by Paul Hess • Natrona Heights, Pennsylvania • phess@salsgiver.com

Mercury Changes Songs

Dire effects of mercury contamination on birds' physiology and behavior make up an alarming list of pathologies, and now we can add one more: Mercury in the diet may be poisoning birds' songs.

New evidence comes in a 2010 paper by Kelly K. Hallinger, Daniel J. Zabransky, Katherine A. Kazmer, and Daniel A. Cristol (*Auk* 127:156–161). They compared songs of Eastern Phoebes, Carolina Wrens, House Wrens, and Song Sparrows breeding along contaminated and uncontaminated tributaries of the Shenandoah River in Virginia.

Wrens' and sparrows' songs at contaminated sites were shorter, less diverse in note types, and lower in tonal frequencies than those at uncontaminated sites. In contrast, phoebes' songs did not differ between the two types of sites—a result the authors view as potentially meaningful. Like all oscine passerines ("songbirds"), wrens and sparrows learn their songs. The songs of the phoebe and other New World flycatchers (in the large "suboscine" group of passerines), however, are believed to be inherited rather than learned. An effect on birds that learn songs but not on phoebes suggests that the poison may damage the song-learning process.

Mercury was not sampled in the individuals whose songs were analyzed, but a team led by Cristol had reported in 2008 that those four species and 13 others had much higher blood mercury levels at the contaminated sites compared to the uncontaminated sites (*Science* 320:335).

Songs of Carolina Wrens, House Wrens, and **Song Sparrows** at mercury-contaminated sites along a Virginia river differ from their species' songs at uncontaminated sites. A question prompted by this discovery is whether toxic mercury affects birds' song-learning capability. *Somerset County, Maine; March 2009. Photo by © Garth McElroy.*

Researchers in Belgium also have found that differences in song quality and singing behavior of the Great Tit (*Parus major*) are correlated with heavy-metal contamination. Leen Gorissen and colleagues compared vocalizations at an extremely polluted site and at sites increasingly far from the pollution source. Males in the highly polluted area had a smaller repertoire and sang less during the dawn chorus than males in the more distant areas, according to the 2005 report (*Oecologia* 145:504–509).

Because song is a critical aspect of passerines' breeding biology and reproductive success, the consequences of impaired singing are potentially severe at population and species levels. Hallinger and her coauthors call for studies of possible physiological processes involving mercury that might cause such impairment.

Mercury, primarily from coal-fired power plant emissions, has been studied most extensively in aquatic ecosystems where bacteria convert it to toxic methylmercury, which passes upward through the food chain to top-level predators. Severe contamination was documented in 2007 by David C. Evers and coauthors at locations throughout the northeastern U.S. and southeastern Canada (*BioScience* 57:29–43). Seminal papers on the consequences for loons, avocets, stilts, egrets, night-herons, and Tree Swallows are compiled in a 2008 issue of the journal *Ecotoxicology* (17:61–141), available online <tinyurl.com/352sg9n>.

Methylmercury in terrestrial ecosystems is attracting increased attention. The Cristol team's 2008 report in *Science* includes an analysis of food—none of it aquatic in origin—that adult songbirds delivered to nestlings. Spiders, adult moths, caterpillars, and grasshoppers at contaminated sites in Virginia all contained elevated levels of methylmercury, which were highest in spiders at the top of the invertebrate food chain. The levels were negligible in similar invertebrates at uncontaminated sites.

In 2009 Evers and colleagues reported methylmercury in upland forest soils in New York and Pennsylvania, as well as elevated blood mercury levels in songbirds there <tinyurl.com/3x32dje>. The authors concluded that methylmercury "is more prevalent in terrestrial birds than previously considered" and that thrushes may be at particularly great risk. A worrisome question awaits an answer: Are the

exquisite songs of northeastern forest thrushes being damaged, too?

"Western" Flycatcher Hybrids

The two species of "Western" Flycatcher tell a continuing story of major discoveries. The newest chapter, the most significant in 20 years, reveals a huge contact zone in southwestern Canada where birds genetically intermediate between Pacific-slope Flycatcher and Cordilleran Flycatcher are common.

Andrew C. Rush, Richard J. Cannings, and Darren E. Irwin reported the hybrid zone in 2009 (*Journal of Avian Biology* 40:614–624) after conducting the first-ever genetic analysis of Pacific-slope and Cordilleran populations in southern interior British Columbia and Alberta. Cannings had previously recorded intermediate vocalizations in that area, which prompted the investigation there.

The analysis showed that mitochondrial DNA and nuclear DNA characters differ distinctly between geographically separated Pacific-slope Flycatchers in California and Cordilleran Flycatchers in Arizona, Colorado, and South Dakota. In contrast, more than 60% of "Western" Flycatchers sampled within the Canadian contact zone have a molecular mixture of Pacific-slope and Cordilleran characters.

The geographic picture in southwestern Canada is this: West of the Cascade Range, populations are genetically Pacific-slope. East of the Cascades, the two taxa evidently interbreed in a hybrid zone at least 400 kilometers wide extending from the eastern slope of the Cascades in British Columbia to the eastern slope of the Rocky Mountains in Alberta.

An obvious question is what these findings might imply taxonomically. When the American Ornithologists' Union Committee on Classification and Nomenclature (the "*Checklist* committee") divided the Western Flycatcher in 1989, it cited a prominent 1988 paper by Ned K. Johnson and Jill A. Marten (*Auk* 105:177–191). Johnson and Marten recommended the division, emphasizing a genetic distinction between coastal and interior populations, and an apparent absence of hybridization where the two occur in the Siskiyou Mountains region of northern California. No samples came from what is now known to be the Canadian hybrid zone.

Rush, Cannings, and Irwin make no taxonomic suggestions. On the one hand, they note that the presence of so many genetically intermediate birds might argue for treatment as a single species. On the other hand, they point out that geographically separate Pacific-slope and Cordilleran populations are known to be distinct not only genetically but also behaviorally and ecologically—thus, they evidently remain evolutionarily divergent despite the hybridization in the contact zone.

Genetically intermediate individuals indicate that **Pacific-slope Flycatcher** and Cordilleran Flycatcher hybridize in a broad zone of contact in interior British Columbia and Alberta. Away from the zone, however, the two species are genetically distinct, according to a recent study. *Vancouver Island, British Columbia; May 2008. Photo by © Glenn Bartley.*

These authors recommend detailed studies of the extent and form of reproductive isolation, if any, between the two taxa in the contact zone. Vocal divergence is a key factor in reproductive isolation, and it has already received study in various parts of the two species' ranges. For example, Steve N. G. Howell and Cannings analyzed vocalizations in Mexico in 1992 (*Condor* 94:785–787). At the Cooper Ornithological Society's annual meeting in 2007, Arch McCallum described vocal intermediacy in geographic zones between coastal and far interior populations. McCallum's website <tinyurl.com/2flbt53> illustrates various Pacific-slope and Cordilleran sounds.

Rush and McCallum are exploring whether vocal differences function as barriers to interbreeding and whether adaptation to different habitat types limits gene flow between the two species. More discoveries are sure to come, and more chapters in a fascinating story of evolutionary biology remain to be told.

Gull-billed Tern Decline

"It was formerly much more abundant and more widely distributed on our Atlantic coast than it is today, where it is now one of the rarest of the terns." That assessment of the Gull-billed Tern's status could have been written yesterday,

but the year was 1921 and the author was Arthur Cleveland Bent in *Life Histories of North American Gulls and Terns*.

At that stage in the tern's unfortunate history on this continent, the population had already been decimated during half a century by gunners collecting its pristine white feathers for the millinery trade. No overall population estimates are available for the period when Bent wrote his account, but even without further slaughter, we can imagine how 90 years of seaside development has decreased the Atlantic population since then.

Two notable events in 2010 bring important new scrutiny to the tern's distribution and abundance. One is the publication of a formal U.S. Fish and Wildlife Service (FWS) status review and conservation recommendations for both of the North American subspecies, *aranea* on the Atlantic and Gulf coasts and *vanrossemi* in southern California and western Mexico. The second is a FWS finding announced in June, which may take *vanrossemi* a step closer to formal listing as threatened or endangered under provisions of the U.S. Endangered Species Act.

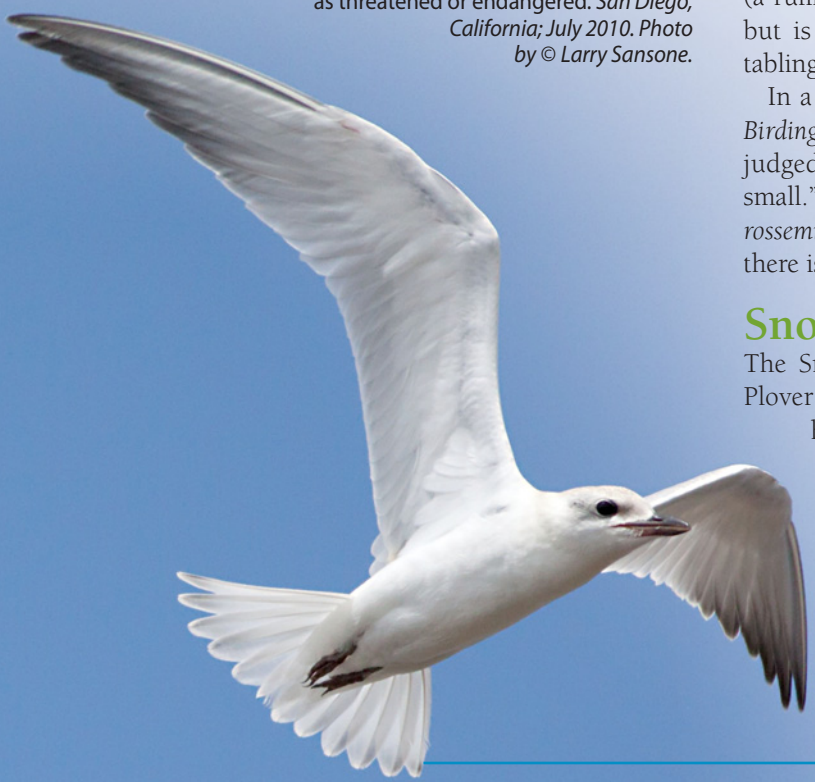
The conservation study is an international collaboration by scientists in the U.S. and Mexico: Kathy C. Molina, R. Michael Erwin, Eduardo Palacios, Eric Mellink, and Nanette W. H. Seto <tinyurl.com/34j5ovx>. Among its results is a report of tremendous scarcity along the Atlantic and most of the Gulf coast.

The entire *aranea* population is estimated at only 3,610 pairs, more than 60% of them in Texas. That leaves only approximately 1,400 pairs in small, thinly scattered coastal colonies from Long Island, New York, all the way around Florida, through Louisiana. Perhaps most lamentable is that no colonies were found in Delaware or Maryland, where the species may be extirpated as a breeder.

For *vanrossemi*, the official finding comes in response to a petition by the nonprofit Center for Biological Diversity. The FWS has determined that the subspecies "may be at risk of extinction now or in the foreseeable future" <tinyurl.com/3266pok>. The Molina team's study estimates this population at just 250 pairs in southern California (at the Salton Sea and in San Diego Bay) and 550 in coastal Baja California, Baja California Sur, Sinaloa, Nayarit, and Colima.

The present step in the listing process is a comprehensive year-long status review of *vanrossemi* by the FWS based on further information about the subspecies and its habitat submitted by governmental agencies, the scientific community, and "other knowledgeable parties." Three outcomes are possible: Listing as threatened or endangered is not warranted (no further action to be taken); listing is warranted (a ruling will be formally published); listing is warranted but is precluded by higher-priority activities (in effect, tabling action for subsequent annual reviews).

In a previous study published in 2006 (summarized in *Birding*, May/June 2007, pp. 31–32), Molina and Erwin judged populations of both subspecies to be "alarmingly small." By the fall of 2011, we should know whether *vanrossemi* will receive governmental help to survive. Thus far, there is no petition for listing *aranea*.



The **Gull-billed Tern** is declining throughout North America, and the U.S. Fish and Wildlife Service has determined that the subspecies *vanrossemi* in California and western Mexico may be at risk of extinction. The Service will next decide whether this subspecies should be listed as threatened or endangered. *San Diego, California; July 2010. Photo by © Larry Sansone.*

Snowy Plover: Two Species?

The Snowy Plover in the New World and the Kentish Plover in Eurasia are so similar morphologically that they have long been classified as a single species. Yet their breeding, migration, and winter ranges are separated by the Atlantic Ocean, and across the Pacific they occur regularly no closer together than Washington state and Japan. Could they conceivably be interbreeding?

Evidently not, according to Clemens Küpper and five coauthors, who report "profound genetic

differences between the two" in both mitochondrial and nuclear DNA. They recommended in 2009 that the Snowy Plover and Kentish Plover should be recognized as distinct species (*Auk* 126:839–852).

The study examined two mitochondrial markers, a sex-linked nuclear marker, and 26 nuclear microsatellite markers in Snowy samples from Utah's Great Salt Lake and Ceuta, Mexico, and in Kentish samples from Spain, Turkey, United Arab Emirates, and Ukraine. For comparison, corresponding DNA markers were analyzed including samples of White-fronted Plover (*Charadrius marginatus*) from Madagascar.

DNA characters differentiated consistently among all three taxa, and phylogenetic analysis indicated that Kentish Plover is more closely related to White-fronted than to Snowy.

The examination was limited to the two most widely distributed subspecies, nominate *alexandrinus* in Eurasia and *nivosus* in the western hemisphere. The authors recommend retaining those names for their proposed species, with *C. alexandrinus* embracing the multiple Old World subspecies and *C. nivosus* comprising the multiple New World subspecies.

Meanwhile, Küpper and his colleagues confirmed a morphological distinction mentioned in identification guides: Snowy Plovers have shorter legs than Kentish Plovers. In samples of 40 males and 40 females from the Mexican population and each of the four Eurasian populations, adults' tarsus length in each sex averaged 13% shorter (approximately 3.8 millimeters) in Snowy. Jon L. Dunn, an expert on the identification and distribution of North American birds, tells *Birding* that the call notes of Snowy and Kentish also differ strongly.

Plumage differences, however, are far from consistent. They not only vary within Snowy and Kentish populations but also overlap between the two. A practical field-identification problem might arise only rarely because their ranges are so far apart, but the possibility of long-distance vagrants would be a concern.

Alaska's only Snowy Plover record, an individual at the Nome River mouth in May 1991, will inevitably be questioned if the North American and Eurasian taxa are separated. Was the long-distance vagrant a Snowy or a Kentish? Daniel D. Gibson of the Alaska Checklist Committee comments to *Birding* that the committee will need to reexamine photographs of the bird to determine whether it can be identified as one or the other.

The difficulty is clear in *Shorebirds: An Identification Guide* by Peter Hayman, John Marchant, and Tony Prater (Houghton Mifflin, 1986) and *Shorebirds of North America, Europe, and Asia* by Richard Chandler (Princeton University Press, 2009). The authors say that Snowy generally lacks rufous on the crown, typically has white lores, and averages paler above. They say that Kentish usually has a rusty crown in alternate plumage, that black is sometimes absent on the lores, and that most individuals have slightly longer legs than Snowy. Identification is worrisomely dubious when such qualifiers are necessary as "generally," "typically," "average," "usually," "sometimes," and "most."

Authors of a recent study of Eurasia's **Kentish Plover** and North America's Snowy Plover suggest that these two subspecies groups should be classified as separate species. Note this individual's impressively long legs. One morphological difference from Snowy is that Kentish has longer legs. *Eastern Europe; July 2009. Photo by © Mike Danzenbaker.*

Small wonder that even Harry C. Oberholser, one of history's most obsessive taxonomic splitters, regarded Snowy and Kentish as one species in 1922 because "it is impossible to find any definite line of demarcation" (*Auk* 39:72–78). As usual nowadays, molecular analysis describes what morphological examination cannot see.

The Snowy Plover's taxonomic status is relevant to its conservation status. BirdLife International categorizes the Kentish/Snowy as a species of "least concern" because of its vast worldwide range, although various populations are declining. In contrast, the U.S. Shorebird Conservation Plan ranks Pacific coastal and Caribbean populations as "highly imperiled," the U.S. Endangered Species Act lists Pacific coastal populations as "threatened," and various western states list their populations in categories of special concern. As a distinct species, the Snowy Plover would likely attract attention from BirdLife International as well.