at least 1 ha in extent.	
8	Species co-dominant in a virtually continuous stand at least 1 ha in extent.	
	LESS ABUNDANT THAN "8" WITH THE NUMBER OF PLANTS SEEN PER:	
	10 km-section	1 km-section
7	200 or more	20 or more
6	100 - 199	10 - 19
5	50 - 99	5 - 9
4	20 - 49	2 - 4
3	5 - 19	1
2	2 - 4	N/A
1	1	N/A

2.2 Alien birds

All birds recorded in 29 quarter-degree grid areas visited were listed (Fig. 2). In particular, the environs of 12 restcamps and isolated stations, eight small towns and one city encountered on the journey were searched for alien birds (Fig. 2).

3 RESULTS

3.1 Alien plants

The results of the roadside survey are presented according to the seven vegetation types of South West Africa/Namibia (Geiss, 1971) traversed during the survey (Table 2; Fig. 3). The distribution and mean abundance ratings in each quarter-degree grid area

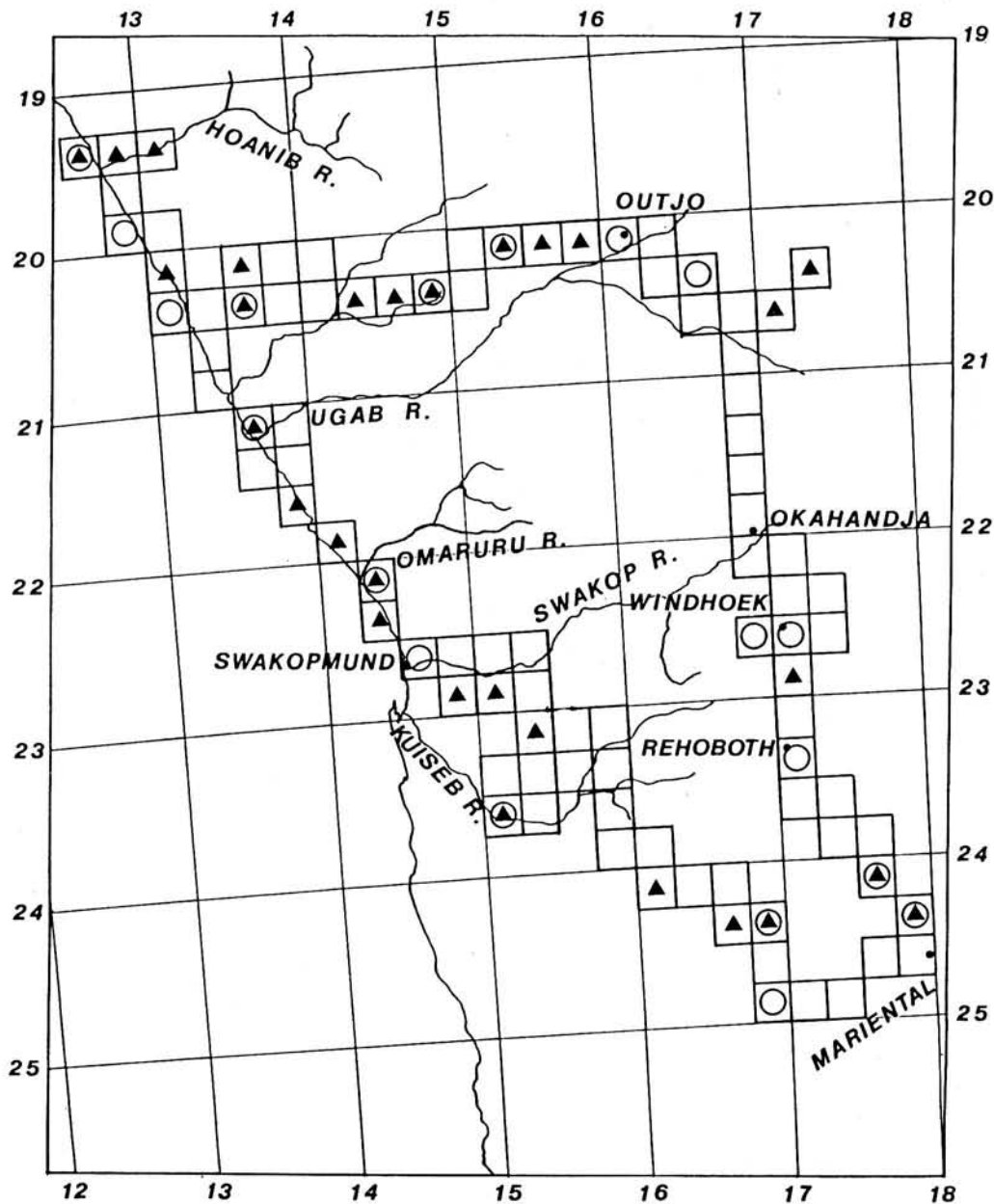


FIGURE 2: Grid squares for which all bird species were recorded (▲) and grid squares in which habitats were checked for occurrence of sparrows (○).

traversed for the most important species are presented in Figures 4 to 9. The results of the four riverbed surveys are presented in Table 3.

### 3.2 Alien birds

The only alien bird species recorded in the wild during the survey were Feral Pigeons *Columba livia* and

House Sparrows *Passer domesticus*. Feral Pigeons were only recorded in one quarter-degree grid area (Windhoek, 2217CA), whereas House Sparrows were recorded in 13 quarter-degree grid areas and around 13 of the 21 sites of human habitation surveyed. The observations made on sparrows around habitations are summarized in Table 4. No alien birds were encountered away from areas of human habitation.

TABLE 2: The percentage frequency of occurrence (F) in 10 km-sections and mean abundance ratings (A) for alien plant species in seven vegetation types sampled on the road transects (see Fig. 3 for names and distribution of vegetation types).

Veld type no.	1		2		4		5		7		8		9	
No. 10 km sections	30		55		25		31		40		12		36	
SPECIES	F	A	F	A	F	A	F	A	F	A	F	A	F	A
<i>Argemone subfusiformis</i> .....			4	5,0	12	3,0	10	2,6	40	5,3	75	3,8	33	4,8
<i>Asclepias fruticosa</i> .....					20	3,4	13	4,0	55	4,2	50	3,0	25	1,9
<i>Caesalpinia gilliesii</i> .....									3	3,0	8	1,0		
<i>Cereus peruvianus</i> .....							3	3,0						
<i>Datura ferox</i> .....							3	3,0	8	1,3	8	2,0		
<i>Datura innoxia</i> .....			4	3,0	4	3,0	26	4,0	23	2,2	25	2,3	8	2,3
<i>Datura stramonium</i> .....					4	3,0	3	3,0	3	3,0	8	5,0		
<i>Dodonaea viscosa</i> .....							3	4,0	3	1,0				
<i>Melia azedarach</i> .....							3	1,0	3	1,0	8	3,0		
<i>Nicotiana glauca</i> .....			4	7,0	8	2,5	6	3,0	5	1,0	8	6,0	3	1,0
<i>Opuntia ficus-indica</i> .....							3	2,0			17	2,5		
<i>Opuntia imbricata</i> .....											8	1,0		
<i>Opuntia inermis</i> .....							3	7,0						
<i>Opuntia microdasys</i> var <i>lutea</i> .....											8	4,0		
<i>Opuntia</i> sp. unident. ....											8	1,0		
<i>Prosopis</i> sp. ....					12	3,3	6	2,0	13	5,4	25	3,7	53	2,6
<i>Ricinus communis</i> .....	3	1,0	2	3,0	12	3,0	3	2,0						
<i>Schinus molle</i> .....							3	2,0	3	1,0				
<i>Tagetes minuta</i> .....							3	4,0	8	4,3	42	4,6		
<i>Tecoma stans</i> .....									3	1,0				

TABLE 3: The percentage frequency of occurrence (F) in 1 km-sections and mean abundance ratings (A) for alien plant species within the riverbeds of four west-flowing rivers in the Namib desert.

River (veld type no. of area)	Section of river surveyed	No. km	SPECIES											
			<i>Argemone subfusiformis</i>		<i>Datura innoxia</i>		<i>Datura stramonium</i>		<i>Nicotiana glauca</i>		<i>Prosopis</i> sp.		<i>Ricinus communis</i>	
			F	A	F	A	F	A	F	A	F	A	F	A
Hoanib (1)	Mouth of river to 35 km up river	35	9	3,7	94	7,2	9	4,0					6	4,0
Ugab (2)	Main road to 11 km upriver	11	73	5,9	100	6,4	45	5,2	100	8,3	27	3,0	18	3,0
Swakop (2 & 4)	Western boundary of Namib-Naukluft Park to 11 km east of Salem	47	6	3,0					21	3,5	94	5,1		
Kuiseb (border of 2 & 3)	Gobabeb to Homeb	22	32	4,1	73	6,0	55	5,7	82	6,0			27	4,2

TABLE 4: Presence (P) or absence (A) of sparrow species around human habitation in central South West Africa/Namibia. Where breeding activities were seen these are indicated by B. Where numbers were counted in the survey these are shown e.g. -6.

Locality	Quarter degree area	Presence of sparrows:				No. of spp. co-existing
		House	Cape	Great	Grey-headed	
<b>REST CAMPS, ISOLATED STATIONS AND FARM HOMESTEADS</b>						
Daan Viljoen Rest Camp	2216DB	P	A	P	A	2
Gobabeb Research Station	2315CA	PB	PB*	A	A	2
Hardap Dam Rest Camp	2417BD	PB	A	PB	A	2
Jackalsput Fishing Camp	2214AB	A	P-6	A	A	1
Mowe Bay Ranger Station	1912BC	P-2**	A	A	A	1
Nomtsas Farm	2416BD	A***	P	P	A	2
Power Station	2214DA	A	A	A	A	0
Springbokwater Ranger St	2013BC	PB-8****	A	A	A	1
Spykersbron Farm	2015AB	A	A	A	P	1
Terrace Bay Rest Camp	2013AC	A	A	A	A	0
Torra Bay Fishing Camp	1912DD	A	A	A	A	0
Ugabmund Ranger Station	2113BA	A*****	A	A	A	0
<b>SMALL TOWNS</b>						
Hentjies Bay	2214AB	PB-13	P-3	A	A	2
Kalkrand	2417BA	PB-6	A	A	A	1
Khorixas	2014BC	P	A	P	A	2
Maltahöhe	2417DC	P	?	?	?	?
Otjiwarongo	2016BC	P	A	A	A	1
Outjo	2016AA	P	?	?	?	?
Rehoboth	2317AC	A	?	?	?	?
Swakopmund	2214DA	P	?	?	?	?
<b>CITIES</b>						
Windhoek	2217CA	P	?	?	?	?

\* Nesting in a hole in the wall of a building

\*\* Only 1 pair, male arrived ca 2 months prior to our survey, female ca 1 month prior. Feeding far from habitation and also being fed kitchen scraps.

\*\*\* The occupant informed us that the species had been present here but that the birds has disappeared during "the drought". Numerous sparrow nests of uncertain origin were present in thorn branches intentionally placed in the rafters of a metal-roofed farm building for this purpose.

\*\*\*\* Has apparently been here since at least 1980 (Titos pers. comm.)

\*\*\*\*\* Vagrants turn up here irregularly but they are discouraged (B. Loutit pers. comm.)

? Areas searched too rapidly for the observers to be confident that a sparrow species had not been missed.

## 4 DISCUSSION

## 4.1 Alien plants, general

This survey showed that a variety of alien plant species is present in most of the vegetation types traversed in central S.W.A./Namibia. Alien plants were recorded at very low frequencies in vegetation types 1 and 2 of Giess (1971) the "Northern Namib" and "Central Namib" (Table 2). However, even in these extremely arid areas, the beds of irregularly flowing rivers were found to sustain alien plant assemblages which were sometimes diverse and normally had at least one spe-

cies occurring at both a high frequency and density (Table 3). Although most of the species were present in each river surveyed, different species were dominant in each of them. *Datura innoxia* was the most important alien species in the lower Hoanib, *Nicotiana glauca* in the lower Ugab, *Argemone subfusiformis* at the mouth of the Omaruru river (vegetation type 2 — quarter-degree area 2214AB, surveyed as part of the main road transect), and *Prosopis* sp. in the lower Swakop. *Datura innoxia* and *N. glauca* were co-dominant in the middle Kuseb. The infestations of *D. innoxia* in the Hoanib, *N. glauca* in the Ugab and *Prosopis* sp. in the Swakop had already assumed mas-

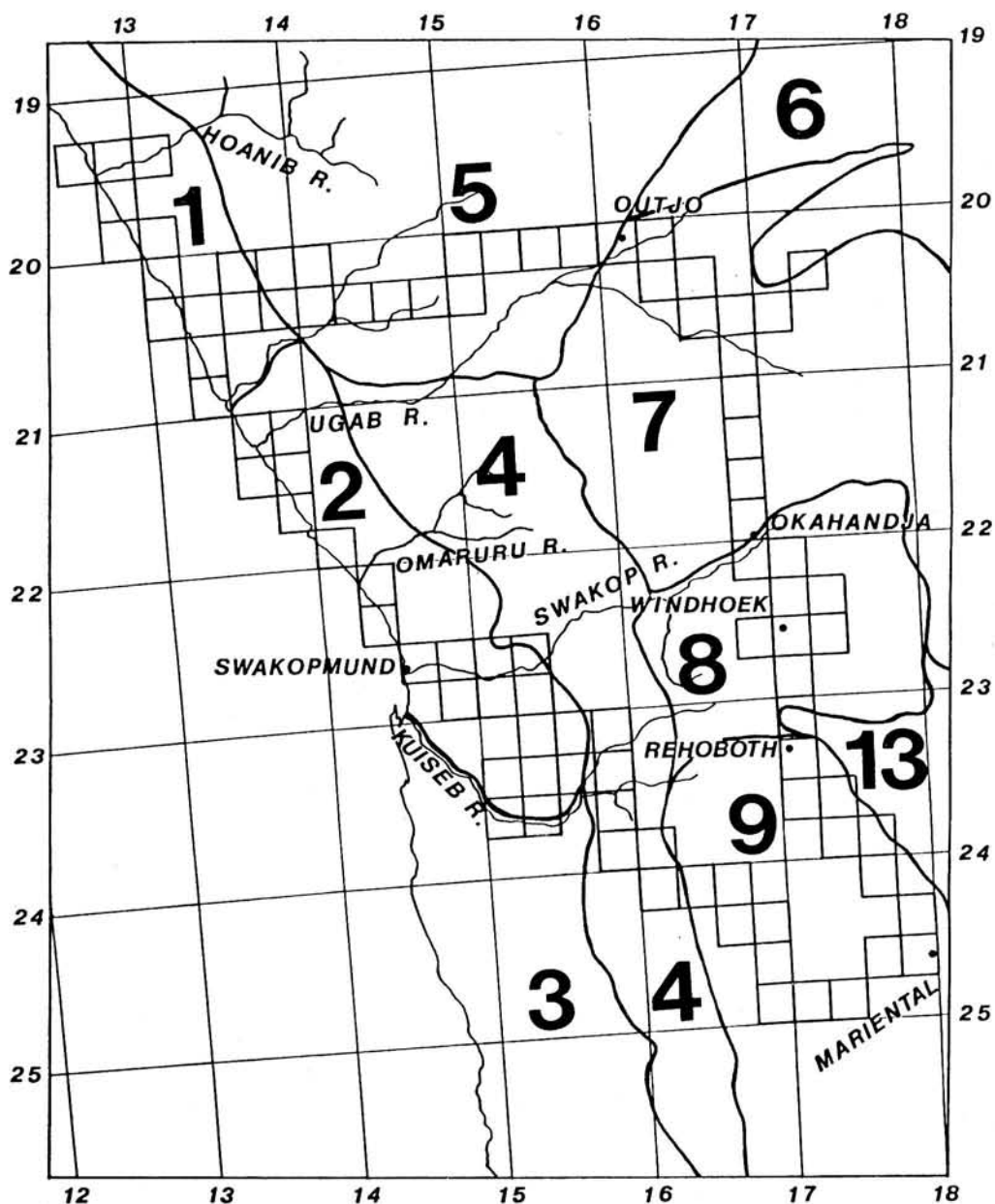


FIGURE 3: Grid squares surveyed within different vegetation types (after Giess, 1971). 1 — Northern Namib; 2 — Central Namib; 3 — Southern Namib; 4 — Semi-desert and savanna transition (escarpment zone); 5 — Mopane savanna; 6 — Mountainous savanna and Karstveld; 7 — Thornbush; 8 — Highland savanna; 9 — Dwarf shrub savanna; 13 — Mixed tree and shrub savanna (Southern Kalahari).

sive proportions. Each infestation occurred as a virtually monospecific stand covering considerable portions of the surveyed sections of the river courses. We consider it likely that these species are already responsible for undesirable impacts on the natural ecological functioning of these river systems which fall within proclaimed nature conservation areas. In this respect, it was gratifying to see that attempts had been made to control the *Prosopis* infestation on the Swakop and to learn that preliminary trials on the feasibility of controlling the other two major infestations had been initiated (P. Tarr, in litt. and R. Loutit, pers. comm.).

4.2 Alien plants, species accounts

*Argemone subfusiformis* was generally found in low density in sites of disturbance, such as roadsides, in

the higher rainfall vegetation types (Fig. 4). Denser stands were found in river courses and the beds of dry impoundments. The species (called *A. mexicana*) was recorded in 1911 at Orab south of Mariental (Grid 2417DD) on the Fish River, and Dinter (1918) commented that it was already found "quiet often" in S.W.A./Namibia soon after the turn of the century. Presumably the species has now reached virtually all suitable areas in central S.W.A./Namibia. The few scattered plants found in the Hoanib appeared to be pioneers, and it would possibly be worth attempting to eradicate the species there.

*Asclepias fruticosa* was mainly found in roadside ditches and other sites of water run-in in the higher rainfall vegetation types (Table 2, Fig. 5). It was most

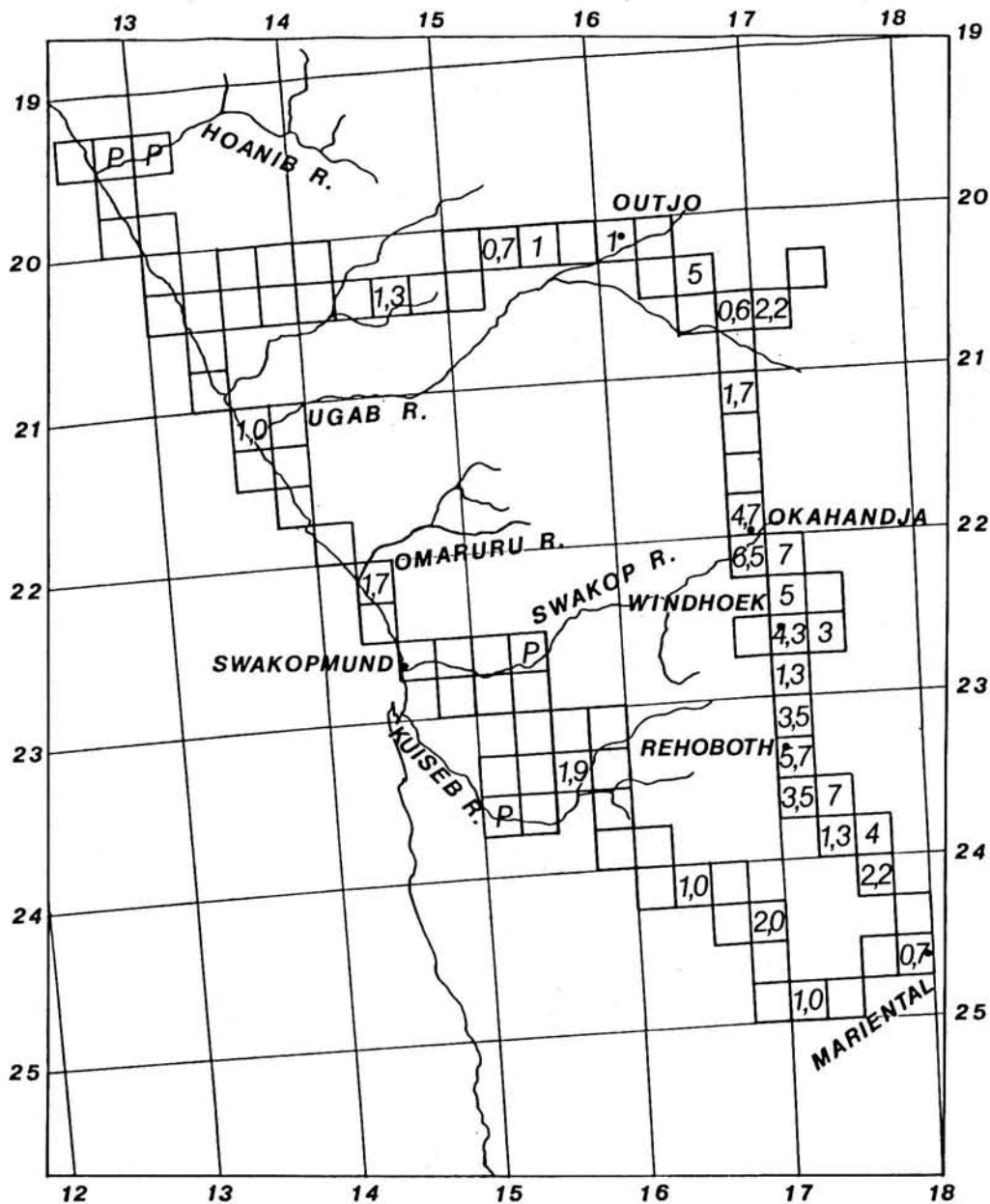


FIGURE 4: Mean abundance ratings for 10 km-sections ( $A_{qd}$ ) for *Argemone subfusiformis*. P = where recorded outside the main road survey.

abundant in the road reserve between Outjo and Okahandja where the woody vegetation had been removed i.e. where competition for moisture would have been considerably reduced. Whether this species is alien to S.W.A./Namibia has not been conclusively established. However, Dinter (1909) reported that the species had been introduced from South Africa, that it indicated where there was water close to the surface and that by this date it was already one of "the commonest plants" in S.W.A./Namibia. As a ruderal in disturbed sites the species appears to pose little ecological threat in S.W.A./Namibia.

*Caesalpinia gilliesii* showed limited short distance spread into indigenous vegetation in the vicinity of Okahandja, Windhoek and Aris. This species could be eliminated with ease, at its present levels of infesta-

tion. However, its continued use in gardens would require that these operations be repeated at regular intervals in the future.

*Cardiospermum grandiflorum* was not recorded during the road transect but was found spreading into the indigenous vegetation at Rodenstein in the Waterberg Plateau Park. This species has become a major problem in localized areas in Natal (Macdonald and Jarman, in press) and should be eradicated wherever present in S.W.A./Namibia.

*Cereus peruvianus* was only recorded showing limited (? vegetative) spread from a cultivated plant on Spykersbron (Omasima) farm (2015AB). This species has become a major problem in certain of the savanna regions in the Republic of South Africa (Taylor &

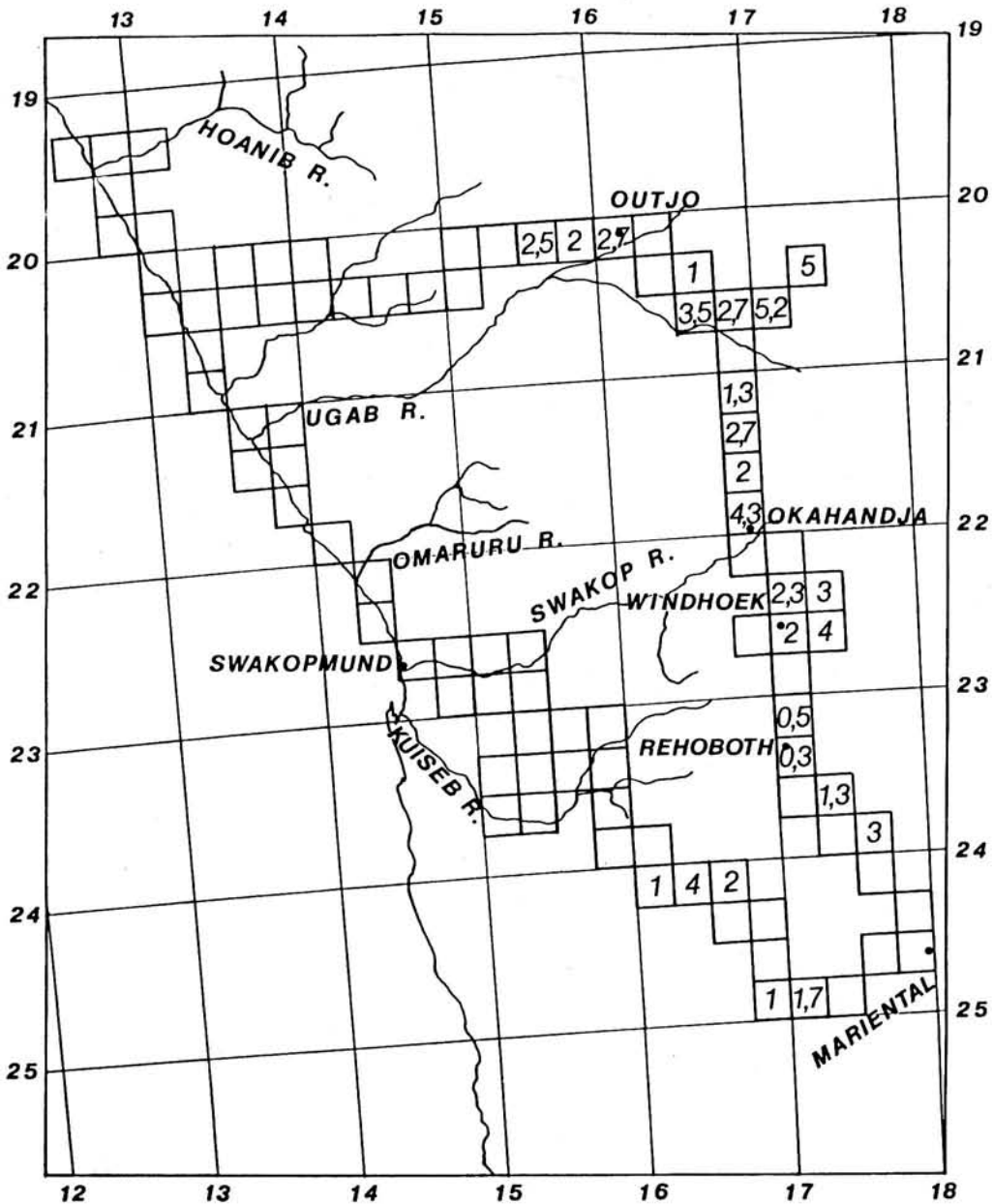


FIGURE 5: Mean abundance ratings (A<sub>qd</sub>) for *Asclepias fruticosa*.



Walker 1984 and Macdonald pers. obs) and should be eliminated from S.W.A./Namibia wherever possible.

*Datura ferox* was found at low densities in scattered roadside infestations in the higher rainfall vegetation types (Table 2).

*Datura innoxia* was found in every vegetation type surveyed (Tables 2 & 3, Fig 6), although in all of them the species was restricted to river courses. This localized occurrence resulted in the species showing low quarter-degree abundance ratings (Fig. 6) compared to widespread aliens such as *A. subfusiformis* (Fig. 4). It was only in the riverbeds of the Namib that the species was abundant (Table 3). The species is apparently absent from the Swakop river system and efforts should be made to maintain this situation.

*Datura stramonium* was not found in the dry Dwarf Shrub Savanna (Table 2), and in the Namib vegetation types was only found in river courses (Tables 2 & 3). It was always less common than *D. innoxia* and nowhere was seen to form a dense infestation. This species does not appear to pose a major threat to any of the ecosystems it has invaded in S.W.A./Namibia. If *D. innoxia* were to be controlled, *D. stramonium* could possibly increase in systems such as the Ugab and Kuiseb where it is already widespread. In this respect, it would possibly be advisable to attempt to eradicate this species from the Hoanib before a major control programme is initiated there for *D. innoxia*.

*Dodonaea viscosa* was seen to be showing limited spread in the vicinity of Outjo and Otjiwarongo. This

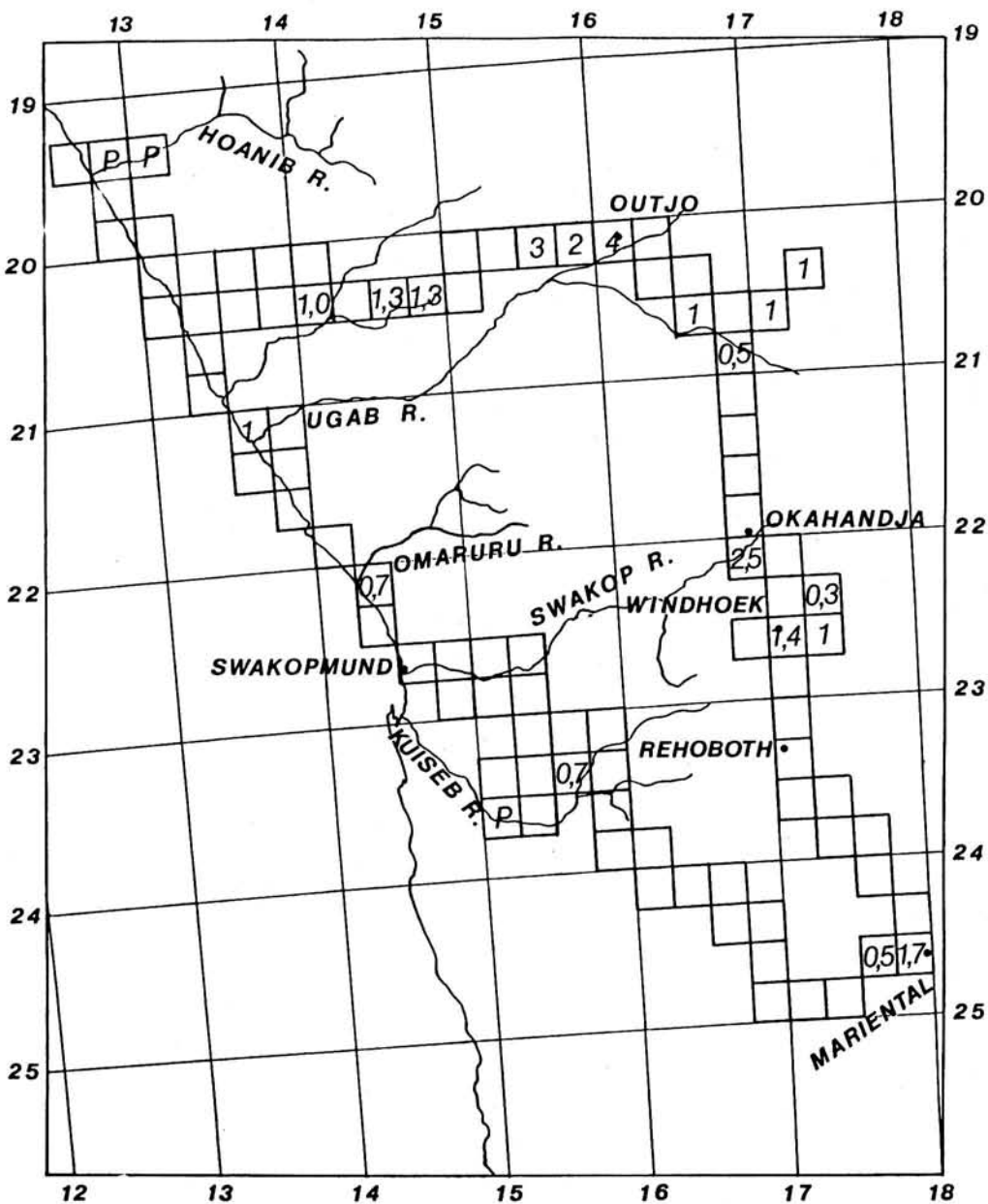


FIGURE 6: Mean abundance ratings ( $A_{qd}$ ) for *Datura innoxia*. P = where recorded outside the main road survey.

species has spread into natural vegetation in areas outside its original range elsewhere in southern Africa and should be controlled while infestations are still light. The species should not be cultivated within nature conservation areas in the higher rainfall areas of the territory.

*Lantana camara*, although not recorded on the road transect, was seen to be invading indigenous vegetation in a kloof of the Waterberg Plateau Park around an old farm homestead. The plants observed had all been heavily browsed and the infestation was not dense. Browsing by indigenous ungulate communities can limit the spread of this species in southern Africa (Macdonald 1983).

*Melia azedarach* was seen as single individuals on the roadside near Outjo, Otjiwarongo and Windhoek. Whether these individuals had been planted or were self sown could not be determined. If the species is invasive in this area it is apparently not very successful and was certainly not posing a problem in any of the areas visited during this survey. The species is highly invasive in the moister eastern part of the subcontinent (Macdonald 1983) and should, ideally, not be planted in the vicinity of perennial or seasonal rivers in the northeastern areas of S.W.A./Namibia.

*Nicotiana glauca* was one of the most widespread alien plants found in this survey (Tables 2 & 3, Fig. 7). Although not recorded in the southernmost portion of

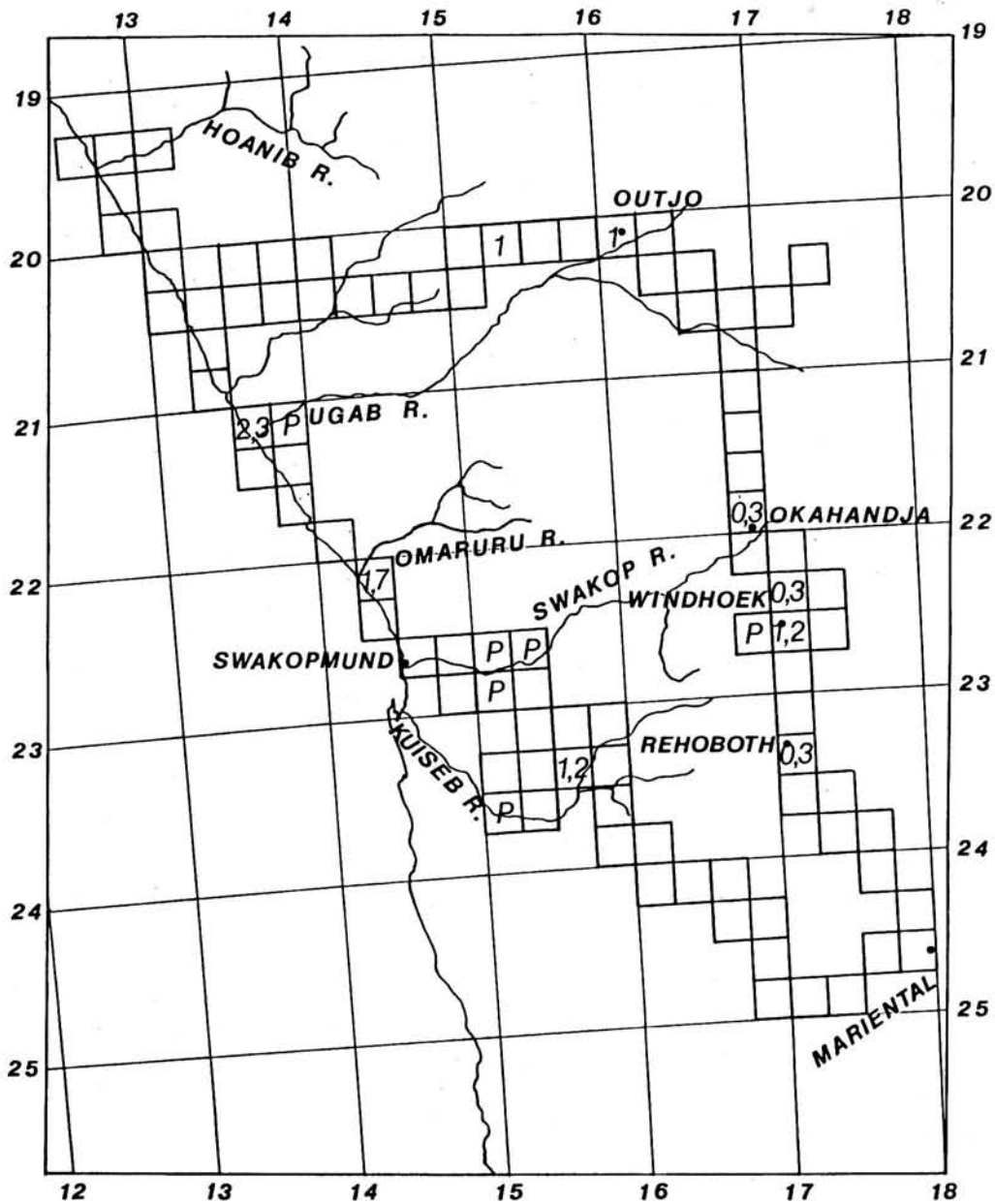


FIGURE 7: Mean abundance ratings ( $A_{qd}$ ) for *Nicotiana glauca*. P = where recorded outside the main road survey.

the survey, this species was recorded in 1911 by Dinter (1918) on the Fish River at Orab south of Mariental (2417DD). That *N. glauca* was already well established in the territory by 1918 is borne out by it having been one of the four most common species at the mouth of the Swakop River in 1913 (Dinter 1918). The species is apparently absent from the Hoanib River system and considerable effort should be expended to maintain this desirable situation.

*Opuntia ficus-indica* was observed in the Mopane Savanna only as a light infestation around Spykersbron (Omasima) farm (2015AB). In the Highland Savanna it was observed as a few scattered individuals near Windhoek and Aris. The most extensive infesta-

tion observed was on the edge of the plateau in the Waterberg Plateau Park. In this locality it was being well controlled by an introduced Cochineal insect *Dactylopius* sp. The species has apparently become less common than was the case early this century (Dinter 1909).

*Opuntia imbricata*, *Opuntia microdasys* var *lutea* and *Opuntia* sp. unident. were all observed showing very limited spread from garden plantings around Windhoek.

*Opuntia inermis* was observed as an extensive infestation in Mopane veld around the homestead of Spykersbron (Omasima) farm (2015AB). None of

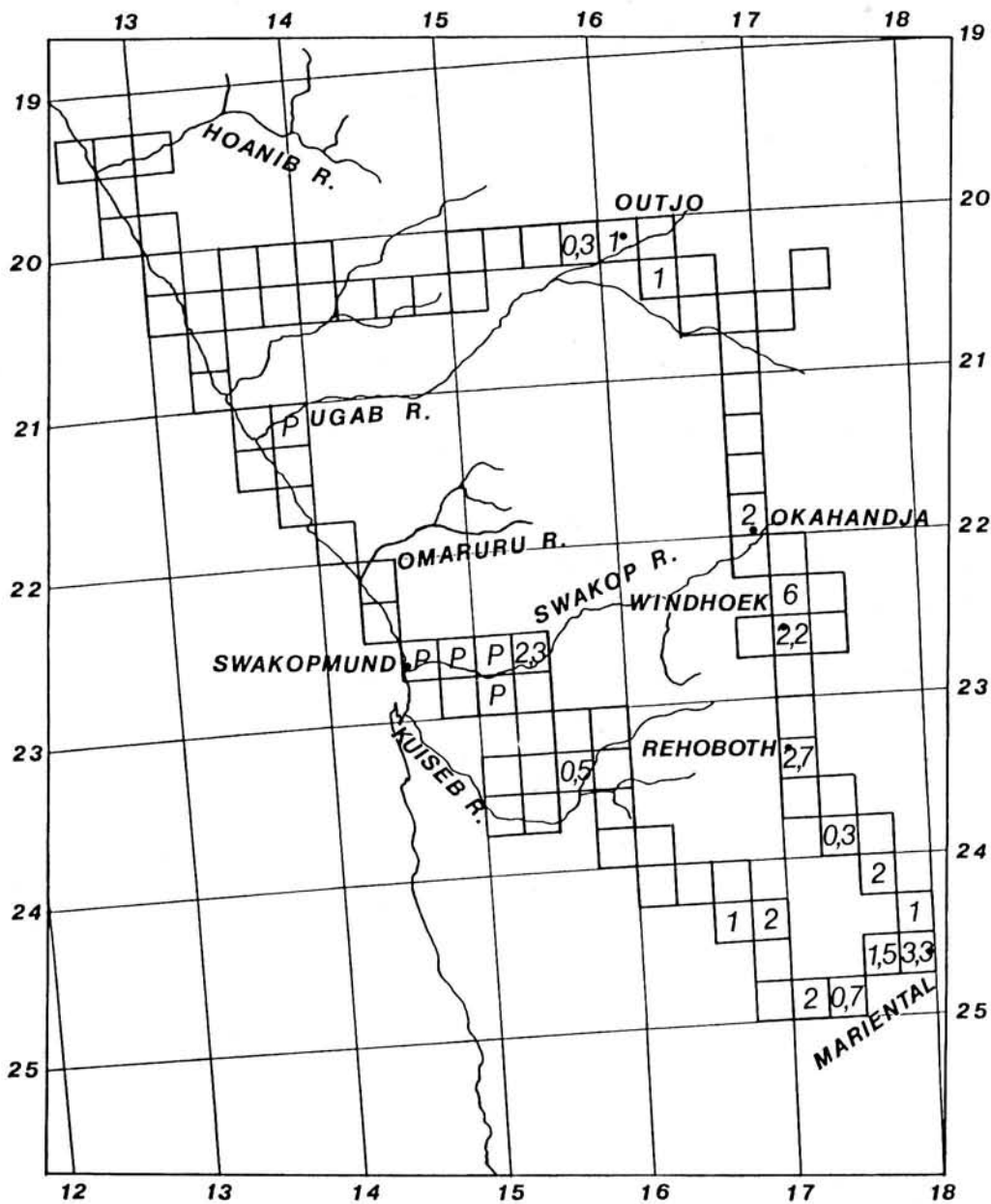


FIGURE 8: Mean abundance ratings (A<sub>qd</sub>) for *Prosopis* sp. P = where recorded outside the main road survey.

these plants showed signs of being attacked by introduced biocontrol insects.

*Prosopis* sp. was found to be cultivated around most of the towns and farm homesteads visited during this survey. The species was first introduced to S.W.A./Namibia in 1912 (Müller, in press). The most extensive infestations seen were on the Swakop River and around Windhoek. Infestations were most widespread in the Dwarf Shrub Savanna (Table 2, Fig. 8), possibly as a consequence of the long history of cultivation at the numerous farm homesteads found in this vegetation type. Although present at low density in the upper catchment of the Kuiseb River (on the Gaub River) no individuals were seen in this river between Gobabeb and Homeb. The upper reaches of this river warrant clearing in order to prevent dense infesta-

tions, such as those found in the Swakop River, from developing. Similarly, the elimination of the few *Prosopis* trees established in the lower Ugab River should be accorded a high priority. In all cases where riverine infestations of this species are to be controlled, operations should be initiated at their source. In this respect the control operations observed near Riet Gaop on the Swakop River are clearly not ideal. Although it is uncertain how far *Prosopis* seed is transported by flood waters in such a river, it is certain that seed will continue to be brought into the cleared portion from the farming areas east of the Namib Naukluft Park. An infestation of *Prosopis* was observed on the banks of the upper Swakop River near Okahandja. That this species is still being planted as a roadside shade tree in S.W.A./Namibia (as was observed at a lay-bye on the road between Otjiwarongo and Oka-

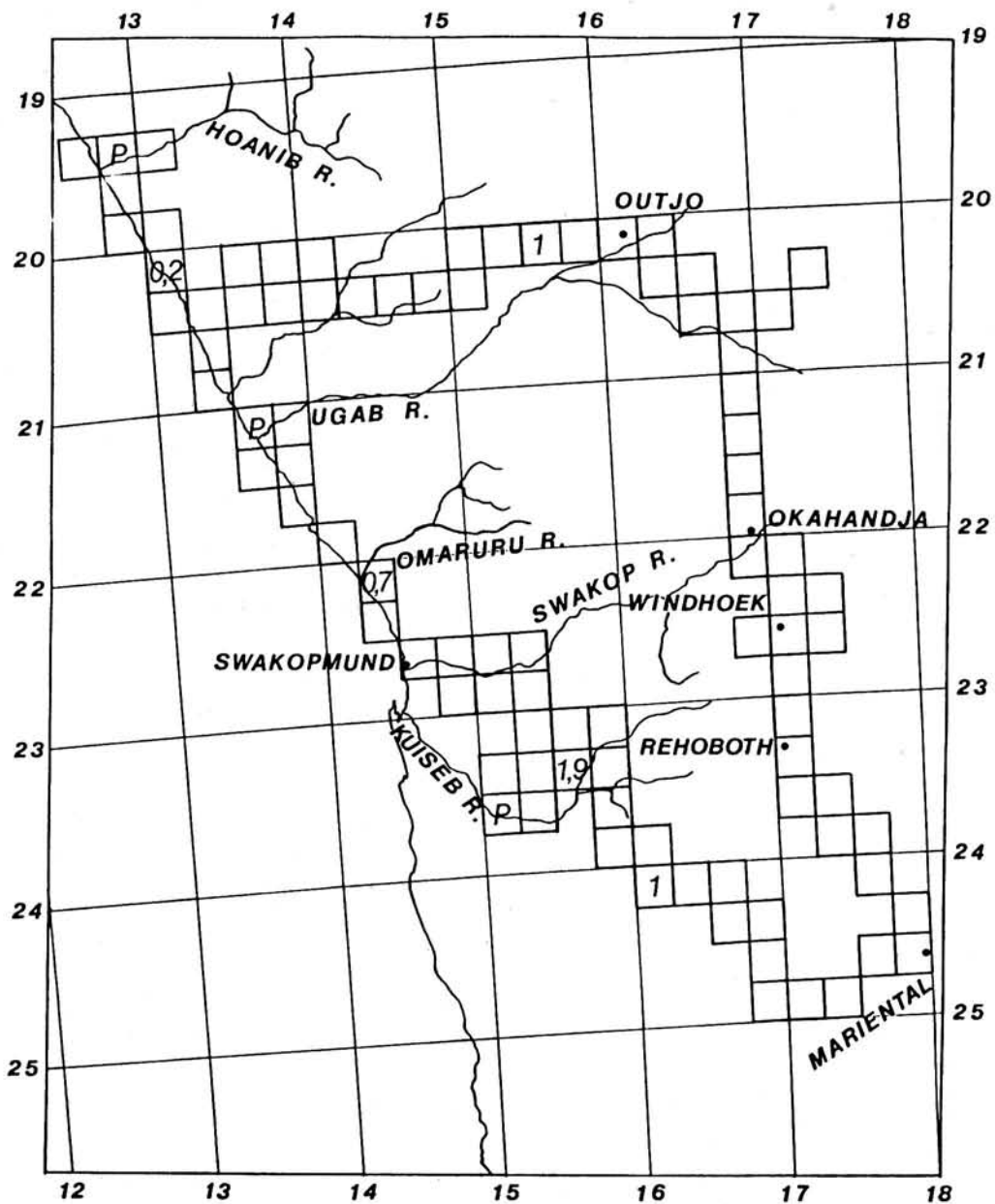


FIGURE 9: Mean abundance ratings ( $A_{qd}$ ) for *Ricinus communis*. P = where recorded outside the main road survey.

handja) is remarkable, given its obvious invasive potential in the territory. Although *Prosopis* has not been shown to have deleterious ecological effects in S.W.A./Namibia, extrapolation from elsewhere indicates that this will be the case (Macdonald, 1985). Already the species has been shown to have deleterious effects on human health in S.W.A./Namibia (Ordman 1959).

*Ricinus communis* was only found as scattered plants, mainly along rivers such as a tributary of the Tsondab, the Gaub, Kuiseb, Omaruru, Ugab and Hoanib. One plant was observed growing next to an isolated pump-house on the road between Torra Bay and Terrace Bay, indicating that the species is inadvertently spread by man in this area. On the middle Kuiseb River the species was being extensively browsed and the only relatively intact individuals seen were those growing in the protection of fallen branches. The browsing was probably being carried out by goats *Capra hircus* which were herded by the Topnaar inhabitants of the Namib-Naukluft Park and which had consumed most of the palatable herbage within their reach by the time of our survey of the river. The species was already common in S.W.A./Namibia early this century and Dinter (1909) was not certain as to whether or not the species was indigenous to the territory. If it is an alien it is certainly having a negligible impact on the rivers it was found in at the time of this survey.

*Schinus molle* was found as a few self-seeded individuals in the vicinity of Outjo and Otjiwarongo. This species has been found invading, albeit very slowly, karoo riverine fringe vegetation in the Republic of South Africa (Macdonald pers. obs).

*Tagetes minuta* occurred mainly in the relatively well-watered Highland Savanna region (Table 2). It was present almost exclusively as a roadside ditch invader. It was also recorded below the plateau in the Waterberg Plateau Park.

*Tecoma stans* was seen once growing on the road-verge south of Outjo. Whether this plant was self sown or not could not be determined.

In addition to the above species, the alien forb *Flaveria bidentis* was seen growing as a roadside weed between Nomtsas and Gamis where rain had fallen recently. This species could not be adequately surveyed from a moving vehicle, because there are several indigenous species which are similar in appearance and it was flowering in only one area. Similarly, *Bidens biternata* was observed in the Waterberg Plateau Park. The alien grass *Polypogon monspeliensis* occurs in the bed of the Swakop River (H. Kolberg, pers. comm.) but was not recorded by us during this survey. The preceding list is neither comprehensive nor complete for the alien plant species present in S.W.A./Namibia. It is a list of the conspicuous species that could be observed in a rapid survey such as the present. The value of our survey lies not in its completeness but in its repeatability for those conspicuous species surveyed.

### 4.3 Alien birds

The House Sparrow was the only widespread alien bird species seen in S.W.A./Namibia. Since Uys (1962) first recorded this species at Grünau (2718CB) in 1961, the species has apparently colonized the whole of the territory, at least as far north as was surveyed on this trip. At this most northerly point, Möwe Bay (1912BC), the species had only arrived during 1984 (Ryan *et al.*, 1984, P. Tarr pers. comm.).

Although three and, in some areas, four species of *Passer* occur sympatrically in those portions of S.W.A./Namibia traversed during this survey (Maclean 1985), in no locality were more than two species found around an area of human habitation (Table 4). At the small, intermittently occupied, sites in the Namib often no sparrow species were recorded. These sites appear marginal for House Sparrows as, apparently, was the Nomtsas farm homestead where the species had disappeared after an initially successful colonization.

At Gobabeb both House Sparrows and Cape Sparrows *Passer melanurus* were breeding at the time of our visit. As the House Sparrow was already present here by 1966 (Willoughby & Cade 1967) it is apparent that the two species have been able to coexist here for at least 19 years. This is made more interesting by the observation that the Cape Sparrow was nesting in a hole in the wall of a building at Gobabeb which is the preferred nest site of the House Sparrow. The Grey-headed Sparrow *Passer griseus* was observed entering the roof of a farm outbuilding on Spykerson farm.

The Great Sparrow *Passer motitensis* which is generally considered "has not adapted to human settlement" in southern Africa (Maclean 1985) was found around two restcamps, one homestead and one small town. At Hardap Dam Rest Camp the species was nesting in a small indigenous shrub growing approximately 30 m from the buildings. At this locality the recently constructed buildings do not apparently offer many suitable nest sites for House Sparrows and the population of these was small. One pair of House Sparrows was observed nesting in a Greater Striped Swallow's *Hirundo cucullata* nest at the reception building and several individuals were seen at the entrance gate building. At Khorixas the Great Sparrow was observed to be far more abundant than the House Sparrow. These observations agree with those of Winterbottom (1964), who observed farther north in the territory that the statement "that the Greater Sparrow is a shy and retiring species of the bush and does not frequent human habitations is certainly not true of S.W.A.". It will be interesting to see whether the relatively recent arrival of the House Sparrow in these areas gives rise to any long term changes in the abundance of indigenous sparrows around habitations. At Kalkrand, where House Sparrows were already present in July 1968

(Macdonald pers. obs), no other species of sparrow was observed in November 1984. However, farther north in S.W.A./Namibia at Okakuejo, where the House Sparrow arrived in December 1976, both the Grey Headed and Great Sparrows were still present in the restcamp in 1985 (Nott pers. obs). The observation that no more than two species of sparrow were present at any of the habitations visited in the central portion of the territory indicates that sparrow "niche space" is limited in S.W.A./Namibia and potential interspecific competition should be watched for.

## 5 CONCLUSION

Alien plants were found to be invading most of the vegetation types observed. Infestations of *Datura innoxia*, *Nicotiana glauca* and *Prosopis* sp. in some of the west-flowing rivers were considered to constitute a conservation problem.

The only alien bird found to be widespread was the House Sparrow which was only found in close association with human habitation.

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