Sources, sinks, and drains in double breeding bird species?

The recognition of a second breeding season in some migratory bird species by Rohwer et al. (1) creates an interesting scenario for conserving migratory bird populations. Previously, conservation biologists assessed sources as large undisturbed habitats and sinks as degraded breeding grounds (2), and treated fragmented and deforested habitats in nonbreeding “wintering” areas as drains on the population. In light of a second, and perhaps vital, breeding season in midmigration, a dichotomous source–sink model is no longer applicable.

The prevailing view of postbreeding habitats for Neotropical migrant birds as a place where only population loss occurs (drain) has focused a great deal of conservation resources on protecting habitat in Central and South America, even though research has shown that there were larger problems in breeding failures in the United States (3). Furthermore, aside from the southernmost parts of Mexico, most conservation efforts to protect North American breeders after their southbound migration focused on Central and South America rather than Mexico.

Although Rohwer et al. modestly touch upon the idea that the Mexican breeding of species such as yellow-billed cuckoos may be important for maintenance of some of the western US populations of this species, the full impact of this is not emphasized enough in the paper. Their revelation that yellow-billed cuckoos are breeding in high numbers in Mexico after some of them have bred in the United States may suggest that the declining US populations are a sink for the Mexican-bred birds.

From a conservation perspective, the discovery of Rohwer et al. borders on revolutionary. The prevailing view of high-population vulnerabilities in their southern “wintering” ranges, and treatment of these as a drain, may need revision. Additionally, conservation “ownership” of these species may no longer belong in the United States. It will be exciting to see new species added to the list of double breeders, and important to revise plans for protecting these species.

What will we do in the future when Mexican birdwatchers decry the United States’ diversion of water in the west as leading to the loss of one of their valuable breeding bird species, and demand that we protect our water resources so as to protect their population of yellow-billed cuckoos? The truly groundbreaking research of Rohwer et al. has opened up this question as legitimate, and its impacts must quickly be considered in bird conservation.

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Reply to Urquhart: Conservation of migratory double breeders

Urquhart (1) raises additional potential conservation implications of our discovery of migratory double breeding in several Neotropical migrants (2) and suggests that source sink thinking is not appropriate for this situation. We fully agree.

Consider the yellow-billed cuckoos as a hypothetical example. What we need to know is whether either breeding population is self-sustaining. Suppose the population growth rate, $\lambda$, is $< 1$ both in the early-summer breeding range and in the late-summer breeding range, but $> 1$ for individuals that breed in both areas. In this case, conservation of cuckoos will be inextricably linked between these areas. A troubling implication of this perspective is that the asymmetry in the number of cuckoos breeding in west Mexico and the United States, will obscure a $\lambda < 1$ in west Mexico until that population is about to collapse. Although cuckoo densities seemed high in the remnant habitats where we worked in Mexico, the massive loss of thorn forest to industrial agriculture along the coasts of Sinaloa and southern Sonora has likely greatly reduced the number of cuckoos that breed there. Thus, the high densities we saw in the remnant habitats where we worked need not imply that the Mexican population is self-sustaining.

In our article we suggested that the number of cuckoos breeding in late summer in northwest Mexico may have been so reduced by habitat loss that production from that region is no longer sufficient to maintain a stable United States breeding population. This implies $\lambda < 1$ in the north, as suggested by the loss of cuckoos from most of their former breeding range in the western United States and by their declines in the east (2). If $\lambda$ is $> 1$ only for the segment of the population that breeds in both areas, then, because the northern breeding population is much larger than the Mexican breeding population, there will be enough second breeders to fill remnant patches of good habitat in northwest Mexico, until breeding numbers in the north have declined to approach the size of the late-summer breeding population in northwest Mexico.

Our article necessarily dealt with documenting the rather complex observational and isotopic evidence for migratory double breeding, and we were unable to fully explore the ramifications of our findings to conservation and management of Neotropical migrant birds. The massive loss of lowland thorn forest to industrial agriculture along the coasts of southern Sonora and Sinaloa will surely have important conservation implications, both to species that migrate there to breed again in late summer, and to species that migrate there for their annual postbreeding molt (2–4). Urquhart has raised important conservation implications of double breeding. We encourage a formal modeling approach to the implications of two breeding locations that presumably vary in their contributions to adult recruitment, as well as a fuller exploration of the politics of migrant bird conservation in North America.

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The authors declare no conflict of interest.

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