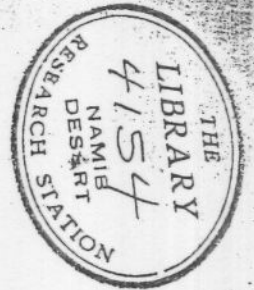


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& J.E.W. DIXON

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1980

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Lower Kuiseb River Perennial Vegetation Survey

(5 Tables, 15 Figures)

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Abstract

The Kuiseb River, located in central South West Africa, is one of several seasonal rivers flowing through the Namib Desert towards the southern Atlantic Ocean. As a linear oasis, it supports an extensive growth of trees and other vegetation which, in turn, allows many non-desertic or partially adapted animal species to extend their range into the true desert. Today, extensive plans to develop this water source for human use threaten the Kuiseb River ecosystem, particularly in its desert reaches.

At least ten species of perennial plants occur in the Kuiseb River system in the Namib Desert: *Acacia alba*, *Acacia erioloba*, *Tamarix usneoides*, *Euclea pseudebenus*, *Salvadora persica*, *Phoenix dactylifera*, *Ficus sycomorus*, *Ficus cordata*, *Maerua schinzii* and *Acanthosicyos horrida*. Their number and canopy

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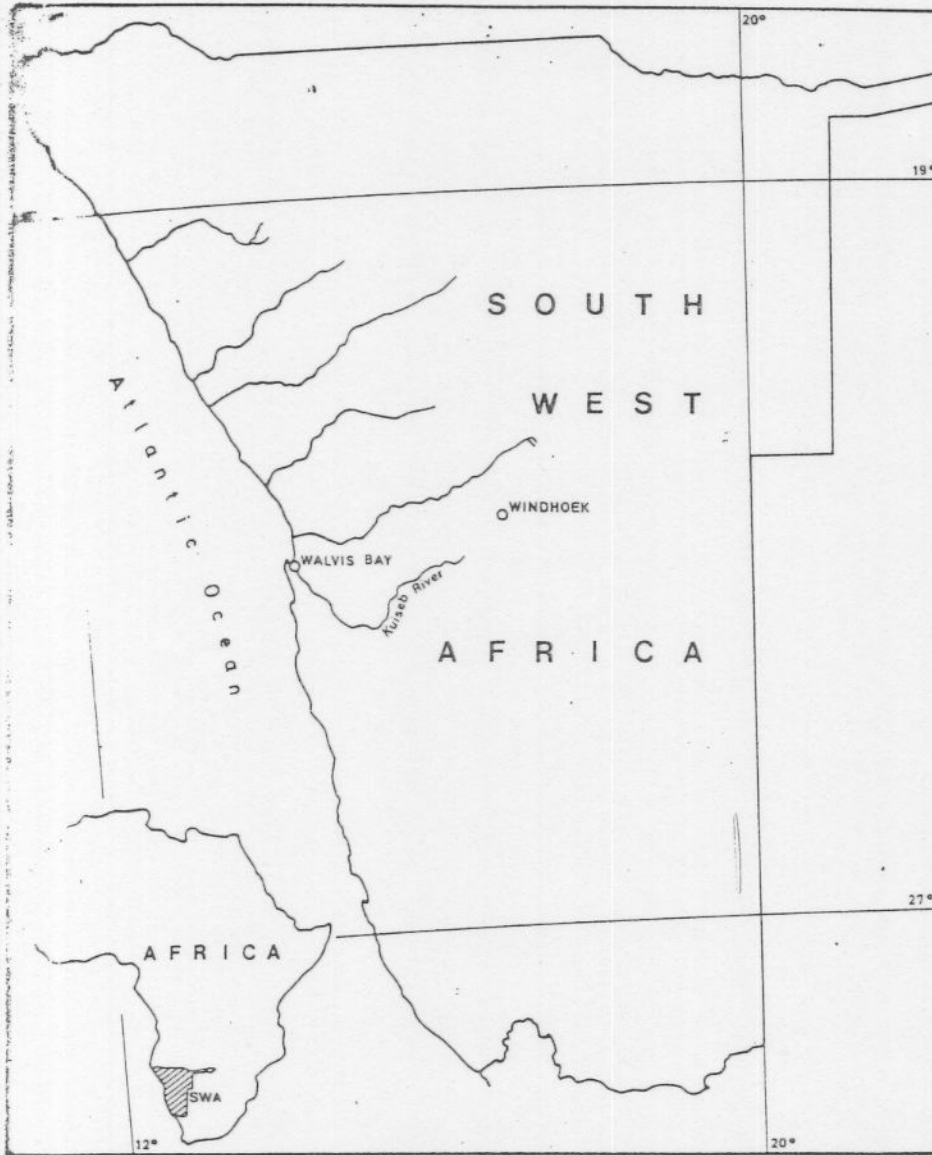


Figure 1. The Kuisieb River of central South West Africa drains the highlands and flows westward through the Namib Desert towards the southern Atlantic Ocean.

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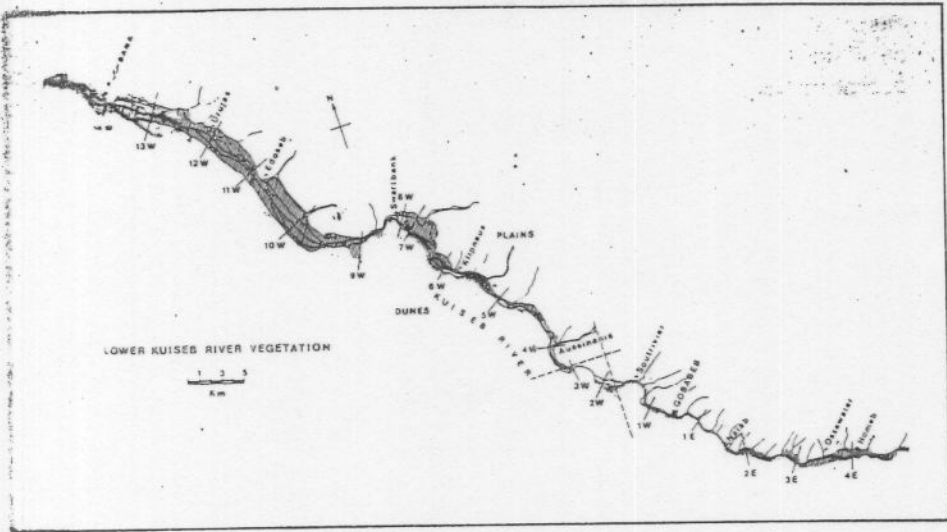


Figure 2. The vegetation of the Kuiseb River from Homeb to Rooibank occupies broad flood plains and is not confined to a narrow canyon as it is further upstream.

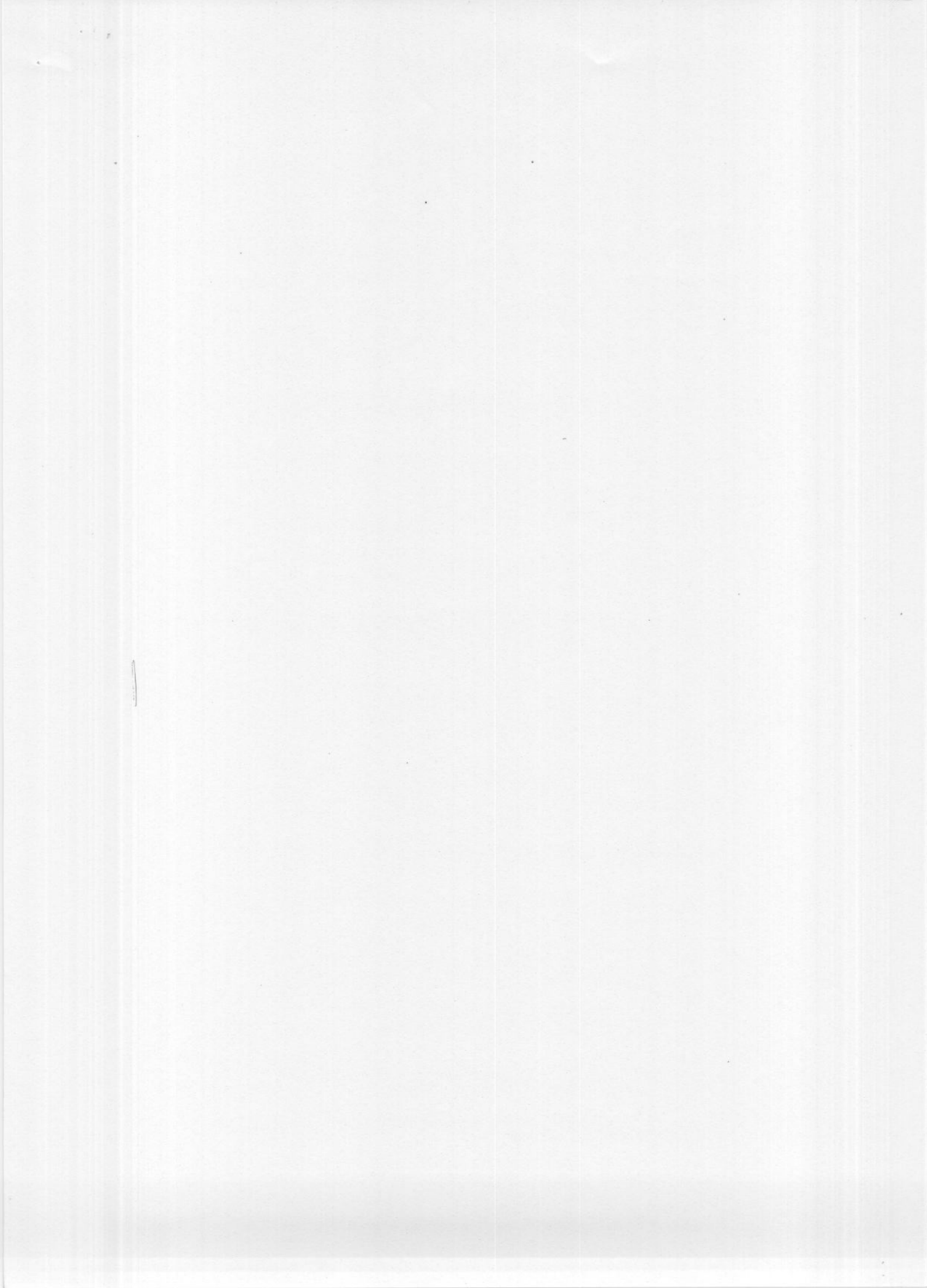
Thus, a regular surface flow of the Kuiseb River is necessary for maintenance of the river course itself and to support an associated fauna and flora. It also supports a *Oryx gazella* population in years when fresh grasses are lacking (Hamilton et al. 1977).

Methods

Vegetation transects:

We selected cross sectional transects as a method to measure characteristics of the vegetation (Phillips 1959) in 1972/73 (above Homeb) and 1973/74 (below Homeb to Rooibank). These transects were established perpendicular to the water course at approximately 5 km intervals on the lower Kuiseb River between Homeb (23° 13'S, 15° 09'E) and Rooibank (23° 12'S, 14° 39'E) (Fig. 2). Transects were numbered consecutively to the west and east of Gobabeb. The total area of vegetation downstream from Homeb is approximately 50 km² over a river distance of 85 km. Increased patchiness of the vegetation above Homeb necessitated more numerous transects in that part of the river system. Here, transects were surveyed at 0,5 km intervals over a river distance of 50 km. These transects were designated by distance in kilometres east of Gobabeb.

The Department of Water Affairs has designated three "Water Provinces" in the lower Kuiseb River based upon geological occurrences (L. W. R. Blom, pers. comm.). In the interval below Homeb almost an equal number of transects was surveyed in each of the three "Water Provinces". Transects 14W to 9W were in the lower province, transects 8W to 3W in the central province and transects 2W to 4E in the upper province of the



production at some sites. Three *Acacia erioloba* trees, two *A. albida* trees and one *Ficus sycomorus* tree were included in this analysis. Fruits of these two *Acacia* species were also censused on the transects below Homeb. Dry weight values for a one metre transect were calculated from average dry weight as determined above.

Animal Distribution:

In 1972/73, when this study was made, gemsbok and goats were the numerically dominant large mammal species. As an index of the distribution of space utilization by these two species, their faecal pellets were censused along a two metre wide path on each transect in the Kuiseb Canyon. All visible, non-bleached faecal pellets were considered and an estimate of the minimum total number to the nearest power of 10 was recorded. For example, all estimates from 1 000 to 9 999 were recorded as 1 000.

Nomenclature:

With the exception of *Acacia erioloba* (Ross 1975), which was used instead of *A. giraffae*, nomenclature in this paper was based upon "Prodromus einer Flora von Südwestafrika" by H. Merxmüller (1966-1972).

Results and Discussion

Vegetation Analysis:

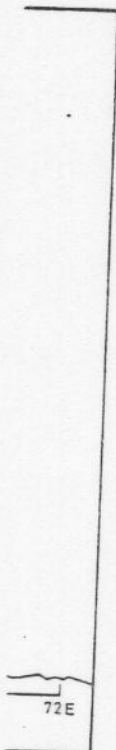
The composition of the perennial woody vegetation of the Kuiseb River is not complex (Fig. 3). Only 8 species, in a total of 509 trees, occurred in the transects from Rooibank to Homeb. Their percent occurrence in this sample was: *Acacia erioloba* E. Meyer (Mimosaceae) 44%; *Acacia albida* Del. (Mimosaceae) 21%; *Tamarix usneoides* E. Meyer ex Bunge (Tamaricaceae) 12%; *Euclea pseudebenus* E. Meyer ex A. DC. (Ebenaceae) 12%; *Acanthosicyos horrida* Welw. ex Bentham & Hooker fil. (Cucurbitaceae) 8%; *Salvadora persica* L. (Salvadoraceae) 2%; *Phoenix dactylifera* L. (Arecaceae) 0,8%; *Ficus sycomorus* L. (Moraceae) 0,4%. One *Maerua schinzii* Pax (Capparaceae) is known from the vicinity of Gobabeb, but did not appear in any transect.

Near Rooibank and Swartbank the palm has been introduced. All the other tree species are indigenous to southern Africa. With the exception of the nara, *Acanthosicyos horrida*, none of the species represented is a true desertic species. The nara occurs along the Kuiseb River from Gobabeb to the delta. Where the river is confined to a narrow course within the canyon the nara occurs on the upper banks only. Its range in places extends several kilometres south of the river into the dunes. Towards the delta, where the river ranges over several ill-defined courses, the nara occurs within the riverbed. Throughout its local range it is apparently dependent upon Kuiseb River ground water.

The percentage occurrence values in the transects from Homeb to 50 km upstream were: *S. persica* 36%, *A. albida* 30%, *T. usneoides* 20%, *A. erioloba* 10% and *E. pseudebenus* 4%. Neither *Ficus sycomorus* nor *F. cordata* Thunb. were encountered along any of the 105 transects above Homeb. A complete census of these trees along these 50 km located 56 *Ficus cordata* and 20 *F. sycomorus* individuals. Thus even the

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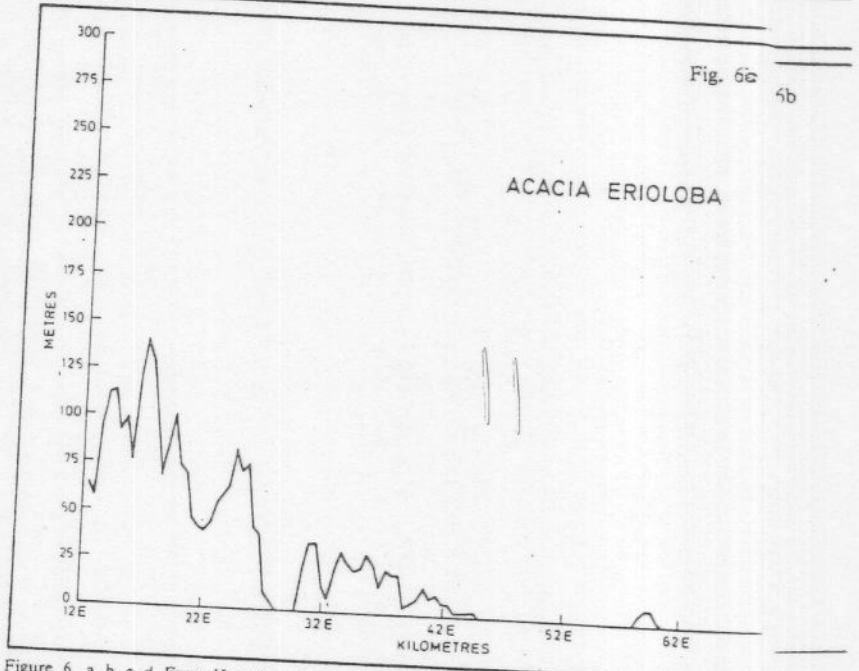
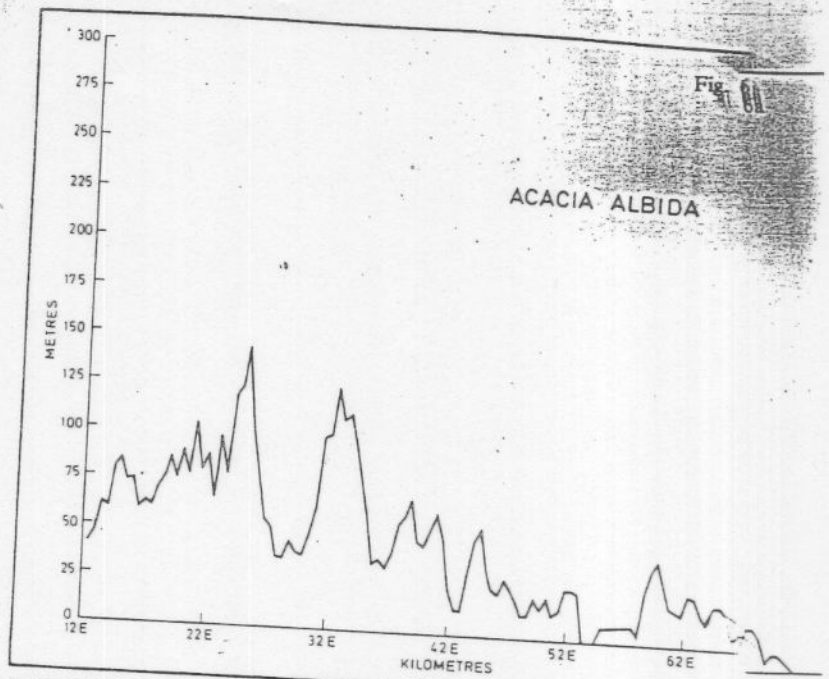


Figure 6. a, b, c, d. From Homeb upstream the reduced amount of vegetation was measured at frequent intervals. The total length of canopy of four common species is plotted against distance along the riverbed.

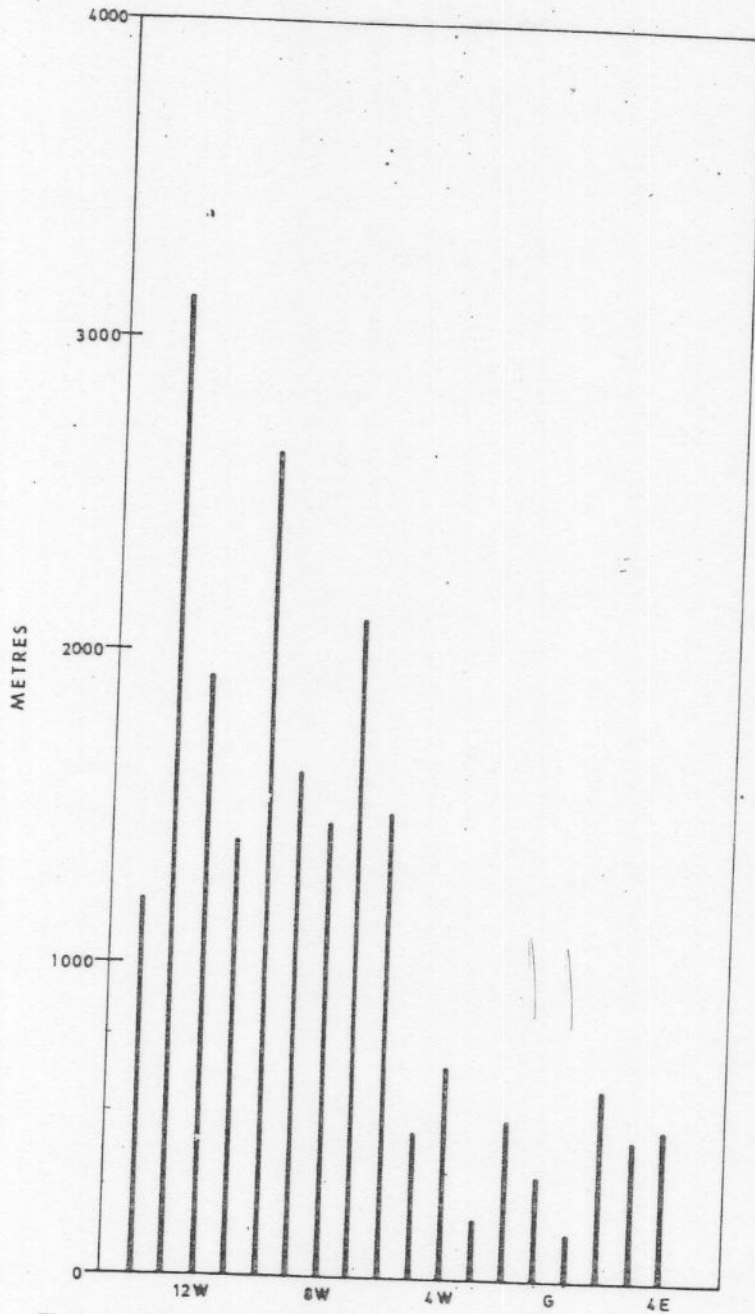


Figure 4. The length of the transects surveyed between Rooibank and Homeb (transects 14W to 4E) varied from a maximum of 3 130 metres to a minimum of 170 metres.

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Table 1 - Kuisseb Floods at Gobabeb 1963-1976

| Year | Days per Month of Flooding | | | | | Total dth for series |
|--------------------------------|----------------------------|------|-----------|-------|------|-------------------------|
| | Dec | Jan | Feb | Mar | Apr | |
| 1962/63 | 0 | 25 | 2 | 25 | 16 | 68 |
| 1963/64 | | | no record | | | |
| 1964/65 | 0 | 2 | 11 | 3 | 10 | 36 |
| 1965/66 | 0 | 0 | 10 | 8 | 0 | 18 |
| 1966/67 | 0 | 0 | 10 | 12 | 0 | 22 |
| 1967/68 | 10 | 0 | 1 | 0 | 0 | 11 |
| 1968/69 | 2 | 0 | 1 | 14 | 1 | 18 |
| 1969/70 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1970/71 | 0 | 0 | 23 | 5 | 6 | 34 |
| 1971/72 | 0 | 8 | 0 | 13 | 22 | 43 |
| 1972/73 | 0 | 0 | 0 | 5 | 10 | 15 |
| 1973/74 | 0 | 13 | 28 | 31 | 30 | 102 |
| 1974/75 | 0 | 0 | 0 | 10 | 0 | 10 |
| 1975/76 | 0 | 11 | 16 | 19 | 15 | 61 |
| Average ¹ | 0.92 | 4.54 | 7.85 | 11.23 | 8.46 | 31.0 |
| Variability ² | 302% | 170% | 122% | 83% | 117% | 87% |
| Percent of days with flooding | 3% | 15% | 28% | 36% | 28% | 22% |
| Years of flow | 2 | 5 | 9 | 12 | 8 | 13 |
| Percent of years with flooding | 15% | 38% | 69% | 92% | 62% | 100% |

¹ Average number of days per month the river has flowed.

² S.D./Average X 100

Table 2 - Percent canopy width of each tree species measured in the three "Water Provinces" adjusted for unequal transect lengths

| Species | Lower Water Province | | | Middle Water Province | | | Upper Water Province | | |
|------------------------------|----------------------|----|---|-----------------------|----|----|----------------------|----|----|
| | 10% | 13 | 2 | 25% | 46 | 26 | 66% | 41 | 72 |
| <i>Acacia albida</i> | | | | | | | | | |
| <i>Acacia erioloba</i> | | | | | | | | | |
| <i>Euclea pseudobenus</i> | | | | | | | | | |
| <i>Tamarix usneoides</i> | | | | | | | | | |
| <i>Sahadara persica</i> | | | | | | | | | |
| <i>Ficus sycamorus</i> | | | | | | | | | |
| <i>Phoenix dactylifera</i> | | | | | | | | | |
| <i>Acanthosicyos horrida</i> | | | | | | | | | |

GRAMS DRY WEIGHT POD PRODUCTION

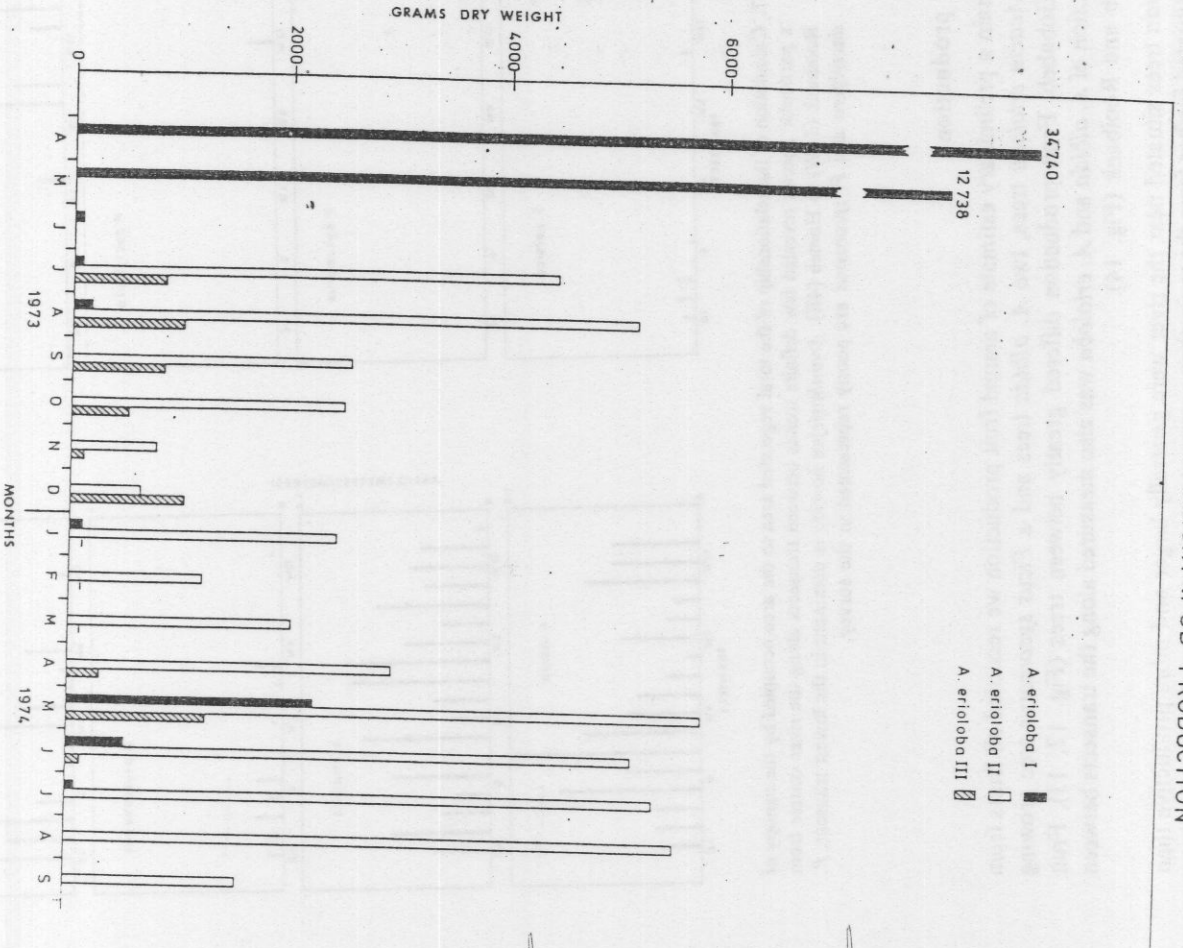


Figure 12. Dry weight of pod production of three *Acacia erioloba* trees situated at varying distances from the water course at Gobabeb.

GRAMS DRY WEIGHT POD PRODUCTION

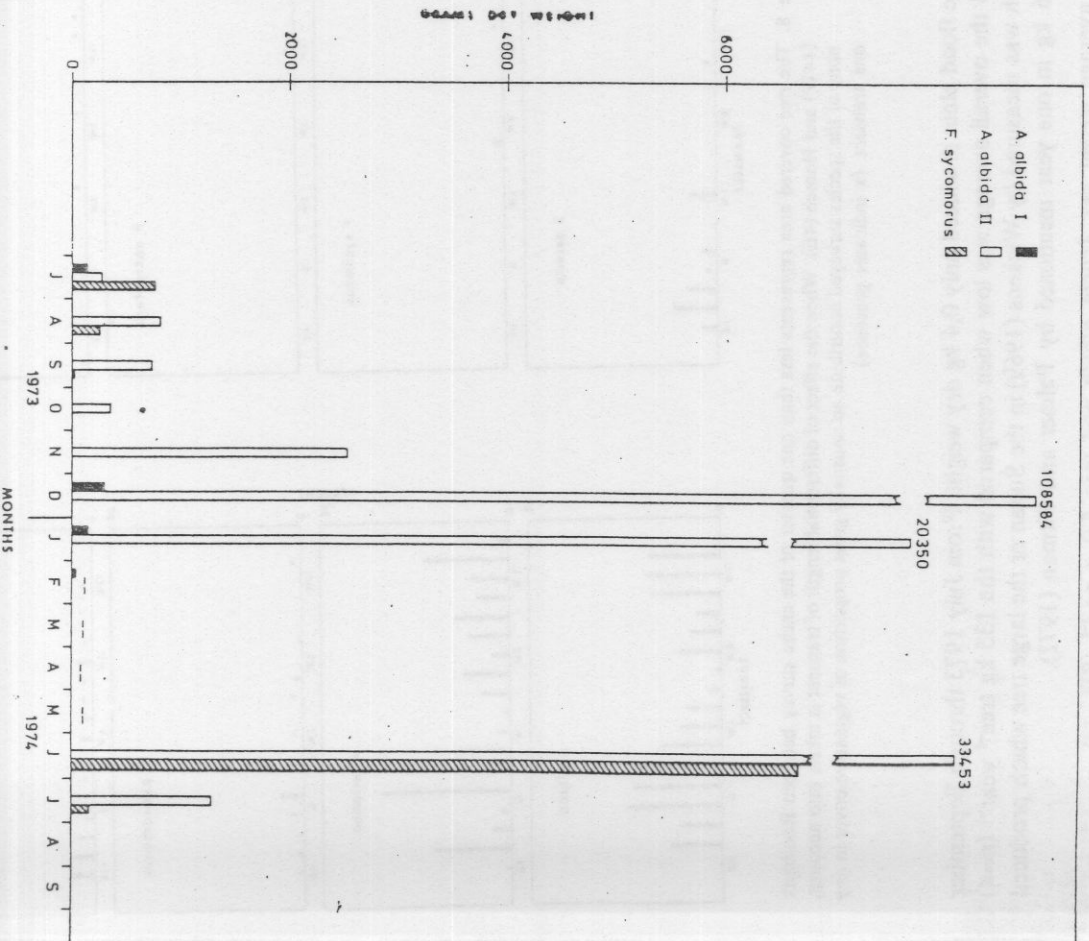


Figure 13. Dry weight of pod production of two *Acacia albida* trees and fruit production of one *Ficus sycamoros* tree at Gobabeb.

