BIRD. diversity past and present

Two over-arching questions in ornithology concern how various groups of birds are related to one another, and why avian diversity is higher in some parts of the world than in others. These two areas have more often than not been studied independently of each other: the first has been the domain of systematists and taxonomists, the second the realm of ecologists and biogeographers. In late 2012, the journal *Nature* published a paper that represents the most ambitious attempt yet to bridge these fields.

Walter Jetz of Yale University and his co-authors used an exceptionally detailed avian phylogeny, together with information on the distributions of extant species, to estimate the rates at which new species have evolved in the past and how diversification rates have varied globally. The study is remarkable for several reasons, but without question the most impressive aspect is that it is based on the distribution and phylogenetic position of every one of the 9 993 extant bird species recognised by current authoritative compilations.

The patterns that emerged provide unprecedented insights into the rates at which new species have arisen in different parts of the world. Surprisingly, tropical regions are not necessarily the hotbeds of evolutionary radiation they are often thought to be; the rates at which new species have evolved are as high in temperate regions as they are on the equator. The reason tropical environments generally hold far more species than temperate regions thus appears to be largely a matter of age, with the tropics having been climatically stable for much longer than temperate latitudes.

Overall diversification rates have been increasing since about 50 million years ago, but have varied greatly between continents. South America, for instance, has seen more rapid recent diversification compared to Africa, particularly among passerines. However, the comparatively slow diversification in Africa implies that ancient radiations among early birds rapidly filled the continent's available niches, leaving fewer evolutionary opportunities for more recent groups. So although South America may be more species-rich, Africa holds greater phylogenetic diversity. Islands, as might be expected, have been characterised by more rapid diversification than continents.

This study is a remarkable achievement by any standard. But there are devils in the detail, and some pre-eminent academics have urged caution in interpreting its findings. One key issue concerns the phylogeny the authors constructed. Although it includes all extant species, it is not based on new genetic analyses. Instead, an existing phylogeny for major bird groups proposed by Hackett et al. (2008) was used as a backbone, onto which was grafted details for each group based on syntheses of (sometimes limited) available data. Moreover, approximately 3 300 species were assigned positions purely on the basis of taxonomic classification, not genetic data. The entire analysis is critically dependent on the accuracy of the underlying phylogeny, and any errors will have serious implications for inferred rates of evolution. Concerns have also been raised about the techniques used to infer the times at which major groups diverged from each other, and hence estimated rates of speciation.

Another shortcoming concerns extinction: the analysis accounted for natural extinction rates, but not for the disappearance of entire groups, such as the recent extirpation of New Zealand's moas and Hawaii's oos, at the hands of humans. So while the study is rightly being hailed as a significant advance in our understanding of the evolutionary history of birds and the patterns of diversity we see among extant species, it is probably best seen as a preliminary analysis rather than the definitive last word.

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Mousebirds comprise a phylogenetically ancient order of birds endemic to Africa.

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References

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