

# colour polymorphism IN BLACK SPARROWHAWKS

Charles Darwin wondered how multiple morphs, unrelated to age or sex, coexist within certain species, because the occurrence of such morphs appears to run counter to the idea of natural selection. Evolution should favour the optimal form for an environment and eliminate the less fit form. Subsequent research has found several mechanisms that allow polymorphisms to persist, but the topic continues to fascinate evolutionary ecologists.

Fitz PhD student Gareth Tate, under the supervision of Dr Arjun Amar, recently initiated research on plumage polymorphism in the Black Sparrowhawk *Accipiter melanoleucus*. The population that colonised the Cape Peninsula in the 1990s has been closely monitored for the past 14 years, first by Odette Curtis as part of her MSc research, and subsequently by Ann Koeslag. These data have allowed us to begin teasing apart the mechanisms that maintain polymorphism in this species and also may shed light on the origins of polymorphism in raptors and other birds.

Adult Black Sparrowhawks occur in either light or dark morphs, and thus exhibit discrete rather than continuous polymorphism (that is, most individuals fall into one of two distinct colour forms instead of grading imperceptibly between these extremes). Light morphs predominate in most of South Africa, comprising more than 80 per cent of birds in KwaZulu-Natal and over 90 per cent in Mpumalanga. However, in contrast, the dark morph comprises almost 80 per cent of individuals in the Western Cape, with a greater proportion of dark males than females. A long-term photographic database shows that during the past decade the ratio of dark to light-morph birds has changed very little on the Cape Peninsula.

Because adults and chicks are individually colour ringed on the Cape Peninsula, we can show that the colour morph follows a classical pattern of Mendelian genetic inheritance (Amar et al. 2013, *Journal of Zoology*, 289: 60–67). The alleles coding for the light morph are dominant and the dark-morph alleles are recessive, meaning that in order for



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a bird to be a dark morph it has to obtain the dark-morph gene from both its parents. The dominance of dark-morph birds in the Western Cape thus suggests that either there was differential immigration of dark-morph birds to the region originally or that there has been strong selection for dark morphs.

The regional differences in morph frequencies appear to be associated with temperature and rainfall during the winter breeding season, with more dark birds found in cool, rainy regions. This provides a possible explanation for the abundance of dark-morph birds in the Western Cape: dark morphs may be better adapted to cope with wet winter breeding conditions than light morphs. One possible mechanism underpinning their selective advantage could be improved hunting success in darker, rainy conditions. This would explain why males (which undertake most of the hunting during the breeding season) have a higher proportion of dark individuals than females.

However, other factors might also play a role. A recent paper published in the journal *PLoS ONE* [doi: 10.1371/journal.pone.0081607] reported that dark-morph birds on the Cape Peninsula had lower levels of a blood parasite than light morphs.

*PhD student Gareth Tate holds a pale-morph Black Sparrowhawk. This form predominates throughout most of South Africa, but is rare in the Western Cape.*

Dark-morph birds may thus be more common in the Western Cape because they are better able to cope with a high prevalence of blood parasites, particularly during the wet winter when the insect vectors of these parasites may be more abundant.

In 2014, Gareth will be extending his Black Sparrowhawk research from the Cape Peninsula to the rest of South Africa. His study will assess levels of blood parasites as well as investigate the genetic structure of sparrowhawk populations. For this work Gareth is seeking information about known Black Sparrowhawk breeding pairs, so if you know of any recently active nest sites, please contact him on [garethjtate@gmail.com](mailto:garethjtate@gmail.com)

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