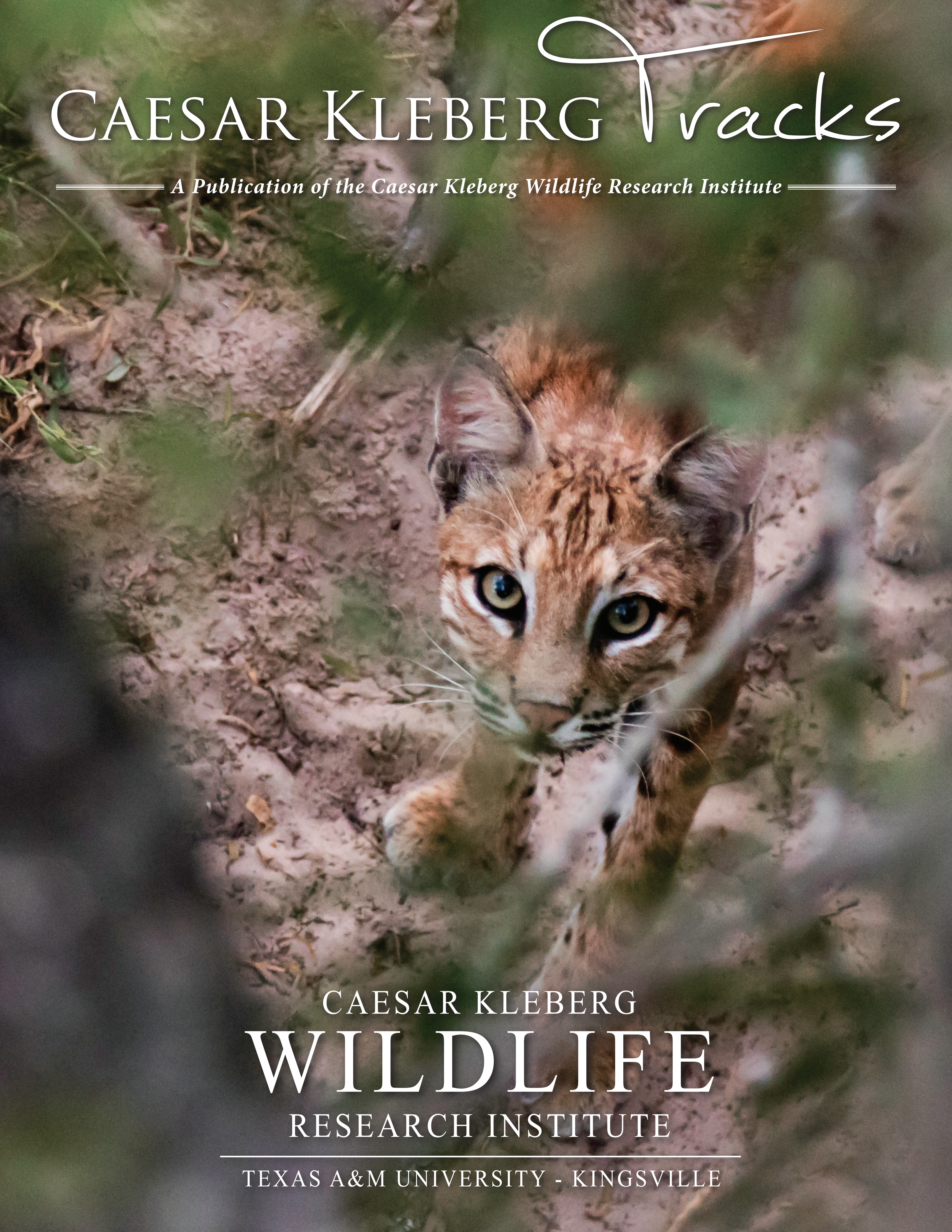
Caesar Kleberg Tracks

A Publication of the Caesar Kleberg Wildlife Research Institute



CAESAR KLEBERG
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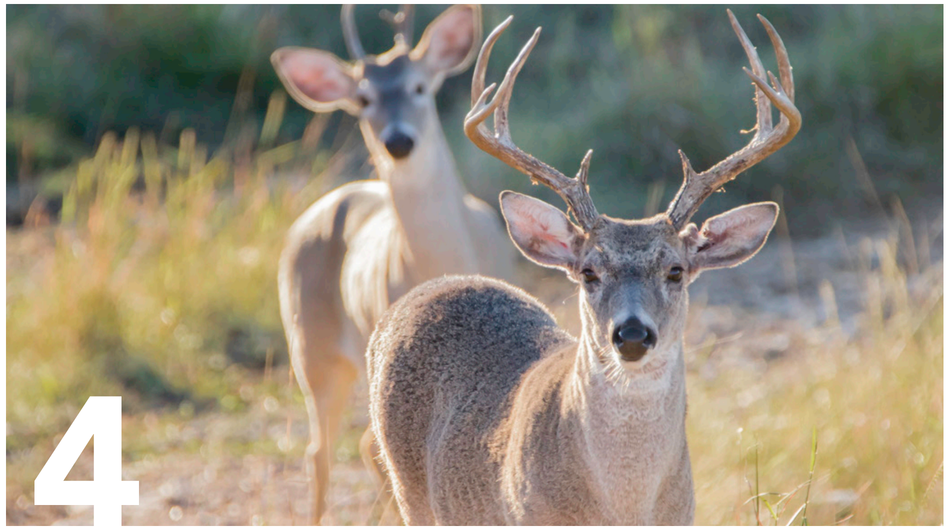
TEXAS A&M UNIVERSITY - KINGSVILLE

Caesar Kleberg Tracks

Volume 4 Issue 1 Spring 2019

In This Issue



Learn More About CKWRI

The Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville is a Master's and Ph.D. Program and is the leading wildlife research organization in Texas and one of the finest in the nation. Established in 1981 by a grant from the Caesar Kleberg Foundation for Wildlife Conservation, its mission is to provide science-based information for enhancing the conservation and management of wildlife in South Texas and related environments.

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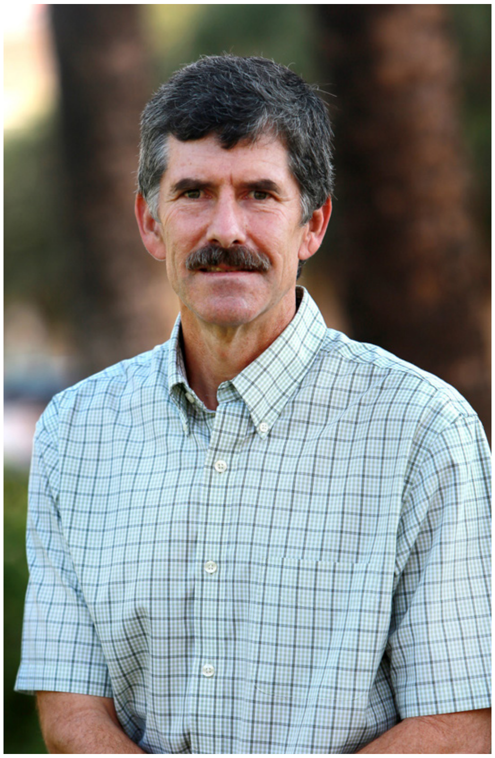
Cover Photo by Zachary Pearson

From the Director



The Gift of Wildlife and the Power of the Outdoors

I like the music of a singer-songwriter named Chuck Brodsky. He has a song called "A Toast to the Woman in Holler" about a schoolgirl, Katherine, who has a passion for music. However, Katherine's family is too poor to buy or even rent an instrument so that she can play in the school band. Katherine is distraught at being unable to fulfill such an important part of who she is, but a woman who lives in the holler (the setting is the Appalachian Mountains) hears about Katherine's problem and secretly provides funds for an instrument. In so doing, the woman in the holler passes on the "gift of music and the power of song."

This song is meaningful to me because I have the same feelings about the outdoors as Katherine has about music. I was lucky because I had places outside I could go and a family that enjoyed the outdoors. However, I know there are people for whom the outdoors is essential to a full and enriched life but who do not have opportunities to go afield. An even more distressing thought is the increasing number of people who may feel something is missing in their lives but who have never been outdoors and are unaware of the gift of wildlife and the power of the outdoors.

The articles in Caesar Kleberg Tracks magazine have different value to different people. One important audience is the wildlife managers and land stewards who are outdoors daily and who can use the information in their wildlife management. We seek to enrich their lives by adding depth to their interactions with wildlife and the outdoors. Another audience is those people who spend little time outdoors and perhaps are unaware of their need to engage the natural world. Like the woman in the holler, the CKWRI seeks to enrich the lives of these people by showing them the gift of wildlife and the power of the outdoors. Next time you have a glass in your hand, please join me in toasting the scientists, students, and staff who do the good work described in Caesar Kleberg Tracks.

All the Best,

Dr. David Hewitt
Leroy G. Denman, Jr. Endowed Director of Wildlife Research

LEARN MORE

Read more about our conservation partner, The Texas Alliance for America's Fish and Wildlife, on page 11.

Comanche Ranch Buck Culling Project: Effects of Intensive Culling on the Distribution of Male Mating Success

By Masahiro Ohnishi, Randy DeYoung, Don Draeger, Charles DeYoung, David Hewitt, Bronson Strickland, and Mitch Lockwood

Male mating behaviors differ among species as a result of the distribution of females and the distribution of resources. For instance, bull elk fight to protect harems of cow elk and repel any challengers to their herd. Elk mating success is related to age, antler size and condition. Large antlers are an advantage in fights with rivals, but a bull has to be physically mature and in good condition to grow large antlers. Thus, dominant mature bulls are able to monopolize access to a harem composed of multiple females; as a consequence, mating success is highly skewed toward mature males. In contrast, white-tailed deer do not form large groups, and bucks compete in a scramble competition for mates. Research at the CKWRI has revealed that many different bucks father offspring, even young bucks. Surprisingly, nearly one-third of offspring were fathered by young bucks (1.5-2.5 years old). Why did mature bucks let this happen?

Part of the story involves time management. The breeding season, or rut, for white-tailed deer in South Texas is relatively brief; most does are bred within a 2-week period in December. A doe's estrus period lasts only about 24 hours, though the onset of estrus is likely detectable 12-24 hrs in advance via scent or behavioral cues. Bucks search for individual estrous does, and may spend 24-48 hrs or more with a doe in a behavior termed 'tending', essentially a buck's attempt to prevent other bucks

Photo by Zachary Pearson

from mating with the doe. Many does are in estrus simultaneously during the peak rut. Since each buck can only be in 1 place at a time, this probably leaves opportunities for many adult bucks and some young bucks to breed, especially during peak rut, when most adult bucks are engaged in tending.

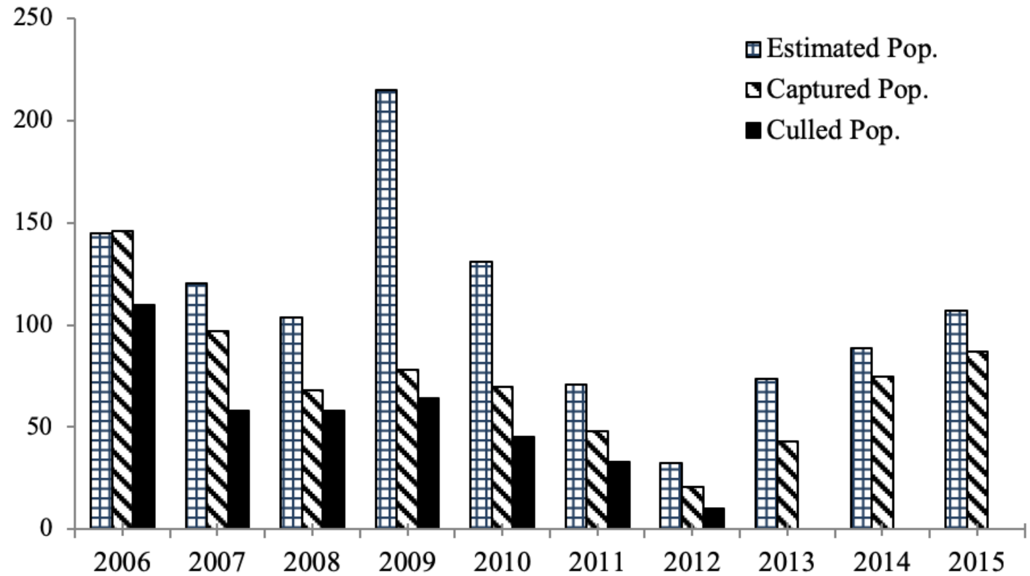


Figure 1 - *Number of bucks in a 3,500-ac intensive culling treatment pasture on the Comanche Ranch, Maverick, County, Texas, during 2006-2015. Each autumn before the rut, bucks were captured using the helicopter and net-gun method; bucks that did not meet age-specific antler criteria were removed. Culling of all age classes occurred during 2006-2012. We estimated population size by re-capture rates of marked deer.*

Many different bucks can breed in the white-tailed deer mating system due to the 1-on-1 nature of courtship; bucks simply cannot monopolize access to groups of does. Mating success is widespread even in age-structured populations, where adult bucks comprise >30% of the male population. What happens if the sex ratio is shifted due to harvest? The wide sex ratios seen on public lands in other states due to high harvest of bucks were long unthinkable in South Texas herds renowned for conservative harvest, where mature bucks are common. However, widened sex ratios have become a bit more common due to selective harvest. Selective harvest practices are a common tool for deer management in South Texas. The expectation is that males with large antlers produce offspring with large antlers. Reducing male competitors for mates in a herd should allow desirable bucks to increase their mating opportunities. If the selected bucks produce more offspring, the process of genetic change or selection in a managed population might be faster and more efficient.

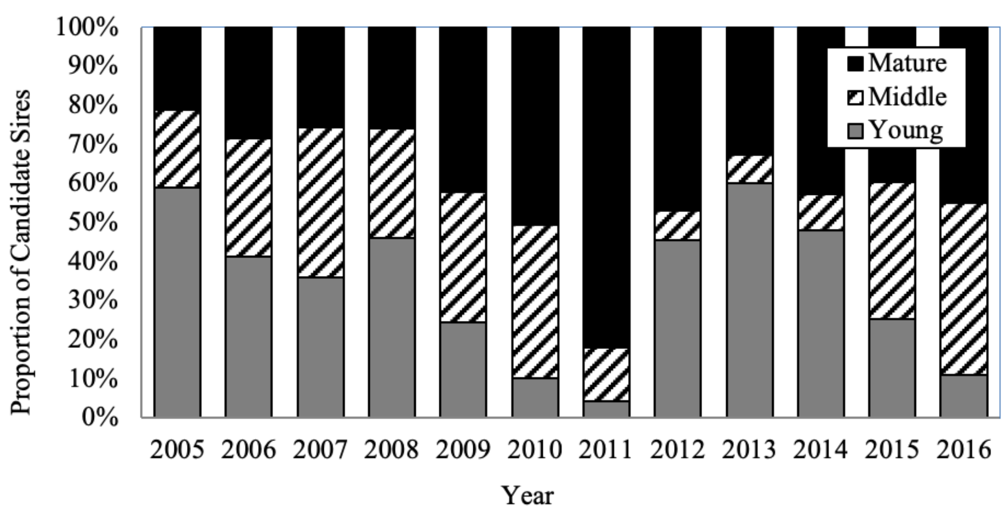


Figure 2 - *Proportion of white-tailed deer bucks by age class in a 3,500-ac intensive culling treatment pasture on the Comanche Ranch, Maverick, County, Texas, during 2006-2015. Each autumn before the rut, bucks were captured using the helicopter and net-gun method; bucks that did not meet age-specific antler criteria were removed. Culling of all age classes occurred during 2006-2012.*

The Comanche Ranch, CKWRI, and Texas Parks and Wildlife Department recently completed an intensive manipulative experiment of selective harvest in a wild population of white-tailed deer on the Comanche

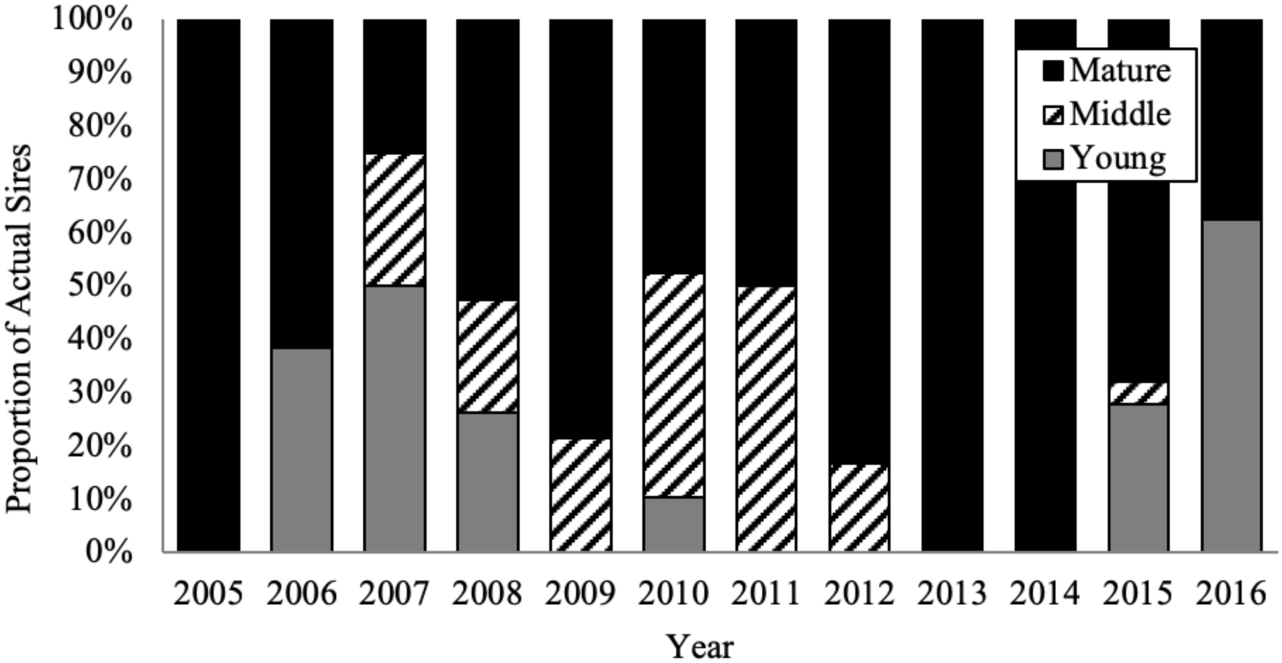


Figure 3 - *Proportion of white-tailed deer bucks by age class that sired offspring in a 3,500-ac intensive culling treatment pasture on the Comanche Ranch, Maverick, County, Texas, during 2006-2015. Culling of all age classes occurred during 2006-2012, and parentage was assigned using genetic markers.*

Ranch in Dimmit and Maverick Counties, Texas. Our goal was to assess the effects of selective harvest on the population, including the distribution of male mating success. We predicted that an intensive selective harvest should decrease competition for mates and result in increased mating opportunities for bucks with desirable antler traits. We also predicted that the intensive selective harvest would alter the age distribution of male breeding stock, and allow bucks of all age classes to mate.

We established an intensive treatment of selective harvest, where we removed yearlings with <6 points, 2.5-year olds with <8 points, 3.5 and 4.5-year olds with <9 points, and ≥5.5-year olds with <145 gross Boone & Crockett (GBC) score. The 3,500-ac intensive treatment area was enclosed by high fence to control dispersal, the movement of animals to and from the study area. Each autumn during 2006–2016, we captured bucks by helicopter and net gun, estimated age, and measured antler characteristics. Bucks that did not meet the criteria were removed during 2006–2012. We collected tissue biopsies for genetic parentage analyses from all individuals. Though constructing pedigree records in a wild population is extremely difficult, 11 years of intensive capture allowed us to make that happen.

We captured 837 bucks, including recaptures, which represented 598 individuals. During the treatment period, we removed 379 bucks (Fig. 1). Captured males declined from 145 in 2006 to 21 in 2012, which resulted in a sex ratio skewed toward females (6 F:1 M in 2010 and 5 F:1 M in 2012). Young bucks sired more than 30% of sampled offspring early in the study. Thus, we fully expected young bucks (1.5-2.5 year olds) to obtain more mating opportunities due to reduced competition during the culling period (Fig. 2). However, mature bucks sired most offspring during the culling period, whereas young bucks produced no male offspring between 2011 and 2014 (Fig. 3). The lack of reproductive contribution by young males as the sex ratio became highly skewed was surprising. Three years after culling ceased, the buck population expanded, and young males began to sire offspring again, including about 60% 0f parentage assignments made in the 2016 fawn birth year.

The intensive culling was successful in that most fawns were sired by bucks with desirable antlers. However, the time between generations increased because young bucks did not breed. This would slow any changes due to selection for antler traits. Why didn't young bucks become more successful? The overall buck population was drastically reduced due to culling, so in part, it may simply be that fewer young bucks equaled fewer offspring from that age class overall. An intriguing possibility is that does might prefer to mate with adult bucks; we cannot rule our female choice, though we would expect does to exert this choice prior to and after culling as well. It appears that the reduced competition actually hurt young bucks' chances for mating. We detected young bucks breeding in the 3rd year post-culling, when the population had rebounded, and competition for mates should increase. Young bucks cannot physically challenge adult bucks for access to an estrous doe. Instead, young bucks probably rely on alternative tactics, perhaps sneaking in when adult bucks face off in dominance interactions. If this reasoning is correct, young bucks need some level of competition for their low-success tactic to pay off.

White-tailed deer are one of the most-studied animals, yet we are constantly learning new things about these amazing and adaptable animals. Perhaps the strongest lesson is not to make assumptions about mating behaviors. Any intensive management that results in major changes to population size, sex ratio, or age structure may have unintended consequences. In our experience, its not a good idea to make assumptions about the mating potential of an individual or age class because deer tend to find ways to surprise us again and again.

Staff Highlight

Masahiro Ohnishi, Ph.D.
Laboratory Manager and Research Scientist

Masa is originally from Tokyo, Japan. He moved to Alpine to attend Sul Ross State University were he received both his bacherlos and masters degrees. Masa has always loved wildlife and conservation. Upon completion of his masters he was accepted to TAMUK and CKWRI as a Ph D student studying the effects of selective-harvest practices on demographic and genotypic traits in male white-tailed deer.

Masa chose CKWRI for a combination of positive factors including, his advisor Dr. Randy DeYoung, his research colleagues Drs. C. DeYoung, Hewitt, and Strickland, and the molecular laboratory which drives his curiosity to answer the research question; can different intensities of the selective-harvest treatments alter the response of male phenotypic traits to the selection.

American Alligators: A Unique History and a Need for Sustainable Harvest

By Cord B. Eversole and Scott E. Henke

American alligators have had an interesting history within the United States. During the colonial and early years of America, alligators were often killed because of human fear and misconceptions. Hunting was done for sport and to prevent livestock depredation. However, during this period there was little to no demand for alligator meat or skins; therefore, hunting had an insignificant impact on alligator populations. The public demand for products made from alligator leather such as shoes, boots, and saddlebags did not arise until the 1850's when these items became fashionable, particularly in Paris and other parts of Europe. Subsequent to the onset of these fashion trends, it was estimated that many thousands of alligators were harvested in just a few short years in order to meet human demands. Therefore, the decline of alligator populations in the United States began.

During the 1860's, the demand for alligator products intensified due to the growing need for alternative leather and meat sources in the south to supply confederate forces during the American Civil War. Later, the introduction of automobiles and outboard boat motors allowed for greater and easier access to hunting areas. These technological advances intensified the harvest of alligators and by mid-1900's, alligator hunting was considered quite profitable. In addition to population declines due to intense hunting harvest, alligator populations began to decrease because of habitat loss due to drainage of marshlands for agriculture and rapid urbanization.

Photo by David Hewitt

By 1960, it was reported that alligator populations in the United States had reached record lows, with many areas known to historically host substantial populations becoming completely void of alligators. In 1962, federal law banned the commercial and recreational hunting of alligators; however, it was not until 1967 that the species was awarded protection under the Endangered Species Preservation Act of 1966, a law that predated the Endangered Species Act of 1973. Habitat for alligators became protected under the passage of the Endangered Species Act, which afforded alligator populations a chance to rebound.

By 1980 the United States Fish and Wildlife Service re-established the legalized sale of alligator products (e.g., meat, skins, parts, etc.) in the United States. By 1985 this ruling was extended to allow for export of these same products out of the United States. Therefore, in 1987 American alligators were reclassified as threatened due to 'similarity of appearance' throughout the entirety of its range. Although American alligator numbers had rebounded, American alligators closely resemble other crocodilian species that were and are still threatened or endangered, such as the Chinese alligator and American crocodile, and it was feared that products from these species could be sold as American alligator products. The 'similarity of appearance' status allows for greater oversight by authorities, as is confirmed under the Conference of International Trade of Endangered Species (CITES).

During the period of over-harvest it has been estimated that the total number of alligators in the United States decreased by as much as 80%. Alligator populations have since rebounded to levels at which overpopulation and human-alligator conflict are often a concern. However, does this mean that alligator hunters can return to past practices? Not according to two researchers at the Caesar Kleberg Wildlife Research Institute, Cord Eversole and Scott Henke. They have been studying alligators for nearly a decade and warn that unless wildlife agencies carefully implement sustainable harvest practices that severe population reductions could once again become a reality.

Although much more closely monitored than during times of pre-'endangered' status, many state wildlife agencies allow three periods of alligator harvest that include a fall hunting season (i.e., September), egg collection season (i.e., late summer), and in some cases a spring nuisance alligator season (i.e., April - June). In Texas, the current harvest strategy allows for 50% egg harvest, and 4% hunting harvest. Although such harvest levels sound low, Eversole and Henke hypothesized that current harvest levels are not sustainable for the long term (> 100 years) and that egg harvest has the greatest effect on the overall population of alligators.

Statewide management strategies for alligators are largely based upon data from harvested populations; however, it is not known if both harvested and non-harvested populations react similarly to these strategies. This is an important consideration because population demographics of alligators are thought to vary by habitat type, habitat condition, geographic region, and alligator density. Also, alligator harvest targets two separate age/size classes. Commercial and recreational hunters primarily target larger "trophy" alligators, as in many other game species, and egg collection targets alligator eggs from wild populations. However, often smaller, sub-adult alligators are harvested in equal proportion to adult alligators due to the non-selective methods that are used to hunt alligators. The impacts of harvest on a long-lived species such as the American alligator may not be evident on short time scales (i.e., <50 years); therefore, Eversole and Henke suggest that alligator population management strategies must consider this.

To test their hypotheses, the two researchers built a population model for American alligators based on current knowledge of alligator ecology and behavior and included several harvest strategies. Results of model simulations showed that the current harvest strategy of 50% egg harvest, 2% sub-adult harvest, and 2% adult harvest in Texas is sustainable if alligator populations are desired to be managed at levels below population potential. However, such a strategy can be negatively impacted by natural disasters such as hurricanes and extreme weather such as droughts and floods. The best harvest scenario for a sustainable harvest that maintains alligator population size at a relatively unchanging level is a 38% egg harvest, 2% sub-adult harvest, and 2% adult harvest. An elevated egg harvest of 80% can be sustained if no hunting harvest occurs. Contrarily, an increased hunting harvest of 4% sub-adult and 4% adult can be sustained with no egg harvest. Eversole and Henke hope that their model will aid future management decisions for alligators that balance the needs of all stakeholders with sustainable alligator populations. Doing so hopefully will forever keep American alligators from heading down the path toward endangered status again.

NOTE: Dr. Cord Eversole is now an Assistant Professor with the Department of Biology and Chemistry at Texas A&M International University in Laredo, Texas.

Conservation Partner Highlight

The mission of The Texas Alliance for America's Fish and Wildlife is to promote active, sustainable conservation strategies for Texas fish and wildlife and the habitats on which they depend.

Texas Alliance for America's Fish and Wildlife is a coalition of businesses and organizations that recognize the value of healthy wildlife populations and realize that our natural heritage is in jeopardy.

With over 150 member organizations, the Texas Alliance is a diverse coalition consisting of landowners, conservation organizations, privately-held businesses, sportsmen's groups, church congregations, educational institutions, nature centers, and other civic organizations, who have come together to support fish and wildlife conservation, outdoor recreation, and conservation education.

Visit www.texaswildlifealliance.org to learn more.

TEXAS ALLIANCE FOR AMERICA'S FISH & WILDLIFE

Use of a Holistic Approach to Study the Complex System of Bobwhites and Their Parasites Within South Texas

By Nicole J. Traub and Alan M. Fedynich

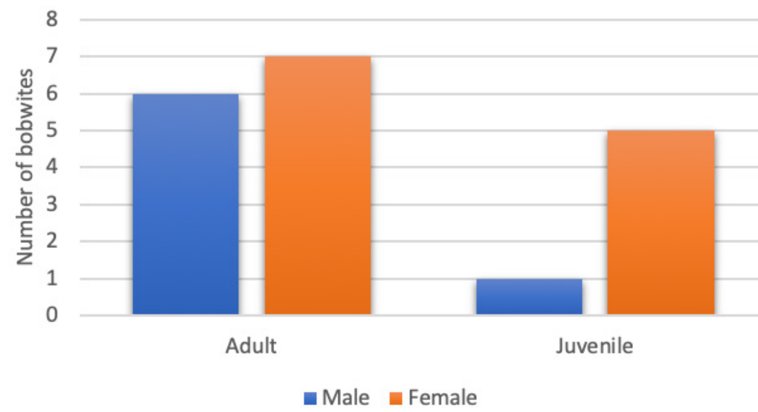
The northern bobwhite is a game species of ecological, economic, cultural, and recreational importance in Texas. South Texas is regarded as one of the last places in the state with suitable habitat for bobwhite populations; nevertheless, bobwhite populations have been declining. The underlying cause of the quail population decline has been attributed to habitat fragmentation and loss; therefore, most management efforts focus on improving existing habitat and developing new habitat. Despite these efforts, bobwhites have continued to decline, which has led quail biologists to explore other potential causes, such as parasitism, for declining quail numbers. Bobwhite populations in South Texas exhibit marked variations in abundance among years—a boom-and-bust phenomenon—that is attributed to fluctuations in weather conditions. When rainfall is abundant, vegetation is expected to be plentiful, populations of insects are expected to rise, and quail populations boom. How this cycle affects the parasite infections in quail is unknown. Our study concentrates on examining the interactions between precipitation and helminth population dynamics, so we can have a better understanding of the overall quail-parasite relationship. We are conducting a multi-year (2012–2019) internal parasite survey (with contributions from previous CKWRI graduate students Andrew Olsen and Stephanie Shea) from bobwhites hunter-harvested in South Texas in conjunction with a systems-based holistic approach to meet 3 main study objectives: (1) determine if parasite community structure and pattern is affected by host and environmental variables; (2) determine which insect species are used as intermediate hosts and the effect intermediate host density has on parasite community structure; and (3) create a simulation model to demonstrate the relationships between bobwhite density, insect intermediate host abundance, parasite infections, and precipitation.

Although an essential component of the quail diet, insects can serve as intermediate hosts for helminth parasites. Helminth parasites of northern bobwhites in South Texas utilize indirect lifecycles, meaning the parasites require more than one host species to complete all life stages. Northern bobwhites are the definitive, or final, host and several insects are believed to act as the intermediate, or first, host(s). In conjunction with field collections of insects during summer months, we are examining bobwhite crops from hunter-donated birds to determine which insects are being eaten during the fall and winter period that possibly could be utilized as intermediate hosts for the nematodes *Aulonocephalus pennula* (cecal worm) and *Oxyspirura petrowi* (eye worm).

We began examining population dynamics of insects that serve as food for quail as well as intermediate hosts for parasites during the 2016–2017 Texas quail hunting season. One hundred and thirty-six bobwhites were donated during the 2016–2017 hunting season, of which 19 had insect species present in the crop at the time of necropsy (Figure 1). Insects were identified to order and stored in 95% ethanol for further investigation. Insects of 6 different orders were present (n=165; Figure 2). Order Coleoptera (n=94, 57%) was most dominant followed by Hemiptera (n=6, 4%), Hymenoptera (n=11, 7%), Lepidoptera (n=22, 13%), Orthoptera (n=30, 18%), and Parasitiformes (n=2, 1%). The most abundant insect (n=79) found was a larval Coleoptera species of the Chrysomelidae (Leaf beetle) family. In addition to the insects, two snails and one spider were also present within the crop contents.

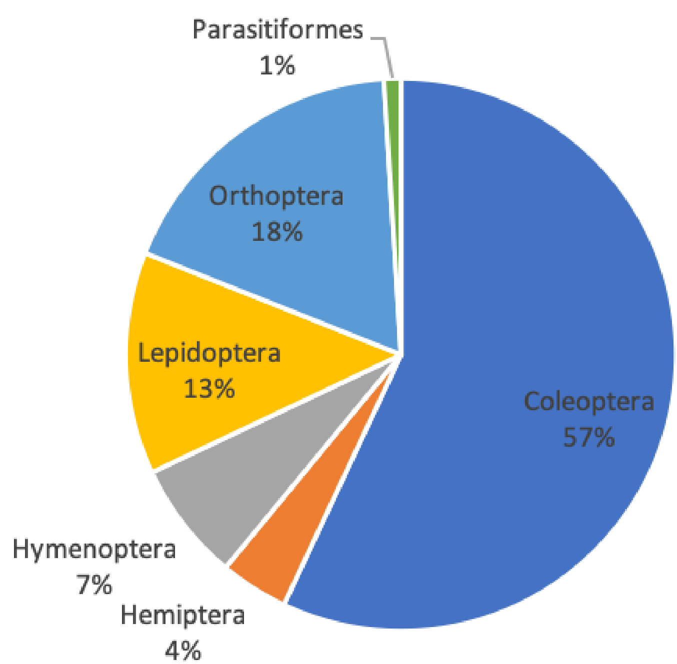
We are partnering with local ranches to collect various insects twice a month during each summer month (May-Aug) in 2019. We want to track insect abundance throughout the summer to (1) determine which insects are available as food for quail, (2) determine which insect species are being used as intermediate hosts by parasites, especially the cecal worm and eye worm, (3) determine the percent-

Figure 1



Number of northern bobwhites (n=19) with arthropods found in crop separated by age and sex from 2016–2017 hunting season.

Figure 2



Percent of insect orders found within northern bobwhite crop (n=19) during the 2016–2017 hunting season.

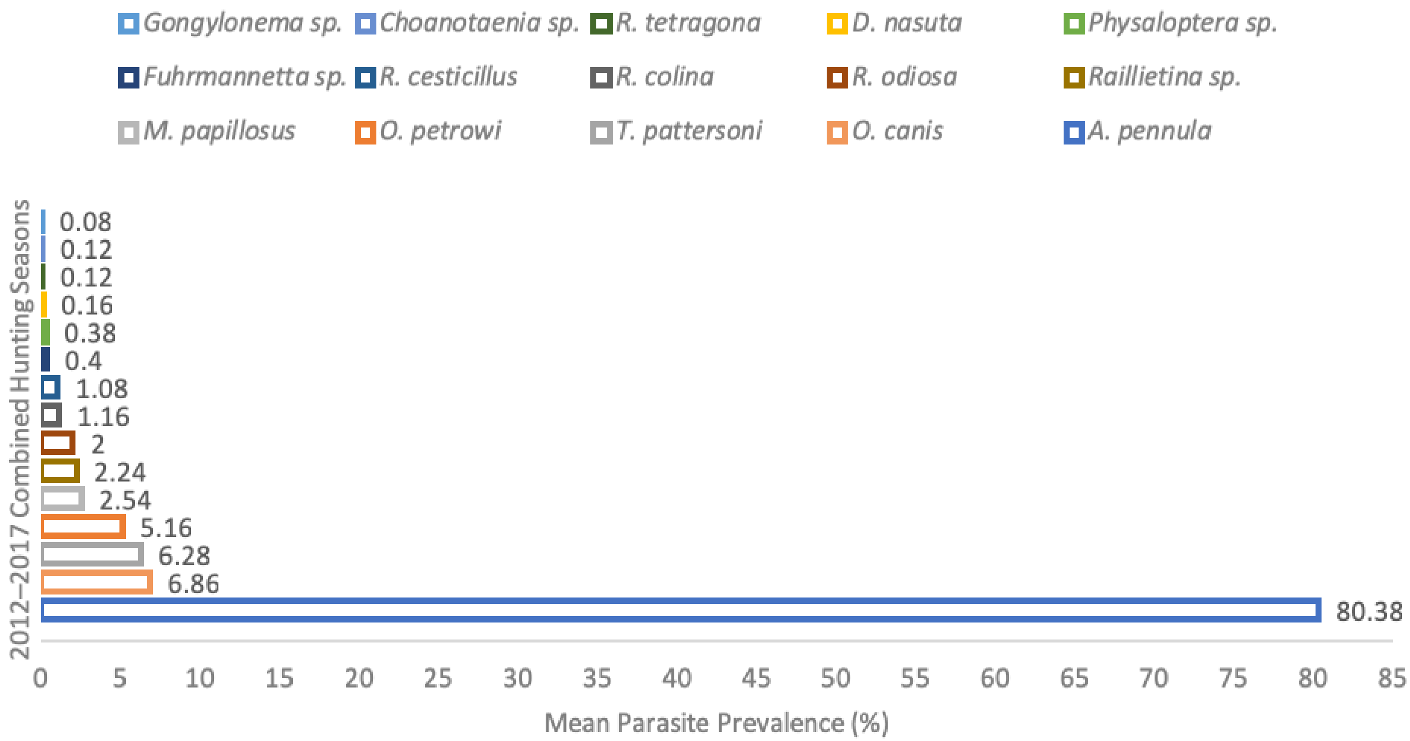


Figure 3 - *Prevalence (%) of parasite species found within northern bobwhites (n=734) from 2012–2017 hunting seasons.*

age of the insect population infected by larval stages of the cecal worm and eye worm, and (4) examine the relationship between insect abundance and rainfall.

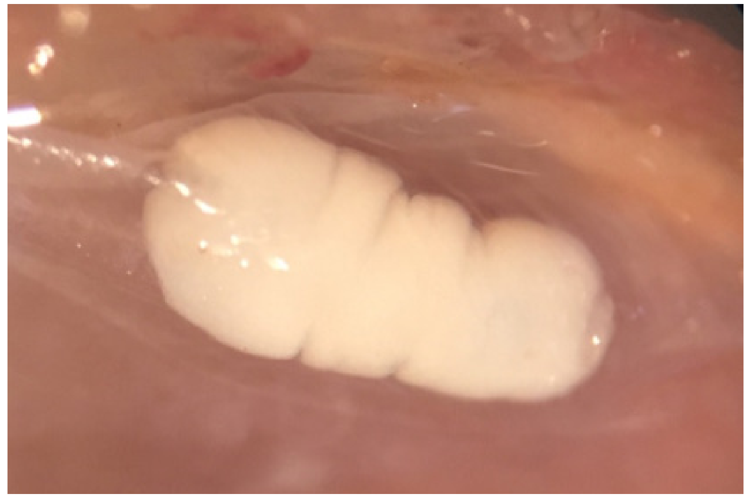
Fifteen parasite species have been identified from the long-term internal parasite survey of bobwhites between 2012 and 2017. The cecal worm, *Aulonocephalus pennula*, was the most dominant parasite with a 5-year mean prevalence of 80.4%, followed by *Oncicola canis* (6.9%), Tetrameres pattersoni (6.3%), and Oxyspirura petrowi (5.2%). The remaining 11 parasites are considered rare and were found at less than 3% mean prevalence from 2012–2017 (Figure 3).

In addition to the long-term parasite survey data being collected, we have found a new parasite that has not been reported from South Texas. During the 2016–2017 quail hunting season, a scaled quail from Zapata County was found to be infected with a

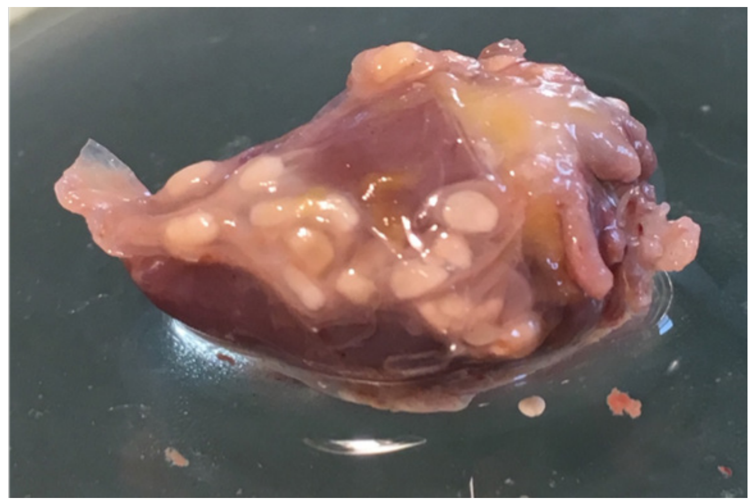
Pictures of Aulonocephalus pennula. Top: Picture of an extended bobwhite ceca caused by cecal worms. Right: Picture of A. pennula spilling out of the bobwhite ceca. Bottom: Picture of A. pennula being fixed in acetic acid after removal from bobwhite ceca. Pictures by Nicole J Traub, CKWRI tapeworm previously unreported in scaled quail. This tapeworm, a species in the genus Mesocestoides, has an indirect life-cycle and uses 3 hosts: an insect, quail, and a carnivore (coyote, ocelot, or another four-legged carnivorous mammal). However, it is possible for this tapeworm to infect humans if the live larval stage is consumed. As of 2016, the CDC estimates 30 cases of human infections with adult Mesocestoides tapeworms have been documented worldwide, 10 of which occurred in the United States. We urge hunters to use caution when cleaning quail. If the quail has white or cream-colored rice-shaped spots on the flesh or organs (Figure 4), we suggest the quail be discarded and not eaten by human or animal. Discard the carcass in a place where other carnivores, including your hunting dogs, cannot eat it, and be sure hunters and ranch cleaners thoroughly clean their hands after touching an infected quail.

Studying relationships between precipitation and parasite population dynamics is needed to have a better understanding of host-parasite ecology. Understanding the life-cycle of an organism is important for conservation and management purposes, but for parasites, understanding the life-cycle and transmission dynamics is especially crucial since disrupting a portion of the life-cycle can effectively control the parasite. Parasitism in bobwhites has gained much attention over the past decade due to concerns about parasites negatively effecting declining bobwhite populations. Clearly, individual bobwhites can experience adverse effects due to parasites as found in a study conducted by Dr. Fedynich and then CKWRI graduate student Andrea Bruno. Unfortunately, very little research has been conducted on the pathogenicity of helminths occurring in South Texas quail, and it is yet unknown to what extent parasites negatively impact bobwhite populations. Much work remains to be done before a definitive answer to the question "Do parasites regulate bobwhite populations?" can be answered confidently.

Figure 4



Picture of Mesocestoides tapeworm larvae.



Heart covered in Mesocestoides tapeworm larva.

Body cavity covered in Mesocestoides tapeworm larva.

Student Highlight

Nicole Traub, Doctoral Candidate

Hometown: Trinity, Texas

Project: Helminth Parasites of Northern Bobwhite and Scaled (blue) Quail

Nicole is originally from southeastern Wisconsin but she has called Trinity, Texas home since she was 12. She graduated from Groveton high school and subsequently attended the University of Texas-Tyler and received a B.S. in biology.

Recently, she graduated with my M.S. in biology from Sam Houston State University where she studied helminth parasite community differences between Greater white-fronted geese and Black brant from Arctic and sub-arctic Alaska. Nicole moved to South Texas to join the Caesar Kleberg Wildlife Research Institute to get her Ph.D. under Drs. Fedynich and Brennan. She will be continuing a project on helminth parasites of northern bobwhite and scaled (blue) quail. Since much of the groundwork has previously been researched, she plans to compile past graduate students' data on helminth prevalence/intensity/abundance in regards to quail density and precipitation and see if the helminths follow the same boom and bust cycle as the quail. Nicole came to CKWRI to specifically work with this project.

ONLINE

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Got Quail?

DONATE QUAIL TO NICOLE TRAUB'S Ph.D. PROJECT TO GET A FREE REPORT OF PARASITES IN YOUR QUAIL

We are seeking donations from hunters and ranches in South Texas to build a long-term dataset of quail parasites for the region.


Photo by Zachary Pearson

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OR

Dr. Alan Fedynich
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Pronghorn in the Texas Panhandle: The Habitat-Cropland Paradox

By Anthony Opatz, Gary Mizer, Timothy E. Fulbright, Randy W. DeYoung, Humberto L. Perotto-Baldivieso, Warren C. Conway, and Shawn S. Gray

Pronghorn are an iconic big game animal of the Great Plains of North America. The range of pronghorn in North America contracted by 64% during the past 2-3 centuries. One of their last strongholds of the species in Texas is the Panhandle region. The fleet-footed animals are supremely adapted to open rangelands, where they rely on excellent vision and speed to escape predators. Cropland is not a major feature of the landscape in most of the remaining range of pronghorn in North America. In the Texas Panhandle, however, croplands have a major presence.

Cropland now covers more than a third of the Panhandle, and rangelands in the region have declined in recent years because of conversion of native prairie to irrigated agriculture. Dallam and Hartley counties have seen 106,000 acres converted from rangeland to cropland in the last 20 years, according to the Texas A&M Natural Resources Institute, despite a disappearing source of water for irrigation. The Ogallala aquifer, which provides the water for irrigated agriculture in the Texas Panhandle, is a fossil aquifer and is not rechargeable like the Edward's aquifer in central Texas. Consequently, at some point in the future, irrigation will no longer be feasible in the Panhandle. A large area of the aquifer in Dallam County, for example, has a usable life of under 15

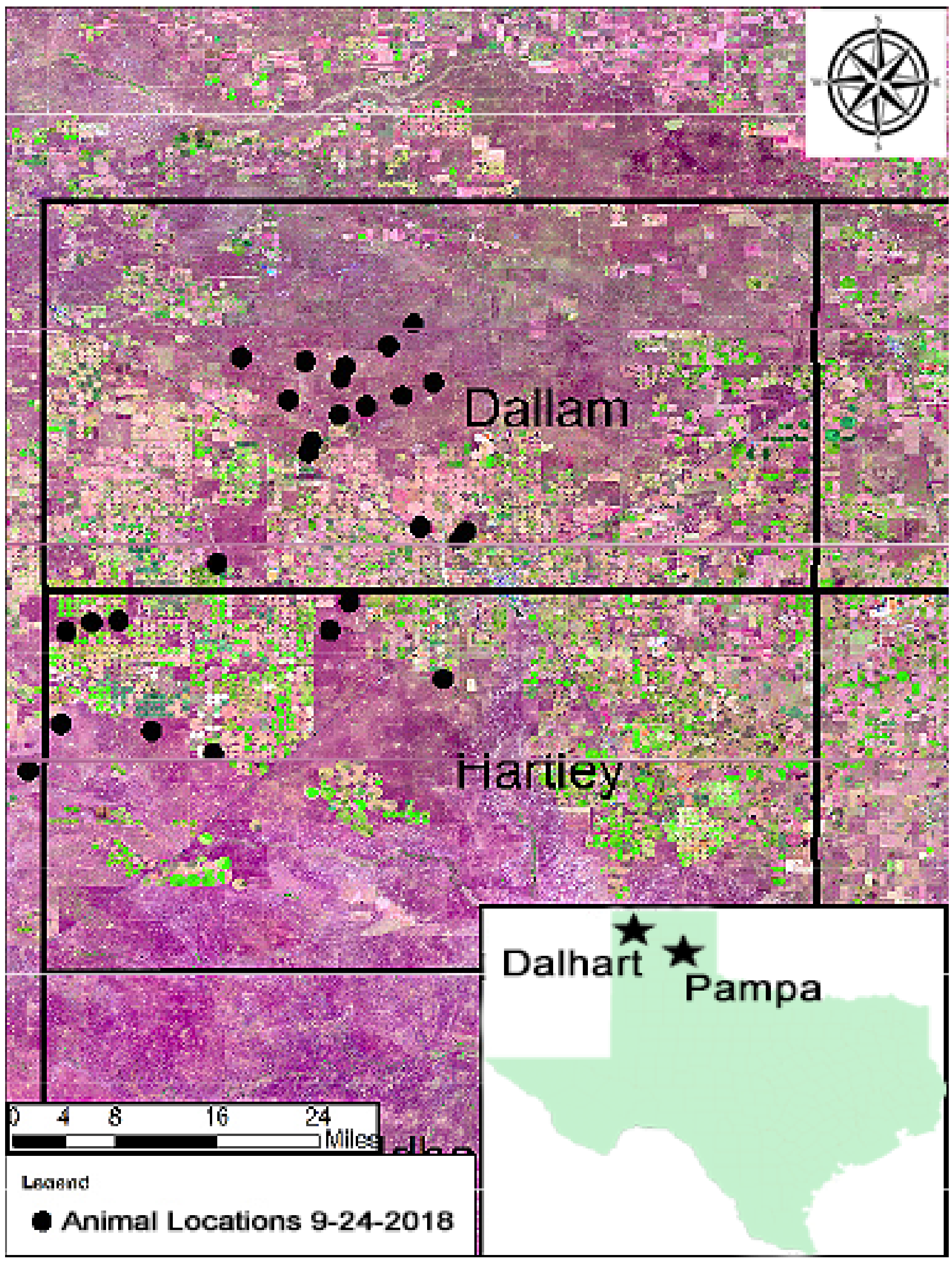


Figure 1
Location of study areas near Dalhart and Pampa, Texas. Black dots represent home ranges of individual pronghorns.

years according to an article in the Texas Water Journal. Loss of habitat to irrigated agriculture may pose a threat to pronghorns, yet, irrigated crops, which may have a relatively bleak future, may provide benefits as well.

There are several questions regarding the interactions between pronghorn and crops, the answers to which are unclear. For example, how does the abundance of irrigated fields affect pronghorn? What crops do they use? How much time do they spend in crops versus rangeland? How are movements influenced by roads and fences associated with agriculture? In 2016, the Texas Parks and Wildlife Department funded a joint study between the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville and Texas Tech University to address those questions.

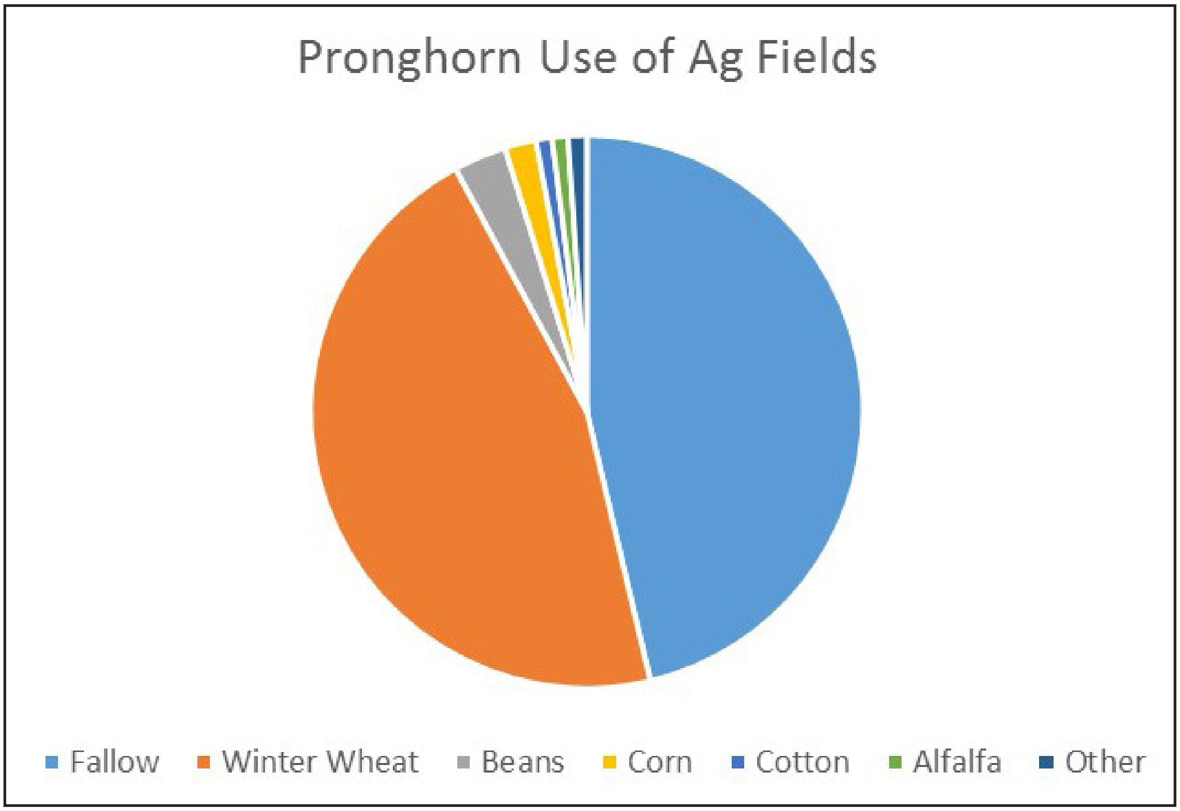
We placed global positioning system (GPS) collars on 64 adult pronghorn (*Antilocapra americana*) in the Panhandle, 32 near the town of Dalhart and 32 near the town of Pampa, in February 2017. The collars were equipped to transmit GPS fixes to satellites so that we could download data without having to retrieve the collar. We set the collars to record a GPS fix every 2 hours. We collared an additional 29 animals between the 2 study areas in February 2018 to account for mortality that occurred in the previous year from various causes, primarily predation and hunting.

Overall, pronghorn in the Dalhart study area chose to spend more time in mixed-grass prairies and Conservation Reserve Program–Improved grasslands than in agricultural fields during most of the year. Pronghorn in the Pampa study area chose to spend more time in agricultural fields, when crops were available to them, and sandy shrublands than in mixed-grass prairie and shortgrass prairies. Use of agricultural fields varied among seasons and between sexes. Males tended to use crops more than females. However, both sexes were found in fields more in the winter

Figure 2

A pronghorn outfitted with a GPS collar capable of sending coordinates of the position of the animal to a satellite for downloading by researchers every 2 hours.

Figure 3
Percent of pronghorn locations that were visits to agricultural fields by crop type.



and spring than the rest of the year. Females used rangeland more than males did during the fawning season, illustrating the importance of having adequate cover to hide fawns.

In 2017, 5,700 (10%) of GPS fixes were recorded in agricultural fields, and 92% of the fields used were winter wheat or fallow fields. A severe drought occurred throughout the Panhandle beginning in December 2017 and lasted more than 100 days. During the drought in 2018, GPS fixes in croplands increased by 250% (20,500 points) compared to 2017. Pronghorn not only used winter wheat and fallow fields, but expanded their use to alfalfa, corn, and cotton. The greatest use of crops for both years occurred during November through June, when crops are in early developmental stages.

We collected fecal samples on a monthly basis from each study area to determine the influence of croplands on pronghorn diet composition. Samples were collected from a mixture of rangeland and cropland locations. Based on 34 samples collected from May – November 2017, which coincided with the lowest use of agricultural fields, there were 5 cultivated plant species in diets: wheat, barley, rye, alfalfa, and cotton.


Photo by Timothy Fulbright

Native plant species in the same genus as barley and rye also occur on rangeland, so these results could have reflected consumption of rangeland vegetation. Fifty-eight plant genera were identified from the 34 samples. Overall, diet composition consisted of forbs (weeds), leaves and twigs of shrubs, and grasses (87%, 9%, and 4%, respectively).

Continued development of new highways and roads associated with irrigated agriculture is detrimental to pronghorns. Roads in agricultural areas restrict pronghorn movements when fence lines occur along either side of the road. Otherwise, dirt roads along agricultural fields and in rangeland that are not bordered by fences do not affect movement. Major paved roadways, such as Texas State Highway 70 north of Pampa, are impenetrable barriers to pronghorns. Animals on one side of the highway may be unable to access crops or fawning grounds that are just across the road from them.

Active irrigation may provide a consistent, nutritious food source for pronghorns when drought conditions occur. Availability of native rangeland, however, is important throughout the annual cycle of pronghorn on the Texas landscape. Increasing conversion of native rangeland in the Texas Panhandle to agricultural crops therefore presents a paradox for pronghorn: it results in habitat loss, yet crops could benefit the species nutritionally during certain seasons and prolonged periods of drought. Identifying how these animals use cropland and native grasslands in relation to each other is critical to understanding how to effectively manage pronghorn populations in the Panhandle. In addition, more knowledge on how pronghorn use native grasslands when crops are not present could inform us of healthy reclamation practices and can protect this iconic species after the wells run dry.

Figure 4

A group of pronghorns using an irrigated agricultural field in the Texas Panhandle.

The Texas Native Seeds Program

TEXAS NATIVE SEEDS RECEIVES PRESTIGIOUS AWARD

The Texas Commission on Environmental Quality recently revealed the winners of the prestigious Texas Environmental Excellence Awards. Governor Greg Abbott and TCEQ commissioners jointly selected the ten winners—based on recommendations from a Blue-Ribbon Committee—in nine categories. TNS was awarded the distinction in the Agriculture category and will be recognized at a banquet on May 15 as part of the TCEQ's Environmental Trade Fair and Conference at the Austin Convention Center.

DID YOU KNOW

Seedlings are starting to grow in the new greenhouse facility in Alpine at Sol Ross State University. Most seedlings will be transplanted in Alpine and Odessa for new species research evaluations, and some will go into seed increase plots in Alpine. Some of these seedlings are the future of commercially available native seeds for west Texas.

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Wildlife Ecology and Management in Mexico

Mexico is the fourteenth largest country in the world and ranks fifth in biodiversity. Located in the transition zone between the temperate and tropical regions of North and South America, Mexico is an important migratory corridor for wildlife and also provides wintering habitat for several species of bats, monarch butterflies, and temperate North American nesting birds.

Mexico faces several challenges to wildlife management and conservation efforts. While there is increased public education and acknowledgment of the valuable benefits wildlife provides, there is still much work to do to incentivize conservation efforts. Fortunately, there is growing recognition that Mexico's wildlife resources can be a critical component in the rural economic development of the country.

Bringing together an international team of wildlife experts across North America, Wildlife Ecology and Management in Mexico provides information on the status, distribution, ecological relationships, and habitat requirements and management of the most important game birds and mammals in Mexico. It also reviews current threats and challenges facing wildlife conservation as well as strategies for resolving these issues. This reference is a valuable tool for wildlife biologists, wildlife management professionals, and anyone interested in conserving Mexico's wealth of natural resources. By laying out the challenges to conservation research, editors Raul Valdez and J. Alfonso Ortega-S. hope to encourage interdisciplinary communication and collaboration across borders.

ONLINE

Wildlife Ecology and Management in Mexico is available for purchase from TAMU Press and Amazon.

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