colour coding

BLACK POWER

During the Industrial Revolution, air pollution coated urban areas in England with a fine layer of soot, blackening trees and killing epiphytic lichens. The resultant increase in the formerly rare melanistic (dark) form of the peppered moth provided one of the most famous cases of natural selection in action, and led to the term 'industrial melanism'. Today most of the soot has gone, the lichens have returned, and the moth's pale morph is again dominant. But debate continues about the causes underpinning another example of industrial melanism: the rise of the dark morph of the Rock Dove or Feral Pigeon *Columba livia* in modern urban environments.

The proportion of dark-morph Rock Doves is much greater in urban areas than among rural populations. Marion Chatelain and colleagues recently suggested that this might be because melanistic birds are better able to cope with trace metal pollutants found in urban environments (*Biology Letters* 10: 20140164). We know that during feather formation, melanin binds metals such as zinc circulating in a bird's bloodstream, and so Chatelain predicted that melanistic pigeons would be better able to reduce their body burdens of these pollutants.

By keeping pigeons captured in Paris in a rural environment for a year, she showed that the amount of lead and zinc in their feathers decreased by more than 70 per cent. The degree of melanism had no effect on their metal concentrations when first captured, but the amount of zinc in feathers grown after a year in a clean environment was greater in melanistic birds, suggesting that they could offload accumulated metals at a faster rate than paler individuals.

The effect was quite weak, however, and other hypotheses also might explain the prevalence of melanistic birds in urban areas. Recent papers by Lisa Jacquin and colleagues, also from Chatelain's lab in Paris, have shown that melanistic pigeons are better able to cope with internal parasites in heavily urbanised areas, but that this advantage switches to normal-coloured birds in suburban areas (*Journal of Avian Biology* 42: 11–15; *Oecologia* 173: 1089–1099). And Belgian ecologist Marcel Eens suggests that melanistic birds are favoured in urban areas because they are bolder and more aggressive. Clearly, dark-morph birds have advantages over their paler peers in certain environments.

PETER RYAN

BRIGHT WHITE Leucism and albinism in birds

CAPE GLOSSY STARLING, KGALAGADI NATIONAL PARK RUDY BÖHMER

In January 1981, I struggled to identify a small, white bird at Highmoor State Forest in the KwaZulu-Natal Drakensberg. With the help of colleagues at the Durban Natural Science Museum, we came to the conclusion that it was an African Stonechat (*Bokmakierie* 36(3): 71). Since then I have seen only a handful of leucistic birds across southern Africa. It was thus interesting that during March and April 2014 I received no fewer than five records of leucistic birds: a Cape Glossy Starling in the Kalahari, a Fiscal Flycatcher near Paarl, a Magpie Shrike in the Kruger National Park, a Spotted Eagle-Owl in Knysna and a Ludwig's Bustard in the Karoo.

Leucism results from an absence or reduction in melanin pigments, producing white or washed-out plumage. It is caused by an inherited genetic defect that affects the differentiation and/or migration of pigment cells during embryonic development. The whole bird is affected if all cells are defective, as shown by the shrike, eagle-owl and bustard, or the effect can be localised if only some cells are defective, as shown by the starling and flycatcher. Birds produce two types of melanin – eumelanin and phaeomelanin – and mutations can affect the expression of one or both of these pigments.

SPOTTED EAGLE-OWL, KNYSNA MARY LOWTEN

MAGPIE SHRIKE, KRUGER NATIONAL PARK GEOFF SEAR

LUDWIG'S BUSTARD, EASTERN KAROO ELMIEN LE ROUX

Albinism, with which leucism is often confused, is caused by another genetic mutation that prevents the production of any melanin pigments due to the absence of the enzyme tyrosinase. This affects all tissues, including the iris, so albinos have red eyes because the underlying blood vessels show through. By comparison, most leucistic birds – including the five individuals shown here – have normally coloured eyes. The lack of melanin in the iris results in UV damage to the retina, so most albino birds die soon after fledging, apparently as a consequence of their poor eyesight.

Leucism is rare in birds, because it involves genetic mutations resulting from the inheritance of recessive genes. The survival of leucistic individuals is compromised because they are more susceptible to predation as a result of the lack of protective camouflage, or because they stand out from the rest of their group. In addition, their feathers wear more rapidly than birds with normal pigmentation, putting them at a further disadvantage in terms of flight ability and insulation. However, some individuals can live productive lives: the leucistic Ludwig's Bustard was photographed incubating two eggs!

Although it's hard to read too much into five reports of leucistic birds in a few months, it does seem as though we are seeing more avian 'freaks' these days, including birds with abnormally-developed bills. This might simply reflect the increasing numbers of birders or people willing to send in reports, but it is tempting to speculate that it is at least in part a consequence of the increasingly polluted and stressful environment in which we live.

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