DOUG NEWMAN

how will birds cope with CLIMATE CHANGE?

Climate change in Africa is as old as the continent itself. If you could watch Africa's ecological history in fast-forward mode, you'd see a mesmerising array of changes. Rainforests would flourish, then shrink; deserts would creep, then be pinched off. The powerful rivers and vast lakes that are Africa's life-blood would well up, dry up, then swell again. In that shifting panorama, humans and other species evolved. Environmental change is just grist to the mill of evolution in Africa.

RES ALTWEGG

But if that's the case, what's the problem with current climate change? The answer involves three things: thresholds, speed and compound effects.

THRESHOLDS

Our gas-guzzling lifestyles are taking us into 'non-analogue conditions' – novel climates outside the comfort zones of species' evolutionary pasts. Energy pollution is making the air hotter and richer in carbon dioxide than at any other time in human history. By the time your grandchildren are adults, they will face global temperatures that will be among the highest of any in the past 740 millennia, and carbon dioxide levels will be much higher than in the past 650 millennia.

*Range expansionists like the Hadeda Ibis and Egyptian Goose benefit from a high reproductive rate and habitat generalism to move into new areas. Res Altwegg's team is researching the demographic traits that predispose Hadeda Ibises to their recent noisy and successful colonisation of western South Africa (*http://adu.org.za/hadeda.php*)*

*Dietary or habitat specialists, like many fynbos endemics such as the Cape Sugarbird, may increasingly be forced to move or adapt to gardens. Planting locally indigenous flowering plants (preferably not hybrids) will help birds move across built-up areas. Phoebe Barnard's team is gathering population, behavioural, genetic and disease information to shed light on how fynbos endemics adapt to climate and urbanisation stresses (*www.fitzpatrick.uct.ac.za/docs/climate.html*).*

That's hot, and highly carbonised. Most species in Africa have evolved under far cooler and more moist conditions.

SPEED

Many species can adapt to change, but only if it is gradual relative to their generation times. Previous climate changes have happened very abruptly – you've seen the graphs of past carbon dioxide and temperature ranges, which resemble a patient's erratic heartbeat under periodic shock treatment. The rate of current climate change is at least as abrupt, and beyond many species' capacity to adapt.

ROB SIMMONS

Climate change and rising carbon dioxide levels can also reduce habitat quality. Bush encroachment is favoured by rising carbon dioxide levels and reduces the food-finding efficiency of the Namibian Waterberg's vultures. When carcasses were provided experimentally by UCT student Pippa Schultz in areas with different tree densities, vultures only found food in areas of 2 600 trees per hectare or less. As most of the area is now surrounded by thickets of 8 000–10 000 trees per hectare, this is bad news for these birds.

Increasingly, local populations of vulnerable species will decline and go extinct, while those of opportunistic species move into new areas.

COMPOUND EFFECTS

With 6.7 billion humans on earth (and counting), species are already seriously stressed by other environmental threats. Sprawling cities, fences, polluted rivers and acidifying oceans all constrain plant and animal adaptation to a difficult climate. Many species, most of which have persisted for more than a million years, are fast heading for a brick wall thrown up by humans, mainly in the past 50 years.

Birds that may prove particularly vulnerable to climate change are: those that rely on specialised habitats, diets or nesting sites, including narrow coastal strips; long-distance migrants, especially those that rely on declining wetlands; endemic high-altitude birds; and possibly species of hot, treeless inland deserts.

Those species with a canny, generalist lifestyle are already inheriting the earth, but some of our loveliest endemics may disappear. Pied Crows, Egyptian Geese and Sacred and Hadeda ibises already occupy the suburbs, while rock-thrushes and helmet-shrikes retreat from areas they once held. New species will arise from all this change, but our children are inheriting a homogenised, challenging world, without the incredible diversity and beauty we are privileged to know.

PHOEBE BARNARD & ROB SIMMONS

SABAP2 AND **CLIMATE CHANGE**

'Climate' is on the move. Some areas are getting hotter, others drier, and a few are getting wetter. The community of species (both plant and animal) that function best in a particular range of temperatures and other climate variables will try to move to places that offer their preferred climate. Alternatively, they will need to adapt. Climate change will impact birds in five ways, and SABAP2 measures four of these.

DISTRIBUTION A species can only move if its food moves. In the simplest case, if climate gets warmer, all the biological components on which the species depend ought to move polewards. In the northern hemisphere, Little Egrets have expanded their range northwards into Britain and Ireland. The patterns of change in southern Africa are complex because climate zones form a complicated patchwork mosaic. SABAP2 is documenting range expansions: species which are spreading westward include Fork-tailed Drongo and Amethyst Sunbird along the southern coast, and Thick-billed Weaver in the interior. It takes disciplined observations to detect a range contraction – and that is one of the strengths of atlasing.

THE TIMING OF MIGRATION One of the realities of climate change is that spring in Eurasia is beginning earlier each year and so is the period when food is abundant. Breeding is timed so that maximum demand by growing chicks coincides with the food flush. Somehow, long-distance migrants, such as the Barn Swallow, need to leave southern Africa earlier so they can start breeding at the right time. Have they achieved this shift? Comparison of data from SABAP1 and SABAP2 will tell us whether the timing of migration has indeed changed.

ABUNDANCE As climate changes across the range of a species, that bird is likely to become more common in some parts of its range and rarer in (or perhaps even disappear from) others. Such moves are subtle and it is difficult to document when they begin, so we encourage atlasers to work 'deep' in their pentads, generating unlimited numbers of checklists for their areas. We know that, given enough data, the SABAP2 protocol can detect even small alterations in abundance.

THE COMPOSITION OF BIRD COMMUNITIES In many Cape Town suburbs, people now wake up to the calls of three particularly noisy species: Hadeda Ibis, Egyptian Goose and Helmeted Guineafowl. None of these was a significant component of the region's suburban bird community a few decades ago.

CHANGES IN SIZE AND SHAPE Those species that stay in the same place while the climate changes have to adapt. In the past few decades, some species have literally become smaller as the climate has warmed. This is bizarre, but it is a general rule in ecology: a small body functions better in a hot climate than a large one does. For example, the smallest Brimstone Canaries are those closest to the equator. What is amazing is the pace at which changes in size have taken place in a population at a single place. While SABAP2 cannot help us detect this kind of change, the data collected by bird ringers does.

LES UNDERHILL & PHOEBE BARNARD