

Sept. 2003, Michaela Fürst

Namaqualand- an overview over its climate, its geological conditions and the resulting flora

The following text shall give an introduction into the flora of Namaqualand with its special features that evolved due to its unique climate. Additionally, there is a list of plants that occur at the Geogap Nature Reserve.

Geological History of the Karoo-Namib region

Namaqualand is part of the succulent Karoo, which together with the Nama-Karoo and the Namib Desert forms the southern African Karoo-Namib region.

Most deserts are, geologically speaking, young, about 4 million years old. At that time the atmosphere became drier and colder. But already 80 million years ago, the Namib Desert experienced dry conditions, which is why an ancient gymnosperm (Nacktsamer), *Welwitschia mirabilis*, could survive in this region but got extinct everywhere else, where dry periods were of shorter duration. The climate had to be constantly dry enough for such an species to survive that was adapted to arid conditions.

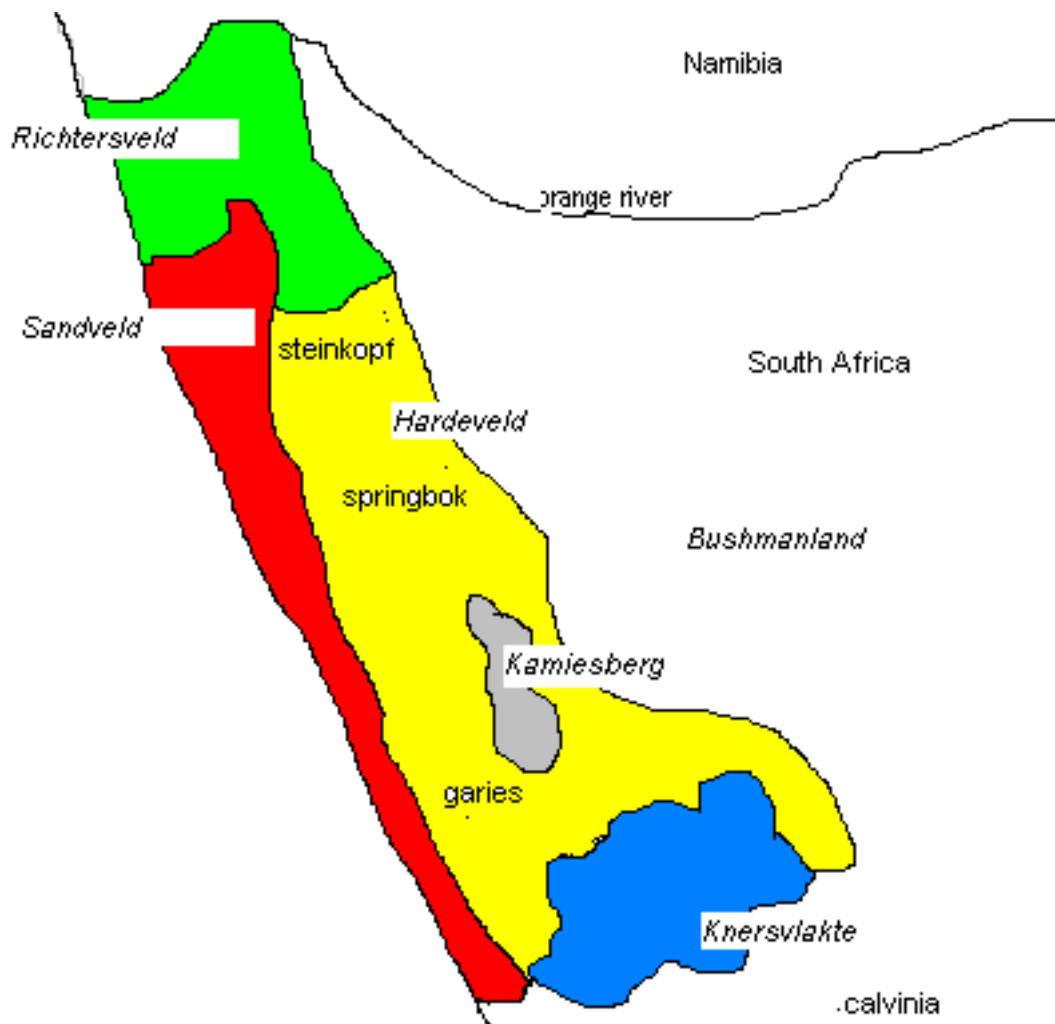
2600 million years ago, Namaqualand experienced a time of mountain building and erosion, which led to the building of sand sediments, and volcanism also took part in the building of the relief of the landscape. The first sediment layer, which was once widespread, was intruded by granite stones between 1000-2000 million years ago. 500 million years ago, a new sedimentation cycle started, many of the rocks that evolved at that time are still visible today at the Richtersveld and Knersvlakte. A rifting in the pre-Gondwanian land-mass lead to the building of a basin. In the next 400 million years, many layers of sediment were deposited in the basin. Later Gondwana was assembled and formed the Richtersveld Mountains. The sediments named from the oldest to the youngest are the following: Gariiep, Stinkfontein, Numees and Nama:

- Gariiep consists of mainly quartzites, phyllites, schists and volcanics. It can be seen north of Port Nolloth.
- Stinkfontein rocks are mainly erosion resistant quartzites that can be seen at the Vandersterberg and in the Stinkfontein mountains. The weight of the Stinkfontein sediment made the basin sink.
- Numees sediments evolved 700-800 million years ago. It consists of tillite, phyllite, dolomite and quartzite and can be seen in the namaquan highlands.

100 million years later, the Nama sediment was desposited. It is made of lime stones, marbles, and shales, quartzites and lenses of conglomerate. It is visible in the west of Springbok.

Namaqualand in geographical terms

Namaqualand itself can be divided in four parts, according to the geographical surroundings: the Richtersveld, the Namaqualand Klippkoppe, the Sandveld and the Knersvlakte.



The Richtersveld is in the north-western corner of Namaqualand between the Orange River, Port Nolloth and Steinkopf. This region is often regarded as the southern part of the Namib Desert due to its low rainfall of about 50 mm per year. The plants are on average less than 50 cm high and the variation of succulents is enormous. The coasts are rich of diamonds and therefore give lots of people their income, and small stock farming, mostly with goats is also a common way to earn ones living.

Namaqualand Klippkoppe is regarded as the true Namaqualand. It stretches from Steinkopf in the north to Bitterfontein in the south and is characterized by granite hills separated by sandy plains. The average rainfall is around 100-200 mm per year, but can in single cases be up to 400 mm per year. The plants are between 50 centimeters and one meter high and the dominant dwarf shrub is kraalbos (*Galeria africana*). Here also extensive small-stock farming is performed, often with karku, (Sheep), but wheat is also grown. The copper industry is highly important in that region.

Sandveld, a 30 km wide stripe along the coast, from Orange River to Olifants River can be characterized, as the name itself says, by its sand, white one in the coastal region and red one in the interior. The rainfall varies from 50-150 mm per year, and the vegetation is between 30 cm at the coast to 1 m high. The fish and the crayfish industry are settled here, diamond mining is an important source of income, but also small-stock farming can be seen.

Knervslakte is known as the region between Bitterfontein and Vanrhynsdorp and between the Bokkeveld Mountains and Sandveld. Its main features are rolling hills with white quartz pebbles and red sandy plains. The rainfall is 100-200 mm per year and the plants are relatively small, between 10 to 50 centimeters high. Mesembryanthemaceae are the dominant plants. People are occupied on small-stock farming or on mining the mineral deposits, especially gypsum.

Flora of Namaqualand

Rainfall in Namaqualand varies between 20 and 290 mm per year, with an average of 100 mm per year. During summer, temperatures can hit the 40 degrees (Celsius). Fog is only common along the coast and frost is infrequent.

Due to its unique climatic conditions, there evolved a unique diversity of plants. The following plants appear in Namaqualand:

Short plants, squat rounded shrubs, with succulent leaves or succulent stems. There are about 3000 species out of 648 genera and 107 families. Compared to other deserts, this numbers are surprisingly high. About 1500 of the 3000 plant species are endemic, which means they occur only in Namaqualand and nowhere else in the world.

There exist about 1000 succulent species in the region (of 150 genera and 10 families), which provide about one third of the whole flora and 10 percent of the worlds succulents. The special feature of succulents is the fact that they store their water either in their stems (stem succulents) or in their leaves, which makes them appear fleshy. The most astonishing succulent in Namaqualand is the species of the so-called halfmen, *Pachypodium namaquanum*. Those plants are tall with a bushel of leaves at the top that reminds of a human head and often with two single branches, also with leaf-bushels at the end, that remind of the arms. The halfmens are thought to be centuries old. Other well-

known genera are *Ruschia*, *Drosanthemum*, *Leupoldia*, *Tetragonia* (Aizoaceae), *Othonna* (Asteraceae), *Zygophyllum* (Zygophyllaceae), and the Crassulaceae.

Additionally, Namaqualand has around 250 species of miniatures, which become less than 10 centimeters high. For example there is *Anacampseros* (gansmis).

There are about 650 species of shrubs (bushes), of 165 genera and 47 families, most of them evergreen. This and the fact that they retain their leaves is very unusual among shrubs. Throughout the year only the ten *Lycium* species and *Didelta spinosa* lose their leaves. It may be surprising for the reader that the shrubs show remarkable gaps in their distribution, and that there is also a large fynbos shrub flora, which is typical for the Cape Floral Kingdom. Fynbos is Afrikaans for fine bush and the flora got that name because most of its plants have no leaves. The largest group among the shrubs is *Hermannia*, *Helichrysum* and *Pteronia* are the second largest groups, and they are daisies. Many endemic daisies can be found in the genera of *Pteronia*, *Osteospermum* and *Euryops*. The most famous fynbos shrubs are *Protea namaquana* (Kamiesbergsugarbush) and *Vexatorella alpina* (Kamiesberg vexator).

In Namaqualand, trees can be found along watercourses and in the rocky Hardeveld and Richtersveld. But there are only a 35 species of 24 genera and 13 families, and most of the species are arid-adapted species. The majority of the tree species is evergreen and has hard leaves. The most interesting tree in Namaqualand is the quiver tree, koekerboom, Koecherbaum or *Aloe dichotoma*. The species is distributed from the Richtersveld throughout Namaqualand and Bushmansland up to Namibia. It grows extremely slow and can reach a height of about seven meters. These trees have massive normally unbranched stems, only at the top there is a bunch of short branches. Those branches have a crown of gray-green leaves that have short white teeth to avoid to be eaten by animals. From mid- to late winter one can see the trees yellow flowers. Endemic trees in Namaqualand are *Ozoroa dispar* (Namaqualand resin tree) and *Rhus horrida*.

Bulbs (Zwiebel- oder Knollengewächse) are wide spread and with their 480 species of 100 genera and 19 families they provide 16 percent of the total flora. This number is ten times higher than in any other desert with winter-rainfall in the world. One can see an incredible diversity of flower form and color to attract pollinators, and also the variation in leaf form is interesting: there are leaves which are shaped like swords, and flat leaves that lie on the surface of the soil. The largest families are the Iridaceae, Hyacinthaceae, Oxalidaceae and Amaryllaceae. But bulbs can also be found among the crassulas, tylocodons and phyllobolus. There are only 16 species of orchids among the bulbs. Annuals only provide 10 percent of the total flora, which is not much compared to other deserts, where they make up to 20-30 percent. Although there are 330 species of 85 genera and 24 families, there are very few endemic species. The largest groups are the Scrophulariaceae, the second largest group are the Asteridaceae.

The grasses and grass-like plants consist of the Poaceae (real grasses), the sedges (Cyperaceae) and the restoids (Restoidaceae), the last two are the grass-like.

The different veld types and their influence on the plant mixture

Namaqualand has a astonishing diversity of plant communities, and a slight change in the moisture level, slope orientation or soil type can lead to a complete new mixture of plants, but each veld type has its typical plants. There are six main veld types:

1. The Vygieveld, shallow soils in the lower Namaqualand with dwarf succulent shrubs dominated by vygies. This veld type can also be found in the quartz veld of Knersvlakte, Sandveld and Richtersveld and in the arid gravel plains of the lower Orange River valley, and on the lower coastal plains and lower mountain slopes. The annual rainfall is about 150 mm, and there occurs frequent fog.
2. The Namaqualand Broken Veld, with an annual rainfall of 100-300 mm per year, is the place of taller shrubs and low trees, at higher altitudes in the Hardeveld and Richtersveld. The name arises from the fact that the veld is “broken” by the presence of trees.
3. At the Namaqualand Renosterveld, the rainfall is normally more than 300 mm per year, so it is clear that this veld type can be found at the western, rain-exposed summits of the Hardeveld and Richtersveld mountains and at the Kamiesberg. The characteristic flora here is shrubland with small- and leathery leaved plants.
4. Kamiesberg fynbos appears on the cool and moist upper slopes of Kamiesberg, and the annual rainfall reaches 400 mm per year. The vegetation is undistinguishable from the fynbos at the Cape Floral Kingdom concerning its appearance.
5. The Sandveld, which contains much silt and fine-grained sand particles and which has a generally soil, has a great influence on its vegetation: fine grained soils can store more water than rough grained soils, but it is harder for the plants to extract the moisture out of fine soils, so there is a sparser vegetation.
6. Sandveld fynbos with its acid, infertile soil can be found along the Garies road. This veld can be regarded as the northern extension of the fynbos that grows on the sandy, acid coastal plains of southern Namaqualand. Much of this veld type has been destroyed by farming and by alien plants, so it would be very important to protect those areas.

Protection of this unique flora - introduction of different concepts

Several groups of scientists developed ideas about how the Namaqualand biome can be protected. At the moment only two percent are protected and it is thought that this number has to increase enormously to have a real effect. Namaqualand can be divided in twelve parts according to the different types of flora, and only three of these parts contain national parks at the moment. One interesting concept for protection is the biodiversity hotspot concept. It regards areas as hotspots that have exceptional high numbers of endemic plants and suffer exceptional loss of habitat. In numbers, each region that

qualified for a hotspot had to contain at least 5 percent of the endemics of the world. With this definition, 25 hotspots were identified worldwide, the succulent Karoo among them. A different approach was taken by a group of South African scientists who established a strategy to decide which parts of the succulent Karoo needed additional reserves to ensure sufficient protection for the unique flora. They used a red data book (RDB) and divided the area in pieces using a quarter degree scale (QDS). Then they determined the QDS with the most red data book species and proposed that the 5 percent of QDS, the most threatened 11, should be protected additionally. Then fifty percent of the local RDB flora could be protected in eight percent of the area of the biome.

The special features of Namaqualands plants

Special Physiology

The lack of water over most of the year, made it necessary for plants to evolve mechanisms which made it possible to undergo the germination within the shortest period possible. If the plant needs too much time to reproduce, it will die of lack of water without being successful in that respect. Most succulents also evolved a superficial root system to absorb the water, if there is one, as effective as possible. The water is then stored in the stems (stem succulents like Euphorbiaceae) or in the leaves. The transpiration of the stored water is reduced by the plants either by reducing leaves and so reducing the surface or by making the leaves fleshy. If a plant produces leaves, then they are mostly of cylindrical or orate form, to minimize the surface. Some plants can move their leaves according to the angle in which the sunlight falls on the plant and minimize the surface that is exposed directly to the sunlight. This phenomenon is called circadian rhythm. A number of plant species arrange their leaves in a rosette, so that they can fold their leaves if the sunlight becomes too intense. Another possibility to prevent leaves from sunlight is to press them against the stem. Succulents in general possess few stomata, and those then appear in deepenings, such that transpiration is reduced very much in comparison to non-succulent plants. A thick cuticle also helps to retain the hard acquired water. In the family of the *Compositae*, a woolly layer can be seen on the leaves of some of its species. But due to the fact that every plant needs energy in form of sunlight for their metabolic pathways, the plants had to evolve a solution so they did neither get too much nor too less sunlight. Some succulents developed so-called “windows” to allow some of the sunlight to reach the inner leaf tissue in which photosynthesis takes place. Windows are tissues that don’t contain any chlorophyll and therefore have a transparent appearance. Windows can be found mostly in the leaf apex. In those species, which have their leaves sunk in the ground, only the windows are exposed to the sunlight. The cell walls of the window tissue contain lime oxalate crystals so that the light can be passed effectively to the photosynthesis-performing tissue. Windows also often have a bulbiform, this makes them work like a lens and reflect much of the sunlight.

Special biochemical pathways

Another important invention to save water was the Crassulacean Acid Metabolism (CAM), which doesn't only exist in crassulaceans, but was discovered in them first and therefore got that name. Plants with that metabolism assimilate carbon during the night, what makes them lose much fewer water than C3- and C4 plants that assimilate carbon during the day. This is due to the fact that they can keep their stomata closed during the day. In CAM-plants, the first assimilatory product is a C4-body, malate, which is made from the assimilated CO₂ and oxalacetate. The malate is stored in the vacuoles. Malate is an acid, so the pH of the cells slowly sinks during the night. During the days, when sunlight is there for the photosynthesis cycles, the fixed C in the malate will be used to make glucose and the other photosynthesis products. With every malate that is reduced, the pH grows until the evening. One severe disadvantage of the CAM metabolism is the slow growing rate of the plant compared to C3 plants. A lot of species are able to switch between the CAM metabolism, which is used in dry and hot times, and the C3 metabolism that is used when more water is abundant.

Specials in reproduction

The question may come up in the readers mind how there can be so many different plant species in region in which the conditions for plants are far away from optimal. There are two main types of plants; the succulent shrubs and the bulbs, which comprise most of the regions endemics, this is a sign that their lines must have diversified extremely in Namaqualand. Due to the fact that there appear everywhere clusters of relatively close related species, speciation should be a recent phenomenon. So one can say that the endemics in Namaqualand are not relicts of old floras, but neoendemics. The question is now, why those two plant types did diversify that much in Namaqualand. For diversification being able to happen some conditions have to be fulfilled: the plants have to reproduce sexually and to be self-incompatible to prevent a new generation without new combination of genes and to make it possible that new features can evolve. Furthermore the gene dispersal must be limited, so that isolated populations can preserve their genetical identity. Helpful are short life spans of the plants, such that selection can act on more generations within a given period. The last condition is that the plants should occur in large populations so that diversity can accumulate. Most of the vygies reproduce sexually and are pollinated by insects that transport the seeds over short distances. The seeds can normally be found in the direct surrounding of the parental plant. The life spans among vygies (Mesembryaceae) are short, between 3 to 30 years, and they live in big populations, which do not take much place, because the individual plants are very small. Most vygies are not resistant to droughts, so mass death can happen if a severe drought occurs, like in 1979, but cases like that are a big chance for evolution to create a new diversity which possibly is better adapted to the circumstances and more ecological niches can become occupied. The trend among vygies seems to go to smaller plants that can colonize extremer habitats. This trend also can be seen in some bulb lineages, for example in *Oophytum*, where the older leaves are dispersed and only the young leaves are on the plants. *Oophytum* plants can therefore be regarded as permanent seedlings. Among the crassulaceans, which have a similar biology, most are able to reproduce vegetative under drought, and their seeds are dispersed more widely. In case of drought, they are able to shed their leaves, which can develop roots when the

conditions improve. Trees, which are widely distributed, but in a low number, have the advantage that their seeds can be dispersed by birds over a large area, but they have a long life-span, which makes it harder for selection to act on them than on plants with shorter life-span. A lot of shrub species also have widely-dispersed seeds and live long. The annuals (flowers) are short living in large populations, but their seeds are mostly wind-dispersed. Many of the annuals are self-compatible. Among the bulbs, almost all species are self-incompatible, their seeds are dispersed by insects over short distances, and about their life-span few is known. In periods of drought bulbs may lose to much water and go extinct. For the bulbs, pollinators seem to have been important to drive speciation, but one of the primary forces still is the need to adapt to different soil types.

Origin of the plants

Most succulents and bulbs are descendant from an ancient semi-arid stock. More than 3 million years ago Namaqualand was covered in wood that included both fynbos vegetation and tropical tree flora. When the climate changed to a drier type, the rainfall changed from summer-rain to winter-rain. The plants had either to adapt to the new conditions or they died out. As a conclusion, one can say that the flora that appears in Namaqualand in our days, is relatively young, and only those species that managed to conquer ecological niches under the new climate conditions established.

Today many shrubs and bulbs also appear at the fynbos flora, so it is suggested that Namaqualand can be regarded as part of the Cape Floral Kingdom. Almost everywhere in Namaqualand plants with fynbos affinity can be found. The other part of the succulents has tropical origins. Lots of the trees are relicts from the late Tertiary periods and have affinities to species in summer-rainfall deserts. Some shrubs can be regarded as migrants from the Namib Desert.

Plant families and plant species that can be seen in the Geogap Nature Reserve:
(here only those plants are listed for which information was available while this text was written)

◆ *Poaceae*

Ehrhardta longiflora

In Afrikaans it is called Rooisaadgras or pepe-grass, it is annual and becomes about 20 cm high. Its flower heads are up to 5 cm long and its leaf-blades are up to 5 mm wide. It is distributed all over Namaqualand and can be found in sandy places. It is non-palatable.

Ehrhardta calycina

It is also called Rooisaadgrass, but is perennial and grows up to 60 cm high. Its leaf-blades are expanded or rolled and the flower heads are up to 25 cm long. This grass is often eaten by cattle. It can be found all over Namaqualand, in the Cape Province, the Orange Free State and in Namibia.

Stipagrostis ciliate

It is also known under the name Langbeenboesmangras, is perennial and unbranched and can become 1 m high, but is usually shorter. The leaf-blades are enrolled, curved, hairless and end in a narrow point. The flower-heads become 30 cm long. It is distributed in sandy soils over Namaqualand, but is more common in Bushmanland and in Namibia.

Stipagrostis obtusa

The Kortbeenboesmangras is small, less than 60 cm high, compact, tufted and perennial. The leaf-blades are rolled, rigid and usually recurved. The narrow flower heads are up to 20 cm long. It is palatable. One can find it on sandy soils in Namaqualand, but it also occurs in Namibia and Bushmanland.

Tribolium utriculosa

Is a annual, small grass with many culms that can flower and grow up to about 6 cm. The leaf-blades are ornamented with scattered, stiff white hairs. The flower heads are up to 1.5 cm high. This grass can be found in the sandy Namaqualand the western Cape Province.

Fingerhutia africana

The Vingerhoedgras or borseltjiegras is perennial, densely tufted and has unbranched culms which are about 50 cm high. The leaf-blades are expanded at the base, narrowing to a long pointed tip. The flower heads are dense, cylindrical and up to 2 cm long. This unpalatable grass is distributed over the rocky Namaqualand, but can also be found in the Cape Province, Transvaal and in Namibia.

Schmidtia kalahariensis

The Suurgras is annual, tufted, with culms that grow to 15 cm high. The leaf-blades are expanded at the base, but often rolled towards the tips. The flower heads are compact at the culm-ends. This grass is aromatic and unpalatable and can be found in the sandy Namaqualand, Bushmanland and the Kalahari.

◆ *Cyperaceae*

Isolepis spec.

It must be one of the 10 species of *Isolepis* that occurs in Namaqualand. In South Africa in total occur 24 species.

◆ *Liliaceae*

The *Liliaceae*, a member of the Monocotyledonae, is found throughout the whole world. There are about 230 genera and about 2800 species in total. In southern Africa about 57 genera occur, of which 5 can be regarded as succulents. The family consists of geophytes (plants that can endure bad conditions by reducing to a underground part), bulbous and rhizomatous plants, but there are also shrubs, trees and annuals. The following genera are included in that family: Aloe, Bulbine, Gasteria, Haworthia and Sansevieria. All Aloe species contain a bitter sap, which comes out of the plant if it is damaged. This sap can be used as a remedy for animals.

Bulbine frutescens

It is a small succulent shrub with fibrous roots and bright green leaves, which are about 4-8 mm thick and about 15 cm long. The flower stems have many white, orange or yellow flowers and are about 30 cm long. It is distributed over Namaqualand and other parts of the Karoo.

Bulbine latifolia

The Geelkopmannetjie or geelkatstert is a erect, perennial herb which can become up to 1 m high and has a erect rhizome covered with fibres. The basal leaves are linear, entire with many veins and up to 65 mm wide and up to 50 cm long. The flowers can be from yellow to deep orange and are about 2.5 cm long and 4.5 cm in diameter. They appear in a dense spike. The stamens are not bearded. This plant can be found in seasonally damp places all over the Cape Peninsula, the Calvinia area and Namaqualand Klipkoppe.

Trachyandra falcata

It is known as Hotnotskool, bokkool and veldkool and is a perennial herb which can grow up to 60 cm. It normally has 4-5 basal leaves that are up to 30 cm long and 3.5 cm broad and with few hair or hairless. The flowers are white to pale mauve and are marked with brown parts and are about 1.2 cm long and appear in an branched spike. The young unopened flowers can be used in stews. It is distributed over Namaqualand, in dandy places and over Namibia and south to Saldanha Bay.

Trachyandra tortilis

The perennial herb grows up to 25 cm high and has 3-6 grey-green basal leaves of 10 cm length and 2 cm width. The leaves are folded in a transversal manner. The flowers are pale pink marked with green, are borne in a much-branched spike and become up to 2 cm in diameter. This plant is distributed over Namaqualand from Springbok southwards to Hopefield.

Chlorophyllum crassinerve

This perennial herb grows up to 40 cm and has a bulb. The basal leaves, 4-5, grow in a rosette and are up to 14 cm long and 2 cm broad and have a leathery appearance. The flowers are white with red keels, about 3 cm in diameter and spaced in a unbranched spike. It is distributed from Garies to Springbok.

Aloe dichotoma

The Kokerboom grows up to 9 m high and is much-branched in the upper part. The narrow leaves can reach a length of about 35 cm and have short teeth, about 1 mm, along the margin. The bright yellow flowers can be seen in July and are about 3 cm long. The Kokerboom is distributed over Namaqualand and Namibia. In South Africa there are about 170 species of Aloe.

Aloe khamiesensis

The small succulent tree, about 1.2 m high, has green roundish leaves with white marks, they appear at the top of the tree and are about 60-80 cm long and 5-7 cm wide with toothed margins. It appears in Namaqualand Klipkoppe from Steinkopf to Garies.

◆ *Hypoxidaceae*

Spiloxene spec.

This perennial herb grows up to 15 cm high and has a corm. The leaves are numerous, narrow, linear, hairless and have a length of about 15 cm and a width of about 6 mm. The yellow flowers are borne on long stalks and 2 cm in diameter. This species can be found in the rocky hills of Namaqualand on south-facing slopes.

◆ *Iridaceae*

Moraea serpentina

The perennial herb, named slanguintjie, grows up to 20 cm high. The normally unbranched stem has 3 leaves that are basal, narrow, keeled and twisted. There are few flowers, normally white to yellow, pink or mauve, of about 3.5 cm in diameter. *Moraea serpentina* can be seen everywhere in Namaqualand, in Bushmanland and in the Karoo in sandy, flat places.

Homeria miniata

The tulp, a perennial herb, grows up to 60 cm and has a branched stem. There are only two leaves, that are narrow, linear and often longer than the stem. The yellow to red flowers are grouped along the stems, they are 4.5 cm in diameter. This species can be found in Namaqualand and southwards and in the Calvinia area in sandy, flat places.

Homeria schlechteri

The perennial herb, also named tulp, can become about 20 cm high with widely branched stems and a corm. The two leaves are as long as the stem or shorter. The yellow flowers of 3.5 cm in diameter are grouped at the ends of the stems. It can be seen throughout Namaqualand in flat, sandy places.

Gladiolus orchidiflorus

The Groenkalkoentjie, as it is named in Afrikaans, is a perennial herb that can become 75 cm high with a either branched or unbranched stem. The leaves, which may be 3 to 8, are grass like and up to 40 cm long. The flowers are dull green to beige and 3-5 cm long with a median purple stripe. There can be 5-15 of them. This species can be found in sandy soils in Namaqualand and Namibia and also in the Cape Province.

◆ *Urticaceae*

Forsskaolea candida

The herbaceous plant has a woody base and grows up to 50 cm high. The stem is red. Its leaves are dark green on top and have irregular dentate margins. The flower heads have long silky hair. The male flowers form a ring around the female flowers. This species can be found in the rocky hills of Namaqualand and in Namibia.

◆ *Aizozeae*

Adenogramma glomerata

This annual herb is much branched and prostrate. The leaves are linear, 1 cm long and appear in groups along the branches. The white flowers, that appear in clusters, are about 2 mm in diameter. This plant can be seen in Namaqualand and southwards to the Cape Province and at the Cape Peninsula and in Namibia.

Limeum africanum

The Koggelmandervoet is a branched, prostrate, annual or perennial herb that can become up to 35 cm high. The leaves, that can grow up to 3 cm, are linear to oblanceolate and blue-green. The flowers, that can become 7 mm in diameter, are green with white edges and can be found in clusters at the end of the stems. This species belongs to the highly palatable plants. It can be found in sandy soils in Namaqualand, southwards to the Cape Province, the Cape Peninsula and in Namibia.

Pharmaceum croceum

The annual herb that grows up to 12 cm high, has leaves in basal rosettes that are narrow, entire and up to 4 cm long. The flowers can appear in white or pink with a diameter of about 7 mm and are bound loosely at the branched leafless stems. The specialty of this plant is that its flowers only open during the afternoons. It can be found in red sand in Namaqualand southwards to the Cape Province, Bushmanland and in Namibia.

Hypertelis salsoloides

The Haasuring, a much branched small perennial shrub or herb, grows up to 25 cm and has narrow, cylindrical leaves that are succulent and up to 3.5 cm long. The white to pink flowers are up to 7 mm in diameter and appear at the end of the

branches. The leaves taste sour. This plant has its home in the saline soils in Namaqualand, the drier parts of the Cape Province and in Namibia.

Galenia africana

The Kraalboss, a yellowish-green shrub is erect and can grow up to 1.5 m high. The leaves are hairless, opposite, entire and up to 5 cm long. The flowers can reach 1.5 cm in diameter and are yellowish-green and borne in loose groups. This species is an indicator of disturbance, and also the first plant to appear after disturbance or the only remaining plant when all other species have died out. When it is eaten, it causes dropsy. This species is the dominant plant in Namaqualand, but it also can be found in Namibia, and the drier winter-rainfall areas in the Cape Province.

◆ *Mesembryanthemaceae* (vygies)

The name of these plants means midday plant, and it is called like that because the flowers open in the afternoon. Previously the Aizoaceae were also part of this family, but a botanist tried to make them regarded as an independent family, but he wasn't successful in that respect. The family consists of perennial and annual herbs, small succulent shrubs, dwarf plants and creeping plant species. The leaves are free at the base, opposite, and all petioled. The branches are arranged in irregular or equal pairs. The genera are too numerous to be all named here.

Astridia longiflora

The erect shrub, that can become 30 cm high, has blue-green succulent leaves which can be about 6 cm long. The flowers are red, 5 cm in diameter and terminal. The fruits only open when it is wet to distribute their seeds and close when it is dry. The species can be seen in the rocky hills of the northern part of Namaqualand.

Cheiridopsis denticulata

The perennial succulent can become up to 15 cm high. The leaves are up to 11 cm long and grayish-green. The flowers, that are about 7 cm in diameter, are on single stalks. Animals like to feed on that plant very much. It can be found in sandy places from Garies to the Richtersveld.

Cephalophyllum namaquanum

The prostrate perennial becomes up to 5 cm high. The leaves are succulent, opposite, up to 4 cm long and gray-green. The flowers vary from yellow to orange and are about 5 cm in diameter. They appear single. This plant is unpalatable. It can be seen near Springbok and around Richtersveld.

Sphalmanthus scintillans

This herb is prostrate, perennial and can become up to 17 cm long. The leaves are succulent, opposite, concave above, rounded below and about 2 cm long with papillae. The flowers are about 5 cm long and can be white, cream or brown-purple. This species occurs in sandy flat places in Namaqualand.

Capobrotus edulis

The Hotnotsvy is a perennial herb up to 1 m high. The flowers are yellow. It can be seen in Namaqualand along the coast.

Ruschia robusta

The Swartstnavyebos is an erect shrub that can become up to 1 m high. The leaves are succulent, blue-green and about 3-5 mm in diameter and about 5 mm long.

The flowers are borne singly and they are purple with a diameter of about 18 mm. The flowers appear along short branches along the main stem. This plant is unpalatable and can be found in sandy places in the Namaqualand Klipkoppe and Bushmanland.

◆ *Caryophyllaceae*

Dianthus namaensis

The grass carnation, also named grasangeliertjie, is perennial, herbaceous and can become 10 cm high. The 7 cm long blue-green leaves are linear-lanceolate and 2 mm broad. The flowers can be white or pale pink with 1 cm in diameter. This species can be seen in Namaqualand's hills and in Bushmanland and Namibia.

◆ *Brassicaceae*

Heliophila variabilis

The Sporrie, an erect annual herb, can grow up to 35 cm high. The leaves are lobed into segments and up to 7 cm long. The flowers can be seen at the end of the stems in loosely clusters, they are 1.3 cm in diameter and can be white to pink. It has its home in every sandy soil in Namaqualand.

Heliophila lactea

The Sporrie is erect, an annual herb and up to 40 cm long. The leaves are up to 9 cm long. The flowers, that are loosely clustered at the ends of the stems, are pale blue with white centers and are about 1.5 cm in diameter. This species can be seen in Namaqualand, Namibia and Bushmanland.

Heliophila amplexicaulis

The species is also called Sporrie, an annual herb up to 40 cm high. The leaves are 4 cm long, unlobed, lanceolate and 1.5 cm broad. The flowers are grouped at the ends of the branches, up to 1 cm in diameter and white, pink or mauve. It is a resident of Namaqualand and the southwestern Cape Province.

Heliophila laciniata

The Sporrie is growing up to 50 cm high and an annual herb. The basal leaves are arranged in a rosette and 4-15 cm long. The flowers are clustered at the ends of the branches and have a diameter of about 2 cm. The colour is white to mauve.

This species can be found in sandy places in Namaqualand Klipkoppe from Springbok to Bitterfontein.

◆ *Asteraceae*

This family is also called *Compositae* and it is the largest plant family in the whole world with about 900 genera and 17 000 species. The family includes annual and perennial herbs, succulents, small trees and sub-shrubs. These plants often resemble the vygie family. The succulents of this family are mostly found in the Karooand in the Transvaal highveld. Important genera are *Othonna*, *Senecio* and *Kleinia*.

Pteronia incana

The tangled bush grows up to 1 m and has a dark bark. The leaves can become up to 2 mm broad and 1 cm long. The flowers are yellow, the heads have a diameter of about 4 mm and the plant can both be palatable and unpalatable. It occurs in Namaqualand from Garies to Steinkopf and in rocky places and dry areas around Port Elizabeth.

Pteronia divarcata

The Geelknopbos or spalkepenbos is a dense bush with a height of about 1 m. The leaves are up to 1.5 cm long, 0.2 cm broad, slightly rough, elliptic and green. The flower heads have a diameter of about 4 mm and are 1.3 cm long and are yellow. It can be seen throughout Namaqualand and southwards to the Cape Peninsula.

Pteronia glabrata

The perennial shrub can become 60 cm high and has blue-green, elliptic succulent leaves of about 5 cm length. The yellow flowers are arranged in florets. The species can be found in sandy places in Namaqualand and in Namibia.

Eriocephalus africanus

The wild rosemary or wilderosemaryn is a small, much branched shrub of 1 m height. The branches are short, alternate and bear the leaves, which are small and narrow and covered with silver hairs. The flower heads are woolly, small and clustered at the ends of the branches. There are 3-4 ray-florets and the disc-florets are deep purple. This is a palatable plant that can be found in Namaqualand as well as in the Cape Province.

Eriocephalus ericoides

The Kapokbos is a much branched shrub of maximal 1 m height with short branches that bear the green-gray, narrow leaves of about 3 mm length. The florets are white and almost hidden in their involucre bracts. The plant is unpalatable to palatable depending on the season and can be found in Namaqualand and drier parts of the Cape Province.

Lassiospermum brachyglossum

The Knoppiesopslag is an annual, suberect herb of 10-30 cm height. The leaves are doublelobed and the flower heads are about 1-1.5 cm in diameter and borne

singly. The ray-florets are purple and the disc-florets yellow. This species occurs in Namaqualand in sandy places and also in the eastern Karoo.

Cotula barbata

The Gansogies or knoppiesolag is a annual, tufted herb of 9-18 cm height with sparsely hairy leaves that are about 4 cm long. The flower heads are of 1 cm in diameter and are borne singly on a slender stalk. The disc-florets are yellow and the female flowers don't have a corolla. This species can be seen in Namaqualand south of Springbok.

Cotula leptalea

This tufted, annual herb can become 9- 30 cm high and bears hairy, deeply lobed leaves of 9-45 mm length. The flower heads have yellow disc-florets and are about 8 mm in diameter and are borne on stalks that are longer than the leaves. This plant occurs in Namaqualand in moist sandy places.

Cotula laxa

The Knoppiesopslag is a small, erect, annual herb of 11 cm height with branches from the base. The leaves are thinly hairy and about 4 cm long. The flower heads have a diameter of 4 mm and are singly with cream-coloured disc-florets. This species can be seen throughout Namaqualand.

Felicia australis

The Sambreeltjies is a annual herb of about 4-20 cm height with branches from the base and narrow, thick, linear leaves of 1.5 cm length. The flower heads are on singly stalks with a diameter of 1.5-3 cm, the 25 ray-florets are deep blue and the disc-florets are yellow. The species can be seen in Namaqualand from Steinkopf southwards and in the Great Karoo.

Felicia brevifolia

The erect shrub of 1.5 m has a grayish bark and its leaves are 5-15 mm long, gray-green and entire to variously lobed. The flower heads are 3-5 cm in diameter and borne on short leafless stalks. The 15 ray-florets are blue and the disc-florets are yellow. The palatable plant can be found throughout Namaqualand , in the Calvinia area and in Nambia.

Felicia merxmulleri

The Sambreeltjies is a erect annual herb of about 5-25 cm height with hairy leaves of 2 cm length and 5 mm width. The flower heads have a diameter of about 2.5 cm, the ray-florets are blue and the disc-florets are yellow. The species occurs in rocky places in Namaqualand an southwards in the Karoo.

Felicia namaquana

This species has pale blue ray-florets and yellow disc-florets and can be seen in the whole Namaqualand.

Scenecio arenarius

The Hongerblom is an annual herb of about 20 cm height. The lobed leaves have glandular hairs and are up to 7 cm long. The flowers have a diameter of around 2.5-3 cm with magenta ray-florets and yellow disc-florets. This unpalatable species can be seen in sandy places in Namaqualand, in the southern Cape Province and in Namibia.

Scenecio cinearescens

The Vieroulap or handjiebos is a perennial shrub that can become 1 m high. The leaves are white-wooly, about 10 cm long and deeply lobed. The flower heads have yellow ray- and disc florets and are about 2 cm in diameter. They are borne in groups at the end of the branches. This species can be found in Namaqualand and in Namibia.

Scenecio sisymbriifolius

The erect annual herb can become 50 cm high and has lobed, toothed, hairy leaves that can be oblong to ovate. The yellow flowers can become 1.5 cm long. The species can be seen in Namaqualand in cool, shady places and in Bushmanland as well.

Scenecio cardaminifolius

The Hongerblom is an annual herb of 10-35 cm height with variously lobed leaves that are almost hairless and about 5 cm long. The flower heads with yellow disc- and ray-florets are borne in clusters and are of 2 cm in diameter. The species can be seen in Namaqualand in sandy places.

Euryops dreaganus

The Vaallansrapuis is a much branched shrub of 80 cm height with hairy leaves that are arranged in groups along the branches. The leaves are about 4 cm long and 1 cm wide and toothed and lobed. The flower heads are yellow and 3-4 cm in diameter. This plant can be seen throughout Namaqualand in rocky hills.

Euryops multifidus

The Rapuis is a erect much-branched shrub that can become up to 1.5 m high. The leaves appear in groups mostly at the ends of the branches and are 1-3 cm long, linear, hairless and lobed. The flower heads are yellow, and of 1 cm in diameter. The species can be seen in Namaqualand and southwards in rocky hills.

Hirpicium alienatum

The Haarbos is a densely branched shrub that can grow up to 1 m high and that has linear leaves of about 1.7 cm length that are wooly below. The flower heads have a diameter of about 2 cm and are borne singly at the ends of the branches. This highly palatable plant can be found in Namaqualand, Bushmanland and Namibia.

Hirpicium echinus

The perennial herb with branches from the base can become 15 cm high and its leaves are rough, lobed into segments with white spines and are up to 3 cm long. The flower heads are solitary on stalks and are of 2-3.5 cm in diameter. The species can be seen in Namaqualand, Bushmanland and Namibia.

Othonna cylindrica

The Ossierapuisbos is a branched shrub of 0.5-1 m height with succulent, narrow leaves of 3-4 cm length. The flower heads are of 2 cm in diameter and can be seen in loose groups above the leaves. This species, of which only the flowers are palatable, occurs at the coast of Namaqualand and in the Bushmanland.

Othonna sedifolia

The Karoorapuis is a branched shrub that can become 60 cm high. The succulent leaves are 4 mm thick and 5-10 mm long. The flower heads are of 1.5 cm in diameter with yellow ray- and disc- florets. This palatable plant can be seen in Namaqualand from Bitterfontein northwards to Richtersveld.

Leysera gnaphalodes

This shrub can grow up to 50 cm high and has narrow leaves of 2-2.5 cm length that are hairy and gray to green. The flower heads are borne solitary on stalks and have a diameter of up to 2 cm. the florets are yellow. This species occurs in Namaqualand southwards from Steinkopf and in the southwestern Cape and in Namibia.

Leysera tenella

The Teebossie is a small, annual to biennial, woody herb that can reach 10 cm height. The narrow leaves are about 1 cm long and wooly. The flower heads are solitary on slender stalks and are of 1.5 cm in diameter. The florets are yellow. The species can be seen throughout Namaqualand and in the Karoo on sandy flats.

Castalis tragus

The Jakkalsbos is a perennial herb of 20-35 cm height with narrow, oblong leaves that are about 7 cm long and sparsely toothed. The flower heads differ in diameter from 4 to 6 cm and are borne singly on leafless stalks. This plant occurs in Namaqualand and in the Calvinia area.

Dimorphoteca sinuata

The Namaqualand daisy or jakkalsblom is a loosely-branched annual herb of 10-30 cm height with shallow-lobed or unlobed leaves. The flower heads are borne singly and 4-7 cm in diameter. The species occurs in Namaqualand, the southwestern Cape Province and in Namibia.

Dimorphoteca polyptera

This annual herb with branches from the base can grow up to 3-25 cm and has leaves that are once or doubly-lobed, sticky and up to 4.5 cm long. The flower heads are up to 2 cm in diameter and can be seen in loosely groups at the ends of the branches. The florets are yellow. It can be seen in sandy places in Namaqualand and in Namibia.

Osteospermum grandiflorum

The Muishondbos is a much-branched, erect shrub that can become 1 m high with sticky, toothed leaves of 2-5 cm length and 1-2 cm width. The flower heads can reach 5 cm in diameter. This highly palatable plant can be found in the rocky hills in Namaqualand and southwards.

Osteospermum pinnatum

This sticky annual herb grows up to 40 cm high with deeply lobed leaves of 3 cm length. The flower heads are borne singly at the ends of the branches and can be up to 5 cm in diameter. This species can be seen in Namaqualand, the Karoo and Namibia in sandy places.

Osteospermum sinuatum

The Skaapbos is a erect shrub of up to 90 cm height with semi-succulent leaves that can be up to 4 cm long and grayish-green. The flower heads have a diameter of up to 3.5 cm and are borne on single stalks. This highly palatable plant can be found in the sandy places of Namaqualand and in the dry parts of the Cape Province.

Osteospermum oppositifolium

The Skaapbos is a erect shrub that can reach 1 m height with its semi-succulent leaves that can be between 2 and 4 cm long and grayish-green. The flower heads are borne on single stalks and can be 4-5 cm in diameter. This plant is especially palatable when it is in flower and can be seen in Namaqualand and the Calvinia area in rocky places.

Osteospermum hyseroides

The Dassiegousblom is an annual aromatic herb that can grow up to 50 cm high and its leaves can be up to 10 cm long with short glandular hairs. The flower heads are arranged in loose groups at the ends of the branches and have a diameter of 3-5 cm. It can be seen in Namaqualand and the Calvinia district.

Osteospermum amplexans

The Dassiegousblom is an annual aromatic herb that can become 70 cm high with its hairy and irregular toothed leaves that can be up to 11.5 cm long. The flowerheads have a diameter of up to 4.5 cm. The species can be found in Namaqualand from Bitterfontein northwards and in the Calvinia area.

Ursinia nama

This prostrate annual can become 5 cm high with its hairless leaves that are deeply lobed and can be 1.5-3.5 cm long and slightly succulent. The flowerheads are yellow and up to 2.5 cm in diameter. It can be found in Namaqualand, the Little Karoo, eastern Cape and Namibia in sandy places.

Ursinia cakilefolia

The annual herb can grow up to 25 cm high and has leaves that are 6 cm long, toothed and double-lobed. The flower heads are single and of 2.5-3 cm in diameter. This species can be seen in Namaqualand and the Calvinia area.

Ursinia calenduflora

The Bergousblom is an annual herb that can grow up to 36 cm and has deeply lobed leaves of up to 5 cm length. The flower heads are borne solitary on stalks and are of 2-5 cm in diameter. The species occurs throughout Namaqualand in sandy places.

Arctotheca calendula

The Cape dandelion or soetgousblom is an annual herb that can grow up to 25 cm high. It has leaves that are lobed, rough above and white-wooly below. The flower heads are up to 6 cm in diameter and are borne on single stalks. The species can be found throughout Namaqualand and in the western Cape Province.

Goerthia diffusa

The beetle daisy is a prostrate annual herb that can become 30 cm high with a rough stem and narrow, usually unlobed leaves that can be up to 5 cm long. The flower heads are of 2.5-3 cm in diameter and are borne on single stalks. It occurs in Namaqualand and in the drier parts of the Cape Province.

Berkheya fruticosa

The Vaalperdebos is an erect shrub of up to 1.5 m height with alternate leaves that are up to 4 cm long and 2.5 cm broad and wooly below and hairless above. The flower heads are very spiny, single or in groups and 3-3.5 cm in diameter. The florets are yellow. This plant is palatable and can be seen in Namaqualand on rocky slopes and in the Calvinia area.

Didelta carnososa

The Perdeblom is a woody, perennial herb that can grow up to 1 m high with its succulent leaves that can be up to 10 cm long and hairless. The flower heads have a diameter of 4-7 cm and appear singly on stalks at the ends of the branches. This plant is highly palatable throughout the year and can be found in the sandy places of Namaqualand and in Namibia.

Didelta spinosa

The Perdebos is an erect shrub that can reach 2 m height and has bright green leaves that can be up to 7 cm long and 6 cm broad and hairless. The flower heads

are 4-7 cm in diameter. The plant is highly palatable and can be found in Namaqualand on dry and rocky places and in the Calvinia area and Namibia.

◆*Lobeliaceae*

Monopsis debilis

This annual herb can grow up to 15 cm high and has elliptic, basal leaves that are up to 5 cm long and leaves at the stem that are up to 3 cm long. The flowers are blue-purple and can be seen in clusters at the ends of the branches. This species can be found along streambanks in Namaqualand and southwards to the Cape Peninsula.

◆*Plantaginaceae*

Plantago cafra

This tufted, annual herb can become 10 cm high and has basal, linear leaves of 10 cm length that are hairy. The flowers are green, or cream-coloured and have white calyces and are borne in clusters at the ends of the branches. This plant occurs in sandy patches in places that are moisty in Namaqualand and southwards to the Cape Peninsula.

◆*Campanulaceae*

Whalenbergia oxyphylla

This shrub is much branched, rigid, perennial and up to 20 cm high. The blue-green leaves are stiff, spiny, finely toothed, up to 5 mm long and can be seen at the lower parts of the plant. The flowers are blue to white and have a length of about 1 cm. it occurs at flat rocks in the hills of Namaqualand.

Whalenbergia prostrata

This herb is annual, spreading and branching from the base. Its maximal height is 20 cm. its leaves are linear and up to 1,4 cm long. The flowers can be seen on long stalks. The species can be seen in Namaqualand northwards from Springbok to the Richtersveld in sandy places.

Whalenbergia annularis

The Bluebells is an annual herb branches at the base and can become 20 cm high. The basal leaves are linear and up to 5 cm long. The flowers are borne on leafless branches. The corolla is pale blue. This plant can be found in Namaqualand, south to the Cape Peninsula and in Namibia.

Lightfootia thunbergiana

This perennial shrub is untidy, brittle and up to 80 cm high. Its leaves stand at a 90 degree angle or are recurved and are up to 1 cm long. The flowers, that are white to light brown and are borne at the ends of the branches. They have the

form of stars. The species occurs in the hills of Namaqualand and in the Little Karoo.

◆*Selaginaceae*

Hebenstretia parviflora

This annual herb is erect, branching from the base and growing up to 25 cm high. The leaves are up to 3 cm long and linear. The flowers are mostly white, but sometimes pink and closely set at the ends of the branches. It is found throughout Namaqualand and in the drier parts of the Cape Province and in Namibia.

Hebenstretia robusta

This species is perennial with white flowers with an orange throat and can be found in Namaqualand.

Dischisma spicatum

The annual herb is either branched or unbranched and can grow up to 30 cm high. Its leaves are linear, up to 4 cm long and 4 mm broad and often slightly toothed. The white flowers are about 1,2 cm long and are borne in cylindrical spikes. This species occurs throughout Namaqualand, in the Calvinia area and in Namibia in sandy places.

Selago albida

The muishondbos is a perennial, aromatic, much branched shrub that can become 25 cm high. The linear leaves can be 5 mm long. The flowers, that are numerous, white to mauve and about 3 mm in diameter, are 5 mm long and borne along the upper parts of the branches. The species can be seen in Namaqualand, the rest of the Karoo and in Namibia.

Selago minutissima

This aromatic shrub is much branched and up to 40 cm high with linear leaves that are up to 3 mm long and borne in small groups along the stem. The white to mauve flowers can be seen in small heads along the upper parts of the branches. The species occurs southwards from Steinkopf in sandy places and is also part of the drier parts of the Cape Province.

◆*Solanaceae*

Nicotiana glauca

The Tobacco tree is an erect shrub that can become 3 m high. The leaves are up to 10 cm long, stalked, oblong, entire and grayish-green. The flowers are yellow and are arranged in groups at the ends of the branches. The wood is poisonous for animals. The species can be seen in Namaqualand and drier parts of the Cape Province, especially in riverbeds.

Solanum burchellii

The Lemoenbossie is a spiny, much branched shrub up to 75 cm high with branches that can have up to 1 cm long spines. The leaves are yellow-green, hairy and shallowly lobed. The purple flowers are of around 1.4 cm in diameter. The orange berries of the plant seem to cure toothache. The species can be found in Namaqualand Klipkoppe and in the northern Cape Province and Namibia.

Solanum giftbergense

The Giftappeltjie is small, much-branched, up to 40 cm high and with many spines up to 1 cm long along the stem. The leaves are up to 5 cm long, covered with hair and lobed. The flowers are purple and 2 cm in diameter. This species can be found throughout Namaqualand in rocky places and also in Namibia.

Lycium cinereum

The Kriedoring is a much-branched, spiny shrub that can become 1 m high and has thin spines along the young branches and thick spines along the stem and the older branches. The leaves are hairless and slightly succulent, and appear in clusters on the stems or thorns and have a length of 7-17 mm and are 1-2 mm wide. The flowers can be white or light purple and less than 1- mm long. This unpalatable plant occurs in Namaqualand in flat, sandy places or rocky hills and also in the Little Karoo, and the Orange Free State.

Lycium ferocissimum

The Kriedoring or Karriedoring is a spreading shrub that can become 1-1.5 m high and has thorns at right angles to the stem that are about 3-5 cm long. The leaves are hairless and slightly succulent and can be seen in clusters of 3-5 along the stem and on the thorns. The leaves can be 12-24 mm long and 4-7 mm wide. The flowers are purple and 10-14 mm long and 7-10 mm in diameter. The unpalatable species can be found throughout Namaqualand in sandy places and southwards to the Cape Peninsula, in the Transkei, the Orange Free State and in Lesotho.

◆*Scrophulariaceae*

Aptosimum spinescens

The Doringviooltjie is a spiny shrub that can become 30 cm high and has spines on the stem that can be up to 1.7 m long. The leaves are up to 2.5 cm long, narrow, linear and entire. The flowers are purple, dark blue or white and have a diameter of about 1.5 cm. this palatable plant can be found in sandy, flat places in Namaqualand, the northern Cape Province, Bushmanland and Namibia.

Aptosimum indivisum

This small shrub can be 7 cm high and has numerous leaves that are narrowly elliptic and have stalks as long as the blades. The flowers are purple to blue and about 2,5 cm long. The palatable species can be seen in Namaqualand from Bitterfontein to Okiep in sandy places and in the Cape Province.

Peliostomum virgatum

This shrub is perennial, dwarf, branches at the base and can be up to 20 cm high. The leaves are ovate to elliptic, entire and up to 12 mm long, the flowers are borne along the branches, up to 2 cm long and purple or dark blue. The palatable plant occurs in Namaqualand from Okiep southwards and in the northern Cape Province.

Diascia namaquensis

The Bokhorinkies is an annual herb that can be up to 40 cm high and has branches from the base. The leaves are up to 5 cm long and 1.2 cm broad, and toothed to shallowly lobed. The flowers are single on long stalks, salmon to purple red and about 2 cm in diameter. The species can be found in Namaqualand in sandy places and in the Calvinia area.

Diascia rudolphii

This erect, annual herb can be up to 15 cm high and has basal leaves that are 2-6 cm long and 1-1,5 cm wide. The flowers are light orange with a yellow center and are about 1-2 cm in diameter. The species occurs throughout Namaqualand in sandy places.

Colpias mollis

The Klipblom is a small shrublet with many branches that can be up to 10 cm high with hairy branches. The leaves are also hairy and 2-4 cm long. The flowers are sulphur-yellow. It occurs in crevices of granite rocks in Namaqualand, in the Calvinia area and Namibia.

Nemesia bicornis

The Kappieblommetjie is an annual herb that sometimes has branches from the base and can be between 17 and 60 cm high. The leaves are narrow and toothed. The flowers are white to blue with yellow protuberances. The species occurs in Namaqualand and southwards to the Cape Peninsula.

Nemesia ligulata

This annual herb sometimes branches from the base if the plant is strong enough and can be 12-30 cm high. The leaves are toothed and lanceolate. The flowers are blue, white or yellow with orange protuberances. It can be found in Namaqualand and southern.

Nemesia azurea

This annual herb can be 10-30 cm high and often branches from the base. The leaves are toothed to entire. The corolla is deep blue and has two yellow protuberances. The species occurs in Namaqualand in sandy places.

Nemesia vesicolor

The annual herb sometimes branches from the base and can be 12-40 cm high. The leaves are narrow and toothed to entire. The corolla is blue to white and has

two orange protuberances. It can be found in Namaqualand and south to the Cape Peninsula.

Sutera pedunculosa

This branched herb can be annual or sometimes perennial and is up to 50 cm high. The leaves are ovate to oblong, have toothed margins, are hairy and are 1-3 cm long and 5-10 mm wide. The flowers are yellow and are 5-15 mm in diameter. The plant occurs in rocky hills in Namaqualand.

Sutera tristis

The Aandblom is an annual, erect, sticky herb that can be 8-40 cm high. The leaves are up to 6 cm long and oblong to elliptic. The flower is 1-1.4 cm in diameter and gives a strong scent at dusk. The species occurs in Namaqualand in flat, sandy places and can also be found in the western Cape Province and Namibia.

Zaluzianskya benthaminia

This annual herb branches from the base and can be up to 25 cm high with linear, entire leaves of 2 cm length. The flowers are pale yellow and borne in long spikes. It occurs in Namaqualand in sandy places and in Namibia.

Zaluzianskya villosa

The Drumsticks is an annual herb that can be 4-20 cm high and that branches from the base. The lower leaves are up to 3.5 cm long and entire. The flowers are mauve with a yellow eye and can be found at the ends of the branches. The plant occurs in Namaqualand in flat sandy places, down to the coast and south of the Cape Peninsula.

◆*Lamiaceae*

Salvia denta

The Bergsalie is a shrub of up to 1 m height with many branches. The leaves are aromatic, opposite, with hair and usually a toothed margin and up to 3 cm long. The flowers are blue, up to 2.5 cm long and can be found in groups along the ends of the branches. This unpalatable species can be found in the hills of Namaqualand.

Ballota africana

The Kattekruie is a perennial herb that has 4-angled hairy stems and can be up to 1 m high. The leaves are hairy, up to 3 cm long and opposite. The flowers are white, light blue or light purple and are borne in clusters along the stem. The plant can be found throughout Namaqualand and in the drier parts of the Cape Province.

◆*Borangiaceae*

Anchusa capensis

The Koringblom is a perennial herb that can be up to 75 cm high and has hairy, elliptic leaves. The flowers are purple to blue and 1 cm in diameter. The species occurs in Namaqualand from the Kamiesberg to Springbok.

◆*Asclepiadaceae*

The stapelia family has about 200 genera and about 2000 species. It contains perennial herbaceous species, succulents, small tropical and sub-tropical shrubs. The flowers are bisexual and are highly complicated in structure. Pollination is done by beetles, flies and bluebottles. The insects are attracted by the odor of a liquid from the lobes. The flowers of the *Stapelia* species resemble meat. The family includes many succulent species.

Microtoma sagittatum

The Bokhoring is a slender perennial herb with narrow, arrow-shaped leaves that are opposite and up to 2.5 cm long with hairs. The pink flowers are about 7 mm long and in loose clusters. The very unpalatable plant can be found throughout Namaqualand and south to the Cape Peninsula.

Asclepias fruticosa

The Tonteldoosbos is a shrub with slender, erect branches, that can be up to 2 m high and contains a milky sap. The leaves are yellow-green and narrowly lanceolate. The flowers are cream to yellow and are borne in clusters. It can be seen in flat sandy places, in dry riverbeds and along roads in Namaqualand, throughout South Africa and Namibia.

Asclepias cancellata

The Dermhout is a branched shrub that can be up to 1 m high with leathery, entire up to 5 cm long and 3.3 cm broad leaves. The flower heads consist of 12-30 flowers that are 5-7 mm long, white and often purple on the underside. The root can be used as medicine for stomach ailments. The plant can be found in Namaqualand in stony places and is also common in the Cape Peninsula.

Sarcostemma viminale

The Spantou-melkbos is a shrub with succulent, blue-green leafless stems that contain a milky sap. The flowers are yellow and up to 1.5 cm in diameter. They are borne in clusters. It can be found in Namaqualand in the Richtersveld and Namaqualand Klipkoppe, in the eastern Cape Province, Natal and the Transvaal.

◆*Hydrophyllaceae*

Codon royenii

The Soetdoringbos is an erect herb covered with straight white spines and can be up to 1.3 m high. The leaves also have long white spines and are broad. The flowers are up to 2.5 cm long, white and have sweet nectar. The species can be seen in Namaqualand and Namibia in sandy places.

◆*Eberaceae*

Diospyros ramulosa

This shrub is erect, much branched, has dark gray stems and can be up to 1.8 m high. The leaves are entire, elliptic, small, with silky hairs and crowded at the ends of the branches. The flowers are green-white to cream and of 1-2 cm in diameter. This plant is very palatable and can be found throughout the Namaqualand Klipkoppe.

◆*Plumbaginaceae*

Dyerophytum africanum

This shrub can be up to 50 cm high and has spoon-shaped leaves that are entire, about 3 cm long and 2 cm broad. The flowers are borne dense at the ends of the branches. The palatable plant can be found in Namaqualand, Bushmanland and Namibia.

◆*Malvaceae*

Anisodonteia triloba

The Wilde-stokroos is a slender shrub of about 1-2.5 m height with yellow, hairy stems. The leaves are also hairy, crisped, ovate, 1.5-4 cm long, broad and yellow-hairy underneath. The flowers are pink and about 1-2 cm long. It occurs in the hills of Namaqualand and the rest of the Karoo.

Radyera urens

The Sandpampoentjie is a perennial herb that is densely covered with star-like hairs. The leaves are of kidney-shape and up to 12 mm broad. The flowers are about 4 cm long and orange to brownish. The roots can be cooked and used as remedy for piles. The plant can be found near Springbok to Bushmanland and in the drier interior of the Cape Province.

◆*Sterculariaceae*

Hermannia trifurca

The Koerasie is a branched shrub that can be around 50 cm high and has linear to oblong leaves with three points at the end that can be up to 1.5 cm long. The flowers are pink to purple and the plant is palatable. It can be found throughout Namaqualand and southwards.

Hermannia disermifolia

The Jeukbos is a branched shrub that can become 1 m high. The leaves are yellow-green, long-stalked, up to 3 cm long and covered with hairs. The flowers are yellow and are borne in clusters at the ends of the branches. The unpalatable

species occurs in rocky places in Namaqualand and the eastern Namaqualand Klipkoppe.

Hermannia cuneifolia

The Broodbos is a branched shrub that can be up to 50 cm high with leaves that are covered in hairs and have a length of 3-20 mm. the flowers are yellow. The very unpalatable plant can be seen in Namaqualand, the Cape Province and Lesotho.

◆**Melanthaceae**

Melianthus pectinatus

This branched shrub can become 1.5 m high and has leaves that are up to 19 cm long. The flowers are scarlet, are 1.5-2 cm long and are borne in spikes at the ends of the branches. The species can be found on rocky slopes in Namaqualand.

◆**Euphorbiaceae**

The rubber or noors family, consists of annuals, biennales, perennials, small shrubs, herbs, trees, and shrubs. There are about 300 genera and 5000 species that can be found mainly in the tropics. The flowers are solitary. In the following three genera of South Africa succulents appear: *Euphorbia*, *Monodenium* and *Synadenium*. Several species of the family are used medicinally, but others are poisonous, for example the contact of the juice of *E. ingens* with the eye can cause blindness.

Euphorbia decussata

The Soetmelkbos is a shrub with blue-green branched stems ending in spikes that can become up to 60 cm high. The leaves are small, opposite and drop off early. The flower heads are yellow and about 1 mm in diameter. The plant produces a milky sap when injured. The palatable plant can be found in the hills of Namaqualand and in Namibia.

◆**Anacardiaceae**

Rhus burchelli

The Taaibos is a much branched shrub that can be up to 2 m high and has stalked leaves. the flowers are insignificant. The palatable species can be seen in Namaqualand on rocky slopes and in Bushmanland and Namibia.

◆**Polygalaceae**

Nylandtia spinosa

The Skilpadbessie is a erect shrub with many branches and can be 1 m high. The flowers are pale mauve and about 5 mm long. The plant is palatable and the fruits are edible. It occurs in Namaqualand Klipkoppe and in the Cape Province.

◆Zygophyllaceae

Zygophyllum meyeri

The Skilpadbos is a branched shrub that can become 1 m high with stems that are square in cross-section. The leaves are up to 1.1 cm long and are divided in two fleshy leaflets. The flowers are yellow to white. The unpalatable plant can be found in rocky hills in Namaqualand and in the southwestern Cape Province.

Zygophyllum morgsana

The branched shrub can be up to 1.5 m high and has leaves that are 1.2-2.5 cm long and are divided in two succulent leaflets. The flowers are yellow and borne in pairs at the ends of the branches. The unpalatable plant can be found throughout Namaqualand in sandy places as well as on rocky slopes.

Zygophyllum divaricatum

The Dwergskilpadbos is a much branched perennial shrub that can be up to 70 cm high. The leaves are slightly succulent, hairy and paired. They are 5-10 mm long and 3-5 mm wide. The flowers are pale yellow with brown-purple markings and are about 1 cm long. The palatable species can be seen in the hills of Namaqualand.

Augea capensis

The Boesmandruiwe is an erect dwarf shrub with a yellow succulent stem that can be up to 50 cm high. The leaves are succulent, yellow-green and 3-4 cm long. The flowers are whitish-green and solitary. The species occurs in Namaqualand usually on disturbed soil and in Bushmanland and Namibia.

Trilobus zehery

The Duwveltjie is a prostrate, annual herb that can be up to 125 cm high and has leaves of 3 cm length that are opposite and divided in 7-13 leaflets. The flowers are yellow or white. The plant can be found in Namaqualand in flat, sandy places and also in the rest of South Africa.

◆Oxalidaceae

Oxalis obtusa

This very variable species is a perennial herb that can become 25 cm high either with a corm and stemless or with a hairy stem. The leaves are borne in 2-10 leafstalks. The leaflets are 0.5-3 cm long, without hair and intended at the top. The flowers are 1.5-3 cm long and are pink, white or orange-pink. The species can be seen throughout Namaqualand and other winter rainfall areas.

Oxalis pes-caprae

The Langbeensuring is a perennial herb that can be up to 40 cm high with a corm. The leaves are numerous, up to 12 cm long, divided in three leaflets each and form a rosette. The flowers grow in heads of 3-20 flowers. The plant is palatable

and the leaves are sometimes used for cooking. It can be found in Namaqualand in sand between rocks and in the southwestern Cape Province and in Namibia.

Oxalis comosa

The Bobbejaansuring is a perennial branched herb that can be 20-40 cm high with a corm. The leaves are crowded at the ends of the branches, 2-8 cm long and divided in three leaflets each. The flowers are borne singly and are pale rose. The plant is palatable in winter and can be found in rocky places from Okiep to Kamieskroon.

◆**Geraniaceae**

The *Pelargonium* family consists of 11 genera with 800 species worldwide in temperate and sub-tropical regions. In South Africa and Namibia 5 genera can be found which contain much aromatic species. Some species are also used in the medical sector. For example, an extract from *Geranium incanum* is used against venereal diseases. Many *Pelargonium* species are used as remedies against diarrhoe and dysentery. In the family occur herbs, both perennial and annual, and few trees.

Erodium cicutarium

The Horlosie-bossie is a weed that has been introduced from Europe. It is annual or biennial. The leaves are deeply lobed and up to 9 cm long. The flowers are pink and are 4-7 mm long and appear in groups of 3-8. Children often use the colour of the flowers for drawing. The plant can be seen in Namaqualand and the rest of the Cape Province.

Sarcocaulon crassicaule

The Bowsmankers is a succulent shrub that can be up to 40 cm high with spines. The leaves are ovate to obovate and covered with hairs. The flowers are pale yellow and of 3 cm in diameter. The species occurs in Namaqualand in rocky places and also in Namibia.

Sarcocaulon solmoniflorum

The succulent, erect to spreading shrub can be up to 40 cm high and has spines. The leaves are hairless, elliptic and entire. The flowers are about 1.2 cm in diameter and orange to salmon. The plant can be found in Namaqualand on plains but not in the coastal belt.

Pelargonium crithmifolium

The succulent branched shrub can be about 50 cm high and has knobby yellow-green stems. The leaves are fleshy, deeply lobed and up to 12 cm long. The flowers are white with red marks at the base and are about 2 cm in diameter.

Pelargonium incrassatum

The perennial herb can be up to 30 cm high with a tuber and has leaves that are lobed with silvery hairs and up to 14 cm long. The flower head has 20-40 flowers

that are pink to purple. The tuber is regarded a delicacy by the locals. The plant can be found in stony places in Namaqualand.

Pelargonium triste

The Rasmusbas is a perennial herb with a tuber that can be up to 50 cm high. The leaves are basal, up to 45 cm long and divided in numerous hairy segments. The flower heads consist of 6-20 yellow-green to purple-brown flowers that are about 1.7 cm in diameter. The palatable plant can be seen in Namaqualand and the southern Cape Province often on abandoned agricultural fields.

Pelargonium scabrum

The Hoenderbos is a erect, woody shrub that can reach 2 m height. The leaves are around 4 cm long and shallowly divided into toothed lobes. The flower heads have 2-6 mauve or white flowers. The palatable species occurs in sandy soils in Namaqualand from Springbok southwards.

Pelargonium praemosum

The shrub can be up to 1 m high and has shiny brown branches. The leaves are kidney-shaped and up to 2 cm long. The flowers are 4 cm in diameter and single or in pairs. The palatable plant can be found in Namaqualand in the shelter of rocks.

◆*Fumariaceae*

Cysticapnos vesicarius

The Klapklappie is a soft annual herb that can be up to 1 m long. The leaves are entire, blue-green, up to 8 cm long and with lobed segments. The flowers are pink with darker ends and up to 8 mm long. It occurs throughout Namaqualand and the Cape Province.

◆*Amaranthaceae*

Hermbsstaedtia glauca

The Bokhout is an erect shrub of around 70 cm height with blue-green stems. The leaves are of the same colour, up to 25 mm long and 2 mm wide. The flowers are mauve to cream and are borne in a flower head of 2.5 cm in diameter. The plant can be seen in Namaqualand and Bushmanland.

◆*Chenopodiaceae*

Atriplex lindleyi ssp inflata

The Blasiebrak is a shrub with whitish stems and up to 30 cm height. The leaves are elliptic, grayish and around 3 cm long. The flowers are in clusters and insignificant. The species has been introduced from Australia and is unpalatable. It can be found in disturbed places in Namaqualand and South Africa in general.

Manochlamys albicans

The Spanspekbos is a loosely branched shrub that can be up to 50 cm high with pale stems. The leaves are gray, up to 4 cm long and 3.2 cm broad. The flowers are clustered at the ends of the branches. The plant can be found in Namaqualand and in Namibia.

Salsola kali

The Tumbleweed is a rigid, annual herb that can be up to 50 cm high and has fluted stems. The leaves are entire, triangular and up to 1.2 cm long. The perianth is hard and brown. The species has been introduced from Asia and can be found throughout Namaqualand in sandy places and in the Cape Province.

◆**Polygonaceae**

Rumex cordatus

The Tongblaar is a perennial herb that can be up to 50 cm high and has a underground tuber. The leaves are hairless, almost entire and up to 3 cm long. The flowers are borne in a branched spike. The plant can be found in sandy patches in the hills of Namaqualand and throughout southern Africa.

◆**Santhalaceae**

Thesium lineatum

The blue-green, woody perennial shrub can be around 80 cm high with grooved stems. The leaves are few, linear, flattened and fleshy. The white solitary flowers have exerted anthers. The species occurs in the hills of Namaqualand, other parts of the Karoo and Namibia.

◆**Visceraceae**

Viscum capense

This parasite is green to blue-green and grows in rounded clumps on trees or shrubs. The stems are rounded and have scale-like leaf rudiments. The flowers are solitary and cream to green-cream. It can be found in Namaqualand, Namibia and southwards to the Cape Peninsula.

◆**Tecophiliaceae**

Cyanella hyacinthoides

The Raap is a perennial herb with a corm that can be up to 30 cm high. The leaves are basal and numerous, up to 20 cm long and variable in appearance. The flowers are about 2 cm in diameter, bluish-mauve and borne loosely in a spike. The species occurs in Namaqualand in rocky places.

◆**Crassulaceae**

The plakkie family has species with a general succulent appearance, with fleshy stems and leaves. Worldwide, there are 16 genera and 400 species known, but most of the plants occur in the southern Africa. The family consists of herbs and sub-shrubs with fleshy nature. The flowers are bisexual. Those succulent genera are present:

Adromischus, *Crassula*, *Cotyledon*, *Kalanchoe* and *Rochea*.

References:

- Anneliese leRoux & Ted Schelpe, Namaqualand South African Wildflower Guide 1 revised edition
- Gideon Smith, first field guide to aloes of southern Afrika
- Richard Cowling & Shirley Pierce, Namaqualand, a succulent desert
- Norman Myers et al. (2000), Biodiversity hotspots for conservation priorities.
- B P Barkhuizen, Succulents of South Africa
- A. T. Lombard et al. (1999), reserve selection in the succulent karoo, South Africa: coping with high compositional turnover