by Paul Hess

New Crossbill Species

A new species has recently been proposed within the North American Red Crossbill complex, thanks to a decade of intensive studies by Craig W. Benkman and colleagues. It is named the South Hills Crossbill (*Loxia sinesciuris*), and it is presently known from only two locations in Idaho. Benkman tells *Birding* that the population is probably 5,000 at most and perhaps fewer than 2,000.

Benkman, Julie W. Smith, Patrick C. Keenan, Thomas L. Parchman, and Leonard Santisteban formally described the species in 2009 (*Condor* 111:169–176). It has long been known that North America's Red Crossbills are a varied lot. The fifth edition of the American Ornithologists' Union *Check-list*, published in 1957, lists eight subspecies. Subsequently, most taxonomists have increasingly emphasized that these nomadic varieties are not geographically defined breeding populations, and, thus, do not qualify as subspecies by a strict definition of the term.

This crossbill pair belongs to a population in Idaho's South Hills that is described as a new species, the **South Hills Crossbill.** The American Ornithologists' Union Check-list Committee will soon vote on whether to classify this specialized non-nomadic population as a separate species. *South Hills, Idaho; June 2004.* © *Craig W. Benkman.*

In 1993 came Jeffrey Groth's famous monograph reporting eight distinct "call types" within the Red Crossbill complex (*University of California Publications in Zoology* 127:1–143). These vocal differences do correspond in some degree to morphological, ecological, and genetic variations, and Groth proposed that the different types warranted species status. His proposal quickly became an ornithological cause célèbre, but no formal taxonomic classification was adopted. Because of historically complex and often-disputed subspecies designations, as well as morphological overlap among some call types, Groth was unable to match his eight types to subspecies in the 1957 AOU *Check-list*. Genetic distinctions Groth found were rather weak, and crossbills' nomadic habits precluded obtaining behavioral evidence that any of the types was reproductively isolated from the others.

The deficiency of information began to change in 1997 when Benkman discovered a resident, not nomadic, population of Red Crossbills within a 100-square-kilometer forest in the South Hills and adjacent Albion Mountains in south-central Idaho. These birds represent a ninth call type, and their elaborate songs also differ from two other vocal types that occur sympatrically in the area.

Further, the South Hills birds' bills average significantly deeper and shorter than bills of other Red Crossbills in the same region, the result of a "coevolutionary arms race" between the structures of the bill and the local lodgepole pine cone. In the absence of squirrels, the pines continually evolve larger cones in defense against the local crossbills. In response to the increases in seed defenses, the South Hills birds evolve a bill size and shape that enables them to feed efficiently on the relatively large cones. Crossbills of two nomadic call types occur in the area, but only a few breed, evidently because their bills are not well adapted to extracting seeds from the local cones. The pattern of local coevolution (summarized in *Birding*, November/December 2008, pp. 30–31) rests on absence of squirrels—hence the authors' choice of *sinesciuris*, "without squirrels," as the specific epithet.

What Benkman and his associates initially lacked was strong evidence that the South Hills birds are reproductively isolated from other sympatric Red Crossbills, a requirement of classification as a biological species. After studying local crossbills' breeding behavior in 2001 and 2002, Smith and Benkman were able to report such evidence in 2007 (*American Naturalist* 169:455–465). The 2001–2002 findings and unpublished 2003–2006 data showed a conspicuous pattern: Among 1,704 paired South Hills Crossbills, only 12 were paired with birds of the other two call types—a demonstration of virtually complete reproductive isolation.

The paper concludes with a startling ecological irony. South Hills Crossbills rely on locally consistent seed availability provided by mature stands of lodgepole pine threat-

ened by a pine bark beetle, fire, and climate change. The authors note one climatologist's forecast that a warming climate could eliminate lodgepole pine from the region by the end of this century. Perhaps, then, the new species would disappear as well.

Previous publications documenting research in support of the species status for the South Hills Crossbill are available at Benkman's website <uwyo.edu/benkman>.

Birds of Northern Sonora

Sinaloa Wren (*Thryothorus sinaloa*) joined the impressive list of rare ABA-area visitors from Mexico when one ventured to Arizona in August 2008. Can Happy Wren (*T. felix*) be far behind?

Aaron D. Flesch recently discovered Happy Wrens presumably breeding at two locations in Sonora as close as 50 miles south of Arizona. The species had not been reported before in those areas, which are more than 100 miles north of the previously known range limit. Noting the discovery, Rick Wright calls *felix* a conceivable stray to Arizona and advises birders to watch carefully for it (*Birding* Photo Quiz Answers, January 2009, pp. 66–69). Flesch suggests that the best places to look are in dense patches of understory in humid riparian thickets.

Flesch reported the wrens in 2008 after the most extensive survey of avian distribution and status ever undertaken in northern Sonora (*Studies in Avian Biology* 37:28–45). From 2000 to 2007, he made 568 site visits at 306 localities in the Sonora, Concepción, Gila, and Sonoyta river watersheds—all within 75 miles of the U.S. border.

He lists 161 species as confirmed, presumably, or possibly breeding. They include six first records for the study area: Short-tailed Hawk, Eurasian Collared-Dove, Violet-green Swallow, Happy Wren, Fan-tailed Warbler, and Western Meadowlark.

Many species' distributions are more widespread than previous studies have shown. Among these are White-tailed Kite, Gray Hawk, Short-tailed Hawk, White-tipped Dove, Buff-collared Nightjar, Thick-billed Kingbird, Sinaloa Wren, Rufous-capped Warbler, Five-striped Sparrow, and Streak-backed Oriole. Many apparent distributional changes likely reflect his extensive survey effort, but Flesch believes that some represent real range expansions driven by changes in vegetation and climate.

Missing from his findings are seven species presumed to have bred in northern Sonora in the past: Northern ("Masked") Bobwhite (subspecies *ridgwayi*), Flammulated Owl, Blue-throated Hummingbird, Magnificent Hummingbird, Pygmy Nuthatch, Le Conte's Thrasher, and Red-faced Warbler. Flesch suspects that all except the bobwhite still occur in the area he surveyed.

He believes that northern Sonora supports a higher richness of breeding landbird species than any other region of similar size in the borderlands of northern Mexico. Particularly rich in bird diversity are broadleaf riparian woodland, Madrean evergreen woodland, and Madrean montane conifer forest. Noting that his coverage was limited in some high-elevation areas, he urges additional surveys, especially in several mountain ranges that have probably never been visited by ornithologists.

The **Happy Wren** (*Thryothorus felix*), endemic to Mexico, has never been recorded in the U.S., but birders should watch for it in Arizona. A recent survey in Sonora turned up birds only 50 miles south of the border that were presumed to be breeding. *Barre de Navidad, Jalisco; October 1991. © Rick and Nora Bowers–VIREO.*

Flesch sees promising prospects for conservation because the human population is low, vast areas of natural vegetation remain relatively intact and unfragmented, and conservation organizations are active in the region. Nevertheless, he warns that loss and degradation of riparian areas due to agriculture, overgrazing of grasslands, and excessive withdrawal of groundwater remain significant threats.

His report is part of *Birds of the U.S.–Mexico Borderlands: Distribution, Ecology, and Conservation* published in 2008 by the Cooper Ornithological Society and edited by Janet Ruth, Tim Brush, and David Krueper. Twelve chapters cover avifaunal changes on the U.S. and Mexican sides of the

border; population trends and ecology of riparian, wetland, and grassland birds; migratory passerine movements over the arid Southwest; and conservation planning. More information on the book is available at the U.S. Geological Survey–Fort Collins Science Center website <www.fort.usgs.gov/Products/Publications>.

Loggerhead Shrike Recovery

Look closely at a range map for the Loggerhead Shrike in eastern North America. A thin line of disjunct breeding distribution crosses part of southern Ontario, more than 300 miles north of the main range limit in the mid-Atlantic states. In 2008, the strip contained just 27 confirmed wild breeding pairs, the last remnants of a once-widespread population.

These **Loggerhead Shrike** fledglings are products of a captive-breeding project designed to help rebuild Ontario's endangered eastern population of the species. In the current economic climate, finding funds to continue the program has become a serious concern. *Ingersoll, Ontario; June 2008. © Andrew Smart.*

Even that meager total is an improvement from Ontario's record low of 18 known pairs in 1997. The increase reflects a lot of science, commitment, hard work, and hope by participants in a ten-year-old captive-breeding project coordinated by the nonprofit organization Wildlife Preservation Canada (WPC) under contract by the governmental agency Environment Canada. This recovery effort may be the last chance for survival of the Loggerhead Shrike's endangered eastern population (part of the *migrans* subspecies) in Canada.

In a historical review and update of the project in 2008 (*Ontario Birds* 26:176–188), WPC Executive Director Elaine Williams and Species Recovery Biologist Jessica Steiner emphasize that little was known about how to raise shrikes of this population in captivity when captive breeding began in 1997–1998. After early trial-and-error with mixed results in zoo-based surroundings, the team turned in 2001 to a "field breeding" technique. The captive shrikes were able to raise their young in large wood and wire mesh enclosures situated in traditional shrike habitat.

That was the key step. Productivity of young quickly increased sufficiently to permit the release of approximately 100 fledglings each year. What Williams and Steiner characterize as "our big breakthrough" came in 2005 when a captive-bred shrike returned from migration, bred with a wild male, and fledged five young. By 2008, 22% of the wild pairs confirmed in Ontario contained a released bird. Details and results are available in annual reports for 2003–2008 on the WPC website <wptc.org/wildlife/shrike.php>.

Williams and Steiner caution that it is too early for the program to create sustained wild population levels. At least 15 years of breeding and releases may be required before an impact on the wild population is evident. Meanwhile, they warn that shrikes' grassland and savannah habitats continue to shrink. Much of what remains is on private land, and a crucial facet of the recovery project is a "community outreach" effort encouraging land owners to restore and even improve their property's attraction to shrikes. So far, more than 4,600 hectares of important shrike habitat have been enhanced, and more than half of Ontario's wild population now nests in those areas.

Yet much appropriate breeding habitat remains unoccupied. Too few juvenile shrikes are returning after migration to populate the available areas. By radio-tracking released shrikes, WPC researchers followed them after departure from a breeding site in 2008. More than 75% survived before leaving Canada on migration, which suggests that most mortality must be occurring along migration routes and on wintering grounds. A new long-distance tracking experiment is being developed, which would use tiny new electronic "geolocators" that continuously record birds' positions by measuring light levels and day length. WPC hopes to learn where the shrikes go, and where they die—knowledge critical for successful conservation.

Funding uncertainties loom over the effort. Federal government budget cuts to Environment Canada, the lead government conservation agency for migratory birds, have affected the project, and it survived in 2008 thanks to a contribution from Boisset Family Estates (makers of French Rabbit wines). WPC is searching for resources to continue the recovery and is relying again on "bridge funding" from Boisset to conduct the 2009 field season.

Clutch Size Variation

From the viewpoint of natural selection, variations in birds' clutch sizes have not been easy to explain. In a seminal study in 1944, R. E. Moreau compared clutches of equatorial African birds with those at high latitudes (*Ibis* 86:286–347). Clutch sizes average smaller in the equatorial region than in Britain and South Africa, both in populations within a species and among closely related species. He suggested that mortality is greater at high latitudes because of harsher winters, and that clutch sizes evolve to maintain a balance with mortality rates. Moreau was unsatisfied with the simplicity of his suggestion, and he lamented the problem's "immense complexity."

David Lack came to a different conclusion in a famous analysis in 1947 (*Ibis* 89:302–352). Within European species, he also found larger clutches in higher-latitude populations. Lack suggested that clutches at high latitudes are larger because longer day length in the breeding season enables adults to feed more young. He could not explain an east-to-west pattern in which clutches in central Europe averaged larger than those in Britain. Perhaps available food was greater in central Europe, but Lack admitted an absence of evidence relating brood size directly to food supply.

Later authors criticized Lack's focus only on the breeding season. N. P. Ashmole hypothesized in 1963 that the scarcity of winter food in tropical oceans causes density-dependent competition and controls productivity of young in oceanic birds (*Ibis* 103b:458–473). David J. T. Hussell suggested in 1972 that clutch size in Arctic passerines is governed both by food resources and by aspects of morphology and reproductive strategy (*Ecological Monographs* 42:317–364). Robert E. Ricklefs concluded in 1980, as had Ashmole, that clutch size is density-dependent—determined mainly by population limits in the nonbreeding season and not by resource abundance in the breeding season (*Auk* 97:38–49). Walter D. Koenig studied North American woodpeckers in 1986 and agreed that clutch size is related to density-dependent interaction between winter resources and breeding productivity (*Condor* 88:499–504).

Those studies were limited in geographic scope, numbers of taxa, and potentially relevant factors examined. In contrast, Walter Jetz, Cagan Sekercioglu, and Katrin Böhning-Gaese gave the issue a worldwide perspective in a study published in 2008 (*PLoS Biology* 6[12]:e303). Analyzing 5,290 landbird species, the authors integrated intrinsic and extrinsic characteristics to produce a global model predicting which factors determine clutch size. Their data came from an immense compilation published in 2004 by Sekercioglu, Gretchen C. Daily, and Paul R. Ehrlich, who collected data on the distribution, ecology, and biology of 9,787 extant and 129 extinct bird species (*Proceedings of the National Academy of Sciences* 101:18042–18047).

The results show that clutch size averages larger in precocial species, altricial migrants, cavity nesters, granivores and omnivores, and smaller species. It also averages larger at higher latitudes and in environments with a stronger difference between summer and winter temperatures. Viewed in biographic realms, clutches are relatively small in Australasia, the African tropics, and Oceania.

What biological and ecological factors influence birds' clutch sizes (here a typical **Killdeer** clutch)? A worldwide analysis associates relatively large clutch sizes with strongly seasonal environments that create a powerful interplay among population density, mortality, and food resources. *Wildwood, New Jersey; April 2002. © Kevin T. Karlson.*

Overall, the combined model suggests that the best predictor of large clutch size is a strongly seasonal environment fostering an interplay of density-dependent adult mortality and food resources—roughly corresponding to the Ashmole-Ricklefs-Koenig view. This foremost predictor also appears in the model when the species are grouped at the taxonomic levels of order and family.

Jetz and his colleagues view their comprehensive model as a demonstration of how biological factors, the environment, and evolutionary relationships combine to influence reproduction and survival through a trait such as clutch size. In effect, the authors offer a path through Moreau's "immense complexity."