



By Craig M. Pease

Habitat Loss and Bird Extinctions

Many years ago, on some islands off the coast of California, there lived an odd duck. It was as large as a goose. It fed by diving for fish, as do loons. And it was flightless, as are penguins. It lived happy and well until about 11,000 years ago, when humans, having recently crossed the Bering Strait land bridge and colonized what would become California, started to hunt it. By 2,400 years ago, this duck was extinct.

All of this is laid out in Terry Jones and colleagues' fascinating *Proceedings of the National Academy of Sciences* paper on California's flightless sea duck. It is methodologically similar, in one key respect, to recent work of Mike Brooke, Stuart Butchart, and their collaborators published in *Conservation Biology* and *Oryx*. They also take a case study approach to studying bird extinctions, but focus instead on more recent extinctions, as well as near misses — the extinctions that almost happened, but did not. Brooke and Butchart make a good case that, since 1994 we have averted about 16 bird extinctions — these are losses that likely would have happened, absent conservation efforts. For example, only nine California condors were then alive, and they would almost certainly now be extinct but for a successful captive breeding program.

By this measure, our biodiversity

treaties and laws have been effective. Certainly, any evidence showing the global success of an environmental program is welcome. Even so, the overall picture with respect to biodiversity protection is grim. Early this year, Ahmed Djoghlaif, executive secretary of the Convention on Biological Diversity, unambiguously stated that the parties had not met their goal "to substantially reduce the rate of loss of biodiversity by 2010." The CBD's "Global Biodiversity Outlook 3," forthcoming later this spring, promises a nice overview of the relevant science. Yet Djoghlaif's assertion does superficially contradict Brooke and Butchart's portrait of success.

Part of the resolution to this paradox lies in observing that, our wins notwithstanding, several bird species have in fact gone extinct since 1994 (including the Po'ouli and Nukupu'u, both Hawaiian). Even one extinction is one too many. Over such a short time, in the absence of humans, we would expect none. Over long times, the cumulative impact of even a modestly elevated extinction rate can be substantial. Of the about 10,000 bird species alive in the year 1500, roughly 150 are now extinct, nearly all because of humans. Even more remotely, there is evidence that aboriginal humans caused roughly 2,000 bird species extinctions before 1500, mostly on small Pacific islands.

This paradox also has a deeper answer. In their *Conservation Biology* paper, Brooke and Butchart also found that our conservation efforts have provided little to no overall benefit to rare species not on the brink. Evidently, we are adept at mounting last minute efforts to rescue the most critically endangered species just as they are ready to go, but we have simultaneously failed to have any real impact on the ever-increasing number of bird species rushing toward the precipice. Importantly, they also

show that many of our successes arise from intense, species-specific management, such as captive breeding or killing nest predators, in addition to habitat protection.

Ultimately, to protect biodiversity, we must protect habitat. This is where we are failing. Scientists have discovered and named essentially all living birds species, but perhaps only 1 in 10 insects and other smallish critters. We cannot write a species-specific management plan for a species we have not yet discovered, to say nothing of the astronomical cost of conserving the estimated 5 to 15 million species now alive on Earth, one at a time (last ditch management can easily exceed \$1 million per species). Conversely, buying tropical rainforest habitat is a bargain (roughly \$100 per acre). By failing to protect habitat today, we are locking in extinctions thousands of years from now.

Human population growth and economic activity drive habitat destruction. The broad outlines of these relations are codified in four well supported empirical rules: First, most biodiversity resides in the tropics, rather than temperate or polar regions. Second, a 10 percent reduction in forest area results in eventual loss of a few percent of the original species, plus or minus. Third, as Joe Wright and Helene Muller-Landau show, the fraction of original forest area remaining decreases strongly as the rural human population density increases. Fourth, as a country develops economically, an increasing fraction of the human population lives in urban rather than rural settlements. I never promised you a simple explanation.

I hold out little hope that we will be able to control these ultimate drivers of habitat destruction. Certainly, to date, we have failed to do so.

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