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**Some Notes on the Vegetation
of the Namib Desert** with a List of Plants

Collected in the Area

Visited by the Carp-Transvaal Museum

Expedition during May 1959

W. GIESS - HERBARIUM S.W.A. - WINDHOEK

Es wird versucht, einen vorläufigen, kurzen Ueberblick über die Wüstenvegetation der zentralen Teile der Namib zu geben.

Besondere Beachtung wird dabei den von der Carp-Transvaal-Museum Expedition besuchten Wüstenbereichen geschenkt, die in vier ökologische Gebiete unterteilt wurden. Mit der Liste der während der Dauer der Expedition gemachten Aufsammlungen aus diesen Gebieten, werden kurz die Feldnotizen, wie Fundorte, Angaben über Verbreitung und ökologische Betrachtungen zu den einzelnen Pflanzen aufgeführt. Die fotografischen Illustrationen sollen einen besseren Ueberblick geben und zur allgemeinen Verständlichkeit der Pflanzenwelt dieses Gebietes beitragen.

Von den in der systematischen Liste aufgeführten Pflanzen, die jedoch keinen Anspruch auf Vollständigkeit erhebt, liegt je ein Satz im Landesherbarium Windhoek, dem National Herbarium Pretoria und der Botanischen Staatssammlung München.

Daar word gepoog om 'n voorlopige, kort oorsig oor die woestyn-plantegroei van die sentrale dele van die Namib te gee.

Besondere aandag word aan die Namibwoestyngebiede, wat 1959 deur die Carp-Transvaal-Museum-Ekspediese besoek is, gegee. Hierdie deel word in vier ekologiese gebiede onderverdeel. Gegewens oor verspreiding, ekologiese waarnemings, sowel as 'n uitgebreide hoewel nog onvolledige beskrywende taksonomiese lys word behandel aan hand van talryke fotografiese illustrasies. Die lys verwys na die versameling uit hierdie gebied waarvan een eksemplaar elk in die Herbarium van die Landbou Afdeling te Windhoek, die Nasionale Herbarium te Pretoria en die Botanische Staatssammlung te München is.

SOME NOTES ON THE VEGETATION OF THE NAMIB DESERT
WITH A LIST OF PLANTS COLLECTED IN THE AREA
VISITED BY THE CARP-TRANSVAAL MUSEUM EXPEDITION
DURING MAY, 1959.

Through the kind invitation of Mr. Bernhard Carp I had the opportunity to join the Expedition in an advanced stage and to collect plants in the area of the Kuiseb River as well as in the Namib flats between the Kuiseb and Swakop Rivers and northwards at the Rössing Mountains.

It was a bad time for collecting plants in this part, since the whole country, especially the desert was suffering from a very severe drought. We found only a few small areas that had had light local rains where some vegetation was observed. Most of the vegetation in these areas was very dwarfed but flowering so that collections and identifications could be made. The local rains drew large numbers of game to these areas which resulted in overgrazing.

In the area along the Kuiseb River the Topnaar-Hottentots have their reserve with their water and homesteads all along the river. This part is overstocked with goats and donkeys are also being kept there. At one place east of Rooibank some cattle were to be seen.

Overgrazing is very evident, especially in a dry year like the present one. In normal years the rivers bring water from inland which causes a richer vegetation in and along the river beds.

I tried to identify the plants that were in a very dry, nonflowering and nonfruiting stage. These were not collected but are mentioned in the list so as to give a better idea of the vegetation as a whole. Because I did not have the opportunity to accompany those members of the Expedition who collected at Sandwich Harbour, a few plants collected from there by Mr. E. Jensen of Walvis Bay, one of the collaborators of our Herbarium at Windhoek are also taken up in this list.

The area covered is the part of the Namib Desert from Walvis Bay about 60 miles eastwards to Gobabeb all along the Kuiseb River. From Gobabeb further inland only one collecting trip was made in a northeasterly direction about 17 miles northeast of Hope Mine. Near Hope Mine the most southerly distribution of *Welwitschia bainesii* is to be found.

The main collecting took place at Rooibank, Zwartbank Mountains, and further north to the Vogelfederberg, the newly named "Carp Rocks", a group

of granite koppies northeast of the Vogelfederberg, Swakop Canyon, Welwitschiafläcche and the Rössing Mountains north of the railwayline Windhoek -- Swakopmund.

This area can be divided into 4 different ecological regions:

1. The red sand dunes south of the southern bank of the Kuiseb River.
2. The riverbeds of the Kuiseb and Swakop.
3. The Namib flats north of the Kuiseb River stretching to the mountainous country of the Swakop Canyon and further north from the Swakop River.
4. The mountains, such as the Zwartbank Mountains, Vogelfederberg, the isolated granite koppies in the flats, and north of the Swakop River the Rössing Mountains.



VW Microbus of the Transvaal Museum in the Namib flats near the Kuiseb River. In the background the Zwartbank Mountains.

VEGETATION OF REGION 1:

The red sand dunes arise on the southern bank of the Kuiseb and all along the river sometimes huge dunes are formed. These dunes stay on the southern bank and do not cross the river bed.

On the river bank at the foot of the dunes are big shrubs of the "Narras" (*Acanthosicyos horrida*), a member of the Cucurbitaceae without leaves and



Spiny shrub of *Acanthosicyos horrida* on the bank of the Kuiseb River at Rooibank.



Southern bank of the Kuiseb River with *Acanthosicyos horrida* and *Aristida sabulicola* on the foot of a huge red sand dune near Rooibank.

Cimbebasia

with light green stems, branches and twigs. The greater part of the plant is embedded in sand and the small dunes thus formed are crowned by the light green branches of the shrubs.

From the river bed big tufts of *Aristida sabulicola* stretch to the foot of the dunes also forming little dunes crowned by the culms of the grass. Most of this grass is badly overgrazed by donkeys. The normal height is probably about 1.50 m and higher under more favourable conditions.

In the valleys of the dunes near the river one finds big trees of *Acacia giraffae*, sometimes almost completely covered by sand which makes them look like shrubs. *Tamarix austro-africana* forms shrubs to small trees with a height of about 3—5 m and occur in more or less large communities. A *Trianthema sp.* which grows in great bunches or cushions on top of small dunes of 5 m and more in diameter was very interesting. This plant was only found once before by Mr. E. Jensen near Rand Rifles on the beach between Walvis Bay and Swakopmund. The branches and leaves are pale yellow-green, the small flowers light pink and the seeds of a blackish brown colour.

With few exceptions, these dunes are devoid of any vegetation southwards along the coast to nearby Lüderitzbucht.



One of the valleys between the dunes south of Rooibank with *Trianthema sp.* in the foreground.



The riverbed of the Kuiseb at Rooibank with overgrazed tufts of *Aristida sabulicola*.

VEGETATION OF REGION 2:

Most of the natural vegetation in the bed of the Kuiseb River is, as already mentioned, destroyed by overgrazing by goats and donkeys.

The dominant trees of the river are firstly *Acacia giraffae* and secondly *Acacia albida*. Large communities of *Tamarix austro-africana* are also to be seen. These are growing as shrubs and little trees. The introduced *Nicotiana glauca* forms the main vegetation in greater parts of the Kuiseb River bed in this area. A swamp vegetation is to be found in the vicinity of Rooibank in places where the underground water of the Kuiseb comes to the surface. Unfortunately it was grazed down to such an extent that no collecting nor identification could be done. The grasses of the riverbed are *Aristida sabulicola*, *Eragrostis spinosa* and on damp places *Cynodon dactylon* and *Odyssea paucinervis*. The *Eragrostis spinosa* looks much more like a shrub than a grass and although very spiny is eaten by donkeys and goats.

VEGETATION OF REGION 3:

The Namib flats are extensive and barren, stretching north of the Kuiseb River with occasional hills, mountains or some isolated koppies. The courses of the Swakop- and Khan Rivers form deep Canyons in the flats. The other watercourses are mostly very shallow and always carry a little more vegetation than the surrounding flats.

Cimbebasia



Namib flats east of the Zwartbank Mountains with the green band of the Kuiseb River and the sand dunes on the southern bank of the river.



Tubas River in the Namib flats between Walvis Bay and Goanikontes. The shrubs are *Arthroa leubnitziae*.

Along the coast and for about 20—30 miles inland these flats are practically without any vegetation. Sparsely scattered plants of *Zygophyllum stapfii*, a shrub of about 1—2 feet high with pairs of round leaves about the size of a florin, and *Arthroaerua leubnitziae*, are the only shrubby inhabitants of this region. In the dry watercourses they are more frequent. Various *Lichens* occur on the gravelly flats in the vicinity of the coast and further inland. The Lichens obtain their moisture from the sea-mist.

The first *Welwitschia bainesii* plants are to be found on the flats south of the Swakop River about 25 miles from the coast near the Swakopmund—Windhoek Road.



A male plant of *Welwitschia bainesii* in the flats south of the Swakop River with *Arthroaerua leubnitziae* (right) and *Sutura canescens* shrublets (left).

The vegetation in this vicinity is still very sparse. One finds a small *Sutura*, *Sutura canescens*, which forms small dwarf shrubs with tiny brown flowers; also a perennial Cucurbit, *Citrullus ecirrhosus*, the Namib tamma, with a perennial rootstock and round fruits of up to 12 cm in diameter with a very bitter and poisonous juice; taller shrubs of *Parkinsonia africana*, the lemoendoring, with yellow flowers, very reduced leaves and small linear pods, the seeds of which were in the past used as a substitute for coffee by the natives; very small shrubs of *Acacia reficiens* and bushes of *Asclepias filiformis*, which flower and fruit all the year round.



Welwitschiafläche north of the Swakop River.

The main distribution of *Welwitschia bainesii* in this area is on the flats and watercourses north of the Swakop River. The plants not only occur in the gravelly sandflats, but also amongst the rocks near the Swakop River and on the marble ridges north of the river in the so-called Welwitschiafläche. Here the vegetation again changes and various species of the genera *Petalidium* and *Aristida* are found.

VEGETATION OF REGION 4:

The Mountains:

On the mountains a richer vegetation, especially of succulents, is to be found. This is due to a greater water supply than on the flats. The dew from the sea fog condenses on the stones. In the Zwartbank Mountains, about 37 miles to the east of Walvis Bay, it could be observed that at 11 a.m. the soil around the stones was wet to a depth of 30 cm. On these stones a very rich lichen flora is to be seen.

Four succulent and one herbaceous species of *Euphorbia* were collected. The *Asclepiadaceae* produced two genera, *Hoodia* and *Trichocaulon* with two species of the latter, *T. pedicellatum* and *T. dinteri*. Other species found were *Sarcocaulon marlothii*, a pink flowering bushmans candle mostly occurring in dry watercourses; one *Anacampseros* sp., *Lithops gracilidelineata* in the Vogel-federberge and *Lithops ruschiorum* north of it in the Rössing Mountains.



Lichens on black dolerite rocks in the Zwartbank Mountains



Parmelia hottentotta (Thunb.) Ach. on a dolerite stone in the Zwartbank Mountains.



Zwartbank Mountain with Kuiseb River and the dunes in the background.



Zwartbank Mountain from the north. White weathered marble with black dolerite outcrops.



The Vogelfederberg.



Mountain north of the Vogelfederberg. Locality of *Lithops gracilidelineata*, *Othonna protecta* and *Othonna litoralis* in weathered white marble.

Othonna protecta and *Othonna litoralis* were found in Vogelfederberg and mountains north of it. A *Hereroa* species of the Ficoidaceae, prob. *Hereroa puttkammeriana*, new for this area, was collected in the Zwartbank Mountains.

The distribution of *Hereroa puttkammeriana* is very interesting. It grows at Aus and Kubub in a mountainous area on granite, mostly in large communities. Prof. K. Dinter cites it in his Sukkulantenforschung II from Auros, 23 km WSW from Warmbad and also on quartzite mountains 2 km north of Klein Karas.



Hereroa cf. puttkammeriana in weathered marble, mostly on westfacing rocks in the Zwartbank Mountains.

It is also found on the Auas Mountains about 12 miles west of Windhoek growing on mica schist, and finally as already stated in the Zwartbank Mountains on white weathered or solid marble. Further north only one record of a *Hereroa* sp. being found is known to me, this specimen has not yet been identified, but probably is also *H. puttkammeriana*. It was collected on top of the Brandberg by Mr. H. J. Wiss in 1955.

A great deal of work has still to be done and many problems solved before a thorough knowledge of the vegetation of South West Africa can be attained. I hope this list will be a small contribution towards this aim.



Female plant of *Welwitschia bainesii*. The trunk has reached a height of nearly 5 feet. The white zone from which the leaves grow out and the inflorescences develop each year can be clearly seen.



Acacia giraffae trees in the Swakop River.

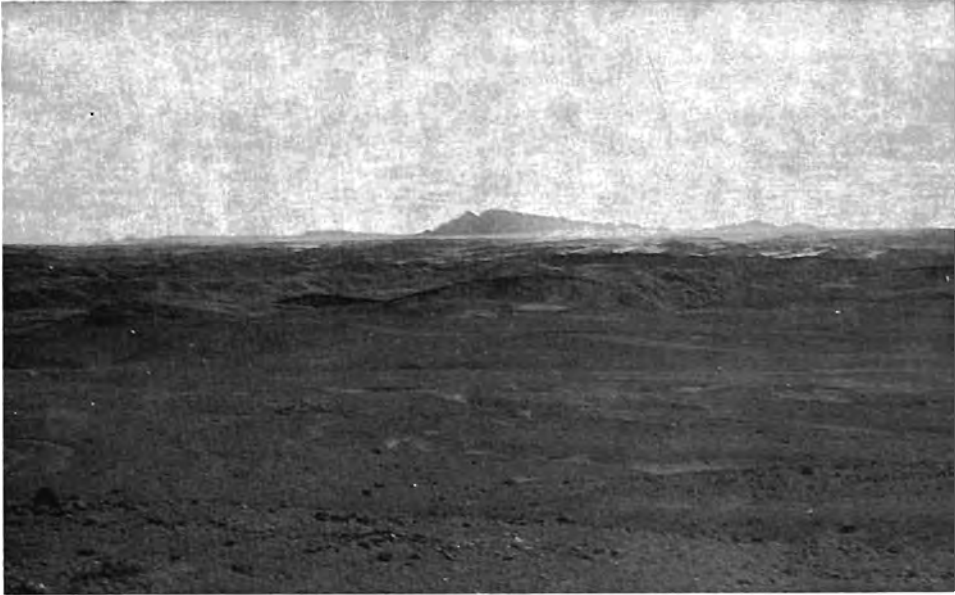
Cimbebasia



Acacia albida tree on the southern bank of Swakop River.



Tamarix austro-africana in the Swakop River.



The Rössing Mountain north of the Swakop River. The Swakop Canyon near Goanikontes in the foreground.



Flowering *Aloe asperifolia* Berg. in weathered white marble on the eastern side high up in the Zwartbank Mountain.



A female plant of *Welwitschia bainesii* on the Namib flats south of the Swakop River, with a dead old trunk and shrubs of *Zygophyllum stapfii* and *Arthroaerua leubnitziae* in the background.



A male plant of *Welwitschia bainesii* with *Sutera canescens* in the background. Namib flats south of the Swakop River.

LIST OF PLANTS COLLECTED IN THE AREA OF THE NAMIB VISITED
BY THE CARP-TRANSVAAL MUSEUM EXPEDITION IN MAY, 1959.

This list includes only those plants which were collected during the period between 10th and the end of May, 1959, as well as some records obtained from Mr. E. Jensen of Walvis Bay.

The families and genera are arranged according to Phillips, Genera of South African Flowering Plants, 1951. The identification was done by our Herbarium in Windhoek and checked by the National Herbarium Pretoria and the Botanische Staatssammlung München.

I hereby wish to express my gratitude for the work performed by both institutions.



Young *Welwitschia bainesii* plant with female flowers, showing the trunk with the two leaves.

WELWITSCHIACEAE

Welwitschia bainesii (Welw.) Carr.
(= *Welwitschia mirabilis* Hook. f.)

On open Namib flats south and north of the Swakop River, beginning about 25 miles east of Swakopmund. More frequent at the Welwitschiafläche north of the Swakop River. Growing not only in sandy gravelly flats, but also on rocks, so near Tsawichab south of the Swakop River and on marble outcrops in the

Cimbebasia

Welwitschiaflähe. Spreading southwards to the Tinkasflähe and reaches its southerly distribution near Hope Mine about 7 miles north of the Kuiseb River. Giess 3075.

TYPHACEAE

Typha latifolia L. var. *capensis* (Rohrb.) Graebn. (= *Typha capensis* Rohrb.)
Sandwich Harbour, May, 1959. E. Jensen 71.

GRAMINEAE

Tricholaena monachme (Trin.) Stapf et C. E. Hubbard var. *annua* J. G. Anderson

Small annual grass, about 20 cm high; on coarse sand near granite koppie, 24 miles west of Usakos. Giess 3007.

Aristida cf. *secalina* Henr.

Perennial; densely tufted. — 20 cm high. Leaves fine. Welwitschiaflähe, north of Swakop River on very shallow soil on flat granite rocks. Giess 2266.

Aristida namaquensis (Nees) Trin. et Rupr.

In dry river beds of the eastern Vornamib. (Sight record).

Aristida ciliata Desf. var. *villosa* Hack.

On coarse sand, as an annual, after light local rain near granite koppie, 24 miles west of Usakos. Giess 3008. On gravelly quartzite flat, 40 miles north-east of Gobabeb, (ca. 13 miles northeast of Hope Mine), after a local rain; browsed by game; in association with *Aristida obtusa* and *Aristida uniplumis*, all in an annual stage. Giess 3016. Annual; after light local rain on stony flat along small dry watercourse near the road from Tsawichab to the Welwitschiaflähe, in association with other *Aristida* spp. Browsed by goats and donkeys of the natives living at Tsawichab on the Swakop River. Giess. 3044a. Perennial; at Carp Rocks, in the surrounding of granite koppie on coarse sand; browsed by Oryx and Zebra. Giess 3066.

Aristida ciliata Desf. var. *tricholaena* Hack.

This variety has a fairly wide distribution in the Namib. Annual and perennial; after light local rain in the Welwitschiaflähe, north of the Swakop River on fairly shallow soil on granite banks. Giess 2263, 2267. Also on a marble outcrop north of Husab mountains on Welwitschiaflähe. Giess 3036a, 3037, 3045a, 3072, 3076.

Aristida schaeferi Mez

Perennial tufts, about 30 cm high and 40 cm in diameter in dry state, only growing on the edges of the tufts with a few flowering culms; mostly grazed down by Springbuck, Zebras and Oryx Antelopes. Some of the tufts are broken up by Zebras to get to the inner green parts of the tufts. Welwitschiaflähe

north of the Swakop River on shallow sandy soil. Giess 2265. Tufts strongly browsed by goats and donkeys of the Natives living nearby, 1 mile north of Tsawichab. Giess 3044. Also in windblown sand on the eastern side at the foot of marble mountains north of the Vogelfederberg. Giess 3056.

Aristida schaeferi Mez var. *biseriata* Henr.

Forms small dense cushions, about 15 cm high and 20 cm in diameter. These are densely covered by small drepaniform, hard leaves. A great part of the cushions is broken up by Zebra to get to the softer inner parts. The roots are covered by a thick felt which is densely packed by small particles of sand and reach a diameter 0.75 cm. Giess 2265a. On white marble ridge on the Welwitschiafläche. Giess 3073.

Aristida sabulicola Pilger

Together with *Eragrostis spinosa* Trin. *A. sabulicola* is the dominant grass of the Kuiseb riverbed near Rooibank; stretching to the foot of the sand dunes on the southern bank of the river. Mostly growing on small dunes. These dunes sometimes reach the height of 10—12 feet. Upright with pendulous branches and pungent leaves, probably 5—6 feet high. All plants very strongly grazed down by donkeys and goats of the natives. In the Kuiseb River at Rooibank. Giess 3024.

Aristida lutescens (Nees) Trin. et Rupr.
(= *Aristida marlothii* Hack.)

Perennial suffrutescent tufts, on small dunes from 50—150 cm height and diameter. Tufts about 50 cm high with spiny leaf blades. In small watercourse on the eastern side at the foot of the Zwartbank Mountains. Giess 3070.

Aristida hirtigluma Steud. ex Trin. et Rupr.

This species has a fairly wide distribution in the Namib. It occurs mostly in windblown sand on rock outcrops as well as on coarse weathered granite soil near granite koppies. 24 miles west of Usakos, Giess 3003a. Welwitschiafläche, Giess 3034, 3036. Vogelfederberg, Giess 3057. Farm Onanis, Giess 2259.

Aristida obtusa Del.

Annual and perennial; after light local rain on gravelly quartzite plains, 40 miles northeast of Gobabeb (ca. 13 miles NE of Hope Mine), strongly grazed by all game. Giess 3018, 3019. After a local rain in association with *Aristida ciliata* Desf. var. *villosa* Hack. covering the coarse sandy plains as annuals; only 15 cm high and very sparsely growing. (Ripe seeds found already). About 1 mile northeast of Tsawichab, on the road to the Welwitschiafläche on a small area. Grazed by donkeys and goats of the natives living at Tsawichab. Giess 3045. Also on marble outcrops, in windblown sand between the rocks on the Welwitschiafläche. Giess 3035a.

Cimbebasia

Aristida uniplumis Licht.

After local rain as annual on coarse weathered granite sand near granite koppie, 24 miles west of Usakos, Giess 3003; and on gravelly quartzite plains in small shallow dry watercourse, 40 miles NE of Gobabeb, Giess 3015. On wind-blown sand between rocks on marble outcrop in the Welwitschiafläche, Giess 3035. Perennial; —80 cm high, very much branched tufts in a big hole with sandy underground of about 15 yards in diameter in the main rocks of the Carp Rocks which is protected against game through its position, Giess 3050.

Aristida congesta R. et S.

(Annual forms formerly called *Aristida rangeana* Pilger but cannot be distinguished from *A. congesta*, according to identification from National Herbarium Pretoria). Small annual, only a few cm high after local rain in coarse sand near granite koppie, 24 miles west of Usakos, Giess 3011a.

Sporobolus robustus Kunth

Very frequent in the riverbed of the Swakop at Goanikontes; —150 cm high, with woody and hard base, Giess 3048.

Cynodon dactylon (L.) Pers.

On damp places in association with *Odysea paucinervis* (Nees) Stapf. Grazed down to the ground. At Rooibank. (Sight record).

Triraphis ramosissima Hack.

Perennial tufts with hardy culms in rocky crevices on small granite koppie. 24 miles west of Usakos. Giess 3002.

Phragmites communis L.

Sandwich Harbour. Jensen 67.

Odysea paucinervis (Nees) Stapf

On damp places together with *Cynodon dactylon* (L.) Pers. Grazed down to the ground by goats and donkeys of the natives. At Rooibank. (Sight record).

Eragrostis spinosa Trin.

Spiny bushes mostly on small sand dunes in the bed of the Kuiseb River. Very common, together with *Aristida sabulicola* it is the main vegetation of the riverbed at Rooibank. Also well grazed. Seeds are much liked by birds. (Sight record).

Eragrostis porosa Nees

Annual; on coarse sand near granite koppie, 24 miles west of Usakos. Giess 3007a.

CYPERACEAE

At Rooibank in the Kuiseb River different Cyperaceae are to be seen, but so badly grazed down that no collection nor identification could be made.

Cyperus marginatus Thunb.

—80 cm high; in bed of the Kuiseb River, mostly grazed down to a height of 10 cm by donkeys and goats. Rooibank. Giess 3022.

Scirpus littoralis Schrad.

Sandwich Harbour. Jensen 65.

LILIACEAE

Aloe asperifolia Berg.

In the Namib between the Kuiseb and Swakop River about —30 miles from the coast, this Aloe is only found on or near the mountains or "Inselberge". In the Zwartbank Mountains they are only found in the higher parts in dry watercourses. Flowering May 1959. Giess 3029. Also seen flowering on, and at the foot of, the white marble mountains north of the Vogelfederberg and at Carp Rocks (coarse granite koppie) in small dry watercourses between the bigger granite koppies. Further east about 40 miles from Swakopmund they are growing in colonies on the Namib flats but in the parts south of the Swakop River I never found them on the open plains.

Aloe dichotoma Masson

Farm Onanis, Vornamib; on granite koppie. Giess 2281a.

MORACEAE

Ficus sycomorus L.

Large tree in Kuiseb River bed, east of, and at Gobabeb. (Sight record).

LORANTHACEAE

Loranthus oleaefolius Cham. et Schlechtd.

Bank of Swakop River at Gross-Husab. Jensen 56.

Loranthus sp.

With yellow flowers on *Euphorbia gregaria*, on the Namib flats north of the Swakop River, about 45 miles from the coast. (Sight record).

CHENOPODIACEAE

Salsola spp. of this area were not collected. (In dormant state).

AMARANTHACEAE

Arthroerua leubnitziae (O. Ktze.) Schz.

Together with *Zygophyllum stapfii* the only shrubs which grow, sometimes very sparsely, on the Namib flats right to the coast or at least near to the sand dunes along the coast between Swakopmund and Walvis Bay. In the dry river beds at Tubas River they are more frequent than on the plains themselves. Collected at the foot of the marble mountains north of the Vogelfederberg. Giess 3042.

Calicorema capitata (Moq.) Hook. f.

On the way from Gobabeb to Hope Mine. Small round leafless bluegreen shrubs with woolly capitate inflorescences. (Too poor for collecting). In the run-down from Langer Heinrich Mountain to the Swakop River. Jensen 1.

AIZOACEAE

Sesuvium sesuvioides (Fenzl) Verdcourt

Prostrate herb with folded leaves and scarlet flowers. Marble Mountains north of Vogelfederberg, Giess 3059. Welwitschiafläche, Giess 2262.

Trianthema sp.

Perennial small shrub on —90 cm high small sand dunes with a diameter of 2—3 m. Plants only 30—40 cm above sand in more or less large cushions, yellow-green with small pink flowers and dark-brown seeds. In a valley between the dunes south of the Kuiseb River at Rooibank. Giess 3025. Also collected before at Rand Rifles, near the coast between Walvis Bay and Swakopmund by E. Jensen nr. 40.

Galenia africana L.

At the foot of mountains or "Inselberge", in places with a somewhat greater water supply than the dry watercourses, just under large flat granite rocks where water collects. Yellow green shrubs. At Carp Rocks. Giess 3056.

Tetragonia arbusculoides Engl.

Shrub, —60 cm high; flowers yellow. Strongly browsed by Oryx and Springbuck. Dry watercourse on the eastern side of the Zwartbank Mountains. Giess 2297.

Hereroa cf. *puttkammeriana* (Berg. et Dtr.) Dtr. et Schwant.

Small succulent plant with yellow flowers. Growing in rocky crevices in the Zwartbank Mountains, mostly on westfacing rocks. Giess 3033.

Lithops gracilidelineata Dtr.

On weathered white marble gravel between bigger stones on the mountains north of Vogelfederberg. Giess 3077.

Lithops ruschiorum (Dtr. et Schwant.) N.E.Br.

Small clumps, mostly in quartzite outcrops (Rosequartz) at Rössing Mountains, east of Swakopmund. Giess 3086.

Mesembryanthemum pingue (L. Bol.) L. Bol.

Very succulent herb, -40 cm high covered with glistening papillae and about 40 cm in diameter. Flowers pinkish with many staminodes. Leaves in the flowering region and sepals rose red. Rooibank, on weathered granite near pump station. Giess 3020.

Psilocaulon dinteri (Engl.) Schwant.

Shrubs up to 60 cm high with woody branches (not flowering), in dry watercourse on the eastern side of the Zwartbank Mountains, but also as one of the few plants growing on black dolorite outcrops between the white marble rocks of the mountains. Giess 3069.

Psilocaulon salicornioides (Pax) Schwant.

Succulent plants forming large cushions of 2 m in diameter on small sand dunes. Flowers white. At the eastern foot of the Zwartbank Mountains. Giess 3068.

PORTULACACEAE

Anacampseros albissima Marl.

Small whitish plants, in sandy gravel, mostly on quartz in the Rössing Mountains. Giess 3078. Also on marble outcrops in the Welwitschiafläche north of the Swakop. Giess 3079.

PAPAVERACEAE

Argemone mexicana L.

Weed, very frequent in and along Kuiseb and Swakop Rivers. (Sight record).

CRUCIFERAE

Coronopus integrifolius (DC.) Spreng.

Small herb, growing after light local rain on coarse weathered granite sand near granite koppie, 24 miles west of Usakos, Giess 3010.

CAPPARIDACEAE

Cleome diandra Burch.

Very small herb, -10 cm high, after local rain. Flowers yellow. On coarse sand near granite koppie, 24 miles west of Usakos, Giess 3009.

Cimbebasia

Cleome luederitziana Burch.

Herb with yellow flowers and violet stamens. In dry watercourse east of marble outcrop in the Welwitschiaflähe. Browsed by Zebra, Oryx and Springbuck. Giess 3041. Also seen in dry sandy riverbed near Tsawichab on the Swakop River. (Sight record).

Capparis hereroensis Schz.

Sandwich Harbour, flowering and fruiting May 1959. E. Jensen 70.

Boscia foetida Schz.

Tubas River. E. Jensen 24.

MORINGACEAE

Moringa ovalifolia Dtr. et Berg.

On gravelly flats, about 30—40 miles NE. of Gobabeb. Small trees with succulent whitish trunks (Sight record).

SAXIFRAGACEAE

Vahlia capensis Thunb.

Small herb with yellow flowers, in the bed of the Kuiseb River. (Sight record).

CRASSULACEAE

Cotyledon orbiculata L.

On white marble outcrop eastern Welwitschiaflähe. (Sight record).

LEGUMINOSAE

Acacia albida Del.

"Ana Tree". — Big tree in the Swakop River bed at Tsawichab. Giess 2272. Also growing in the Kuiseb River bed. (Sight record).

Acacia giraffae Burch.

"Camelthorn Tree". — The main tree in the river beds of the Swakop and Kuiseb Rivers. (Sight record).

Acacia hebeclada Willd.

At the windfill, Tubas River. E. Jensen 25.

Acacia reficiens Wawra

As shrubs in dry watercourses north and south of the Swakop River on the Namib flats on the road to Tsawichab and further to the Welwitschiaflähe. (Sight record).

Cassia obovata Coll.

Very small herb after a local rain in coarse sand near granite koppie 24 miles west of Usakos. Giess 3009a.

Parkinsonia africana L.

Shrubs up to 12 ft. high in dry watercourses on the road to Tsawichab, about 3 miles south of the Swakop River. (Sight record).

Lotononis sp.

Little plant of miniature size, together with *Cassia obovata*. Too poor for identification. Giess 3009a.

Crotalaria colorata Schz.

Silverygrey hairy shrublets with yellow flowers on the way to Sandwich Harbour. E. Jensen 66.

Indigofera auricoma E. Mey.

Perennial; small prostrate shrublet with pinkish flowers. On fairly shallow soil above granite in the Welwitschiaflähe. Giess 2270. Also as an annual after local rain. Giess 3009a.

Psoralea obtusifolia DC.

In the river bed of the Swakop at Husab. E. Jensen 31.

Tephrosia dregeana E. Mey.

Perennial prostrate herb with ascending branches, 50 cm in diameter and 30—40 cm high, woody at the base. Flowers pink. In sandy hole in a big granite rock at the eastern foot of the Carp Rocks. Giess 3051. But also on shallow soil on granite in the Welwitschiaflähe. Giess 2270. And as an annual after local rain in coarse sand. Giess 3009.

GERANIACEAE

Sarcocaulon mossamedense (Welw. ex Oliv.) Hiern
(= *Sarcocaulon marlothii* Engl.)

Shrubs up to 50 cm high with pink flowers. In shallow soil on granite banks on the Welwitschiaflähe. Giess 2269. Also seen at different places on dolomite outcrops in the Namib flats on the road from Rössing to Khan Mine, in the Rössing Mountains and further east on the escarpment near the Gamsberg.

Pelargonium otaviense Kunth
(= *Pelargonium rössingense* Dtr.)

Little shrublets up to 30 cm high, with darkbrown bark in windblown sand in pockets between marble rocks, Welwitschiaflähe. Giess 3084. Also on the rose-quartz koppie in the Rössing Mountains. (Sight record).

ZYGOPHYLLACEAE

Zygophyllum cylindrifolium Schz.

Small prostrate herb with greenish yellow leaves and ascending branchlets. Flowers small, white. Farm Onanis, on granite koppie in weathered granite gravel. Vornamib. Giess 2258. Near Hope Mine. (Sight record).

Zygophyllum simplex L.

Yellow green mats, after local rains in the Namib, mostly in dry water-courses where the water collects. Flowers yellow. Very frequent along the road from Swakopmund to Windhoek via Khomashochland. (Sight record).

Zygophyllum stapfii Schz.

Together with *Arthroaerua leubnitziae* the only shrubby vegetation of the coastal Namib region, but also further inland about 50-60 miles. Collected at Zwartbank Mountains. Giess 2275.

BURSERACEAE

Commiphora saxicola Engl.

(= *Commiphora dulcis* Engl.)

Small, in the Namib prostrate trees with succulent swollen trunks and branches. Leafless for the greatest part of the year. Mostly on dolorite outcrops in the Namib flats north of the Swakop River, but also reaching further south to the Kuiseb and to the east on Farm Schlesien becoming erect, small trees. (Sight record).

EUPHORBIACEAE

Euphorbia gregaria Marl.

Tall shrubs of grey-green colour on the Namib flats north of the Swakop River about 45 miles east of Swakopmund, very abundant. (Sight record).

Euphorbia lignosa Marl.

Growing in form of spiny cushions of 50 cm height and 50 or more cm in diameter in rock crevices of the Zwartbank Mountains. (Sight record).

Euphorbia phylloclada Boiss.

Small perennial plants with succulent roots, mostly prostrate and with bluegreen leaves. Between marble rocks and stones on and on top of the mountains north of the Vogelfederberg. Giess 3061.

Euphorbia virosa Willd.

Succulent plants, up to 4 feet high. Rössing Mountains. (Sight record).

Euphorbia sp. (cf. *E. mundii* N.E.Br.)

Many branched shrubs up to 50 cm high. Branches succulent, of a redbrown to green colour. Flowers yellow. Zwartbank Mountains on weathered marble gravel. Giess 3028.

RHAMNACEAE

Ziziphus mucronata Willd.

In the tributaries of the Kuiseb and Swakop Rivers, but more inland; Vor-namib; also as shrubs and trees in the Kuiseb and Swakop River. (Sight record).

MALVACEAE

Pavonia rehmannii Szysz.

Shrublet, 25 cm high with dry fruits. In windblown sand on the eastern side of a marble outcrop in the Welwitschiafläche north of the Swakop River. Giess 3039.

Radyera urens (L.f.) Bull.

(= *Allenia urens* (L.f.) Phill.) (= *Hibiscus urens* L.f.)

Looking like a Cucurbit, with big green hairy leaves, prostrate. Only one plant seen in the Tubas River along the road from Walvis Bay to Goanikontes in the Namib flats. (Sight record).

Cienfugosia pentaphylla Schum.

Perennial shrublet, up to 40 cm high (strongly browsed by goats and donkeys). Flowers rose red with darker spots at the base of the petals. In the riverbed of the Kuiseb at Rooibank. Giess 3021.

STERCULIACEAE

Hermannia lugardii N.E.Br.

Small annual herb. Flowers dark red. On coarse sand near granite koppie 24 miles west of Usakos. Giess 3005.

Hermannia solaniflora Schum.

Small herb, 8 cm high. Flowers brownish violet. In windblown sand between stones on a marble outcrop in the Welwitschiafläche. Giess 3043.

TAMARICACEAE

Tamarix austro-africana Schz.

Shrubs and trees in the Kuiseb and Swakop river beds, also in the valleys between the sand dunes south of the Kuiseb River. Flowers dirty white. Giess 3026.

Tamarix gallica L.

Shrubs and trees up to 12 ft. high. Associated with *T. austro-africana*. Occuring as an escape. In the riverbeds of the Swakop and Kuiseb. Planted as windscreens and also cultivated in Swakopmund. (Sight record).

PASSIFLORACEAE

Adenia pechuelii (Engl.) Harms

One young plant seen in shade of granite rocks in the Carp Rocks. Giess 3053.

LOASACEAE

Kissenia capensis R. Br. ex Harv.

In the mountainous parts northeast of Gobabeb, frequent. (Sight record).

UMBELLIFERAE

Pithuranthus aphyllus (Cham. et Schlechtd.) Benth. et Hook. f. ex Schz.

Nearly leafless shrubs with yellow-green stems, up to 60 cm high. Flowers yellow, also with fruits. Only in the lower parts of the Zwartbank Mountains. Giess 3030.

PLUMBAGINACEAE

Dyerophytum africanum (Lam.) O. Ktze.

Small perennial shrublets. Flowers light yellow on some plants, on others red. Strongly browsed by game. Frequent in all mountains. Zwartbank Mountains. Giess 3032.

EBENACEAE

Euclea pseudebenus E. Mey.

On the Kuiseb and Swakop River banks; also as small tree in the Carp Rocks. (Sight record).

SALVADORACEAE

Salvadora perisca L.

Big light green shrubs in the Kuiseb and Swakop Rivers, as well as in the tributaries. Characteristic shrub for the Namib. (Sight record).

ASCLEPIADACEAE

Curroria decidua Planch. ex Benth. et Hook. f.

(= *Cryptolepsis decidua* (Planch. ex Benth. et Hook. f.) N.E.Br.)

Small shrubs up to 50 cm high. On the road from Gobabeb to Hope Mine. (Sight record).

Asclepias filiformis Benth. et Hook.

Frequent in the Namib flats north and south of the Swakop River. Mostly flowering or fruiting the whole year round. Sometimes the only plant in vegeta-

tive state in the area, but not seen on the Namib flats along the Kuiseb River from Rooibank to Gobabeb. (Sight record).

Asclepias fruticosa L.

Only dry relicts seen in the Kuiseb River bed at Rooibank.

Orphanthera albida Schz.

Shrubs, up to 60 cm high, older branches leafless, only the younger with small linear leaves. Flowers yellow-green, axillary. At Hope Mine in deep dry watercourse. Giess 3062. With olive-green flowers, in dry watercourse at the eastern side of the Zwartbank Mountains. Giess 3067.

Hoodia sp.

In granite crevices on the Carp Rocks. (Sight record). In windblown sand between stons on a marble ridge in the Welwitschiafläche. Giess 3081.

Trichocaulon dinteri Berg.

Succulent plant. Stems very small, up to 8 cm high and 2—4 cm in diameter, greygreen. At Rössing Mountains on a quartz ridge. Giess 3082. On a marble ridge in the Welwitschiafläche north of the Swakop River I found one plant which was partly covered under windblown sand. One of the stems was nearly 23 cm long and 6 cm in diameter. Giess 3083.

Trichocaulon pedicellatum Schz.

Stems up to 20 cm long and more or less 3 cm thick; usually with bristles at the end of the stems only. I found one plant which was growing between rocks, so protected against wind that it had bristles all over, so I came to the conclusion, that the bristles on the older parts of the stems are blown and rubbed off by the sand carried by the strong wind occurring in these parts. The little darkbrown flowers are pedicelled and at the end of the stems. Pedicel 0.5 cm long. In rock crevices, mostly on rocks facing to the east. In the white marble parts of the Zwartbank Mountains. No plants were found in the black dolorite outcrops. Giess 3027.

CONVOLVULACEAE

Ipomoea arenioides Schz.

Upright few-branched poor shrubs in a very dry state. On marble ridge in the Welwitschiafläche. (Sight record).

HYDROPHYLLACEAE

Codon royeri L.

Flowers white to light yellow. Very spiny, small herbs. In the Swakop River near Husab. E. Jensen 36.

BORAGINACEAE

Heliotropium curassavicum L.

On damp places in the Swakop River near the mouth. (Sight record).

Heliotropium tubulosum E. Mey. ex DC.

Very felty small herb with woody base and small white flowers. On very shallow soil above granite in the Welwitschiaflähe. Giess 2271. Also in dry watercourse on the eastern side at the foot of the Zwartbank Mountains. Giess 2278.

VERBENACEAE

Chascanum garipense E. Mey. ex DC.

Woody shrub up to 70 cm high. Flowers pure white, turning to lilac with wilting. Only at the lower parts of the Zwartbank Mountains. Giess 3031. In dry water course at the Carp Rocks. (Sight record).

SOLANACEAE

Lycium sp.

Dense large shrubs with somewhat succulent small leaves. At Rooibank in the river bed of the Kuiseb. Also at several places at Swakopmund and in the Swakop River bed. (Sight record).

Datura spp.

Seen only in dry state at Rooibank.

Nicotiana glauca Grah.

Shrubs to small trees in the river bed of the Kuiseb (at Gobabeb plentiful), mostly in a dry state. A native of South America and probably introduced as a garden plant. (Sight record).

SCROPHULARIACEAE

Anticharis imbricata Schz.

Small shrublets with lax branches of 30—40 cm in length, imbricate leaves covering the branches, flowers violet-blue. On the way down to the Swakop River at Tsawichab. Giess 3074.

Aptosimum steingroeveri Engl.

Small woody and spiny shrublets, up to 30 cm high. Flowers blue with darker throat. On gravelly quartzite flats, 12 miles northeast of Hope Mine. Giess 3017.

Sutera canescens (Benth.) Hiern

Small woody shrublets with silverygrey leaves and small dark brown flowers. Mostly found in association with the *Welwitschia* south of the Swakop River. Giess 3046. Also seen in the *Welwitschia*fläche north of the Swakop River.

Sutera maxii Hiern

Small viscose shrublet with a woody base and white flowers. In dry watercourse on the eastern side of the Zwartbank Mountains. Giess 2276. Cushion-forming shrub, up to 50 cm high, densely viscid. Flowers white with brown dots in the throat. In small river running to the Swakop at Tsawichab. Giess 3054.

PEDALIACEAE

Rogeria longiflora Gay

Herb with white flowers up to 1.20 m high, becoming woody with age. Only in dry state at the *Welwitschia*fläche on very shallow soil above granite. (Sight record).

Sesamum capense Burm. forma

Herb, up to 20 cm high. Flowers light pink-blue with a dark brown throat. On coarse sand near granite koppie 24 miles west of Usakos. Giess 3006.

ACANTHACEAE

Petalidium variable (Engl.) C.B.Cl. var. *glutinosum*

Woody shrub, —50 cm in height. Flowers dirty pinkish, later becoming brownish. Very severely browsed by game. On shallow soil above granite on the *Welwitschia*fläche. Giess 2264 & 3040.

Blepnaris bossii Oberm.

Dense spiny shrubs, up to 60 cm high and in diameter with pale blue flowers. In dry watercourse in the Carp Rocks. Giess 3064. Also in a tributary of the Tubas River in the Namib flats on the road Swakopmund to Windhoek. Giess 2261.

Monechma arenicola (Engl.) C.B.Cl.

Very woody shrubs due to severe browsing by all kind of game. Up to 40 cm high. Flowers light red-violet. On gravelly quartzite flats 17 miles northeast of Hope Mine. Giess 3014.

RUBIACEAE

Kohautia ramosissima Bremek.

Perennial herb with woody base. Flowers small and yellowish. In wind-blown sand at the foot of a marble mountain north of the Vogelfederberg. Giess 3055.

CUCURBITACEAE

Acanthosicyos horrida Welw.

Big light green spiny, leafless shrubs on the banks of the Kuiseb River right at the foot of the sand dunes. At Rooibank. Giess 3021. Also found on the eastern aspect at the foot of the Zwartbank Mountains in small windblown sand dunes. Giess 2274. Further recorded on the eastern aspect at the foot of the huge coastal sand dunes between Walvis Bay and Swakopmund about one third up in the dunes, and on the southern bank of the Kuiseb River near Gobabeb.

Citrullus ecirrhosus Cogn.

"Namib tsamma". Perennial, prostrate with underground rootstock and large runners. Fruit up to 12 cm in diameter. On the Namib flats. Collected in dry watercourse south of the Swakop River. Flowering. Giess 3047.

COMPOSITAE

Felicia smaragdina (S. Moore) Merxmüller

Very small herb with yellow capitulae occurring after a local rain. In coarse weathered granite sand near granite koppie 24 miles west of Usakos. Giess 3004.

Helichrysum leptolepis DC.

Small woolly, prostrate herb with pinkish white capitula. On coarse sand near granite koppie 24 miles west of Usakos. Giess 3004a.

Pegolettia senegalensis Cass.

Very small herb in a shallow dry watercourse on sand. Flowers yellow. Farm Onanis. Giess 2260.

Geigeria africana Griess.

Plants only 2 cm high between quartz pebbles. In flower. Quartzite flats, 13 miles northeast of Hope Mine. Giess 3013.

Geigeria alata (Hochst. ex Steud.) Benth. et Hook. ex Oliv. et Hiern

Very small and mostly strongly browsed by game. Only a few centimeters high. Yellow rayflowers, usually three to a capitulum. On quartzite gravel flats about 13 miles northeast of Hope Mine. Giess 3012.

Senecio marlothianus O. Hoffm.

Small herb with white flowers (without rays). Between stones in wind-blown sand on a marble outcrop in the Welwitschiafläche. Giess 3038.

Othonna litoralis Dtr.

Succulent brown stemmed shrubs from 10–40 cm in height. Flowers yellow. On marble outcrops in the Welwitschiafläche north of the Swakop River. Giess 3085.

Othonna protecta Dtr.

Small plants with a round or bottleshaped, succulent stem which is partly under ground. In rock crevices on marble mountains north of the Vogelfederberg. (Sight record).

Osteospermum microcarpum (Harv.) Norl.

Annual herb, —20 cm high, with somewhat succulent leaves and yellow rayflowers. On coarse sand near granite koppie 24 miles west of Usakos. Giess 3011. Also in windblown sand on a mountain north of Vogelfederberg. Giess 3058.

Gazania jurineaefolia DC. *spp. scabra* (DC.) Roessl.

Small plants, —7 cm high, flowers nearly white, rays with pale lilac. Between rocks on the eastern side of the Zwartbank Mountains. Giess 2277. Also seen in a very dry state in the Rössing Mountains.

Dicoma schinzii O. Hoffm.

Small herb, silverygrey, hairy. Between stones in sand on mountain north of the Vogelfederberg. Giess 3071.

Launaea goraensis (Lam.) Sch. Bip.

Flowers pale cream. Herb up to 60 cm in height. In a big hole in granite in the Carp Rocks on sand and protected against game. Giess 3049.