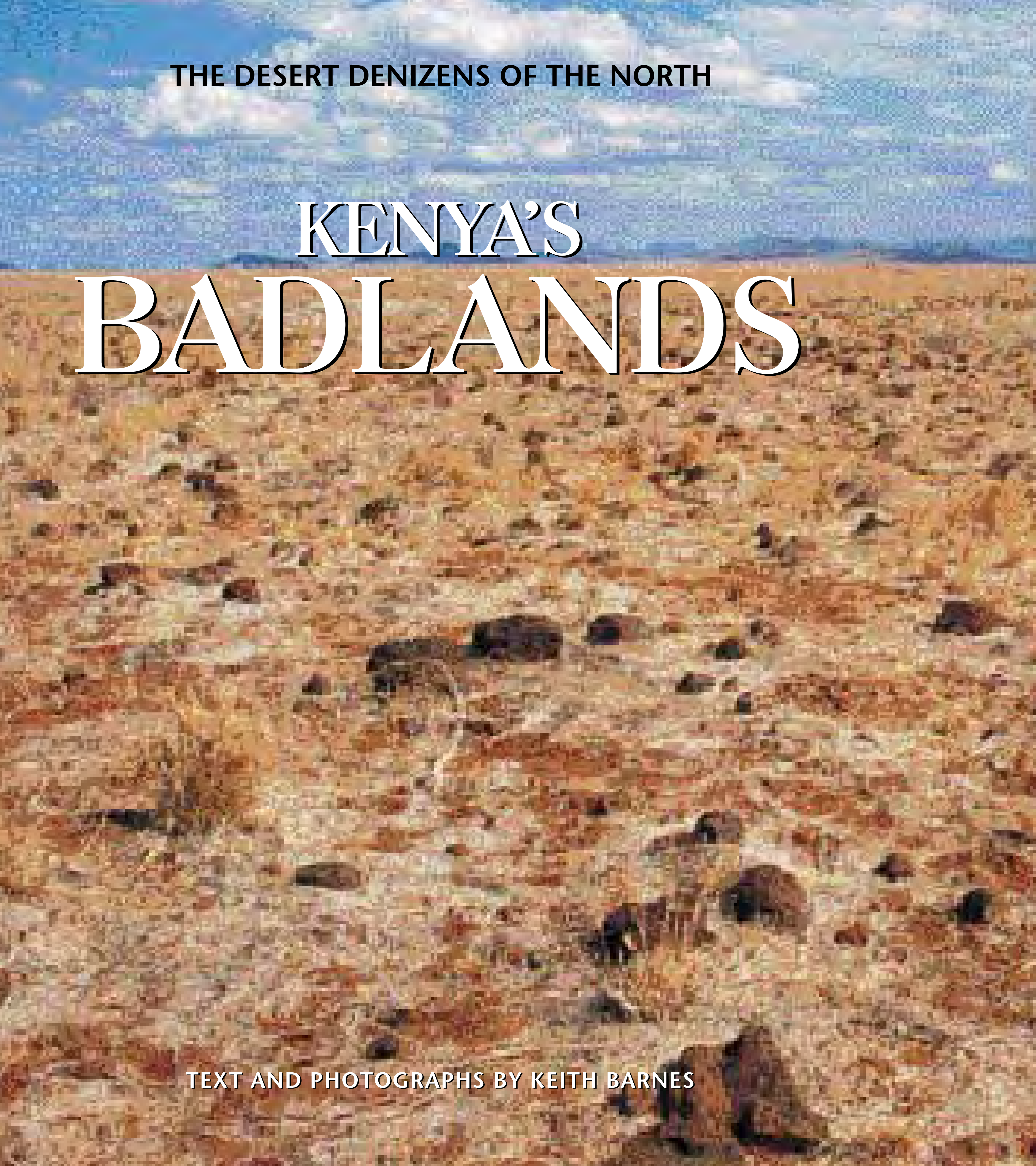
THE DESERT DENIZENS OF THE NORTH

KENYA'S BADLANDS

TEXT AND PHOTOGRAPHS BY KEITH BARNES



A Thekla Lark, its crest raised during a display in an attempt to attract a mate or expel a competitor.

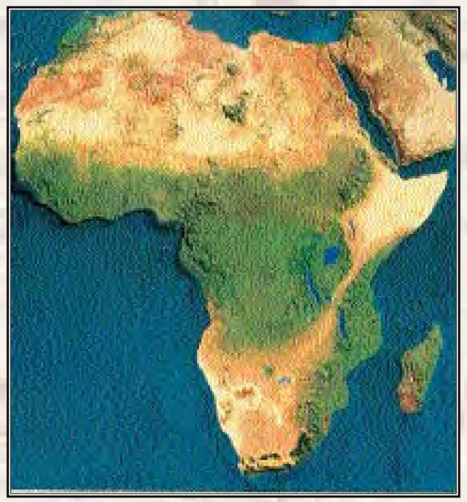
Just north of Nanyuki, the Kenyan highlands of Africa's Great Rift Valley begin to fracture, and the great escarpment crumples down to the Badlands, the sweltering lowland plains that stretch from northern Kenya into Ethiopia and Somalia.

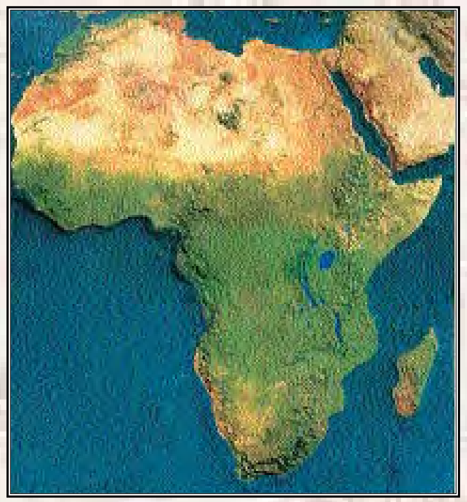
Keith Barnes describes some of the special adaptations of the birds in this fascinating area, and its links to other Old World deserts.

The barren lava plains north of Isiolo, stretching towards Marsabit and Ethiopia, are the habitat of Masked and William's larks, the latter being one of Kenya's seven endemic lark species.

Historically just extreme races of the same species, with the separation of deserts by miombo woodland, the Purple Grenadier (right) in the north-east has differentiated sufficiently from its sister taxon, the Violet-eared Waxbill (far right) in the south, to be regarded as a different species.

WARWICK TARBOTON





A theoretical image of what Africa may have looked like during the cold, dry Plio-Pleistocene cycles (far left) – a desert corridor stretching from the Somali Horn to just outside Cape Town. During warm, wetter intervals (left), such as the conditions prevailing in Africa today, the moist woodlands expand across central Africa, slicing the corridor in two and fragmenting the desert world into a series of desert islands that persist only in the most geologically and climatically stable areas of the continent.

Eons ago, when swathes of forest covered North Africa, Kenya encompassed the centre of a desert world that in its prime stretched from Mongolia's Gobi Desert to the scorching sands of the Namib. Throughout the Plio-Pleistocene, a period some four million to 800 000 years ago, the earth's climate fluctuated enormously, and glacial cycles resulted in repeated periods of dry, cool weather interspersed with moist, warm intervals. Some theorists suggest that during the dry periods, desert corridors connected the great African deserts (see maps above). During wetter times the forests expanded from Central Africa, leaving islands of desert in the most geologically and climatically stable areas of the continent. These included the Chalbi, Dida Galgalu and Kaisut deserts of northern Kenya, where desert birds have had the most time to adapt themselves to the rigours of this demanding environment.

High body temperature, excellent insulation and their great mobility contribute to making birds some of the desert's most successful inhabitants. A comparison of the Violet-eared Waxbill *Uraeginthus granatinus* of southern Africa with the Purple Grenadier *Uraeginthus ianthinogaster* of East Africa best illustrates how Africa's turbulent geological past drives desert speciation. These were once a single species, but its intolerance of the moist broadleafed woodland that crept across most of central Africa essentially split the population in two. Each population followed its own evolutionary pathway until, inevitably, the two became different enough to be regarded as separate species (Violet-eared Waxbill/Purple Grenadier). This process has happened with many different species and species groups, and at many different times as the deserts contracted and expanded during wet and dry cycles. Groups where the resultant patterns of speciation are most obvious are the larks and sandgrouse.

Birds living in these 'wastelands' have to cope with scarce and, even worse, unpredictable rainfall, temperatures that fluctuate from extreme cold to extreme heat in a couple of hours, and an unpredictable food supply. The larks met this challenge and have proliferated in Africa's deserts, where they are arguably the most successful group of birds. Some 38 lark species have been recorded in East Africa; in Kenya, 14 of the 21 species are found primarily in the arid zone. Typically written off as LBJs, their variation in shape, form and behaviour is dramatically under-appreciated, as is their ability to eke out an existence where few other birds dare to venture.

Kenya holds nomadic, resident and migrant lark forms; they are one of few bird groups to display all three strategies to cope with the erratic desert environment. Finchlarks are gregarious nomads and in East Africa flocks comprising up to 4 500 birds have been recorded. Their nomadism allows them to exploit environments and food resources that exist for only the briefest moment in time, and their sociable networking in large groups increases the probability of finding locally abundant, if rather patchy, resources – a situation typical of most East African deserts.

Most birds have a more or less predetermined breeding season, but many larks are ready to breed at any time of year. Hormones maintain the organs of reproduction in a permanent state of readiness. This permits the birds to begin developing eggs within days of a breeding stimulus. Finchlarks are known to lay eggs within weeks of a rainfall event, and to continue to raise subsequent broods for as long as favourable conditions persist.

Being nomadic and gregarious in an unpredictable environment, one might expect some larks to lay large clutches and have short lifespans, yet they don't. Most lay only two eggs, rarely three. Instead, larks seem to hedge their bets by laying as many clutches as possible during the favourable period. But why do they do this? There are two possible explanations. The first suggests that losses of eggs (which are laid on the ground) and young to predators are enormous (see *Africa – Birds & Birding*, 'Hide & seek', vol.4, no.2). So rather than producing a single clutch laden with plump, edible nestlings, they produce as many small clutches as possible. In this scenario, it would be logical to find the birds relying heavily on camouflage, hoping that at least a few individuals will escape the attentions of adders and mongooses. The other explanation is that clutch size is smaller because food is scarce and unpredictable. In the deserts where chick starvation and egg mortality are high, the parents 'gamble', investing less effort in each breeding attempt, and more effort in producing more clutches, in the hope that one will succeed.

Much maligned for their dull coloration, larks' cryptic plumage contributes to the survival of their eggs, chicks and, invariably, themselves. Although quite confiding at times, larks can reduce their visibility at will; once, at the approach of a harrier, I observed some finchlarks crouch under rocks and others remain motionless until the danger had passed before they resumed standard activities. When recently fledged finchlark chicks are approached, they lie flat and immobile, heads outstretched on the sand, bills closed and eyes half closed, effecting excellent camouflage. When the parents spot a potential predator, a warning call can elicit this behaviour in their chicks.

In Kenya, the Thekla Lark *Galerida theklа* inhabits the stony shores of Lake Turkana, a stretch of lava plains virtually devoid of vegetation and surely one of the most inhospitable habitats on earth. The bird uses its prominent crest in many aggressive encounters with neighbours and in complex courting displays but, when threatened, it can quickly avoid detection by dropping its crest, opening its wings and crouching next to a stone, where it will blend imperceptibly into the pebble mosaic. The crest is a feature of many larks. It is not only a fashion accessory, it also helps to regulate temperature; when raised during the day it scatters solar radiation to divert unwanted heat, but at night it is used to trap a layer of air to insulate the head against the desert chill.

A lark's activity is limited by ground temperature, and birds spend much of the day crouching in the shade of bushes or remaining inactive in an effort to conserve water and avoid the expensive exercise of cooling down. Perhaps the most taxing time is during breeding, when male larks are forced to abandon their usual cryptic demeanour and soar into the sky, indulging in elaborate displays to impress potential mates. These typically involve an energy-sapping wing-clapping or undulating flight coupled with complex singing.

When birds fly, their massive pectoral flight muscles generate a substantial amount of heat and, when the air temperatures are extremely high, offloading this heat becomes a problem. This can be solved in a number of ways. By evolving complex but multi-functional displays, including activities where the skin is exposed (like leg-trailing or raised-wing advertisements), certain larks are able to attract mates and shed heat simultaneously. Furthermore, by displaying higher above the ground, where the air is cooler and air movement is greater than it is nearer the ground, additional convective cooling can be achieved.

Sandgrouse are another major group ▷

The White-headed Buffalo Weaver, common in Kenya's Badlands.

The spectacular Vulturine Guineafowl. The facial skin acts as a radiator in the desert heat, cooling the bird down. This is the only guineafowl that is able to go for many months without drinking.

to have succeeded in exploiting Old World deserts, particularly in southern Africa and Kenya. Of the world's 16 species, 11 occur in Africa's deserts and five are found in Kenya. Sandgrouse are thought to have evolved in Africa during the Upper Cretaceous period, when most of Eurasia was covered in subtropical forest. During the Middle Tertiary, when the great Palaearctic deserts developed, sandgrouse moved into Eurasia. Although the taxonomic affinities of sandgrouse are uncertain, most authorities consider them to be most closely related to waders.

Ironically, the basic anatomical and physiological equipment evolved by waterside waders has pre-adapted sandgrouse to the desert world. In common with waders they lay cryptically coloured eggs on the ground, have chicks that are able to walk within a day of hatching, possess pointed wings and strong muscles for flying great distances, and spend a great deal of time walking on strong legs. Furthermore, they have a short bill, neck and legs – much like the seedsnipes, aberrant seed-eating waders from an ecologically similar environment in South America.

Like the larks, their cryptic plumage helps hide these birds as they spend long hours foraging in the open for seeds. Sandgrouse seldom squabble, which may be to avoid detection by predators or unnecessary energy expenditure in hot environments. They also exhibit some remarkable behavioural adaptations to regulate body temperature, and have been likened to reptiles. They bask in the sun in the early morning or on cold days and avoid overheating by flying during the cool morning or evening hours. At midday they crouch under bushes and at night they huddle together to conserve energy. The soles of their feet, which

Black-faced Sandgrouse indulge their daily ritual of coming in to desert puddles to drink and to absorb water in their breast feathers for the long journey back to their chicks.

often have to endure contact with scorching ground, are very thick and covered with small, callous-like scutes. When temperatures exceed 31 °C, sandgrouse initially employ wing drooping to cool down, exposing the sparsely feathered under-wing skin to the air. Once the air temperature exceeds body temperature they do something very odd indeed – they huddle together. By keeping the air surrounding them at body temperature, they reduce the amount of heat gained from the surrounding air. As a last line of defence, gular flutter is employed to reduce body temperature and enables them to keep their body temperature below 42 °C, even when air temperature exceeds 50 °C. Although the evaporative cooling gained from gular flutter is an effective way to lose excessive heat, sandgrouse pay a high price by losing precious water.

Despite being such successful desert residents, sandgrouse and their chicks have to drink on a daily basis and they have developed two major adaptations to achieve this. Their strong, pointed wings allow the birds sustained flight of 60–70 kilometres per hour, which helps in the search for tiny, far-flung water puddles in a vast ocean of unrelenting sand, and their sponge-like belly feathers can absorb and retain water for the long return flight to the chicks. Sandgrouse also time their flights to water impeccably, either in the early morning or late afternoon. Although they forage independently, they arrive at waterholes in large flocks, and their characteristic overhead calls to others of the species may serve to co-ordinate the synchronous sandgrouse 'happy hour'. Having arrived at the chaotic waterhole, drinking and departing are rapid.

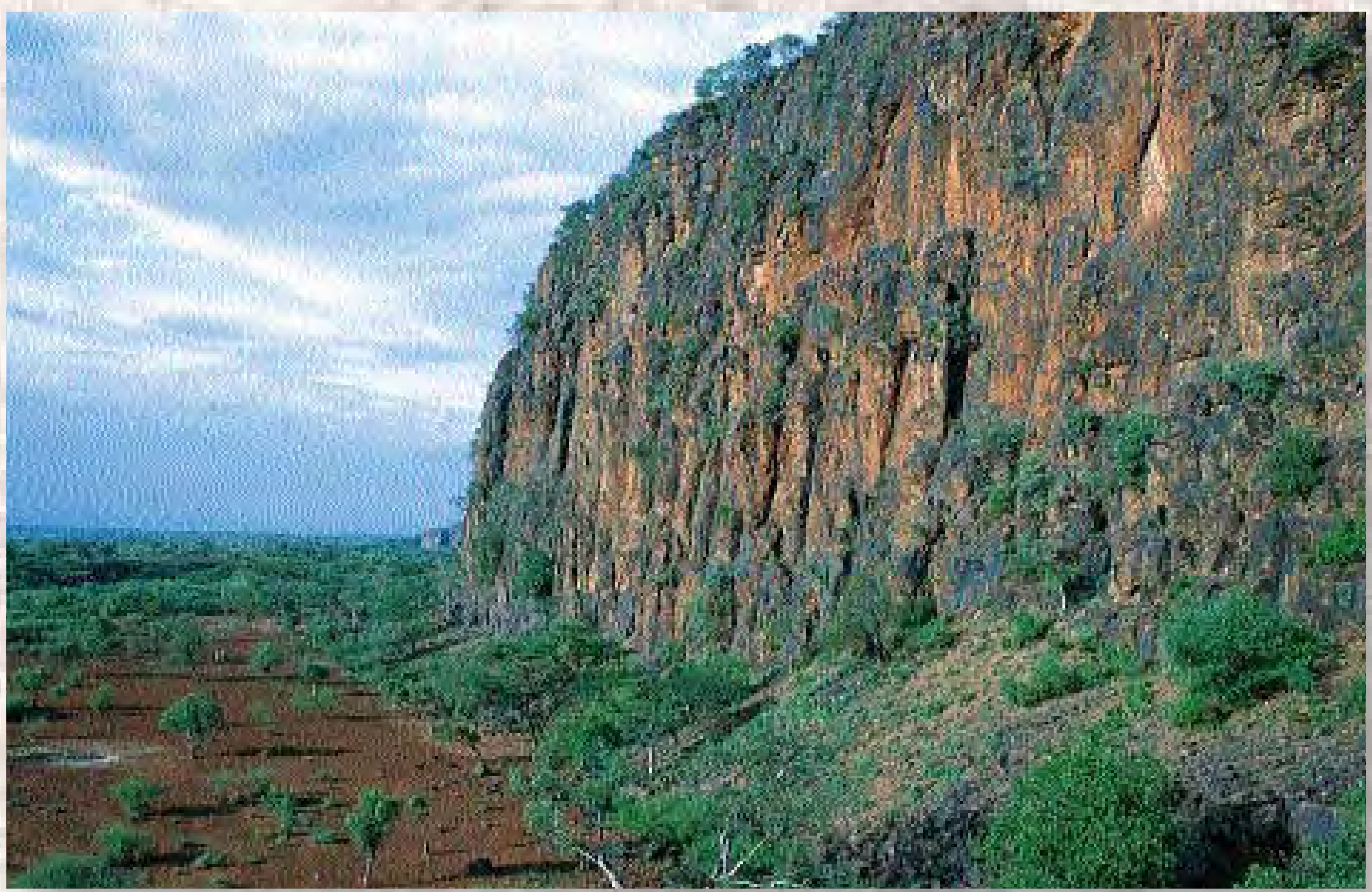
Their flights to and from waterholes are the only times during the day that the sandgrouse abandon their otherwise unobtrusive demeanour. It seems clear that they flock when drinking to reduce the risk of being attacked by falcons and other aerial predators. Larger flocks have a greater chance of detecting a swooping predator than a smaller flock. By joining a larger flock each individual can reduce the amount of time spent watching for predators. As most aerial predators prefer to hunt by directing their attacks at single, isolated individuals, an individual in a large group stands a smaller chance of being attacked than if it were by itself. Furthermore, the sight of hundreds of birds alighting simultaneously often creates confusion in the mind of the predator, providing enough time for potential prey to escape.

Larks have solved the water quandary in a completely different way to sandgrouse. They maintain high metabolic rates so that a maximum amount of internally produced water is extracted from their food during digestion. When combined with low rates of water loss to evaporative cooling, this reduces the need for regular drinking.

Fischer's Starlings flock, sometimes in huge numbers, which enhances their ability to find locally abundant but spatially patchy food resources in East Africa's arid zones.

Like the larks, the Vulturine Guineafowl *Acryllium vulturinum* hardly drinks at all and it has solved this problem in a slightly different way. The size of the Vulturine, the world's largest guineafowl, is apparently related to its preference for open habitats in the semi-deserts of the Horn of Africa. Here its head protrudes over most of the scrub, enabling it to 'peer' at predators without being vulnerable to attack. The bare neck and head that give this species its odd appearance and name are thought to play a vital role in regulating its temperature. All guineafowl are obligate drinkers and are limited by the availability of water. The Vulturine Guineafowl, however, has an exceptionally long caecum, the portion of the intestine involved in water re-absorption. The modified caecum permits it to regulate and limit water loss to the extreme, lessening the necessity to drink.

Living in extreme environments – for example intense heat, intense cold and scarce water – tends to bring out the most remarkable adaptations in animals. Birds such as larks and sandgrouse seem to have perfected these survival strategies in this uncompromising domain. It is these adaptations that predispose them to taking advantage of new niches as the desert world expands and contracts over geological time, driving speciation and resulting in their domination of the Old World deserts. Perhaps in retrospect, then, it is not so surprising that the avifaunas of Kenya's Kaisut and Namibia's Namib deserts share more than just a superficial resemblance. □



The dramatic Baringo escarpment at the edge of the Badlands, and one of Africa's best birding sites.