A little goes a long way – the unique southern Namib flora

Text by **Antje Burke**
All photos by **Antje Burke** ©, except photo 10, by **John Burke**

Photo 1: The "window plant" (*Fenestraria rhopalophylla*) is a perfect example for coping with limited water and hiding from strong and sand-blasting winds.

Having experienced several cycles of often dramatic climatic fluctuations from hyper-arid to warm subtropical and to relatively benign winter rainfall conditions, responses to these conditions have been stored in the evolutionary memory of the southern Namib flora and still expressed in its flora to this day.

Today the vegetation in the Sperrgebiet, between Oranjemund and Lüderitz and a 100 km semi-circle to the north and east is part of the southern Africa's Succulent Karoo Biome and recognised as one of the world's top biodiversity hotspots (Myers et al. 2000). The varied long-term climatic history, the fact that the area is today positioned at the interface of two major bioclimatic regions in Africa and a tremendous variety of topographic diversity have made it one of Namibia's most diverse floras. Nearly a quarter of the country's entire plant diversity is literally locked up in the restricted diamond area, known as the Sperrgebiet (Burke & Mannheimer 2004).

Nevertheless the study area is arid with an annual mean rainfall ranging between 20-70 mm, which makes this remarkable diversity even more astounding. But rains are not the only sources of moisture to sustain life here. Fog and dew play an almost equally important role and even more so, as they occur throughout the year, while rains are more restricted to a particular season.

Superficially the vegetation on the vast open plains appears fairly homogenous with expanses of succulent shrubs at no more than

0.5m height dominant. But structural diversity here happens at a micro-scale. For example many minute plants grow amongst the shrubs, easy to overlook and thus often discounted. Most of these are adapted to special microhabitat conditions and many are endemic to this part of the world. Growing low and largely below-ground is likely an adaptation to coping with limited water as well as the onslaught of almost permanent strong winds (Burke 2004a). The "window plant" (*Fenestraria rhopalophylla*) is a dwarf succulent shrub, endemic to the southern Namib's coastal area and hides the majority of its body below-ground. Most of the year only the tip of the stem, with a translucent "window" to let light into the interior of the plant for photosynthesis, can be seen. But brilliant white or yellow flowers on long stalks emerge after rains, attracting pollinators and so ensure that pollen is carried about, thus flowers fertilized and are seeds produced (Photo 1). Other dwarf succulents grow very small, but above-ground, like the minute *Euphorbia verruculosa* (Photo 2). Also hiding below-ground for most of the year, but following a very different life strategy are bulbs. These occur in great diversity here and also include many restricted to this area, for example several striking *Bulbine* and less conspicuous *Eriospermum* species. However, in contrast to the dwarf succulent shrubs, bulbs are only active for a short period every year, usually after major rains and spend the rest of the year in hibernation underground (Photo 3).

Diversity in landforms and underlying rock types is another factor contributing to the astounding plant diversity in this desert. Well over 1000 million year old metasedimentary rocks (granitic gneisses and metabasic rocks) to recent unconsolidated Tertiary to Quartenary deposits (sediments and calcrete) present a varied palette of substrate, sometimes deposited in well sorted layers on level surfaces (for example the shallow marine succession of sediments of the Nama Group), sometimes thrust upwards by the inner earth's forces as a result of tectonic movements and volcanic activity, for example the Klinghardt Mountains. From a plant's point of view these varied rock types and their erosion products provide a variety of soil types differing in terms of chemical and physical properties, and a more varied topographic relief related to inselberg's and mountains. Then the forces of water and wind acted on these landforms and the combined result is a chessboard-like mosaic of sand, gravel, gypsum and calcrete plains, semi-mobile dunes, pans, inselbergs, outcrops and mountain ranges, dissected by a network of dry rivers and shallow washes. What a variety of microhabitats to choose from!

Photo 2: This minute member of the spurge family (*Euphorbia verruculosa*) stays small its entire life to escape the onslaught of strong winds and desiccating heat.

Photo 3: Only active for a short time of the year, the attractive lily *Bulbine namaensis* is restricted to the sand plains of the southern Namib.

The inselbergs and mountains deserve particular attention as the domicile of many plant species restricted to these mountain habitats (Photo 4). These include dwarf succulents hiding in more sheltered microhabitats such as *Crassula aurusbergensis* (Photo 5) and many enigmatic *Conophytum* species (Photo 6). Completely escaping observation are often many of the dry-adapted (poikilohydric) ferns occurring in the mountain habitats (Photo 7). Masters of utilising minimum moisture, they posses rapidly hydrating cells that enable them unfold their fonds within hours of receiving a reasonable rain shower and start photosynthesising, while other plants take several days to produce photosynthesising leaves.

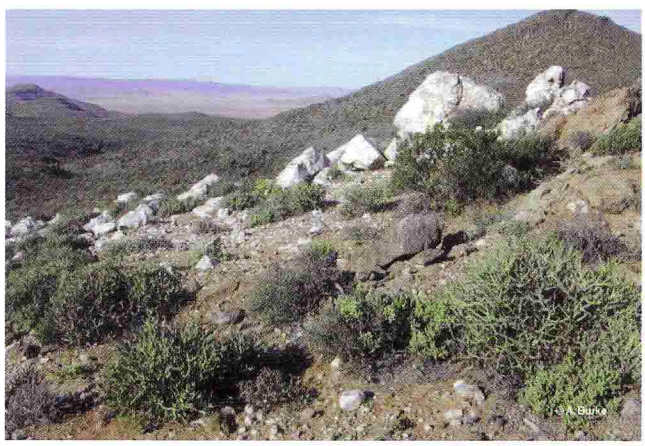

Photo 4: The slopes of the Aurus Mountains in the Sperrgebiet show extremely high plant diversity, hardly surpassed anywhere else in the country.

But not only the mountains, the rocky coastal strip also supports many species restricted to this area. When in flower the coastal pelargonium (*Pelargonium cortusifolium*) (Photo 8) and the rare succulent *Namibia cinerea* (Photo 9) are attractive sights. A remarkable discovery was made not too long ago when a new plant species was described that had been known to occur, but was never found in flower to that date (van Wyk et al. 2010). The weird shrub *Polemanniopsis namibensis* (photo 10) had eluded all observers for decades by being active, that is producing leaves and photosynthesising, as most other plants in this area in winter, but by flowering in the height of the dry season in this area in March. This plant may be a relic of a former climatic regime, when rains occurred also in later summer here. Many more of such intriguing adaptations await to be discovered here with the southern Namib providing an inexhaustible natural laboratory tickling scientists' curiosity for decades to come, provided that adequate protection is granted to this unique place.

References

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Photo 5: Often hiding under rock overhangs, *Crassula aurusbergensis* occurs on some inselbergs in the southern Namib.

Photo 6: Treasured by plant collectors, the rare dwarf succulent *Conophytum ernianum* grows on inselbergs in the southern Namib.

Photo 7: The fern *Cheilanthes rawsonii* can quickly respond to rains by unrolling its fonds and photosynthesising within a few hours.

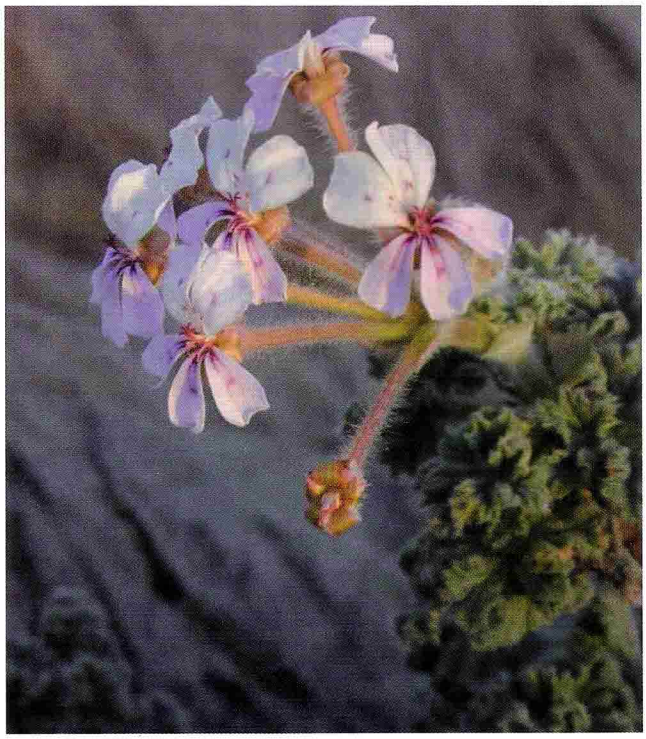

Photo 8: The southern Namib coastal endemic *Pelargonium cortusifolium* has great horticultural potential.

Photo 9: This low succulent shrub is appropriately named *Namibia cinerea*, as it is only found in Namibia, and here only in a very small area of rocky outcrops in the southern Namib.

Photo 10: The flower arrangements of the newly described *Polemanniopsis namibensis* clearly indicates its relationship to parsley plants (photo by John Burke).