colour coding
IN A CHANGING WORLD

Eurasian Scops-Owl

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Some bird species comprise several distinct, genetically determined colour morphs, a phenomenon known as colour polymorphism. The Gouldian Finch *Erythrura gouldiae* from Australia's northern tropics is one of the best-known examples, with both sexes exhibiting three strikingly different forms, having either yellow, red or black heads. Several African species also exhibit marked colour polymorphism. Mountain Wheatear *Oenanthe monticola* males with black plumage and a white crown, for instance, are marginally more common than ashy-grey males of the same species.

Colour polymorphism can have profound consequences for avian reproduction and, ultimately, how species evolve. Among Lazuli Buntings *Passerina amoena* in North America, for instance, males occur in a range of colour morphs, from a dullish brown form with plumage similar to that of females to a vividly coloured form whose brilliant blue head and neck contrast with reddish-brown and white underparts. Unexpectedly, both very dull and very bright first-year males are more successful at obtaining good-quality territories, attracting mates and producing offspring than are intermediate, 'average' males.

New research has found that the relative frequencies of various colour morphs are not static within a species, but can change over relatively short time scales. The Eurasian Scops-Owl *Otus scops* is a Palearctic migrant that winters in the wooded savannas of North Africa, where its range overlaps with that of the African Scops-Owl *O. senegalensis*. Plumage coloration in Eurasian Scops-Owls is highly variable, reflecting the relative amounts of particular feather pigments. The two most common colour morphs are dark reddish and pale reddish, but the plumages of many individuals are intermediate between these two extremes.

Year-to-year variation in scops-owl plumage coloration correlated with both temperature and rainfall

A team of ornithologists recently examined plumage coloration in 281 Eurasian Scops-Owl specimens in Italian museums, collected between 1870 and 2007. To their surprise, the researchers found that the proportion of dark reddish individuals increased significantly during this period. The majority of scops-owls collected in the late 19th century were pale reddish in colour, but by the second half of the 20th century the preponderance of colour morphs had shifted to darker birds.

This conspicuous change in coloration suggests that the evolutionary forces acting on the various colour morphs of this species have been modified by environmental factors. Whereas in the 19th century pale reddish scops-owls were evidently more successful at passing on their genes to subsequent generations, the situation has now reversed and under present conditions it is the dark reddish birds that enjoy greater evolutionary fitness.

To understand why these changes have occurred, the researchers examined how the relative frequencies of different colour morphs responded to short-term fluctuations in climatic and environmental factors. They found that year-to-year variation in scops-owl plumage coloration correlated with both temperature and rainfall. Minimum temperatures in Italy increased by just over one degree Celsius during the 20th century and this warming trend appears to have been one of the major factors driving shifts in colour morph frequencies. Increases in the extent of Italian woodlands during the 20th century have also been implicated, since dark plumages tend to be more cryptic in closed habitats. These changes in vegetation cover are thought to have led to dark-form scops-owls becoming less susceptible to predation compared to paler individuals, with the genes coding for darker plumage thereby proliferating among the population.

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REFERENCE
Galeotti, P. et al. 2009. 'Global changes and animal phenotypic responses: melanin-based plumage redness of scops owls increased with temperature and rainfall during the last century.' *Biology Letters*, 5: 532–534.