Recent Literature

Compiled by C. John Ralph (If you would like to help review articles of interest to banders, please contact cjr2 "at" humboldt.edu, and feel free to mention if you have a particular journal or geographic area of interest).

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EQUIPMENT, TECHNIQUES, AND STATION REPORTS

Comparison of Two Color-Marking Techniques for American Kestrels in South Texas. Carter G. Crouch, Robert H. Benson, and Leonard A. Brennan. 2018. *Journal of Raptor Research* 52:66-71. Texas A&M University-Kingsville, Kingsville, TX 78363 cartergcrouch@gmail.com

This is an important study testing what is otherwise usually personal preference among investigators. The authors compared celluloid color leg bands and colored dye on the feathers, for individual identification of kestrels (*Falco sparverius*). They trapped and color-marked 65 kestrels over two years. With binoculars and a spotting scope, they confirmed that seven of the 195 color bands were lost during the study. The longest time that dye was still visible was 149 days after marking. They saw color bands from a maximum distance of 245 m and color dye from a maximum distance of 428 m. Of kestrels they were able to identify at least 10 times (n = 39) within the season that markings were applied, they saw only dye 17.3% of the time and only bands 19.4% of the time. Showing how important redundancy is in "recapturing" these birds they saw both markers (dye and at least one band) 63.3% of the time. Both methods can be used for successful identification of wintering kestrels, but a combination of the two techniques can increase the chance of seeing an identifiable mark. Color bands are long-term markers and allow identification of kestrels whose dye has faded or those that return in following years. Color dye makes it easier to identify kestrels that are difficult to approach, as well as those with territories extending away from accessible roadways. CJR

No short- or long-term effects of geolocator attachment detected in Pied Flycatchers *Ficedula hypoleuca*. S.C. Bell, El Harouchi, M., Hewson, C. M. and Burgess, M. D. 2017. *Ibis*. 159(4): 734-743.

Once again, a study showed that properly attached devices have no effect on small birds. The authors tested whether there were any effects of fitting geolocators weighing 3% of body mass on male Pied Flycatchers. In the deployment year, they compared adult provisioning rates to nestlings, nestling growth and nest success between nesting attempts in which adult males were fitted with a geolocator, with control nests where males had the same capture history but were not tagged. They found no difference between treatments in provisioning effort by males or their associated female 2 days after geolocator fitting, in terms of nestling growth, subsequent brood reduction or nest success. Return rate, arrival date on territories, nest timing and breeding parameters were compared between tagged and untagged males in the following breeding season. They found no difference in return rate or arrival date, and no difference in nest timing, fecundity or outcome. **CJR.**

IDENTIFICATION, MOLTS, PLUMAGE, WEIGHTS, AND MEASUREMENTS

Molts and plumages in the Long-tailed and other Jaegers. Peter Pyle and Martin Reid. 2016. *Western Birds* 47:242–257. The Institute for Bird Populations, Point Reyes Station, CA, ppyle@birdpop.org

Accounts of the timing and extent of molts in the Long-tailed Jaeger (*Stercorarius longicaudus*) are variable and confusing, because they molt at sea, primarily in the Southern Hemisphere, and are thus also under-represented in specimen collections. The authors used 23 photographs taken of 11 adult jaegers, of four age groups, off the coast of Chile, in combination with examination of 647 specimens, to describe the first, second and definitive molts for this species. They also reinterpret

traditional terminology of jaeger molt, suggesting that they breed in basic plumage and wear alternate plumage during fall and winter. The Pomarine *(S. pomarinus)* and Parasitic (*S. parasiticus*) Jaegers also follow a similar molt strategy. This paper is a good example of how high-quality images of wild birds can be used to study molt patterns. **CMS**

NORTH AMERICAN BANDING RESULTS

Spatial variation in songbird demographic trends from a regional network of banding stations in the Pacific Northwest. Sarah M. Rockwell, John D. Alexander, Jaime L. Stephens, Robert I. Frey, and C. John Ralph. 2017. *The Condor*: *Ornithological Applications* 119(4): 732-744. Klamath Bird Observatory, Ashland, Oregon, USA. smr@klamathbird.org

The authors analyzed 2002-2013 capture data from a regional network of 10 constant-effort banding sites in the Klamath-Siskiyou Bioregion in Oregon and adjacent northern California, to evaluate population trends and productivity. They focused on 12 Western forest bird species with large sample sizes during the breeding season and compared the banding data to results from the USFWS Breeding Bird Survey. The Survey has been a major source of bird conservation data and trends for North America since it was started in 1966, providing large-scale and long-term trend information on populations. Significant declines in some breeding populations of Purple Finch (*Haemorhous purpureus*) and Yellow-rumped (Audubon's) Warbler (*Setophaga coronata auduboni*), were documented, and near-significant declines in Dark-eyed (Oregon) Junco (*Junco hyemalis oreganus*). Additionally, other species with stable adult populations, including Purple Finches and Spotted Towhees (*Pipilo maculatus*), showed significant declines in productivity. The analysis of the authors here shows the value of a regional network of banding stations in providing finer scale data, including habitat associations and productivity, where the Survey is less informative. The authors helpfully suggest that future studies using regional networks may begin to show source-sink dynamics and perhaps other important bird conservation issues. **ATC**

Survival and habitat selection of Canada Geese during autumn and winter in metropolitan Chicago. Brett E. Dorak, Michael P. Ward, Michael W. Eichholz, Brian E. Washburn, Timothy P. Lyons, and Heath M. Hagy. 2017. *The Condor*: *Ornithological Applications* 119(4): 787-799. Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign, Urbana, Illinois, USA. heath_hagy@fws.gov

During mid-November through late February 2014-2016, 41 Canada Geese (*Branta canadensis*) were captured and fitted with cellular GPS transmitters attached to neck collars to study habitat selection and survival during autumn and winter in the Greater Chicago Metropolitan Area. Habitat use changed as temperatures dropped during the autumn and winter season. The geese showed a clear preference for green spaces, but also regularly used industrial urban habitats such as rooftops and rail yards, which has not been previously reported. High survival, use of non-traditional habitats, and avoidance of agricultural fields suggests Canada Geese may be minimizing risk rather than maximizing energy intake by using urban areas during winter. **ATC**

Summer and winter space use and home range characteristics of Golden Eagles (*Aquila chrysaetos*) in eastern North America. Tricia A. Miller, Robert P. Brooks, Michael J. Lanzone, Jeff Cooper, Kieran O'Malley, David Brandes, Adam Duerr, and Todd E. Katzner. 2017. *The Condor*: *Ornithological Applications* 119(4): 697-719. West Virginia University, Morgantown, WV, USA. tricia.miller@mail.wvu.edu

Between November 2006 and February 2015, a total of 52 Golden Eagles were trapped mainly on wintering grounds in a large area of the eastern U.S., and fitted with GPS telemetry units, to investigate the topography, vegetation characteristics, and size of wintering and breeding territories, taking into consideration age and sex variables and comparisons with populations elsewhere in the species' range. Adults had smaller territories than younger birds, which was consistent with other studies, but overall territories of this genetically distinct eastern population were larger.

The researchers suggested that Golden Eagles in eastern North America may need to compensate for lower quality habitat by using larger territories to access adequate resources including prey, open and diverse topography, and nesting and roosting sites. Results suggest that climate change-induced afforestation on the breeding grounds and ongoing land cover change from timber harvest and energy development on the wintering grounds may affect the amount of suitable habitat for this species in eastern North America. **ATC**

Post-breeding dispersal and staging of Common and Arctic Terns throughout the western North Atlantic. Pamela H. Loring, Robert A. Ronconi, Linda J. Welch, Philip D. Taylor, and Mark L. Mallory. 2017. *Avian Conservation & Ecology* 12(2):20. University of Massachusetts Amherst, Amherst, MA. ploring@eco.umass.edu

This study deployed 182 VHF transmitters on 130 adult Common Terns *(Sterna hirundo)* and 52 Arctic Terns *(S. paradisaea)* at four breeding colonies from northeastern Nova Scotia, Canada, to Massachusetts. Their objective was to study post-breeding movements within their study area, using a coastal array of 62 automated radio telemetry receivers to detect the birds' location. Both species usually started their migration at night within two hours of sunrise. Among the three colonies where both species were tagged, Arctic Terns departed, on average eight days later than Common Terns. The authors theorized that this may relate to different migration strategies, as they had low detections of Arctic Terns during dispersal compared to Common Terns, suggesting that the former migrated directly to offshore staging areas while the latter moved to known staging areas in Nantucket Sound. Until technology improves so that offshore telemetry arrays and/or satellite transmitters are more feasible, knowledge of the staging areas and migratory routes of Arctic Terns can only be inferred from geolocator data from other studies. **CMS**

Nest site selection and nest survival of Greater Prairie-Chickens near a wind energy facility. Jocelyn Olney Harrison, Mary Bomberger Brown, Larkin A. Powell, Walter H. Schacht, and Jennifer A. Smith. 2017. *The Condor: Ornithological Applications* 119(4):659-672. University of Nebraska-Lincoln, Lincoln, Nebraska, USA. Jocelyn.harrison15@gmail.com.

The researchers radio-tagged female Greater Prairie-Chickens *(Tympanuchus cupido pinnatus)* to investigate the effects of a pre-existing, 36-turbine wind energy facility on nest site selection and nest survival in the unfragmented grasslands of the Nebraska Sandhills in 2013 and 2014. They found 91 nests, ranging in distance from 0.13 km to 24.10 km from the nearest wind turbine, with little evidence of effects of the wind energy facility on nest site selection and survival. Instead, they found that livestock grazing and other grassland management practices have the greatest impact as has been determined in other studies. Most interesting was that Greater Prairie-Chickens in this study avoided placing their nests near roads, with 74% of them selecting nest sites more than 700 m from roads. The authors caution future planners of wind energy facilities to account for the potential negative effect of roads on nest site selection. **ATC**

Daily consumption of nectar by Rufous Hummingbirds at a feeder in Victoria, British Columbia. Geoffrey L. Holroy and J. Cam Finlay. 2016. *British Columbia Birds* 26:32–34. Tofield, AB, Canada. geoffholroyd@gmail.com.

Have you ever watched a busy hummingbird feeder and wondered how many birds are really there? And is there a way to monitor their numbers without capturing them? The authors may have found a novel non-invasive method. They trapped and banded 49 Rufous Hummingbirds (*Selasphorus rufus*) during only 4.5 hours of effort at an artificial feeder. This became their marked population, and then captures over the following two hours became their recapture sample (15 of 22 birds were already banded). Their population estimate was 71.9 hummingbirds. The previous day they had carefully measured the amount of sugar water consumed during a full day (345 ml) and calculated that if all 71.9 hummingbirds were present, then each hummingbird consumed 4.8 ml per day. They suggest that you could measure how much syrup was consumed and then estimate the

number of birds present, without capturing any birds. While this technique will never be precise due to variability in quantity of syrup consumed due to weather, time of year, breeding condition, territoriality, etc., it could provide a general index to monitoring hummingbird numbers at a site over time and between sites. **CMS**

New Michigan Tick *(Acari: Ixodidae)* **and Flea** *(Sophonaptera: Ceratophyllidae)* **Records from Colonial Nesting Birds**. W.C. Scharf. 2000. *Great Lakes Entomologist* 33:155-159.

The value of checking for parasites on birds is demonstrated in this report where the author reports the collection of ticks (n=5) from Herring Gull *(Larus argentatus)* chicks (n=2) and fleas from fecal debris of ground nesting Double-crested Cormorant *(Phalacrocorax auritus)* over a 30-year period from a sample 30,000+ gulls and 10,000 cormorants during banding and census work. The ticks *(Hemaphysalis leporispalustris)* are commonly found on Snowshoe Hares *(Lepus americanus*), with some 40 species of birds carrying immature ticks. The fleas (*Ceratophyllus lari*) seemed to be common in the fecal debris. Other species of gulls and cormorant, as well as domestic poultry are reported to carry this tick species. These are new host records for both ectoparasites, and the flea is a new species to Michigan.

The concern is the aerial spread of Rocky Mountain Spotted Fever and tularemia carried by this species of tick, with this tick also shown to carry the Lyme disease bacterium. The fleas are host to Newcastle disease, a major threat to domestic poultry. **WHS**

Temporal migration patterns between natal locations of Ruby-throated Hummingbirds *(Archilocus colubris) and their Gulf Coast stopover site.* Theodore J. Zenzal, Jr., A.J. Contina, J.F. Kelly, and F.R. Moore. 2018. *Movement Ecology* 6:2. University of Southern Mississippi, Hattiesburg, USA. tjzenzal@gmail.com

Bird species with a large breeding range might be expected to have difference(s) in their migration pattern, and this hummingbird is no exception. Two types of migration are described: Type 1, where southern birds depart before northern birds, and Type 2, where northern birds overtake southern birds during migration. The authors looked at the natal origins and their arrival at a Gulf coast stop-over site in Alabama. During banding operations at the coast, birds were aged by bill corrugation, plumage, and morphology. The outer rectrices of HY birds were collected. Stable hydrogen isotope ratios were analyzed to determine the natal origins and compared to the stopover site arrival dates. The authors found a Type 1 pattern, where hummingbirds from southern latitudes (30° - 35° N) begin migration earlier than northern latitudes (40°- 50° N) and pass through the banding site in September and October, respectively. The authors found no relation between fuel load or fat-free body mass to natal origin. **WHS**

Constructing and evaluating a continent wide migratory songbird network across the annual cycle. Samantha M. Knight, David W. Bradley, Robert G. Clark, Elizabeth A. Gow, Marc Bélisle, Lisha L. Berzins, Tricia Blake, Eli S. Bridge, Lauren Burke, Russell D. Dawson, Peter O. Dunn, Dany Garant, Geoffrey L. Holroyd, David J. T. Hussell, Olga Lansdorp, Andrew J. Laughlin, Marty L. Leonard, Fanie Pelletier, Dave Shutler, Lynn Siefferman, Caz M. Taylor, Helen E. Trefry, Carol M. Vleck, David Vleck, David W. Winkler, Linda A. Whittingham, and D. Ryan Norris. 2018. *Ecological Monographs.* doi:10.1002/ecm.1298. Department of Integrative Biology, University of Guelph, Ontario, Canada. sknigh04@uoguelph.ca

This article reports on the newly emergent technology that is supplementing one aspect of banding, the recapture of birds to determine home ranges, migratory routes, and other spatially specific information. For the first time it gives us comprehensive information on the spatial structure of migratory networks across a species' range, particularly for small bodied, long distance migratory animals. The authors constructed a migratory network for Tree Swallows (*Tachycineta bicolor*) and used network based metrics to characterize the spatial structure and prioritize regions for conservation. The network was constructed using year round movements derived from 133 archival light level geolocators attached to birds from 12 breeding sites across their North American breeding

range. From these breeding sites, they identified 10 autumn stopover nodes in North America, 13 non breeding nodes located around the Gulf of Mexico, in Mexico, Florida, and the Caribbean, and 136 unique edges (migratory routes) connecting nodes. They found strong migratory connectivity between breeding and autumn stopover sites and moderate migratory connectivity between the breeding and non-breeding sites. They identified three distinct 'communities' of nodes that corresponded to western, central, and eastern North American flyways. Several regions were important for maintaining network connectivity, with South Florida and Louisiana as the top-ranked non-breeding nodes and the Midwest as the top ranked stopover node. They found that migratory songbird networks can have both a high degree of mixing between seasons, yet still show regionally distinct migratory flyways. Such information will be crucial for accurately predicting factors that limit and regulate migratory songbirds throughout the annual cycle. Their study highlights how network-based metrics can be valuable for identifying overall network structure and prioritizing specific regions within a network for conserving a wide variety of migratory animals. We can expect a lot more of papers with this type of information, filling in many gaps in our knowledge. **CJR**

Tag location and risk assessment for passive integrated transponder-tagging passerines. K. N. Oswald, A. A. Evlambiou, A. M. Ribeiro, and B. Smit. 2018. *Ibis* 160:453–457. Nelson Mandela University, Summerstrand, Port Elizabeth, South Africa. knoswald@gmail.com.

The authors tested whether body temperature readings differed between passive integrated transponder (PIT) tags injected subcutaneously interscapulae and intra-peritoneally and whether intraperitoneal tag injuries differed among three weight classes of passerines. They found no significant difference in body temperature readings and observed that the intra-peritoneal injection of PIT-tags may cause adverse effects among smaller (<25 g) birds. The risk of detrimental injury was greatest in small species, and thus recommend implanting PIT-tags subcutaneously between the scapulae for smaller birds. **JS**

Population trends in *Vermivora* warblers are linked to strong migratory connectivity. G. R. Kramer, D. E. Andersen, D. A. Buehler, P.B. Wood, S.M. Peterson, J.A. Lehman, K.R. Aldinger, L.P. Bulluck, S. Harding, J. A. Jones, J.P. Loegering, C. Smalling, R. Vallender, and H.M. Streby. 2018. Proceedings *National Academy Sciences:* Apr 3;115(14):E3192-E3200. University of Toledo, Toledo, OH 43606; gunnarrkramer@gmail.com.

The authors present a range-wide assessment of the nonbreeding distribution and migratory connectivity of two broadly dispersed Nearctic-Neotropical migratory songbirds. They used geolocators to track the movements of 70 *Vermivora* Warblers from sites spanning their breeding distribution in eastern North America and identified links between breeding populations and nonbreeding areas. Unlike Blue-winged Warblers *(V. cyanoptera)*, breeding populations of Golden-winged Warblers *(V. chrysoptera)* exhibited strong migratory connectivity, which was associated with historical trends in breeding populations: stable for populations that winter in Central America and declining for those that winter in northern South America. **JS**

NON-NORTH AMERICAN BANDING RESULTS

Proximate mechanisms affecting seasonal differences in migration speed of avian species. H. Schmaljohann. *2018. Scientific Reports* 8:4106. Institute of Avian Research "Vogelwarte Helgoland", Wilhelmshaven, Germany. heiko.schmaljohann@uni-oldenburg.de

The author reviewed 64 studies of 401 tracks to show that in waders, gulls, swifts, and songbirds speeds were significantly higher in spring, while the opposite was the case in waterfowl and owls. Thus, the ultimate mechanisms selecting for a faster migration in spring might not consistently act across bird groups. Breeding latitude, migration strategy, migration distance, flight style, body mass, and sex did not explain seasonal differences in speed. The ratio between spring and autumn total stopover duration of 257 bird tracks significantly negatively affected the seasonal migration speed ratio of the same individuals in a

comparative analysis accounting for shared ancestry. Seasonal variation in stop-over duration appears thus to be the main biological mechanism regulating seasonal differences in migration speed. **JS**

Around the Mediterranean: an extreme example of loop migration in a long-distance migratory passerine. P. Klvaňa, J. Cepák, P. Munclinger, R. Michálková, O. Tomášek, and T. Albrecht. 2018. *Journal of Avian Biology:*e01595. Bird Ringing Centre, National Museum, Hornoměcholupská, Prague, Czech Republic. petr_klvana@nm.cz

They used light-level loggers to map migration routes of Barn Swallows *Hirundo rustica* breeding in the center of a wide putative contact zone between the northeastern and southwestern European populations that differ in migration flyways utilized and wintering grounds. They documented high variation in migration patterns and wintering sites of tracked birds from a single breeding colony, with evidence for loop migration in all but one of the tracked swallows. **JS**

Environmental characteristics drive variation in Amazonian understorey bird assemblage. Juliana Menger, William E. Magnusson, Marti J. Anderson, Martin Schlegel, Guy Pe'er, Klaus Henle. 2017. *PlosOne* 12(2): e0171540. doi:10.1371/journal.pone.0171540. Helmholtz Centre for Environmental Research, Leipzig, Germany. j.menger@ufz.de

Birds spatial distribution and communities composition in the tropics are attributed to, in a smaller scale, the landscape heterogeneity and inter-specific interaction; and often to dispersal limitations due rivers as barriers in larger scale. Using mist nets, this study measured, at a small scale, how environmental, spatial and topographic variables are related to differences in bird communities – species identity, abundance and richness – across space. Although mist-netting has limitations as a method to sample the community, possibly underrepresenting species that use higher forest strata, the authors addressed this limitation during analyses with a method that helped to avoid this source of potential error. **LF**

Age effects on survival of Amazon forest birds and the latitudinal gradient in bird survival. Alejandra Pizarro Munoz, Marc Kery, Pedro Vitor Martins, and Gonçalo Ferraz*. 2018. *The Auk*. 135:299–313. *Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. goncalo.ferraz@ufrgs.br

This is an interesting example of the value of banding data to answer broad ecological questions. The positive relation between birds' clutch size and latitudinal gradient has grounded the hypothesis of an inverse latitudinal variation on birds' survival. The higher survival of tropical species has, however, found no statistic support. An expected variation on survival of juveniles alone across the latitudinal gradient has then been proposed as alternative hypothesis to explain the observed clutch size variation. In this study authors used banding data in the Central Amazon, Brazil, to estimate survival by age class of 40 tropical landbird species and test the juvenile low survival hypothesis. They did meta-analysis with several other bird banding studies, compiling estimated survival for 175 species across a latitudinal gradient. They found a strong age effect on survival, with lower survival of juveniles, as well as "a real latitudinal trend in forest passerine survival in the Americas, which may contribute to the persistence of latitudinal differences in clutch size". This study contributes to our understanding on large scale patterns of central parameters of population dynamics theory. **LF**

Partial migration and decreasing migration distance in the Hungarian population of the Common Blackbird (*Turdus merula Linnaeus, 1758)*: Analysis of 85 years of ring recovery data. Z. Németh. 2017. *Ornis Hungarica* 25:101–108. University of Debrecen, Debrecen, Hungary. znemeth05@gmail.com

The author analyzed 85 years of ring recovery data of the blackbird, ringed during the breeding season and recovered during migration or winter. He found that they had both migratory and resident strategies, thus can be considered as partial migrants. They had been recovered increasingly closer (-5.9 km/year) to their breeding grounds in the past decades. Age and sex had no effects on

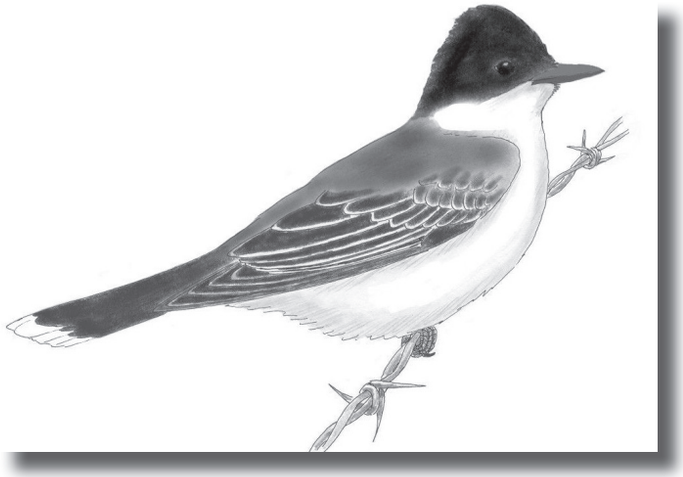
recovery distance. Migrant recoveries were 88% of the result of shooting or hunting activities in Mediterranean countries, primarily in Italy, highlighting both the need to understand the effects of hunting pressure on migratory behavior at the population level in songbirds, and the urgency to ban the killing of migratory birds in European countries. **JS**

Seasonal dispersal and longitudinal migration in the Relict Gull *Larus relictus* **across the Inner-Mongolian Plateau.** D. Liu, G. Zhang, H. Jiang, L. Chen, D. Meng, and J. Lu. 2017. PeerJ 5:e3380. Chinese Academy of Forestry, Beijing, China zm7672@caf.ac.cn

The authors satellite-tracked 11 adult Relict Gulls from the Ordos sub-population in Hongjian Nur, China, over 33 migration seasons and conducted extensive ground surveys. Relict Gulls traveled about 800 km between Hongjian Nur in northern China to the coast of eastern China in a predominantly longitudinal migration, following a clockwise loop migration pattern. The gulls migrated faster in spring than in autumn due to a time-minimization strategy for breeding, and they showed considerable between-individual variation in the timing of the autumn migration, probably due to differences in the timing of breeding. Pre-breeding dispersals away from the breeding area were distinct, which seemed to be a strategy to cope with the degradation of breeding habitat at Hongjian Nur. **JS**

Mist-netting of migrating bee-eaters Merops apiaster positively influences honey bee *Apis mellifera* **colony performance**. Aleksandra Łangowska, Reuven Yosef, Piotr Skórka, and Piotr Tryjanowski. 2018. *Journal of Apicultural Science.* March. Poznań University of Life Sciences, Institute of Zoology, Poland.alango@up.poznan.pl

This is a different approach to birds than we usually encounter, being bee-centric in emphasis. In Israel, Bee-eaters (*Meropidae*) are considered agricultural pests and their presence provokes conflicts with beekeepers and farmers who rely on bee pollination services. This problem is often dealt with through the mass killing of the birds. This paper reports the performance of honey bee colonies protected with mist nets from migrating flocks of European Bee-eaters. In the study, the weight gains of bee hives surrounded by mist nets were 6.44 times higher than that of unprotected hives (26.4 kg vs. 4.1 kg). The authors allow that "mist-netting appeared to be an effective mitigation method for alleviating conflicts between beekeepers and bee-eaters." The study showed that bees were able to differentiate between their main predator and other birds trapped in mist nets and stung only bee-eaters, resulting in some bird fatalities. They do suggest that "due to accidental mortality of birds, mist-netting is recommended only on the migratory routes in cases when bee hives cannot be moved to other areas." This is, of course, an abhorrent use of mist nets. I have also seen such use of nets in New Zealand to protect vineyards. Such nets are readily available to the general public on the web, such as a 3x12m net recently on Amazon for US $16! **CJR**



Eastern Kingbird
by George West