bioclimatic regions are likely to become more arid in Namibia. Semi-arid parts of the country are predicted to become arid, with a temperature increase of several degrees. This means that up to about 97% of Namibia will be arid and a small portion, now sub-humid, is likely to become semi-arid. These shifts in bioclimatic regions will have dramatic implications for the natural environment and biodiversity conservation. As people with their livestock attempt to adapt to these changes, we can expect environmental change in Namibia to accelerate, especially in intensively used habitats such as wetlands.

In summary, environmental change in Namibia is an ongoing process driven by many factors, both natural and human-induced. All habitats in Namibia are affected by this ongoing change to different degrees.

— Mary Seely

2.3 Areas of high species endemism

Africa’s arid southwest, roughly centred on Namibia, is a major zone of evolution for groups such as melons (Cucurbitaceae), some families of succulent plants, fishmoths (Lepismatidae), solifuges or sun-spiders (Solifugae), geckos and tortoises. Namibia is obliged by its Constitution and the Convention on Biological Diversity to protect its endemic species, which are unique and occur nowhere else. This section summarises the major areas of Namibia which are rich in endemic species. A taxonomic overview of the numbers of endemic and other species in Namibia is given in section 2.9.

A recent analysis of endemism patterns has shown that most Namibian endemic plants, invertebrates, amphibians, reptiles, mammals and birds are found in a zone running along, and to the west of, the Namib escarpment (maps 2.2-2.7). There is also an important region of endemism for succulent plants, reptiles and invertebrates in the Succulent Karoo Biome (see map 2.1). Congruence between endemism hotspots, particularly on rocky substrates, is remarkably high, implying broadly similar speciation processes.

Areas of endemism and species richness overlap poorly for endemic vertebrates, which are mainly arid-dwelling, as richness is highest in the mesic wetlands and woodlands. However, the correlation between endemism and richness for succulent plants, insects and arachnids is relatively high.

Centres of endemism for plants and vertebrates fall mainly outside state protected areas, as few parks were established with biodiversity indices in mind. The similarity of endemism patterns in different taxa is a strong argument for developing additional protected areas, using creative non-traditional conservation approaches, to safeguard Namibia’s unique biota (section 2.6).

Broad-scale analyses of endemism contend with certain problems. First, the use of the term ‘endemism’ is not consistent in Namibia. Vertebrate zoologists tend to class a species as endemic if 75% or more (frogs, reptiles and mammals) or 90% or more (birds) of its total range occurs within Namibian political boundaries. For insects, arachnids, flowering plants and freshwater fish, a species is endemic if 100% of its range falls within Namibia. Except for fish, most endemics in these groups are found in the Namib Desert or escarpment. This ancient desert stretches marginally into southwest Angola and northwest South Africa, so political boundaries dissect ecological ones, and Namib Desert endemics are not necessarily restricted to Namibia. Also, political instability in Angola means that the Namibian near-endemics occurring there may be essentially unprotected. For now, Namibia must assume greater responsibility for their conservation.

Fig. 2.22 Endemic Namibia pomonae, the Sperrgebiet.
Courtesy G Williamson
Maps 2.2 - 2.7 Patterns of endemism in Namibian plants and terrestrial vertebrates in relation to protected areas.

Maps show the species richness distribution of endemics for: (2.2) plants; (2.3) frogs; (2.4) reptiles; (2.5) mammals; (2.6) birds and (2.7) vertebrate taxa combined. The plant map is a preliminary analysis and is thus shown at the half degree-square level to minimise sampling bias.49
Second, data accuracy and coverage vary greatly between taxa. Only about 24% of all Namibian spiders, and about 18% of an estimated 35,000 insect species, are described (section 2.9). By contrast, the Southern African Bird Atlas comprehensively summarises distributions of all southern African birds, allowing fine-scale analysis of Namibian bird distributions. Data quality for other taxa falls between these two extremes. Endemism patterns in maps 2.2-2.7 are based on species richness data.

The number of endemics known in Namibia (overview, section 2.9) is certainly an underestimate, since many undescribed taxa, especially invertebrates, are likely to occur in small, isolated, endemic populations. Further sampling on inselbergs in particular is almost certain to reveal more endemic invertebrates and plants. Sampling of birds, mammals, and frogs has probably been sufficient to reveal most endemics. Unevenly sampled taxa, or those such as reptiles with 'cryptic' species (which can be distinguished only by genetic analysis) may reveal additional endemics with further study. Even in birds, recent genetic work on the larks (Alaudidae) has promoted a subspecies of the dune lark Certhilauda erythroclamys to a new species, C. barlowsi. Much of the country’s terrain is rugged, arid and remote, so more endemics will certainly come to light in the future.

— Rob Simmons

2.4 Sites and species of ecological, economic or archaeological importance

Our knowledge of the biogeography and ecology of Namibia’s biota remains patchy, and so only a minimum assessment of the country’s outstanding sites and species of special importance is feasible at this time. The following are sites and species (or categories thereof) identified by the Biodiversity Task Force and other specialists. All merit urgent individual consideration for some form of conservation protection where this does not yet exist or is not yet secure. This assessment needs to be updated regularly as our knowledge base improves.

![Upland succulent Karoo, Aurasberg, Spergebiet. Courtesy J Irish](image)

Sites of special ecological importance

Namibia has numerous localised sites and larger areas which need protection. Among the most important categories of larger areas are the areas of high species endemism outlined above (section 2.3, maps 2.2-2.7), and underprotected habitats (section 2.6). Due to their treatment elsewhere, these categories are not discussed here in detail, although individual sites needing particular protection are mentioned.

The major categories of Namibian sites of special ecological importance are (Table 2.2):

- caves and sinkholes;
- inland wetlands (perennial and ephemeral);
- the coastal zone;
- mountains and inselbergs;
- the Namib sand sea and adjacent gravel plains;
- the winter-rainfall desert zone.

Of these, the wetlands category is particularly threatened and ecologically important due to Namibia’s aridity, the increasing pressure on water resources, and the ecological isolation and distinctiveness of many wetlands. Terrestrial ecological importance, especially in terms of endemism, is perhaps highest in Namibia’s mountains and inselbergs, along with the winter-rainfall desert zone of the Succulent Karoo Biome, the Namib gravel plains, and the Namib sand ‘sea.’ In all of these categories, we have only an extremely fragmentary knowledge of the resident biota and their status. Research in these areas is a matter of national and regional priority.