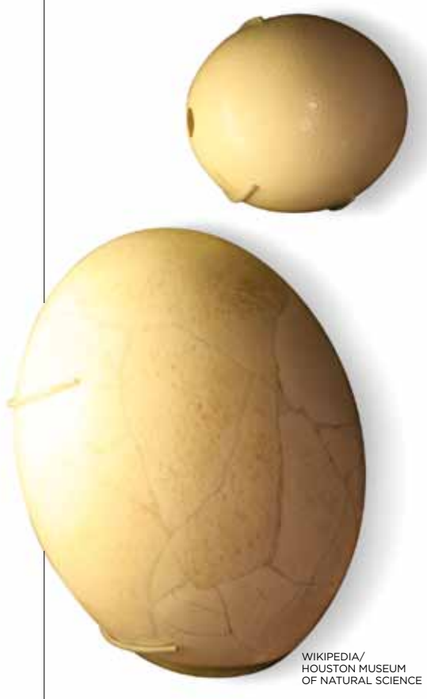
enormous, enigmatic & extinct

The elephant birds of Madagascar

In the mid-1800s three huge eggs were transported from Madagascar to France, and the Western world came to learn that this island had once been home to giant birds. Named *Aepyornis maximus* by French naturalist Etienne Geoffroy Saint-Hilaire, the species that laid the eggs was the largest bird known to have existed in recent millennia, standing three to four metres in height and weighing about 450 kilograms, more than the combined weight of four ostriches.

Other species of elephant birds have subsequently been described. Current thinking is that there were probably four *Aepyornis* and three *Mullerornis* species, although the actual numbers remain unclear. This uncertainty reflects the fact that all these species were described from the morphological traits of bones and eggshell remains. Until molecular techniques are used to analyse extracted DNA, it will be almost impossible to rule out scenarios such as two 'species' in reality being the males and females of one sexually dimorphic species, as happened in the case of New Zealand's moas.



WIKIPEDIA/ HOUSTON MUSEUM OF NATURAL SCIENCE

Size comparison between the giant egg of the elephant bird and that of the Common Ostrich.

Madagascar in the age of the elephant birds was a very different place to Madagascar today. The island's forests were home to an incredible variety of extinct mammals, among them gorilla-sized lemurs and aye-ayes four times larger than the single extant species. Sloth-lemurs moved along the undersides of branches in a manner akin to their South American namesakes. Dwarf hippopotami wallowed in lakes and rivers, and bizarre creatures known as bibymalagasias, or Madagascar aardvarks, fed on ants and termites.

Almost nothing is known about the natural history of elephant birds, but several inferences can be drawn from biochemical analyses of their remains. The most significant recent study appeared in 2006, when Simon Clarke and his colleagues reported that the stable carbon isotope signatures of *Aepyornis* eggshells from southern Madagascar are consistent with the birds feeding on plants with C3 photosynthesis. This reveals that elephant birds fed mainly on trees and shrubs, and grasses and succulent plants represented only a small part of their diet.

The C3-dominated diet further suggests that the elephant birds foraged mainly in forests, since the spiny vegetation typical of Madagascar's arid regions generally is characterised by other, isotopically distinct, photosynthetic pathways. It has been proposed by several researchers that elephant birds were important seed dispersers for a number of Malagasy trees, including the six species of baobabs endemic to the island.

THE EGGS OF *A. MAXIMUS* WERE TRULY ENORMOUS, EACH WITH A **VOLUME EQUIVALENT TO ABOUT SEVEN OSTRICH EGGS**

The Clarke et al. paper also presented information about oxygen isotopes and the data that emerged are relevant to reconstructing the elephant birds' ecology. The stable oxygen isotope signatures of eggshells reveal that elephant birds drank regularly from groundwater-fed ponds, wetlands and lakes in coastal areas of southern Madagascar and were thus probably associated with habitats in the vicinity of such water sources.

One aspect of elephant bird ecology that can be inferred without resorting to biochemical analysis is that some species nested colonially. At the southern tip of Madagascar, coastal dune sites with exceptionally high densities of *A. maximus* eggshell fragments reveal that these giants nested in large colonies, with breeding sites possibly being used by many generations. To this day, intact eggs are occasionally found in this area.

The eggs of *A. maximus* were truly enormous, each with a volume equivalent to about seven ostrich eggs. Many visitors to modern-day Madagascar will have encountered these eggs, which have been pieced together from fragments and are offered for (illegal) sale as curios. A little-known fact about the eggs is that until as recently as the mid-19th century they were used by humans to transport liquids. There is something distinctly surreal about the notion of a gigantic egg, several centuries old, being used as a water container by a thirsty Malagasy traveller.

All the elephant birds were extinct by the 17th century. A French governor stationed in Madagascar during the mid-1600s mentioned ostrich-like birds that occurred in remote regions, but he did not see them at first hand. There is no way of knowing whether the birds still existed at that time or if his accounts were based on already vanished creatures that persisted only in the oral traditions of local people.

The reasons for the elephant birds' demise are far from clear. Human presence in Madagascar dates back at least 2 000 years, and possibly to a significantly earlier date. Elephant birds and humans thus co-existed for at least the better part of two millennia and no unequivocal archaeological evidence for human predation of the birds has been found. This suggests that the overkill hypothesis, so often invoked to explain megafaunal extinctions that coincided with the arrival of humans, probably does not explain the disappearance of Madagascar's giant ratites.

WIKIMEDIA COMMONS (2)

Aepyornis skull on display in the National Museum of Natural History, Paris.

Another possible cause concerns natural climate change. There is evidence that southern Madagascar, which appears to have been one of the strongholds of the elephant birds, has become substantially drier within the past thousand years. Many animals associated with moist habitats are known from sub-fossil sites in the area but no longer occur there. It may well be that habitat changes driven by this shift in climate contributed to the extinction of the birds.

Elephant birds have been mooted as the origin of the legend of the *rokh*, the giant bird in Sindbad's adventures in *The Arabian Nights*. The *rokh*, so the story goes, was an eagle-like bird so enormous that it preyed on elephants. There is good reason to suspect that this fanciful tale originated from birds that occurred on Madagascar, and elephant birds have long been seen as the obvious candidates.

But Steven Goodman and William Jungers have recently pointed out that another extinct Malagasy bird could have contributed to the origin of this legend. Belonging to the same genus and approximately the same size as Africa's Crowned Eagle, *Stephanoaetus mahery* was probably a specialised lemur hunter. Perhaps sailors' tales of a large and formidable forest eagle became intertwined with accounts of the gigantic elephant birds and the chimera that emerged was the terrifying raptor of Arabian legend.

ANDREW McKECHNIE

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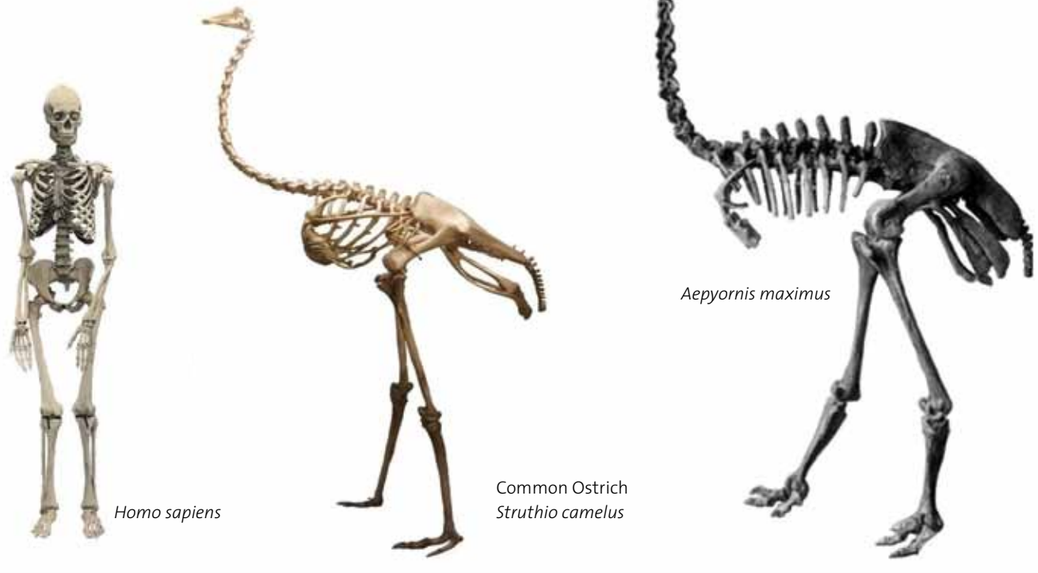

more than just hot air

Scientists have long known that birds are feeling the heat due to climate change. However, a new study of a dozen affected species in the Western Cape suggests their decline is more complex than previously thought – and in some cases more serious.

According to the study, published in *Conservation Physiology* and carried out by scientists from the Percy FitzPatrick Institute (University of Cape Town) and the Nelson Mandela Metropolitan University in Port Elizabeth, there could be several reasons why birds are being negatively affected by human-made climate change.

They suggest that, contrary to expectations, the birds' heat tolerance – or lack thereof – is not necessarily the main factor causing declines. Other factors, such as changing fire and rainfall cycles and altered bird behaviour patterns, could also be responsible for the decline according to the study, which includes some well-known species such as the Malachite Sunbird and the Familiar Chat.

Co-lead researcher Susie Cunningham says a better understanding of how climate change affects bird species could help develop conservation strategies to increase chances of survival. 'We know climate change is linked to changes in species' numbers and distributions, but we don't always know exactly how or why,' Cunningham says. 'We need to figure out the factors actually driving declines before we can develop proper conservation measures to halt them.

'Fynbos birds are particularly important in this regard because they live in an area that has been extremely stable, climatologically speaking, for a very long time. So changes in climate are not something they are used to. Furthermore, six of the species we studied are endemic to fynbos, so if we lose them from this biome, we lose them altogether,' she explains.

The new study profiles the well-being of 12 fynbos bird species based on a comparison of data contained in the two Southern Africa Bird Atlas (SABAP) surveys conducted 15 years apart. This data was matched with climate data for the comparative period, as well as with physiological data. A key aspect of the study is a comparison of climate and bird population data with the heat response – or 'thermal tolerance' – of each bird species. In this way researchers assessed to what extent birds can cope with changing temperature and whether this is the primary indicator of alterations in bird abundance.

To obtain data, researchers subjected birds to a range of temperature tests to determine their physiological response. Considerable variation in the relationship between the response to temperature and rate of species' decline prevented researchers confirming a direct link across the board between how species are faring under current climate change and their thermal physiology.

Despite this, the study showed a strong correlation between temperatures within birds' ranges and rates of decline, with cool-climate species faring worse under climate change than warmer-climate birds. Most notably, Cape Rockjumpers and Protea Seedeaters, species that live in the coolest parts of fynbos, have declined the most under recent warming. SABAP reporting rates of these two species dropped by 31 per cent and 32 per cent respectively during the period under review. In the Cape Rockjumper, these declines occurred specifically in areas of its range that have warmed most rapidly in recent decades.

In addition, the Cape Rockjumper is the only species whose decline is clearly linked to a low physiological tolerance of heat, prompting the study authors to call for conservation intervention. 'Conservation action appears to be urgently needed for the Cape Rockjumper and Protea Seedeater if their declines are to be properly understood and halted,' the study says. 'We need further research to determine the cause of decline of Protea Seedeaters and to assess how Cape Rockjumpers may best be assisted to cope in the face of continuing climate change.'

Cunningham says the overall findings suggest scientists should not jump to conclusions about bird physiology when assessing the effects of climate change. 'The main findings are that physiology, though often considered the ultimate factor limiting species distributions, may not be the factor responsible for warming-related declines in most fynbos birds,' she explains.

SCIENCEDAILY

DIONNE MILES

The study revealed that the fynbos-endemic Orange-breasted Sunbird showed a 10 per cent decrease in reporting rate in the 15 years between the SABAP1 and SABAP2 surveys.

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World Seabird Conference making waves

Interested in how seabirds navigate at sea, how young seabirds learn their trade or how an increasingly stormy planet is going to affect seabirds? These were just some of the topics explored at the Second World Seabird Conference (WSC), which took place in Cape Town in October 2015 under the auspices of the World Seabird Union.

The WSC brand was established in 2010, when the Pacific Seabird Group hosted the first meeting in Canada. It also saw 21 regional seabird organisations joining forces to form the World Seabird Union to promote seabird research, management and conservation worldwide.

Following the success of the first WSC, the African Seabird Group offered to host the second WSC. The meeting attracted 562 delegates from 52 countries, including 173 students. Local students were well represented and three from the University of Cape Town featured in the top 10 student presentations.

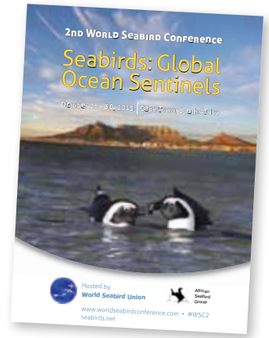
The conference was titled 'Seabirds: Global Ocean Sentinels', but it covered virtually all aspects of seabird biology and conservation. In addition to showcasing the latest seabird research, it promoted legacy projects such as the global seabird colony and tracking databases that were launched at the first WSC. The meeting ran for four days, with 400 oral presentations in four parallel sessions and 200 poster presentations.

For me, one of the highlights was the suite of findings from the Oxford Navigation Group. They used a clock-shift experiment to show that breeding Manx Shearwaters use a sun compass to orientate at sea, but also follow visual landmarks once they are in sight of land. Previous work on shearwaters has confirmed the importance of scent for homing.

Many studies used the latest tracking technology, but have moved beyond simply documenting migration routes and are now attempting to understand how individuals behave. The general pattern emerging for most species is that individuals tend to use the same parts of the ocean consistently whether they are breeding, migrating or wintering, but there can be variation linked to age and sex.

Even birds as small as storm petrels can now be tracked. Most Leach's Storm Petrels from Nova Scotia winter off West Africa, but some reach the Cape. And most Sabine's Gulls breeding west of Baffin Island in the high Canadian Arctic winter off Peru, although a few migrate to southern Africa; members of one pair even consistently visit different oceans.

Studies are increasingly addressing how young seabirds learn to survive after leaving their breeding islands. Young albatrosses are left to literally sink or swim – most that fail die within a week or so of leaving the island. Young King Penguins also obtain no assistance from



their parents and many do not survive the first few months, when they seldom dive to more than 100 metres. Those that make it through this period show an increase in dive depth and duration, reaching depths of 250 metres (but still less than adults). By comparison, adult Greater Frigatebirds return to their colony each night for five to seven months to feed their fledglings, giving the youngsters plenty of time to learn the aerial skills they will need to survive their first year, which is spent almost entirely aloft.

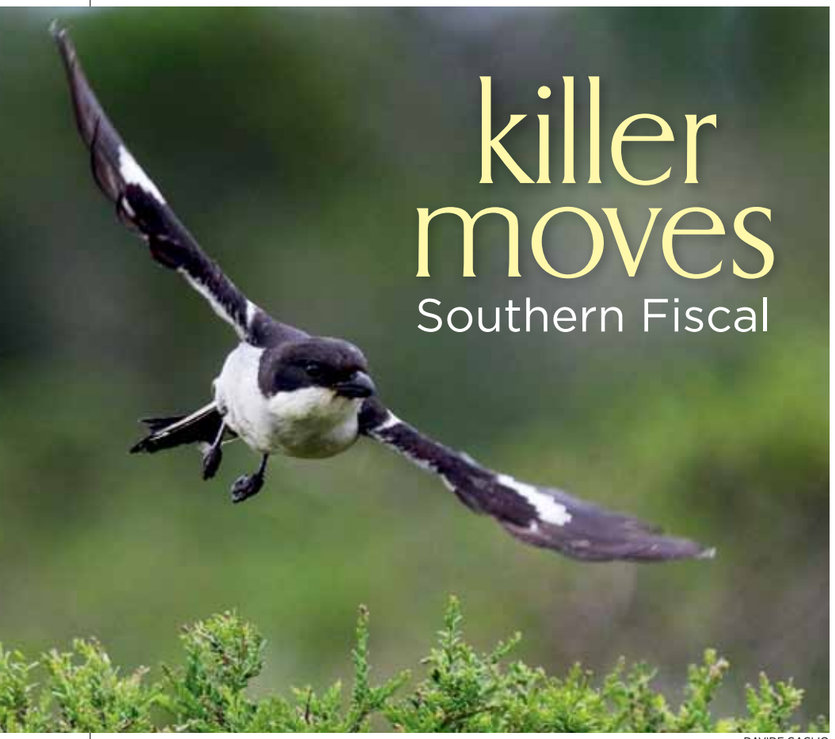
The conference also tackled many applied subjects, ranging from managing conflicts with fisheries and introduced predators to the influences of offshore wind farms and plastic pollution. One worrying theme was how increasing storm frequency and severity, linked to global climate change, is likely to affect seabirds.

With so much on offer, it's a pity that more South African birders didn't take the opportunity to attend the meeting. To learn more about the World Seabird Union, visit *www.seabirds.net*

PETER RYAN

killer moves

Southern Fiscal



DAVIDE GAGLIO

Fiscal Shrike, Common Fiscal, Southern Fiscal. This familiar bird has changed its name several times in recent years. Fiscals are widespread in Africa south of the Sahara, and the latest name change reflects new information about this complex group of species. In 2011, FitzPatrick Institute researcher Jerome Fuchs discovered that all of the 'Southern Fiscals' in South Africa were the same species (*Lanius collaris*) and genetically distinct from fiscals found north of about 15° south of the equator ('Northern Fiscals'). So the Jackie Hangman from the back garden in Cape Town or Pretoria is the same as the Southern Fiscal with the white eyebrow from the Kalahari – only with a little less make-up!

Southern Fiscals hunt a wide variety of small creatures from beetles and grubs to mice, small reptiles and birds, with the well-known caching behaviour of impaling them on thorns to eat later. They like to watch for prey from a high, open perch with a good view, such as an exposed branch or an overhead line. They only hunt from cover when it's really windy or hot, because it is harder for them to spot food when on a perch surrounded by foliage. In fact, in the Kalahari, moving into the shade to beat the heat can cut a Southern Fiscal's hunting success by half.

If the only available perches are low or sparse, Southern Fiscals will sometimes hunt while in the air. They hover and then dramatically drop down onto their unsuspecting victims, many of which will never know what hit them. Other birds that hover and pounce in this way include Rock Kestrels, Jackal Buzzards and Black-shouldered Kites. Although diminutive by comparison, Southern Fiscals are easily as ferocious as these raptors. Fiscals sometimes attack prey as large as themselves, or larger. Michelle Thompson from the University of Pretoria describes seeing a Southern Fiscal kill an adult African Pipit: 'The dead pipit was too heavy for the fiscal to lift, so it flew-hopped and dragged the bird over to a barbed wire fence to eat'. I studied Southern Fiscals for two summers in the Kalahari and several times saw my study birds labouring to fly while carrying freshly killed full-grown striped field mice.

Despite their ferocity (or perhaps because of it), Southern Fiscals are not always successful in their more ambitious hunting endeavours and sometimes bite off more than they can chew. I once saw a Southern Fiscal significantly misjudge the size of its target and crash beak- and feet-first into a Namaqua Sandgrouse half-hidden in the long Kalahari grass. The result was feathers flying and a very startled sandgrouse bolting into the air, while the chagrined shrike beat a rapid retreat in the opposite direction.

The bird in this image was observed for a couple of days by FitzPatrick Institute PhD student Davide Gaglio in De Hoop Nature Reserve in September 2015. It was using a hover-pounce technique to hunt more conventional prey: large beetles and grubs. The smooth white flanks of the bird, with no sign of any chestnut feathers, identify it as a male.

Davide says: 'I noticed this Southern Fiscal hunting every day over a grassy lawn kept short by grazing bontebok and eland, at De Hoop Nature Reserve. He was a creature of habit, always using the same tree branches to hunt from, and even repeatedly hovering in the same place when he wanted to search for prey over the open grass. After watching him for several days, one evening I tried crawling carefully over to his favourite hovering spot on the lawn, hiding myself by lying flat on the ground. Sure enough, within two minutes of my arrival he was back hunting in the same place as always and I was able to take some intimate close-ups.'

SUSIE CUNNINGHAM

CONGRATULATIONS!
The lucky-draw winner of the subscriber competition of a Wilderness Safaris holiday to Hwange, Zimbabwe, is Natasha Venter of Parktown North, Gauteng.

OUT ON display

White-browed Sparrow-weaver

At the start of their display, the White-browed Sparrow-weavers both raised their heads and tails.

A recent sighting made us realise that we are sometimes far more familiar with the courtship displays of exotic birds, such as birds-of-paradise and the moonwalking Red-capped Manakin, than we are with some of our local, rather more common species. I hasten to add that our familiarity with the courtship displays of such exotic birds unfortunately does not come from first-hand experience, but rather from watching numerous natural history documentaries.

On 19 September 2015, after a day spent birding at the Biddulphsberg Mountain Resort (near Senekal in the Free State), we were about to leave when we noticed a White-browed Sparrow-weaver *Plocepasser mahali*, perched in a strange position on a low sandstone wall. It took us a moment to realise that there were in fact two birds and that a courtship display was in progress.

They were about a half a metre apart and both were holding their heads and tails straight up. The male then began to sway from side to side and 'dance' his way very slowly towards the female (with lighter bill). While doing this he fluffed out his feathers and drooped his wings slightly. The female remained in the same spot and also drooped her wings slightly.

When the male eventually reached the female, he half circled her until they were facing each other and again both raised their heads. They swung their heads from side to side for a while. The male then moved behind the female, again held his tail and head vertically, and started to call softly to her. The female lowered her body in response and this was apparently the signal the male was waiting for, because he immediately mounted her. The actual copulation lasted only a second or two, after which the pair flew away together.

The display of these White-browed Sparrow-weavers was sweet and gentle. By comparison, that of the male Pin-tailed Whydah, which regularly entertains us in our garden with his energetic and jerky hovering display flights while trying to impress his harem, is almost boisterous.

MARTIN & MELANIE POTGIETER
BETHLEHEM, FREE STATE

The ritualised courtship display ended in a brief mating, after which the birds flew away together.