





WILDLIFE

Namibia's marine and terrestrial fauna

Namibia is globally renowned for its wildlife. Iconic species such as elephant and lion are well known, but there are thousands of species that are less familiar. Each one plays a role in ecological processes that maintain the health, productivity and beauty of the environment. Even species that are considered by many people to be pests – termites, snakes, rats and wasps, for example – have valuable, yet often poorly known, ecological functions. Impacts on one species can easily disrupt the ecological balance and result in unforeseen consequences. As living organisms, all animals have inherent qualities – which we may or may not understand – for which we should ensure they can survive.

Namibia recognises the value of its wildlife, flora and landscapes and strives to protect them through its constitution, a range of environmental legislation, 21 state-protected areas, 86 communal conservancies and several transboundary initiatives (page 256). Furthermore, many areas in Namibia are internationally recognised as special in one way or another, often because of the wildlife or ecosystems they support; these designated areas include four Ramsar sites, two world heritage sites, nineteen important bird areas (IBAs), four endemic bird areas (EBAs) and seven ecologically or biologically significant marine areas (EBSAs).

The marine environment is driven by the cold Benguela Current, and localised upwellings which bring nutrient-rich water from the depths to the surface (page 76). These nutrients support productive webs of life which form the basis of Namibia's substantial and lucrative fishing industry.

Terrestrial wildlife contributes significantly to Namibia's economy through its contribution to the tourism, hunting and farming sectors, in addition to providing obvious direct benefits such as meat. Wildlife also provides a variety of important indirect benefits to people – known as ecosystem services – which are less easy to quantify, such as the role of vultures in consuming carrion and preventing the spread of diseases; or the cultural and spiritual values gained by experiencing beautiful natural environments.

The long reed frog (*Hyperolius nasutus*) is a common resident of the Zambezi Region but is rarely seen. It is less than 25 millimetres long.

Marine life

Ocean currents, upwelling and marine events

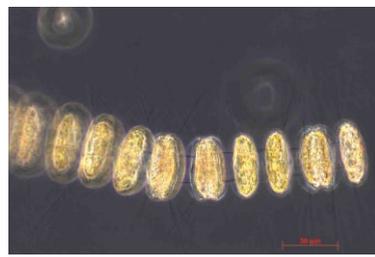
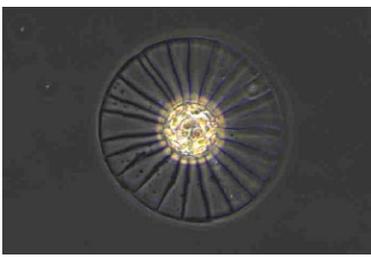
The waters of the cold Benguela Current are tremendously productive. This is a consequence of the wind-driven upwelling (page 77) that brings a continual supply of dissolved nutrients from deeper waters to the surface. Tiny organisms called phytoplankton absorb nutrients; near the surface, with exposure to sunlight and the process of photosynthesis, these organisms reproduce rapidly, supplying the ocean with an abundant primary base for marine food webs. These phytoplankton blooms cover vast areas of the ocean and are visible from space. Phytoplankton are a source of food for microscopic animals, collectively known as zooplankton. Zooplankton, in turn, provide food to all the higher trophic levels of invertebrates and vertebrates, ranging from benthic creatures, such as anemones, crabs and lobsters associated with the seabed, to shrimps, fish and sharks widely distributed in

pelagic waters and air-breathing mammals, birds and reptiles such as seals, whales, dolphins, gannets and turtles and, ultimately, to humans.

The continual massive production of phytoplankton in Benguela waters, fuelled by powerful upwelling cells along the Namibian coast, not only supports prolific food webs, but also consumes a significant amount of atmospheric carbon dioxide. A large proportion of this abundant microalgal bounty sinks uneaten to the sea floor where it forms soft organic-rich sediments with exceptionally high carbon content. Initial decomposition of this matter by bacteria uses oxygen from the water. When the oxygen is depleted, anaerobic bacteria take over, releasing hydrogen sulphide (a toxic gas) and methane, which build up in the sediments. Sporadically, large amounts of hydrogen sulphide and methane bubble up from the sediments. The hydrogen sulphide quickly reacts with all available oxygen in the water, resulting in severely oxygen-depleted (anoxic) water and microgranules of colloidal sulphur, which create an opaque turquoise colour to surface waters. During these locally named 'sulphur eruptions' so much hydrogen sulphide is released that the foul rotten-egg odour can be smelled on land. The subsequent lack of oxygen in the water, even though short in duration, can cause sea life to avoid the area and fish and other marine animals in the vicinity to die. These eruptions of hydrogen sulphide are characteristic along the central coast of Namibia, where the earliest observers recorded them in the late nineteenth century.

The upside of hydrogen sulphide is that it fuels extensive mats of large sulphide-oxidising bacteria on the seabed. These include the largest bacteria in the world *Thiomargarita namibiensis* known also as 'the sulphur pearl of Namibia'.¹ Not only do these bacterial mats thrive on the sulphidic seabed, but in doing so they detoxify the habitat, and provide food for the small animals living there, which range from a variety of meiofauna (tiny invertebrates) to polychaetes, bivalves, cnidarians, crustaceans and even fish. These bottom-dwelling communities have adapted physiologically and behaviourally to deal with the stressful conditions created by occasional hydrogen sulphide eruptions and anoxia.

Hydrogen sulphide is not the only cause of lowered oxygen levels in the water. Warm-water events caused by unusually high sea temperatures, or incursions from warm currents, can also result in low oxygen levels. Towards the northern limits of the Benguela Current, intrusions of warm water from the Angola Current cause such events in cycles of approximately ten years. Such conditions can result in a reduction in biological production and the displacement of fish populations from their usual feeding and breeding grounds.



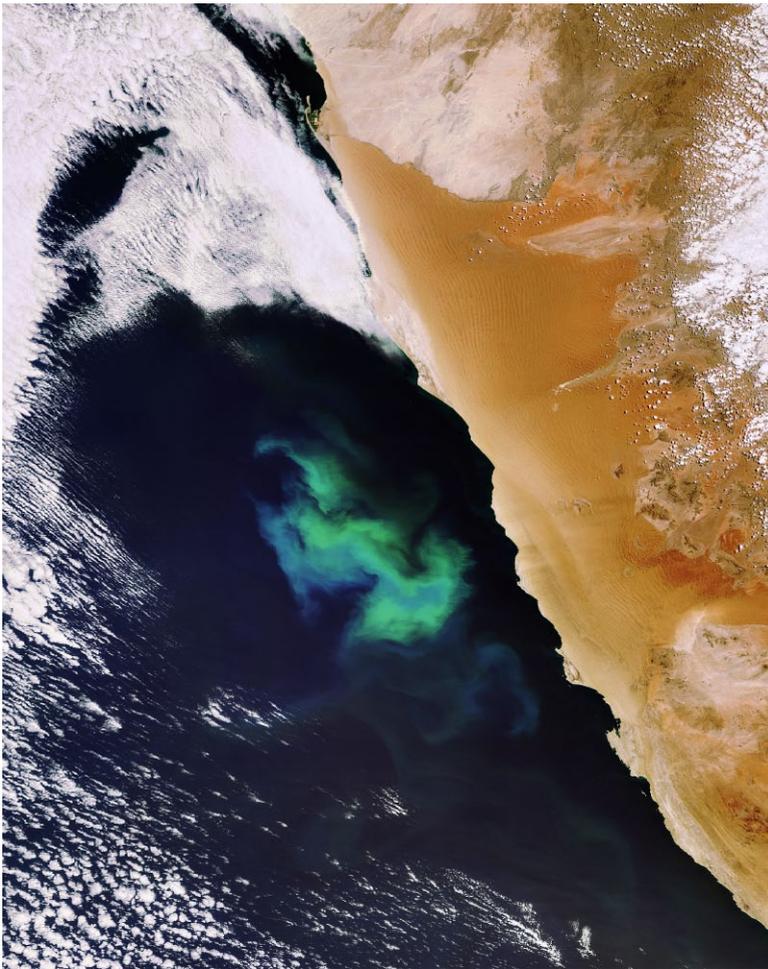
Phytoplankton



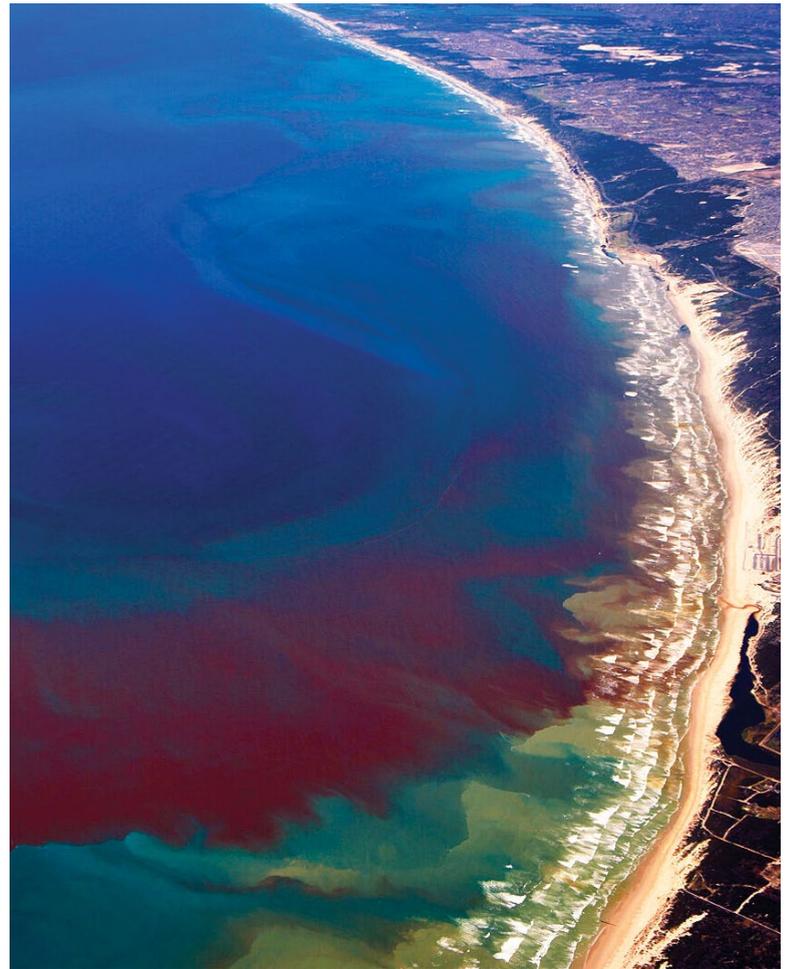
Zooplankton



Thiomargarita namibiensis, the largest known bacterium in the world, lives in low-oxygen sea-floor sediments off the coast of Namibia and oxidises hydrogen sulphide into sulphur.²



A bloom of phytoplankton north of Lüderitz photographed from space [Image centre 24.6° S, 13.8° E]



Red tide in the southern Benguela [34.1° S, 18.7° E]

Any animals living in the Namibian upwelling system are at some stage challenged by low oxygen – this contributes to the low diversity patterns we see. Some marine animals, such as west coast rock lobster, are particularly sensitive to low-oxygen conditions and when faced with such conditions move inshore in search of oxygenated water where they may become stranded in large numbers and die.

The vast quantities of planktonic nutrients introduced from upwelling can also have adverse effects. High chlorophyll content in the water can cause dinoflagellates (a type of phytoplankton that flourishes in calm seas) to proliferate, turning the nutrient bloom toxic and leading to the mass poisoning of fish, shellfish, marine mammals, seabirds and other animals which then wash up on beaches.³ The reddish pigment in some dinoflagellates causes the sea to appear red, which is why these events are known as ‘red tides’. Such an event occurred in 2011 along the southern coast.

The anoxic and sulphidic sediments of the offshore shelf of Namibia are considered one of the most inhospitable environments on Earth. Yet despite this, the shelf sustains a remarkable concentration of marine life that has evolved over millennia to cope with these difficulties, and has thrived.⁴ It is therefore not surprising that Namibia’s coastal waters have long been exploited: whaling in the eighteenth and nineteenth centuries; a worldwide ‘guano rush’ to the islands in the eighteenth century; and intense fishing by foreign companies in the twentieth century before independence.



Mass mortality of lobsters following a warm-water, low-oxygen event.



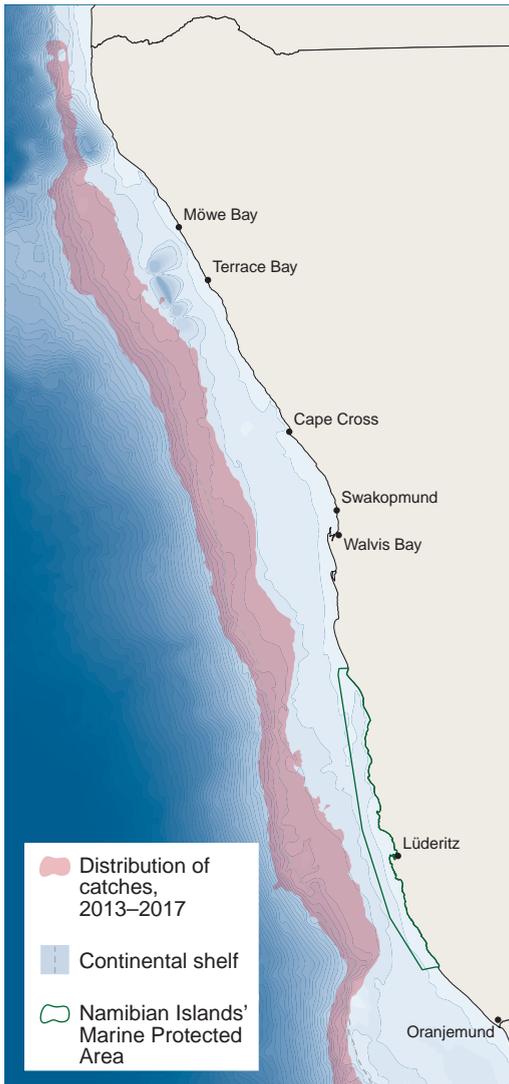
The waters of the Benguela Current support a substantial fishing industry.

Marine fisheries

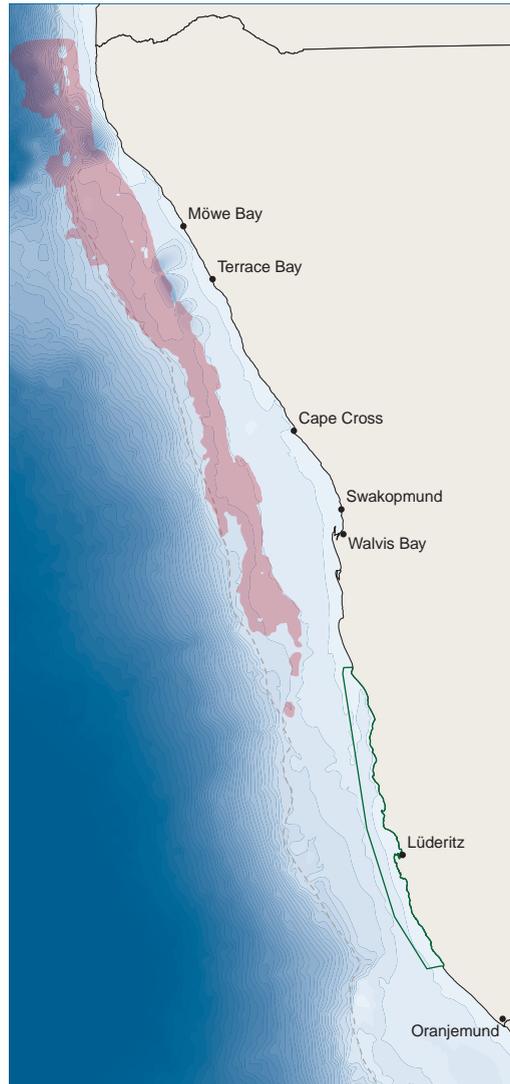
The upwellings of the Benguela Current transport nutrient-rich waters from the ocean depths to the upper layers where they support abundant fish populations and one of the world's richest fisheries. Almost 500 species of fish are known

to occur in Namibian waters of which about 410 species are bony fish and 83 species are cartilaginous fish. Eight species are fished commercially.⁵

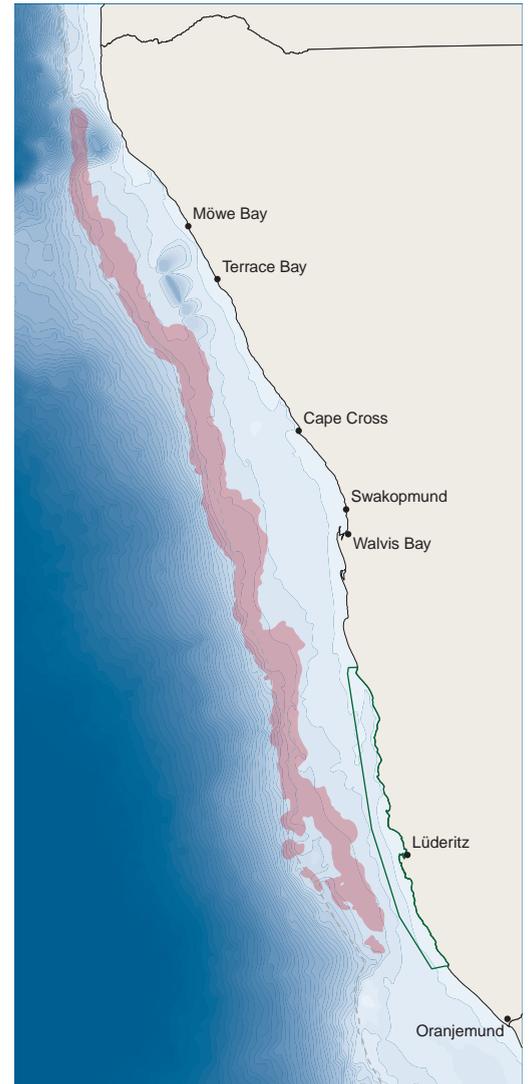
Cape hake and deepwater hake



Horse mackerel



Monkfish



7.01 Distribution of selected commercially valuable marine species⁶

Two species of hake comprise Namibia's most valuable commercial fish: Cape hake (or shallow-water hake *Merluccius capensis*) and deepwater hake (*M. paradoxus*) which are demersal, living on or near the seabed. Cape hake is usually found where the depth is 100–450 metres, while deepwater hake favours areas where the depth is 300–1,000 metres. Cape hake spawn along the central and southern coast, south of 21 degrees south from June–August and February–March. About 97 per cent of the final value of Namibian hake products is derived from exports, mainly to Spain (61 per cent) and South Africa (16 per cent).⁷

Young horse mackerel (*Trachurus trachurus*) are generally found close to shore and near the surface, while adults occur further offshore and migrate between

surface and deeper waters each day.

Two species of monkfish (*Lophius vomerinus* and *L. vaillanti*) occur in Namibian waters, mainly at depths of

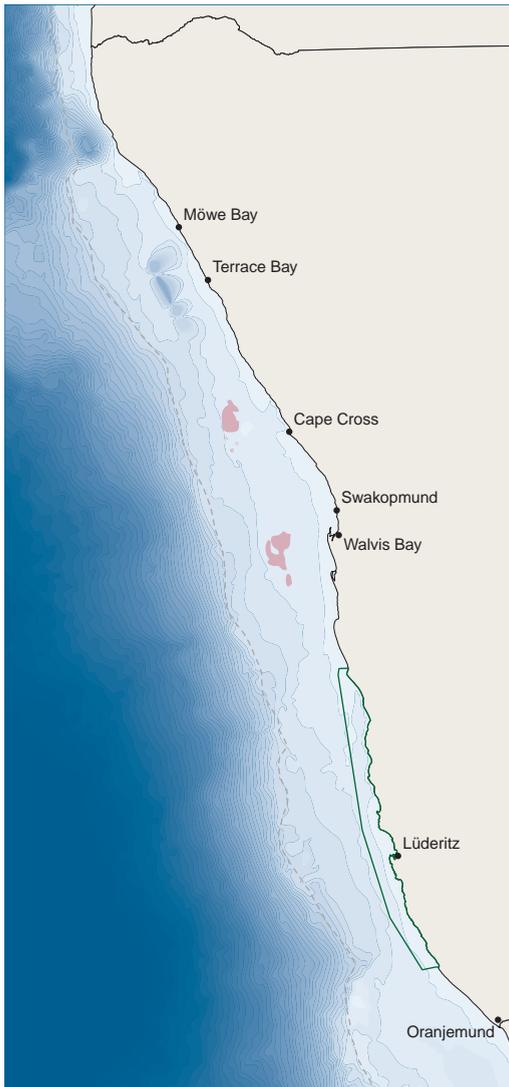


On board a Namibian trawler

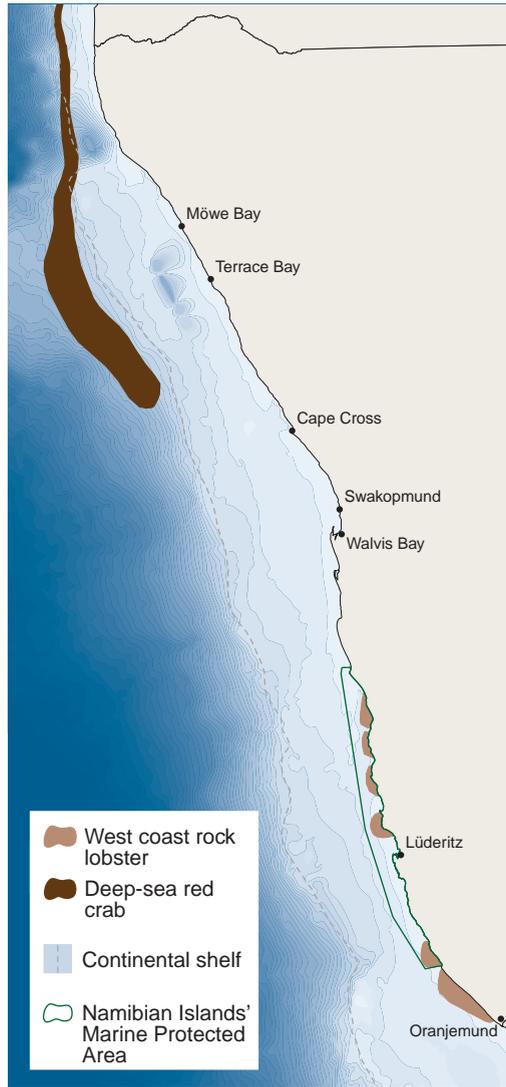


Monkfish

Pilchards and anchovies



West coast rock lobster and deep-sea red crab

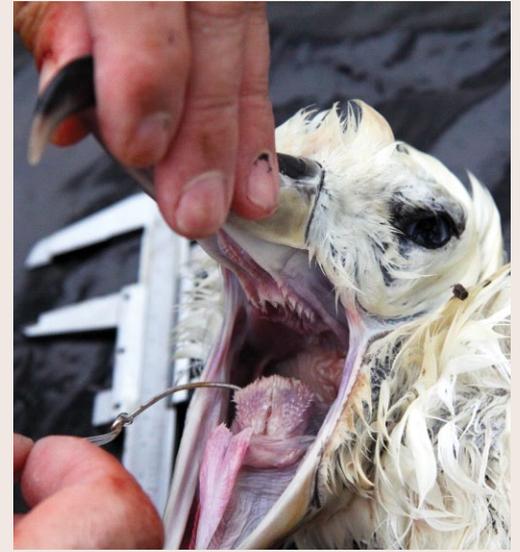


300–400 metres. They are slow growing and take about four years to reach sexual maturity. Monkfish are also known as anglerfish because they have an extension to their first dorsal spine that they move like a fishing rod to lure their prey.

Pilchards (*Sardinops ocellata*) and anchovies (*Engraulis capensis*) are typically found in shallow waters within 50 kilometres of the coast. Pilchard stocks in Namibia remain at a low level following the collapse of the pilchard fishery in the early 1980s.

West coast rock lobster (*Jasus lalandii*) and deep-sea red crab

(*Chaceon maritae*) are two commercially valuable crustacean species. West coast rock lobsters are harvested between November and April when they occur close to the shore in water shallower than 30 metres. In winter they prefer deeper waters, up to 100 metres. The rock lobsters are slow-growing, long-lived predators that feed extensively on mussels; harvests and their populations have plummeted since the 1970s. Consequently, the fishing industry has increasingly been catching deep-sea red crabs that are found far off the coast at depths of about 300–900 metres.



By-catch in industrial fishing is a significant cause of mortality of seabirds and is thought to be one of the main reasons for the decline of albatrosses. Of 22 species of albatross, fifteen species are threatened with extinction. The birds get hooked on lines dragged behind longline fishing vessels and drown (top); they also collide with cables and become entangled in the nets of trawlers. Effective mitigation methods do, however, exist. Since 2015, Namibia's hake demersal-trawl and longline fisheries have been required by law to use bird-scaring lines – colourful streamers that move and scare birds away from the back of the boat (bottom). Their use reduced the number of seabirds killed by the longline fleet from about 22,000 in 2009 to about 215 in 2018 – a reduction of more than 98 per cent. In the trawl fleet, the number of birds killed declined from about 7,000 in 2009 to about 1,500 in 2017.⁸

Marine mammals

Marine mammals in Namibia's waters include the Cape fur seal and 31 species of whales and dolphins. There are eight species of baleen whales, which feed

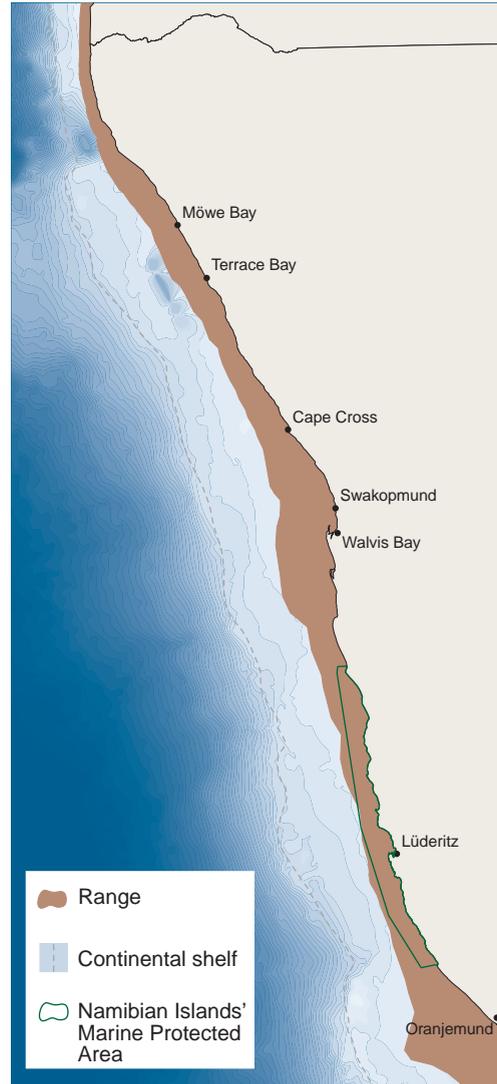
by filtering food such as copepods and krill, and 23 species of toothed whales, including sperm whales, beaked whales, killer whales and dolphins, which hunt

their prey. The Sea Fisheries Act (29 of 1992) gives Namibia's marine mammals full protection within the 200-nautical-mile exclusive economic zone (page 6).⁹

Bottlenose dolphin



Heaviside's dolphin



Dusky dolphin



7.02 Distribution of five marine mammals along Namibia's coast¹⁰

The population of common bottlenose dolphin (*Tursiops truncatus*) resident in central Namibia is small, with fewer than 100 individuals. These dolphins grow to over 3.5 metres in length. They regularly feed in association with Cape fur seals.



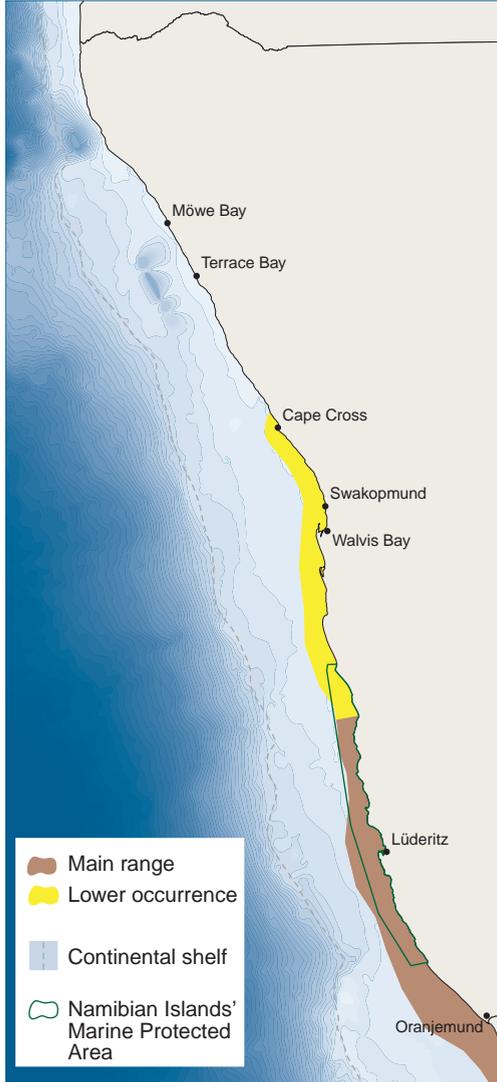
Heaviside's dolphins (*Cephalorhynchus heavisidii*) are endemic to the Benguela ecosystem, and amongst the smallest of dolphins. They tend to stay close to the shore during the day and move offshore to feed in deeper waters (up to 100 metres deep) at night.



Dusky dolphins (*Lagenorhynchus obscurus*) are found off South America, New Zealand and the west coast of southern Africa. They range widely across Namibia's continental shelf and are less easily seen from shore than the other dolphin species.



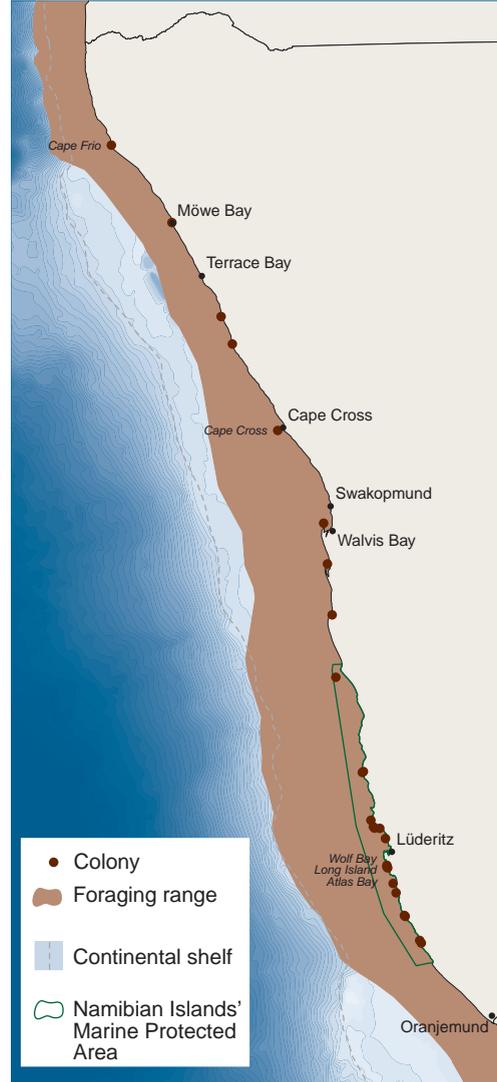
Southern right whale



Southern right whales (*Eubalaena australis*) spend the winters off the coasts of southern Africa, South America, Australia and New Zealand and summers in Antarctica. The 19th century whaling industry almost drove the population to extinction but it is gradually recovering and repopulating its previous range. A calf born in Elizabeth Bay in 1996 was the first Namibian breeding record for a century.



Cape fur seal



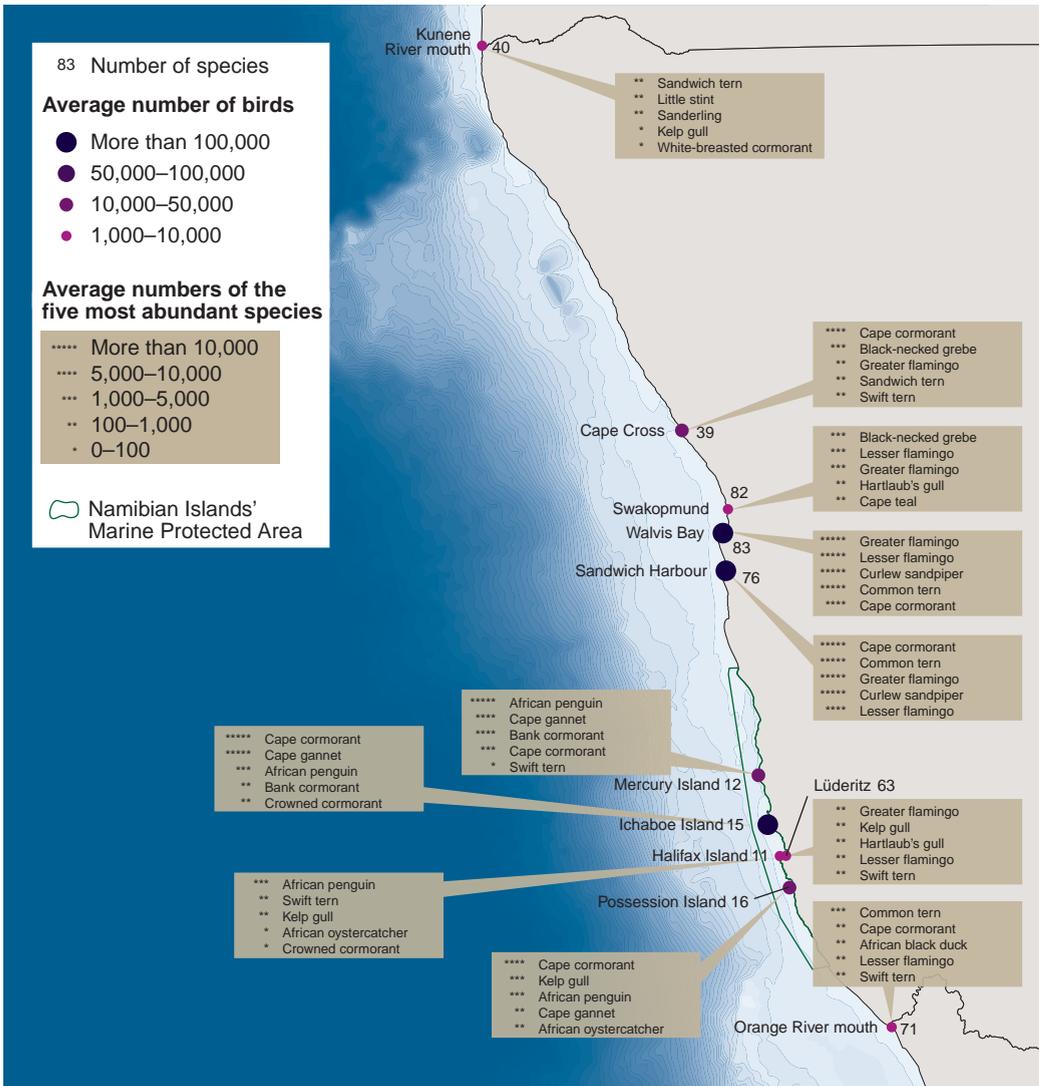
Approximately 60 per cent of the world's population of Cape fur seal (*Arctocephalus pusillus pusillus*) occurs in Namibia. Although the overall population is stable, there has been a northward shift in its distribution in recent years.

As such, Namibian and Angolan populations are growing while those further south are shrinking. They breed in dense colonies on small, rocky offshore islands and at a number of mainland rookeries.

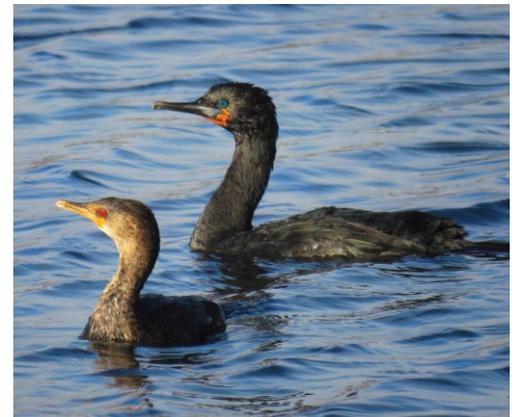
The five main breeding colonies, in order of size, are Cape Cross, Atlas Bay, Wolf Bay, Cape Frio and Long Island. The seals feed on a wide range of prey including juvenile Cape hake, horse mackerel and pelagic goby, as well as squid, lobster and crab.



Coastal birds



African oystercatcher (*Haematopus moquini*)



Crowned cormorant (*Microcarbo coronatus*) and Cape cormorant (*Phalacrocorax capensis*)



African penguin (*Spheniscus demersus*)



Hartlaub's gull (*Chroicocephalus hartlaubii*)

7.03 Distribution and abundance of coastal birds¹¹

The abundance of nutrients, and therefore fish and other marine foods, makes the Namibian coast a rich habitat for many birds. Coastal birds can be divided into three groups: species that breed and roost on islands just off the coast, such as cormorants, penguins, gannets and many gulls; those that forage off the coast but breed elsewhere in the world, such as albatrosses, petrels and shearwaters; and those that frequent estuaries and bays, which provide good feeding grounds to terns and wading birds such as flamingos, plovers and sandpipers.

This map shows the numbers of birds and bird species counted at key sites along the coast between 2001 and 2020. The most important onshore bird sites are the lagoons and bays of the central coast at Walvis Bay and Sandwich

Harbour, which each typically host more than 100,000 birds in summer. The islands off the southern coast provide roosting and breeding sites for substantial numbers of cormorants, penguins and gannets.

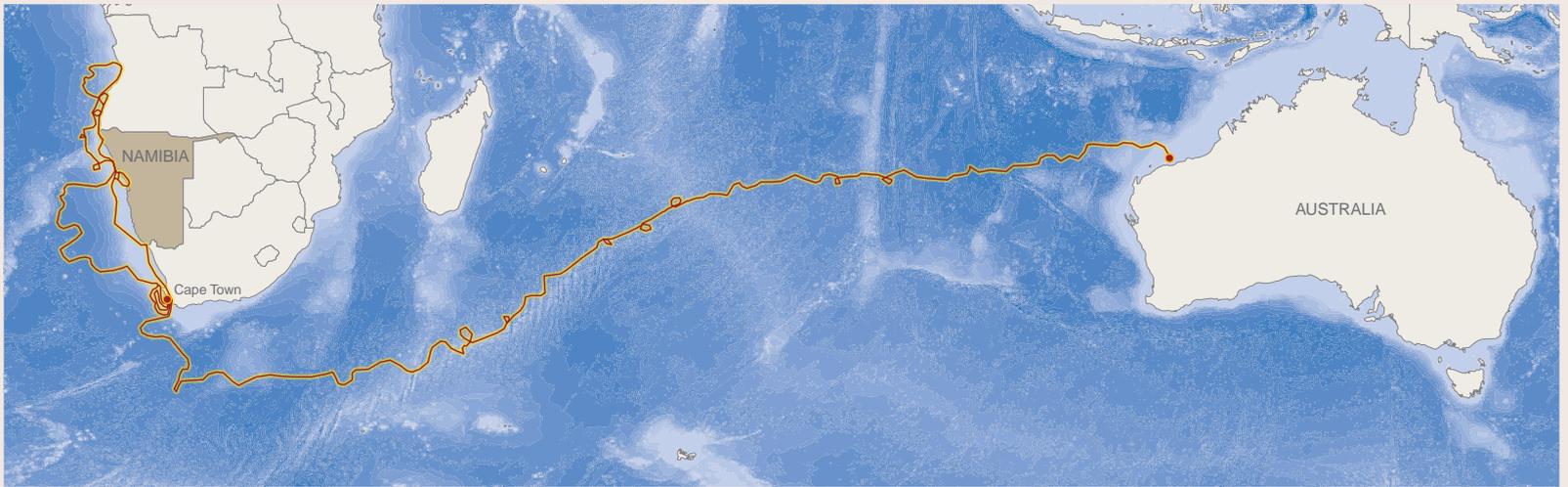
Other birds that breed along the coast in coastal salt pans and estuaries include waders such as white-fronted sandplover (*Charadrius marginatus*) and chestnut-banded sandplover (*C. pallidus*).

Substantial numbers of non-breeding migrant birds from the islands of the Southern Ocean overwinter in Namibia's waters, usually foraging far offshore, and therefore rarely seen. These include up to 750,000 albatrosses, petrels and shearwaters. The ocean to the north of 26.5°S (Mercury Island) is particularly attractive to these birds.¹²

Boundless oceans

The oceans change with the seasons and many marine animals migrate great distances to find waters that offer them warmth, protection and food. Migratory marine animals

include whales, seabirds (figure 7.56), turtles, and numerous fish species.



7.04 The marathon journey of a loggerhead turtle¹³

Individual turtles rescued by marine scientists offer the opportunity for attaching small transmitters to their shells to follow their movements. This was the case with a loggerhead turtle (*Caretta caretta*) that was rehabilitated by the Two Oceans Aquarium and released near Cape Town. Over the 26 months that followed its release, the loggerhead travelled 37,000 kilometres, averaging 48 kilometres a day. A turtle navigates the open oceans by sensing the forces of Earth's magnetic field, and finds its way back to the beach where it hatched by recognising the distinct

magnetic signature of that particular stretch of coastline. The route shown here was plotted up to February 2020, where the individual possibly returned to its hatching place on the coast of Western Australia.

Similarly, many other marine creatures use Earth's interconnected oceans to travel great distances. A tagged leatherback turtle that was found stranded at Sandwich Harbour in 2008 had been recorded nesting on a Brazilian beach 15 months previously.¹⁴



Five of the world's eight species of sea turtle occur in Namibian waters. The green sea turtle (*Chelonia mydas*), shown here, rarely breeds in Namibia but individuals have been found on beaches all along the coast and are regularly found feeding in the Kunene river mouth. Leatherback turtles (*Dermochelys coriacea*) are the most abundant, and are most often seen between Henties Bay and Sandwich Harbour where they feed on the abundance of jellyfish found there. Most sea turtles are considered globally threatened and all are protected in Namibia by the Sea Fisheries Act of 1992.



The humpback whale (*Megaptera novaeangliae*) is the most common whale seen in Namibian waters. These baleen whales spend summers in the rich feeding grounds of Antarctic waters where they feed on krill and small fish. In winter, they migrate northwards past southern Africa to tropical waters off West Africa where they breed.

Marine conservation

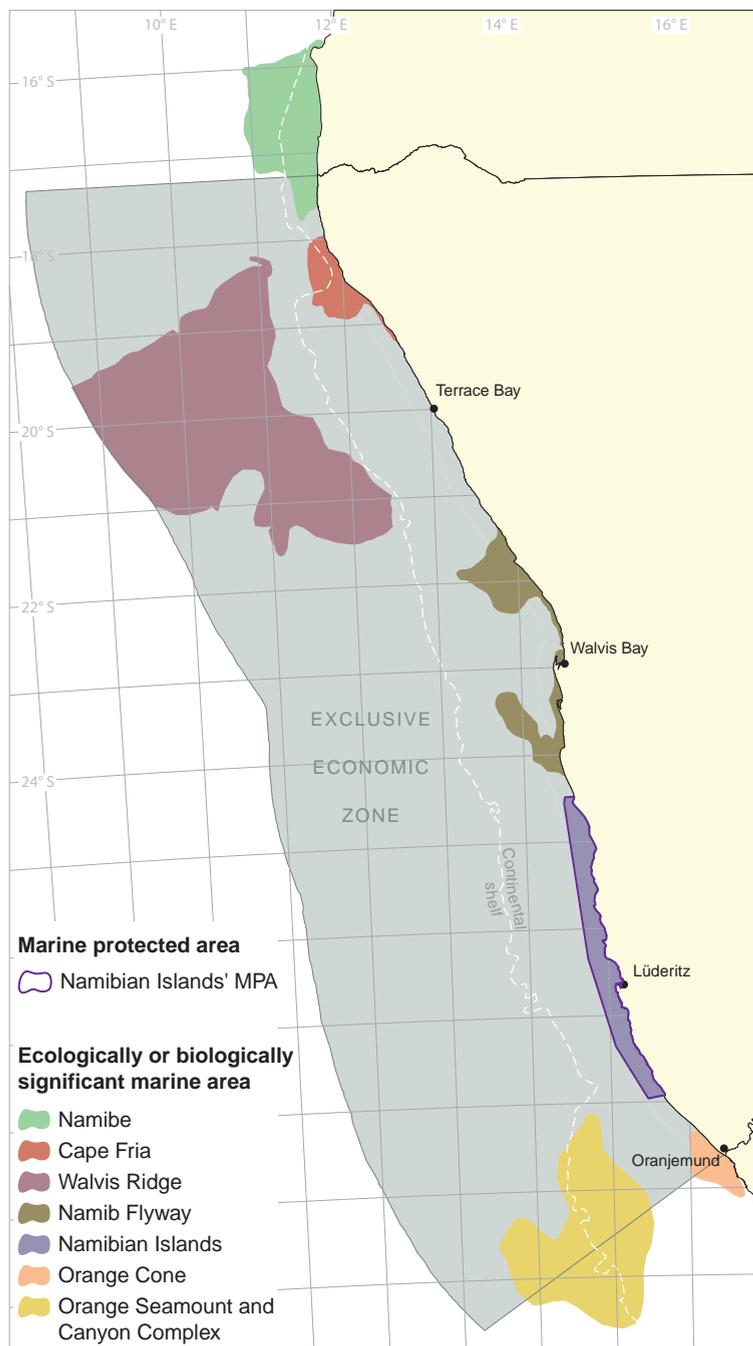
7.05 Namibian Islands' Marine Protected Area and ecologically or biologically significant marine areas¹⁵

The Namibian Islands' Marine Protected Area, declared in 2009, spans 1,200 square kilometres along the southern coast; it is approximately 400 kilometres in length and about 30 kilometres wide. The area includes the 14 islands (page 30) and several additional islets or rocks, some of which seemingly disappear during high tides; these islands and rocks provide sanctuaries to an astonishing variety of marine life. Seabirds and seals dominate the islands' land fauna.

The marine protected area primarily protects seabirds, specifically by safeguarding roosting and nesting areas. Eleven of the 14 seabird species breeding in Namibia breed on these islands and inshore rocks, including Namibia's endangered African penguins and 90 per cent of the world's endangered bank cormorants. The area also protects the kelp beds around the islands, and important spawning and nursery grounds for fish and other marine resources.

Within the protected area, buffer zones encompass the islands. These zones are subdivided into four levels of protection, which confer strict protection for specified islands, sanctuaries for rock-lobster and limit line fishing and harm caused by marine mining activities, most notably diamond mining.

Currently the Namibian Islands' Marine Protected Area is the only formal marine protected area in Namibian waters. However, six other areas within Namibia's exclusive economic zone have been identified as being of ecological or biological significance, and were adopted as such by the Convention of Biological Diversity in 2014. Of these areas, three are transboundary (Namibe, Orange Cone and the Orange Seamount and Canyon Complex) and three are completely within Namibia's jurisdiction (Cape Fria, Namib Flyway and Walvis Ridge). The designation



| Ecologically or biologically significant marine area | Criterion | | | | | | |
|--|-----------------------|-------------------------------|--------------------------------|---------------------------------|-------------------------|----------------------|-------------|
| | Uniqueness and rarity | Important life-history stages | Threatened species or habitats | Vulnerable or sensitive species | Biologically productive | Biologically diverse | Naturalness |
| Namibe | H | H | M | M | H | H | M |
| Cape Fria | M | H | H | DD | H | M | H |
| Walvis Ridge | H | H | M | H | M | M | H |
| Namib Flyway | H | H | H | M | H | M | M |
| Namibian Islands* | H | H | H | H | M | L | H |
| Orange Cone | H | H | H | M | M | M | M |
| Orange Seamount and Canyon Complex | L | M | H | M | M | H | H |

H = the criterion is met at a high rank; M = medium; L = low; DD = data deficient.

*Formally proclaimed as the Namibian Islands' Marine Protected Area.



View from Mercury Island towards Spencer Bay and the wreck of the *Otavi* (page 293)

of these areas requires that at least one of seven scientific criteria are met. Namibia's significant marine areas all meet a number of these criteria as listed in the table opposite;¹⁶ many include interesting marine features (figure 2.02). Protecting these areas

through conservation or other management measures would help stop the rapid loss of marine biodiversity in Namibia's benthic and pelagic marine habitats.



Along Namibia's coastline in the cold Atlantic waters, large brown algae (kelp) grow in dense aggregations known as kelp beds. Kelp beds and larger kelp forests are used by a wide range of marine life as a source of food and protection. Globally, kelp forests and the marine life in these ecosystems are under threat from increasing sea temperatures and pollution.

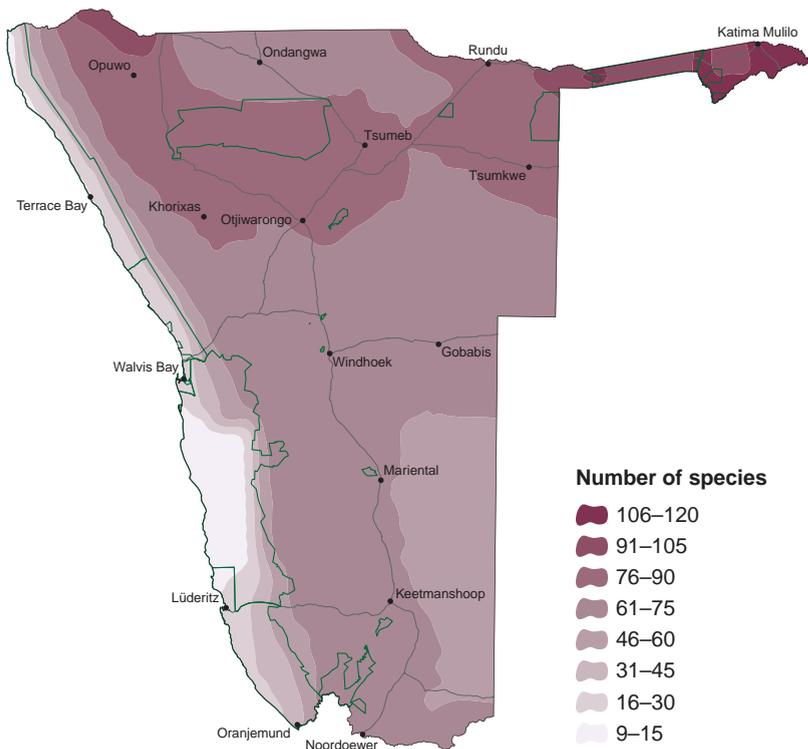
Terrestrial wildlife

Patterns of diversity

The study of biodiversity seeks to document and understand the patterns of distribution and variety of living organisms. From this work we can identify areas with high or low numbers of species, or rare and unusual species, allowing us to focus conservation efforts.

Often patterns of diversity in different animal groups are similar, and many show similarities to the patterns of diversity of plant groups. For instance, northern areas generally have the greatest numbers of species of mammals and birds because of the higher rainfall there and the presence of wetland and forest habitats not found elsewhere in Namibia. Many species that occur in the northern regions are more tropical, their ranges

extending south into Namibia from neighbouring countries. There are also places of high diversity in central Namibia, particularly in highland areas where species converge because of the mix of rocky areas, woodlands and other habitats there. Animals such as frogs and toads, which are dependent on water for various life stages, have distributions that reflect rainfall patterns and wetland habitats, while reptile diversity is broader and less associated with particular habitats. Some of the maps that follow also reflect variance in the amount of research carried out in different areas. Thus, many taxa show higher diversity in well-studied, accessible areas than in more remote areas.



7.06 Diversity of mammals¹⁷

Of the 217 species of mammals in Namibia, the most diverse groups are rodents (53 species), bats (43 species) and carnivores (35 species). Many tropical mammal species are associated with wetlands and forests, and have most of their populations to the north and east of Namibia, with just the southern edges of their ranges within Namibia, and this is shown by the higher diversity in the northeast and in the Kunene River valley. Much of the country has more than 60 species, while the Namib Sand Sea has the lowest diversity with just a tenth of the number of mammal species found in the richest areas of the northeast. See figures 7.07 and 7.08 for more information on the diversity of carnivores and large herbivorous mammals. The patterns of diversity of mammals and birds (figure 7.09) are similar.



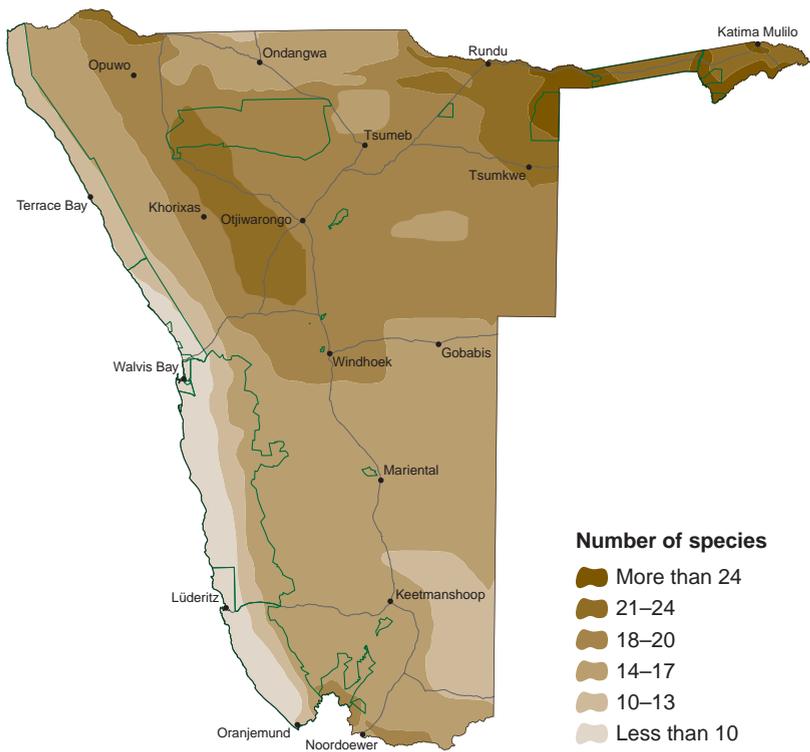
Angolan epauletted fruit bat (*Epomophorus angolensis*)



Dassie rat (*Petromus typicus*)



Vervet monkey (*Chlorocebus pygerythrus*)



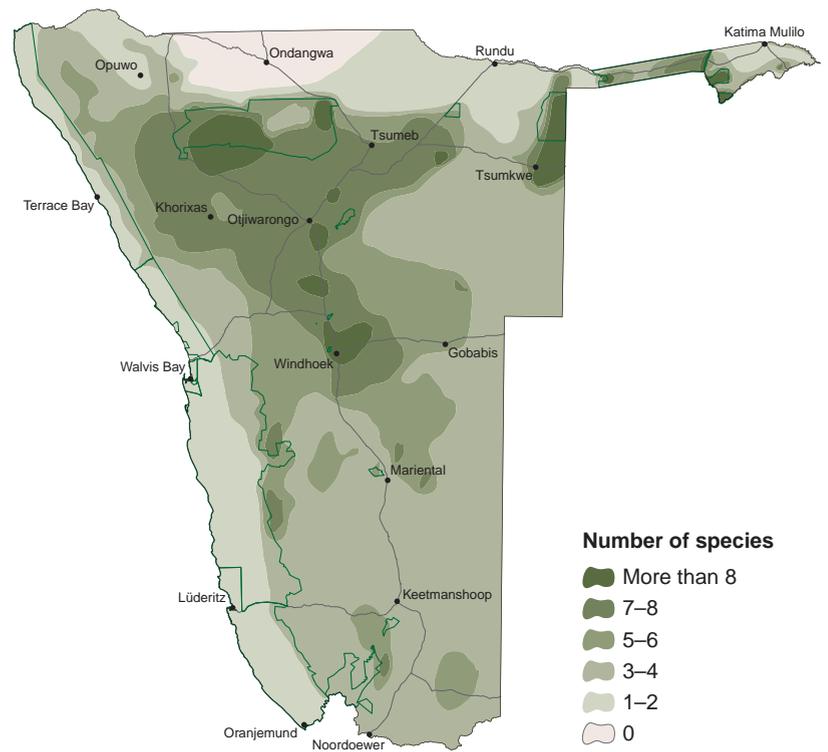
7.07 Diversity of carnivores¹⁸

Namibia's 32 carnivores – mammals in the taxonomic order Carnivora – comprise six large species – cheetah, lion, leopard, brown hyaena, spotted hyaena and African wild dog – and 26 medium-sized and small species. These include cats such as caracal, black-footed cat and serval; dogs such as jackals and foxes; aardwolf, otters, genets, weasel and polecat, honey badger, and 11 species of mongoose. Many of these species occur at very low densities in most areas, are highly secretive or nocturnal, and are seldom seen.

The greatest diversity is found in northeastern Namibia where there is the combination of wetlands, high rainfall and dense vegetation, and where a few tropical species find suitable habitat not available elsewhere in Namibia. These wetter areas are home to carnivores such as otters, rusty-spotted genet, African striped weasel, and three kinds of mongoose. Also noticeable for their relatively higher diversity than the surroundings are the Kunene and Orange rivers, where water-dependent species such as otters and water mongoose add to the diversity.

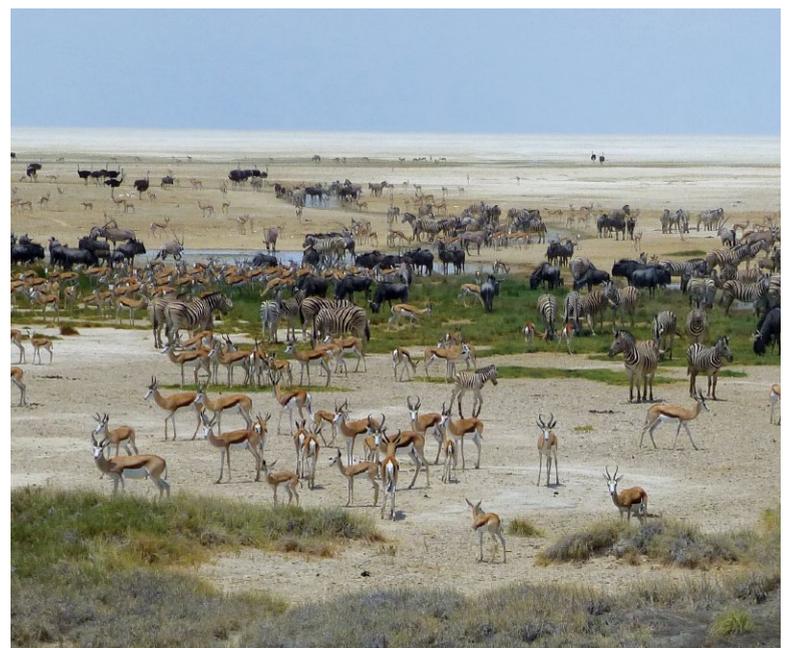
The diversity of mammal carnivores across most of the northern half of the country, at more than 18 species, is high. These areas are home to species such as civet and serval, banded mongoose and dwarf mongoose, and Namibia's only endemic carnivore, the black mongoose, that inhabits mostly rocky outcrops in northwestern Namibia.

A few species such as honey badger and striped polecat are widespread throughout the country except the Namib Sand Sea, while some species are true generalists that can survive even in the sandy Namib. These include the ubiquitous black-backed jackal, caracal and African wild cat.



7.08 Diversity of large herbivores¹⁹

The map shows the diversity of 16 species of herbivores ranging in size from springbok to elephant. There are essentially two groups – savanna species and wetland species. Zambezi Region has populations of hippopotamus, buffalo and waterbuck that are associated with wetland and floodplain habitats, while Etosha National Park and the areas south and west of it support high numbers of species such as springbok, Burchell's zebra and giraffe. Some herbivores have rather localised distributions while others are very widespread (figures 7.38–7.46). Many species make seasonal movements, following rainfall and the new growth that it stimulates. The lowest numbers of species are in the densely populated northern regions, as well as in the far west and south, where there is relatively little vegetation.





Diederik cuckoo
(*Chrysococcyx caprius*)



Speckled pigeon
(*Columba guinea*)



Namaqua sandgrouse (*Pterocles namaqua*)



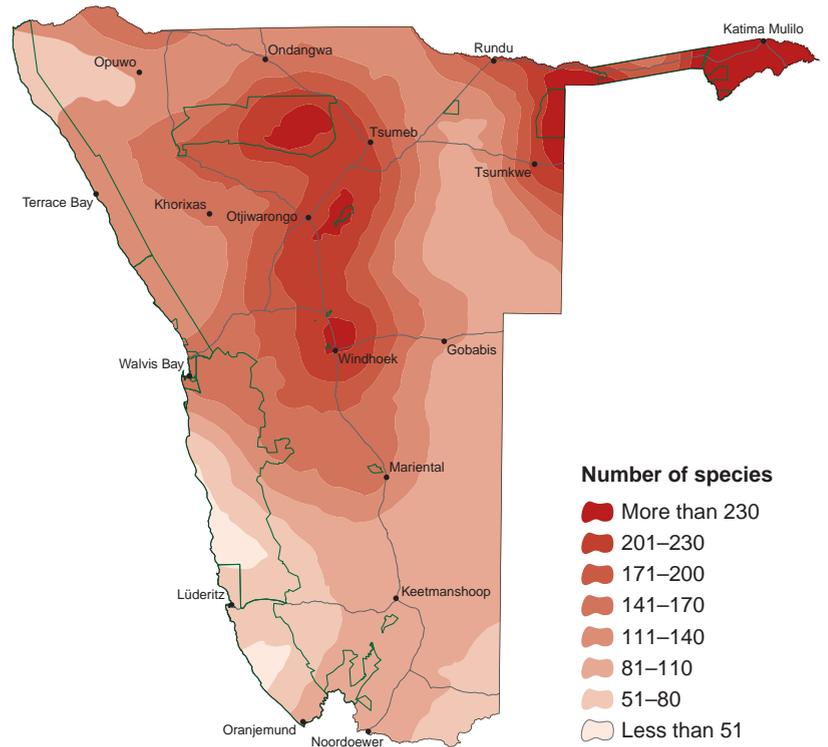
Swift tern (*Thalasseus bergii*)



Marabou stork
(*Leptoptilos crumenifer*)



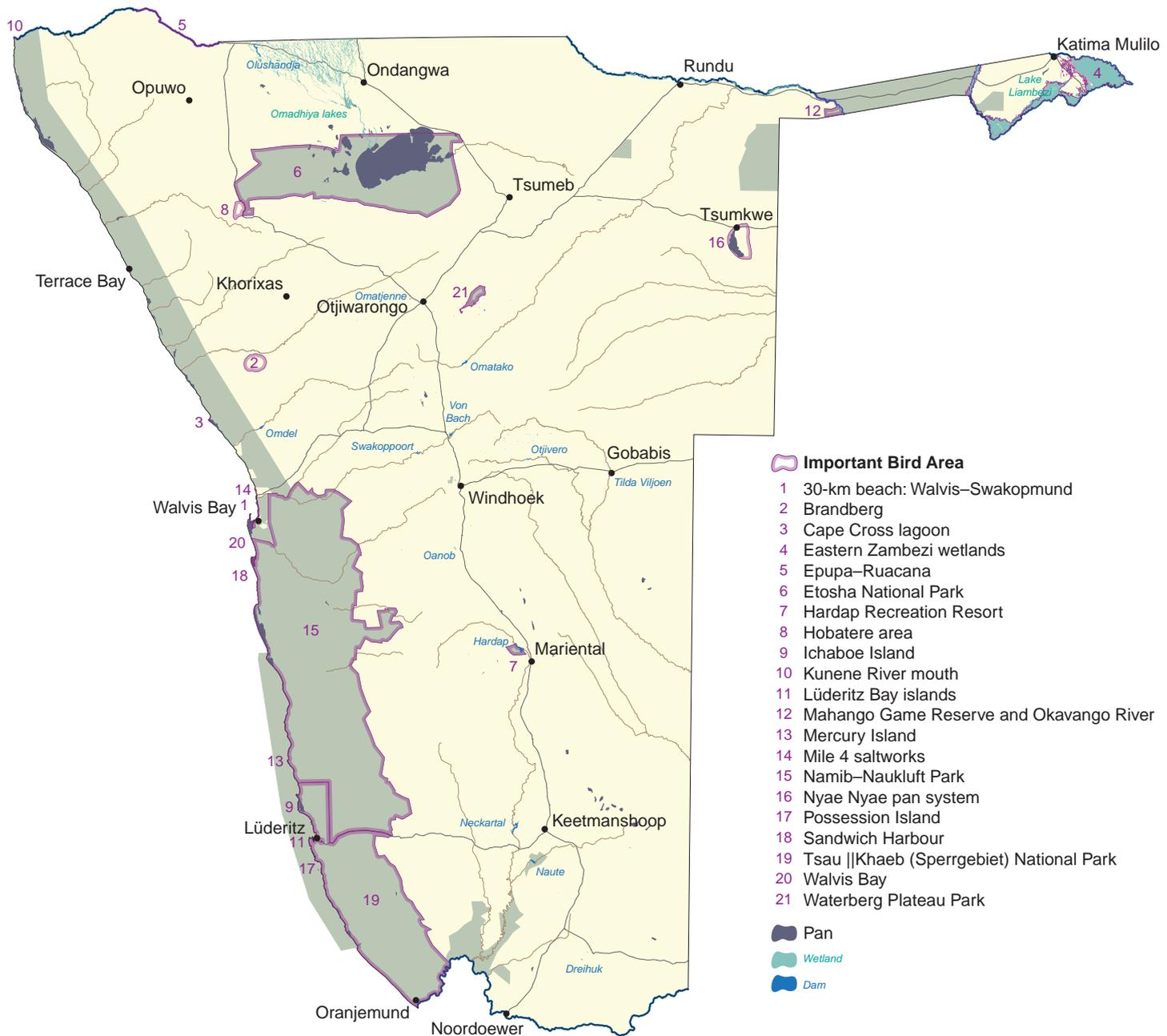
Red-necked falcon
(*Falco chicquera*)



7.09 Diversity of birds²⁰

An impressive total of 676 bird species has been recorded in Namibia due to the variety of habitats found within its borders, namely desert, savanna, grassland, riverine forests, wetlands, coastal shores and ocean.²¹ Species richness is highest in the northeastern areas where rainfall is relatively high, and where four of the country's six perennial rivers and associated wetlands are found. Diversity is also high in the central parts of the country where mountains, savanna and pan systems contribute to a high level of habitat complexity. The savannas in the central parts of the country support a higher diversity than the more arid areas to the west and south and, surprisingly, more than the higher rainfall areas to the east where woodlands on deep Kalahari sands are poor in nutrients and low in habitat diversity. There are several key areas for birds along the coast, where offshore islands and coastal lagoons offer critical feeding and breeding spaces. Some of these are especially important for migrants that rely on these small but vital habitats during the southern hemisphere summer. Namibia has 21 areas designated as 'important bird areas' (figure 7.10).²²

Seventy-eight of Namibia's bird species are on the IUCN's Red list, indicating significant threats to these species' survival.²³ Threats arise predominantly from four main impacts of human activities: degradation of habitats such as wetlands, savannas and forests; poisoning of scavengers; overfishing and destructive fishing methods in the ocean; and collisions with power lines.



7.10 Important bird areas²⁴

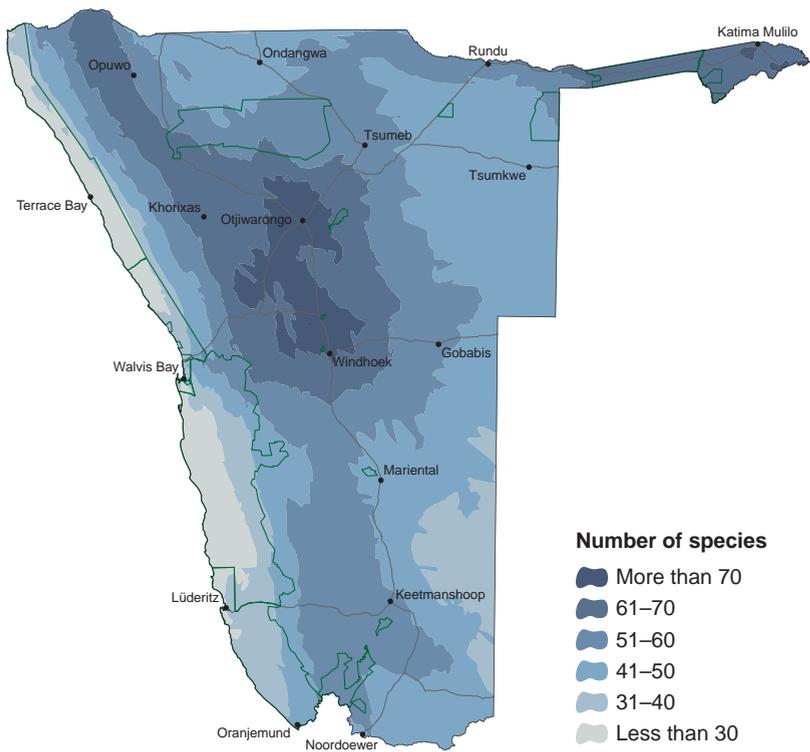
Areas with high concentrations of birds, particularly with significant numbers of threatened or endemic species or with more than one per cent of the global population of any species, are recognised as ‘important bird areas’. These areas do not necessarily enjoy legal protection, but they are identified as valuable for sustaining bird as well as other life on Earth. Because birds can readily be identified and counted, the size and trend of their populations can reveal useful information on aspects such as the quality of water resources or the state of the food they rely on.

Many of Namibia’s wetlands are identified as important bird areas; almost a third of the country’s bird species depend on rivers, lakes and lagoons and their associated floodplains, marshy habitats and shorelines for at least part of their life cycle. Wetlands are rich sources of food such as fish, frogs and invertebrates (figures 7.12, 7.13, 7.15) and they support reedbeds and dense stands of trees along riverbanks, which create places for nesting and shelter. Five of Namibia’s wetlands are recognised as Wetlands of International Importance under the Ramsar Convention (figure 8.09), four of which are at the coast, and are vital feeding and stop-over posts for migratory shorebirds.

Areas of critical importance for seabirds are the offshore islands in the vicinity of Lüderitz. Penguins, gannets and cormorants cluster on these islands where they are safe from land predators such as jackals and hyaenas. These fall within the Namibian Islands’ Marine Protected Area (figure 7.05). Namibian populations of Cape gannet and African penguin – the only penguin species that breeds on the continent – have dropped by over 60 per cent in the past 40 years, largely due to human overexploitation of their main food items, sardines and anchovies.

Some of the important bird areas are entire national parks, such as Namib-Naukluft and Tsau ||Khaeb (Sperrgebiet) National Park. These are justified in that they support significant populations of endemic and near-endemic birds, and are also important areas for raptors, such as threatened lappet-faced vultures and secretarybirds.

Many of these important bird areas are attractive tourist destinations, offering the exhilaration of wilderness and wildlife of undisturbed natural areas, and provide important economic returns to the country (pages 338–339).



7.11 Diversity of reptiles²⁵

Reptile diversity is highest in the central highlands (up to 79 species), while the escarpment and associated highlands are also notably diverse due to the mosaic of habitats and numerous inselbergs, which provide important refugia for many species. The eastern Zambezi Region supports a large number of species due to the higher rainfall and abundance of aquatic habitats in this area; some of these species also occur in central Africa.

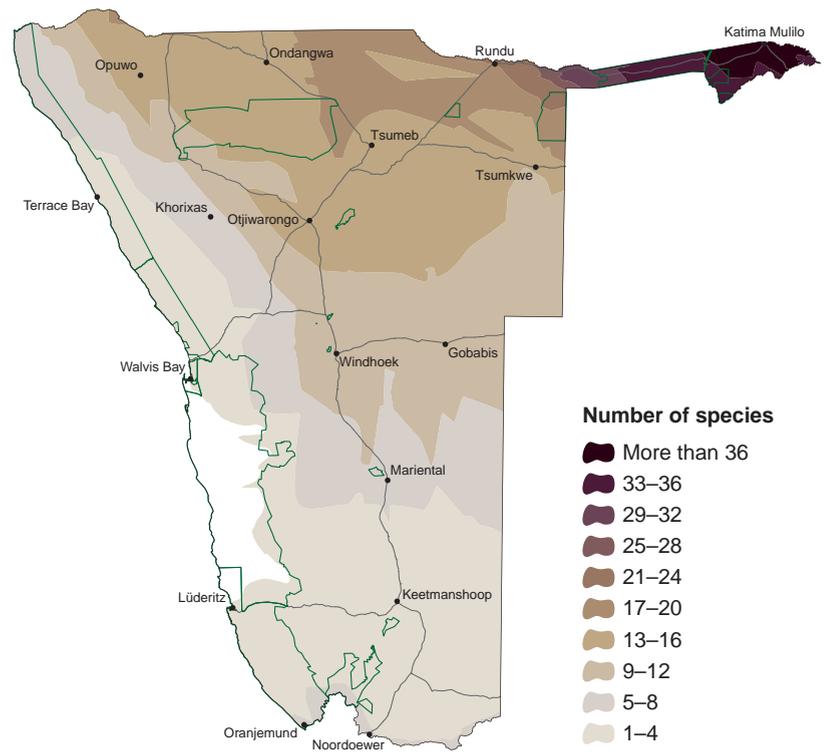
Namibia supports some of the richest reptilian assemblages in Africa, with a total of 292 species including 173 lizard and 93 snake species. It boasts the second highest tortoise diversity (at least six species, and six more terrapins) in Africa. Lizards are the most diverse group, with the family of geckos comprising 25 per cent (73 species) of all reptile species found in Namibia. Ongoing phylogenetic studies show that some Namibian reptile species remain undescribed.



Barking geckos (*Ptenopus*) are some of the most common vertebrates in the arid areas of Namibia. Their loud calls are iconic sounds of the desert, and are emitted by males to attract females to their burrows. The males also have a bright yellow throat patch, which is thought to act as a mating and territorial signal. Three species are currently recognised.



The Nama padloper (*Chersobius solus*) is the second smallest tortoise in the world, and occurs in a small part of the southern Namib Desert around Aus. This tortoise has a flattened shell, which allows it to crawl under rocks to shelter from harsh conditions. It is the only tortoise known to drink fog that condenses on its shell and on rocks.

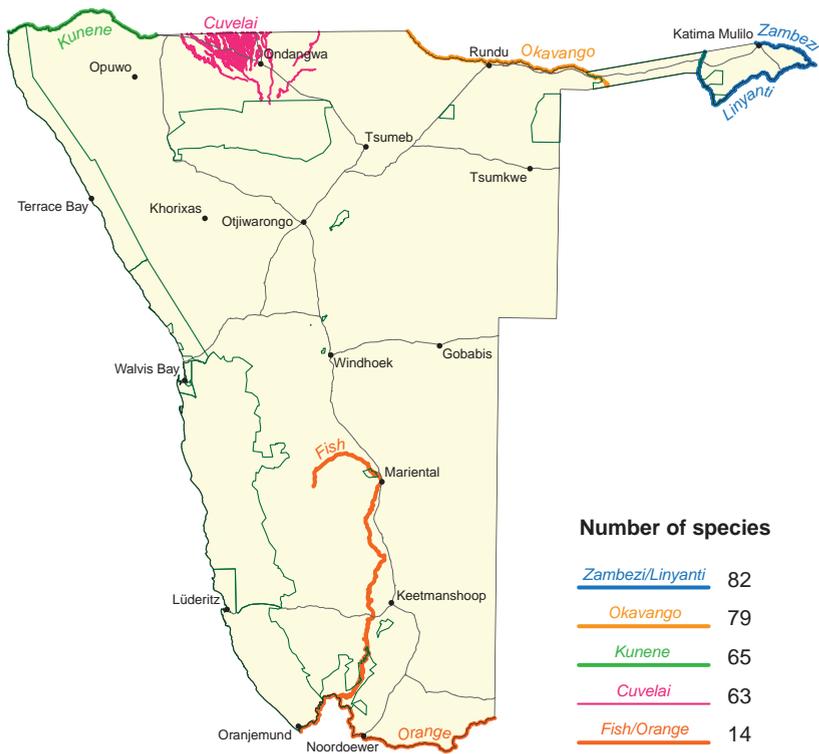


7.12 Diversity of amphibians²⁶

Amphibian diversity is highest in eastern Zambezi Region (40 species) and decreases with average rainfall, due to their dependence on surface water for breeding. Their activity is highly seasonal, and most species will not be detected outside the rainy season. Perennial waterbodies are often dominated by a few species with high numbers of animals, while small, temporary waterbodies tend to accommodate a greater range of species. Twelve amphibian families occur in Namibia, the most diverse being toads (14 species) and bullfrogs and sand frogs (16 species). While most species breed in open water, the rain frogs breed in subterranean tunnels and occur independently of waterbodies. One species even occurs in the sand dunes of the southern Namib Desert. There have been few studies on Namibian amphibians and it is likely that Namibia has more than the 63 species currently recognised.



Namibia boasts one of the world's largest amphibians, the giant bullfrog (*Pyxicephalus adspersus*), which is considered a delicacy by many Namibians. These frogs may take decades to reach adult size. Breeding occurs in ephemeral pans after heavy rainfall, and males fight viciously for breeding privileges. The male often remains after breeding to guard the tadpoles, even digging channels to allow them to move to deeper pools when their pool dries up.



7.13 Diversity of freshwater fish²⁷

Most of the 115 species of freshwater fish in Namibia are in the northern river systems. Many of these species occur in more than one river system, but not all the species reported from a river system are present along the whole course of the river. Seventeen species have been recorded as occurring naturally in the iishana of the Cuvelai drainage system, while another 46 species were introduced to the iishana via the canal from the Calueque Dam (figure 4.21) on the Kunene River. Six species have been recorded in the ephemeral rivers that flow to the coast, and 11 species occur in man-made dams, such as Von Bach, Hardap and Omatako.

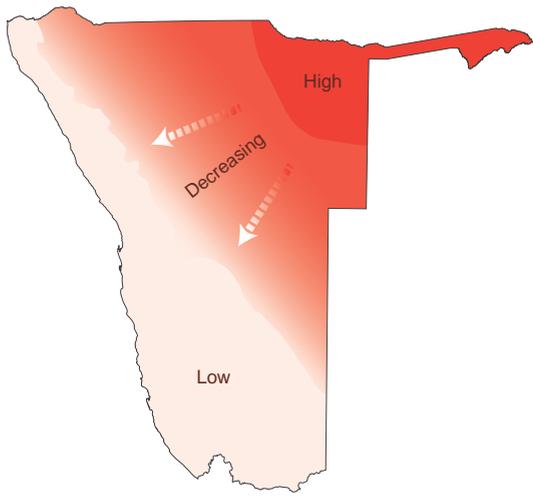
7.14 Movements of African tigerfish in the Okavango River²⁸

There is little information on how African freshwater fish use various parts of the river systems they live in for feeding, spawning and colonising new habitats. A telemetry study of African tigerfish (*Hydrocynus vittatus*) in the Okavango River has shown that some of these large predatory fish are migratory, and move between Namibia and Botswana, while others stay resident in a short stretch of the river. These different behaviours are thought to promote genetic diversity in the population. The map shows the furthest locations recorded for 12 fish that were tagged in Bwabwata National Park. Some individuals moved at least 400 kilometres; this is the longest movement recorded for any freshwater fish species in Africa. Understanding how fish use the river is important for the management and protection of regional populations and their key habitats.



Catfish ("Barbel") *Clarias* sp.





7.15 Diversity of invertebrates²⁹

Invertebrates are the most numerous macroscopic biota on the planet and, unsurprisingly, in Namibia too. The most comprehensive available listing of named and documented Namibian invertebrates currently includes more than 12,000 species, but it is a work in progress and the true number is expected to exceed 16,000. Insufficient data exist to derive a map of overall invertebrate diversity.

As examples of invertebrate diversity, maps of specific, better-studied groups of invertebrates follow – nematodes, solifuges, termites, tenebrionid beetles and scorpions (figures 7.16–7.20).



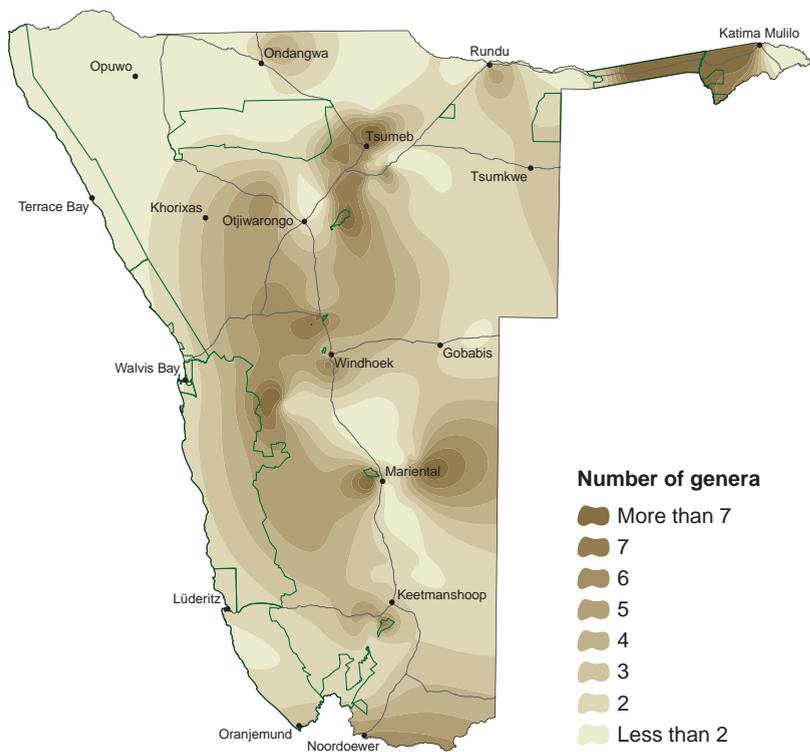
Centipede (*Scolopendra morsitans*)



Blister beetle (*Hycleus dentatus*)



Brown-veined white butterfly (*Belenois aurota*) migrates every year, travelling hundreds of kilometres from coastal areas of South Africa to Mozambique and towards Madagascar, with many passing through Namibia on the way.



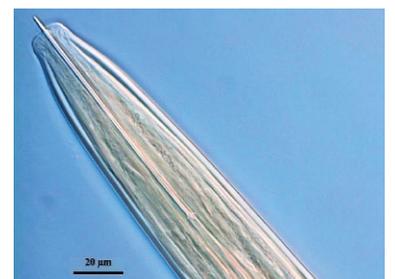
7.16 Diversity of nematodes³⁰

Nematodes, or roundworms, are unsegmented animals belonging to the Phylum Nematoda and are possibly the most abundant animals on Earth. They live in a range of environments including soil, fresh water and salt water, and there are species that feed on fungi, bacteria, protozoans, other nematodes, and plants. They can also parasitise insects, humans and other animals. They range in size from 80 micrometres up to an enormous 8 metre specimen which was found in the placenta of a whale.

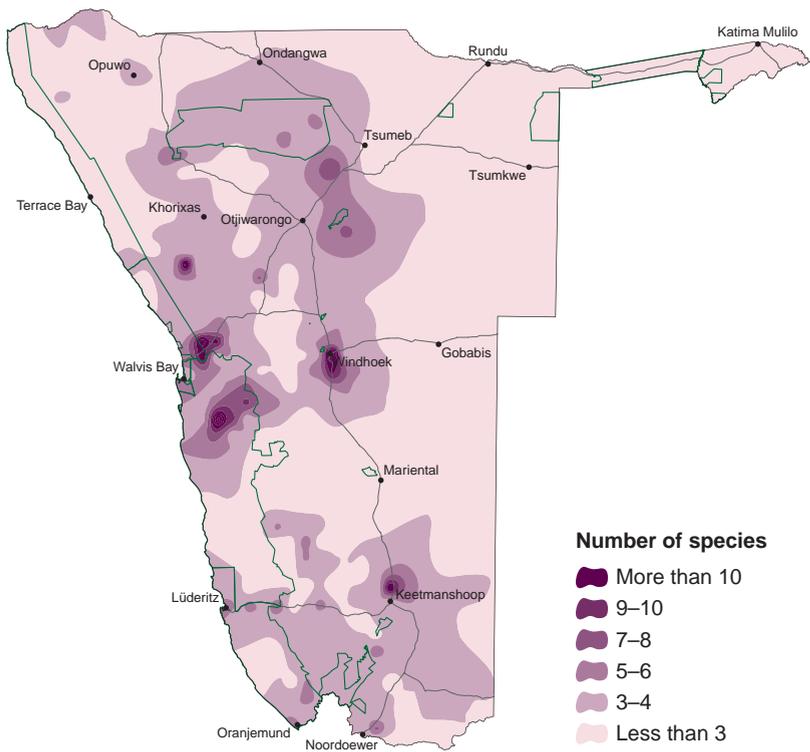
This map shows the diversity of nine families of plant-feeding nematodes that live in the soil. Most nematodes found in soil are small, usually from less than one to about ten millimetres in length. Worldwide, over 4,300 plant-feeding nematode species are known, and 65 of these have been reported from Namibia. Plant-feeding nematodes can cause extensive damage to crops. In Namibia, several species are associated with maize and pearl millet.



A nematode in the *Criconema* genus.



Xiphinema capenses, a dagger nematode that feeds on plant roots.



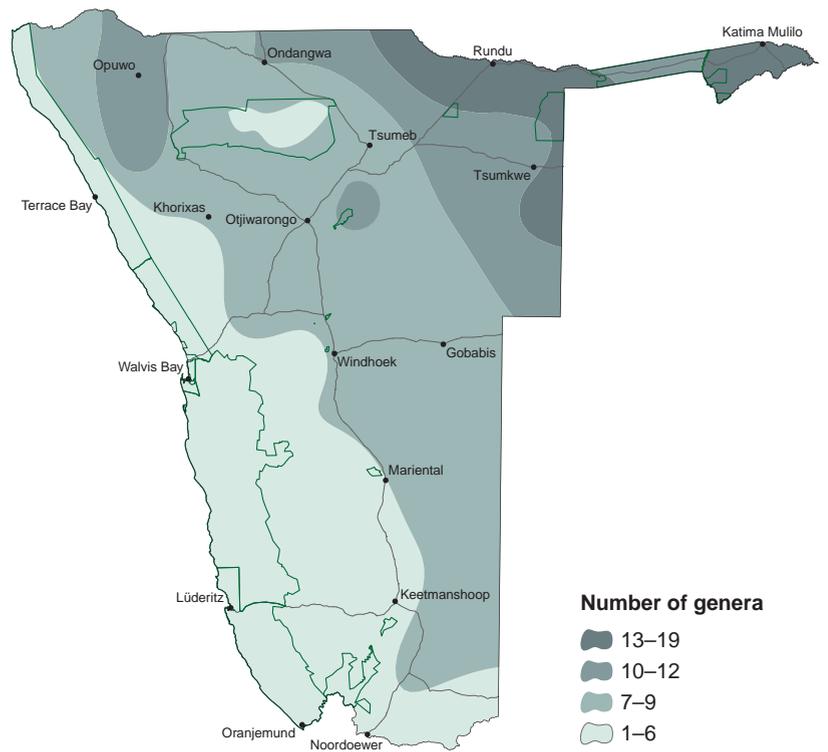
7.17 Diversity of solifuges³¹

Solifuges, locally known as red romans, sunspiders or Kalahari Ferraris, are arachnids that belong to the order Solifugae. They can be distinguished from spiders by their large, scissor-like jaws. Solifuges are fast running and carnivorous, feeding on prey that they can subdue, such as insects and scorpions and occasionally small lizards, birds and rodents. They are harmless to humans.

Globally, most solifuges occur in arid areas, and Namibia has high levels of diversity and endemism. Currently, 122 species of six families are described from Namibia, including 59 endemic species. Diversity is highest in the more arid western and southern parts of the country, but highlands also provide important habitats. The map indicates a general distributional trend based on current knowledge. However, gaps in the geographic coverage of surveys as well as incomplete taxonomic identification of some specimens could explain the apparent low diversity in some areas.



Metasolpuga picta, a diurnal solifuge which is endemic to Namibia.

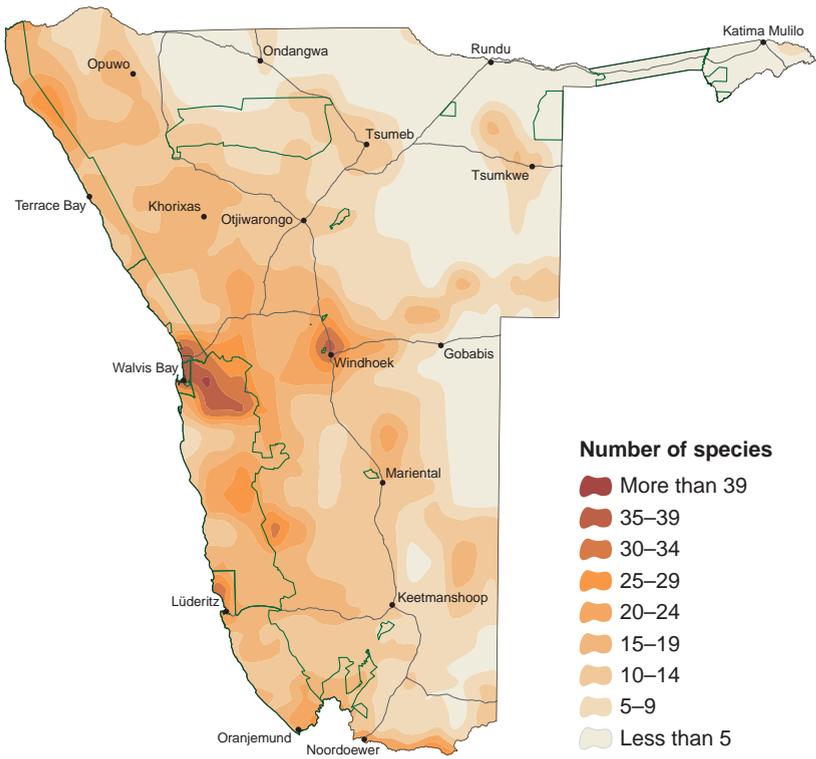


7.18 Diversity of termites³²

Only the number of genera is available to provide a measure of diversity among termites, but a close relationship between numbers of species and genera can be expected. Eastern Zambezi and areas surrounding the Okavango River valley have the greatest diversity, with numbers tailing off towards the southwest, indicative of an association between rainfall and diversity. Pockets of higher diversity are present in the highlands in Kunene Region and in the vicinity of Waterberg.



Huge numbers of termites emerge after the rains and provide an important food source for other animals such as these milvus kites.

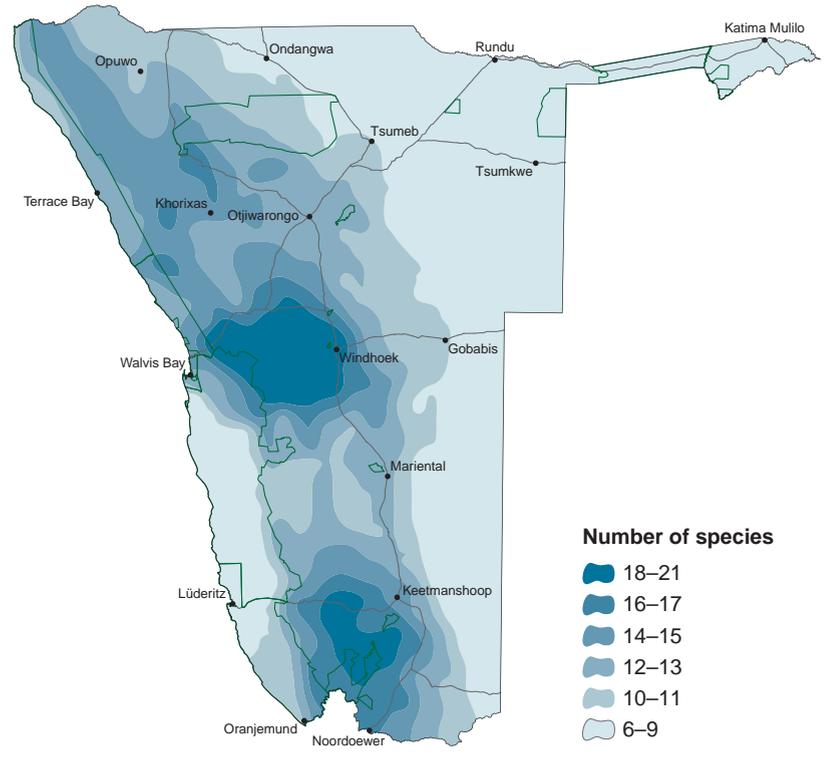


7.19 Diversity of tenebrionid beetles³³

Namibia has about 600 species of beetles within the family Tenebrionidae, known as darkling beetles or, colloquially, toktokkies due to the tapping sounds some species use to communicate. Their abundance and diversity tends to be highest in the driest parts of the country, peaking in the central Namib where there are over 80 species.



Many tenebrionid beetles in the Namib Desert are active by day, foraging for food (mostly dry plant matter) or searching for mates. In this area where rain rarely falls, they often also venture from their underground shelters at night to collect moisture from fog or dew. Two species of fog-basking beetles are particularly iconic, doing 'headstands' on top of dunes during foggy conditions; they orientate their bodies so that the fog condenses on their abdomens and runs down towards their mouths. Many other species also come out to drink water droplets that have condensed on grass or sand. Although there is no shortage of theories, none fully explains why there are so many tenebrionid species in the Namib Desert.



7.20 Diversity of scorpions³⁴

Many species of scorpion are adapted to arid areas, and this is where most occur, especially in rocky areas in southern and western Namibia. By contrast, there are few species in the predominantly sandy areas of the eastern half of the country and in the Namib dunes.



Opisthophthalmus adustus, a species of burrowing scorpion



Parabuthus granulatus, Namibia's most venomous scorpion

Patterns of endemism

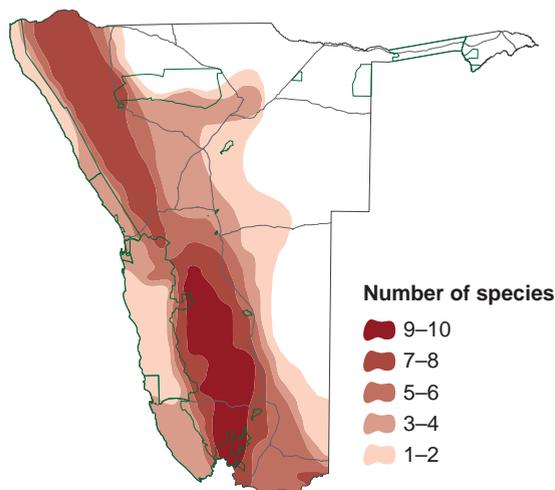
Some species are widely distributed across one or more continents and most animals in Namibia are also found beyond its borders in the neighbouring countries of Angola, Botswana, South Africa and Zambia and elsewhere in Africa. Other species are restricted to particular areas, to which they are ascribed as being endemic. Some of Namibia's endemic species are found in very small areas of the country and only in association with a specific type of habitat, such as the escarpment or the Namib Sand Sea. As with the plants, many of our endemic animals have evolved unusual strategies which allow them to live in an environment that is generally arid with unpredictable rain and a limited supply of nutrients. These include behavioural, physiological and reproductive adaptations. These evolved due to major environmental changes during Namibia's past, such

as rocky areas becoming isolated from others by the formation of large dune fields, the expansion and contraction of wooded savannas, and global temperature changes.

The cut-off that Namibian ecologists use to determine endemism varies for different groups of animals and plants, ranging from 75 per cent to 100 per cent of individuals or their distributions falling within the country. Most of the restricted-range birds that occur in Namibia also occur in Angola, and there are around 16 species of endemic or near-endemic birds (species with 90 per cent or more of their range in Namibia and Angola). There are 65 species of endemic reptiles (75 per cent or more of their range in Namibia), 15 mammals (75 per cent or more), 14 scorpions (100 per cent) and 5 amphibians (75 per cent or more). There are also five species of freshwater fish that occur only in Namibian waters.

Since either these species occur nowhere else on Earth or the greatest part of their ranges is within this country, Namibia has a particular responsibility to protect these special animals and the areas they occupy. Their limited range makes these species particularly vulnerable to environmental changes such as desertification and bush encroachment, land use change and pressures caused by factors such as human population growth and poor land management. Some are also targeted by collectors.

As with diversity, adequate information on endemism is currently only available for certain groups, and much more needs to be discovered about the distribution of other endemic organisms. The distributions of several groups of species endemic to Namibia are mapped here to illustrate distribution patterns and areas of conservation importance.



7.21 Mammal endemism³⁵

Namibia's endemic mammals include Hartmann's mountain zebra (*Equus zebra hartmannae*), black-faced impala (*Aepyceros melampus petersi*), black mongoose (*Galerella nigrata*) and several rodents. The distribution of endemic mammal species is similar to that of birds (figure 7.22), with

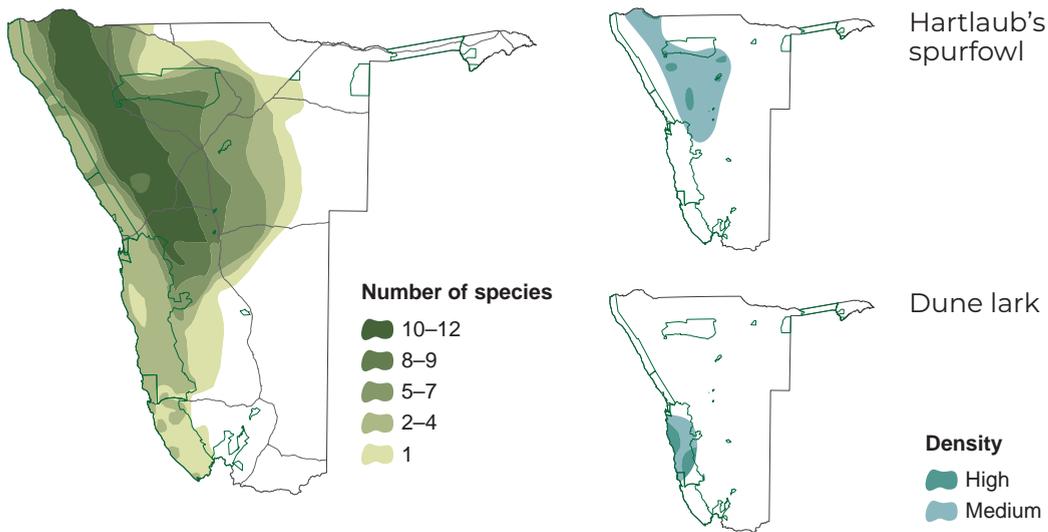
most species being broadly associated with the escarpment separating the Namib Desert from higher elevations to the east. However, the majority of endemic mammals occur in southern Namibia, and some species have ranges that extend into similar habitats in northwestern South Africa.



Juvenile black-faced impala



Namib round-eared elephant shrew (*Macroscelides flavicaudatus*)



7.22 Bird endemism³⁶

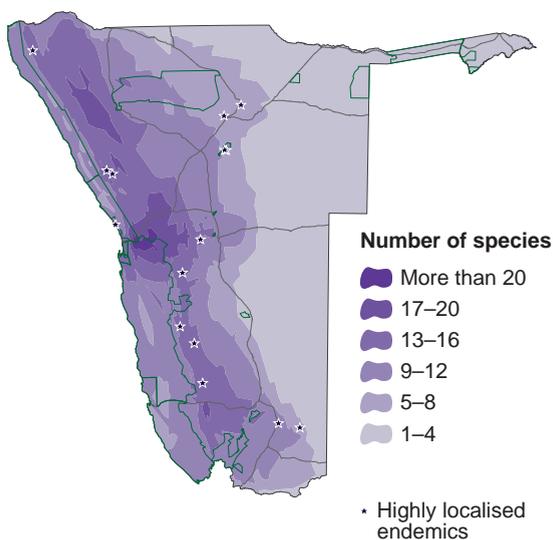
Around 16 species of birds have 90% or more of their global population either entirely within Namibia, or within Namibia and extending into Angola. These species are concentrated in the western half of the country, in the Namib Desert and the belt of mountainous terrain and dry savanna running along the escarpment and immediately inland of it. These areas largely fall within the network of national parks and communal conservancies, where conservation is prioritised.

Hartlaub's spurfowl (*Pternistis hartlaubi*) is a small francolin found

in rocky habitat on the escarpment in northwestern Namibia and southwestern Angola, and farther east towards the Waterberg and the Karstveld around Otavi. The bird is usually found around rocky outcrops and is fairly common within these habitats. Little is known about its ecology. Although the overall low population density and confinement to suitable habitat make this species vulnerable to external influences, it is not classified as threatened.

The dune lark (*Calendulauda erythrochlamys*) is Namibia's only truly endemic species, with its entire

population confined to the dunes of the central Namib. Larks are successful in arid habitats if they are nomadic to some extent, gathering where there is abundant food after rain. Dune larks, however, spend their entire life in the sand dunes, move around very little and make the most of the little shade that is available. Their food of dry seeds is supplemented with insects such as ants and termites, which provide them with sufficient moisture and energy. Such strategies help dune larks live with the extreme heat and aridity of the Namib Desert, where few other bird species can survive.³⁷



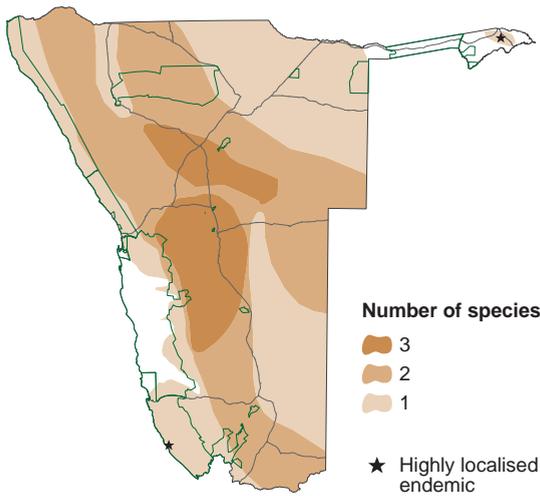
7.23 Reptile endemism³⁸

Reptile endemism is highest in western Namibia (21 species) partly due to the higher diversity of restricted-range species along the escarpment. Of the 65 endemic species, a third (23 species) are thick-toed geckos (genus *Pachydactylus*). There are several highly localised endemics scattered throughout the Namibian interior and these are generally of greatest conservation concern due to their small

distributions, although many are not currently listed as threatened. These localised endemics are often associated with specific substrates or geological features. The escarpment, Karas Mountains, Otavi Mountains and the Namib Desert contain important habitats for localised endemics. Several Namibian endemics were only recently described, and more doubtless await recognition.



The family of thread snakes (Leptotyphlopidae) contains the smallest snakes in the world, and several species occur in Namibia. They are relatively common but rarely seen because of their subterranean habits, only coming to the surface at night or during rainy conditions. This young Damara thread snake (*Namibiana labialis*) is barely a millimetre in body diameter.

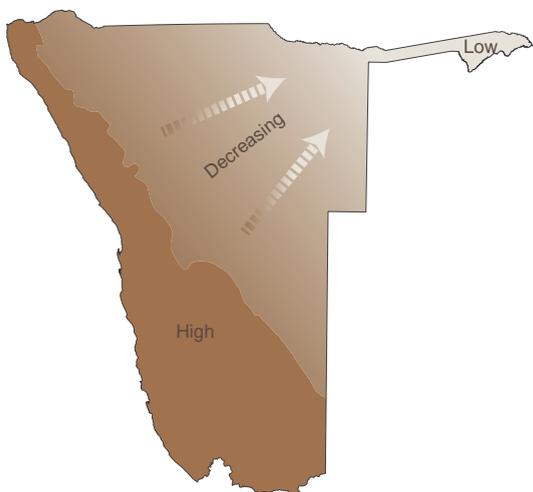


7.24 Amphibian endemism³⁹

Amphibian endemism is highest in central Namibia, in contrast to their diversity which is greatest in the northeast (figure 7.12). Only five species are considered endemic, and three of these are widespread within Namibia. Two species have highly localised distributions and are of greatest conservation concern: the Mapacha grass frog (*Ptychadena mapacha*), which only occurs in a small patch of the Zambezi Region; and the desert rain frog (*Breviceps macrops*) which occurs in the coastal southern Namib Desert, and also extends into South Africa.



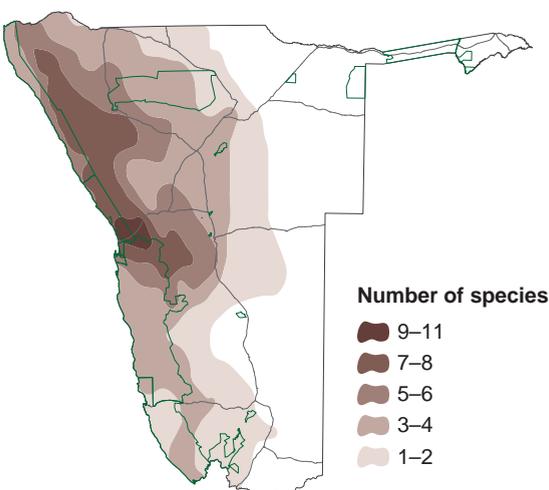
Rain frogs do not breed in water, but build underground nests where the eggs are laid. The tadpoles whip up the egg jelly into a foam with antimicrobial properties, and probably use their tails for oxygen exchange. The desert rain frog (*Breviceps macrops*) occurs only along the coast in the southern Namib Desert, in the fog zone.



7.25 Invertebrate endemism⁴⁰

This map illustrates the probable, general trends of invertebrate endemism. Endemism rates are relatively low in the northeast because the savanna and woodland habitats there extend over vast areas into neighbouring countries. Conversely, endemism rates in the south and west are particularly high, reflecting the arid adaptations of the fauna and the biogeographic history of the region.

The Karas Mountains form an endemic hotspot, as is the escarpment in the west, and the winter-rainfall Succulent Karoo Biome in the far southwest. The highest invertebrate endemism rates in Namibia are found in the Namib Desert; in parts of the Central Namib more than 75 per cent of the species found there occur nowhere else in the world.



7.26 Scorpion endemism⁴¹

Many species of scorpion are adapted to arid areas, and this is where most of the 14 species of endemics occur. The highest diversity occurs in the western areas where there is a range of rocky and sandy habitats and a mix of elevations. By contrast, there are fewer endemic species in the eastern half of the country and in the Namib dunes where there is less variety in the substrate and topography.



Opisthophthalmus litoralis, an endemic burrowing scorpion

Spatial distribution of selected wildlife species

The arid and variable conditions in Namibia result in patchy resources and unpredictable water availability, and many animals that live here have evolved to cope with conditions such as extreme heat and drought. Some have morphological or physiological adaptations while others have evolved to be nomadic to some extent – with individual animals or large groups evolved to move often, either seasonally or sporadically to follow rainfall or prey, for example, or to spend months or years underground (page 160). Habitat fragmentation and

demarcation, especially by fences, have restricted the number and magnitude of many of these movements. Wildlife corridors are effective ways to re-establish connectivity. These are narrow areas which connect and allow movement between key areas. The development of wildlife corridors is being explored in some areas as a mechanism to re-establish historic wildlife movements. Studies suggest that medium-sized herbivores can re-establish migrations relatively quickly once physical barriers have been removed.⁴²

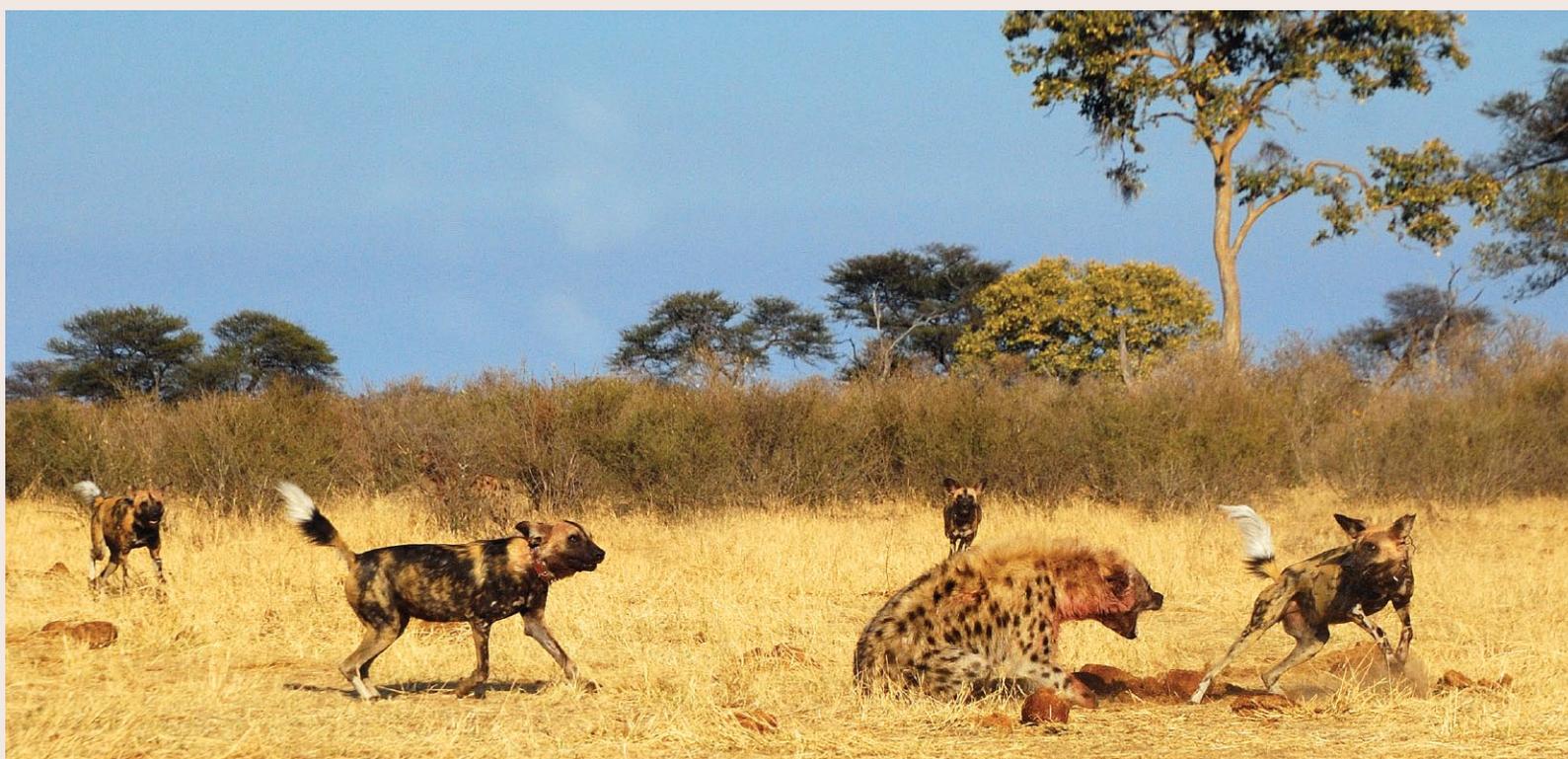
Large carnivores

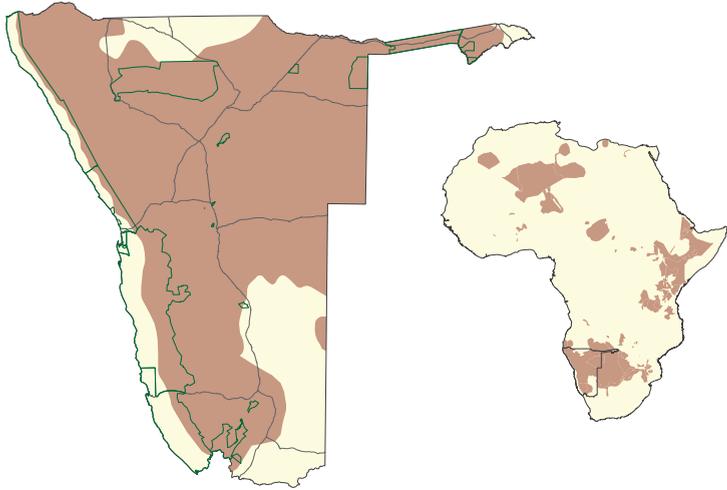
Namibia is proud of its conservation achievements in maintaining the presence of large predators across most habitats, helping to counter the major shrinkage in the global ranges of lion, African wild dog and spotted hyaena in the past 50 years; these are the predators that are least tolerated by livestock farmers (pages 234–235). Strongholds for large carnivores are the national parks, particularly Etosha, and the communal conservancies in northwestern and northeastern Namibia. In contrast, the areas most devoid of carnivores are the Namib Sand Sea, where prey is scarce and water is lacking, and the area north of Etosha, where rural human population density is the highest in the country. Southeastern Namibia also has very low diversity of large carnivores, mainly because poisoning and persecution by farmers has driven out all large carnivores except for leopard. The distribution of large carnivores in Namibia is much more restricted than it was 100 years ago, but carnivores still persist over large parts of the country thanks

both to the extensive farming practices which provide habitat for wildlife that carnivores prey on and, to a large extent, the tolerance of Namibian farmers who coexist with carnivores. While carnivores often conflict with livestock farmers (page 235), they do provide important services in the broader ecosystem such as regulating populations of species lower in the food chain.

State-protected areas, communal conservancies, community forests and concessions made up 40 per cent of Namibia's land surface in 2022 (page 256). Such a large conservation network helps to keep natural ecological processes intact. The tourism value of these areas, supporting iconic cats such as leopard and cheetah, is also an important contribution to Namibia's economy.

The carnivore maps presented here show the areas where the species are likely to be resident. Individuals recorded outside of the main distribution range are usually dispersing immature animals looking for suitable places to establish themselves.

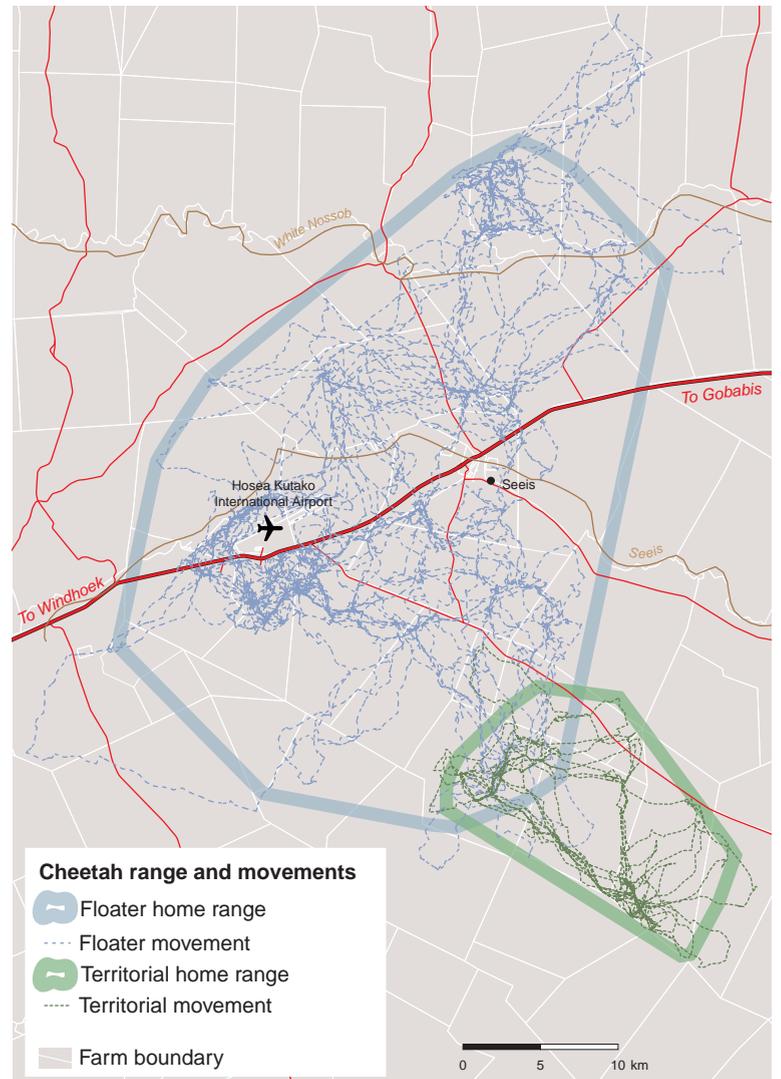
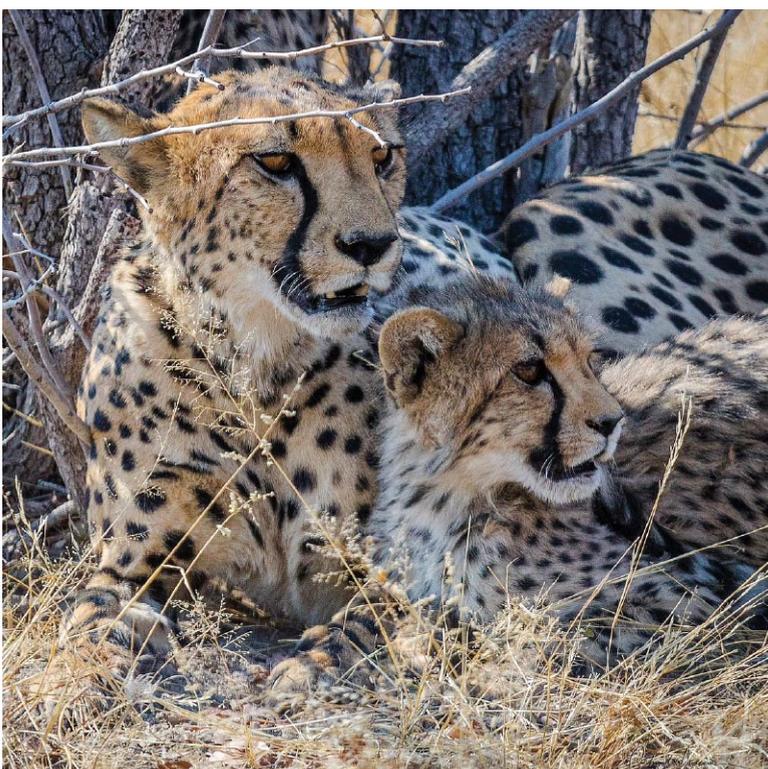




7.27 Distribution of cheetah⁴³

The cheetah (*Acinonyx jubatus*) was once widely distributed through Africa, India and the Middle East but now occurs in less than 10 per cent of its historical range. The largest remaining viable populations are found in southern Africa, and less than a quarter of these are in protected areas. Cheetahs are still found widely throughout the central and northwestern parts of Namibia, and even on the eastern edge of the Namib Desert.

Cheetahs have benefited from the large-scale removal of lions, leopards and spotted hyaenas from freehold farmlands, and from the recovery and reintroduction of wildlife onto livestock and game farms. They prey primarily on wildlife and even on livestock farms about 95 per cent of their prey is wildlife. Nevertheless, conflict with livestock and game farmers is the major threat to the cheetah population in Namibia, as it is elsewhere in southern Africa. There were an estimated 1,500 cheetahs in Namibia in 2022.

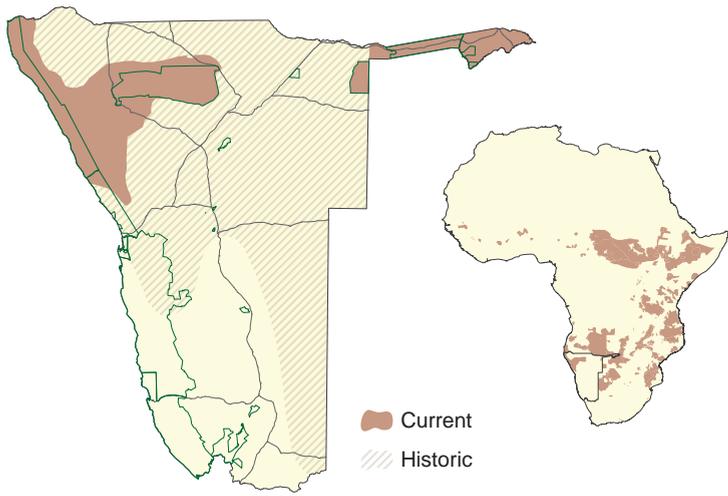


7.28 Cheetah movements on central Namibian farmlands⁴⁴

Cheetahs have an unusual pattern of social organisation. Some males establish territories, within which they frequently mark particular large trees and termite mounds with their urine and faeces which serve as ‘communication hubs’ to advertise their presence to other cheetahs. These territories overlap the larger territories of single females. Other males in the area roam around as ‘floaters’, either singly or in small groups of brothers or other related males.

The map shows the movements of a male that switched from being a floater (blue line), with a home range of 1,116 square kilometres, to being a territory-holder (green line) with a much smaller home range of 289 square kilometres. Territory-holders are usually more aggressive and heavier than floaters, perhaps as a consequence of having better access to food resources, but they eventually lose their territories when challenged successfully by coalitions of floaters.

Understanding the social organisation of cheetahs can help farmers to avoid conflict with them by adjusting their livestock management practices. For example, moving breeding herds away from communication hubs can minimise livestock losses.

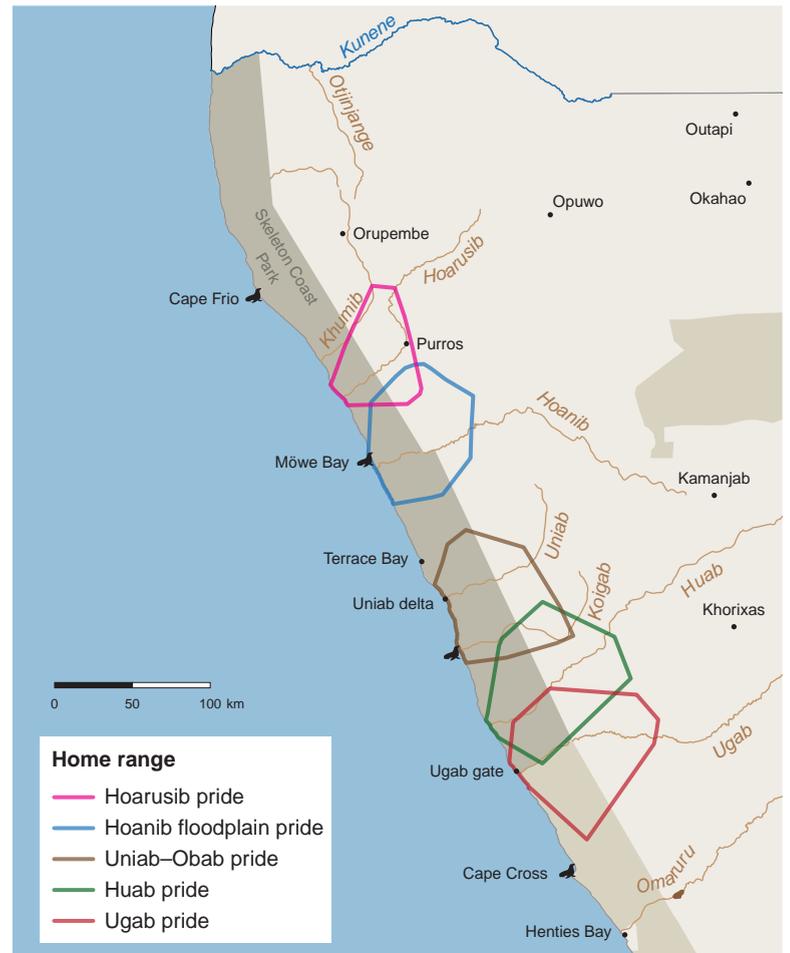


7.29 Distribution of lion⁴⁵

Lions (*Panthera leo*) are now found in less than 8 per cent of their historical range in Africa and central Asia. This map also shows how severely their range has shrunk in Namibia since 1934, when it was noted that “very occasionally a wandering lion may be heard within a mile or two of Windhoek”.⁴⁶ Most lions now live in protected areas such as Etosha National Park, but lions also live in communal conservancies at low densities in the arid conditions of the northwest and savannas of the northeast.

Although lions are generally declining across Africa, four southern African countries – Botswana, Namibia, South Africa and Zimbabwe – have not experienced the same declines because of the implementation of effective conservation practices, which make human–lion coexistence feasible. Most important is the maintenance of wildlife on which the lions can prey, and improved management practices that protect livestock, such as herding cattle during the day and confining livestock in lion-proof kraals (stockades) at night. Other measures include early warning systems that alert farmers to lions approaching their homesteads, and ‘wildlife credit’ schemes through which local residents receive payments for lion sightings by tourists or by camera traps.

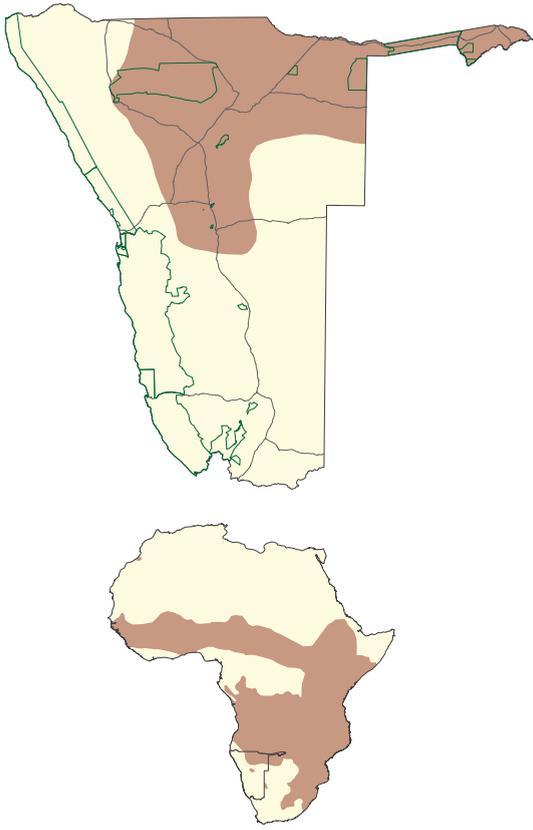
Lions will, however, always be vulnerable to retaliatory killing by livestock owners. Other threats that Namibian lions may face are an increasing trade in body parts such as teeth, bones and claws, and an over-reliance on trophy hunting to address human–lion conflict or for pure profit. Internationally and in Namibia, lions are classified as ‘vulnerable’ according to the international IUCN Red list system of classifying organisms under threat. There were an estimated 800 lions in Namibia in 2022.



7.30 Lions along the Skeleton Coast⁴⁷

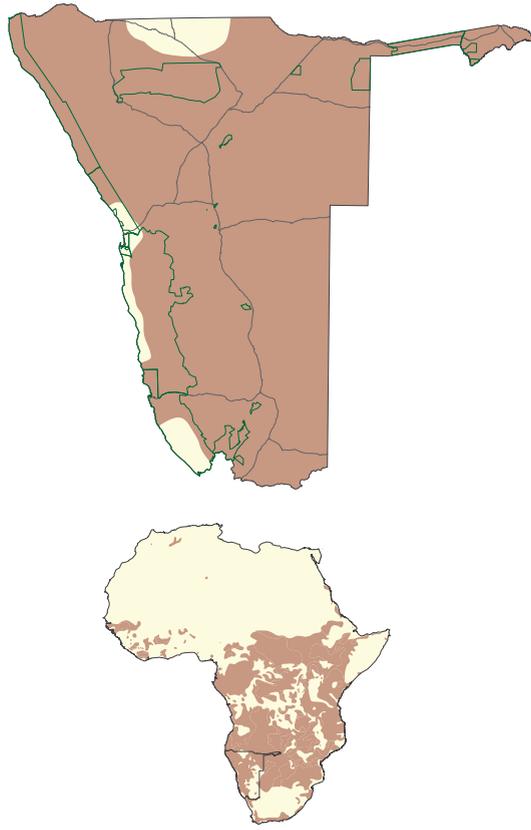
The extremely arid Skeleton Coast Park is not an environment that one immediately associates with lions. Nevertheless, they do live in this area as shown in this map of home ranges of five prides that utilised the area between 2002 and 2017. The home ranges of the prides are centred around a number of ephemeral rivers, which provide conduits to the coast. Lions in these prides have learned to use marine and wetland resources; hunting and scavenging on cormorants and seals on beaches (as in the photo below), and flamingos and ducks at coastal springs. This complements their more usual prey of oryx and ostrich attracted to the green grass and freshwater springs along the rivers and further inland. The home ranges of these desert-adapted prides, at an average size of 4,726 square kilometres, are much larger than those of other prides elsewhere in Namibia and Africa. While these are the only lions known to feed on marine animals, it is not uncommon for lions to specialise on unusual prey, such as porcupine and elephant.





7.31 Distribution of serval⁴⁸

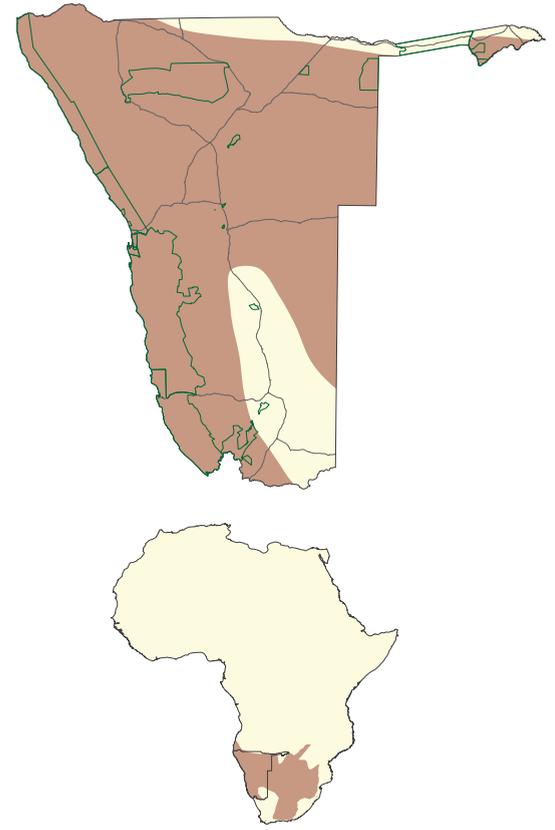
The serval (*Leptailurus serval*) is a slender, long-legged, medium-sized cat that is usually associated with wetlands and their fringing tall grasslands and reedbeds and the denser vegetation of floodplains and riverbanks. Servals are therefore naturally scarce in Namibia. However, records from central Namibia show that these cats are present at very low density in semi-arid savanna habitats too, possibly using riverbeds to move between patches of dense vegetation and water sources. Servals prey mainly on rodents, but also eat birds, reptiles, insects and sometimes other mammals such as small antelopes and hares.



7.32 Distribution of leopard⁴⁹

Of all the large cats in sub-Saharan Africa, the leopard (*Panthera pardus*) has the widest distribution with the least fragmentation and the most connectivity between populations. It is also the most adaptable of the cats, and leopards are found throughout Namibia except for the Cuvelai and the desert coast. The current distribution pattern is probably fairly similar to the historical distribution.

Leopards are opportunistic hunters that prefer medium-sized ungulates but hunt a wide range of species. Being secretive, they survive close to human habitation and most leopards in Namibia live outside national parks on freehold farmland. They are at times trapped or killed by farmers due to proven or perceived threats to livestock; leopards that kill livestock are often sub-adult males or old individuals, preying at times on calves, small stock and poultry. There were estimated to be 11,730 leopards in Namibia in 2022.

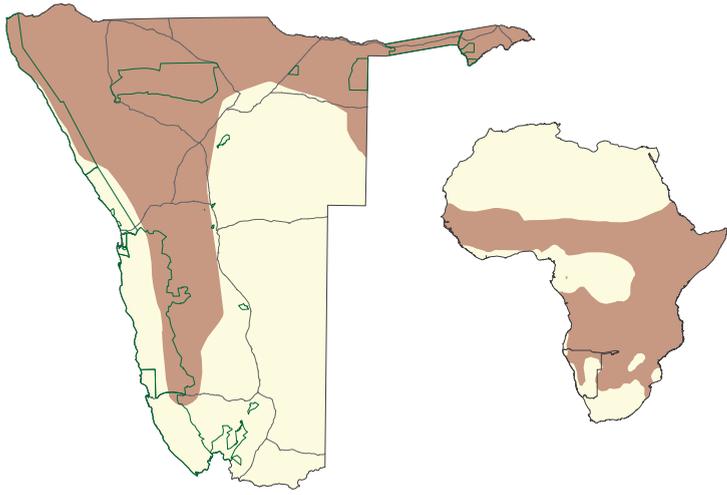


7.33 Distribution of brown hyaena⁵⁰

The brown hyaena (*Hyaena brunnea*), a rather shy carnivore, is quite widespread across Namibia. Historic records show it as being absent or very rare in eastern Zambezi Region and rare in areas of southeastern ǀKharas Region. The current distribution is similar except for its absence in north-central Namibia, which is now densely populated with people. Small-stock farming may account for their absence in parts of southern Namibia, due to increased conflict and less tolerance of farmers towards carnivores. There were estimated to be 3,000 brown hyaenas in Namibia in 2022.

Brown hyaenas are solitary, opportunistic foragers that scavenge most of their food. On Namibian farmland they predominately scavenge from leopard and cheetah kills, while along the coast their diet mainly comprises seals and seabirds.

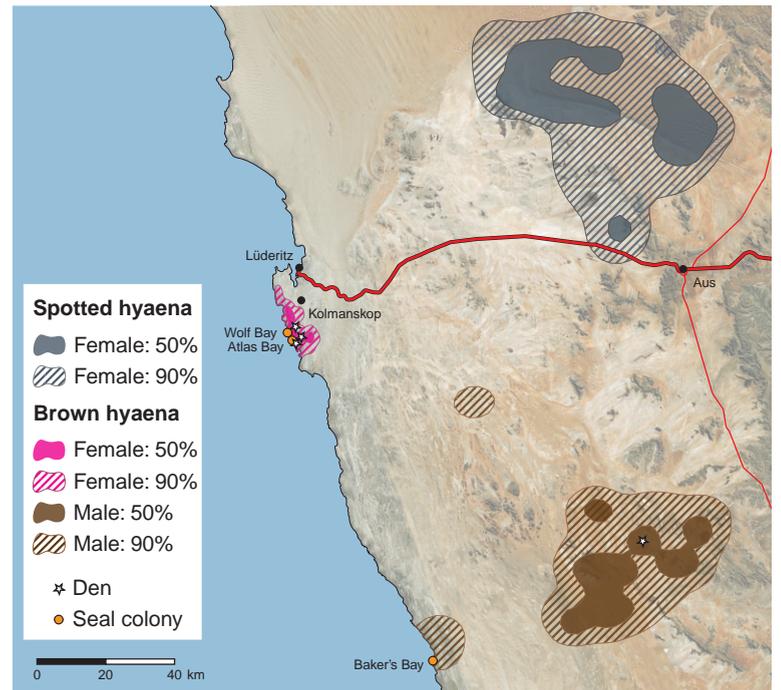




7.34 Distribution of spotted hyaena⁵¹

The spotted hyaena (*Crocuta crocuta*) has been almost completely eradicated outside of national parks and fenced-in private game reserves. Spotted hyaenas do occur outside protected areas in northwest and northeast Namibia, but mostly in areas with few people. They occur at low densities in parts of the Namib, where they have enormous home ranges of more than 4,000 square kilometres, over ten times bigger than those living in Etosha, which have ranges of less than 400 square kilometres.⁵²

They live in social groups called clans in which the females are dominant and all breed, but the dominant female has priority over food that the clan obtains and consequently usually raises the most offspring. Spotted hyaenas are commonly thought to be scavengers but, in fact, they are competent predators in their own right. The population is decreasing across their range mainly because of habitat loss, shortages of prey and conflict with farmers over livestock predation. There were estimated to be fewer than 720 spotted hyaenas throughout Namibia in 2022.



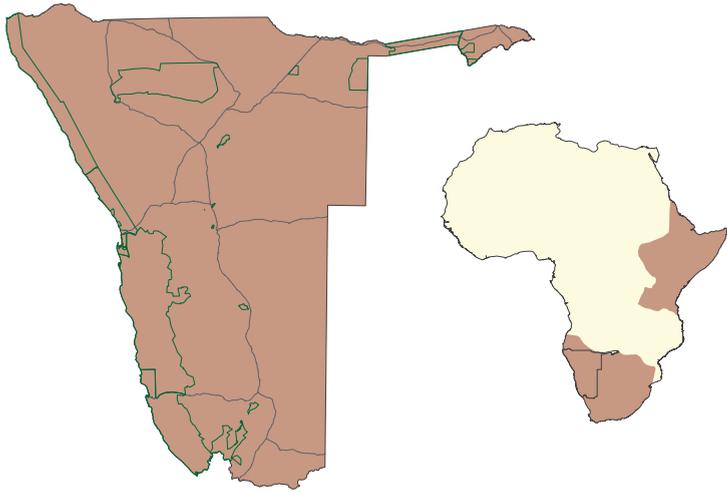
7.35 Hyaena home ranges in the southern Namib⁵³

This map shows the areas covered by two brown hyaena individuals and a spotted hyaena. The inner, solid colours show the home ranges of these individuals where they spent 50 per cent of their time; the outer (striped) areas show the areas where the individuals were for much (90 per cent) of the time during the yearlong surveys.

The brown hyaena living at the coast (pink) fed largely on seals and seabirds and moved relatively little, averaging 18 kilometres a day. Most of the movements made by this female were between her various den sites and the seal colonies at Wolf and Atlas bays. Compare her home range to that of the male (brown shading) who resided further inland, making occasional foraging trips to the Baker's Bay seal colony and the Kaukausib spring, each more than 60 kilometres away from his den.

The spotted hyaena had an even larger range (grey) in the very marginal conditions of the southern Namib. This female's home range near Aus covered an area of just over 3,000 square kilometres. Spotted hyaenas can move tremendous distances; for example, a young male was photographed in the Khomas Hochland in 2018, 450 kilometres from where he lived near Aus in 2016.

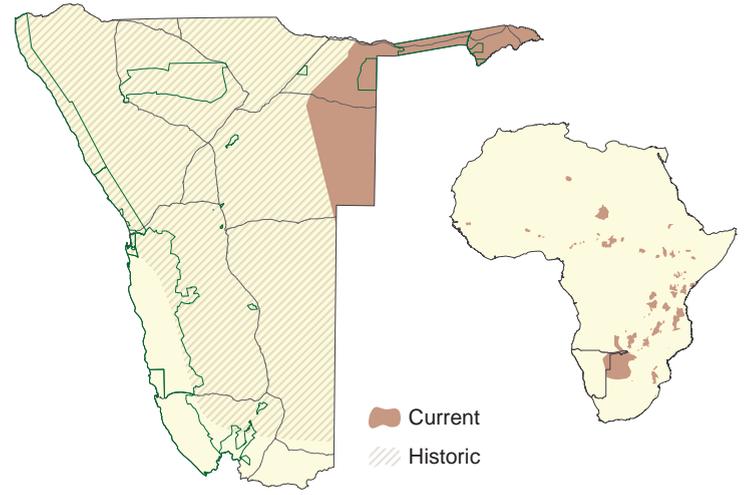




7.36 Distribution of black-backed jackal⁵⁴

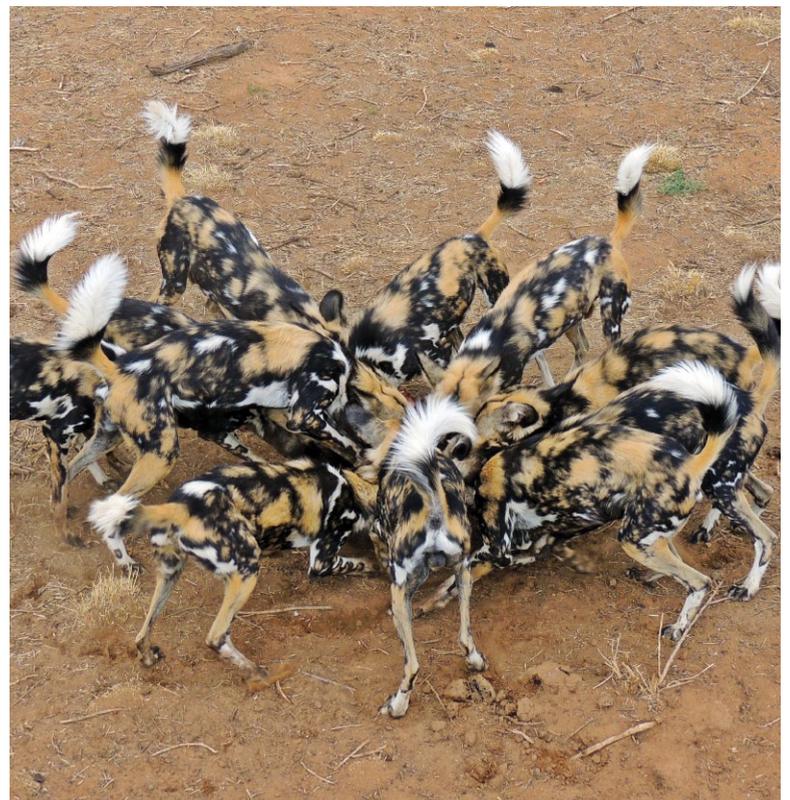
The black-backed jackal (*Canis mesomelas*) is well known and widespread throughout Namibia. In some areas these jackals are considered to be pests for preying on small livestock. But they also serve farmers by controlling populations of rodent and insect pests, distributing seeds from fruits and berries and by scavenging on dead animals that could otherwise be a source of diseases to other animals.

While predator control measures undoubtedly kill many jackals, such measures may be ineffective in controlling the jackal population, and can result in higher levels of carnivore–livestock conflict. This is because non-selective trapping and poisoning depletes the availability of other small mammals, consequently raising the likelihood that jackals will kill livestock. Also, upsetting the social dynamics of the breeding pairs and other immature jackals in the area can result in more opportunistic breeding and a local increase in the jackal population. The map shows that, despite decades of effort trying to reduce jackal numbers, they have not been eradicated anywhere. Their population is regarded as stable.



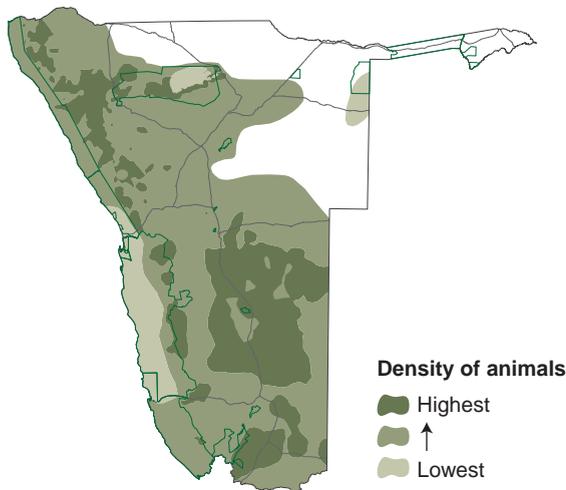
7.37 Distribution of African wild dog⁵⁵

The African wild dog (*Lycaon pictus*), with fewer than 550 individuals in 2022, is considered Namibia's rarest mammal and classified as 'critically endangered'. African wild dogs were originally widespread, extending far into southern Namibia, the pro-Namib and the northwest, but are now confined to the wetter northeastern parts of the country. This severe shrinkage of their range has occurred quickly, as wild dogs were still resident on the eastern edge of the Namib in the 1970s, and is probably because they are more visible than other carnivores, hunting in packs during daylight hours, and using communal dens which makes them vulnerable to farmer retaliation. Road kills are a significant cause of mortality. Their preferred prey is antelope up to the size of wildebeest, but they will attack livestock if their natural prey has diminished.



Large herbivores

Almost all parts of Namibia support one or more large herbivores as illustrated in the following maps.⁵⁶ Some are browsers (eating woody vegetation), others are grazers (consuming grasses and herbs), and others are mixed feeders. Some can survive long periods without water, but others need to drink every day. Many of these herbivores are widespread, occurring in protected areas as well as over large areas of freehold and communal lands. Some

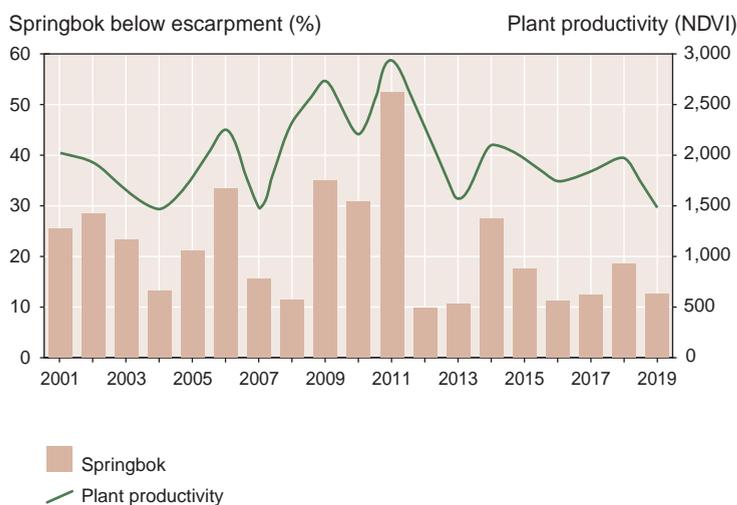


of these species make seasonal movements in response to environmental conditions, such as drought and rainfall. All are important 'big game' attractions for tourists to Namibia and the majority of them are hunted to provide income as trophy animals or meat for local people. Thus, these species have important monetary value, which often exceeds that of livestock. Their considerable intrinsic appeal also contributes to Namibia's character.

7.38 Distribution of springbok⁵⁷

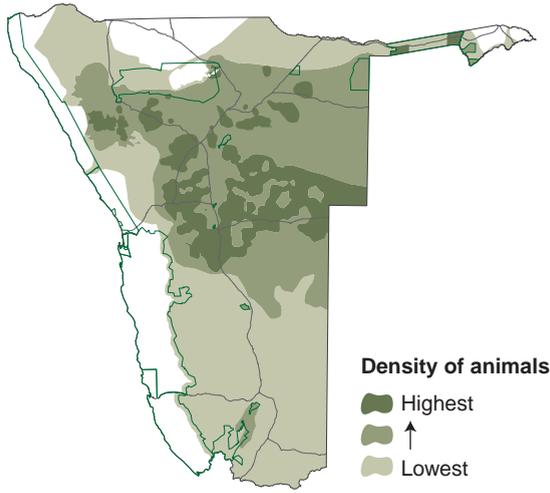
Springbok (*Antidorcas marsupialis*) are widely distributed in Namibia but are most abundant in open habitats with sparse tree cover. They are primarily browsers, feeding on shrubs and succulents, and can survive without drinking even in the harshest desert habitats if their food comprises at least 67 per cent water. The highest densities of springbok are found on the eastern plains of the Namib, in shrubland surrounding Etosha Pan, and in the southeastern regions of the country.

7.39 Movement of springbok up and down the escarpment⁵⁸



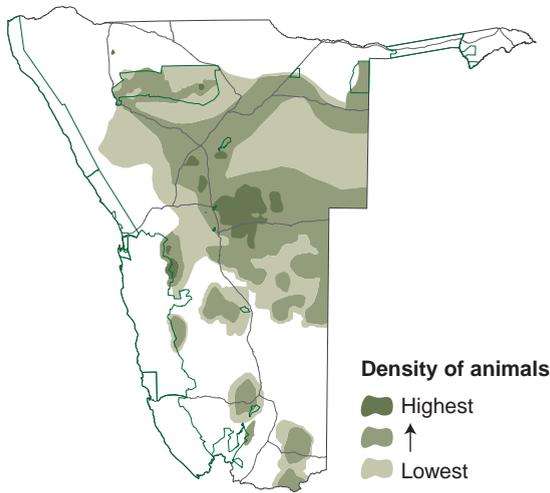
The strongly seasonal nature of rainfall (page 89) and its variability (pages 92–93) influence the availability of forage at different times of year and over consecutive seasons. One strategy used by many herbivores to live with these changeable conditions is to follow the rains and move to areas with better forage. Since 2001, annual game counts have been conducted on communal lands in the Erongo and Kunene regions. Rainfall is low here and vegetation cover is particularly variable, especially at the lower altitudes west of the escarpment. This chart shows the proportion of counted springbok sighted below the escarpment over a 19-year period in relation to plant productivity, shown as a vegetation index (page 176). The springbok responded to changes in the availability of vegetation by moving down the escarpment in good rainfall years and back up again in drier times.





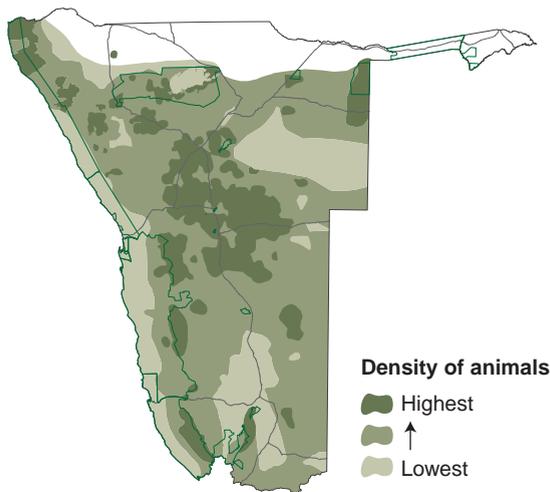
7.40 Distribution of kudu⁵⁹

Kudu (*Tragelaphus strepsiceros*) are found in most parts of Namibia, except the Namib Desert and Cuvelai drainage basin. They are browsers and favour thickets for cover; the highest densities are found in the Acacia Tree-and-Shrub Savanna biome (pages 165–166) in central Namibia. Relatively few kudu occur in protected areas, with the majority being on freehold farms, especially in areas with thick bush.



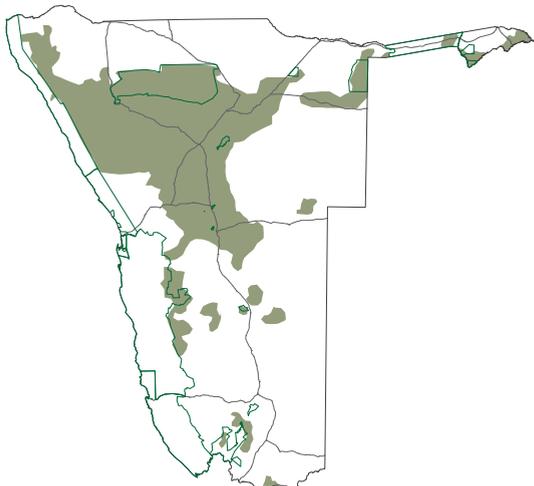
7.41 Distribution of hartebeest⁶⁰

Hartebeest (*Alcelaphus buselaphus*) predominantly occur in the Acacia Tree and-Shrub Savanna biome (pages 165–166) in central Namibia. They are gregarious grazers and typically form herds of over 20 animals. They are mainly active in the early morning and late afternoon, resting in shade during the heat of the day. Most of Namibia's hartebeest occur outside protected areas, on freehold farms.



7.42 Distribution of gemsbok⁶¹

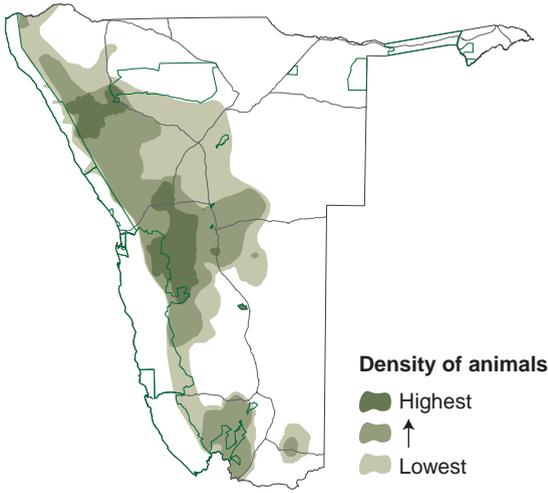
Oryx (*Oryx gazella*), or gemsbok as they are locally known, generally graze but switch to browse when palatable grass is sparse. They do not depend on drinking water and occur throughout most of Namibia, even in areas of true desert. The greatest concentrations are in the central areas and along the edges of the Namib Desert. Along with kudu, they are popular among trophy hunters and their meat is sold by many butchers and restaurants.



7.43 Distribution of giraffe⁶²

Giraffe (*Giraffa camelopardalis* subspecies *angolensis* and *giraffa*) are widely and thinly spread across a broad zone in the central and northern areas of the country. They are browsers, feeding on leaves and twigs of trees, and their distribution largely corresponds to the Acacia Tree-and-Shrub Savanna biome (pages 165–166), but also extends into the desert environment below the escarpment.

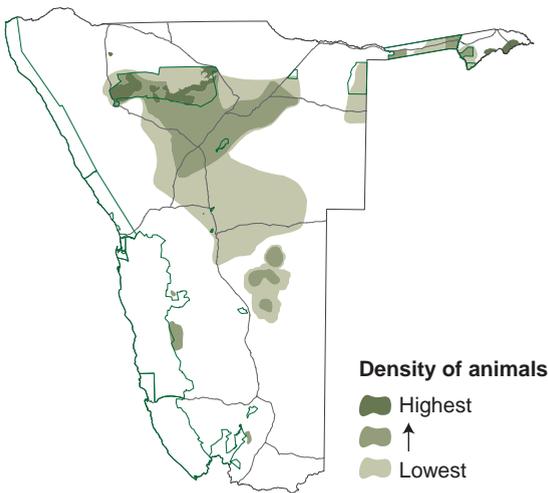




7.44 Distribution of Hartmann's zebra⁶³

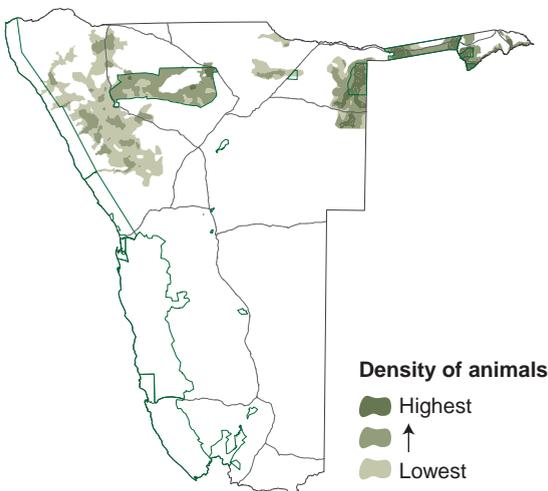
Hartmann's, or mountain, zebra (*Equus zebra hartmannae*) is a protected species and Namibia's only endemic large mammal. Its range is largely confined to the escarpment; partly because they are dependent on water that the many springs (page 122) in the mountains can provide. Hartmann's zebras are grazers and will only browse when there is no alternative. Some individuals move seasonally between summer and winter ranges, while others stay in the same area. The typical social structure is

of small breeding groups comprising an adult stallion with a few mares and their dependent young; non-breeding groups consist primarily of bachelors.



7.45 Distribution of Burchell's zebra⁶⁴

Burchell's zebra (*Equus quagga burchellii*) is a plains animal and most of Namibia's Burchell's zebras are in Etosha National Park, on the plains at the edges of the pan. They live in small harems or bachelor groups that often congregate in larger herds around food and water sources. Burchell's zebras also occur in northeastern Namibia and migrate great distances into Botswana (figure 7.47).



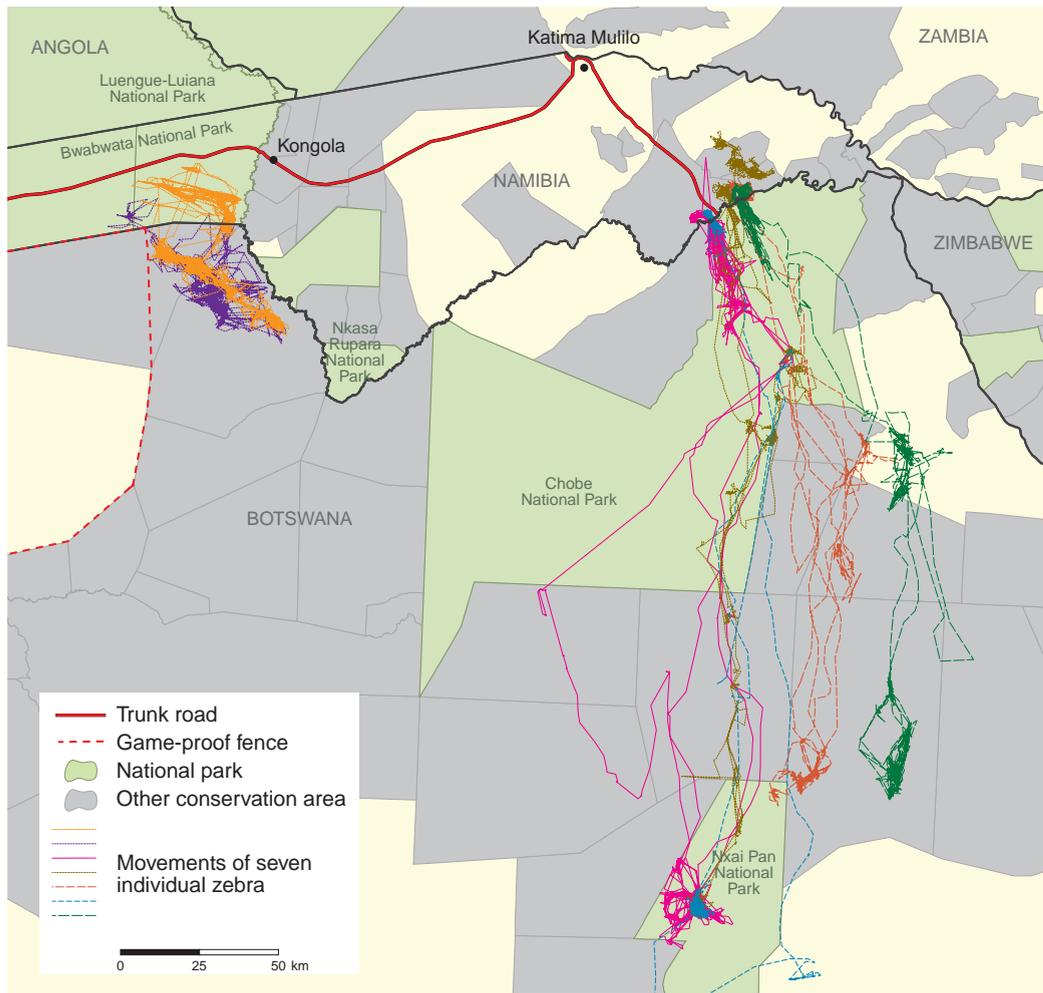
7.46 Distribution of elephant⁶⁵

Elephant (*Loxodonta africana*) occur in the northwest, in Etosha and in the northeastern areas in and around Khaidum National Park and Zambezi Region. The so-called 'desert elephants' in Kunene Region are at a relatively low density compared to the populations in the northeast. Elephants require extensive areas and travel long distances to find food and water; there are substantial

movements of elephant in and out of Zambezi into neighbouring countries as illustrated in figure 7.48. Historically, elephants were found across almost all of Namibia, except in the true desert, but by the beginning of the twentieth century the population was reduced to probably fewer than 1,000 animals as a result of hunting for the ivory trade. There are around 24,000 elephants in Namibia today.

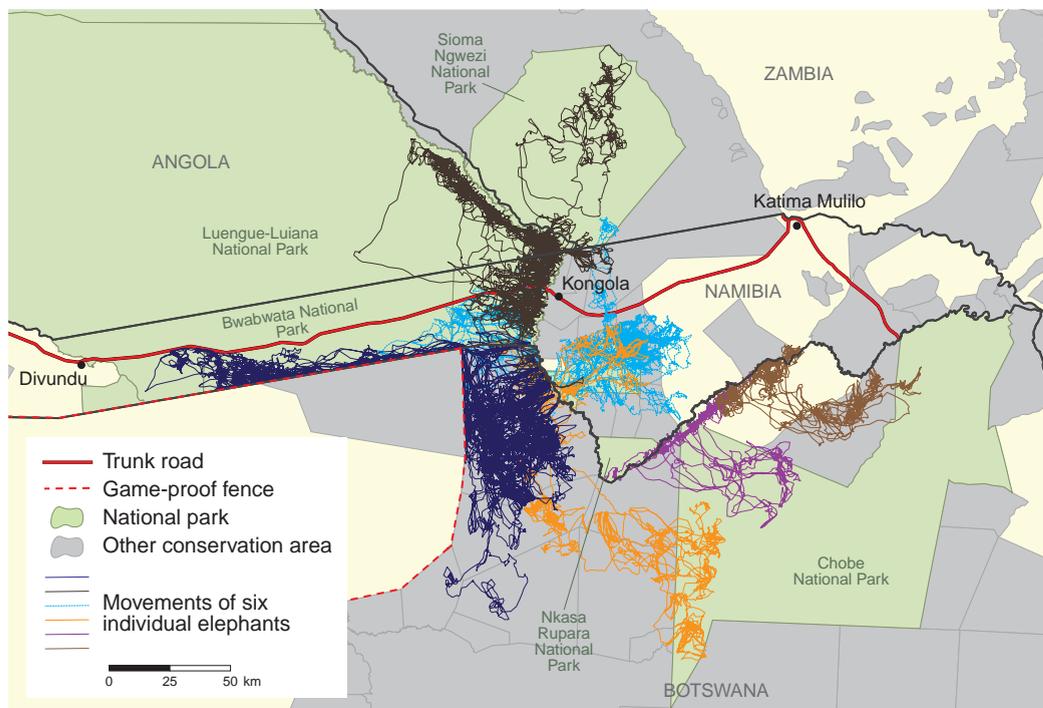


7.47 Burchell's zebra movements around northeastern Namibia⁶⁶



The map shows the seasonal movements of seven individual adult female Burchell's zebras; each had been fitted with a radio collar in Namibia. Five of them migrated from the floodplains of eastern Zambezi Region, leaving in December, crossing the Chobe River into Chobe National Park in Botswana and continuing southwards to Nxai Pan National Park in central Botswana. Their southward journey took about 15 days. They spent about 10 weeks in Nxai Pan before returning to the Zambezi floodplains. This round trip of over 500 kilometres is the longest known migration of any large mammal in Africa.

7.48 Elephant movements around northeastern Namibia⁶⁷



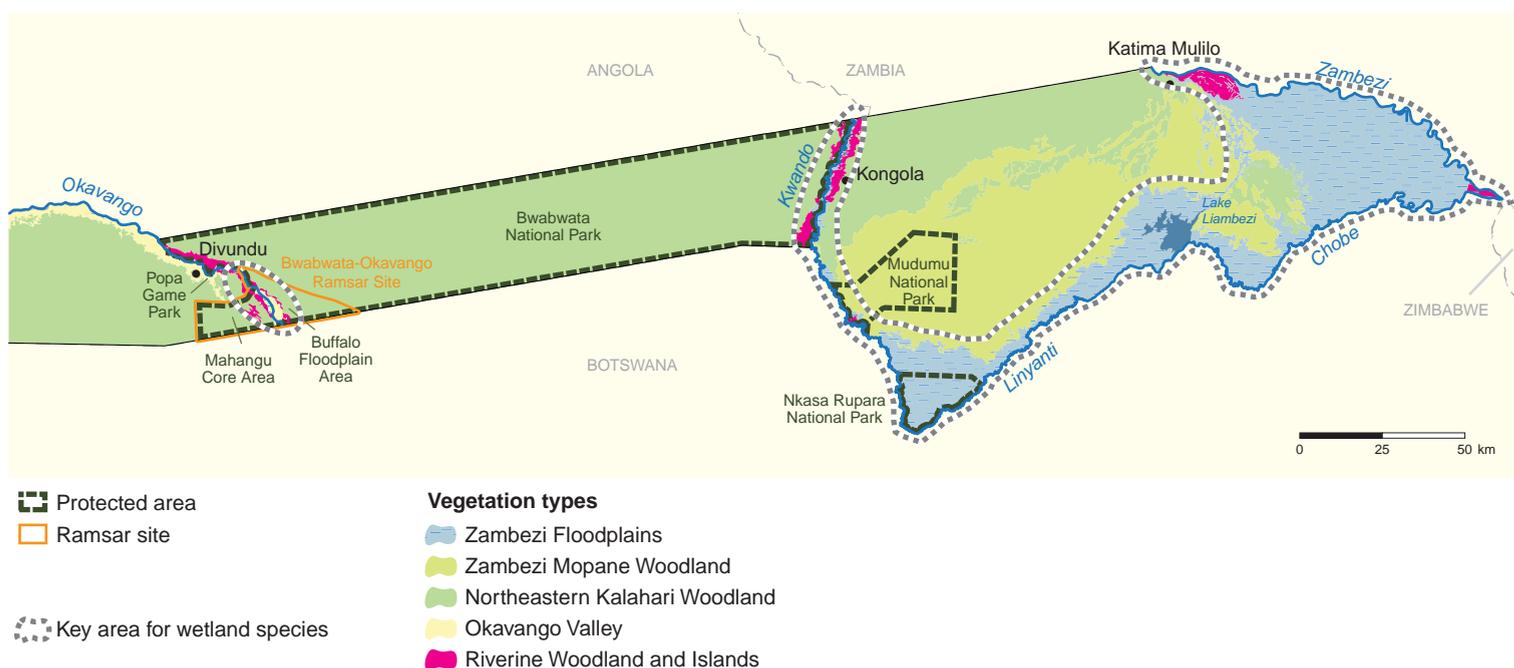
elephants are shown. The map illustrates how some move along distinct corridors close to the Kwando River connecting the Sioma Ngwezi National Park in Zambia and the Luengue-Luiana National Park in Angola with national parks, state forest and conservancies in Namibia and Botswana. Such transboundary movements are thought to be essential for these elephants, the largest contiguous population of African elephants in the world, in finding resources for their long-term health and survival.

Tracking studies, such as these, allow us to understand the animals' requirements for resources in different habitats, and how they avoid contact with resident people. Several factors, such as game-proof fences and roads, restrict the free movement of animals, demonstrated by the individual shown in dark blue that seems reluctant to cross the road, and remains south of it, and north and east of the game-proof fence.

Northeastern Namibia is central to the Kavango–Zambezi Transfrontier Conservation Area, the largest transfrontier conservation area in the world (figure 8.13).

Satellite transmitters fitted to various animals have shown how this large area is connected through the wide-scale movements of large mammals. Here the movements of six

Wetland wildlife



7.49 Large wildlife species of the northeastern wetlands

The Zambezi Region in northeastern Namibia is a refuge for many animals that depend on wetland habitats, and therefore do not occur in other parts of Namibia. This region is quite different in character from other parts of the country and its wildlife reflects this. Habitats here include broad seasonal and ephemeral floodplains adjacent to perennial rivers bordered by riparian forests and open woodland, as well as some permanent marshes and wetlands (page 116). Wildlife moves freely between Namibia and the neighbouring countries (figures 7.47 and 7.48). As well as large herds of buffalo and congregations of species such as hippo, the area is also important for less common and more cryptic mammal species such as sable antelope, roan, tsessebe and sitatunga.

Numbers of some wildlife species in Namibia's northeast wetlands, 2017⁶⁸

| Species | Estimated population |
|---|----------------------|
| Buffalo <i>Syncerus caffer</i> | 9,070 |
| Burchell's zebra <i>Equus quagga burchellii</i> | 1,820 |
| Common impala <i>Aepyceros melampus</i> | 1,380 |
| Crocodile <i>Crocodylus niloticus</i> | 660 |
| Elephant <i>Loxodonta africana</i> | 2,130 |
| Hippopotamus <i>Hippopotamus amphibius</i> | 3,300 |
| Red lechwe <i>Kobus leche</i> | 5,010 |
| Reedbuck <i>Redunca arundinum</i> | 500 |
| Waterbuck <i>Kobus ellipsiprymnus</i> | 190 |



The Mahangu and Buffalo floodplain area in Kavango East and Bwabwata National Park is a Ramsar site and supports a particularly high diversity of birds and other wildlife such as these crocodiles.



The Kwando River and especially Nkasa Rupara National Park is a key area for Namibia's hippos. Outside protected areas they may graze on crops resulting in conflict with people.

Ephemeral wetlands

Ephemeral wetlands – areas that are seasonally or occasionally flooded – are bustling concentrations of production and new life. During dry periods, aquatic plants die down and their nutrients are returned to the underlying soil, lying dormant until rain or floodwaters next arrive.

In the wet season, the entire landscape is transformed. For each permanent tree or bush, thousands of individual grasses, forbs and fungi blanket the ground; for each mammal there are now tens of thousands of insects, mites, millipedes and spiders, for instance. This life emerges from the ground. These wetlands are the only places where many insects, crustaceans, amphibians, fish and birds breed in profusion, fuelled by the great volumes of food produced when nutrients lying dormant in the earth are mobilised by the water and taken up into production. Migrant birds from the northern hemisphere, as well as regional migrants, pour in to take advantage of the abundant resources.

Namibia's most important temporary wetlands are around Tsumkwe, Lake Liambezi, the Cuvelai and its saline grasslands, and in seasonal floodplains along the Okavango, Zambezi and Kwando rivers. Their value in producing life is considerable.



Lake Liambezi is a striking example of how productive ephemeral wetlands can be, even supporting a highly productive fishery when full.



!Abi Pan and a network of other pans (page 123) near Tsumkwe transform periodically into an important wetland habitat which supports an abundance of birds and other wildlife. The contrast between the pan during a dry season (left) and a wet season (right) is striking.



Sossusvlei and the adjacent dunes are usually dry and dramatic but the area becomes even more spectacular when inundated, such as in April 2021, when unusual visitors such as white storks were reported.



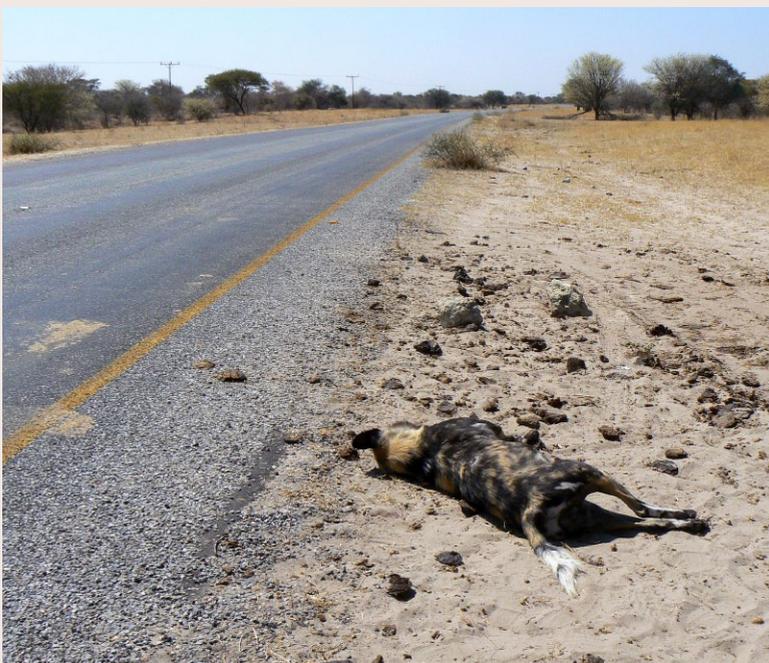
This tadpole shrimp (*Triops granarius*) lives in temporary pools of water. Its eggs are adapted to survive the extended hot and dry periods which occur after the water dries up; they hatch months or years later when the pool fills up again.

Threats and challenges to Namibian wildlife

Namibia's wildlife does not exist in isolation from people and the impacts of human activities. There are many levels of interactions between people and wildlife; some of these are positive, while some are negative. As Namibia's human population increases, pressure on the land and its wildlife is also increasing. Land becomes transformed as wild areas are cleared for farming, industry or urban development, and natural habitat is lost or degraded through factors such as overgrazing, desertification, bush encroachment, erosion and pesticide use. Traditionally, wildlife was able to move freely to find water and grazing, but as the areas available to wildlife shrink, interactions between people living in rural areas such

as conservancies and other communal areas and wild animals become more frequent and result in conflict. At the same time, human impacts cause major hindrances and threats to wildlife. These include impacts of habitat loss, persecution and poisoning, poaching and bush-meat harvesting, fences that impede movements, overharvesting of fish stocks, accidental catches of seabirds, power-line collisions, domestic cats and climate change. As human consumption and populations increase, these impacts will become more severe.

Finding a balance, between the health of wildlife populations and the land on which they depend and the livelihoods of rural people who live on this land, is a challenge.



Many of Namibia's animals utilise large areas of land and move long distances in response to rainfall, in search of grazing or prey. The restriction of free movement of wildlife by fences and roads causes direct mortalities and is also likely to reduce the genetic vitality of animal populations.

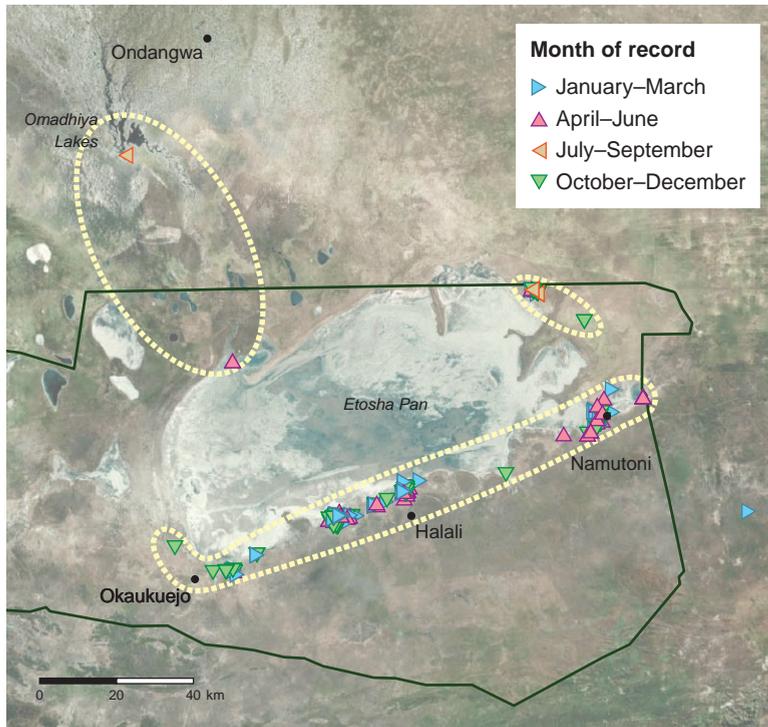


The kori bustard, the world's heaviest flying bird, is a frequent victim of collisions with power lines. It is estimated that over 50,000 bustards, cranes, flamingos and other large birds are killed in this way in Namibia and South Africa each year. Despite extensive research, there are still no fully effective solutions.



Girdled lizards occur in mountains and rocky areas throughout much of Namibia, but are rarely encountered due to their shy nature. They are popular in the pet trade due to their impressive dragon-like appearance, and are often illegally collected and exported.

Species on the edge



The small range of the blue crane in Namibia makes it particularly vulnerable to local pressures, whether they are natural or human-induced.

7.50 A species on the edge: Namibia's tiny, enigmatic blue crane population⁶⁹

While many animals in arid areas have large ranges to meet their needs, others have surprisingly small ones. The blue crane (*Grus paradisea*) has the smallest range of the world's 15 crane species. The main population of around 25,000 birds is in South Africa, where it is classed as 'globally vulnerable'. An apparently highly isolated breeding population of blue cranes also occurs in Namibia, within the Etosha National Park and on the grasslands to the north of the park. Here, population numbers have declined from 300 birds in the 1970s, to 80 in 1992 and 60 in 1994. Since 2006, regular counts have not exceeded 35; the species is therefore regarded as 'critically endangered' in Namibia.

The map shows how cranes move seasonally within and around the park: they arrive in the park at the end of the dry

season, and take up their nest sites on the seeps around Etosha Pan when the rains start. Once the chicks have fledged, the cranes move to grassland habitats in the northeast of the park and, from there, north to the Omadhiya lakes where they spend the dry months.

In these arid habitats blue cranes are dependent upon water for survival, roosting and rearing their chicks in safety from predators. They are therefore vulnerable to changes in the permanence and reliability of waterbodies. They are threatened by habitat loss and increased competition for space and resources, particularly when they leave the park for areas where numbers of both humans and stock have increased, and where illegal hunting has been reported.



In the past Dead Vlei in the Namib received sufficient water to support the growth of large camelthorn trees. The trees died hundreds of years ago when the Tsauchab River was blocked by encroaching sand dunes.



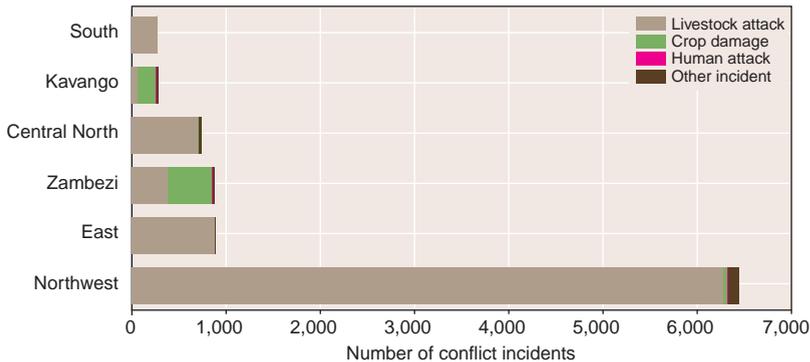
The cave-dwelling catfish, *Clarias cavernicola*, is known only from the Aigamas cave system in the Karstveld, and nowhere else on Earth. This small catfish is confined to a dark underground aquatic habitat in which the temperature and chemical characteristics of the water remain constant. Changes to the physical and chemical properties of the cave system and its water, such as those potentially caused by climate change, chance events and groundwater abstraction, may threaten the survival of this catfish. For this reason the population is considered critically endangered.⁷⁰

Living with wildlife: human–wildlife conflict

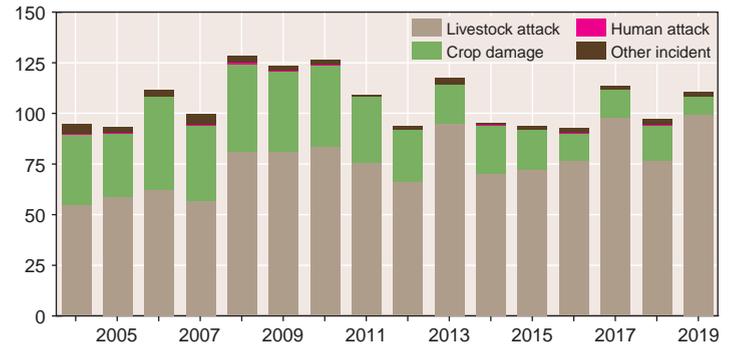
Human–wildlife conflict occurs when people are directly affected by wildlife damaging or threatening their livelihoods or lives. Conflicts between people and animals in Namibia are most problematic on communal lands where large predators and herbivores are present and where farming families are

often unable to bear the costs of damage caused by wildlife. The wildlife living in communal conservancies is, however, also a valuable natural resource, improving local livelihoods through tourism and hunting revenues. Balancing the costs against the benefits of wildlife to local economies is not easy.

Location of conservancies



Average number of incidents/conservancy



7.51 Types of conflicts reported in communal conservancies, 2019⁷¹

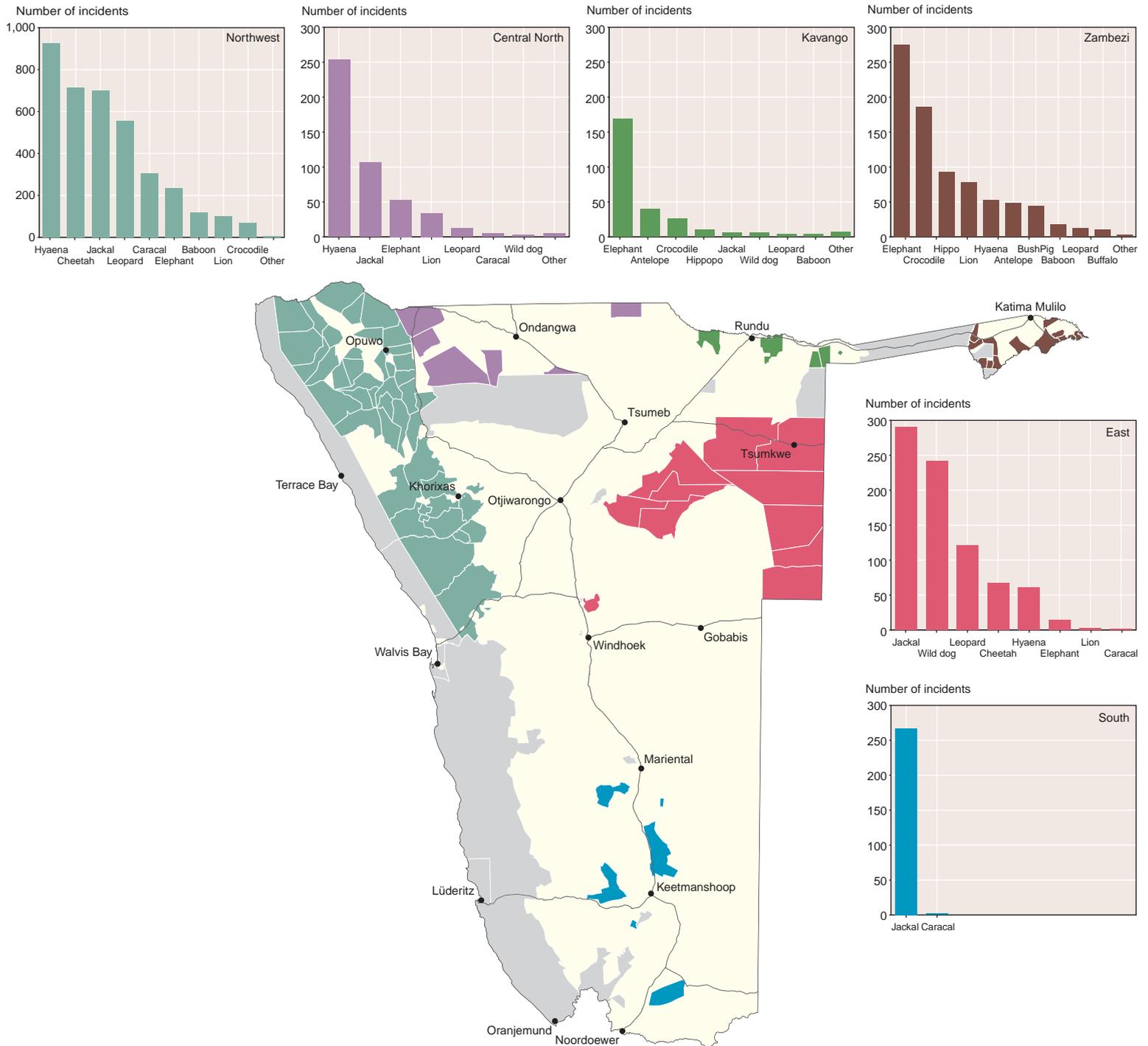
There are four main kinds of conflict: 1) attacks or predation on livestock by predators; 2) damage to crops, usually caused by feeding or trampling by elephant, hippo and antelope; 3) attacks on people, most frequently by crocodiles and elephants; and 4) other incidents, such as damage to water infrastructure by thirsty elephants. Livestock predation was most common in 2019, except in Kavango and Zambezi which were most affected by crop damage. These regions have extensive areas of smallholder crop farming and high densities of people, as well as diverse populations of mammals including a large number of elephants. By contrast in the arid northwest, the main impact of the small population of elephants was on infrastructure, especially of water pumps and pipes, but this impact was small in comparison to attacks on livestock by predators. Human attacks are usually infrequent, and in 2019 they amounted to 18 out of 9,502 reported incidents; nevertheless, these are the most distressing types of attacks for people living with wildlife.

7.52 Annual frequencies of human–wildlife conflicts, 2004–2019⁷²

The average number of incidents per conservancy across Namibia has been relatively stable, despite increases in the human and wildlife populations. Attacks on livestock dominate the conflict, followed by crop damage, other incidents, and attacks on humans. Predator populations have been stable or increasing in recent years and this is reflected in the slight rise in livestock attacks. In contrast, the number of incidents of crop damage has decreased since 2010, possibly as a result of mitigation measures adopted since this time. A range of measures are used to prevent or reduce conflict including chilli ‘bombs’ to deter elephants from damaging crops; predator-secure enclosures to protect livestock at night; and exclusion fences to allow people and livestock safe access to rivers away from crocodiles.



Namibia is home to several highly venomous snake species. Snakes are often the cause of human–wildlife conflict and consequently many snakes are killed on sight, whether they are venomous or not. The zebra snake (left, *Naja nigricincta*) and black mamba (right, *Dendroaspis polylepis*) both occur in densely populated areas, and the zebra snake is the species most commonly involved in snakebite incidents. By contrast, the black mamba, the subject of many legends and stories, rarely bites humans.

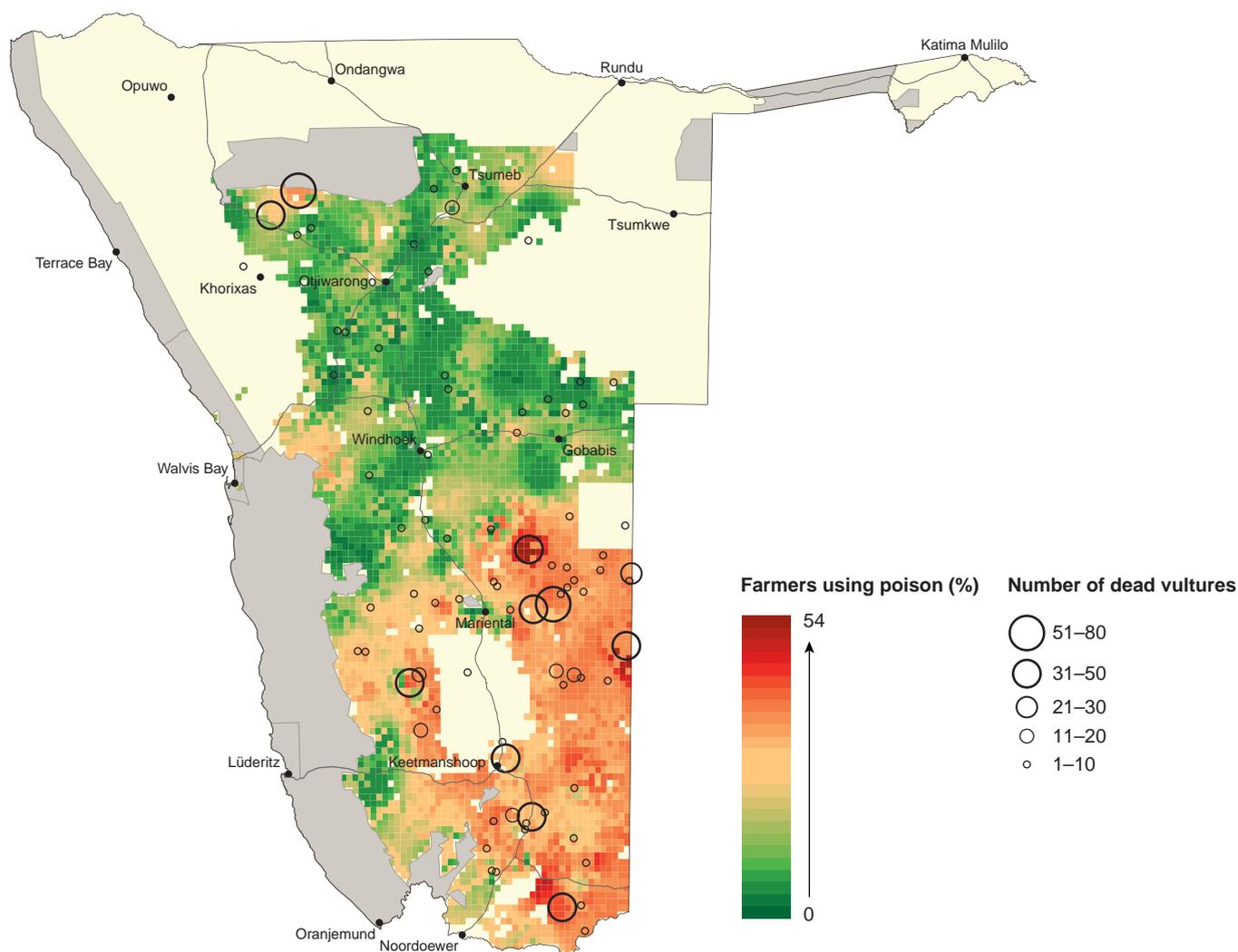


7.53 Species-specific conflict incidents in communal conservancies, 2019⁷³

Sixty-three of 86 registered conservancies reported conflict incidents in 2019. The regional groupings used in the charts reflect the broadly different habitats they encompass. The Okavango, Kwando, Zambezi and Chobe river systems in the northeast are important for both people and wildlife, and the most important conflict species here are elephant, crocodile and hippo. Elsewhere, hyaena or jackal top the list, with cheetah also causing conflict in the northwestern conservancies. Interestingly, although lions are often perceived to be a significant threat, they are actually responsible for fewer incidents than many of the other carnivores.



Crimes against wildlife



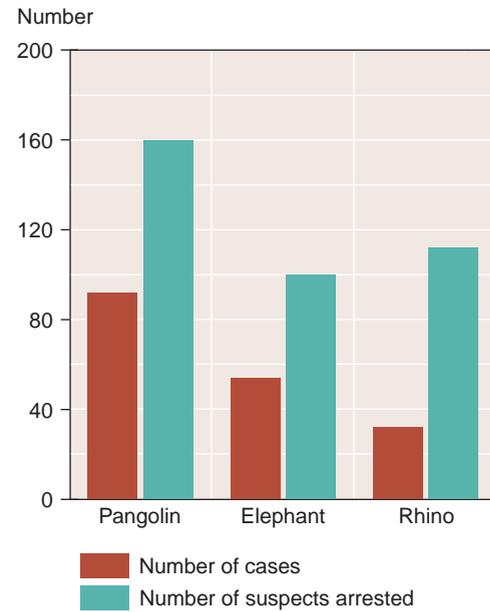
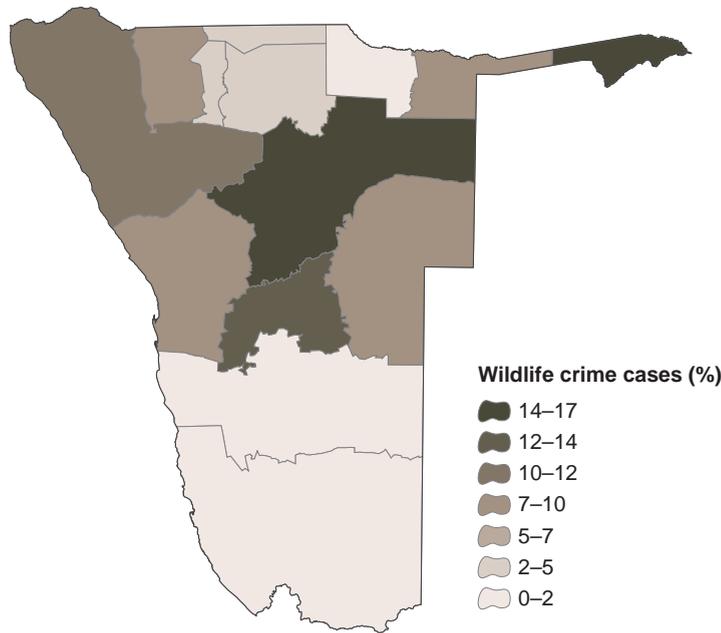
7.54 Poison use and vulture deaths on freehold farms, 2000–2015⁷⁴

Poison is used by livestock farmers to control predators, but often has a significant impact on non-target scavenger species such as vultures. Although the use of poison to control predators has been illegal in Namibia since 2001 this practice is still prevalent, as shown on the map. On average, 20 per cent of Namibia's freehold farmers use poison to control predators with the most frequent use being in the south of the country where about half of

the farmers use it. The symbols show data on a total of 804 dead vultures reported on freehold farmlands between 2000 and 2015, of which around three-quarters (590 birds) died from ingesting poison. Almost all of the others drowned (199 birds), while just a few (7 birds) died from other causes, such as electrocution or being shot. Research indicates that the levels of poison use on communal farmlands are significantly lower than on freehold lands.

In addition to accidental poisoning as shown above, a further serious threat to vultures has arisen in recent decades. As the poaching of high-value wildlife in north-eastern Namibia and northern Botswana has increased, vultures are being deliberately poisoned by poachers. Vultures soar over vast distances to forage, circling and coming down to land when they find a carcass. Thus, their presence can alert wildlife authorities to fresh carcasses. Poachers lace carcasses with poison in order to reduce vulture numbers and avoid detection. Hundreds, probably thousands, of vultures, and other scavenging species, have been killed as a result of these poisonings. Vultures are also deliberately poisoned for the harvesting of body parts for use in the traditional medicine trade. Of Namibia's six species of vultures, one is classified as Extinct as a breeding species, one is Critically Endangered, two are Endangered and two are Vulnerable.⁷⁵





7.55 Wildlife crime, 2019⁷⁶

Wildlife crime is driven by complex factors. Poachers are mostly rural people with limited economic opportunities, who seek a way out of poverty or simply food to eat. Yet high-value wildlife products such as pangolin scales, elephant ivory and rhino horn are the lucrative commodities of organised crime syndicates supplying illicit international markets. Most dealers and kingpins are ruthless criminals involved in a wide range of illegal activities. They recruit rural residents to become poachers, while involving a variety of aiders and abettors with the lure of quick cash.

The effects of wildlife crime on Namibia's economy, biodiversity and local livelihoods are severe and diverse. High-value species such as rhinos face the threat of local and even global extinction. Vast resources, which could be used for national development or conservation priorities, are now spent to combat wildlife crime. Such factors have made wildlife crime one of the central conservation challenges facing Namibia.

Strong collaboration between government, NGOs, local communities, the private sector and international funding agencies has enabled Namibia to strengthen its efforts to combat wildlife crime. Law-enforcement results in recent years have been impressive. The map shows the distribution of wildlife crime cases in 2019. In 2019 there were 174 cases and 363 arrests related to the most-targeted high-value species: pangolin, elephant (*Loxodonta africana*), and black rhino (*Diceros bicornis*) and white rhino (*Ceratotherium simum*) combined (see graph). Over half of the rhino-related arrests were pre-emptive, occurring before a rhino was poached, thus saving the targeted animals while still resulting in the conviction of the perpetrators planning the crime.

In the long term, alleviating rural poverty and reducing international demand for illegal wildlife products will be key aspects to minimising wildlife crime.



Pangolins have become the most trafficked wild animals on Earth, yet very little is known about them or the health of their populations. The ground pangolin (*Smutsia temminckii*), which occurs in Namibia, plays an important ecological role: a single pangolin can eat over 70 million ants and termites per year providing natural control of potential pest species which can negatively impact grasslands and crops and destroy fence posts and other infrastructure.⁷⁷

The bigger picture

Many creatures undertake extensive migrations in the air and in the oceans, following a variety of cues to navigate thousands of kilometres. This section provides a few examples of animals that visit Namibia while undertaking long migratory journeys to find their optimal breeding and feeding sites across the earth.

These long-distance movements can now be tracked due to revolutionary improvements in methods of collecting data using tiny transmitters. Small in size and weight (just a few grams in some cases), these devices allow scientists to monitor animal movements around the globe.



7.56 Global migrations of six migratory bird species

Arctic terns (*Sterna paradisaea*), small birds of the sea and shore that weigh about 100 grams, fly from the Arctic Circle across the North Atlantic and down along the west coast of Africa, and spend the southern hemisphere summer in the Antarctic Circle. They can be seen along the Namibian coast from about November to February. Each tern covers about 60,000–80,000 kilometres each year during its southbound and northbound migrations. This is the longest migration of any species worldwide.⁷⁸

Lesser spotted eagles (*Clanga pomarina*) breed in eastern Europe and migrate to Africa when they are not breeding; they are usually seen in northeastern Namibia from November to March, feeding on termites, grasshoppers and frogs. The path shown in the map was taken by an adult bird from Germany that covered

9,000 kilometres over a period of about eight weeks. It spent four months in southern Africa, then made its way back along an almost identical route to its breeding grounds.⁷⁹

The Amur falcon (*Falco amurensis*) is a small bird of prey weighing less than 200 grams. It commutes between China, where it breeds, and southern Africa each year. During its passage, the Amur falcon undertakes the longest over-water migration of any bird of prey, flying about 4,000 kilometres between India and Africa over the Indian Ocean.⁸⁰

Rollers are brightly coloured, medium-sized birds and the European roller (*Coracias garrulus*) shares its time between warm, dry areas in northern Africa and Europe, and southern Africa. One individual was recently tracked from its breeding site near



Arctic tern (*Sterna paradisaea*)



Lesser spotted eagle (*Clanga pomarina*) with transmitter



Amur falcon (*Falco amurensis*)



Cory's shearwater (*Calonectris borealis*)



European roller (*Coracias garrulus*)

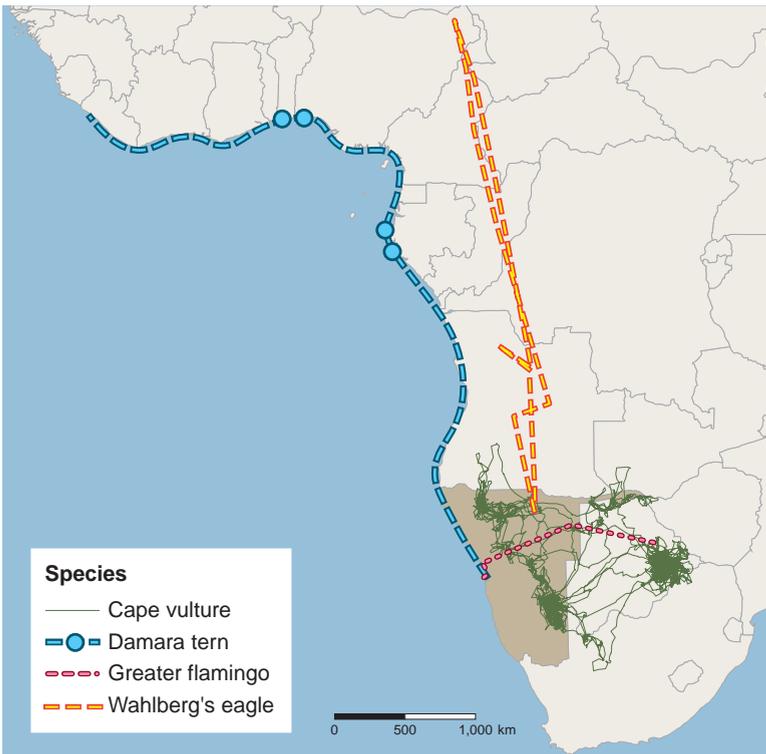


Sanderling (*Calidris alba*)

Rome, Italy, to just south of Etosha and back. Each journey took a little over two months, lingering in certain places to feed and taking about a week to cross the Sahara in each direction. Flying was mostly done at night, with up to 14 hours non-stop over the Sahara and the Mediterranean Sea.⁸¹

Cory's shearwaters (*Calonectris borealis*) are medium-sized seabirds that breed on the Canary Islands, and spend about half the year over the South and North Atlantic oceans. They pass along the coast of southern Africa in summer, concentrating to feed along the edge of the continental shelf. They cover up to 13,000 kilometres without major breaks, flying and catching fish and squid as they go. Daily movements are up to 650 kilometres.⁸²

Sanderlings (*Calidris alba*) weigh less than 80 grams. They breed in the High Arctic in the northern hemisphere summer, and then disperse annually to temperate and tropical coasts across much of the world, covering distances of 4,000–22,000 kilometres a year. In the southern hemisphere summer, thousands of sanderlings gather in the wetlands of Walvis Bay and Sandwich Harbour. In terms of the total number of wading shorebirds supported, Walvis Bay is the most important wetland in southern Africa and probably one of the three most important coastal wetlands in Africa. It is a vital refuelling station for sanderlings which spend months fattening up on invertebrates found in the muddy lagoon.⁸³



settling down in a relatively restricted area. The path of this young female Cape vulture over 63 months shows how she favoured certain foraging areas – presumably where animal carcasses were easily available – in western Omusati Region, southeastern Namibia, and eastern and northern Botswana. She also journeyed into parts of Angola, Zambia, Zimbabwe and South Africa. Such movements are achieved on thermals of warm air up to 1,000 metres above the ground. When foraging, Cape vultures fly lower to search the ground thoroughly.⁸⁵

Greater and lesser flamingos are a well-known sight at the Walvis Bay lagoon. They breed on inland pans such as Etosha, and Makgadikgadi Pan in Botswana, when these pans hold water. How they time these movements in relation to rain filling the pans is not known. The map shows the path of a greater flamingo that left Makgadikgadi Pan, stopped over at Nyae Nyae Pans, and then continued to the coast, flying 1,230 kilometres over two consecutive nights. Some of the 1.1 million lesser flamingos that bred at Etosha in 1971, a year of high rainfall in southern Africa, may have originated from East Africa.⁸⁶

The Damara tern (*Sternula balaenarum*) is Africa's smallest breeding tern. It breeds on barren salt pans and gravel plains along the Namib coast, then all but a small fraction leave southwestern Africa in about April for feeding grounds in West Africa. The birds move northwards along the Namibian coast, coalescing into larger flocks which then migrate northward to overwinter in countries such as Gabon, Nigeria and Benin, and even as far as Liberia and Senegal. They return to their breeding grounds in September and October. The mapped path is hypothetical, but it shows where birds ringed in Namibia and South Africa have been recorded on the West African coast, at least 4,000 kilometres from their breeding grounds.⁸⁷

7.57 Regional migrations of four bird species

Wahlberg's eagles (*Hieraaetus wahlbergi*) migrate each year between their breeding areas in southern Africa and woodlands north of the equator. Many other birds do the same, such as species of swallows, swifts and cuckoos. The path shown in the map is of a bird that flew 3,520 kilometres from Tsintsabis near Tsumeb to northeastern Nigeria. It spent four months there before its return journey south, which ended close to where it was first found, and where it bred again.⁸⁴

Young Cape vultures (*Gyps coprotheres*) move widely before



Wahlberg's eagle (*Hieraaetus wahlbergi*)



The aerial of a transmitter is visible on the back of this Cape vulture (*Gyps coprotheres*).



Flamingos at the lagoon in Walvis Bay



Damara tern (*Sternula balaenarum*) with identification ring

Key points

- Namibia is globally renowned for its wildlife. While some of the species are iconic and well known, many are not. They all play an important role in the functioning of the natural environment, for example by moving and cycling nutrients between trophic levels and different geographical areas.
- The marine environment has a high biomass of phytoplankton and zooplankton because of the abundance of nutrients supplied by upwellings off the coast. These support abundant fish populations and one of the world's richest fisheries. The main marine fish and crustaceans commercially harvested are anchovy, horse mackerel, Cape hake, deep-water hake, two kinds of monkfish, west coast rock lobster and deep-sea red crab.
- Marine mammals in Namibia's waters include the Cape fur seal and 31 species of whales and dolphins.
- The Namibian Islands' Marine Protected Area protects islands, islets, kelp beds and other marine habitats. These are important roosting and nesting areas for seabirds, and spawning and nursery grounds for fish and other marine animals. Six other ecologically or biologically significant marine areas have been identified within Namibia's exclusive economic zone.
- Namibia's wildlife is a major contributor to its economy, especially through its fisheries and earnings derived from tourism, trophy hunting and the sale of meat and live game.
- The value of wildlife is well recognised by the designation of many globally recognised sites. There are also 21 state protected areas, 86 communal conservancies, and several transboundary conservation areas that protect plants, animals and landscapes.
- Northern and northeastern Namibia support the greatest variety of most types of animals due to their more productive soils, higher rainfall, more tropical conditions and the presence of wetland and forest habitats. The coastal plain and Namib Desert supports a substantial number of endemic animals particularly adapted to its extreme aridity. Concentrations of endemics also occur on the central ridge of rocky highlands and escarpment. Most freshwater animals are widely distributed along perennial rivers and in ephemeral wetlands. The diversity of reptiles in Namibia is one of the highest in Africa.
- Animals in Namibia survive long dry periods between sporadic bouts of high primary production. Invertebrates and cold-blooded animals generally spend this time in a dormant state, often hidden underground, appearing only for short periods when conditions to feed and breed are favourable. Warm-blooded animals often move over large areas, opportunistically and nomadically in pursuit of the best supplies of food and/or water.
- As well as animal movements within the country, Namibia is important regionally and globally, with many animals migrating to and from neighbouring countries, sub-regionally and hundreds of bird species covering vast distances during visits to Namibia as migrants or vagrants.
- Significant numbers of six large carnivores have refuge in Namibia; their ranges in many other countries have been reduced by persecution and habitat degradation. The presence of these predators leads to conflicts with farmers in some areas. Balancing these costs against the benefits of wildlife to local economies in conservancies and the national economy is not easy.
- Major hindrances and threats to animals include impacts of habitat transformation and loss, persecution, poaching and bush-meat harvesting, poisoning, human-wildlife conflict, fences that impede movements, over-harvesting of fish stocks, accidental catches of seabirds, power-line collisions and domestic cats. It is predicted that climate-change impacts on Namibia's wildlife will become increasingly important.
- Despite these human-induced impacts, Namibia's animal life has impressive diversity, population sizes, biomass and specialisations to the country's unusual environmental conditions.