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The saltmarsh vegetation of the lower Uilkraals River

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ABSTRACT

Approximately 40 ha of saltmarsh exist around the Uilkraals River. The distribution patterns of species in these marshes are described and compared with patterns found in other marshes in the Western Cape. The marshes might superficially resemble a mosaic of species, but each element of the mosaic could be compared with vegetation in other systems. Peculiar salinity and tidal features are postulated as having a great influence on species distributions at this river.

UITTREKSEL

Daar is ongeveer 40 ha soutmoerasse om die Uilkraalsrivier. Die verspreidingspatrone van spesies in hierdie moerasse word beskryf en met patrone in ander moerasse in die Wes-Kaap vergelyk. Die moerasse om hierdie rivier lyk oppervlakkig soos 'n mosaïek van spesies, maar elke element van hierdie mosaïek kan vergelyk word met die plantegroei in ander stelsels. Besonderse sout- en getyvariasies word voorgestel as belangrike invloede op die verspreiding van spesies by hierdie rivier.

INTRODUCTION

The Uilkraals River (mouth: 34°36′ S; 19°24′ E) is relatively small (Midgely & Pitman 1969; Noble & Hemens 1978; Heydorn & Tinley 1980). The lower parts are shallow and follow a meandering course across sand flats before entering the Atlantic Ocean. The mouth does not close during the dry season as it is partially stabilized by developments adjacent to the mouth (Heydorn & Bickerton 1982). These factors combine to result in a somewhat reduced tidal interaction in the river and the absence of a real estuarine lagoon (Walsh 1968).

Approximately 40 ha of saltmarsh exist around this estuary. Parsons (1982) suggests that this vegetation consists of a single type made up of a mosaic of patches with different dominant species. However, visual observation shows at least two different vegetation types: the low halophytic vegetation of the lower estuary (dominated by *Sarcocornia* spp., *Salicornia meyeriana* and *Chenolea diffusa*); and the taller sedge vegetation in areas of fresher water (dominated by *Juncus kraussii*). Parsons (1982) also gives great prominence to *J. acutus* and does not mention *J. kraussii*. However, this seems to be a misidentification as *J. kraussii* is common in the area whereas *J. acutus* is comparatively rare.

The aim of this study is to gain a clearer understanding of the structure of the saltmarshes of the lower Uilkraals River.

METHODS

After studying aerial photographs, orthophotographic maps and following field reconnaissance, four transects were demarcated across the marshes of the Uilkraals River (Figure 1). The siting of these transects was determined subjectively according to variability in species composition and the relatively undisturbed nature of the vegetation. Details of these transects are presented in Table 1. Elevation profiles of the transects were surveyed using a theodolite, and at least one point on each transect was surveyed to sea level.

Sampling took place on four occasions during 1987 (March, May, September and November) in order to include all bulbous and annual plants. Contiguous 1 × 1 m plots were laid along each transect. The cover-abundance of each species within the plots was estimated according to normal phytosociological methods (Braun-Blanquet 1965). Excessive repetition was avoided by not sampling plots in which it was deemed that the floristic data were simply repetitions of data already recorded from adjacent plots. Taxon names follow Arnold & De Wet (1993) and voucher specimens are housed at the herbarium of the National Botanical Institute at Stellenbosch (STE), the National Herbarium (PRE) and at the Stress Ecology Research Unit at Kirstenbosch. These voucher specimens are listed by O'Callaghan (1994a). The letters MOC refer to indeterminate voucher specimens.

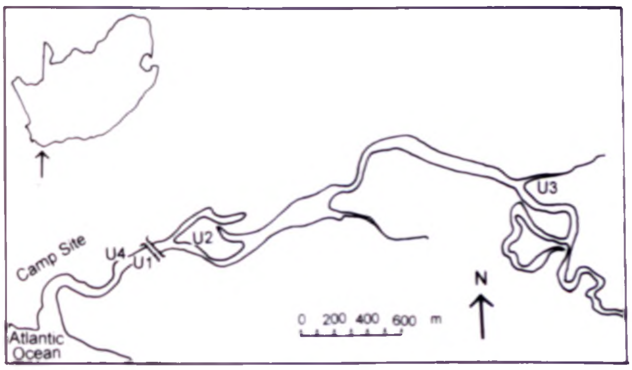

FIGURE 1.—The Uilkraals River. Transects U1 to U4.

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TABLE 1.—Details of transects

Transect	Description	Length (m)	Tidal range (cm at MSL)
U1	Southern shore of river, 10 m west of road bridge, in southeasterly direction	7	72.7–118.7
U2	Southern shore of river, 150 m east of road bridge, in southeasterly direction	70	48.0–104.0
U3	Northern shore of river, 2.6 km east of road bridge, in northwesterly direction	145	– 16.2–126.3
U4	Northern shore of river, 50 m south of road bridge, in northwesterly direction	58	48.0 – 119.0

As classical Braun-Blanquet values cannot be manipulated mathematically, these values were converted according to Table 2. To plot the distribution of species, each transect was divided into elevation classes of 10 cm. The converted factors were averaged within each 10 cm class and further averaged over the four sampling periods. As some of the species have annual geophytic or hemicryptophytic life-cycles, the number next to the species name indicates the number of times this species was located through the year. The order in which the species occur along the transect is primarily determined by its lowest starting point and secondarily by its termination point along the elevation gradient.

RESULTS AND DISCUSSION

The distribution of species along elevation gradients at Transects U1 to U4 are shown in Figures 2–5. Additional species at Transect U3 are listed in Table 3.

The distribution patterns of species along these transects did not compare well with each other, nor was there a close relationship with those of Langebaan Lagoon, the Berg River or Kleinmond Lagoon (O'Callaghan 1994b, c, d). These inconsistencies could be largely attributed to a reduced marine input. Heydorn & Bickerton (1982) report salinities of less than 30‰ in the region of U4, only 400 m from the mouth in midsummer when salinities would be at their highest.

The vegetation also illustrated a reduced marine influence. *Sporobolus virginicus*, usually found at the top of marshes with a strong marine influence (e.g. Langebaan Lagoon and the Berg River (O'Callaghan 1994b & c) was found consistently near the bottom of the transects. This is similar to Kleinmond Lagoon (O'Callaghan 1994d)

TABLE 2.—Conversion factors

Cover/abundance	% Cover	Converted factor
0	present but dead	0.1
r	single plant < 0.01	0.2
+	0.01–1	0.3
1	1–5	1
2	5–25	5
3	25–50	10
4	50–75	15
5	75–100	20

which is largely closed to the sea and therefore has fresher water. The presence of *Juncus kraussii*, *Samolus porosus*, *Sarcocornia capensis* and/or *S. natalensis* at all the transects further indicates lower saline conditions.

Some of the prevailing tidal influences could be inferred from the distribution of species relative to mean sea level (MSL). Saltmarshes started at 72 cm above MSL at U1, compared with – 50 cm at the Berg River at a similar distance from the mouth. Vegetation first appeared at 48 cm above MSL at U2, and the bottom of U4 was 48 cm above MSL. Vegetation at U3 was recorded from – 16 cm, but this was *Potamogeton pectinatus*, a submerged aquatic generally found in river courses. A vertical bank of approximately 70 cm confined the river course in this region; the remainder of this transect was well above MSL.

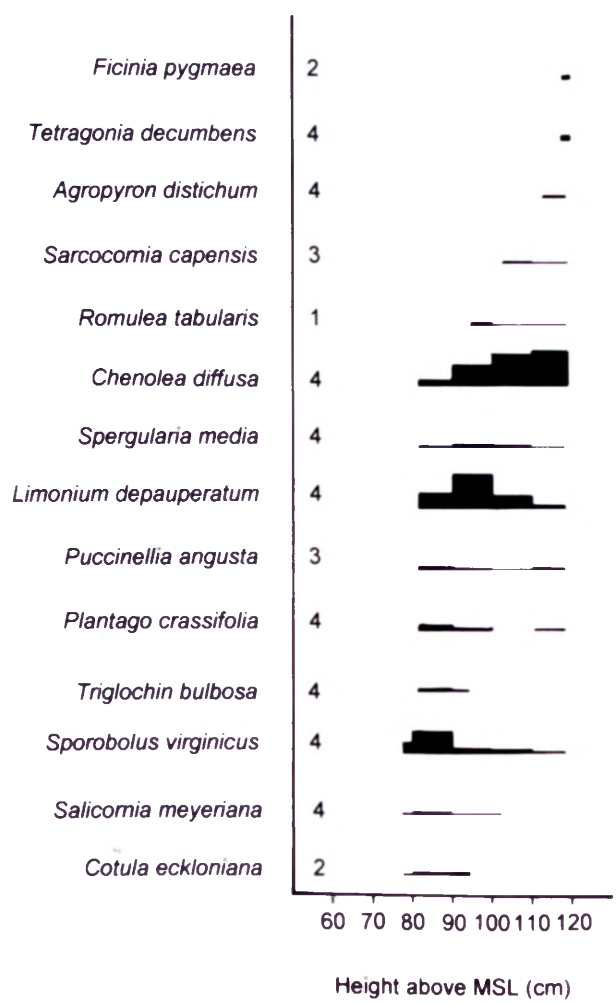

FIGURE 2.—Distribution of species along an elevation gradient on Transect U1. 1–4, numbers of times species located through year.

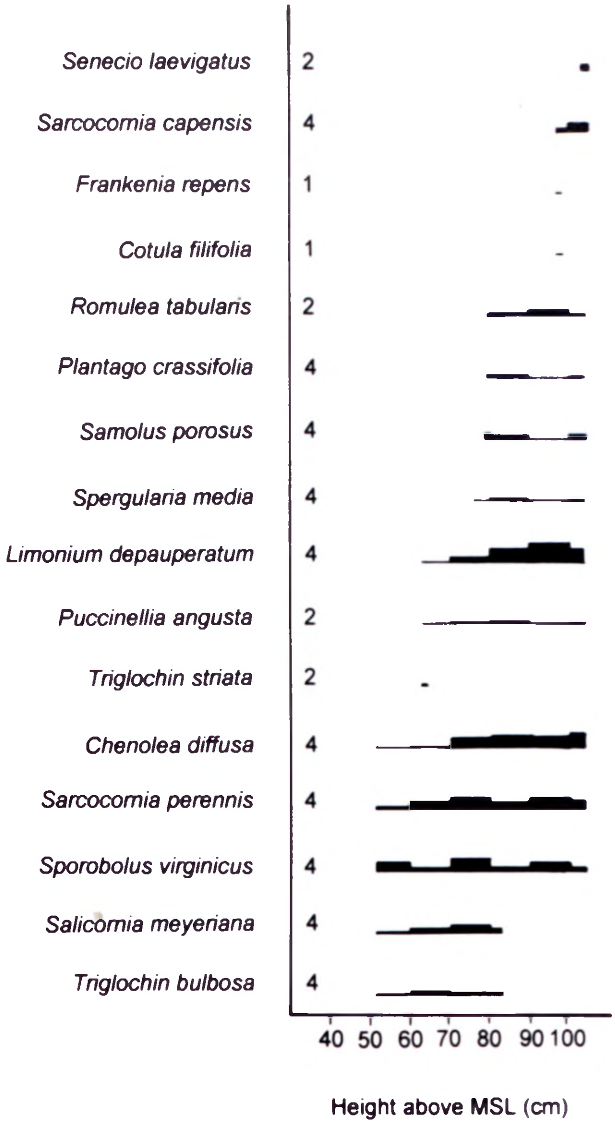

FIGURE 3.—Distribution of species along an elevation gradient on Transect U2. 1–4, number of times species located through year.

Table 4 indicates that these saltmarshes were flooded only occasionally, as most of them began between MHWN (mean high water neap) and MHWS (mean high water spring). The species normally found at or below MSL (*Spartina* and *Zostera* at Langebaan Lagoon, and the Berg River (O'Callaghan 1994b & c)) were absent. It seems that the marshes were displaced upwards with respect to MSL. This could be the result of an interaction between predominant winds (SAWB 1960) and prevailing marine swells (Heydorn & Bickerton 1982) to extend the ebb phase of the tides and push water higher up the shore during high tides. Heydorn & Bickerton (1982) estimate that the tidal influence ceases 3 km upstream from the mouth. However, this is highly variable and depends on prevailing weather conditions. I measured a tidal fluctuation of more than 75 cm at U3 during a westerly storm.

The soils at U3 between 90 cm and 102 cm above MSL were hard and highly saline with a sparse vegetation cover. The salinity of the soils decreased after flooding and numerous annuals and ephemerals (*Oxalis nidulans, Sebaea albens, Cotula filifolia, Salicornia meyeriana*) germinated, greatly influencing the diversity in this area. Depending on the amount of rainfall during late spring and summer, many of these plants died before setting seed. This area was again almost devoid of vegetation by late December.

TABLE 3.—Additional species at Transect U3

Species	Number of times found	Distribution above MSL (cm)
Sarcocomia perennis × *S. pillansii*	1	83.8–83.8
Spergularia media	4	83.8–126.3
Senecio littoreus	4	83.8–126.3
Tribolium hispidum	3	86.8–126.3
Crassula glomerata	4	94.8–126.3
Cerastium capense	3	95.8–126.3
Cotula eckloniana	2	96.3–111.8
Isolepis verrucosula	1	99.8–99.8
Juncus scabrida	1	99.8–112.8
Polypogon monspeliensis	1	99.8–124.8
Gynandriris setifolia	1	101.3–104.8
Frankenia repens	1	104.3–108.3
Lolium loliaceum	2	104.8–126.3
Senecio laevigatus	1	113.8–113.8
Acacia cyclops	3	116.8–116.8
Ficinia pygmaea	1	116.8–124.3
Cenia turbinata	2	116.8–126.3
Isolepis incomtula	1	124.8–124.8

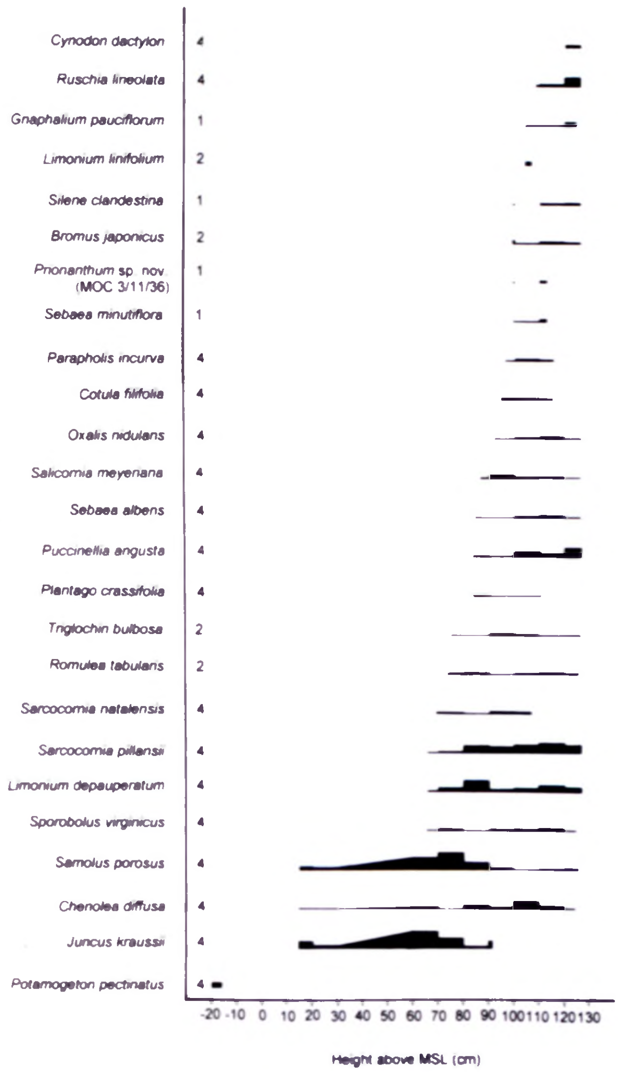

FIGURE 4.—Distribution of species along an elevation gradient on Transect U3. 1–4, number of times species located through year. MOC number refers to voucher specimen.

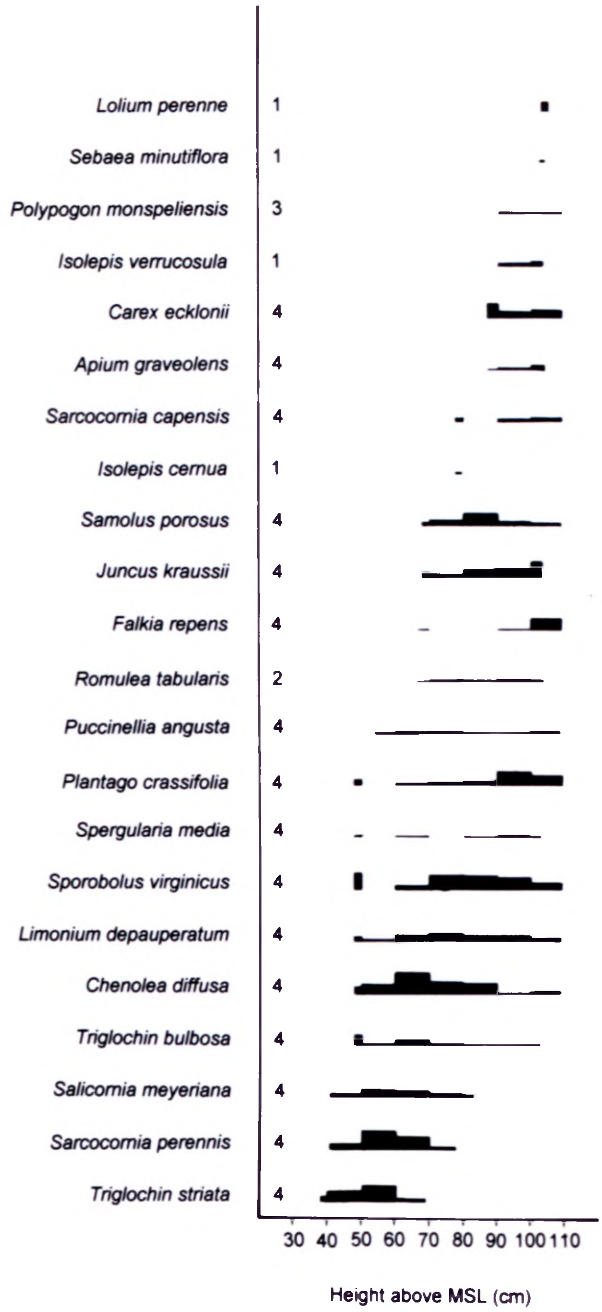

FIGURE 5.—Distribution of species along an elevation gradient on Transect U4. 1–4, number of times species located through year.

The vegetation closer to the river bank at U3 (*Juncus kraussii* and *Samolus porosus*) indicated fresher water conditions. This pattern is reversed at U4 where fresh water seeped onto the top of the transect. U4 could be seen as a concatenation of two situations: a normal saltmarsh at the lower end [comparable to the marshes at and Langebaan Lagoon and the Berg River (O'Callaghan 1994b & c)] and a freshwater sedge marsh [comparable to Kleinmond Lagoon (O'Callaghan 1994d)].

CONCLUSIONS

Reduced or altered tidal interaction and the influence of fresh water in various parts of the river resulted in some irregular species distributions when compared with saltmarsh vegetation in other systems. Superficially, the vegetation at the Uilkraals River seems to be a mosaic of the vegetation types found at Langebaan Lagoon, the Berg River and Kleinmond Lagoon (O'Callaghan 1994b, c, d).

However, the major environmental controlling factors of each element of the mosaics could be identified. Each element of the vegetation mosaic could be compared with the vegetation of the other rivers and further investigation is expected to show that the controlling factors are similar. The *Sarcocornia/Triglochin* marshes at U2 and U4 compare with the intertidal marshes at the Berg River and Langebaan Lagoon. The areas containing *Juncus kraussii* (U3 and U4) are similar to Kleinmond Lagoon and areas of the Berg River and Langebaan Lagoon which have a fresh water influence. U1 is similar to the sandy dune areas at Kleinmond Lagoon and the Berg River.

The saline soils resulting from seasonal flooding and evaporation at U3 are rare in the other systems. Much of the area where these soils occur at the Berg River has been converted to evaporation pans for the commercial recovery of salt. In other systems, the soils of those areas which are seasonally flooded are less saline than areas with a more regular tidal inundation. Similarities do exist between the seasonally flooded areas of Kleinmond Lagoon and the Uilkraals River (*Triglochin bulbosa, Sarcocornia natalensis, Sebaea* spp.). However, Kleinmond Lagoon is better described as being seasonally exposed rather than seasonally flooded. As a result, many of the annuals and ephemerals present at the Uilkraals River are absent from Kleinmond Lagoon.

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