SOUTH TEXAS WILDLIFE

A publication of the Caesar Kleberg Wildlife Research Institute
at Texas A&M University-Kingsville

Summer 2016
Volume 20, No. 2

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GENETIC VARIATION OF NEW WORLD BOBWHITES

by Damon Williford

The northern bobwhite is an important game bird and one of the most familiar birds in North America, with a historical range of eastern US, Cuba, much of Mexico, and northern Guatemala. The northern bobwhite's 2 tropical relatives, the black-throated bobwhite and crested bobwhite, are probably less familiar to our readers.

The black-throated bobwhite occurs in parts of the Yucatán Peninsula, Nicaragua, and Honduras, whereas the range of the crested bobwhite extends along the Pacific coast of Central America to northern Brazil. All 3 species of bobwhites have differences in plumage coloration throughout their geographic ranges. This has led to a confusing array of proposed subspecies, including 19 subspecies for the northern bobwhite, 4 for the black-throated bobwhite, and 20 for the crested bobwhite. However, disagreement exists among taxonomists on how many subspecies are valid and, for that matter, how many species of bobwhites exist.

Drs. Randy DeYoung, Leonard Brennan, Fidel Hernández, and I in conjunction with Dr. Rodney Honeycutt at Pepperdine University recently completed a study of genetic variation in northern, black-throated, and crested bobwhites. We used mitochondrial DNA (a maternally-inherited genetic marker) obtained from 305 museum specimens collected between 1870 and 1989 to compare patterns of genetic diversity with accepted species and subspecies taxonomy of the bobwhites.

Surprisingly, patterns of genetic variation were not congruent with subspecies taxonomy established in the early 20th century. Rather than detecting multiple geographically isolated lineages, we found 2 distinct genetic lineages, one composed of the northern bobwhite and black-throated bobwhite and the other of the crested bobwhite.

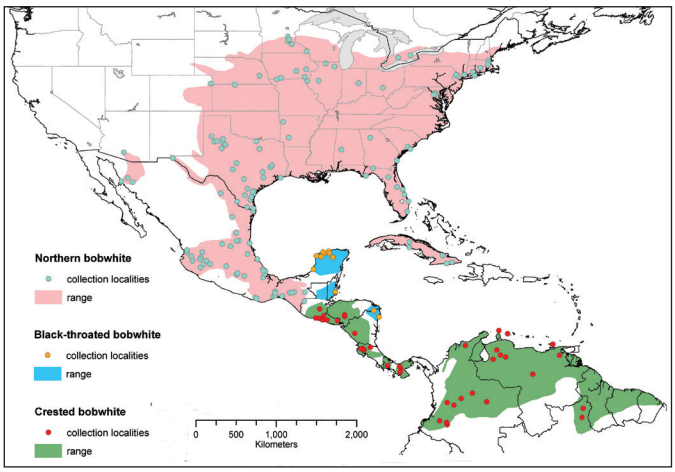
Genetic data also supported species status for the black-throated bobwhite despite past arguments that it was better regarded as a subspecies of the northern bobwhite.

Editor's Note: Dr. Damon Williford is a Research Scientist and Lab Technician at CKWRI.

This Issue

By The Numbers

12–14	number of eggs typically found in a scaled quail nest (Handbook of Birds of the World, Vol. 4, del Hoyo et al., Lynx Edicions)
1,500,000	estimated number of bats roosting under the Congress Avenue Bridge in Austin, Texas (http://www.batcon.org/)



Historical geographic distributions of the northern, black-throated, and crested bobwhites. Colored dots represent the collection localities of the museum specimens used in the study.

Fossil-calibrated divergence times indicated the crested bobwhite split off about 4 million years ago, and the northern and black-throated bobwhites diverged from one another 2.5 million years ago.

Genetic data revealed that accepted subspecies of the northern bobwhite did not represent distinct genetic units despite its broad geographic distribution, extensive plumage variation, limited dispersal capability, and boom-bust population dynamics. This was also true for geographically isolated subspecies such as the masked and Cuban bobwhites. Black-throated and crested bobwhites exhibited greater within-species genetic differentiation. Two genetic lineages were observed in the black-throated bobwhite, with one confined to Nicaragua and the other to the Yucatán Peninsula. The crested bobwhite displayed the greatest amount of genetic differentiation, with 4 distinct lineages: one in northern Central America (Guatemala to Costa Rica), a second in Panama and Colombia, a third concentrated in Venezuela, and a fourth confined to Brazil. None of these lineages, however, was congruent with accepted subspecies taxonomy.

This study confirmed there are 3 species of bobwhites. However, genetic data did not support the existence of multiple subspecies.

Subspecies are often used as proxies for management units under the assumption that this reflects the geographic distribution of genetic variation within a species, but the results of this study indicated that the accepted subspecies taxonomy of all 3 species of bobwhites actually obscures the actual distribution of genetic variation. Management and conservation of bobwhites should focus on geographic regions rather than subspecies as this may preserve the greatest amount of genetic diversity and adaptive potential. ~

CKWRI NEWS

CKWRI Shines at TCTWS Annual Meeting

Students and faculty played an important role at the 52nd Annual Meeting of the Texas Chapter of The Wildlife Society held February 18–20th in San Antonio, TX. Thirty-one of 105 (30%) oral presentations and 42 of 91 (46%) poster presentations were authored or coauthored by CKWRI researchers, graduate students, and undergraduate students affiliated with CKWRI researchers.

Of the 8 graduate students from across Texas competing for the prestigious *Clarence Cottam Award*, 2 were from CKWRI, and both were recognized for their outstanding presentations. **John Leonard** placed 2nd for his presentation "Next Generation Sequencing used to Assess Diversity within Major Histocompatibility Complex of Ocelots" coauthored by **Drs. Michael Tewes** and **Randy DeYoung** (CKWRI), **Dr. Jan Janecka** (TAMU), **Dr. Tyler Campbell** (East Foundation), and **Dr. Arturo Caso** (Secretaria de Medio Ambient y Recursos Naturales). **Stacy Hines** placed 3rd for her presentation "Dietary Niche Partitioning among Cattle, Deer, and Nilgai using Stable Isotopes" coauthored by **Drs. Timothy Fulbright**, **J. Alfonso Ortega-S.**, and **David Hewitt** (CKWRI), **Dr. Thomas Boutton** (TAMU), and **Dr. Alfonso Ortega-S., Jr.** (East Foundation).

John Leonard (top left) and Stacy Hines (bottom left) presented with the 2nd place and 3rd place *Clarence Cottam Award*, respectively, by outgoing TCTWS president Dr. Roel Lopez.

In addition, graduate student **Nichole Alonso** received the *Dan Boone Memorial Scholarship* and several CKWRI researchers received awards. **Dr. Fred Bryant** was recognized for his lifetime of work in wildlife and service to the society, receiving the *Honorary Life*

Dr. Fred Bryant (left) presented with the *Honorary Life Member Award* by outgoing TCTWS president Dr. Roel Lopez.

Member Award. **Dr. Michael Tewes** along with coauthors **Dr. Jan Janecka** (TAMU), **Ms. Linda Laack** (Department of Transportation and Natural Resources), **Dr. Arturo Caso** (Secretaria de Medio Ambient y Recursos Naturales), **Dr.**

Dr. Michael Tewes (left) presented with the *Outstanding Scientific Article Award* by outgoing TCTWS president Dr. Roel Lopez.

Lon Grassman (TAMUK), and **Dr. Rodney Honeycutt** (Pepperdine University) received the *Outstanding Scientific Article Award* for their publication "Loss of Genetic Diversity among Ocelots in the United States during the 20th century

Dr. J. Alfonso Ortega-Santos (left) presented with the *Best Book Award* by outgoing TCTWS president Dr. Roel Lopez.

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linked to Human Induced Population Reductions," which was published in PLOS ONE. **Dr. Raul Valdez** (New Mexico State University) and **Dr. J. Alfonso Ortega-Santos** (CKWRI) received the *Best Book Award* for "Ecologia y Manejo de Fauna Silvestre en Mexico." **Dr. Randy DeYoung** assumed the position of TCTWS president.

Outgoing TCTWS president Dr. Roel Lopez (left) presented with a recognition plaque for his service by incoming president Dr. Randy DeYoung.

Our CKWRI faculty and students have made outstanding accomplishments over the years, and we congratulate them for their service to the wildlife profession. ~

GEOSPATIAL TECHNOLOGIES LABORATORY AT CKWRI

by Humberto Perotto

The first aerial photograph was taken from a balloon of Boston by James Wallace Black on October 13, 1860. The picture was entitled "Boston, as the eagle and the wild goose see it." Since then, mankind has made huge advances in the use of remote sensing (aerial photography, satellite imagery) and other geospatial technologies such as geographic information systems (GIS) and global positioning systems (GPS), which have drastically changed the way we view the world.

Presently, geospatial technologies are an integral part of our lives: smartphones have GPS built-in technology, so we know where we are; and combined with GIS, we can look for addresses and know how to get to different places. We even have access to 3D imagery that provides a 360° view of roads and most urban areas around the world. This technology has definitely changed the way we view the world.

Geospatial technologies also play an important role for conservation and management of wildlife and their habitat. In the last 40 years, the use of satellite imagery has helped us understand the effects of land use dynamics and their effect on ecosystems around the world. Geospatial technologies have increased our awareness of the potential impacts we have on our natural resources and have led us to think in ways to conserve and manage these resources for future generations.

CKWRI graduate students Jose Mata (left) and John Edwards (right) shown collecting field data for image classifications.

Editor's Note: Dr. Humberto Perotto is a Research Scientist at the Caesar Kleberg Wildlife Research Institute and Assistant Professor within the Department of Animal, Rangeland, and Wildlife Sciences at Texas A&M University-Kingsville.

Did You Know?

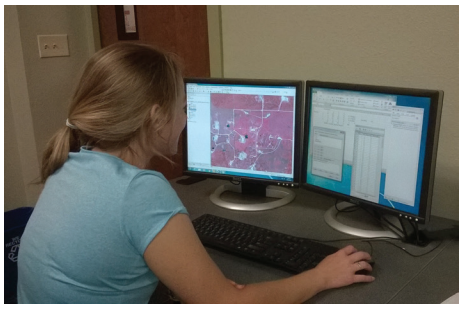
The piping plover prefers "sand and gravel shorelines, river sandbars, and islands." (Piping Plover, TPWD Leaflet D0200-849C)

Texas horned lizards are often called "horny toads" or "horned frogs," referring to their bumpy skin, but they are lizards, not toads or frogs.

The Geospatial Technologies Laboratory at the CKWRI is dedicated to providing support to CKWRI graduate students and faculty in the use of geospatial technologies for their research. With state of the art geospatial technologies, the laboratory is able to support spatially-driven research questions at multiple scales spanning from large scales (e.g., southern US) to local scales (e.g., pasture scale) and integrate information derived from GPS collars, satellite imagery, and GIS data generated in the field.

This year the Geospatial Technologies Laboratory has focused on using aerial photography from the National Agriculture Imagery Program (1-meter resolution color infrared photography) to assess vegetation distribution on the ranches where students are conducting research. Students classify satellite imagery, conduct field accuracy assessments, analyze GPS collar data from pronghorn, deer, quail and other species, and they integrate this information to evaluate the vegetation structure of locations where these species are being recorded.

To achieve these research objectives, the Geospatial Technologies Laboratory has 7 workstations equipped with GIS software (ArcGIS), remote sensing software (ERDAS, Terrset), spatial pattern analysis (Fragstats, CONEFOR Sensinode), advanced spatial analysis tools (geospatial modelling environment, LOAS, BIOTAS), computational statistics (RStudio, Sigmaplot, PAST), and wildlife population survey software (Distance). This complete suite of software tools allows students and faculty at the CKWRI to explore research and management questions at different spatial and temporal scales across the region, state, and country.



Undegraduate student Heather Hannusch classifying remote sensing imagery.

The Geospatial Technologies Laboratory is located in Rhode Hall, room 215. For more information, contact Dr. Humberto L. Perotto email: humberto.perotto@tamuk.edu; phone: 361-593-3977. ~

Consider giving a tax-deductible donation to CKWRI

What Do They Eat?

Hooded orioles eat insects, nectar from flowers of wild and cultivated plants, and fruits. (Handbook of Birds of the World, Vol. 16, del Hoyo et al., Lynx Edicions)

Young Schott's whipsnakes typically dine on lizards, whereas adults eat insects, lizards, small birds, and small mammals. (www.herpedia.com/snakes/colubrids/schottswhipsnake.html)

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Paid
Corpus Christi, TX
Permit #1103

Editor: Alan Fedynich, Ph.D.

SOUTH TEXAS WILDLIFE is printed on recycled paper