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Going Beyond Genetics

"The genetic data are very sketchy." "I do not find the molecular evidence overwhelming." "The molecular data...do not resolve relationships."

Those comments have something noteworthy in common: They were made by ornithologists who voted in favor of recognizing new species in 2010 despite less-than-convincing genetic support.

The voters are members of the American Ornithologists' Union's (AOU) Committee on Classification and Nomenclature of North and Middle American Birds (the "Check-list Committee"), and their decisions appear in the 51st supplement to the AOU *Check-list of North American Birds* (*Auk* 127:726–744), available online <tinyurl.com/2e34e26>.

Factors other than genetics were important in most of those decisions, and it is interesting how often the 51st supplement places vocalizations in the forefront. For 11 newly classified species, vocal differences are listed first among reasons for acceptance in eight cases. Genetic evidence is listed first in only three.

The emphasis on vocal distinctions reflects the committee's endorsement of the biological species concept, which holds that reproductive isolating mechanisms such as distinctive displays and vocalizations restrict interbreeding.

In an admirable service to everyone with a professional or amateur interest in ornithology, the AOU now publishes complete proposals for taxonomic changes and committee members' anonymous comments when they voted <tinyurl.com/2cnzrm5>.

The role of vocalizations is conspicuous in the approval of three splits involving ABA Area birds: Black Scoter into two species, Black Scoter in the New World and Common Scoter in the Old World; Whip-poor-will into Eastern Whip-poor-will and Mexican Whip-poor-will; and Winter Wren into Pacific Wren in the far west, Winter Wren in the east, and Eurasian Wren in the Old World.

The scoter proposal passed 8–3. One member who favored it termed the vocal differences "compelling." Another said ducks' calls "appear to have great importance for species recognition" in courtship, and yet another commented that if vocalizations are used in courtship, the "burden of proof shifts to demonstrating that they are not separate species." Dissenters wanted to wait for molecular evidence and information about relations between the two taxa at a potential contact zone in Russia.

The whip-poor-will proposal passed 10–1 and, not surprisingly for night birds, their sounds were considered important. One member did not even mention genetic data but emphasized that the songs are "immediately diagnosable." Other members who voted for the split expressed dissatisfaction with genetic evidence described in a study that had not yet been published. The lone dissenter preferred to await publication before voting in favor.

The wren proposal passed unanimously, based on both vocal distinctions and evidence that western and eastern taxa do not interbreed where they both occur in British Columbia. One member explicitly gave molecular evidence a secondary role: "The vocal data are very compelling, and the genetic data largely back this up." Others emphasized distinctions not only in songs but also in call notes because the latter may indicate genetic divergence better than song.

Vocalizations also figured to various degrees in three proposals that failed: separation of the *woodhouseii* and possibly the *sumichrasti* subspecies groups of Western Scrub-Jay from the coastal *californica* group; separation of the Curve-billed Thrasher's western *palmeri* group from the eastern nominate *curvirostre* group; and separation of an isolated Red Crossbill

Differences in vocalization are a major reason why the "Check-list Committee" of the American Ornithologists' Union has split the Black Scoter into two species: **Black Scoter** in the New World and Common Scoter in the Old World. The distinctions are considered as evidence of reproductive isolation. *Qualicum Beach, British Columbia; November 2007. Photo by © Glenn Bartley.*

population in the South Hills of Idaho. In the scrub-jay and thrasher cases, voters focused primarily on the unknown extent of interbreeding but also wanted more information about vocal differences. Ironically, one of just two voters who favored the thrasher split commented, "The clincher for me is that *palmeri* has distinct call note differences..." In the crossbill case, a question raised by several members was whether the South Hills population's apparently distinct call type accorded with its morphological distinctions. Additionally, two members doubted that the genetic findings, as submitted, were sufficient to support species status.

All of the published proposals and comments are treasures of taxonomic information and opinion. They offer valuable insights into current ornithological thought, emphasizing in many cases the weight given to vocal, morphological, and behavioral divergence when genetic evidence is weak or absent.

Birds vs. Urban Noise

Urban noise, particularly traffic noise, presents birds with a serious communication problem. They cannot sing loudly enough to overcome it, but individuals of at least a dozen species use an alternative vocal adaptation. They sing at higher minimum frequencies in noisy surroundings than in quieter areas.

The hypothesis is that urban noise is loudest at low frequencies, and the higher minimum pitch enables other birds—whether prospective mates or territorial aggressors—to hear more of the singer's voice. Studies published in 2010 or awaiting publication in 2011 advance understanding of this phenomenon from four viewpoints:

- *Cultural Evolution*. Recordings of White-crowned Sparrows' songs made as long as half a century ago in San Francisco by the late Luis Baptista were resurrected by David Luther and compared with recent White-crowned songs in the same locations. The songs' lowest frequencies gradually became higher between 1969 and 1999, a period when traffic noise was increasing. Luther suggests that the 30-year change across many generations is a form of "cultural evolution" in which each generation's young birds learn the most advantageous songs of their time from parents and neighbors (*Proceedings of the Royal Society B: Biological Sciences* 277:469–473).
- *Rapid Adaptation*. Although most studies have been only correlative, a recent experimental project demonstrates that House Finches raise their songs' minimum frequency right away when the noise grows louder and lower it again when the noise subsides. Eira Bermúdez-Cuamatzin, Alejandro A. Ríos-Chelén, Diego Gil, and Constantino Macías Garcia demonstrated this effect on a busy Mexico City street. In an online report in *Biology Letters* <tinyurl.com/2ejsd2f>, these authors report this frequency change as evidence of the finches' behavioral plasticity—an ability to adjust behavior in immediate response to changing environmental conditions.
- *Mimicry*. Birds' higher song frequencies possibly carry over to a species that mimics them, the Northern Mockingbird. Puja Patel, a student at the University of Florida, compared mockingbirds' songs in urban and non-urban sites in and near Jacksonville. She reported in the *Journal of Undergraduate Research* that mockingbirds in urban environments not only sang at a higher minimum frequency but also shifted the frequency higher when low-frequency background noise was becoming louder <tinyurl.com/243mmkk>. Were the

Many birds in urban areas have increased the minimum frequency of their songs to communicate better amid traffic and other noise. The **Northern Mockingbird** may be doing this in a direct response to the noise, or it may be copying higher frequencies of the urban birds it mimics. *Starr County, Texas; April 2009. Photo by © Alan Murphy.*

urban mockingbirds simply mimicking other urban birds' higher frequencies, or were they shifting their own songs higher as a direct response to the background noise? Patel suggested further research to find out.

- *Environmental Tradeoff*. Acoustically reflective surfaces also affect birds' vocalizations, according to Jenélle Dowling and Peter Marra, who studied Carolina Chickadee, Carolina Wren, House Wren, Gray Catbird, Northern Cardinal, and Song Sparrow songs in the Washington, D.C. area. The minimum frequency of five of these species' songs increased with ambient traffic noise, as other studies have found. But three of the species responded differently in areas with many acoustically reflective surfaces such as pavement and buildings, which distort high-frequency sounds. To avoid the effects of such distortion, these birds sang at lower maximum frequencies and in a narrower frequency range, independently of the noise volume. Results of this study are not yet published, but are available online <tinyurl.com/2bje7vp>.

Noise from human activity is not the only factor affecting avian vocalizations. Elizabeth Derryberry has recently shown that density of vegetation in birds' habitat influences the frequency range of songs. In a WebExtra <aba.org/birding/v43n1p28w1.pdf>, learn about her research and hear recordings, made decades apart, that demonstrate how White-crowned Sparrow songs have changed as vegetation density increased.

Migrants Become Residents

Europe's Blackcap (*Sylvia atricapilla*) is among the most intensively studied Old World passerines for insights into the ecology and evolution of migration. This delightful warbler displays remarkable abilities to adjust migratory behavior in rapid evolutionary response to environmental change (see *Birding*, November/December 2006, pp. 29–30).

The latest discovery—perhaps deserving investigation in North American birds as well—is a Blackcap population's swift and genetically inherited trend from annual migration to year-round residency in southern Germany. Francisco Pulido and Peter Berthold demonstrated in 2010 that this behavioral change represents evolution in action (*Proceedings of the National Academy of Sciences of the USA* 107:7341–7346).

In recent decades, some Blackcap populations have shown strong tendencies toward earlier spring arrival on the breeding grounds and, in some cases, later departure in autumn. Such trends in many nearctic and palearctic species are correlated with increasing average temperatures in the north temperate zone.

Pulido and Berthold advanced these studies by experimentally measuring Blackcaps' basic impulse to migrate and the heritability of the behavior. Two types of experiments were based on measuring captive birds' "Zugunruhe," a nocturnal restlessness that begins at the onset of the migratory period.

In one set of experiments, the authors captured wild nestlings, more than 750 in all, each year from 1988 to 2001. The birds were hand-raised in an indoor laboratory where temperature and humidity were kept constant. Despite the constant conditions, the Blackcaps' level of nocturnal restlessness gradually declined during the 13 years. A similar downtrend occurred in birds bred in the laboratory from parents that had been captured as nestlings in the wild. These decreases in migratory behavior within an artificially constant climate indicate that the reduction is inherited from the wild parents that were exposed to natural climate change.

Birds in a German population of the **Blackcap**, an Old World warbler, are reducing their migration distance and in some cases avoiding migration entirely in what appears to be an adaptation to warming climate. Experiments indicate that this behavior is inherited and represents an evolutionary trend. *Eastern Europe; April 2007. Photo by © Mike Danzenbaker.*

The second set of experiments used artificial selection in which 305 Blackcaps were bred in lines of inheritance repeatedly selected for lower migratory activity. Not only the average amount of migratory activity but also the proportion of non-migrants decreased significantly after only four generations. The short generational span indicates a very rapid pace of evolutionary change.

Most notably, by the end of the four generations, the original exclusively migratory sample of birds yielded a total of 14 individuals with no migratory activity at all—a genetic shift suggesting that the entire population might stay at home year-round at some point in the evolutionary future. Pulido and Berthold speculated that rapid selection for shorter migratory distance may be driven by reduced migration mortality, by the opportunity for a longer breeding period, and by earlier breeding in spring as an adaptation to earlier availability of

plants and insects amid the warming climate.

The European findings raise an intriguing question about North American birds. A National Audubon Society report in 2009 listed shifts northward in the winter ranges of 177 species during the past 40 years (*Birding*, November 2009, p. 35). Might any of these species be evolving a trend toward advantageously shorter migrations?

Slow Ban on a Pesticide

- Bald Eagle, Northern Harrier, Golden Eagle, Black-billed Magpie, and Common Raven in Utah.
- Black Vulture, Cooper's Hawk, Yellow Warbler, and Yellow-rumped Warbler in Georgia.
- Turkey Vulture, Red-tailed-Hawk, and Great Horned Owl in Tennessee.

Those lists are obituaries. They represent 192 birds of 22 species poisoned by the pesticide Aldicarb, as reported by the Avian Incident Monitoring System in an online database <tinyurl.com/2fkk6nn> created by the American Bird Conservancy (ABC).

Aldicarb was registered by the U.S. Environmental Protection Agency (EPA) in 1970 for use on potatoes, citrus, cotton, dry beans, peanuts, soybeans, sugar beets, and sweet potatoes. ABC says it is so toxic that a single granule is lethal if eaten by a songbird.

Among victims, the database also lists individual birds identified only as Canada Goose, egret, gull, wren, bluebird, Northern Cardinal, blackbird, finch, and domestic chicken. As of October 2010, the website reported 43 poisoning incidents in 18 states from Delaware to California. Frequently, the birds were killed not during normal agricultural use but by illegal misuse of Aldicarb against coyotes and other predators.

After years of urging by health, scientific, environmental, and conservation groups, the EPA announced in August 2010 that Aldicarb will be phased out under a voluntary agreement by manufacturer Bayer CropScience. The action does not stem from danger to wildlife; rather, it is because the chemical "no longer meets the agency's rigorous food safety standards and may pose unacceptable dietary risks, especially to infants and young children."

The ban was a long time in coming, and it will be a long time in culminating. Use on citrus and potatoes is allowed until the end of 2011, but use on other crops is allowed to continue with required "risk-mitigation" measures to protect groundwater. Manufacture is permitted until 31 December 2014, and all use is not banned until August 2018.

As long ago as 2005, ABC advocated immediate suspension or cancellation of all registered uses of Aldicarb because of the high risk of mortality to passerine birds and raptors. Michael Fry, ABC's Director for Conservation Advocacy, told the EPA at that time, "Because of its high toxicity and high risk to small birds, the European Union has banned and will stop all uses by 2007. We strongly support an equivalent ban in the U.S." He noted that Bayer CropScience had never submitted a study of avian reproductive toxicity as required for all food-use pesticides.

In a statement to the EPA in 2008 when re-registration of Aldicarb was being considered, Fry expressed support in principle for proposed restrictions to decrease the danger. He added, however, that unless the measures could be verified as reducing avian mortality, "American Bird Conservancy still believes Aldicarb poses an unreasonable risk to protected species of birds, and should be canceled."

Commenting quickly on the 2010 agreement, Fry said in an ABC news release <tinyurl.com/2bxnxva>, "Today's decision to implement a phased cancellation will better safeguard birds and other wildlife as well as drinking water and the health of people in rural America."

Bayer's agreement is welcomed further by the National Pesticide Reform Coalition of 21 nonprofit groups, including ABC, because it precludes what might have been a prolonged and costly lawsuit. The coalition emphasizes dialogue with the EPA, manufacturers, and trade associations as their "first and most important tool" <tinyurl.com/2wcevbd>.

The **Black Vulture** is among 22 bird species known to be victims of the widely used pesticide Aldicarb. The U.S. government and manufacturer Bayer CropScience have agreed to ban all use of the poison—but not until August 2018. *Harris County, Texas; June 2009. Photo by © Alan Murphy.*