some like it hot

AFRICA'S DESERT BIRDS

Text by Andrew McKechnie

To the average inhabitant of a sprawling 21st-century metropolis, the archetypal desert is the one portrayed in films – a sun-blasted world of sand dunes and intense heat, devoid of water and life, and thoroughly inhospitable to any creature unfortunate enough to find itself stranded there. It may therefore come as a surprise to many to learn that the world's deserts are home to diverse and fascinating communities of animals and plants. Rather than the barren, lifeless expanses they are often perceived to be, deserts represent some of the most unique ecosystems on the planet, where birds and other animals bend the rules of physics and chemistry to survive and reproduce.

SHEM COMPION

KEITH BARNES

Above *The Greater Hoopoe Lark, like several other species, makes use of burrows to avoid searing midday surface temperatures in the Sahara Desert.*

Opposite, top *The massive nests of Sociable Weavers provide a spectacular example of how birds can manipulate their thermal environments.*

Opposite, bottom *The Cream-coloured Courser* Cursorius cursor*, a resident of the North African desert plains.*

Birds of the African deserts

Deserts are generally harsh environments where rain often doesn't fall for years (or even decades) at a time and where sweltering midday temperatures contrast with freezing conditions at night. Scarce and unpredictable rainfall means that water and food are almost always in short supply.

Despite their unforgiving nature, the deserts of Africa, like those of other continents, are home to a surprising number of bird species. These include the world's largest extant bird, the Common Ostrich *Struthio camelus*, several species of sandgrouse, the architecturally inclined Sociable Weaver *Philetairus socius*, and species like the Greater Hoopoe Lark *Alaemon alaudipes* that can eke out an existence on even the most barren gravel plain. There are several families of African birds whose evolutionary histories are closely linked to desert habitats, with bustards (Otididae), sandgrouse (Pteroclidae) and larks (Alaudidae) most clearly associated with these environments. A particularly interesting distribution pattern among African desert birds concerns species such as the Kori Bustard *Ardeotis kori* and Pygmy Falcon *Polihierax semitorquatus* that occur in the deserts of both south-western and north-eastern Africa, but nowhere in between. In other cases, pairs of closely related species follow similar patterns. For instance, the White-backed Mousebird *Colius colius* and Scaly-feathered Finch *Sporopipes squamifrons* are the southern counterparts of the White-headed Mousebird *Colius leucocephalus* and Speckle-fronted Weaver *Sporopipes frontalis* of the deserts of north-eastern Africa and the Sahel region.

These striking avifaunal similarities between two far-flung desert regions reflect events that occurred in the distant past. Although today the deserts of south-western and north-eastern Africa are separated by thousands of kilometres of savanna and forest, palaeontologists believe that an arid corridor linking the two regions developed in the past, during recurring glacial events that saw vast areas of North America and Eurasia covered by massive sheets of ice. This corridor, which is thought to have passed between Lakes Malawi and Tanganyika, allowed desert species to move between these corners of Africa, establishing the similarities that we see today in birds, mammals and other organisms.

Behaviour – the key to survival

Many species that live in deserts rely on ingenious behaviour patterns to avoid excessively harsh conditions. In the Sahara Desert of North Africa, Dunn's Lark *Eremalauda dunni*, Bar-tailed Lark *Ammomanes cinctura*, Black-crowned Sparrowlark *Eremopterix nigriceps* and Greater Hoopoe Larks spend the hottest periods of the day underground, in burrows excavated by the large, herbivorous Egyptian spiny-tailed lizard *Uromastyx aegypticus*. By resting in these burrows, the larks avoid the brutal surface temperatures of up to 60 degrees Celsius. They also save a considerable percentage of the water and energy that they would otherwise have expended to keep cool, thus reducing the resources that they have to obtain from their inhospitable environment.

Another way in which some desert birds avoid harsh conditions is by building shelters, with the Sociable Weaver of southern Africa being the undisputed champion in this regard. The investments of time and energy these birds make while building and maintaining their massive nests are returned with interest when air temperatures soar in summer or drop below freezing in winter. The nest-chambers provide the birds with the avian equivalent of air-conditioned apartments – cool in summer and warm in winter.

They also provide another key benefit in habitats that can go for months, or even years, without a drop of rain, followed by a single, massive downpour. Whereas most birds need to go through a busy nest-building period before they can breed, Sociable Weavers can rapidly lay eggs and raise chicks during the first flush of vegetation that follows a storm. Their nest-chambers are regularly taken over by other species, including Pygmy Falcon, Red-headed Finch *Amadina erythrocephala* and Rosy-faced Lovebird *Agapornis roseicollis*, which obtain much the same benefits as the original inhabitants.

Many other desert birds construct nests, albeit on a much smaller scale, with similar motives. On bitterly cold nights in the Kalahari Desert, Scaly-feathered Finches roost communally in insulated nests that trap the heat generated by the inhabitants, providing these tiny desert-dwellers with cosy surroundings and protection from the biting cold. By roosting together in this fashion, the finches probably save around 60 per cent of the energy they would otherwise have used to keep warm. Some birds combine physiological changes with the use of sheltered roosts to reduce their energy requirements even further. In the 1980s, Colin Sapsford found that Pygmy Falcons employ an energy-saving mechanism known as torpor (see *Africa – Birds & Birding* 10(3): 14), and lower their body temperatures by around 10 degrees while roosting in Sociable Weaver nests.

Desert nomads

Another approach to avoiding unfavourable conditions is simply to fly away. Many desert birds, like desert-dwelling humans, are highly nomadic and range across large areas. Nomadic lifestyles are common among desert birds, and heavy rainfall events in the deserts of southern Africa are often the prelude to the sudden appearance of large numbers of species such as ▷

PETER RYAN (2)

Namaqua Sandgrouse *Pterocles namaqua* and *Eremopterix* sparrowlarks. A highly mobile way of life allows these birds to track water and food resources, and to breed in regions where food and water are, for a while at least, in sufficient abundance to sustain them and their offspring. Many nomadic species are granivores, and their movements are dictated by seed production by desert plants in response to patchy and unpredictable rainfall. Because of the large proportion of desert birds that are nomadic, the number of species occurring in any given area may vary dramatically from year to year, with an explosion of avian diversity during occasional wet periods.

Burchell's Sandgrouse

SHEM COMPION

Water by airmail

Behaviour patterns, coupled with anatomical adaptations, can provide remarkable solutions to the challenges faced by desert birds. Although sandgrouse are often considered to be among the birds best adapted to arid habitats, they are in fact obligate drinkers (see box, page 39), as evidenced by their daily arrival at waterholes just after sunset. The arrival of hundreds of Namaqua and Burchell's sandgrouse (*Pterocles namaqua* and *P. burchelli*) at floodlit waterholes in Etosha National Park, Namibia, must rank as one of southern Africa's most special birding experiences. Because the sandgrouse are strong flyers and can rapidly cover great distances (up to 80 kilometres) to a water source, their reliance on drinking water does not normally present a problem.

When they are breeding, however, the situation becomes more complex, because the chicks also need to drink regularly during hot weather. The problem of the chicks' dependence on water has been solved in an intriguing fashion. While at a waterhole, the male birds lower their bellies into the water. The belly feathers, by virtue of their unique structure, soak up water and retain it, much like a kitchen sponge. During the flight back to the nest, these feathers are held close to the skin to minimise evaporation. When the males arrive, the chicks strip the water from the belly feathers with their beaks. The water-carrying capacity of sandgrouse feathers varies between species, with those species inhabiting the driest habitats having the feathers best suited for water transport.

Cutting-edge science

The past decade has seen a new wave of research on desert birds, spearheaded by the work of Irene Tieleman and Joe Williams. Their research has revealed that several fundamental differences exist between desert birds and their non-desert counterparts. Desert birds, as a rule, require about half as much energy and water in 24 hours as other birds. This economy comes about largely through conservative behaviour patterns – desert birds spend less time indulging in energy- and water-demanding activities and more time resting, often in the patchy shade provided by a shrub or grass tussock. However, their research has also revealed that desert and non-desert birds differ more fundamentally. Over the millennia, desert birds have evolved several physiological characteristics that make them well suited to their environments. These adaptations involve slower rates of metabolism, equivalent to a lower 'idling speed', and the ability to make carefully regulated increases in body temperature during very hot weather.

There is also evidence that parenthood is approached very differently by desert birds. Among larks, desert species tend to lay fewer clutches and a smaller number of eggs per clutch than non-desert species, and hence invest less energy and water in breeding. Differences are also evident in the nestlings of desert species, which grow more slowly than those of non-desert species and thus require less energy and water per unit time. However, the flip side is that the chicks of desert lark species are more vulnerable to predation, and are less likely to survive to fledging.

The future for desert birds

There are few organisms on the planet that will escape the effects of climate change in coming decades. As weather patterns change and temperatures around the world increase, largely as a result of human carbon emissions, ecosystems will track the changing conditions with profound consequences for the birds that inhabit them (see Vol. 10(5): 52). The on-the-edge existence of many desert birds makes them particularly vulnerable to changes in their physical environment. Higher temperatures, for example, will lead to large increases in the amount of water that desert birds require and may well prompt catastrophic mortality events during future heatwaves (see Vol.10(2): 12).

Even more worrying, climate change is expected to drive major habitat transformation in some desert areas. Research by a team from Oxford University (Thomas *et al*. 2005 *Nature* 435: 1218–1221) has revealed the devastating effects that climate change is likely to have on several African deserts, most notably the Kalahari Desert of southern Africa. Unlike the massive shifting dunes of the Namib Desert, the red Kalahari dunes are stable and immobile, creating conditions that allow vegetation to grow between them and on their edges. These plant communities provide the food, shade and other resources that allow many bird species to survive in this harsh environment. If wind speeds in the Kalahari Basin increase over the next few decades, as is predicted by most climate models, a frightening scenario is set to unfold. The stable dunes of today's Kalahari Desert will be remobilised, and the shifting sands will bury most of the plants that presently exist there. The loss of permanent vegetation will dramatically affect bird communities, and avian diversity in large parts of the Kalahari will be decimated. □

P. WAGNER/PHOTO ACCESS

Climate change is expected to cause major habitat transformation in some desert areas. Their on-the-edge existence will make desert birds particularly vulnerable to such changes.

DEGREES OF SEPARATION Desert birds and access to water

To survive in a desert, birds need to balance water loss with water intake. In terms of their reliance on drinking water, desert birds fall into one of three categories. Many species, particularly those that feed predominantly on dry seeds, are obligate drinkers that need to visit water regularly – the sandgrouse, doves and pigeons, lovebirds, bulbuls, starlings, sparrows, waxbills and finches, amongst others. These are the species that visit waterholes on a daily basis, often running a gauntlet of predators to do so (see *Africa – Birds & Birding* 10(4): 35).

Other species, including the mousebirds and partly granivorous species such as Stark's Lark *Spizocorys starki*, can survive for lengthy periods on water obtained from their food, but must occasionally drink to balance their water budgets. Species that are totally independent of water, such as the Pygmy Falcon, most insectivorous larks and *Cercomela* chats, comprise the final category. Some of these birds survive and breed in truly waterless places, such as the gravel plains of the Namib Desert.

PETER RYAN

Species such as Stark's Lark are largely, but not entirely, independent of drinking water.