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Birds do not work harder to breathe

An efficient one-way airflow system is essential for bird flight. Extracting more oxygen per breath than mammals, birds can meet the costly fuel demands of flight. However, despite the gains achieved by maximising the amount of oxygen passing through their lungs, the metabolic cost of breathing for birds could be high. Birds were thought to have to work against the weight of their flight muscles loading down the sternum as they breathe, increasing the exertion of breathing even during rest. Yet, no one had ever successfully measured the direct cost of breathing for resting birds. Intrigued by the possibility that high-altitude species may also have evolved special adaptations to minimise the cost of breathing in thin air, Julia York, from the University of British Columbia, Canada, and colleagues from Canada, USA, Peru and Australia, collected 11 species of duck (including teal and pintails) from high-altitude locations (3812 m at Lake Titicaca in Peru) and nearer sea level (~1260 m in Oregon) to measure how much effort it takes birds to breathe.

Recording the work done by a ventilator that was helping the birds to breathe while anaesthetised, York and her colleagues discovered that the respiratory systems of the high-altitude species were less rigid and more compliant than those of the species that are adapted to low-altitude living, which could have helped to reduce their breathing costs relative to their low-altitude cousins. However, when she calculated the metabolic costs of breathing for each of the species, the values fell between 1 and 3% of the basal metabolic rate – the energy required to simply keep that animal alive – which is as low, and sometimes even lower than, the metabolic cost of breathing for other terrestrial species. And when she measured the volume of the high- and low-altitude birds' respiratory systems, they were essentially the same. So birds do not have to work harder to breathe than mammals and other non-fliers, and the high-altitude ducks had not developed larger lungs to improve their oxygen supply in thin air.

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