Birds in a Changing Climate

A Birds have been a prominent feature of life on Earth for eons. The adaptations commonly associated with this group of animals, such as feathers, hollow bones, and air sacs, evolved in a piecemeal fashion almost as soon as dinosaurs arose over 230 million years ago. Present day birds evolved from theropod dinosaurs, a lineage that includes Tyrannosaurs and Velociraptor. Around 150 million years ago during the late Jurassic, Archaeopteryx, considered a transitional form between dinosaurs and birds, first took to the skies. This opened up a vacant niche for these animals and evolution advanced rapidly, eventually giving rise to the 10,000 known bird species living today.

B Despite this ancient history, birds today face an increasing number of threats to their existence, especially from anthropogenic climate change. While some of these seem relatively minor, experts predict that climate change could send more than half of the bird species in North America to join their ancestors in extinction. A thorough understanding of the ways in which climate change can impact birds is essential in predicting extinction risk and in developing possible mitigation strategies.

C To assess how climate change will impact birds, exploring how the planet is actually changing is a prudent first step. Climate change is predominately driven by increases in greenhouse gas emissions of carbon dioxide into the atmosphere. Prior to the Industrial Revolution, carbon dioxide levels in the atmosphere were 280 ppm. Today levels have increased by about 30% to 370 ppm. This level is greater than it has been at any point in the last 800,000 years and possibly greater than it has been over the past 20 million years. In addition to this increase in magnitude, the current rate of increase is at least 100 times faster than it has been at any point in the last 600,000 years and this rate may be unprecedented in the history of the planet.

D These greenhouse gas emissions into the atmosphere have resulted in a global temperature increase of 1.3F over the past century. Two-thirds of that increase has occurred over the last twenty-five years at an increasingly fast rate of 0.3-0.4F per decade. Temperatures in the Arctic have increased more than twice that of the rest of the planet. Average global temperatures are expected to increase more than 2F by the end of the century.

E An obvious consequence of this warming is a hotter climate in many regions of the globe. Climate change will also cause prolonged droughts and wildfires in many arid regions, such as the southwestern United States. Tropical regions will see an increase in the intensity and frequency of hurricanes. This will incur flooding as well as damages from high winds. Sea level is projected to rise as glaciers melt, eroding beaches and coasts. While the ocean warms, it will also become more acidic as it takes up an increasing amount of carbon dioxide from the atmosphere. These changes will dramatically change many habitats, with important consequences for the birds that rely on them for survival.

F Climate change has already been documented to impact the phenology, or timing of natural events, of birds. Because temperatures serve as a trigger for many species to undertake important events like migration or reproduction, shifts in temperatures can change when these activities take place. A good example of how this can impact birds comes from a long-term study of great tits in Europe. These birds time reproduction to when prey will be most abundant for nestlings, as those raised during peak prey abundance are heavier and have increased survival rates. Their main prey consists of caterpillars in oak trees, which emerge during tree bud burst in the spring, before pupating in the soil. This leaves a narrow window in which to time reproduction to coincide with peaks in prey abundance. To accomplish this, birds use temperature as a cue to initiate reproduction.

G Warmer temperatures have led birds to breed earlier in the spring. However, temperatures have also begun increasing more rapidly over the course of the season. This means that caterpillars are emerging sooner and most birds lay clutches too late for them to take advantage of the peak in prey. In essence, the cues the birds are using to reproduce are not matching up with the peak prey availability. This can diminish reproductive output and endanger population survival.

H These problems are intensified in migratory species. Pied flycatchers (Ficedula hypoleuca) have been studied in the same habitat as the aforementioned great tits. These birds are different in that they overwinter in tropical Africa before migrating to Europe in the spring to breed. They use day-length variation on their wintering grounds as a cue for migration, which is not based on temperature. Because prey availability is based on temperature, it has started earlier in the year, which has resulted in birds not arriving at breeding grounds in time to take advantage of peak prey. This represents a mismatch in cues because migrations are independent of temperature and thus birds cannot alter migration patterns as the climate changes. As a result, reproductive output has dropped and populations have declined by more than 90% in some areas. Those populations with the earliest food peaks have had the largest declines, indicating that decreased prey availability is a major factor in these declines.

I As the planet warms, it will alter habitat, which could decrease the ranges of many species. Rare species that are adapted to very specific habitats, such as those at the tops of mountains, are projected to be the most at risk. Species at the poles are very susceptible as well. The ranges of boreal birds in Northern Europe are predicted to decrease by more than 73% over the next century. Birds in more tropical regions may be able to expand their range as temperatures rise, but birds in northern Europe are blocked from northward expansion by the Arctic Ocean. The impacts of climate change on bird ranges are not uniform, but will likely vary across different latitudes and be dependent on their ecological requirements.

Questions 1-7

*Read the passage and select the correct paragraph **1-9** for each sentence from the list of paragraphs provided below:*

1) Birds time most of the important events in their lifespan like migration, reproduction, etc. on basis of temperature.

Select your answer
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2) The temperature in the Arctic region is rising at a greater pace than the rest of the world.

Select your answer
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3) Dinosaurs are the ancestors of modern day birds.

Select your answer
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4) Many natural calamities like hurricanes, floods, and droughts are caused by global warming.

Select your answer
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5) Climate change is causing a mismatch in the timing of birds' reproduction and the emergence of their preys.

Select your answer
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6) The Pied flycatchers are different because they hibernate in Africa and reproduce in Europe.

Select your answer
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7) Rare bird species living at the poles are at the highest risk of extinction.

Select your answer

Questions 8-13

*Read the passage and select the correct heading for each paragraph **1-9** from the list of headings provided below:*

8) The alarming rise in temperatures.

Select your answer

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9) On the verge of extinction

Select your answer

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10) Consequences of early breeding

Select your answer

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11) Role of greenhouse gasses

Select your answer

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12) Evolution of birds on earth

Select your answer

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13) Impact on bird ranges

1	Paragraph A
2	Paragraph B
3	Paragraph C
4	Paragraph D
5	Paragraph E
6	Paragraph F
7	Paragraph G
8	Paragraph H

9 Paragraph I