

Editorial

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How Forest Biodiversity rather than Desertification Can Endanger Some Vulture Species

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Introduction

Vultures are currently recorded as icons of conservation, biodiversity and political ecology, due to the diclofenac epidemic in Asia; the urban invasion of North American cities by Black and Turkey Vultures; and the reintroduction of California Condors into the previous habitats [1-8]. Resultant actions, acknowledgements and plans for vulture conservation exist in Europe (mainly concerning the rare Griffon and Cinereous Vultures), Asia (mainly concerning the Gyps Griffon Vultures), the Americas (mainly concerning the Andean Condor); and more widely on different types of vulture health problems [9-15]. A relevant question is; does higher ecosystem biodiversity contribute to increased vulture presence? As a partial answer to this complex question, vulture habitation in two biomes of maximum and minimum biodiversity; the forest and the desert is examined.

Forests and Deserts as Vulture Habitats

Biome biodiversity is fundamental to species presence; here a biome is a region of similar climatic conditions with associated communities of animals and plants (the World Wide Fund for Nature (WWF) recognises such 14 biomes) [16]. Three 'opposite' biomes (based on biodiversity) are Biomes 1 and 2 (Tropical and subtropical moist dry broadleaf forests) and Biome 13 (the deserts and xeric shrublands). A biodiversity based hypothesis assumes that vultures would be more common in highly biodiverse forest than in the sparse xeric shrublands and especially deserts. However, many vultures avoid forests; preferring Biomes 7, 8 and 10 (savannas, shrublands and grasslands, of the tropical/subtropical, temperate and mountain mountain regions respectively).

Excepting the three *Cathartes* species (Turkey, Greater Yellow-headed and Lesser-headed Vultures), all the other twenty species of New World and Old World vultures hunt by sight rather than smell. The sensory abilities of vultures is long debated [17-32]. Consequently, the non *Cathartes* species are rare in forests, unable to visually penetrate the canopy to trace carrion on the forest floor. Large animals are also generally rarer in forest than savanna. Hence, the "forested areas of Africa or Asia do not support scavenging birds, while neotropical forest is the center of distribution for the cathartid vultures" [33].

Cathartes vultures fly low just above the forest canopy, descending only when food is scented; Turkey Vultures have located hidden carrion easily [33]. "Black Vultures do not have a sense of smell, and my observations in other study areas have shown that they are not found in undisturbed forest and cannot locate food in forest conditions unless led there by Turkey Vultures" [33-36]. The Greater-Yellow-headed Vulture, often named the "forest vulture" to distinguish it from the Yellow-headed Vulture or "savanna vulture"

forages in forests [37]. It has been recorded to locate 63% of provided carcasses in dense forest, while mammalian scavengers found only 5% [29].

The deserts, semi-deserts and xeric shrublands are at least as important as the forest for vultures, hence desertification may not necessarily destroy vulture populations. Desertification, the final stage of deforestation, is defined as land degradation from water, soil and biodiversity decline from drought or improper/inappropriate agriculture [38]. Vultures in deserts track cattle-herding and/or camel driving activities, or seasonal migration of ungulates. In the Saharan and Sahelian habitats of Africa, Egyptian, Hooded, White-backed, Rüppell's Vulture, Lappet-faced and White-headed Vultures subsist on livestock, (camels, cattle, donkeys, and horses) and rarer gazelles, these migrating for grazing and seasonal rain [39]. All these vultures are rare or absent from the African forest [40]. In the New World, Turkey and Black Vultures frequent deserts and semi-deserts in California, Arizona, New Mexico, Nevada and "are probably the most abundant avian scavengers in semi-arid shrublands" of central Mexico [41] and northern Mexico [42].

Conclusions

Crucially, sparsely vegetated landcover must be assessed further for vulture habitation. Reforestation, the commonest form of biodiversity conservation, may actually endanger some vulture species without a sense of smell. The *Cathartes* Vultures must be distinguished from the rest in this regard. Vultures are a feeding clade that generally require open landcover, therefore making a possibly unique case for their inclusion in studies of biodiversity and endangered species.

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