



ALARMING DECLINE IN THE POPULATION OF AERIAL INSECTIVORES

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There are almost 10,700 species of birds that are found all over the world in all major terrestrial biomes. Thus, they express a large variety of lifestyles and foraging behaviors. Some birds primarily eat plant products like seeds, fruits, and nectar, while others consume animals or a mix of plants and animals. Many bird species primarily eat insects and rely on various parts of insects as their prey. Bird species that forage for insects while flying are known as aerial insectivores which include 4 families swallows (Hirundinidae), swifts (Apodidae), flycatchers (Tyrannidae), and nightjars (Caprimulgidae). An aerial insectivore is a predator that is highly mobile and feeds on a variety of prey that have a wide range of distribution.

While the majority of the declines started in the 1980s, the guild continues to struggle with multiple environmental pressures, such as climate change, homogenization of landscapes, urbanization, intensive agrochemical use, insect decline, and their cumulative and interacting impacts. This decline is so alarming that nine of the 31 species of aerial insectivores are now listed under the federal “Species at Risk Act” of Canada and researchers have developed a roadmap to the recovery of this group of birds.

However, information on the status of these birds from developing nations, such as India is lacking due to the lack of historical data on potential causal factors, such as changes in insect populations and nonbreeding ground conditions.

REVIEW OF POTENTIAL CAUSES OF DECLINES

Declines in Aerial Insects

The population decline of aerial insectivores is due to a decrease in their prey base of flying insects. The issue of pollinator decline has become a concern that demands immediate attention. Causes of declining insect populations include intensified agriculture, habitat loss, pesticides, reduced resource diversity, extreme weather, and climate change. Changes in agriculture, such as increased use of pesticides and agricultural intensification, may be contributing to declines in insect populations, including aerial insectivores. Over the past few decades, the push for greater agricultural output has led to changes in crop production methods, such as the use of more agrochemicals, improved drainage, the loss of natural habitats like hedgerows and wetlands, and earlier planting and harvesting.

Further investigation is required to understand the complex effects of agricultural practices on breeding success, body condition, and survival of species such as swallows, although studies suggest that agricultural intensity may negatively impact food availability.

Breeding Habitat Loss

Many bird species, including aerial insectivores, have experienced population declines due to the loss of their habitats. The reduction in nesting substrate may impact the breeding success of birds, which can be better studied in species that use man-made structures like nest boxes or chimneys. Nevertheless, numerous researches on Tree Swallows have identified a decrease in nest box occupancy, even though the number of possible nesting sites has remained constant. For example, during 5 years, there was a 19% decline in occupancy. Barn Swallows in northeastern North America may lose nesting habitat due to the disappearance of old wooden barns. Barn Swallows are more likely to be found near older barns in Italy, and their colony size is positively correlated with the presence of these structures. Breeding habitat loss or loss of nesting structures does not seem to be a significant threat for aerial insectivores, except for a few exceptions like whip-poor-wills and some flycatchers. However, we require a better understanding of what qualifies as suitable foraging habitats for these species.

Climate Change

Shifts in bird species's distribution and earlier migration and nesting times are direct consequences of climate change. Over the 3 last 20 years, European flycatchers have been laying their eggs earlier in response to rising spring temperatures. However, their arrival dates have not changed. This has led to a decline in their population, as they are breeding at a different time than when their main food source is most abundant. (Both et al. 2006). In New Brunswick and Nova Scotia, Canada, the breeding of Barn, Tree, and Cliff Swallows (*Petrochelidon pyrrhonota*) has advanced by 8-10 days over the

past 60 years. These populations have seen either improved or consistent reproductive success. However, Bank Swallows (*Riparia riparia*) have not made significant advancements in their breeding, resulting in lower success rates at all stages of breeding. Although there is some evidence to suggest that climate change may be contributing to the decline in aerial insectivore populations through changes in their seasonal cycles, the evidence is not yet strong enough to definitively establish a causal link. It is important to consider that any alterations in timing and distribution may worsen the current stressors faced by these species.

Conclusion

Insectivores could have important roles to play in future conservation actions, it is important to fully understand how they respond to human disturbance, with more information required from under-represented areas in order to gain a better understanding of how different land-use histories affect the world's ecosystems, it is important to study their response patterns. It is crucial to recognize that birds play a significant role in many ecosystems, and their ecosystem services are often overlooked and undervalued. It has thus been suggested that quantifying the services provided by birds is crucial to understand their importance for ecosystems and for the people that benefit from them.

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