NEWS & VIEWS

feather light

Leucistic White-fronted Plover – or is it?

PETER RYAN (3)

Birders are fascinated by abnormal plumage coloration, perhaps because we rely so heavily on plumage colour to identify birds. One of the most common aberrations is a lack of pigmentation, resulting in partially or wholly white plumage. For many years such birds were called albinos – or partial albinos – until it was pointed out that albinism strictly refers to the complete absence of melanin, including in the bill, legs and eyes (which makes the eyes appear pink due to the blood vessels at the back of the retina). Albinos are extremely rare in the wild, probably because their vision is poor and they soon fall prey to predators, so we should be calling birds with at least some melanin 'leucistic'.

above *This paler than usual White-fronted Plover is a 'brown' or 'hypoeumelanistic' bird, depending on whether you follow the terminology of Hein van Grouw or Jeff Davis.*

But life is seldom that simple. I recently came across an unusually pale White-fronted Plover that has been on the coast south of Olifantsbos in the Cape of Good Hope sector of Table Mountain National Park for the past few years. Not having seen leucism in a plover before, I did a bit of research into leucism in shorebirds. It turns out there are very few records from plovers and sandpipers, but it is more common in avocets and oystercatchers (including the African Oystercatcher). However, I also came across a couple of interesting articles that I should have read when they first came out more than a decade ago.

The first, 'Not every white bird is an albino: sense and nonsense about colour aberrations in birds' by Hein van Grouw, appeared in 2006 in *Dutch Birding* (28: 79–89) and was followed shortly thereafter by Jeff Davis's 'Color Abnormalities' in *Birding* (September–October 2007; 39(5): 36–46). More recently, Hein van Grouw produced another useful review, 'What colour is that bird?' in *British Birds* (2013; 106: 17–29). I encourage readers to consult these sources for a comprehensive explanation of what is quite a complicated story. My aim here is to draw attention to these articles and to highlight the diversity of plumage aberrations that tend to get lumped together as 'leucism'.

Melanin is the pigment responsible for black and brown tones in birds' feathers, although it can also combine with other pigments such as yellow or red carotenoids to create other colours. For example, many birds have brown melanins in the feather barbs and yellow carotenoids in the barbules, which together give the feather an olive-green appearance. If the melanin is lost (through leucism), the feathers appear yellow.

As already noted, an albino is an individual completely lacking any melanin. This results from a recessive mutation that prevents the formation of the enzyme responsible for generating melanin, so there can be no such thing as a 'partial albino'. Leucism, by comparison, results from the failure of the pigment-forming cells to migrate to some parts of the embryo during its development, resulting in the localised absence of melanin. It can affect all parts of the bird except the eyes, which derive their pigment cells from a different embryonic pathway.

Leucism affects birds from birth and remains the same through successive moults. A similar syndrome of partial or even completely white plumage can also develop gradually, like the loss of pigment from human hair with age. It results from the loss of pigment cells as the bird gets older, and is often more common than partial leucism. Van Grouw terms it 'progressive greying', but the two are hard to differentiate, especially if much of the body is affected. Both result in completely white feathers, but these tend to be more symmetrical in partial leucism and more randomly distributed in progressive greying.

Other mutations result in a change in the composition or amount of melanin rather than its absence. Birds that have too little melanin are said to be 'diluted' when the number of pigment granules is reduced, whereas those with too much melanin are melanistic. However, the story is further complicated by the presence of two types of melanin in birds: eumelanin, which colours feathers black, grey or dark brown, and phaeomelanin, which is warmer brown or buff. Most birds have both types of melanin in their feathers, but a few groups only have eumelanin.

Some mutations affect only one form of melanin, resulting in a confusing array of aberrations. In 'browns', the number of eumelanin granules remains the same, but incomplete oxidation of the eumelanin results in plumage that appears paler and browner than usual. This, together with the faster wear of the compromised feathers, probably accounts for the washed-out appearance of the White-fronted Plover.

Browns are easily confused with isabelline dilution, where there is a reduction in the amount of eumelanin but no change to the phaeomelanin, also resulting in paler, browner plumage. However, browns occur in birds that lack phaeomelanins (for example, crows, gulls, terns, tits and oystercatchers), illustrating that the brown colour results from a change in the composition of the eumelanin rather than its absence. Dilution can also affect both types of melanin, in which case it is referred to as pastel dilution.

Several other mutations that also affect melanin expression are known mainly from domestic birds. Suffice to say the ability to determine the exact cause of a plumage aberration in a wild bird is not at all easy. In addition to mutations, disease and poor diet can affect a bird's ability to generate pigments during moult, sometimes resulting in white or paler than usual feathers.

Given the difficulty in determining the underlying causes, Jeff Davis suggested that rather than naming aberrant plumages based on the cause, we should simply describe the symptoms. So a bird lacking melanin from part of its plumage would be termed partially amelanistic, irrespective of whether it resulted from leucism or progressive greying. And a bird with paler than normal plumage would be hypomelanistic, whether it was a brown or a pastel dilution. His names can also specify a particular melanin, such as aeumelanistic for an isabelline dilution. Davis's suggestion has merit, but it remains to be seen whether birders will adopt it over the more traditional, process-based nomenclature advocated by Van Grouw. Either way, the situation is more complex than most birders appreciate!

above *The scattered white feathers on this Sombre Greenbul probably result from progressive greying rather than partial leucism.*

top *This Grey-headed Albatross fledgling on Marion Island was reported as leucistic, but the buffy wash on the wings indicates a form of melanin dilution.*

PETER RYAN

ARNAU SOLER

ice AND memory

Peregrine Falcon migration

Avian migration is one of the marvels of the animal kingdom. Over the past few decades, much has been learnt about why birds migrate, where they go, how they navigate and how some can fly as far as 11 000 kilometres non-stop. But many aspects of the evolution of migration remain mysterious, including how migration routes are formed. A new study of Peregrine Falcons, published in the journal *Nature*, has yielded novel and important insights into how migratory routes develop and persist across generations.

The multinational team of researchers behind the paper used satellite transmitters to track 56 Peregrines. The falcons belong to six populations that breed in Russia's vast northern tundra, in distinct breeding areas ranging from the Kola Peninsula in the far west all the way to the eastern Kolyma region within 1000 kilometres of Alaska. The birds use five distinct migration routes: individuals from the two westernmost breeding populations winter in western Europe, those from the central breeding areas migrate to the Middle East and the Indian subcontinent respectively and eastern birds winter in South-East Asia. The peregrines depart from their breeding areas in September and migrate solitarily along routes whose distances range from 2300 to 11 000 kilometres.

The team then examined the falcons' population genetics to reconstruct the birds' recent evolutionary history. The inferred population size began increasing 100 000 years before present and peaked some 20 000 to 30 000 years ago in the depths of the last Ice Age, or Last Glacial Maximum (LGM). By modelling paleoclimate and changes in the distribution of Eurasian tundra when the vast ice sheets of the LGM melted and earth entered a warmer interglacial period, the authors were able to surmise that the five major migratory routes followed by Peregrines today developed as the ice receded and the distribution of tundra shifted northwards, contracting as it went. The species' population peak during the LGM is thought to reflect the far greater expanses of tundra then present in Siberia, compared to during warmer interglacial conditions.

But it was a deeper look into the falcons' DNA that revealed the study's most impactful finding: evidence for a 'migration gene'. The researchers found that one particular gene, known as ADCY8, differed in a consistent way between Peregrine populations that followed longer migration routes and those whose migration routes are shorter. Intriguingly, the ADCY8 gene also plays a pivotal role in long-term memory in many animals, including humans. The authors argue convincingly that differences in ADCY8 are responsible for population-level differences in migration distance. In essence, some Peregrines have evolved better long-term memory, which facilitates longer migrations.

In addition to reconstructing the influence of past climates on the development of the Peregrines' migration routes, the authors modelled how climate change will affect future migration. Warming will cause the tundra to shrink and contract northwards and the eastern Peregrine populations will face longer migration distances with increased mortality risk along the extended routes. Western Peregrines, however, will lose nearly all of their current breeding areas and may well stop migrating altogether.

ANDREW McKECHNIE

Reference

Gu Z et al. 2021. 'Climate-driven flyway changes and memory-based long-distance migration.' *Nature* 591: 259–264.

birds to watch

American Cliff Swallow

With the increase in the number of birders, new species have been added to the southern African bird list with surprising regularity over the past few years. A popular pastime among twitchers – often indulged in on long road trips to chase yet another vagrant – is to speculate what the next 'mega' to reach our shores will be. Another species to add to that list is the American Cliff Swallow *Petrochelidon pyrrhonota*.

The 11 species of *Petrochelidon* swallows occur across the world, with five species in Africa, one in southern Asia, two in Australasia and three in the New World. In southern Africa we are familiar with the South African Cliff Swallow *P. spilodera*, which breeds in colonies, mainly under bridges, in summer and migrates north to winter in central Africa.

The Red-throated Cliff Swallow *P. rufigula*, which occurs from Gabon to Angola and northern Zambia, has sometimes been flagged as a possible vagrant to southern Africa. It is slightly smaller and more slender than its southern cousin, with white tail spots and a plain breast, lacking the dark breast mottling characteristic of the South African Cliff Swallow. The movements of the Red-throated Cliff Swallow are not well known, but it appears to be at most a partial migrant, so the chances of one reaching southern Africa may not be very high.

Perhaps a more plausible vagrant is the American Cliff Swallow, which breeds across much of North America, from northern Alaska to southern Mexico, and winters south to Argentina and Uruguay. Since the 1980s, some American Cliff Swallows have taken to staying over in Argentina, building nests but are apparently not yet confirmed to lay eggs (unlike the Barn Swallow, which has established a thriving breeding population centred on Buenos Aires). Flocks occasionally wander as far south as Tierra del Fuego and the species has been recorded from the Falkland Islands. Transatlantic vagrants have reached Western Europe.

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PETER RYAN

American Cliff Swallows are common migrants to southern South America, and recent sightings from Tristan da Cunha and Gough Island (lower image) indicate the potential for them to reach southern Africa.

I hadn't considered it as a candidate to reach southern Africa until April 2021, when I saw two on Gough Island, more than halfway from South America to southern Africa. A Barn Swallow was seen feeding over the island on 15 April, but on 20 April four swallows were seen in front of the base – two Barn Swallows and two cliff swallows. Viewing conditions were challenging; the birds were mainly backlit against a grey, rainy sky, but photographs confirmed that they were American Cliff Swallows. A third Barn Swallow arrived on 21 April, but by 26 April only one Barn Swallow and one American Cliff Swallow remained and none was seen after that. It appears that this is not the first time American Cliff Swallows have reached the Tristan archipelago; the RSPB's Andy Schofield reports seeing several at Tristan and Nightingale Island in the past few years.

The American Cliff Swallow is distinctly smaller than its South African counterpart and has a pale golden frons that contrasts with the dark red face and throat, a dark blue crown and a pale buff nuchal collar. The sides of the buffy-orange rump are scaly and the vent is paler than in the South African Cliff Swallow. It typically has one or more narrow white streaks running down the centre of the back, like the Red-throated Cliff Swallow, but lacks that species' white tail spots.

Like many other cliff swallows, the American Cliff Swallow has benefited from breeding on man-made structures and its range and population have increased greatly, particularly in the south-eastern USA. More swallows mean more chances for vagrants to get blown off course on their migrations and potentially reach southern Africa. Perhaps the first American passerine to be recorded from southern Africa will be a swallow.

PETER RYAN

altogether now!

Living in groups makes you clever

PETER RYAN

The demands of incubating eggs and feeding a brood of chicks results in most birds forming partnerships to breed. In most cases, these are simple male–female pairings, which explains why most birds are at least socially monogamous. By comparison, most mammals are polygynous, with one sex – usually the female – left to rear the offspring alone. But some birds take group living a step further, involving more than two birds in raising the offspring. Such species are termed cooperative breeders and the phenomenon is particularly common among birds breeding in southern Africa and Australia.

Living in groups brings its own challenges, including the need to develop and maintain social bonds. It has long been argued that social interactions are a key driver of the evolution of 'intelligence'. Correlative studies suggest that social birds and mammals have better cognitive abilities and increased brain capacity compared to solitary species and experimental studies show that brain structure is related to group size in captive monkeys and even fish, but only recently has this been demonstrated in free-living animals.

Ben Ashton and colleagues worked with habituated groups of Australian Magpies *Gymnorhina tibicen* in Western Australia (*Nature* 554: 364–367). The 14 groups studied ranged in size from three to 12 birds. Individuals were presented with four challenges in the field to assess their cognitive ability to obtain a small cheese reward.

The first task presented food items behind a transparent barrier and measured how long it took a bird to learn to circumvent the barrier without first pecking directly at the food. The next two tests hid the reward behind a coloured lid. In the first trial, the birds had to learn to associate the reward with either a pale or dark lid. Once this task in associative learning was achieved, the following day the pattern was reversed, to see how long it took for a bird to learn the new pattern. And finally, spatial memory was tested by hiding the reward behind one of eight identical lids and presenting this to the birds over a series of days to measure how well they remembered the correct lid.

The study found that performance in each test was strongly correlated among individuals. That is, birds that scored highly for one test tended to do well at all tests, allowing the researchers to compile an index of cognitive performance. As expected, the best predictor of cognitive ability was group size; magpies from larger groups solved the puzzles faster and remembered the lessons learned for longer than birds from smaller groups.

Ashton and colleagues also assessed the development of cognitive skills by presenting the same challenges to juvenile magpies. The young birds initially all fared poorly at solving the tasks, irrespective of group size. However, those from larger groups learned more quickly. This was not simply a consequence of better condition among the juveniles from larger groups, because group size had no effect on provisioning rates or body size of offspring.

The study also found that intelligent females were better parents. Unlike many cooperative breeders where there is a single breeding pair in each group, all adult female magpies breed, with offspring usually being sired by males from outside the group. Among the study population, the best predictor of fledging success and the number of young surviving to independence was the mother's cognitive ability. This suggests that there are direct fitness benefits to being 'clever'.

The magpie study reinforces one of the key lessons from Larry Spear and Nadav Nur's classic study on Western Gulls *Larus occidentalis* (1994; *Journal of Animal Ecology* 63: 283–298), which showed that gulls from one-chick broods had a lower survival rate than those from larger broods, despite fledging with higher average body weights (usually a strong predictor of survival rate).

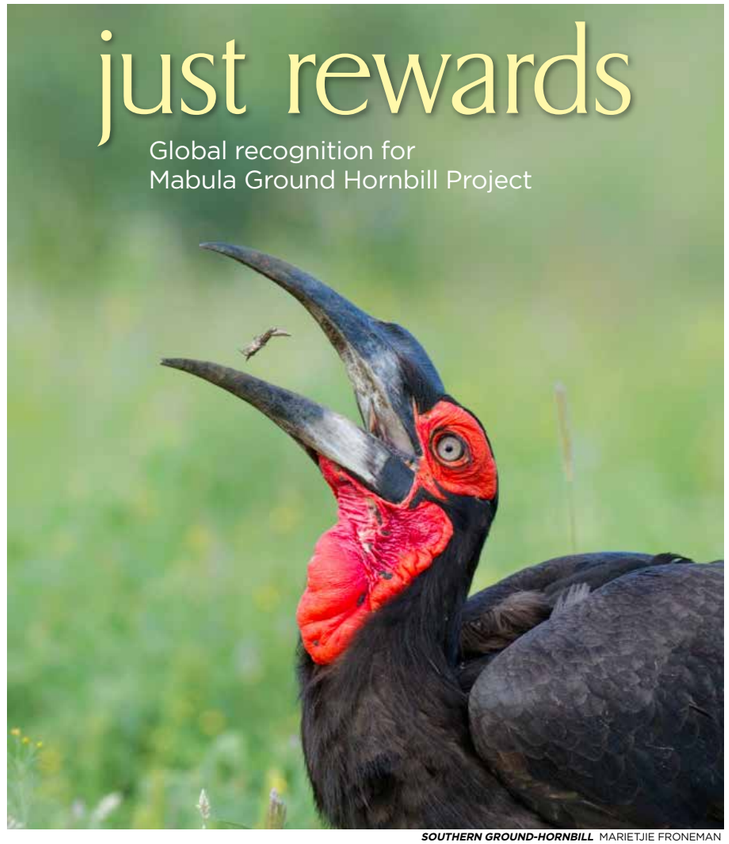
The message for parents of one-child families is clear: send your child to a crèche from an early age. Exposing them to social stimulation and perhaps equally importantly, peer competition, fosters the development of crucial life skills that help them to succeed.

PETER RYAN

above *A recent study assessing the development of cognitive skills showed that Australian Magpies living in large groups are more intelligent.*

just rewards

Global recognition for Mabula Ground Hornbill Project



SOUTHERN GROUND-HORNBILL MARIETJIE FRONEMAN

left *The Mabula Ground Hornbill Project's Lucy Kemp loves linking conservation science to community-led conservation.*

In May 2021 a spotlight was shone on the Southern Ground-Hornbill and the conservation of work of the BirdLife Species Guardian, the Mabula Ground Hornbill Project when Dr Lucy Kemp was honoured as one of six recipients of the prestigious 'green Oscar' Whitley Fund for Nature (WFN) Awards for 2021. The award was granted by the WFN Patron, the Princess Royal, and was accompanied by a documentary of the project's work narrated by Sir David Attenborough (one of the WFN Trustees).

The WFN is a fundraising and grant-giving nature conservation charity that supports conservationists working with and leading grassroots projects that benefit wildlife, habitats and people. Whitley Award winners receive funding, training and profile to support the growth of their conservation work. In future years they can apply for WFN Continuation Funding to further expand successful projects. To date, WFN has given £18-million to more than 200 grassroots conservationists in over 80 countries.

The award of £40 000 will enable the Mabula Ground Hornbill Project to achieve four major goals within a year:

- The construction and installation of 40 artificial nests where they are needed within the range;
- The instigation of a further 40 custodianships, in which landowners (communal or freehold) with nests on their properties are supported to be able to protect their resident group into the future, and contribute to their monitoring;
- To document and utilise cultural perceptions and values to plan bespoke conservation initiatives across six language groups in South Africa; and
- To support Namibia and Botswana in initiating their own conservation plans for the species.

Lucy is thrilled with this award as it recognises the massive conservation and research gains the project and its collaborators have made for the species over the past two decades. In addition, it is a valuable validation for the sponsors who have supported the project's work for so long and so loyally, and it is a win for her team, whose daily commitment to the understanding and conservation of the Southern Ground-Hornbill has now been recognised on the global stage.

Not only that, but the funding is critical in a conservation world struggling to find the resources to sustain its work in a global Covid-crippled economy. The stringent selection process by the WFN also gives potential new sponsors peace of mind that the project meets the highest governance, scientific, strategic and ethical standards.

The award is of immense personal value to Lucy. Her parents started the earliest research into the species in 1969 and what was then considered just an interesting and complex species to study is now the fastest declining bird species in South Africa. It has been a fascinating journey for Lucy to work side by side with her parents for the past decade and together see gains slowly being made for the Southern Ground-Hornbill.