BULLETIN

OF THE

TEXAS ORNITHOLOGICAL SOCIETY

Vol. 47 No. 1–2 December 2014

Published by the
Texas Ornithological Society
www.texasbirds.org

THE TEXAS ORNITHOLOGICAL SOCIETY

MEMBERSHIP

Any person interested in the birds of Texas may become a member of the **Texas Ornithological Society.** Individual membership rates are $25.00 per year, $50.00 at the Sustaining level, $15.00 Student, Family $35.00, $400.00 Life and $500.00 Life w/Spouse. These memberships include print versions of ***Texas Birds Annual, The Bulletin of the Texas Ornithological Society*** and the electronic version of ***TOS NEWS***. To become a member send check or money order in U.S. funds with complete name and address to: **Texas Ornithological Society Memberships**, PMB #189, 12468 Austin Highway, San Antonio, Texas 78209. Memberships can also be obtained by consulting www.Texasbirds.org

PUBLICATIONS

The Bulletin of the Texas Ornithological Society is an annual[1] journal devoted to the biology and conservation of the birds that occur in Texas and adjacent areas.

Texas Birds Annual is published each year and includes new birding areas, recent media, vagrants and noteworthy birds from the previous year, articles on bird conservation issues and species profiles.

TOS News is a tri-annual electronic newsletter produced by TOS. Two issues include registration information on TOS meetings and a third includes information promoting membership in the society. A hardcopy version is available on request.

Occasional Publication Series is published on an irregular basis on scientific works too long for publication in the Bulletin. When published it is provided free to all members as an extra benefit of membership during the year of publication.

Submission to all publications should be e-mailed to: jclintoneitniear@gmail.com

Changes of address and queries about memberships or missing copies: E-mail TOSmember@yahoo.com or submit in writing to the address above.

PERMISSION TO COPY

[1]Starting with Vol. 42 both issues were combined.

Cover photo: Adult male Broad-billed Hummingbird. Photo by Maryann Eastman.

Frontispiece. American Oystercatcher (*Haematopus palliatus*). Art compliments of Alexandra E. Munters.

BULLETIN OF THE

TEXAS ORNITHOLOGICAL SOCIETY

TESTING FIELD SEXING TECHNIQUES FOR AMERICAN OYSTERCATCHERS

Alexandra E. Munters[1,3], Susan A. Heath[2] and M. Clay Green[1]

[1]Wildlife Ecology Program, Department of Biology, Texas State University, San Marcos, TX 78666, USA
[2]Gulf Coast Bird Observatory, Lake Jackson, TX 77566, USA

ABSTRACT.—Distinguishing the sexes of adult American Oystercatchers in the field is challenging because this species is plumage monomorphic and there is considerable overlap between the sexes in morphometric measurements. We attempted to shed light on this challenge by examining a trait that American Oystercatchers share with other oystercatcher species; the presence of iridial depigmentation, or darkened regions within the yellow iris, known as eye flecks. We used morphometric measurements coupled with the presence and severity of eye flecks to sex pairs of adult oystercatchers, captured as part of a larger study addressing the species' breeding ecology in Texas. We collected whole blood for genetic determination of sex using polymerase chain reaction (PCR) amplification of the chromo-helicase-DNA binding protein (CHD) gene on avian sex chromosomes Z and W to confirm the reliability of morphometrics and amount of eye flecks as diagnostic tools in our assignment of sex. We captured and sexed molecularly a total of 42 adult oystercatchers and were able to assign sex in the field to 34 of the birds captured. Lab results confirmed that our assessments were 97% correct (33 out of 34) for the birds whose sex we were able to determine in the field. For oystercatchers captured in Texas, there was a significant difference between the sexes for all morphometric measurements and amount of eye flecks. Although the origin of eye flecks remains unclear, we conclude that they can be used to assist in reliably sexing adult American Oystercatchers.

For species of conservation concern, life history details such as differences between the sexes in resource partitioning to chicks, site fidelity, survivorship, and dispersion, are crucial to creating appropriate recovery plans (Clutton-Brock 1986; Ellegren and Sheldon 1997). However, many shorebirds of the order Charadriiformes are not sexually dimorphic and therefore difficult to sex in the field. American Oystercatchers (*Haematopus palliatus*) are a plumage monomorphic shorebird species that have experienced population declines, and are now listed as a Species of High Concern in the United States Shorebird Conservation Plan (Brown et al. 2001). This species demonstrates a life history of paired territorial partnerships in which both sexes share incubation and chick rearing duties. Reliably differentiating the sexes of a pair of territorial oystercatchers without having to collect blood and molecularly sex the birds in the lab would be useful for conservation biologists monitoring this

[1]Email: aemunters@gmail.com
[3]Current Address: 9400 Old Mount Vernon Road, Alexandria, VA 22309

species and studying their territoriality, foraging behavior, and reproductive success.

Although American Oystercatchers are plumage monomorphic, adult females are generally bigger and heavier than adult males (Carlson-Bremer et al. 2010). However, in Virginia, South Carolina, and Georgia, there was considerable overlap in weight, bill length, and wing length between males and females (Carlson-Bremer et al. 2010). This morphometric overlap can make distinguishing the sex of an adult oystercatcher challenging if only one member of the pair is captured. Another method of sexing adults is checking for cloacal distension immediately following egg-laying. However, this method is only useful if the female is trapped immediately after she has laid eggs.

We attempted to shed light on the potential difficulty of sexing adult oystercatchers in the field by examining a physical characteristic of American Oystercatchers that they share with other oystercatcher species. A number of oystercatcher species show the presence of iridial depigmentation, or darkened regions within the yellow iris, henceforth termed "eye flecks." In Black Oystercatchers (*Haematopus bachmani*), Guzzetti et al. (2008) found the presence of eye flecks in their irises to be a predictor of sex in adult females. Researchers used categories of low, medium, and high eye flecks to classify captured birds in the field. Guzzetti et al. (2008) found that for Black Oystercatchers, researchers more frequently correctly identified sex using eye flecks as a diagnostic tool rather than discriminant analysis based on morphological characteristics. Similarly, Kohler et al. (2009) found that eye flecks can serve as a reliable indicator of sex for African Black Oystercatchers (*Haematopus moquini*).

We explored the accuracy of determining sex of American Oystercatchers in the field as part of a larger study examining breeding habitat preferences and productivity of the species in Texas (Koczur et al. 2014). We used morphometric measurements, specifically mass, culmen length, tarsus length, and wing chord, coupled with the presence and severity of eye flecks to sex pairs of oystercatchers in the field. We then used a molecular method to determine sex to confirm the reliability of these diagnostic tools in our assignment of sex to captured birds.

METHODS

We monitored breeding pairs of oystercatchers on the upper Texas coast (29° 29' N, 94° 93' W) from February through July, 2011 and 2012. We captured males and females with whoosh nets, decoy-noose traps, and box traps on their territory or at their nest (McGowan and Simons 2005). We limited whoosh netting attempts to less than one hour whenever possible to minimize disturbance.

Once captured, we banded individuals with U.S. Geological Survey Bird Banding Lab stainless steel bands and color-coded darvic bands for individual identification in the field. Identification leg bands were placed on each bird in accordance with American Oystercatcher Working Group protocols for permanent identification. We recorded the wing chord, culmen length, tarsus length and mass of captured individuals; all linear measurements were made using standard calipers and wing rules and mass was measured with a 1,000 g Pesola spring scale. We recorded presence and severity of eye flecks (none, minimal, moderate, severe) and took photographs of the eyes of individuals for further a posteriori classification. Based on morphometric measurements and the severity of eye flecks, we assigned sex to both members of captured territorial pairs, with the female as the larger bird with more eye flecks. When only one member of a breeding pair was captured, we used morphometrics and the presence and severity of eye flecks to determine sex. If the amount of eye flecking was indeterminate and the measurements fell in the overlap zone between males and females, we recorded sex as unknown.

When birds were captured, a maximum of 1 ml of blood was collected by venipuncture of the brachial vein using a disposable 0.7 × 25 mm needle and sodium heparinized 3 cc syringe. Samples were immediately aliquoted into 1.5 ml micro centrifuge tubes containing 600 microliters of cell lysis solution. Blood collection tubes were stored in a cooler until transferred into a refrigerator. The whole blood collected was packaged on dry ice and shipped to Oregon State University for genetic determination of sex using polymerase chain reaction (PCR) amplification of the chromo-helicase-DNA binding protein (CHD) gene on avian sex chromosomes Z and W (Zoogen Inc., Davis, California, USA). The PCR product was subjected to electrophoresis through a 2% agaorse gel in 1x TA buffer, and visualized using gel red and UV illumination. The gender of each individual was scored on the basis of the presence (indicates female) or absence of the 110 bp band in the gel following digestion of the PCR product (Fridolfsson and Ellegren 1999).

We used the results of the molecular sex determination to confirm the assignment of sex in the field based on morphometrics and eye flecks. We then examined morphometric and eye fleck differences between the sexes. Images of oystercatcher eyes were imported into ImageJ (National Institute of Health, USA), a public domain software program, to quantify the amount of eye flecks. The area of the iris was calculated using the ellipse drawing tool. We then calculated eye fleck area by zooming into the photo and tracing the pixels of black within the iris (Fig. 1). We calculated a proportion for each eye of the eye fleck pixels divided by the total pixels in the iris. To ensure that there was no relationship between the overall size of the bird (mass), and the remaining morphometric measurements we first tested for correlation between the morphometric variables and eye fleck measurements by creating a correlation matrix of r values. Means and standard deviations for each of the variables were calculated and t-tests were performed to examine differences between males and females with respect to the proportion of eye flecks, culmen length, tarsus length, wing chord, and body mass.

Figure 1. Photographs depicting how eye fleck proportions were derived from ImageJ. Top photograph illustrates how the total number of pixels in the eye was obtained, while the bottom photograph illustrates how the number of flecked pixels was calculated.

RESULTS

We captured and sexed molecularly a total of 42 adult oystercatchers. We assigned sex in the field to 34 of the birds captured based on morphometrics and presence and severity of eye flecks. The sex of the remaining 8 birds was left unidentified in the field because of overlap in measurements between the individuals of a captured territorial pair, or only one member of the pair was captured.

The results of the PCR indicated that 18 (43%) were female and 24 (57%) were male. Of the birds whose sex we left unidentified in the field, lab results indicated that 5 were males and 3 were females. We measured eye flecks using high-resolution photographs from 27 of the 42 adults that were molecularly sexed. Twelve (44%) of those birds were female and 15 (56%) were males. Lab results confirmed that our assessments were 97% correct (33 out of 34) for the birds whose sex we were able to determine in the field. The results of the molecular sex determination indicated that one bird we had identified as a male was actually a female.

A paired t-test indicated that there was no significant difference between the eye fleck proportion in left or right eyes in individual birds ($p = 0.85$, $n = 27$), so the proportions derived from the left eyes were used for comparison between males and females. The correlation analysis indicated that none of the morphometric variables or eye flecks were significantly correlated (Table 1), so we were able to compare specific morphometric measurements between the sexes. Females had significantly longer culmens than adult males (P

Table 1. Correlation coefficients (r) for morphometric variables and eye fleck proportions calculated from adult American Oystercatchers (*Haematopus palliatus*) (n = 27) captured on the upper Texas coast, 2012 and sexed molecularly. Of the 42 birds captured overall for this study, we only used 27 birds for which we had photographic documentation of the eye flecks as well. Covariates with |r| > 0.60 were considered to be highly correlated.

Covariate	Wing	Culmen	Tarsus	Weight	Eye Flecks
Wing	1.00	0.42	0.2	0.17	0.16
Culmen		1.00	0.3	0.21	0.16
Tarsus			1.00	0.41	0.35
Weight				1.00	0.29
Eye flecks					1.00

Table 2. Sample means ($\bar{\chi}$) and standard deviations (SD) for morphometric variables measured from American Oystercatchers (*Haematopus palliatus*) (n = 42) captured on the upper Texas coast, 2012 and sexed molecularly. An asterisk (*) indicates that data from females differed significantly from data from males (two sample t-tests, P < 0.05).

	Female		Male		*P*-value
	mean	±SD	mean	±SD	
Wing (mm)	264.94	10.22	256.63	6.06	0.003*
Culmen (mm)	93.29	3.25	86.5	4.27	< 0.001*
Tarsus (mm)	64.64	2.36	62.62	2.3	0.004*
Weight (g)	693.89	60.01	622.08	43.41	< 0.001*
Eye Flecks (%)**	3.5	2	1.4	1.4	0.005*

**N = 27 as we only obtained high quality photos of eyes for 27 of the 42 birds captured.

< 0.001) with bill lengths ranging from 85.26-99.6 mm, and male culmens ranging from 78.57-95.64 mm. Females also had significantly longer wing chords, tarsus lengths, greater mass, and more eye flecks (Table 2).

DISCUSSION

For oystercatchers captured in Texas, there was a significant difference between the sexes for all morphometric measurements and amount of eye flecks. Prior to the results of PCR, we used the combination of these indicators in the field to assign sex to the birds before sexing them molecularly and lab results confirmed that our assessments were 97% correct for the birds whose sex we were able to determine in the field.

In Virginia, South Carolina, and Georgia, Carlson-Bremer et al. (2010) found considerable overlap in weight, bill length, and wing length between the sexes of 171 oystercatchers and concluded that these parameters are less reliable indicators of sex. Our results from Texas oystercatchers indicate that all measurements differed significantly between males and females, but we also found a large overlap in morphometric measurements. It was easiest to determine the sex of a breeding pair when we were able to capture both of the birds and could compare their measurements, but more difficult to determine sex if only a single bird was captured whose measurements were close to the overlap between males and females.

For the 34 adult oystercatchers whose sex we could confidently assign in the field, we correctly assigned sex to 33 of them (97%) according to lab results. The results of the molecular sex determination indicated that one bird we had identified as a male, was actually a female. This is a perplexing finding as this bird's mate was also molecularly sexed to be female. Both members of the pair were captured and we deemed the smaller as a male and larger as a female. The pair has continued to defend breeding and foraging territories and has laid clutches in subsequent breeding seasons and has fledged chicks. This result is unexplained but a contaminated blood sample or erroneous lab analysis is the most logical answer. Our results illustrate that no method is 100% accurate in all manners of sex determination and we suggest that a combination of tools be employed but that some birds will not be able to be reliably sexed only in the field due to overlap in morphometrics.

This research confirms that quantitatively, females have a greater proportion of eye flecks. However, it is not feasible to quantify the amount of eye flecks in the field. Amount of eye flecks can be considered categorically (none, low, medium, severe) in the field and this characteristic can help reliably determine sex when coupled with morphometric measurements.

We present here an exploration of effective methods of sexing American Oystercatchers in the field without the permitting, cost of equipment and personnel, and laboratory knowledge required to molecularly sex the species. Although the origin of eye flecks remains unclear, we conclude that they can be used to assist in reliably sexing adult American Oystercatchers. Noting the presence and severity of eye flecks can also help correctly determine the sex of a captured bird in the event that it is a particularly large male or a particularly small female oystercatcher. Additionally, advances in optical technology, spotting scopes or high-resolution photography could potentially allow for eye flecks to function as a tool for sexing the birds at a distance.

ACKNOWLEDGMENTS

We thank Dr. Butch Weckerly and Dr. Randy Simpson for reviews on an earlier version of this manuscript. We thank the following people and agencies for assisting with this research and for access to field sites: Chad Thomas, Dr. Felipe Chavez-Ramirez, Amanda Hackney and Audubon Texas, Jennifer Wilson and the USFWS, and Sean Murphy and Tom Mullins at Oregon State University for genetic analysis. This research was funded in part by a grant to the Gulf Coast Bird Observatory from the National Fish and Wildlife Foundation ConocoPhillips SPIRIT of Migratory Bird Conservation program.

LITERATURE CITED

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Carlson-Bremer, D., T. M. Norton, K. V. Gilardi, E. S. Dierenfeld, B. Winn, F. J. Sanders, C. Cray, M. Oliva, T. C. Chen, S. E. Gibbs, M. S. Sepulveda, and C. K. Johnson. 2010. Health assessment of American Oystercatchers (*Haematopus palliatus*) in Georgia and South Carolina. Journal of Wildlife Diseases 46: 772-780.

Clutton-Brock, T. H. 1986. Sex ratio variation in birds. Ibis 128: 317-329.

Ellegren, H. and B. C. Sheldon. 1997. New tools for sex identification and the study of sex allocation in birds. Trends in Ecology and Evolution 12: 255-259.

Fridolfsson, A. and H. Ellegren. 1999. A simple and universal method for molecular sexing of non-ratite birds. Journal of Avian Biology 30: 116-121.

Griffiths, R., M. C. Double, K. Orr, and R. J. G. Dawson. 1998. A DNA test to sex most birds. Molecular Ecology 7: 1071-1075.

Guzzetti, B. M., S. L. Talbot, D. F. Tessler, V. A. Gill, and E. C. Murphy. 2008. Secrets in the eyes of Black Oystercatchers: a new sexing technique. Journal of Field Ornithology 79: 215-223.

Kohler, S., B. Bonnevie and S. Dano. 2009. Can eyeflecks be used to sex African Black Oystercatchers Haematopus moquini in the field? Ostrich 80: 109-110.

Koczur, L. M., A. M, Munters, S. A. Heath, B. M. Ballard, M. C. Green, S. J. Dinsmore and F. Hernández. 2014. Reproductive success of the American Oystercatchers (*Haematopus palliatus*) in Texas. Waterbirds. 37: 371-380.

McGowan, C. P. and T. R. Simons. 2005. A method for trapping breeding adult American Oystercatchers. Journal of Field Ornithology 76: 46-49.

TEXAS BIRD RECORDS COMMITTEE REPORT FOR 2013

Eric Carpenter[1]

4710 Canyonwood Drive, Austin, Texas 78735

The Texas Bird Records Committee (hereafter "TBRC" or "committee") of the Texas Ornithological Society requests and reviews documentation on any record of a TBRC Review List species (see TBRC web page at http://texasbirds.org/tbrc/). Annual reports of the committee's activities have appeared in the Bulletin of the Texas Ornithological Society since 1984. For more information about the Texas Ornithological Society or the TBRC, please visit www.texasbirds.org. The committee reached a final decision on 68 records during 2013: 56 records of 37 species were accepted and 12 records of 11 species were not accepted, an acceptance rate of 82.35% for this report. In addition, there was 1 record which was withdrawn by the submitter (Northern Pygmy-Owl, 2013-10). A total of 128 observers submitted documentation (to the TBRC or to other entities) that was reviewed by the committee during 2013.

The TBRC accepted one first state record in 2013. **The addition of Black-tailed Godwit brought the official Texas State List to 639 species in good standing.** This total does not include the five species on the Presumptive Species List, which now includes Razorbill which was first documented in 2013.

In addition to the review of previously undocumented species, any committee member may request that a record of any species be reviewed. The committee requests written descriptions as well as photographs, video, and audio recordings if available. Information concerning a Review List species may be submitted to the committee secretary, Eric Carpenter, 4710 Canyonwood Drive, Austin, Texas 78735 (email: ecarpe@gmail.com). Guidelines for preparing rare bird documentation can be found in Dittmann and Lasley (1992) or at http://www.greglasley.net/document.html.

The records in this report are arranged taxonomically following the AOU Check-list of North American Birds (AOU 1998) through the 53th supplement (Chesser et al. 2012). A number in parentheses after the species name represents the total number of accepted records in Texas for that species at the end of 2013. Species added to the Review List because of population declines or dwindling occurrence in recent years do not have the total number of accepted records denoted as there are many documented records that were not subjected to review (e.g. Brown Jay, Pinyon Jay, Tamaulipas Crow, and Evening Grosbeak). All observers who submitted written documentation or photographs/recordings of accepted records are acknowledged by initials. If known, the initials of those who discovered a particular bird are in boldface but only if the discoverer(s) submitted supporting documentation. The TBRC file number of each accepted record will follow the observers' initials. If photographs or video recordings are on file with the TBRC, the Texas Photo Record File (TPRF) (Texas A&M University) number is also given. If an audio recording of the bird is on file with the TBRC, the Texas Bird Sounds Library (TBSL) (Sam Houston State University) number is also given. Specimen records are denoted with an asterisk (*) followed by the institution where the specimen is housed and the catalog number. The information in each account is usually based on the information provided in the original submitted documentation; however, in some cases this information has been supplemented with a full range of dates the bird was present if that information was made available to the TBRC. All locations in italics are counties. Please note that the county designations of offshore records are used only as a reference to the nearest point of land.

TBRC Membership—Members of the TBRC during 2013 who participated in decisions listed in this report were: Randy Pinkston, Chair; Keith Arnold, Academician; Eric Carpenter, (non-

[1]Email: ecarpe@gmail.com

voting) Secretary; Greg Cook, Tim Fennell, Mary Gustafson, Mark Lockwood, Jim Paton, Martin Reid, and Byron Stone. During 2013, both Jim Paton and Byron Stone were re-elected as voting members after their first term expired. The Chair, Academician and Secretary were also re-elected.

Contributors—Chris Acree (**ChA**), Connie Andrus (**CoA**), Marlin Andrus, Ben Archer, John Arvin, Dan Belcher, Tom Benson (**TBe**), Susan Bergeson, Erik Breden, Tim Brush (**TBr**), Kelly Bryan, Frank Bumgardner, Bryan Calk, Eric Carpenter, Cameron Carver, Steve Collins, Greg Cook, Mike Creese, Cory DeStein (**CDe**), Bonnie Deming (**BDe**), Drew Dickert (**DDi**), Mike Dillon, Vladimir Dinets, Bob Doe (**BDo**), Cookie Dwyer (CDw), Don Dwyer (**DDw**), Marc Eastman (McE), Maryann Eastman (MyE), John Ebner, Gil **Eckrich**, Lorna Engleman, Mark Esparza (**MEs**), Tim Fennell (**TiF**), Terry Ferguson (**TFe**), Thomas Finnie (**TFi**), Mark Flippo, Harry Forbes, Laurie Foss, Phyllis Frank, Tony Frank (**TFr**), Brush Freeman (**BrF**), Bob Friedrichs (**BoF**), Ruth Friedrichs, Terry Fuller (**TFu**), John Groves, Mary Gustafson, Shelia Hargis, OT Hargrave (**OTH**), Glenda Harrison, Petra Hockey, Jim Howard, Erik Huebner, Huck Hutchens, Don Jeane (**DJe**), Dan Jones (**DJo**), Jim Jones, Joseph Kennedy, Paula Kennedy, Ronnie Kramer, Sandra Kroeger, Greg Lambeth, Tim Lenz, Michael Lindsey (**MLi**), Brad Lirette, Mark Lockwood (MLo), Dean Logan, Stephan Lorenz, Ann Mallard (**AnM**), Aaron Marshall (**AaM**), Karen Marshall, Steve Mayes, John McClung (**JMc**), Jon McIntyre (**JMi**), Wayne Meyer, Darlene Moore, Arman Moreno (**ArM**), Bruce Neville, Terry Nickel, Carolyn Ohl-Johnson (**COJ**), Sue Orwig, Jay Packer (**JaP**), Greg Page, Dan Pancamo, John Park (**JoP**), Lee Pasquali (**LPa**), Levi Perez (**LPe**), Barrett Pierce, Randy Pinkston, Janet Rathjen (**JRa**), Martin Reid (**MaR**), Helen Rejzek, Jim Rejzek (**JRe**), Michael Retter (**MiR**), Clayton Rickett (**CRi**), Kerry Ross, Chris Runk (**CRu**), Isaac Sanchez, David Saunders (**DSa**), Lynne Schaffer, Mark Scheuerman, Willie Sekula, Paul Sellin (**PSe**), Ted Seto, Philip Shoffner (**PSh**), Don Simons (**DSi**), Birgit Stanford (**BiS**), Rex Stanford, Harlen Stewart, Byron Stone (**ByS**), Joe Stuckey, Paul Sunby (**PSu**), Bill Supulski (**BSu**), Brady Surber (**BrS**), Barbara Tompkins, Heidi Trudell, Gilbert Wade, Ron Weeks (**RWe**), Steve Welborn (**SWe**), Ed Wetzel, John Whittle, Richard Wilde (**RWi**), Dan Wilkerson, Shirley Wilkerson (**SWi**), Adam Wood, Adam Woodis (**AWs**), John Yochum, Matt York, Barry Zimmer.

Acknowledgments—The TBRC is very grateful to the many contributors listed above, without whom this report would not be possible. The committee would also like to thank John Arvin, Charles Collins, Fred Collins, Jack Eitniear, Jesse Fagan, Matt Heindel, Steve Howell, Alvaro Jaramillo, Michael Patten, Peter Pyle, Michael Retter, Dave Stejskal, Robert Straub, Michiaki Ujihara, and Osao Ujihara for providing the TBRC with expert opinion concerning records reviewed during 2013. The author thanks Mark Lockwood and Randy Pinkston for reviewing previous drafts of this report.

Additional Abbreviations—AOU = American Ornithologists' Union; NP = National Park; NS = National Seashore; NWR = National Wildlife Refuge; SHS = State Historic Site; SNA = State Natural Area; SP = State Park; TBSL = Texas Bird Sounds Library (Sam Houston State University); TCWC = Texas Cooperative Wildlife Collection (Texas A&M University); WMA = Wildlife Management Area.

ACCEPTED RECORDS

Brant (*Branta bernicla*) (31). Up to two at Southeast Park, Amarillo, Randall, from 24 December 2012–17 February 2013 (**BP**; 2012-78; TPRF 3099). One at Lubbock, Lubbock, from 16–17 February 2013 (**CRi**, SC, SB; 2013-21; TPRF 3100).

Barrow's Goldeneye (*Bucephala islandica*) (10). One at Possum Kingdom Lake, Palo Pinto, from 17–24 February 2013 (**RWi**, DJo, BT, JJ, GW, ChA; 2013-20; TPRF 3101).

Red-necked Grebe (*Podiceps grisegena*) (25). One at White Rock Lake, Dallas, on 4 December 2012 (**CRu**, DM; 2012-74; TPRF 3102).

Great Shearwater (*Puffinus gravis*) (19). One at Padre Island NS–mile marker 1, Kleberg, on 10 August 2012 (**JH**; 2012-54; TPRF 3104). One at Wright Patman Lake, Cass, on 31 August 2012 (**JS**, MD; 2012-60; TPRF 3103).

Leach's Storm-Petrel (*Oceanodroma leucorhoa*) (30). One offshore, 24 miles e. of Port Aransas, Nueces, on 18 July 2011 (**JMi**; 2011-73; TPRF 3105).

Brown Booby (*Sula leucogaster*) (37). One at Canyon Lake Dam, Comal, from 25 August–3 September 2012 (ByS, RP, LPa, FB; 2012-55; TPRF 3107). One at Lynchberg Ferry, Harris, from 29–30 August 2012 (**SL**, TFr, PF, JRa; 2012-56; TPRF 3108). One at Lynchberg Ferry, Harris, on 29 September 2012 (**SL**; 2012-64). Five at Corpus Christi Bay, near Indian Point Park, Nueces, on 19 March 2013 (**GL**; 2013-27; TPRF 3106). One at San Luis Pass, Galveston, on 31 May 2013 (**OTH**; 2013-41; TPRF 3109).

Short-tailed Hawk (*Buteo brachyurus*) (42). One at Santa Ana NWR, Hidalgo, on 3 September 2012 (**TBr**, LPe; 2012-57; TPRF 3110). One at North American Butterfly Association park & Bentsen-Rio Grande Valley State Park, Hidalgo, from 3–9 August 2013 (**MaR**, BSu, JE, MG; 2013-50; TPRF 3111).

Northern Jacana (*Jacana spinosa*) (36). One at Pintail Lake, Santa Ana NWR, Hidalgo, on 3 November 2012 (**AaM**, **KM**, JMc; 2012-68; TPRF 3112).

Black-tailed Godwit (*Limosa limosa*) (1). One at Brazoria NWR, Brazoria, from 4 June–13 August 2012 (**RWe**, WS, EC, RP, RS, ByS, CRu, MLi, BL; 2012-45; TPRF 2972). This was the first record for the state of Texas.

Purple Sandpiper (*Calidris maritima*) (26). One at Baytown, Harris, on 24 November 2012 (**DDi**; 2013-03).

Red Phalarope (*Phalaropus fulicarius*) (42). One at Hagerman NWR, Grayson, from 27–30 October 2012 (EW, GC, BT; 2012-67; TPRF 3114). One at Balmorhea Lake, Reeves, on 31 October 2012 (**HT**, **MY**; 2012-69; TPRF 3115). One at Balmorhea Lake, Reeves, on 7 May 2013 (**MD**; 2013-33; TPRF 3113).

Long-tailed Jaeger (*Stercorarius longicaudus*) (23). One at the Texas City Dike, Galveston, on 1 December 2012 (**DP**; 2012-80; TPRF 3116).

Heermann's Gull (*Larus heermanni*) (3). One at Tornillo Reservoir, El Paso, on 24 September 2012 (**BZ**; 2012-61; TPRF 2973).

Mew Gull (*Larus canus*) (37). One at Delta Lake, Hidalgo, on 27 October 2012 (**MG**, **DJo**; 2012-70; TPRF 3117).

Slaty-backed Gull (*Larus schistisagus*) (6). One at Port Aransas, Nueces, on 23 February 2012 (**JMi**, PH; 2012-21; TPRF 3118).

Razorbill (*Alca torda*). One offshore, just n. of Flower Gardens National Marine Sanctuary, Galveston, on 16 March 2013 (**VD**; 2013-26). Razorbill is not yet fully documented on the state list but the written documentation for this record served to add this species to the Presumptive List.

Ruddy Ground-Dove (*Columbina talpacoti*) (22). One at Crescent Bend Nature Park, Bexar, from 5–18 October 2012 (**BDo**, TN, MC, HR, JRe, EH, SL, AW, AnM, LE, GE, HF; 2012-62; TPRF 3119).

White-collared Swift (*Streptoprocne zonaris*) (6). One on Galveston Island, Galveston, on 3 July 2012 (**DSa**; 2012-49).

Green Violetear (*Colibri thalassinus*) (75). One at San Benito, Cameron, from 12–15 May 2013 (**TFu**; 2013-32; TPRF 3120). One at Wimberley, Hays, from 23–26 May 2013 (LS, BA; 2013-40; TPRF 3121).

Costa's Hummingbird (*Calypte costae*) (37). One at Christmas Mountains, Brewster, from 1–5 January 2003 (**COJ**; 2013-11; TPRF 3122). One at Christmas Mountains, Brewster, from 7–17 November 2012 (**COJ**, KB; 2012-73; TPRF 3126). One at El Paso, El Paso, from 24 December 2012–3 February 2013 (**BZ**, DB; 2012-77; TPRF 3123). One at Kerrville, Kerr, from 29 December 2012–26 January 2013 (**DDw**, **CDw**; 2013-09; TPRF 3125). One at Study Butte, Brewster, from 14–20 January 2013 (**KB**, PSu, COJ; 2013-07; TPRF 3124).

White-eared Hummingbird (*Hylocharis leucotis*) (34). One at Tobe Canyon, Davis Mountains Preserve, Jeff Davis, from 27–28 June 2013 (**MY**, **HT**; 2013-47; TPRF 3127).

Greater Pewee (*Contopus pertinax*) (24). One at Bear Creek Park, Harris, from 5 October 2012–23 March 2013 (**GP**, PSe, SO, SL, AW, JK, RP; 2012-63; TPRF 3128).

Buff-breasted Flycatcher (*Empidonax fulvifrons*) (27). One at Davis Mountains Preserve, Jeff Davis, from 26 April–15 July 2012 (MLo, RP, CRu; 2012-46; TPRF 3129).

Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*) (22). One at Quintana, Brazoria, on 18 May 2013 (**SK**, TFr, PF, HF; 2013-38; TPRF 3131). One at Christmas Mountains, Brewster, on 15 June 2013 (**COJ**, MLo; 2013-42; TPRF 3130).

Gray Kingbird (*Tyrannus dominicensis*) (11). One at Palacios, Matagorda, from 2–3 July 2013 (**BoF**, RF, BrF, JRa, PSe, EC, HF; 2013-48; TPRF 3132).

Fork-tailed Flycatcher (*Tyrannus savana*) (24). One near McKinney Falls SP, Travis, from 15–26

December 2012 (**SH**, **LF**, RP, TiF, ArM, RK; 2012-76; TPRF 3133).

Rose-throated Becard (*Pachyramphus aglaiae*) (49). One at Salineno, Starr, on 16 May 2009 (**BC**; 2013-46; TPRF 3135). One at Estero Llano Grande SP, Hidalgo, from 9 November 2011–10 January 2013 (**MiR**, MS, BSu, JA, JMi, MEs, PK, JY, HH, CDe, TBe, DW, SWi; 2011-88; TPRF 3134).

Pinyon Jay (*Gymnorhinus cyanocephalus*) (1). Seven at Terlingua, Brewster, on 17 October 2012 (**MF**; 2012-65).

American Dipper (*Cinclus mexicanus*) (8). One on the Guadalupe River, just w. of Hunt, Kerr, on 16 February 2010 (**TS**; 2013-34; TPRF 3136).

Varied Thrush (*Ixoreus naevius*) (43). One at the Christmas Mountains, Brewster, from 20 October 2012–19 March 2013 (**COJ**, RP; 2012-66; TPRF 3138). One at Kress, Swisher, from 3–24 February 2013 (CC, CoA, MA; 2013-16; TPRF 3137).

Connecticut Warbler (*Oporornis agilis*) (12). One at High Island, Galveston, on 7 September 2012 (**KR**; 2012-58).

Rufous-capped Warbler (*Basileuterus rufifrons*) (28). Up to two at Chalk Bluff Park, Uvalde, from 22 April–27 May 2012 (**TL**, HF; 2012-82; TPRF 3139).

"Slate-colored" Fox Sparrow (*Passerella iliaca schistacea*). One at El Paso, El Paso, from 20–27 September 2012 (**BZ**; 2012-59; TPRF 2974). This represents the first fully documented Texas record of this subspecies group.

Golden-crowned Sparrow (*Zonotrichia atricapilla*) (37). One at Franklin Mountains SP, El Paso, from 29 April–9 May 2013 (**BDe**, BZ, JG; 2013-31; TPRF 3140). One at the Convention Center, South Padre Island, Cameron, from 17–21 May 2013 (**BiS**, RS, EB, JY, HF, MG; 2013-36; TPRF 3141).

Pine Grosbeak (*Pinicola enucleator*) (6). One in upper Dog Canyon, GMNP, Culberson, on 30 December 2012 (**EH**; 2013-01).

Common Redpoll (*Acanthis flammea*) (14). One at Trophy Club, Denton, from 10 February–13 March 2013 (**PSh**, JaP; 2013-17; TPRF 3142).

Evening Grosbeak (*Coccothraustes vespertinus*) (5). Up to four at the Davis Mountains Resort, Jeff Davis, from 27–31 October 2012 (**McE**, **MyE**; 2013-04; TPRF 3144). One at San Augustine, San Augustine, from 9–17 February 2013 (**GH**; 2013-24; TPRF 3143).

NOT ACCEPTED

A number of factors may contribute to a record being denied acceptance. It is quite uncommon for a record to not be accepted due to a bird being obviously misidentified. More commonly, a record is not accepted because the material submitted was incomplete, insufficient, superficial, or just too vague to properly document the reported occurrence while eliminating all other similar species. Also, written documentation or descriptions prepared entirely from memory weeks, months, or years after a sighting are seldom voted on favorably. It is important that the simple act of not accepting a particular record should by no means indicate that the TBRC or any of its members feel the record did not occur as reported. The non-acceptance of any record simply reflects the opinion of the TBRC that the documentation, as submitted, did not meet the rigorous standards appropriate for adding data to the formal historical record. The TBRC makes every effort to be as fair and objective as possible regarding each record. If the committee is unsure about any particular record, it prefers to err on the conservative side and not accept a good record rather than validate a bad one. All records, whether accepted or not, remain on file and can be re-submitted to the committee if additional substantive material is presented.

Masked Duck (*Nomonyx dominicus*). Two at Santa Ana NWR, Hidalgo, on 22 December 2012 (2013-08).

American Flamingo (*Phoenicopterus ruber*). Four at Santa Ana NWR, Hidalgo, on 13 January 2013 (2013-13).

Sooty Shearwater (*Puffinus griseus*). One at Hospital Rocks, 35 nautical miles offshore, Nueces, on 23 July 2012 (2013-06).

Northern Goshawk (*Accipiter gentilis*). One se. of Lockett, Wilbarger, on 21 November 2012 (2012-71).

Ruff (*Calidris pugnax*). One at Oso Bay, Nueces, on 5 April 2012 (2012-41).

Long-toed Stint (*Calidris subminuta*). One at Hagerman NWR, Grayson, on 5 August 2012 (2012-52).

Western Gull (*Larus occidentalis*). One at Fort Hancock Reservoir, Hudspeth, from 15–16 November 2012 (2012-72).

Brown Noddy (*Anous stolidus*). One at Lake Tanglewood, Randall, on 4 August 2012 (2012-53).

One offshore, 7 miles se. of Port Aransas, Nueces, on 10 August 2013 (2013-51).

Vaux's Swift (*Chaetura vauxi*). One at Mitchell Lake, Bexar, on 9 August 2009 (2011-06).

Tropical Mockingbird (*Mimus gilvus*). One at Sabine Woods, Jefferson, from 18 April–28 July 2012 (2012-36). The identification was not in question but the committee felt that there the bird's natural occurrence in Texas was questionable.

Golden-crowned Warbler (*Basileuterus culicivorus*). One at Zapata Library, Zapata, on 31 January 2013 (2013-14).

LITERATURE CITED

American Ornithologists' Union. 1998. Check-list of North American birds, 7th ed. American Ornithologists' Union, Washington, D. C.

Chesser, R. Terry, R. C. Banks, , C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, A. G. Navarro-Siguenza, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, D. F. Stoltz, and K. Winkler, 2014. Fifty-fifth supplement to the American Ornithologists' Union Check-list of North American Birds. Auk 131:CSi-CSxv.

Dittmann, D. L., and G. W. Lasley. 1992. How to document rare birds. Birding 24:145-159.

Varied Thrush (*Ixoreus naevius*) photographed in the Christmas Mountains by Carolyn Ohl-Johnson.

HOME RANGES OF BREEDING NORTHERN BOBWHITE HENS IN SOUTH TEXAS WITH ACCESS TO SUPPLEMENTAL FEED

Andrew N. Tri[1], Leonard A. Brennan, Fidel Hernández, William P. Kuvlesky, Jr., and David G. Hewitt

Caesar Kleberg Wildlife Research Institute, Texas A&M University—Kingsville, Kingsville, Texas 78363

ABSTRACT.—Our goal was to 1) quantify and compare 95% Minimum Convex Polygon and Adaptive Kernel estimates of home range size and 2) compare 95% Adaptive Kernel and 95% Minimum Convex Polygon estimates of mean bobwhite home range size between Northern Bobwhite (*Colinus virginianus*; hereafter, Bobwhite) hens with access to a protein-carbohydrate ration and hens with access to a carbohydrate only ration. We used 95% Minimum Convex Polygon and 95% Adaptive Kernel methods to estimate home range sizes between Bobwhite hens with access to a 16% crude protein-carbohydrate commercial ration and Bobwhite hens with access to a carbohydrate only ration during the breeding season (April-August in 2008). Mean Adaptive Kernel home range estimates were > 160% larger than mean Minimum Convex Polygon home range estimates. The mean (± SE) Minimum Convex Polygon home range size (n = 51 hens) was 9.97 ± 0.54 ha and the mean (± SE) Adaptive Kernel home range size (n = 51 hens) was 26.7 ± 1.3 ha. Bobwhite home ranges estimated by the Minimum Convex Polygon and the Adaptive Kernel methods were similar between the pastures with protein-carbohydrate rations (mean = 9.4 ± 0.3 ha and 27.8 ± 1.6 ha, respectively) and pastures with carbohydrate only rations (mean = 10.5 ± 0.7 ha and 25.9 ± 1.2 ha, respectively). Provision of a protein-based supplemental feed had little, if any, influence on the home range sizes of breeding Bobwhite hens in South Texas, compared to the carbohydrate only supplemental feed.

Wildlife managers often use supplemental feed to congregate animals; however, the provision of supplemental feed to wild Bobwhite populations is a common management practice with inconsistent benefits (Guthery 2000). Bobwhite movements and distribution are influenced by the provision of supplemental feed (Rosene 1969). Supplemental feed facilitates harvest by attracting Bobwhites (Haines et al. 2004). Additionally, home ranges are smaller when supplemental feed is supplied because the energetic requirements for Bobwhites are met on a small area surrounding the feed site (Guthery 2000).

Estimation of home ranges is often based on radiotelemetry, but the numerous analytical methods for estimating home range sizes and shapes are not standardized and often result in different conclusions and inferences (White and Garrott 1990). The home range size (Burt 1943:351) of a species is influenced by geographic location, life stage, time intervals between collection of location points (Swihart and Slade 1985, Swihart and Slade 1997, Otis and White 1999), analytical methods (Adams and Davis 1967, Dunn and Gipson 1977, Smith et al. 1981), and sample sizes (Schoener 1981, Bekoff and Mech 1984, Arthur and Schwartz 1999, Seaman et al. 1999). Any of these variables can alter home range size estimates, and thus cause problems when comparing home range estimates among studies (White and Garrott 1990).

Bobwhites in South Texas tend to have smaller home ranges than Bobwhites in other regions (Puckett et al. 2000, Haines et al. 2004, Terhune et al. 2006). The difference in size is most likely due to the vast amount of contiguous, usable habitat space available on the South Texas landscape (Hernández et al. 2002). Providing food grains—such as corn (*Zea mays*) or milo (*Sorghum* spp.)—is an increasingly common management practice

[1]E-mail: andrew.tri@tamuk.edu

in south Texas (Haines et al. 2004). Supplemental feeding practices by south Texas landowners may also influence Bobwhite home range size. In South Texas, a recent development has been to provide supplemental feed for Bobwhites year-round and to supplement breeding season rations with food pellets containing at least 16% crude protein, purportedly with the management goal of enhancing nesting success.

The objectives of our study were to 1) quantify and compare 95% Minimum Convex Polygon and Adaptive Kernel estimates of home range size and 2) compare 95% Adaptive Kernel and 95% Minimum Convex Polygon estimates of mean Bobwhite home range size between Bobwhite hens with access to a protein-carbohydrate ration and hens with access to a carbohydrate only ration. We used Adaptive Kernel in our study to compare a home range estimation technique that is widely recognized (Minimum Convex Polygon; Burgman and Fox 2003) to a method (Adaptive Kernel Estimator) that is expected by some statisticians to produce more accurate estimates (Seaman and Powell 1996). We hypothesized a *priori* that 1) Adaptive Kernel estimates would be larger than Minimum Convex Polygon estimates of breeding Bobwhite hen home ranges, and 2) breeding Bobwhite hens in pastures with access to a protein-carbohydrate ration would have smaller home ranges than hens in pastures with a carbohydrate only ration.

METHODS

Study Area and Design

Our study was conducted 1 March to 30 August 2008 on a private ranch located 10 km west of Falfurrias in Brooks County, TX. The study area was divided into four 200-ha pastures. Each pasture was randomly assigned a feed type resulting in two pastures with carbohydrate only rations and two pastures with protein-carbohydrate rations. Carbohydrate only supplemental feed was distributed over most of the ranch, year round, thus making it impossible to have non-fed control pastures as part of the study design. The study area consisted of 800-ha of chaparral brush vegetation typical of the Coastal Sand Sheet within the South Texas Plains Ecoregion (Gould 1975).

Vegetation on the study area was dominated by mixed brush containing honey mesquite (*Prosopis glandulosa*), huisache (*Acacia farnesiana*), granjeno (*Celtis ehrenbergiana*), and Texas prickly pear (*Opuntia engelmannii*). The dominant grass species on the study site was seacoast bluestem (*Schizachyrium scoparium* var. *littorale*). This site was a former livestock production ranch but the primary land use for the past 10 years has been Bobwhite hunting and related wildlife recreation activities.

Ranch employees used a truck-mounted broadcast spreader to distribute feed along roads or mowed paths spaced 450-m apart. Supplemental feed on all pastures was broadcasted year-round each week and distributed at a rate of 10 kg/ha of pasture. The feed distributed on the carbohydrate only pastures was a 50:50 mix of corn and milo. Ranch workers distributed a 16% crude protein formulated feed ration (Quail Breeder 16, Lyssy and Eckles Feed Co., Poth, TX) on the 2 pastures that received the protein-carbohydrate ration.

Trapping and Telemetry

We trapped Bobwhite hens from March–July during 2008 using standard funnel traps (Stoddard 1931) baited with milo. We maintained a sample of 15 hens per pasture (n = 60 hens) throughout the breeding season (April– August) and trapped to replace deceased birds. We fit hens weighing > 150-g (Hernández et al. 2004) with a 5–6-g necklace style radio transmitter (American Wildlife Enterprises, Monticello, FL) and an aluminum leg band. We monitored Bobwhite hens 2 times per week (every 3–4 days) from sunrise to 10:00 AM using a hand held radio receiver (Communications Specialists, Orange, CA) and 3-element Yagi antenna. We marked the location of each radiomarked hen using a hand-held Global Positioning System (GPS) unit (Garmin, Olathe, KS).

Home Range Estimators

We used ArcGIS 9.0 (ESRI, Redlands, CA) to compile all hen locations into a geographic information system. We calculated a 95% Minimum Convex Polygon and Adaptive Kernel estimates for each hen with 19–22 locations (n = 51 hens) using the Home Range Extension (Centre for Northern Forest Ecosystem Research, Ontario Ministry of Nation Resources). We censored relocations from nesting hens in which she was sitting on the nest. For the kernel estimation, we selected a least squares cross validation for a smoothing parameter.

Statistical Analysis

For comparison of home ranges on pastures with different supplemental feeds, we pooled like feed type data (supplemental feed type; n = 25 hens in pastures with the protein-carbohydrate ration, n = 26 in pastures with carbohydrate-only ration) for home range size. We calculated means and a *t*-test for both Minimum Convex Polygon and 95% Adaptive Kernel in R 2.10.0 (R Core Development Team, Vienna, Austria) to compare home range sizes between Bobwhite hens in pastures with hens in pastures with the protein-carbohydrate ration and in pastures with carbohydrate only ration

RESULTS

On average (± SE), we relocated each Bobwhite hen 20 ± 2 times. The pooled mean (± SE) for the 95% Minimum Convex Polygon home range size was 9.97 ± 0.54 ha and the mean (± SE) for the 95% Adaptive Kernel home range size was 26.7 ± 1.34 ha (Table 1). Adaptive Kernel home ranges were > 160% larger than Minimum Convex Polygon home ranges (Table 1). Minimum Convex Polygon home ranges (9.35 ± 0.3 ha SE) were similar between the pastures with the protein-carbohydrate rations and the pastures with the carbohydrate only rations (10.5 ha ± 0.7 ha SE; Table 2). Adaptive kernel home range estimates were similar between pastures with the protein-carbohydrate rations (27.8 ± 1.6 SE ha) and pastures with carbohydrate only rations (25.9 ± 1.2 SE ha; Table 2).

DISCUSSION

Bobwhite Home Range Estimates

Bobwhite home range estimates vary from 3.5 ha to 282 ha (Brennan 1999). Our 95% Minimum Convex Polygon home range estimates were well within the published range of home range estimates for Bobwhites during the breeding season (Lehmann 1946, Puckett et al. 2000, Sisson et al. 2000) and were similar to findings from a study in Maryland (Oakley et al. 2002). The 95% Adaptive Kernel values also fell within the published home range sizes of Bobwhites during the breeding season (Taylor et al. 1999, Guthery et al. 2004, Haines et al. 2004). Our home range estimates were most similar to those from Haines et al. (2004, 2009; 8.73 ha Minimum Convex Polygon and 17.23 ha Fixed Kernel, respectively) on a ranch 15 km west of our study site. Bobwhites in our study had home range sizes in the lower range of published values (Puckett et al. 2000, Sisson et al. 2000, Haines et al. 2004). Our estimates fall in the lower 50% range for breeding hens found in a study in Mississippi (11.2 – 44.1 ha, n = 44 hens) and our mean Minimum Convex Polygon estimates were lower than estimates found in a study in Louisiana (18.4 – 58.4, n = 14 hens) (Brennan 1999).

Bobwhites in areas with scant usable space will have to actively search for sufficient resources for a longer time than those in areas with abundant usable space (Guthery 1997). We conducted our study on private land that was primarily managed for Bobwhite hunting. It contained large (800 ha – 2,200 ha), contiguous tracts of usable space for Bobwhites, enabling hens to meet their daily needs in a smaller area than those in other studies. Additionally, the entirety of the study site was supplied with supplemental feed (protein-carbohydrate ration or carbohydrate only ration, depending on the pasture). Bobwhites in areas provided with supplemental feed generally have smaller (19% – 47%) home range sizes (Guthery et al. 2004, Haines et al. 2004, Haines et al. 2009) than Bobwhites in areas without supplemental feed.

Adaptive Kernel vs. Minimum Convex Polygon.

Our Adaptive Kernel home range estimates were substantially larger than our Minimum Convex Polygon home range estimates. The Adaptive Kernel method uses the probability of animal locations to estimate a probability density of home range on the landscape. Some have argued that this method provides less biased estimates than the Minimum Convex Polygon method (Seaman and Powell 1996). While we could not evaluate the

Table 1. Descriptive statistics of 95% Minimum Convex Polygon and Adaptive Kernel home range estimates (ha) for 51 bobwhite hens in Brooks County, TX, during the 2008 breeding season (April – August).

Estimation method	*n* (hens)	Relocations/hen	Home range size	SE	95% CI
Minimum Convex	51	19–22	9.97	0.54	8.9–11.0
Adaptive Kernel	51	19–22	26.7	1.34	24.0–29.4

Table 2. Comparison of home range size using minimum convex polygon) and adaptive kernel methods for Bobwhite hens with access to a commercial feed ration (16% crude protein, denoted as Protein-carbohydrate) and Bobwhite hens with access to corn and milo (9–11% crude protein, denoted as Carbohydrate only) in Brooks County, TX, during the 2008 breeding season (April–August).

Estimation Method Feed type	*n* (hens)	Home range (ha)	SE	*t*-value	*df*	*P*-value
Minimum Convex Polygon						
Protein-carbohydrate	25	9.4	0.3	-1.96	45	0.056
Carbohydrate only	26	10.5	0.7			
Adaptive Kernel						
Protein-carbohydrate	25	27.8	1.6	0.32	45	0.746
Carbohydrate only	26	25.9	1.2			

inherent biases in each technique with our data, estimates from the Adaptive Kernel method were consistently larger than the Minimum Convex Polygon method.

Home ranges estimated using the Minimum Convex Polygon method can be biased by sample size and may include unsuitable areas of habitat within the home range. When home range shapes are truly convex, the Minimum Convex Polygon method provides an accurate measure of home range; when home range shapes are not convex, the Minimum Convex Polygon tends to overestimate home range size (Anderson 1982). To resolve a home range estimate using a home range area asymptote—the point at which the majority of home range size variation is captured (Odum and Kuenzler 1955)—requires at least 100–300 relocations per hen for Minimum Convex Polygon (Beckoff and Mech 1984) and $>$ 50 relocations per hen with the Adaptive Kernel method (Seaman et al. 1999). Sample size was low for all of our hens and it is possible that the small home range sizes estimated could have resulted from an insufficient number of samples. The Adaptive Kernel method consistently overestimates home range size when sample size is low (Naef-Daenzer 1993, Seaman and Powell 1996, Seaman et al. 1999). Some researchers recommend the Fixed Kernel over the Adaptive Kernel method based on results from Monte Carlo simulations (Boulanger and White 1990, Seaman et al. 1999). The Fixed Kernel method can potentially estimate home range size with more accuracy and precision than the Adaptive Kernel method, given a sample size of $>$ 20 relocations (Seaman et al. 1999, Blundell et al. 2008).

Bobwhite Home Range Sizes and Supplemental Feed

Bobwhites with access to supplemental feed tend to have smaller home ranges (Haines et al. 2004) than Bobwhites that do not. Our hypothesis—Bobwhite hens with access to the protein-carbohydrate ration would have smaller home ranges than hens with access to carbohydrate only ration—was not supported. There were no statistical differences between the home ranges of Bobwhite hens between pastures. These estimates are based on a relatively small number of locations/hen (n = 19–22 locations per hen), and because of this, we might not have had sufficient power to detect possible differences (Seaman and Powell 1996). We found a slight difference—which was not statistically significant—in mean home range size between pastures, but the results were equivocal. There was a 10% decrease in home range size (using Minimum Convex Polygon estimators) between pastures with protein-carbohydrate rations and pastures with carbohydrate only rations, but we found the opposite to be true when we used the Adaptive Kernel estimator. Regardless, a 10% difference between hens in protein pastures and carbohydrate only pastures has tenuous biological significance; a 10% decrease in home ranges size constitutes approximately a 1 ha smaller mean home range size, but it is not known how important a home range size constriction is to a breeding Bobwhite hen.

ACKNOWLEDGMENTS

We sincerely thank Mr. C. Berdon Lawrence for financial support and for providing access to his ranch. David Grall, Aron "Benny" Cantu, Ron Jankowiak, and Jeff Knapp provided logistical help and advice in the field. We thank Eric Grahmann and Bart Ballard for providing editorial reviews that improved earlier drafts of this manuscript. This is publication number 15-103 from the Caesar Kleberg Wildlife Research Institute. Leonard Brennan was supported by the C.C. Charlie Winn Endowed Chair for Quail Research, Fidel Hernández was supported by the Alfred Glassell, Jr. Endowed Professorship. David Hewitt was supported by the Stuart Stedman Endowed Chair for White-tailed Deer Research. The Richard M. Kleberg, Jr. Center for Quail Research also supported this work.

LITERATURE CITED

Adams, L. and S. D. Davis. 1967. The internal anatomy of home range. Journal of Mammalogy 48: 529–536.

Anderson, D. J. 1982. The home range: A new nonparametric estimation technique. Ecology 63: 103–112.

Arthur, S. M. and C. C. Schwartz. 1999. Effects of sample size on accuracy and precision of brown bear home range models. Ursus 11: 139–148.

Bekoff, M. and L. D. Mech. 1984. Simulation analyses of space use: Home range estimates, variability, and sample size. Behavior Research Methods and Instrumentation 16: 32–37.

Blundell, G. M., J. A. K. Maier and E. M. Debevec. 2008. Linear home ranges: Effects of smoothing, sample size, and autocorrelation on kernel estimates. Ecological Monographs 71: 469–489.

Boulanger, J. G. and G. C. White. 1990. A comparison of home-range estimators using Monte Carlo simulation. Journal of Wildlife Management 54: 310–315.

Brennan, L. A. 1999. Northern bobwhite (*Colinus virginianus*) in: The Birds of North America no. 397 (Gill, A. P. and F. Poole., eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Burgman, M. A. and J. C. Fox. 2003. Bias in species range estimates from minimum convex polygons: implications for conservation and options for improved planning. Animal Conservation 6: 19–28.

Burt, W. H. 1943. Territoriality and home range concepts as applied to mammals. Journal of Mammalogy 24: 346–352.

Dunn, J. E. and P. S. Gipson. 1977. Analysis of radio telemetry data in studies of home range. Biometrics 33: 85–101.

Gould, F. W. 1975. Texas plants—a checklist and ecological summary. In: Texas Agricultural Experiment Station Miscellaneous Publication 585. College Station.

Guthery, F. S. 1997. A philosophy of habitat management for northern bobwhites. Journal of Wildlife Management 61: 291–301.

Guthery, F.S. 2000. On Bobwhites. Texas A & M University Press, College Station.

Guthery, F. S., T. L. Hiller, W. H. Puckett, JR., R. A. Baker, S. G. Smith and A. R. Rybak. 2004. Effects of feeders on dispersion and mortality of bobwhites. Wildlife Society Bulletin 32: 1248–1254.

Haines, A. M., F. Hernández, S. E. Henke and R. L. Bingham. 2004. Effects of road baiting on home range and survival of northern bobwhites in southern Texas. Wildlife Society Bulletin 32: 401–411.

Haines, A. M., F. Hernández, S. E. Henke and R. L. Bingham. 2009. A method for determining asymptotes of home-range area curves. Proceedings of the National Quail Symposium 6: 489-498.

Hernández, F., F. S. Guthery and W. P. Kuvlesky, Jr. 2002. The legacy of bobwhite research in south Texas. Journal of Wildlife Management 66: 1–18.

Hernández, F., J. A. Arrendondo, F. Hernández, D. G. Hewitt, S. J. DeMaso and R. L. Bingham. 2004. Effects of radiotransmitters on body mass, feed consumption, and energy expenditure of northern bobwhites. Wildlife Society Bulletin 32: 394–400.

Lehmann, V. W. 1946. Mobility of bobwhite quail in southwestern Texas. Journal of Wildlife Management 10: 124–136.

National Climatic Data Center. 2010. Available online at: http://www.ncdc.noaa.gov (accessed 15 March 2010).

Naef-Daenzer, B. 1993. A new transmitter for small animals and enhanced methods of home-range analysis. Journal of Wildlife Management 57: 680–689.

Oakley, M. J., D. L. Bounds, T. A. Mollett and E. C. Soutiere. 2002. Survival and home range estimates of pen-raised northern bobwhites in buffer strip and nonbuffer strip habitats. Proceedings of the National Quail Symposium 5: 74–80.

Odum, E. P. and E. J. Kuenzler. 1955. Measurement of territory and home range size in birds. Auk 55: 128–137.

Otis, D. L. and G. C. White. 1999. Autocorrelation of location estimates and the analysis of radiotracking data. Journal of Wildlife Management 63: 1039–1044.

Puckett, K. M., W. E. Palmer, P. T. Bromley, J. R. Anderson, Jr. and T. L. Sharpe. 2000. Effects of filter strips on habitat use and home range of northern bobwhites on alligator river national wildlife refuge. Proceedings of the National Quail Symposium 4: 26–31.

Rosene, W. 1969. The bobwhite quail, its life and management. Rutgers University Press, New Brunswick, New Jersey

Schoener, T. W. 1981. An empirically based estimate of home range. Theoretical Population Biology 20: 281–325.

Seaman, D. E., J. J. Millspaugh, B. J. Kernohan, G. C. Brundige, K. J. Raedeke and R. A. Gitzen. 1999. Effects of sample size on kernel home range estimates. Journal of Wildlife Management 63: 739–747.

Seaman, D. E. and R. A. Powell. 1996. An evaluation of the accuracy of kernel density estimators for home range analysis. Ecology 77: 2075–2085.

Sisson, D. C., H. L. Stribling and D. W. Speake. 2000. Effects of supplemental feeding on home range size and survival of northern bobwhites in south Georgia. Proceedings of the National Quail Symposium 4: 128–131.

Smith, G. J., J. R. Cary and O. J. Rongstad. 1981. Sampling strategies for radiotracking coyotes. Wildlife Society Bulletin 9: 88–93.

Stoddard, H. L. 1931. The bobwhite quail: Its habits, preservation and increase, C. Scribner's Sons, New York.

Swihart, R. K. and N. A. Slade. 1985. Influence of sampling interval on estimates of home-range size. Journal of Wildlife Management 49: 1019–1025.

Swihart, R. K. and N. A. Slade. 1997. On testing for independence of animal movements. Journal of Agricultural, Biological, and Environmental Statistics 2: 48–63.

Taylor, J. S., K. E. Church, D. H. Rusch and J. R. Cary. 1999. Macrohabitat effects on summer survival, movements, and clutch success of northern bobwhite in Kansas. Journal of Wildlife Management 63: 675–685.

Terhune, T. M., D. C. Sisson, H. L. Stribling and J. P. Carroll. 2006. Home range, movement, and site fidelity of translocated northern bobwhite (Colinus virginianus) in southwest Georgia, USA. European Journal of Wildlife Research 52: 119–124.

White, G. C. and R. A. Garrott. 1990. Analysis of wildlife radio-tracking data, Academic Press, San Diego, California.

Northern Bobwhite hen (*Colinus viriginianus*). Photo by Andrew Tri.

RELATIONSHIP OF VEHICULAR TRAFFIC FLOW AND ROADSIDE RAPTOR AND VULTURE ABUNDANCE IN SOUTH-CENTRAL TEXAS

Katheryn A. Watson[1,2] and Thomas R. Simpson

Wildlife Ecology Program, Department of Biology, Texas State University, San Marcos, TX 78666

ABSTRACT.—Annual roadside raptor and vulture surveys are commonly used to monitor populations and assess trends. However, the volume of vehicular traffic may affect survey results. Raptors and vultures are winter and year-round residents of the Blackland Prairies and Oak Woods and Prairies regions of Texas. We surveyed 211 km along seven highways through South-Central Texas twice monthly to assess impact of traffic levels on observed raptor populations. According to the Texas Department of Public Transportation, traffic levels on these highways ranged from 653 to 13,141 vehicles per day in 2012. Using Pearson's Correlation Coefficient, we found a strongly negative correlation between raptor abundance and traffic volume and a moderately negative relationship between raptor diversity and traffic volume. There was a weak negative relationship between species richness and traffic volume. Although perches and road kill attract raptors to roadways, noise pollution, risk of vehicular mortality, and prey availability may cause sensitive species to avoid roadways with high traffic levels. Vultures, however, may be more attracted to roadways because of the abundance of carrion. Because of increased roadway traffic in the study area, this survey may be used as a baseline to evaluate impact on predatory birds resulting from oil and gas drilling activity.

Roadside raptor surveys are a unique management tool to assess abundance of diurnal raptors (Order: Falconiformes) and New World vultures (Family: Cathartidae) and to detect rare raptor species (Bird et al. 2007). Raptors can be 75% to 90% detectable on these surveys, depending on species and roadside habitat. More than one observer may be included in surveys to increase detection (Berthiaume et al. 2009). Traffic may influence raptor behavior, with some birds being more sensitive than others to noise pollution, risk of vehicular collision, and reduced prey availability than other species (Kociolek et al. 2011, Halfwerk et al. 2011, Boves and Belthoff 2012). For these reasons, the amount of traffic flow along roadways might impact species composition, abundance, and diversity of raptor populations.

Because of the variety of habitats and the Central Flyway migration path, raptor diversity in Texas is high. At least 33 diurnal raptor species and two vulture species (Turkey Vulture, *Cathartes aura*, and Black Vulture, *Coragyps atratus*) can be found in Texas (Sibley 2003, Bryan et al. 2006, Peterson 2008). Although various groups, societies, and organizations record raptor sightings across Texas, such as annual Christmas Bird Counts (Cerea 2015) and citizens using the eBird reporting program (Cornell Lab of Ornithology 2015), raptors have not been comprehensively studied outside of coastal areas. Few roadside raptor surveys (Bildstein and Grubb 1980, Stayer 2008) and no roadside vulture surveys have been conducted along the small highways of the South-Central region to monitor populations or to see how land-use changes, such as developing cities, increasing traffic, and oil and gas drilling may be affecting predatory birds. Our objectives were to determine species richness, abundance, and diversity of raptors and vultures along highways of South-Central Texas and to determine whether traffic flow influenced raptor and vulture populations.

METHODS

We conducted roadway surveys from May 2012 to January 2013, in Hays, Caldwell, Gonzales, and Guadalupe counties, Texas. This South-Central Texas location included the Post-oak Savannah and

[1]E-mail: watsonkatheryn@gmail.com

[2]Present address: 250 Wayne Dr. Apt 4C Richmond, KY 40475

Blackland Prairies ecoregions. Habitats along the survey route were primarily grasslands, mesquite shrublands and oak forests, with a mixture of cultivated fields and urban areas. The 211 km route began in San Marcos, Texas, (SH 80) and passed through the following towns: Luling (SH 80 and US 183), Gonzales (US 183), Pilgrim (FM 1116), Smiley (US 87), Wrightsboro (FM 108), Cost (FM 466), Seguin (SH 123), and returned to San Marcos (Fig. 1). We surveyed twice monthly on days of mild weather with low wind and little-to-no precipitation (Beaver and Roth 1997).

One or two observers, usually the driver and passenger, scanned power lines, utility poles, treetops, fences, building edges, open fields, and the skyline for raptors and vultures, and identified birds using binoculars and a field guide (Sibley 2003). We also examined and attempted to identify birds found dead on or near the roadside. We recorded species, number, location, time, habitat, and behavior for each sighting. GPS locations were recorded for all raptors and groups of ten or more vultures.

We calculated species richness, abundance (birds per km) and diversity (Simpson's Index of Diversity, 1-D) of raptors for each highway. Because vultures are abundant year-round and have distinctive feeding and lifestyle behaviors, they were analyzed separately to avoid skewing the data.

Texas Department of Public Transportation compiles annual average daily traffic counts at standard points for highways throughout Texas. Data from 2012 for points along our survey route were used to find the average traffic flow for the seven highways. Pearson's Correlation Coefficient (*r*) was used to compare species richness, abundance, and diversity with traffic flow of each corresponding highway for raptors and vultures.

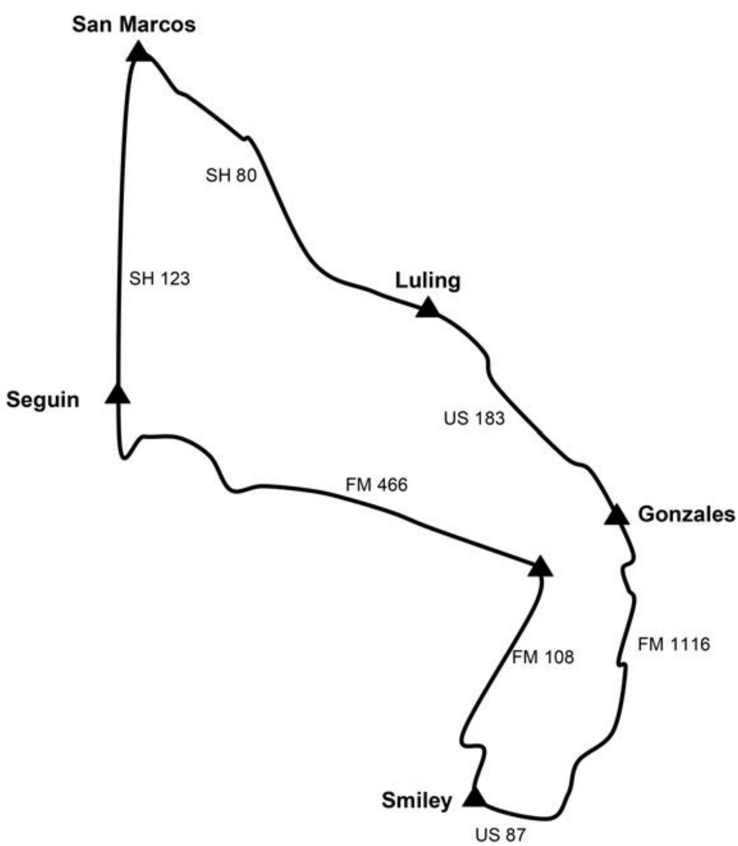


Figure 1. Route followed during the course of raptor surveys, including cities, towns, and highways.

RESULTS

We identified eleven raptor species and two vulture species during the course of 18 surveys (Table 1). Birds were encountered in all weather conditions, including extreme heat and light rain. We identified Crested Caracaras (*Caracara cheriway*) and Red-tailed Hawks (*Buteo jamaicensis*) on every survey. American Kestrels (*Falco sparverius*) were found on every survey from late September through January. The occurrence of Harris's Hawks (*Parabuteo unicinctus*) within the survey region is variously reported as rare (Sibley 2003), or year-round (Oberholser 1974, Peterson 2008, Dwyer and Bednarz 2011). We identified 17 Harris's Hawks over the course of the year, often occurring in pairs and mostly concentrated in Guadalupe County on FM 108 and FM 1116. Golden Eagles (*Aquila chrysaetos*), Merlins (*Falco columbarius*), and White-tailed Kites (*Elanus leucurus*) were uncommon sightings. We also identified one Harlan's Hawk (*Buteo jamaicensis harlani*, Peterson 2008), a black subspecies of Red-tailed Hawk. In addition to raptors, we identified a Barn Owl (*Tyto alba*), a Great-horned Owl (*Bubo virginianus*), a Barred Owl (*Strix varia*), and many Loggerhead Shrikes (*Lanius ludovicianus*). Vultures were seen alone, in small groups, and in groups of up to 300 birds. Both vulture species were found year-round, in all habitats, intermingling with Crested Caracaras and Red-tailed Hawks. Overall survey counts were lower in the summer and increased during the winter months as raptors and vultures migrated into the area (Fig. 2).

Greatest raptor species richness (10) was found on FM 466 and lowest (4) on SH 123. Abundance was calculated as mean birds/km for each of the highways (Table 3) and ranged from 1.8 birds/km (SH 123) to 6.4 birds/km (FM 108). Diversity (1-D) of raptors likewise varied by highway, ranging from a low of 0.556 on SH 123 to a high of 0.695 on FM 466 (Table 3). For vultures, we only compared mean abundance to traffic flow (Table 3) because both species of vultures were present on all survey routes.

The seven highways making up the survey loop transect ranged from 653 to 13,141 vehicles per day in 2012 (Table 2).

Raptor abundance was strongly negatively correlated with increasing traffic levels ($r = -0.841$, $p = 0.018$), with diversity showing a moderate correlation ($r = -0.626$, $p = 0.132$) and richness showing only a weak correlation ($r = -0.347$, $p = 0.446$). Vultures exhibited a negative moderate correlation between abundance and traffic flow ($r = -0.597$, p = 0.157).

DISCUSSION

Raptor presence, particularly abundance, appears to be affected by roadway traffic, while vultures are ubiquitous. Bautista et al. (2004) found that some

Table 1. Eleven species of raptors and two species of new-world vultures were identified on roadway surveys in South-Central Texas from May 2012 to January 2013. Species and total individuals encountered are listed in this table.

Common Name	Species	Total
Crested Caracara	*Caracara cheriway*	296
Red-tailed Hawk	*Buteo jamaicensis*	164
American Kestrel	*Falco sparverius*	146
Harris's Hawk	*Parabuteo unicinctus*	17
Red-shouldered Hawk	*Buteo lineatus*	13
Northern Harrier	*Circus cyaneus*	3
Swainson's Hawk	*Buteo swainsoni*	3
Cooper's Hawk	*Accipiter cooperii*	2
Golden Eagle	*Aquila chrysaetos*	1
Merlin	*Falco columbarius*	1
White-tailed Kite	*Elanus leucurus*	1
Black Vulture	*Coragyps atratus*	2306
Turkey Vulture	*Cathartes aura*	2170

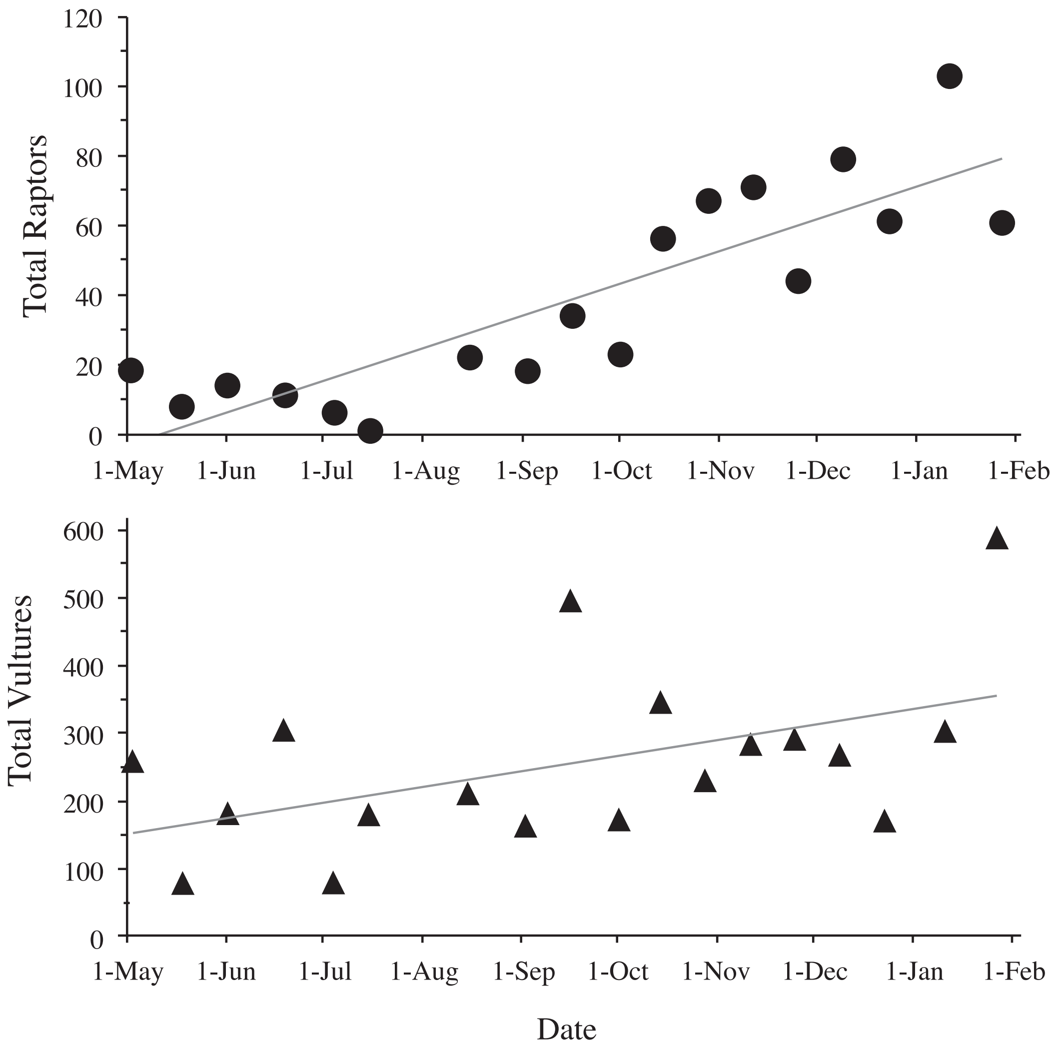


Figure 2. Total raptors and vultures counted during a bi-weekly roadside survey in South-Central Texas from May 2012 to January 2013.

raptor species experienced cycles of activity near roadways as traffic increased on the weekends and decreased during weekdays, while others showed no sensitivity to traffic changes. We found less-common species, including Merlin, White-tailed Kite, Cooper's Hawks (*Accipiter cooperii*), Swainson's Hawks (*Buteo swainsoni*) and Northern Harriers (*Circus cyaneus*) (Table 1), on low-traffic highways (FM 466, FM 108, and FM 1116, Table 2). We suspect that these less-commonly-seen birds may be more susceptible to disturbance generated by traffic flow. We found only Red-tailed Hawks, Crested Caracaras, and American Kestrels on SH 123, the highway with the highest-traffic flow. This might indicate that these species are less sensitive to traffic levels (Varland and Loughin 1993, Rivera-Rodríguez and Rodríguez-Estrella 1998, Stout et al. 2006).

Some raptors may alter their behavior in response to high-traffic disturbance due to noise pollution (Halfwerk et al. 2011), danger from vehicular collisions (Boves and Belthoff 2012), and prey availability. Kociolek et al. (2011) found that noise disturbance and vehicular mortality had a greater effect on bird populations than habitat fragmentation and other roadway-caused disturbances. While we did not quantify noise level, we did locate 32 dead

Table 2. Average traffic flow along a South-Central Texas raptor survey route in 2012, as determined by the Texas Department of Transportation. (/d = per day)

Highway	Vehicles/d
SH 123	13141
SH 80	9762
US 183	9553
US 87	3850
FM 1116	1200
FM 466	1135
FM 108	653

raptors, vultures, and owls, which is 1.8 mortalities per survey, and at least 3.6 mortalities per month. However, the majority of carcasses were found on roadways with the lowest-traffic flow. The elevated abundance of raptors combined with high speed limits (>65 mph) along low traffic roads might account for this.

Prey availability is a good predictor of raptor distributions (Preston 1990). Therefore, it is possible that higher traffic levels cause disturbance to prey sources, such as rodents and small birds (Kociolek et al. 2011), forcing highly-selective species to hunt away from roadways. Some raptor species may find roadsides attractive for roosting and foraging. The availability of utility poles, power lines, and billboards offer increased perching, nesting, and roosting sites, which attract birds of prey (Prather and Messmer 2010). Unlike many raptors, Crested Caracaras and, to a lesser extent, Red-tailed Hawks feed on carrion (Whitacre et al. 1982), which may draw them to higher-traffic highways due to the availability of recent road kill. The abundance of road kill might explain why vultures had essentially no relationship with traffic levels in our study. For carrion-eating birds, the benefits of an abundant food supply and suitable perches may outweigh the costs and disturbance of roadways.

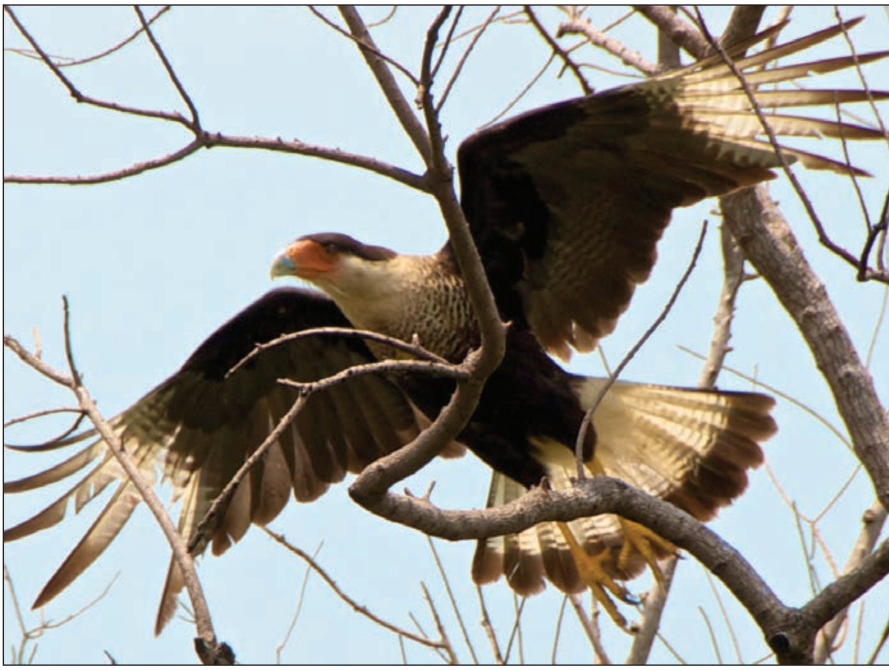
The Eagle Ford Shale region of South Texas has been under intensive oil and gas drilling for several years, but at the time of this survey we were unaware of any activity within the survey area. At the end of our survey time period, evidence of increased traffic due to oil drilling activity appeared on FM 1116 in Gonzales County. The impact this industry has on roadway traffic is significant (Prozzi et al. 2011, Texas Department of Transportation 2014). We saw a shift in vehicle type from personal-use vehicles to commercial trucks, along with an increase in traffic flow along previously low-traffic highways. Between 2009 and 2012, traffic on FM 1116 increased 112%, FM 108 increased 30%, and FM 466 increased 11%. With the introduction of oil and gas drilling, traffic counts between 2012 and 2013 increased an additional 26% on FM 1116, 109% on FM 108 and 18% on FM 466. It would be interesting to use this data as a baseline for pre-drilling populations to see how the traffic flow changes over the next several years and how raptors and vultures are affected.

ACKNOWLEDGMENTS

We thank Floyd W. Weckerly for help with statistical analyses and Richard W. Manning for

Table 3. Species richness, abundance (birds per km) and diversity (Simpson's Index of Diversity, 1-D) of raptors and vultures were calculated for a South-Central Texas roadside survey route from May 2012 to January 2013. Data were correlated with annual average traffic flow (vehicles/day) for each highway using Pearson's Correlation Coefficient (*r*).

	Raptors			Vultures		
Highway	Richness	Abundance	Diversity	Richness	Abundance	Diversity
SH 123	4	1.8	0.556	2	5.5	0.495
SH 80	7	2.2	0.618	2	10.3	0.485
US 183	5	2.1	0.604	2	28.1	0.496
US 87	5	3.1	0.685	2	17.0	0.481
FM 1116	5	3.7	0.652	2	24.6	0.498
FM 466	10	4.2	0.695	2	20.4	0.489
FM 108	5	6.4	0.588	2	64.8	0.498
r	−0.347	−0.841	−0.626	–	−0.597	–



Crested Caracara (*Caracara cheriway*) photographed by Katheryn Watson at the Attwater Prairie Chicken NWR in May 2013.

Red-tailed Hawk (*Buteo jamaicensis*) juvenile photographed by Katheryn Watson in Gonzales Co., TX in January 2013.

comments on the manuscript. We also thank Drew T. Harvey, Marcus Patterson, Madison Torres, and Amanda Hargrave for field observations.

LITERATURE CITED

Bautista L. M., J. T. García, R. G. Calmaestra, C. Palacín, C. A. Martín, M. B. Morales, R. Bonal, and J. Viñuela. 2004. Effect of weekend road traffic on the use of space by raptors. Conservation Biology 18: 726-732.

Beaver D. L. and J. J. Roth. 1997. Winter survey of raptors with notes on avian scavengers in Northwestern Colorado. Great Basin Naturalist 57: 184-186.

Berthiaume É., M. Bélisle, and J. Savard. 2009. Incorporating detectability into analyses of population trends based on hawk counts: a double-observer approach. Condo, 111: 43–58.

Bildstein, K. L. and T. C. Grubb, Jr. 1980. Roadside raptor count in Eastern Texas. Bulletin of the Texas Ornithological Society 13: 20-22.

Bird, D. M., K. L. Bildstein (Editors), D. R. Barber, and A. Zimmerman (Assistant Editors). 2007. Raptor research and management techniques. Hancock House Publishers, Blaine, Washington.

Boves T. J. and J. R. Belthoff. 2012. Roadway mortality of Barn Owls in Idaho, USA. Journal of Wildlife Management 76: 1381-1392.

Bryan, K., T. Gallucci, G. Lasley, M. Lockwood, and D. H. Riskind. 2006. A checklist of Texas birds. 7th edition. Technical series No. 32, Texas Parks and Wildlife, Austin.

Bunn, A. G., W. Klein, and K. L. Bildstein. 1995. Time-of-day effects on the numbers and behavior of non-breeding raptors seen on roadside surveys in Eastern Pennsylvania. Journal of Field Ornithology 66: 544-552.

Cerea, C. 2015. Christmas Bird Count. National Audubon Society: http://www.audubon.org/conservation/science/christmas-bird-count (Accessed 30 January 2015).

Cornell Lab of Ornithology. 2015. eBird: http://ebird.org/content/ebird/ (accessed 30 January 2015).

Dwyer, J. F. and J. C. Bednarz. 2011. Harris's Hawk (*Parabuteo unicinctus*), The Birds of North America Online: http://bna.birds.cornell.edu.libproxy.eku.edu/bna/species/146 (accessed 8 January 2014).

Halfwerk, W., L. J. M. Holleman, C. M. Lessells, and H. Slabbekoorn. 2011. Negative impact of traffic noise on avian reproduction success. Journal of Applied Ecology 48: 210-219.

Kociolek, A. V., A. P. Clevenger, C. C. St. Clair, and D. S. Proppe. 2011. Effects of road networks on bird populations. Conservation Biology, 25: 241-249.

Oberholser, H. C. 1974. The bird life of Texas. (E. B. Kincaid, Jr., Editor). Volume 1. University of Texas Press, Austin.

Peterson R. T. 2008. Peterson field guide to birds of North America. Houghton Mifflin Company, New York, New York.

Prozzi, J., S. Grebenschikov, A. Banerjee, and J. Prozzi. 2011. Impacts of energy developments on the Texas transportation system infrastructure. Center for Transportation Research Technical Report 0-6513-1A. University of Texas, Austin.

Prather, P. R. and T. A. Messmer. 2010. Raptor and corvid response to power distribution line perch deterrents in Utah. Journal of Wildlife Management 74: 796-800.

Preston, C. R. 1990. Distribution of raptor foraging in relation to prey biomass and habitat structure. Condor, 92: 107-112.

Rivera-Rodríguez, L. B. and R. Rodríguez-Estrella. 1998. Breeding biology of the Crested Caracara in the Cape region of Baja California, Mexico. Journal of Field Ornithology 69: 160-168.

Sibley D. A. 2003. The Sibley field guide to birds of Eastern North America. Andrew Stewart Publishing, Inc., New York, New York.

Stayer, J. R. 2008. Red-tailed Hawk (*Buteo jamaicensis*) presence along roadside corridors in relation to urban environment characteristics in Austin, Texas. Thesis. Texas State University, San Marcos.

Stout, W. E., S. A. Temple, and J. M. Papp. 2006. Landscape correlates of reproductive success for an urban-suburban Red-tailed Hawk population. Journal of Wildlife Management 70: 989-997.

Texas Department of Transportation. 2014. Be Safe. Drive Smart. http://www.txdot.gov/driver/share-road/be-safe-drive-smart.html (accessed 30 January 2015)

Varland, D. E. and T. M. Loughin. 1993. Reproductive success of American Kestrels nesting along an interstate highway in Central Iowa. Wilson Bulletin 105: 465-474.

Whitacre, D., D. Ukrain, and G. Falxa. 1982. Notes on the hunting behavior and diet of the Crested Caracara in Northeastern Chiapas and Tabasco, Mexico. Wilson Bulletin 94: 565-566.

SHORT COMMUNICATIONS

CAPTURE OF AN AMERICAN KESTREL WITH DILUTE PLUMAGE

Lance Morrow[1] and Jill Morrow[1]

Shenandoah Valley Raptor Study Area, Timberville, Virginia 22853

Aberrant plumage in wild birds is not uncommon and can be caused by a variety of conditions: genetic mutations (van Grouw 2013), staining (Nesbitt 1975 and Bales 1909), hybridization (Pyle 2008), environmental contaminants (Bortolotti et al. 2003), diet, age, disease, parasites or injury (Guay et al. 2012).

On 23 January 2003, while surveying wintering raptors in south Texas, we captured a female American Kestrel (*Falco sparverius*) with aberrant plumage (Figs. 1 and 2). The kestrel was captured using a bal-chatri (Berger and Mueller 1959) with a house mouse (*Mus musculus domesticus*) as a lure. The bird was released at the site immediately after it was measured, photographed and banded with an aluminum butt end USGS-issued band. The capture and release location was 6.62 kilometers north-northwest of Hargill, Hidalgo County, Texas.

At first glance, this individual appeared to be a very pale female kestrel with dilute plumage, a condition in which there is a quantitative reduction of melanin with faded but normal feather patterns (van Grouw 2006). Upon closer examination we noticed the normally dark barring on the rufous ground color of the body feathers was an abnormally pale brown to silvery gray color. This aberrant plumage occurred on both the dorsal and ventral aspects. The crown and nape feathers surrounding the normal rufous cap were silvery gray instead of the normal slate bluish-gray color. Throat, chin, malar and auricular feathers were the least affected by aberrant plumage, exhibiting nearly normal malar and other vertical dark stripes on a whitish cheek. The kestrel's eyes, cere, legs and orbital skin were all normal in appearance (Smallwood and Bird 2002). The bird appeared to be in good health and exhibited normal behavior during capture, handling and immediately upon release.

The age of the kestrel was initially thought to be juvenile based on the aligned fault bars in the rectrices which is the pattern consistent with simultaneous growth of feathers that normally occurs in nestlings (Hamerstrom 1967). The fault bars are particularly obvious in this individual's tail due to the lack of pigmentation of the feather adjacent to each fault bar; a phenomenon noted previously (Smallwood 1989). However, the dark subterminal band wider than the other dark barring on the tail is consistent with definitive female kestrel plumage (Pyle 2008). This condition could be explained in the case where all the kestrel's tail feathers were pulled out and, while she was growing the rectrices simultaneously, there was a period of stress or starvation that created fault bars in the same relative location on the tail. Also, there is a feather missing from the left side, possibly r4, perhaps due to damage to the feather follicle during the event in which the kestrel lost its tail. Wild raptors missing feathers has been documented in some North American and Eurasian species (Clark 1988).

This aberrant bird appeared to have decreased amounts of eumelanin, the pigment responsible for black, dark brown and dark gray colors. The bird appeared to have normal amounts of phaeomelanins, the pigments associated with tan, reddish browns and some yellow feather coloration (Gill 1995). Our supposition that in some feathers eumelanin was decreased or deficient in this particular kestrel was based on the overall faded dark colors in conjunction with the observation that the flight feathers were excessively worn and frayed and the right distal primary tip (p10) was short due to breakage. Abnormal or lack of eumelanin renders feathers less resistant to abrasion and fracture than normal (Bosner 1995). A study of wild normal and pied New Zealand Fantails (*Rhipidura*

[2]Email: landjmorrow@earthlink.net

fuliginosa) revealed that white feathers (lacking eumelanin) on pied birds had a significantly higher rate of feather breakage and wear compared to the homologous black feathers (Mackivnen and Briskie 2014). Closer examination of the feathers of this aberrant kestrel revealed that the abnormally pale brown barring appears to have been bleached and has changed from pale brown to a silvery color in proportion, probably due to each feather's exposure to sunlight. Note the tail (Fig. 1) in which the most extreme bleaching occurred on central rectrices. The other rectrices have less bleaching because they are partly shielded from sunlight by the central rectrices and adjacent overlapping rectrices.

Aberrant plumage due to genetic mutations in wild birds can be categorized as: albinism, the complete lack of melanin; leucism, "partial" albinism with dark eyes; schizochroism (also spelled schizochromism), characterized by the lack of, or decreased, melanin pigmentation in all or part of the plumage; melanism, an excess of melanin; carotinism, causing a shift to red or yellow plumage; and dilution, a general decrease in all pigment colors (Guay et al. 2012). We can rule out albinism and leucism because birds with these mutations have complete or patches of aberrant white plumage which this kestrel clearly does not. Similarly, we can also rule out melanism and carotinism.

One potential cause of this kestrel's aberrant plumage that we considered was schizochromism, the condition in which the affected individual has a pale, washed-out appearance due to a decrease, or complete absence of, one of two of the melanin pigments normally present (van Tyne and Berger 1959). Schizochromism is usually named from the pigment, either eumelanin (black, dark brown or

Figure 1. Dorsal view of an American Kestrel with aberrant plumage.

gray pigment) or phaeomelanin (red to brownish pigment) that is decreased or absent. Birds with schizochromism have the same patterns of coloration as normal birds with an abnormal pale washed-out appearance, a condition that has been variously termed dilute, fawn variant, pale mutant, "brown" mutant, erythristic and others. Another falcon species, a Peregrine Falcon (*Falco peregrinus*), has been reported with schizochromistic plumage (Ellis et al. 2002). An Anhinga (*Anhinga anhinga*) with abnormal eumelanin, classified as a non-eumelanic schizochroic bird, exhibited pale plumage overall with extreme wear, breakage and fraying in the rectrices (Post 2012). The condition of the aberrant Anhinga's feathers was similar to, but much more extensively worn and broken than the feathers of the aberrant kestrel described herein. This aberrant kestrel fits the description of a non-eumelanic schizochromistic bird, in that it appears to have less eumelanin pigmentation than normal.

Another potential cause of this kestrel's aberrant plumage that we considered is the mutation "brown" which, according to van Grouw, is a qualitative reduction of eumelanin pigmentation (van Grouw 2013). In birds with the "brown" mutation eumelanin is produced and deposited in feathers in the same concentrations as a normal bird but that eumelanin is incompletely oxidized due to the mutation and is thus more readily bleached by sunlight. The latter property, bleaching, further confuses classification due to the "brown" mutation because the aberrant plumage color at the time of observation is dependent on the "freshness" of the aberrant plumage and how much bleaching from sunlight has occurred. Recently an aberrantly plumaged Northern Goshawk (*Accipiter gentilis*) from southern Poland was described and deemed to be due to the "brown" mutation (Ciach and Maniarski 2012). Based on descriptions and published accounts, it seems that this aberrant Kestrel's plumage exhibits the phenotype of the "brown" mutation; substantiated by the overall faded appearance with pale brown to silver barring instead of black to dark brown barring combined with significant bleaching of the plumage that accompanies this condition. However, since

Figure 2. Ventral view of an American Kestrel with aberrant plumage.

"brown" is a genetic mutation it should cause all black pigmentation in the entire plumage to become brown. Since this kestrel's head appears to have black malar and other vertical stripes on the head, the "brown" mutation could also be ruled out.

The other possible causes of aberrant plumage: staining, hybridization, environmental contaminants, diet, age, disease, parasites and injury seemed, to us, less likely to have created this kestrel's abnormality. The plumage did not appear to be due to staining and no wild kestrel hybrids have ever been documented (Pyle 2008), also this kestrel did not appear to be aged, diseased or injured. The remaining non-genetic causes of aberrant plumage, environmental contaminants, diet and parasites were not conclusively ruled out however, all of the other female Kestrels captured in the same area had normal plumage.

Documentation of aberrant plumage is rare in American Kestrels; we found only two accounts in the published literature for this species. Melanism had been reported in a male kestrel (Carpenter and Carpenter 1988). It had nearly black dorsal plumage with normal ventral and head plumage. There is also a published account of sexually mosaic plumage in a female kestrel (Parrish et al. 1987) which exhibiting half male and half female plumage. Lance Morrow observed another sexually mosaic kestrel found near Fort Davis, TX (personal observation). We have not located a published account describing aberrant plumage similar to the Kestrel described herein.

There are numerous published instances of wild birds exhibiting aberrant plumage but the vast majority is based on a single encounter of a single individual, so these accounts are merely phenotypic descriptions of abnormal coloration. Complicating the situation is the fact that aberrant plumage can have multiple causes which are not necessarily mutually exclusive. Sage (1962) reported birds expressing partial melanism and a few individuals that expressed both albinism and melanism.

There are many potential pitfalls in ascribing a cause for aberrant plumage based on observation alone, whether it is photographic documentation or having the bird in hand. Photographic documentation has many caveats. As most wild birds maintain a distance from photographer, the photograph's resolution is liable to be poor. Variable and irreproducible lighting conditions change the appearance of colors and it is difficult to ascertain the condition of the feathers (soiled, stained, worn, bleached, destroyed by parasites, et cetera). For example, a "melanistic" Red-tailed Hawk (*Buteo jamaicensis*) with very dark plumage was observed and photographed near Anacostia in the District of Colombia. When the hawk was captured it was found to be a normal bird whose plumage was coated with a dark oily substance making it appear from a distance as a melanistic bird (unpublished observation). Another example of observance leading to an incorrect conclusion, a Golden Eagle (*Aquila chrysaetos*) with a white or leucistic head and nape was observed in Wyoming. The bird was subsequently captured which revealed that all the brown and golden color on the feathers of the head and nape appeared to have been destroyed by feather lice leaving the rachesis and exposed white down feathers (unpublished observation). The situation was resolved by spraying to kill the lice and allowing the captive eagle to grow in new feathers, restoring its plumage to normal.

Currently there is not much consistency in the use of terms for aberrant plumage between field researchers, birders, ornithologists, bird banders and curators. Even with the bird in hand, as in this case, determining the precise cause of the aberrant plumage is not possible without further analysis (Morrow et al. 2015). Perhaps the best term to describe this American Kestrel's abnormal appearance is dilute plumage which describes the plumage characteristics without ascribing the cause.

ACKNOWLEDGMENTS

The authors would like to thank William S. Clark, Kerri Cooper-Bailey, Hein van Grouw and John Smallwood for their assistance.

LITERATURE CITED

Bales, B. R. 1909. The Brown Stain Occasionally Seen on the Feathers of Wild Ducks. Wilson Bulletin 69: 221-223.

Berger, D. D. and H. C. Mueller. 1959. The bal-chatri: a trap for the birds of prey. Bird-Banding 30: 18-26.

Bortolotti, G. R., K. J. Fernie and J. E. Smits. 2003. Carotenoid concentration and coloration of American Kestrels (*Falco sparverius*) disrupted by experimental exposure to PCBs. Functional Ecology 17: 651–657.

Bosner, R. H. C. 1995. Melanin and the Abrasion Resistance of Feathers. Condor 98: 590-591.

Carpenter, T. W. and A. L. Carpenter. 1988. The occurrence of melanism in an American Kestrel. Journal of Raptor Research 22: 72.

Ciach, M. and R. Maniarski. 2012. Plumage aberration in Northern Goshawk *Accipiter gentilis*. Ardea 100: 211-213.

Clark, W., K. Duffy, E. Gorney, M. McGrady and C. Schultz. 1988. Supernumerary Primaries and Rectrices in some Eurasian and North American Raptors. Journal of Raptor Research 22: 53-58.

Ellis, D. H., L. W. Oliphant and J. K. Fackler. 2002. Schizochromism in a Peregrine Falcon from Arizona. Journal of Raptor Research 36: 200-202.

Gill, F.B. 1995. Biochrome pigements, In *Ornithology*. W. H. Freeman & Co., New York.

Guay, P. -J., D. A. Potvin and R. W. Robinson. 2012. Aberrations in Plumage Coloration in Birds. Australian Field Ornithology 29: 23–30.

Hamerstrom, F. 1967. On Use of Fault Bars in Ageing Birds of Prey. Inland Bird-Banding Association News 39: 35-41.

Mackivnen, K. and J. V. Briskie. 2014. Differential Wear of Feathers in the Polymorphic New Zealand Fantail (*Rhipidura fuliginosa*)—a Selective Advantage of Melanism? Emu 114: 154-159.

Morrow, J., L. Morrow and T. G. Driscoll. 2015. Aberrant Plumages in Cooper's Hawks. Journal of Raptor Research. In press.

Nesbitt, S. A. 1975. Feather Staining in Florida Sandhill Cranes. Florida Field Naturalist 3: 28-30.

Parrish, J. R., J. Stoddard, and C. M. White. 1987. Sexually mosaic plumage in a female American Kestrel. Condor 89: 911-913.

Post, W. 2012. First report of Abnormal Plumage in Anhingidae. Florida Field Naturalist 40: 81-84.

Pyle, P. 2008. Identification Guide to North American birds. Part II. Slate Creek Press, Point Reyes Station, CA.

Sage, B. L. 1962. Albinism and melanism in birds. British Birds 53: 201-225.

Smallwood, J. A. 1989. Age Determination of American Kestrels: A Revised Key. Journal of Field Ornithology 60: 510-519.

Smallwood, J. A. and D. M. Bird. 2002. American Kestrel (*Falco sparverius*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/602 doi:10.2173/bna.602 (last accessed 24 January 2015).

van Grouw, H. 2006. Not every white bird is an albino: sense and nonsense about colour aberrations in birds. Dutch Birding 28: 79-89.

van Grouw, H. 2013. What colour is that bird? The causes and recognition of common colour aberrations in birds. British Birds 106: 17-29.

van Tyne, J. and A. J. Berger. 1959. *Fundamentals of Ornithology*. John Wiley and Sons. New York

COMMENSAL FORAGING BY A SCISSOR-TAILED FLYCATCHER OVER A FORAGING LADDER-BACKED WOODPECKER

Stephen Kasper[1]

Lake Alan Henry Wildlife Mitigation Area, Parks and Recreation Department, City of Lubbock, Lubbock, Texas 79401

Commensalism is an association between individuals of two species in which one species obtains food or other benefits because of the second without either harming or benefiting the second. A common example of commensalism among bird species, or with birds and mammals or fish, is when a species unintentionally flushes prey which benefits the commensal species. Many bird species have learned to prey on insects stirred up by grazing mammals, and others feed on organisms uncovered by the plow. In one example of commensalism in birds, numerous Scissor-tailed Flycatchers (*Tyrannus forficatus*) in South Texas were observed on multiple occasions foraging commensally with foraging Wild Turkeys (*Meleagris gallopavo*) (Baker 1980). These flycatchers followed walking flocks of turkeys and preyed on the insects they flushed (Baker 1980), often changing perches as the turkeys moved through the habitat (Regosin, 2013; about Baker's observations).

The following observation of commensalism occurred on 9 August 2012 ca. 0745 am CST at Lake

[1]E-mail: skasper@mail.ci.lubbock.tx.us

Alan Henry Wildlife Mitigation Area (LAHWMA), 12 km S, 26 km W of Clairemont (33° 03' 52" N, 101° 01' 32" W), Kent Co., Texas. The surface air temperature was 22.8°C with little to no wind. Initially I observed through binoculars at ca. 20 m a male Ladder-backed Woodpecker (*Picoides scalaris*) flying into a honey mesquite (*Prosopis glandulosa*). The woodpecker began to probe and peck the inner trunks and branches when a second flight was noticed to the mesquite. An adult male Scissor-tailed Flycatcher perched on a high branch while the woodpecker continued gleaning the main trunks. The Scissor-tailed Flycatcher is an aerial and ground feeding insectivorous flycatcher that will generally utilize a high and conspicuous perch, then fly out and take flying insects (Rylander 2002). The woodpecker flew to a second similar-sized (4-5 m) mesquite and then to a third larger (5-6 m), denser mesquite, each time the Scissor-tailed Flycatcher flew to a high branch above and outside of the woodpecker position. No acquisition of prey by the Ladder-backed Woodpecker was noted at this point, however due to the speed of the movements and visual blockage by foliage, branches, and trunks this behavior may have gone unnoticed. After 10-20 sec of probing by the woodpecker at the third mesquite, the Scissor-tailed Flycatcher flew down to the side of the mesquite and hovered near the branch tips for 2-4 sec. It returned to the top of the tree and perched on a branch end. There was not any flying insect noticed during this hovering sequence or any feeding activity by the Scissor-tailed Flycatcher post perching.

The Ladder-backed Woodpecker then flew to a more open fourth mesquite (3-4 m) nearer my position and probed along the larger inner branches and the four main trunks, with the Scissor-tailed Flycatcher flying to the end of a top branch. Within 10 sec a small light colored insect, with a flight tract like that of a grasshopper, flew from the inner to outer portion of the mesquite and was taken by the Scissor-tailed Flycatcher near the branch ends. It returned to a high perch, manipulated the prey in its bill using the branch for 10-15 sec with fragments falling (probably legs and/or wings), and then consumed the insect. During the Scissor-tailed Flycatcher's insect manipulation, the Ladder-backed Woodpecker flew to a fifth smaller, bushier mesquite and probed around the creases between the single main trunk and lateral branches. After consuming the insect and a noticeable pause, the Scissor-tailed Flycatcher flew to a taller netleaf hackberry (*Celtis reticulata*) adjacent to the shorter mesquite and visually orientated toward the woodpecker. The Ladder-backed Woodpecker then went to a sixth open branched mesquite (3-4 m) near the edge of a food plot and probed with the Scissor-tailed Flycatcher soon alighting to the top of the mesquite. After 10-15 sec, the Ladder-backed Woodpecker flew across the adjacent open food plot and within 1-2 sec was followed by the Scissor-tailed Flycatcher. Both birds went out of view.

The Scissor-tailed Flycatcher that I observed learned to associate a foraging woodpecker with flying insects at a time of the day when these prey were not readily available. Foraging rates for the Scissor-tailed Flycatcher are lower in early morning (Regosin 2013), the lower morning temperatures reducing overall insect activity. Their foraging success rates are the highest in early afternoon with low winds, conditions increasing insect aerial activity (Foreman 1978; Teather 1992). This Scissor-tailed Flycatcher was able to utilize a time of day that was not conducive to catching flying insects by following a foraging Ladder-backed Woodpecker that was able to flush inactive prey concealed within the dense branches. It incorporated observation and experience (operant conditioning) into its innate feeding behavior, leading to an optimal foraging strategy in which its energy intake, the prey, was much greater than the energy and time expended to find the prey. Innate behaviors are commonly modified by operant conditioning (Rylander 2002). My observation is similar to the Scissor-tailed Flycatchers in southern Texas foraging along with Wild Turkeys in that the Scissor-tailed Flycatchers used moving turkeys as a stimulus to aerial insect activity. Herein the stimulus must have been the sight of any foraging woodpecker, or it may have been initiated by the movements of any foraging bird species large enough to flush insects. In addition, this learned behavior may be much more plastic than has been previously documented for the Scissor-tailed Flycatcher or birds in general. On several occasions while I was driving an all-terrain vehicle (ATV) very slowly at LAHWMA, I have noticed Scissor-tailed Flycatchers flying along in front of the ATV and perching in a station-to-station manner and taking flying insects (mostly grasshoppers) that were flushed by the ATV. For the Ladder-backed Woodpecker, there are no known foraging associations other than those interactions with other woodpeckers that "seem related" to food or foraging (Lowther 2001).

ACKNOWLEDGMENTS

I thank Kent Rylander for the ongoing discussions concerning bird behavior in general. I also appreciate Mark Lockwood and Kent Rylander for their time in reviewing the manuscript.

LITERATURE CITED

Baker, B. W. 1980. Commensal foraging of Scissor-tailed Flycatchers with Rio Grande Turkeys. Wilson Bulletin 92:248.

Foreman, L. D. 1978. Activity patterns and foraging behavior of the Scissor-tailed Flycatcher (*Muscivora forficata*). PhD. Dissertation. Texas A&M University, College Station.

Lowther, P. E. 2001. Ladder-backed Woodpecker (*Picoides scalaris*), The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/565.

Regosin, J. V. 2013. Scissor-tailed Flycatcher (*Tyrannus forficatus*), The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/342.

Rylander, K. 2002. The Behavior of Texas Birds. University of Texas Press, Austin.

Teather, K. 1992. Foraging patterns of male and female Scissor-tailed Flycatchers. Journal of Field Ornithology 63:318-323.

PHYSICAL INTERACTION BETWEEN SAY'S PHOEBE AND VERMILION FLYCATCHERS

Franklin D. Yancey, II[1] and Stephen Kasper[2]

[1]Oakhurst College Center, P.O. Box 1910, 40241 Highway 41, Oakhurst, CA 93644
[2]Lake Alan Henry Wildlife Mitigation Area, Parks and Recreation Department, City of Lubbock, Lubbock, TX 79401

Intra- and interspecific agonistic behavior with physical contact is well documented for many species of North American tyrant flycatchers (Fitch 1950; Austin and Russell 1972; Ohlendorf 1976; McCarty 1996; Murphy 1996; Lanyon 1997; Bemis and Rising 1999; Tweit and Tweit 2000; Cardiff and Dittman 2000, 2002; Weeks 2011; Gamble and Bergin 2012; Regosin 2013). However, published accounts of such behavior by Say's Phoebe (*Sayornis saya*) are sparse, with most being intraspecific chasing with little physical contact (Schukman and Wolf 1998). These behaviors are undocumented for the Vermilion Flycatcher (*Pyrocephalus rubinus*), with only intraspecific chasing and no known physical contact events (Ellison et al. 2009).

This report documents a physical interaction between an individual Say's Phoebe of indeterminate sex and a pair of Vermilion Flycatchers. The incident occurred on 20 June 2013 ca. 1030 CST adjacent to the east side of the bridge spanning Limpia Creek on Texas State Highway 17 (30° 40.876' N, 103° 47.494' W; 1363 m elevation), 10.3 km N, 10.0 km E of Fort Davis, Jeff Davis County, Texas. This site is situated within the drainage of Limpia Creek, which was dry at the time of the observation. The riparian habitat in which the event occurred is dominated by Fremont cottonwood (*Populus fremontii*) and Goodding's Willow (*Salix gooddingii*). The surrounding habitat is upper elevation Chihuahuan Desert scrub.

From the bridge we observed a male Vermilion Flycatcher initially perched on a dead limb in the Limpia Creek basin. Almost immediately we observed nondescript wings vigorously flapping on the ground in the dense cottonwood leaf litter, as if a bird had been snared in a trap or captured by a predator. Following a 10-20 sec observation of the commotion, it was determined that two birds were flapping on the ground and connected in some way. The two birds were a Say's Phoebe and a female Vermilion Flycatcher that were coupled by clamping bills and/or entangled feet. As this

[2]E-mail: skasper@mail.ci.lubbock.tx.us

encounter ensued, the male Vermilion Flycatcher flew to a perch directly above the two birds, which were thrashing in the cottonwood leaf litter. The Say's Phoebe subsequently disengaged from the female Vermilion Flycatcher and flew directly at the perched male Vermilion Flycatcher in a 1-2 sec loop, thus chasing it away from the immediate area. The Say's Phoebe immediately returned to the female Vermilion Flycatcher, which remained on the ground in the leaf litter despite having a distinct opportunity to flee. At this time, a second entangled physical interaction ensued. At about 10-15 sec into this second, very physical encounter between these two birds, the male Vermilion Flycatcher returned to perch near the two birds wrestling on the ground. As the male Vermilion Flycatcher landed on its perch, the Say's Phoebe once again flew directly at the male Vermilion Flycatcher, thereby chasing it off a second time. The three birds then dispersed in separate directions and perched calmly at individual sites, thus ending the encounter. The entire interaction occurred over a 50-60 sec period. The Say's Phoebe clearly was the aggressor in this encounter and dominated both the female and male Vermilion Flycatchers.

In general, aggressive behavior in tyrannids has been interpreted as a means to protect a nest from predators and to defend a nesting area against resource competitors (Bemis and Rising 1999; Ellison et al. 2009; Weeks 2011; Regosin 2013). Say's Phoebes are reported to be somewhat tolerant of other nearby nesting birds, including other tyrannids (Schukman and Wolf 1998). However, there are documented accounts of interactions near nest sites between Say's and Black Phoebes (*Sayornis nigricans*) in Texas, and between Say's and Eastern Phoebes (*S. phoebe*) in Kansas (Ohlendorf 1976). It is not known whether the Say's Phoebe involved in the encounter described herein was nesting at the time of the incident. Say's Phoebes do not typically nest along water courses (Bent 1942), such as that where the encounter occurred, but they do frequently nest within desert environs (Schukman and Wolf 1998), which surround the Limpia Creek drainage. Furthermore, Say's Phoebes commonly build nests under bridges (Rylander 2002), such as the one spanning the drainage. In southwest Texas these birds are known to commonly produce two broods a year (Ohlendorf 1976). When a second clutch is produced, it often is initiated from early to mid-June (Schukman and Wolf 1998), when this encounter was observed. Therefore, it certainly is plausible that this individual Say's Phoebe was defending its nesting territory against a related competitor that utilizes very similar food resources.

ACKNOWLEDGMENTS

We appreciate Clyde Jones, Mark Lockwood, and Kent Rylander for reviewing the manuscript. We also thank Mark Lockwood for the vegetation data for Limpia Creek.

LITERATURE CITED

Austin, G. T. and S. M. Russell. 1972. Interspecific aggression of Ash-throated Flycatchers on Cassin's Sparrows. Condor 74:481.

Bemis, C. and J. D. Rising. 1999. Western Wood-Pewee (*Contopus sordidulus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/451.

Bent, A. C. 1942. Life histories of North American flycatchers, larks, swallows, and their allies. U.S. National Museum Bulletin 179:166-173.

Cardiff, S. W. and D. L. Dittmann. 2000. Brown-crested Flycatcher (*Myiarchus tyrannulus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/496.

Cardiff, S. W. and D. L. Dittmann. 2002. Ash-throated Flycatcher (*Myiarchus cinerascens*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/664.

Ellison, K., B. O. Wolf, and S. L. Jones. 2009. Vermilion Flycatcher (*Pyrocephalus rubinus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/484.

Fitch, F. W. 1950. Life history and ecology of the Scissor-tailed Flycatcher, *Muscivora forficata*. Auk 67:145-168.

Gamble, L. R., and T. M. Bergin. 2012. Western Kingbird (*Tyrannus verticalis*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/227.

Lanyon, W. E. 1997. Great Crested Flycatcher (*Myiarchus crinitus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/300.

McCarty, J. P. 1996. Eastern Wood-Pewee (*Contopus virens*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/245.

Murphy, M. T. 1996. Eastern Kingbird (*Tyrannus tyrannus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/253.

Ohlendorf, H. M. 1976. Comparative breeding ecology of phoebes in Trans-Pecos Texas. Wilson Bulletin 88:255-271.

Regosin, J. V. 2013. Scissor-tailed Flycatcher (*Tyrannus forficatus*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/342.

Rylander, K. 2002. The Behavior of Texas Birds. University of Texas Press, Austin.
Schukman, J. M. and B. O. Wolf. 1998. Say's Phoebe (*Sayornis saya*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/374.
Tweit, R. C. and J. C. Tweit. 2000. Cassin's Kingbird (*Tyrannus vociferans*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/534.
Weeks, H. P., Jr. 2011. Eastern Phoebe (*Sayornis phoebe*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/094.

FIRST JANUARY RECORD OF BUFF-BREASTED SANDPIPER FOR NORTH AMERICA

By Ron Weeks[1] and Bob Friedrichs[2]

[1]110 Indian Warrior Lake Jackson, TX 77566
[2]300 St. Joseph Parkway #322 Houston, TX 77002

On 03 January 2014, Bob Friedrichs reported 11 Mountain Plovers *Charadrius montanus* from a sod farm located along Citrus Road in Matagorda County, Texas. That and the first winter plumage Glaucous Gull *Larus hyperboreus* also found by Friedrichs at the nearby Matagorda jetty got Ron Weeks out birding early on the morning of 04 January. Dawn found Weeks at the jetty adding the gull to his Matagorda County list. He then proceeded to the Citrus Road Sod Farms to look for the plovers. He arrived about 0900 hours and began glassing the short grass on the south end of the property. Weeks quickly spotted some Black-bellied Plovers *Pluvialis squatarola*. And he then spotted some other smaller plover-like birds out in the field. He called Brad Lirette who he knew was en route to see the Mountain Plovers and let him know to keep coming. He studied the smaller plover-like birds while waiting for Lirette and found it odd how they fed with a pecking motion like that of a Buff-breasted Sandpiper *Calidris subruficollis*. They were not doing the normal run-and-stop plover habit. But they were so far off and after all, Buff-breasted Sandpipers are in South America by now he told himself.

Once Lirette arrived with his young son, Joel, Weeks showed him the smaller plover-like birds and Lirette informed Weeks the Mountains had been reported from the other end of the sod farms. Still puzzled by the distant plover-like birds, Weeks and Lirette moved a few hundred yards up the road when Weeks saw a shorebird fly in closer. He was stunned to realize IT WAS A BUFF-BREASTED SANDPIPER! He alerted Lirette and desperately tried to get a photograph of the bird realizing the significance of such a January sighting. Lirette had to attend to his son and Weeks started getting nervous as he had a hard time finding the bird in the viewfinder of his camera. Weeks started snapping off photographs in the general direction of the bird. Before he could get a fix on the bird, it flew off with two others. They could still see the three of them in the distance for a while, but nothing like when they were close. Weeks madly searched through his shots trying to see if he had anything. Fortunately, he did. No work of art but identifiable (see Figure 1).

Weeks called Friedrichs and Brent Ortego to let them know about the birds and posted it to the TexBirds Listserv. Unsuccessful at getting any better views of the birds, Weeks and Lirette eventually moved on and saw the Mountain Plovers down the road. Weeks later returned and looked some more for the Buff-breasted Sandpipers with no luck. Friedrichs had a similar experience later in the day—nothing. Fortunately, he returned the next afternoon at approximately 1430 hours and got some

[1]E-mail: ronweeks@sbcglobal.net

Figure 1. Cropped photograph of Buff-breasted Sandpipers at Citrus Road sod farm. Taken by Ron Weeks on 03 January 2014

Figure 3. Cropped photograph of two of the Buff-breasted Sandpipers at Citrus Road sod farm. Taken by Bob Friedrichs on 04 January 2014.

decent pictures of now 4 Buff-breasted Sandpipers at approximately 40 yards (see Figures 2, 3 and 4). The weather was windy that afternoon and the birds were very restless, not staying in one place long. The birds soon flew from the sod field and landed in a cow pasture. Friedrichs gave chase but was unable to locate them in the taller brown grass. He returned to the sod farm on 10 January and managed to re-locate the birds in a very distant part of the sod farm, only visible with a scope. Those four birds were last reported by Derek Muschalek and Willie Sekula at the same location on 12 January. Despite occasional return trips by the Weeks and Friedrichs, the Buff-breasted Sandpipers were not found again.

Figure 4. Photograph of all four Buff-breasted Sandpipers showing the semi-dwarf Bermuda (*Cynodon hybrid*) grass they frequented during their stay at the Citrus Road sod farm. Taken by Bob Friedrichs on 04 January 2014.

Figure 2. Cropped photograph of 3 of Buff-breasted Sandpipers taking flight at Citrus Road sod farm. Taken by Bob Friedrichs on 04 January 2014.

Immediately after the sighting on 04 January, Weeks began to research the significance of the presence of Buff-breasted Sandpipers in Texas in January. The Buff-breasted Sandpiper's typical fall migration window though Texas is from late July to early October (Lockwood and Freeman 2014). The latest Texas record we could find was 24 October (Eubanks, Behrstock, and Weeks 2006). This matches the latest departure dates for other areas of the US which include individuals found October 17th at Clatsop Beach, Oregon (Paulson 1992) and 23 October in Michigan (Granlund, McPeek, Adams et al., 1994).

The only winter record in the Christmas Bird Count (CBC) database was of a bird found and photographed on the Creole Louisiana CBC on a beach near the town of Cameron, Louisiana on

15 December 2002. This was a single, apparently healthy bird, associating with Sanderlings *Calidris alba*, and was not re-found after the CBC. The only other northern hemisphere record is a bird that apparently over wintered in Poland in 1982/83 (Hayman, Marchant, and Prater 1986); this is a latitude between that of Calgary and Edmonton, Alberta, Canada. The authors found no information on the health of this overwintering bird. eBird staff could also find no other North American winter records in their database or elsewhere. The closest date found was one in Hawaii on 28 February—likely an early returning migrant. So, from what the authors were able to find, the birds found at the Citrus Road sod farm represent the first January record and first winter record of multiple healthy Buff-breasted Sandpipers in North America and indeed the northern hemisphere.

The sod farm where the Buff-breasted Sandpipers were found is within the count circle for the Mad Island CBC. These sod farms were carefully checked during that CBC but neither the Buff-breasted Sandpipers nor the Mountain Plovers were located. Additionally, Friedrichs had checked the sod farm several times during November and December without finding either species. Nevertheless, it is impossible to know whether these birds may have been in the general area earlier (and later) in the winter as there is extensive acreage of fallow agricultural fields in the general area. Other sods farms are also present elsewhere in Matagorda County.

The Citrus Road sod farms are planted in a variety of turf grasses including St. Augustine *Stenotaphrum secundatum*, Bermuda *Cynodon dactylon* and Semi-dwarf Bermuda *Cynodon* hybrid. The field where the Buff-breasted Sandpipers were seen is planted in Semi-dwarf Bermuda (see Figure 4). The sod farm apparently provides good habitat and food supply for the species, substantiated by recent eBird data showing multiple Buff-breasted Sandpiper sightings there during the normal spring and fall migration windows. The adjacent cow pastures and fallow fields also hold the species during migration so likewise are believed to provide suitable habitat and food supply.

Based on unsuccessful attempts to relocate the birds, it is possible they left the immediate area of the sod farms. However, the authors wonder if perhaps these birds stayed in Texas—possibly in the aforementioned habitat in the general area. The rightmost bird in Figure 2 seems to show the bird's secondaries have already been molted (Kevin Karlson pers. comm.). Such a molt condition in January implies an adult. "Adults undergo a partial molt to breeding plumage in March/April which includes head and much of the body. The complete molt to non-breeding plumage begins in early July on the breeding grounds with some head and body feathers. All molt is suspended in late July or August and completed on the winter grounds in South America, starting in October. Flight feathers are molted last, sometimes as late as February/March (O'Brien, Crossley, and Karlson 2006)." Therefore, the molt progress of the bird in Figure 2 could imply the bird had finished its migration and was wintering locally.

This record raises many questions about why four healthy Buff-breasted Sandpipers would choose to linger/winter some 4000 miles from the known wintering grounds. It has been speculated that Buff-breasted Sandpipers have a yet undiscovered staging area somewhere in northern South America during fall migration as individuals continue to arrive on the breeding grounds until January (COSEWIC 2012). Perhaps the Matagorda County birds were simply late migrants staging before proceeding to the wintering grounds. Weather is often looked to for explanations on birds lingering into winter. However, the winter of 2013-2014 had its share of cold fronts reach the Texas coast. Climate data from nearby Palacios showed low temperatures of 32F on 28 October, 31F on 24 December, 27F on 03 & 06 January, and 23F on 07 January. It should be noted that Palacios sits on the tempering waters of Tres Palacios Bay, while the Citrus Road sod farms are a few miles from the bay. Therefore, it is quite possible that several additional freezes occurred at the sod farms. It is impossible to know if the original presence of these birds was related to the strong early January front. Similarly, it is also impossible to know whether the very low temperatures on the 7th could have changed the food situation at the sod farms. The diet of Buff-breasted Sandpipers is "poorly documented". Migrant birds in Alberta were found to eat primarily adults and larvae of *Diptera* (flies) and *Coleoptera* (beetles) along with miscellaneous seeds and spider parts (Lanctot and Laredo 1994). However, we could find no literature on the diets of Buff-breasted Sandpipers in Texas or on the known wintering grounds. Regardless of the reason for these birds to appear and depart these sod farms on the Texas coast, our research indicates the presence of multiple birds in the northern hemisphere in January is unprecedented.

LITERATURE CITED

EUBANKS, T. L., R. A. BEHRSTOCK, AND R. J. WEEKS. 2006. Birdlife of Houston, Galveston and the Upper Texas Coast. Texas A&M University Press, College Station.

HAYMAN P., J. MARCHANT, AND T. PRATER. 1986. Shorebirds: An Identification Guide. Houghton Mifflin Company, Boston.

LANCTOT R. AND D. LAREDO. 1994. Buff-breasted Sandpiper in The Birds of North America, No. 91, Poole & Gill editors.

LOCKWOOD, M. W. AND B. FREEMAN. 2014. TOS Handbook of Texas Birds, 2nd ed. Texas A&M University Press, College Station.

MCCPEEK, G. A., J. GRANLUND, AND R. ADAMS. 1994. The Birds of Michigan. Kalamazoo Nature Center, Kalamazoo and Sarett Nature Center, Benton Harbor.

O'BRIEN M., R. CROSSLEY, AND K. KARLSON. 2006. The Shorebird Guide. Houghton Mifflin, New York.

PAULSON, D.R. 1992. Shorebirds of the Pacific Northwest. University of Washington Press, Seattle.

SMITH, A.L. for COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC assessment and status report on the Buff-breasted Sandpiper Tryngites subruficollis in Canada (accessed 22 June 2014 at http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection_2013/ec/CW69-14-653-2012-eng.pdf)

WINTER ASSOCIATION BETWEEN A RED-THROATED LOON AND A COMMON LOON ON A WEST TEXAS LAKE

Stephen Kasper[1]

Lake Alan Henry Wildlife Mitigation Area, Parks and Recreation Department, City of Lubbock, Lubbock, Texas 79401

Four species of loons are known migrants and winter residents to Texas (Lockwood and Freeman 2014). Of these, the Common Loon (*Gavia immer*) is the most regular loon species on fresh water and along the Gulf Coast (Sibley 2014) and has by far the largest winter distribution of any loon species in Texas, with flocks and individuals found along the Gulf coast and in clear water lakes in the eastern half of the state, becoming increasing uncommon to the west (Lockwood and Freeman 2014). The Red-throated Loon (*Gavia stellata*) primarily winters near North American ocean shores and has a limited inland winter distribution where it is generally rare on fresh water other than the Great Lakes (Sibley 2014). In Texas, it is a rare inhabitant along the upper coast and on reservoirs in northeastern Texas and only a casual visitor to most other areas of the state (Lockwood and Freeman 2014). The following report describes more than 9 weeks of winter interactions between a Common Loon and Red-throated Loon on a deep, clear water lake on the Rolling Plains of western Texas.

While observing waterfowl at distance on 10 January 2014, I first identified a Common Loon (*Gavia immer*) with a smaller bird, originally thought to be a larger grebe species, on the periphery of a large group of American Coots (*Fulica americana*) and indeterminate ducks on Lake Alan Henry (LAH), Garza and Kent Cos., Texas. Because the deeper, widest portion of the lake is ca. 0.75 km from viewing positions on the roadway that crosses the top of the dam, definitive identification of the smaller bird to a Red-throated Loon (*Gavia stellata*) was not made until 29 January when these birds were closer due to a weather front. While crossing the dam during regular duties for Lake Alan Henry Wildlife Mitigation Area, these two loon species were always observed in a close association, never singly, on each of the 13 days (4 in January, 4 in February, and 5 in March). On 5 March, the two loons were forced to use the dam as a wind break because of a severe wind northern front and discernable photographs were taken (Fig. 1). During the 13 dates of observations, the Common Loon was always in the lead with the Red-throated Loon following nearby, but always to the side and behind. When fishing, the Common Loon always dove first with the Red-throated Loon diving second or holding to a spot on the water. For all winter

[1]E-mail: skasper@mail.ci.lubbock.tx.us

Figure 1. For each photo, Common Loon (top) and Red-throated Loon (bottom) in winter plumages on 5 March 2014 at Lake Alan Henry, Garza and Kent Cos., Texas. Photos by Stephen Kasper.

observations combined, the Common Loon was seen taking 11 dives, 5 times coming up with a fish. The Red-throated Loon was seen diving 8 times, each following a Common Loon dive, with fish brought to the surface on 7 occasions. Identification of the fish species was not determinable at distance, although the stocked Gizzard Shad (*Dorosoma cepedianum*) is the most numerous open water species in LAH. The last date that either of these loons was observed was 17 March.

The first record of the Red-throated Loon for LAH is exceptional in that the species is only occasionally found on large freshwater lakes and there is very limited data for the species during the winter (Barr et al. 2000). This record also adds to the casual status of the species in the western half of Texas and the timeframe for these observations (10 January to 17 March) falls within known records (26 October to 3 May) for the state (Lockwood and Freeman 2014). For the Common Loon on LAH, the range of dates is consistent with the known records for Texas from early November through late March or early April (Lockwood and Freeman 2014). Common Loons have been observed intermittently in previous winters on LAH, usually singly but one year there was a triplet flock. Wintering Common Loons are known to be mostly solitary by day but will forage in groups, a more effective strategy for patchy prey (Evers et al. 2010). The interaction between these two loon species on LAH is unique in that there are no known interspecific interactions for the Red-throated Loon on its winter range (Barr et al. 2000). Interspecific interactions by the Common Loon on its winter range typically do not indicate aggression (Evers et al. 2010) and I saw not aggression by either loon species during all observations. The Red-throated Loon was perceived as generally passive with the Common Loon, always following the Common Loon in swimming and fishing. It appeared as if the Red-throated Loon chose to be in a flock with the Common Loon being independent of that decision.

ACKNOWLEDGMENTS

I thank Mark Lockwood and Kent Rylander for reviewing an earlier version of the manuscript.

LITERATURE CITED

Barr, J. F., C. Eberl, and J. W. McIntyre. 2000. Red-throated Loon (*Gavia stellata*), The Birds of North America Online, http://bna.birds.cornell.edu/bna/species/513.

Evers, D. C., J. D. Paruk, J. W. McIntyre, and J. F. Barr. 2010. Common Loon (*Gavia immer*), The Birds of North America Online, http://bna.birds.cornell.edu/bna/species/313.

Lockwood, M. W., and B. Freeman. 2014. The TOS Handbook of Texas Birds. 2nd edition, revised. Texas A&M University Press, College Station.

Sibley, D. A. 2014. The Sibley Guide to Birds. 2nd edition. Alfred A. Knopf Publ. Co., New York.

SCAVENGING OF CROCODILE EGGS BY VULTURES (*CATHARTES AURA* AND *CORAGYPS ATRATUS*) IN QUINTANA ROO, MEXICO

Steven G. Platt[1], Pierre Charruau[2] and Thomas R. Rainwater[3]

[1]Wildlife Conservation Society—Myanmar Program, Building C-1, Aye Yeik Mon 1st Street, Hlaing Township, Yangon, Myanmar
[2]Centro del Cambio Global y la Sustentabilidad en el Sureste, A.C., Calle Centenario del Instituto Juárez S/N, Col. Reforma, C.P. 86080, Villahermosa, Tabasco, México
[3]United States Fish and Wildlife Service, Ecological Services Field Office, 176 Croghan Spur Road, Suite 200, Charleston, South Carolina 29407

Black Vultures (*Coragyps atratus*) and Turkey Vultures (*Cathartes aura*) are soaring obligate scavengers (Ruxton and Houston 2004) common throughout Mexico and Central America (Kirk and Mossman 1998, Buckley 1999). In general, Black Vultures prefer larger carrion, while Turkey Vultures appear more specialized for detecting and consuming smaller carcasses; however, both species are opportunistic foragers known to consume a wide range of foods, including carrion from wild and domestic animals (fish, amphibians, reptiles, birds, and mammals), terrestrial and aquatic invertebrates, carrion-dwelling insects (e.g., maggots and beetle larvae), animal dung, household garbage, and on occasion fresh and rotting fruits (Kirk and Mossman 1998, Saul Sánchez and Ortiz 1998, Buckley 1999, Platt and Rainwater 2009).

Despite an extensive literature on the dietary habitats of Black and Turkey Vultures, there are few published observations of either species scavenging or predating the eggs and neonates of crocodilians. Ross (1997) attributed the loss of several captive juvenile Cuban crocodiles (*Crocodylus rhombifer*) to predation by Turkey Vultures, which have also been observed opening the nest of an American crocodile (*Crocodylus acutus*), extracting eggs, and consuming embryos (Rodriguez-Soberón et al. 2002). Somaweera et al. (2013) stated that both Black and Turkey Vultures scavenged American crocodile eggs after raccoons (*Procyon lotor*) had opened nests, but provided no further information. We herein report on Black and Turkey Vultures scavenging eggs, eggshell membranes, and dead neonates from an American crocodile nest. Unlike previous accounts, we include detailed observations of this behavior based on sequential photographs and video taken by an automatic wildlife camera placed at the crocodile nest site.

Our observation occurred in the Punta Sur Ecological Park (PSEP) as part of a larger study on nest attendance and parental care among wild *C. acutus* in Quintana Roo, Mexico (Charruau and Hénaut 2012). PSEP (54° 17' N; 86° 26' W) is a protected area located at the southern end of Cozumel Island encompassing 1,110 ha of coastal dunes, open beaches, shallow hypersaline lagoon systems (>1.5 m deep), and mangrove forests (González-Cortés 2007). PSEP harbors a robust population of *C. acutus* which nests on elevated beach ridges during March-April (Charruau et al. 2011, Charruau and Hénaut 2012). *Crocodylus acutus* is classified as a "hole-nesting" crocodilian, i.e., females deposit clutches of 20-60 eggs in holes (ca. 20-30 cm deep) excavated in a porous substrate, usually deep sand (Thorbjarnarson 1989).

During a survey of PSEP in May 2009, one of us (PC) located a recently constructed *C. acutus* nest containing 27 eggs, 11 of which were infertile. A Moultrie® I-60 Digital Infrared Game Camera was installed about 2 m away from the nest to monitor activity of the attending female crocodile and record predation events. This camera (optical field of view = 52° with an approximate detection range of 12 ± 1.5 m) was programmed to take a single high resolution digital photograph with accompanying video (30 sec duration during daylight; 5 sec after

[1]E-mail: sgplatt@gmail.com

dark) at 60 second intervals whenever motion was detected by infrared sensors; the date and time were automatically recorded on each photograph. PC returned to the nest site on 5 July 2009, recovered the camera, and later downloaded the digital images and video.

Our examination of the photographs and video taken at the nest site indicates the clutch hatched on the night of 29-30 June; beginning at 2130 hr the attending female crocodile is seen making repeated visits to the nest, excavating the overlying sand, and transporting what are inferred to be neonates to a nearby mangrove lagoon. A subsequent series of 35 photographs (with accompanying video) taken from 2-5 July at the excavated nest shows Black and Turkey Vultures scavenging unhatched eggs (infertile eggs and those containing dead neonates) and eggshell membranes. Black Vultures (1-4) are present in most photograph-video combinations, two photograph-videos each show a single Turkey Vulture in company with 1-4 Black Vultures, and three photograph-videos reveal a single Turkey Vulture, but no Black Vultures. Because we were unable to distinguish individuals, and additional birds could have been present beyond the optical field of view, the number of vultures at the crocodile nest might well have been greater.

To briefly summarize the images in our series of photograph-videos, at 1642 hr on 2 July a single Turkey Vulture arrives at the nest, followed three minutes later by a single Black Vulture (1645 hr). Within two minutes additional Black Vultures begin to arrive and by 1649 hr, four Black Vultures are present together with the single Turkey Vulture. During this period (1642-1654 hr) the vultures can be seen walking around the nest site, investigating the nest cavity, and removing and consuming unhatched eggs and eggshell membranes (Figure 1). The Black Vultures also appear to be harassing the Turkey Vulture, which moves onto a downed snag and then departs at 1654 hr. From 1656-1725 hr, 1-4 Black Vultures continue searching the nest site and consuming unhatched eggs and eggshell membranes, which can be seen strewn about the nest site. A single spiny-tailed iguana (*Ctenosaura similis*) comes into view at 1718 hr and remains visible through the last photograph-video sequence taken at 1725 hr. Although often in close proximity to scavenging Black Vultures, no interactions between the two species are observed. Neither does the iguana appear to be scavenging at the nest, despite it being a likely predator of crocodile eggs and hatchlings (Charruau and Hénaut 2012). A lone Turkey Vulture returns to the nest site on 3 July (1628-1633 hr) and again on 5 July (1134 hr). During both visits, the Turkey Vulture briefly searched the nest site and then departed, presumably because the supply of eggs was exhausted by the initial group of feeding vultures. PC recovered the camera on 5 July, 73 minutes after the Turkey Vulture departed.

Our photographs and video suggest the crocodile nest was first detected by a Turkey Vulture, most likely by olfactory cues emanating from decomposing eggs, some of which contained dead neonates. Turkey Vultures possess a well-developed sense of smell and controlled experiments have demonstrated their ability to locate carrion solely by olfaction (Owre and Northington 1961, Stager 1964). Similarly, odors lingering at the nest site may have prompted brief visits by a lone Turkey Vulture on 3 and 5 July. We attribute the two-day lag between neonate emergence and arrival of the vultures to the fact that the decomposition of dead neonates had to be well underway before discernible odors were produced (Houston 1986). Turkey Vultures are also known to detect and exhume buried carrion (Smith et al. 2002, Platt and Rainwater, unpubl. data), an ability that no doubt aids in exploiting crocodile nests. Additionally, unearthed eggs and eggshell membranes left by the attending female crocodile may have provided visual cues that abetted vultures in detecting the nest.

The arrival sequence of Turkey and Black Vultures at the crocodile nest is best explained by their respective foraging strategies. Because Black Vultures have a poorly developed sense of smell and largely rely on visual cues when foraging, they generally fly higher than Turkey Vultures and follow them to carrion (Rabenold 1987, Buckley 1999). Although Turkey Vultures typically precede Black Vultures to a food source, the latter usually arrive quickly thereafter and in greater numbers (Rabenold 1987, Kirk and Mossman 1998, Buckley 1999), a sequence consistent with our photographs and video taken at the nest site. Once at a food source, continuous squabbling and frenzied feeding among Black Vultures often causes Turkey Vultures to leave the site (Kirk and Houston 1995, Buckley 1996). For these reasons, Black Vultures are regarded as the chief competitor of Turkey Vultures for carrion (Kirk and Mossman 1998, Buckley 1999).

Figure 1. Black Vulture (left) and Turkey Vulture (right) photographed with an automatic wildlife camera scavenging eggs from an American crocodile nest on Cozumel Island, Quintana Roo, Mexico. The nest is located in the shallow depression to the immediate right of the Black Vulture. Note eggshells and eggshell membranes scattered about the nest site.

Our observations appear to constitute one of the few reports of oophagy among Black and Turkey Vultures. In addition to crocodile eggs (Ross 1997; Rodriguez-Soberón et al. 2002, Somaweera et al. 2013; our study), Black and Turkey Vultures have been observed consuming the eggs of green turtles (*Chelonia mydas*) (Fowler 1979), and Turkey Vultures reportedly feed on eggs at pelagic seabird colonies (Kirk and Mossman 1998). The fact that oophagy has been so infrequently observed among vultures is somewhat surprising because eggs are a rich source of calcium, lipids, proteins, and water (Manolis et al. 1987; Congdon and Gibbons 1990; Noble 1991). Given these potential nutritional rewards, we consider it likely that oophagy has simply escaped notice by previous workers and is actually more widespread than the few published observations would suggest.

In conclusion, our observations of Black and Turkey Vultures scavenging American crocodile eggs at PSEP are noteworthy for several reasons. First, our observations complement previous accounts of vultures scavenging crocodilian eggs and neonates, and provide additional details on this under-reported behavior. Second, our findings are yet another example of how vultures can adjust foraging behaviors to best exploit available carrion resources. Indeed, this adaptability has probably contributed to the continuing northward range expansion of both species of vultures in North America (Rabenold 1989, Kelly et al. 2007). Finally, our study further highlights the utility of automated wildlife cameras for investigating poorly known aspects of vulture biology (see also Rollack et al. 2013).

This project was made possible through the generous support of the Fundación de Parques and Museos de Cozumel. Support for SGP was provided by Wildlife Conservation Society. We thank Deb Levinson and other library staff at

Wildlife Conservation Society for assisting us with obtaining literature. Comments by Lewis Medlock improved an early draft of this manuscript. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

LITERATURE CITED

Buckley, N. J. 1996. Food finding and the influence of information, local enhancement, and communal roosting on foraging success of North American vultures. Auk 113:473-488.

Buckley, N. J. 1999. Black Vulture (*Coragyps atratus*). The Birds of North America No. 411.

Charruau, P. and Y. Hénaut. 2012. Nest attendance and hatchling care in wild American crocodiles (*Crocodylus acutus*) in Quintana Roo, Mexico. Animal Biology 62:29-51.

Charruau, P., F. R. Méndez de la Cruz, and H. G. Cortés. 2011. Preliminary results of nesting ecology of *Crocodylus acutus* on Cozumel Island, Mexico. Crocodile Specialist Group Newsletter 30:29-32.

Congdon, J. D. and J. W. Gibbons. 1990. Turtle eggs: Their ecology and evolution. Pages 109-123 in Life history and ecology of the slider turtle (J.W. Gibbons, Editor). Smithsonian Institution Press, Washington, D.C.

Fowler, L. E. 1979. Hatching success and predation in the green sea turtle, *Chelonia mydas*, at Tortuguero, Costa Rica. Ecology 60:946-955.

González-Cortés, H. 2007. Estudio poblacional de *Crocodylus acutus* (Cuvier, 1807) en el Refugio Estatal de Flora y Fauna Laguna de Colombia, Cozumel, Quintana Roo, Mexico. Thesis, University of Veracruz, Córdoba, Mexico.

Houston, D. C. 1986. Scavenging efficiency of Turkey Vultures in tropical forest. Condor 88:318-323.

Kelly, N. E., D. W. Sparks, T. L. DeVault, and O. E. Rhodes, Jr. 2007. Diet of Black and Turkey Vultures in a forested landscape. Wilson Journal of Ornithology 119:267-270.

Kirk, D. A. and D. C. Houston. 1995. Social dominance in migrant and resident vultures at carcasses: Evidence for a despotic distribution? Behaviour, Ecology, and Sociobiology 36:323-332.

Kirk, D. A. and M. J. Mossman. 1998. Turkey Vulture (*Cathartes aura*). The Birds of North America, No. 339.

Manolis, S. C., G. J. W. Webb, and K. E. Dempsey. 1987. Crocodile egg chemistry. Pages 445-472 *in* Wildlife Management: Crocodiles and alligators (G.J.W. Webb, S.C. Manolis, and P.J. Whitehead, Editors). Surrey Beatty and Sons, Sydney, Australia.

Noble, R. C. 1991. Comparative composition and utilization of yolk lipids by avians and reptiles. Pages 17-28 *in* Physical influences on embryonic development in birds and reptiles (D. L. Deeming and M. W. J. Ferguson, Editors). Cambridge University Press, Cambridge, United Kingdom.

Owre, O. T. and P. O. Northington. 1961. Indication of the sense of smell in the Turkey Vulture, *Cathartes aura* (Linnaeus) from feeding tests. American Midland Naturalist 66:200-205.

Platt, S. G. and T. R. Rainwater. 2009. Noteworthy observations of foraging Turkey Vultures. Wilson Journal of Ornithology 121:839-841.

Rabenold, P. P. 1987. Recruitment to food in Black Vultures: evidence for following from communal roosts. Animal Behaviour 35:1775-1785.

Rabenold, P. P. 1989. Black and Turkey Vultures expand their ranges northward. Eyas 2:11-14.

Rodriguez-Soberón, R., M. Alonso Tabet and V. Berovides Alvarez. 2002. Nidificacion del Cocodrilo Americano (*Crocodylus acutus* Cuvier) en el Refugio de Fauna "Monte Cabaniguan", Cuba. Pages 135-156 in La Conservación y el Manejo de Caimanes y Cocodrilos de América Latina. Vol.2 (L.M. Verdade, and A. Larriera, Editors). CN Editoria. Piracicaba, Sao Paulo, Brazil.

Rollack, C. E., K. Wiebe, M. J. Stoffel, and C. S. Houston. 2013. Turkey Vulture breeding behavior studied with trail cameras. Journal of Raptor Research 47:153-160.

Ross, F. D. 1997. A geographically divided historical review of items about *Crocodylus acutus*, *Crocodylus moreletii* and *Crocodylus rhombifer* in volumes 1 to 9 (June 1971 to December 1990) of the I.U.C.N. Crocodile Specialist Group Newsletter; with notes about citing items, and about an expedition investigating Central American *Crocodylus*. Pages 150 to 181 in Proceedings of the 4th Regional Meeting of the IUCN Crocodile Specialist Group in Latin America. IUCN Publications, Gland, Switzerland.

Ruxton, G. D. and D. C. Houston. 2004. Obligate vertebrate scavengers must be large soaring fliers. Journal of Theoretical Biology 228:431-436.

Saul Sánchez, S. and C. F. Ortiz. 1998. Oil palm pests and pollinators in Tabasco, México. ASD Oil Palm Papers (Costa Rica) 18:25-28.

Smith, H. R., R. M. DeGraaf, and R. S. Miller. 2002. Exhumation of food by Turkey Vulture. Journal of Raptor Research 36:144-145.

Somaweera, R., M. Brien, and R. Shine. 2013. The role of predation in shaping crocodilian natural history. Herpetological Monographs 27:23-51.

Stager, K. E. 1964. The role of olfaction in food location by the Turkey Vulture (*Cathartes aura*). Los Angeles County Museum, Contributions in Science 81. Los Angeles, California.

Thorbjarnarson, J.B. 1989. Ecology of the American crocodile (*Crocodylus acutus*). Pages 228-258 in Crocodiles. Their Ecology, Management, and Conservation (P.M. Hall, Editor). IUCN Publications, Gland, Switzerland.

PAINTED REDSTARTS IN SOUTH TEXAS DURING 2013 AND 2014

Tim Brush[1]

Department of Biology, University of Texas-Pan American, 1201 West University Drive, Edinburg, TX 78539

Standing out for their vibrant colors even among the brightly colored warblers, Painted Redstarts (*Myioborus pictus*) breed in oak (*Quercus*) and pine (*Pinus*) forests and associated riparian areas in mountains of the southwestern United States, Mexico, and northern Central America (Barber et al. 2000). Their conspicuousness is enhanced when they use the bright white patches in their wings and tail in foraging, holding them partially open to cause potential prey insects to fly (Jablonski 1999). This "flush-chasing" may work best in the species' typical habitat of open forest, where the bird can pursue insects flushed from branches. In Texas, Painted Redstarts are rare summer residents in the Chisos and Guadalupe mountain ranges of the Trans-Pecos region (Lockwood and Freeman 2014). They breed regularly and occur year-round in oak forests of the Sierra Madre Oriental range of northeastern Mexico, about 150 km (94 miles) southwest of Falcon Dam. They are very rare migrants in lower elevations of the Trans-Pecos and casual migrants elsewhere in Texas. An individual wintered at Richmond, Fort Bend County, in the Upper Texas Coast region, in 2002-2003 (Lockwood and Freeman 2014). In Fall-Winter 2013-2014, a small number of Painted Redstarts were reported in southern Texas, where the species had not been known to winter.

I used eBird (www.ebird.org/tx), an electronic database, supplemented by information from other sources, to take a closer look at this "mini-invasion" in 2013 and 2014. Using eBird and listserves such as TexBirds, I attempted to determine the certainty of the discovery and disappearance dates, possible roles of weather and other factors in causing bird movements, and the impact of Painted Redstart searchers in finding other regional or seasonal rarities. The occurrence of birds in South Texas and nearby areas is plotted in Figure 1, with numbers corresponding to locations listed below. I have seen photographs of all individuals except the Lost Maples bird, and most are also available on eBird.

[1]E-mail: tbrush@utpa.edu

Localities referenced in text.

BIRDS SEEN IN SOUTH TEXAS, (2013-2014)

1. National Butterfly Center, Mission, Hidalgo County, August 22, 2013

Brandon Percival (accompanied by 10 others) discovered this Painted Redstart on August 22 at the butterfly center, which is 1 km east of Bentsen Rio Grande Valley State Park. It was sought but not found by a few birders for a few days immediately following. The site is visited most by butterfly enthusiasts, some of whom are also birders, but it is difficult to estimate the percentage overall who would notice birds. Since the bird disappeared so quickly, there was little time for visitors to find other rarities.

2. University of Texas-Pan American campus, Edinburg, Hidalgo County, October 13-November 13, 2013

This urban campus was very lightly birded in August, September, and early October 2013. I found the Painted Redstart during casual birding on 13 October. Given the rarity of the bird, many observers came to look for it, and observers peaked in early November, when the Rio Grande Valley Birding Festival was going on. A Tropical Parula (*Setophaga pitiayumi*) was discovered on 13 October by birders looking for the Painted Redstart, and one-two Black-throated Gray Warblers (*S. nigrescens*) were seen, beginning on 21 October. The redstart was usually seen foraging on its own, but on at least two occasions was seen in a mixed-species foraging flock, sometimes including the above species and uncommon-rare species such as Wilson's Warbler (*Cardellina pusilla*), Northern Parula (*S. americana*), Magnolia Warbler (S. magnolia), Black-throated Green Warbler (*S. virens*), and American Redstart (*S. ruticilla*). The Painted Redstart foraged often in live oaks (*Quercus virginiana*, the dominant tree on campus), but also in other trees and shrubs. Sometimes the bird was seen foraging on the ground and on the brick and cement surfaces of the covered walkway. The presence of abundant snout butterflies (*Libytheana carinenta*) and other lepidopterans may have encouraged it and other warblers noted above to remain, although butterflies and moths were still fairly common even after the Painted Redstart left. The redstart was seen on at least 15 dates until the last observation date. This bird may have been present before 13 October, given the lack of birding effort in early fall. I believe that it likely left on 13 November or very shortly thereafter, given the very open habitat and intensive efforts of birders to find it and other rare warblers—the Tropical Parula was last reported on 25 December, and one of the Black-throated Gray Warblers was seen through 02 February 2014. There was no striking weather change around the time of departure.

3. Falfurrias area, TX: rest area along US Highway 281, Brooks County, October 18, 2013-March 18, 2014

This rest stop is in the live-oak belt of the South Texas sand plains, is tree-shaded and has a very open understory around rest-room buildings and picnic tables in the highway median strip. There were just a few visits reported from the site on eBird before the bird's discovery—one in August, none in September, and none in October until the 18th. It was discovered on 18 October, by birders (Corey Lange and 5 others) who had visited the Lower Rio Grande Valley to see other rare warblers, including the UTPA Painted Redstart mentioned above, and a Golden-crowned Warbler (*Basileuterus culicivorus*) at Frontera Audubon Society's sanctuary in Weslaco (Hidalgo County). Other rare birds found by birders, many of whom were searching for the redstart, include Bald Eagle (*Haliaeetus leucocephalus*, flying over on 14 December), American Redstart (19 October), and Western Tanager (*Piranga ludoviciana*; 10 and 21 November). The Painted Redstart was noted foraging in live oaks, grape vines (Vitis sp.), on the ground (up to 25% of time on 26 November), and on rest area structures (picnic tables, brick walls). It was occasionally noted foraging with other birds, but there were no regular mixed-species flocks seen in this area. The rest area was regularly birded from discovery to departure, with a dip in late December and early January. After the last sighting, birders continued to visit frequently through the end of March, with observer numbers gradually dropping off in April and May. This individual may have been present before 18 October, but I am reasonably confident of the departure date. There was no significant weather change around March 18.

September 20, 2014-December 31, 2014

There were four visits reported on eBird in August and one in September before the bird was seen. I saw an individual on 20 September, loosely associated with a flock of 4 Eastern Bluebirds (*Sialia sialis*), while I was returning from the HummerBird Celebration in Rockport-Fulton. It was in the same area that the previous winter's bird was seen. Given the species' general rarity, I think this is probably the same individual returning for a second winter. It has been seen by many observers through 20 February 2015. Other unusual birds noted included "Audubon's" Yellow-rumped Warbler (*Setophaga coronata audubonii;* 10 October-05 January; maximum 8 individuals on 26 October), Scarlet Tanager (*Piranga olivacea*; 01 and 14 October), and Western Tanager (01 October-20 November). Foraging and flocking behavior was generally the same as noted in the previous winter. Some observers noted it singing a "soft song."

4. Aransas National Wildlife Refuge visitors center, Aransas County, December 8, 2013-January 26, 2014

This redstart was discovered on 08 December 2013, by David True, a refuge employee who had regularly birded the area for several months beforehand. This bird was observed in the area immediately surrounding the refuge visitors center, an open forest of mainly consisting of live oak and blackjack oak (*Q. marilandica*) and post oak (*Q. stellata*). The bird sometimes defended Yellow-bellied Sapsucker (*Sphyrapicus varius*) sap wells in oak trees, chasing off Ruby-crowned Kinglets (*Regulus calendula*) and Yellow-rumped Warblers. The redstart was seen regularly in mixed-species flocks with Ruby-crowned Kinglets, Yellow-rumped Warblers, and sometimes other small birds. The bird was noted as being very tame and often foraged very close to observers. Observers attracted to the redstart found a Baltimore Oriole (*Icterus galbula*; 12-28 December) and a Red-headed Woodpecker (*Melanerpes erythrocephalus*; (10 October-07 April), both rare for the area (Baltimore Oriole is a common migrant but very rare in winter). The Painted Redstart was last seen on 26 January 2014. Fairly regular birding continued through February and early March. I am fairly confident of both the discovery and disappearance dates, given the frequent visitation in this regularly-birded refuge. There was no significant weather event around 26 January.

5. Private ranch, Calhoun County, December 19, 2013

An individual was discovered by Bob Friedrichs during the Guadalupe Delta Christmas Bird Count. It was foraging in live oaks around the main ranch house. Since the ranch is not otherwise open to birders, the bird's actual arrival and departure dates are completely unknown.

6. Bentsen-Rio Grande Valley State Park, Hidalgo County, August 5-6, 2014

This park is regularly visited by birders throughout the year. Gregory Askew found a bird in open thorn forest near a resaca (isolated oxbow) lake on 05 August, and Tiffany L. Kersten heard the bird calling $<$ 0.5 km the following day. This was evidently a transient migrant, as other observers failed to find it on the following days.

7) Coast of Cayo de Grullo bay, Kleberg County, September 17, 2014

Glenn Perrigo saw an individual in his yard, about 28 km southeast of Kingsville, on the evening of 17 September. The habitat was described as open live-oak "forest" with surrounding mesquite and pasture areas. It was not seen again, despite the regular presence of the observer.

BIRDS SEEN ELSEWHERE IN TEXAS EAST OF THE PECOS RIVER, 2013-2104

Private ranch, Kerr County, May 25-July 10, 2013

The owners of a private ranch about 18 km W of Kerrville observed a Painted Redstart during 25-28 May. It was recorded singing on 30 May and 30 June (fide Tony Gallucci). A juvenile and an adult were seen in the same location on 10 July. The ranch is along the South Fork of the Guadalupe River and is described as a well-wooded, mesic canyon. As far as I know, this is the first Texas breeding record outside the Trans-Pecos.

Lost Maples State Natural Area, Bandera County, April 20-26, 2014

This park is birded fairly lightly, with most observers probably looking for Golden-cheeked Warblers (*Setophaga chrysoparia*) or Black-capped Vireos (*Vireo atricapilla*) or enjoying the unique forest. David Kalina saw an individual along the Sabinal River in a thin strip of riparian forest, and the bird was re-sighted on 26 April by Matt Heindel. There were only 8 eBird checklists from the park in May, and I do not know if the specific area was visited.

DISCUSSION

The number of Painted Redstarts seen during 2013-2014 in South Texas seems higher than one would expect. It is hard to know for certain, as more observers use eBird, and overall communication of rarities is always improving. However, given that some of the birds occurred in heavily birded areas such as Bentsen-Rio Grande Valley State Park and Aransas National Wildlife Refuge, it is likely that the increase is real but modest. Observers looking for reported Painted Redstarts found a variety of other seasonal or regional rarities, such as wintering warblers and tanagers. This is another example of the "Patagonia picnic table" effect, where birders attracted to a lightly-birded roadside rest stop by reports of Rose-throated Becards (*Pachyramphus aglaiae*) found other rarities such as Five-striped Sparrows (*Amphispiza quinquestriata*) and Thick-billed Kingbirds (*Tyrannus crassirostris*; Kaufman 2006).

The successful breeding attempt of Painted Redstarts in Kerr County, within the Edwards Plateau region of central Texas in 2013, is unprecedented. Although a nest was never found, the report of a juvenile indicates successful nesting. The Lost Maples bird of 2014 was in suitable nesting habitat but evidently did not stay long enough to nest. From the late April date, it may have been a migrant. Given the large amount of private land containing potentially suitable habitat in the Edwards Plateau, there may be more breeding pairs present in that region of Texas as well as in the highest mountains of the Trans-Pecos region.

Taking a broader look across Texas, at least one pair of Painted Redstarts bred successfully in Boot Canyon of the Chisos Mountains in 2013 and 2014 (pair and at least one juvenile in June 2013; pair feeding young in the nest on 15 May 2014). The species has been a regular breeder in the Chisos Mountains since 2002 (Lockwood and Freeman 2014). In 2013, a pair bred successfully in Jobe Canyon of the Davis Mountains (at least two juveniles were seen in very early August; Mark Lockwood, pers. comm.), where they are considered "annual" in recent years (Lockwood and Freeman 2014). Painted Redstarts continued as rare migrants from low-elevation sites in the Trans-Pecos and adjacent southeastern New Mexico. Overall, these observations reflect the continuation of a very small breeding population in the Trans-Pecos region, plus a scattering of sightings of migrants.

In all cases in South Texas where the bird stayed for more than one week, the habitat was open oak forest, in some cases somewhat more mesic (moist) than is typical. Individuals visited water features at UTPA and the Brooks County rest area. Birds were seen foraging actively, hawking, gleaning and hovering to capture insects. Observers noted more typical warbler gleaning from foliage and twigs, as well as the more active flush-chasing. This fits known habitat preferences and foraging behavior (Marshall and Balda 1974, Jablonksi 1999, Jablonski and McInerney 2005, Lockwood and Freeman 2014). In no cases were birds seen going to feeding stations (as noted by Barber et al. 2000), and no mention was made of feeding stations being present in any areas. As noted in Mexican studies, Painted Redstarts sometimes forage with mixed-species flocks, and sometimes singly (King and Rappole 2000).

Observers at UTPA and the Brooks County Rest Area frequently noted the Painted Redstart landing on and foraging from bricks of various structures such as walls and other support structures. This use of artificial surfaces has not been recorded in the literature. In addition, the defense of Yellow-bellied

Painted Redstart photographed by Joe Fischer at Aransas National Wildlife Refuge

Sapsucker sap wells seen in the Aransas bird has not been reported. In Arizona, birds have been seen consuming sap and sugar water and defending natural sap flows against other birds (Barber et al. 2000).

More Painted Redstarts were reported in South Texas in 2013 and 2014 than in previous years. This may represent a true increase in the very small Texas population. Given the tendency of the species to occur as far as British Columbia, Massachusetts, and Baja California Sur, more wandering birds can be expected. Thanks to all observers who reported their sightings.

LITERATURE CITED

Barber, D. R., P. M. Barber, and P. G. Jablonski. 2000. Painted Redstart (*Myioborus pictus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu.bnaproxy.birds.cornell.edu/bna/species/528doi:10.2173/bna.528.

Jablonski, P. G. A rare predator exploits prey escape behavior: the role of tail-fanning and plumage contrast in foraging of the Painted Redstart. Behavioral Ecology 10: 7-14.

Jablonski, P. G., and C. McInerney. 2005. Prey escape direction is influenced by the pivoting displays of flush-pursuing birds. Ethology 111: 381-396.

Kaufman, K. 2006. Kingbird highway: the biggest year in the life of an extreme birder. Houghton Mifflin, Boston, MA.

King, D. I., and J. H. Rappole. 2000. Winter flocking of insectivorous birds in montane pine-oak forests in Middle America. Condor 102: 664-672.

Lockwood, M. W., and B. Freeman. 2014. The TOS handbook of Texas birds, 2nd ed. Texas A&M University Press, College Station, TX.

Marshall, J., and R. P. Balda. 1974. The breeding ecology of the Painted Redstart. Condor 76: 89-101.

THE BREEDING STATUS OF BROAD-BILLED AND WHITE-EARED HUMMINGBIRDS IN TEXAS

Kelly B. Bryan[1], Maryann Eastman[2] and Marc Eastman[3]

[1]P. O. Box 786, Fort Davis, Texas 79734
[2,3]101 Deer Run Trail, Fort Davis, Texas 79734

Eighteen species of hummingbirds appear on the official Texas list (Bryan, et al. 2006, Lockwood and Freeman, 2014). Of these, seven species regularly nest in the state, and one species, Anna's Hummingbird (*Calypte anna*), has nested only three times (Bryan 2014). Regular nesting species include Blue-throated (*Lampornis clemenciae*), Magnificent (*Eugenes fulgens*), Lucifer (*Calothorax lucifer*), Ruby-throated (*Archilochus colubris*), Black-chinned (*Archilochus alexandri*), Broad-tailed (*Selaphorus platycercus*), and Buff-bellied Hummingbird (*Amazilia yucantanensis*). Broad-billed Hummingbird (*Cynanthus latirostris*) was reported nesting in Texas four times from 1934 to 1941. It is now considered a rare but regular visitor to Texas and since 1999 has become a local summer resident in the Davis Mountains in Jeff Davis County (Bryan and Karges 2001, Lockwood and Freeman 2014). In 2003, it was removed from the Texas Bird Record Committee's (TBRC) "Review List" of rare species requiring documentation. Despite its regular occurrence in Texas in summer, no contemporary nesting records existed prior to 2008. White-eared Hummingbird (*Hylocharis leucotis*) remains on the TBRC "Review List". Since 1993, however, it has occurred almost annually in a remote portion of the Davis Mountains (Bryan and Karges 2001, Lockwood and Freeman 2014). Breeding had been suspected in that area due to the presence of multiple males and females in summer, but prior to 2009 no specific documentation existed to substantiate that status. In 2007 Bryan initiated a broad-based hummingbird banding research project that has been instrumental in determining the status and distribution of all the species found in the region. The Eastmans joined this effort in 2009. Herein we report the status and recent evidence of breeding in both Broad-billed Hummingbird and White-eared Hummingbird in Texas.

BROAD-BILLED HUMMINGBIRD HISTORY AND STATUS

The Broad-billed Hummingbird generally ranges from central Mexico north to the southwestern portions of the United States; it is resident throughout its breeding range except in northern Mexico and the US (Howell and Webb 1995, Powers and Wethington 1999, Williamson 2001). The species was added to the Texas list on 17 May 1934 on the basis of a reported nest with eggs near the Rio Grande at the Johnson Ranch, 8 miles southeast of Castolon, Brewster County, Texas (Quillin 1935, Van Tyne and Sutton 1937, Oberholser 1974). Subsequent observational reports, all including nesting activities and all from Brewster County, include an adult on a nest in Alpine, 15-25 June 1940; a nest with two young near Boquillas on the Rio Grande, 21 July 1940; and an adult feeding young at Hot Springs on the Rio Grande 26 July through 1 August 1941 (Oberholser 1974). Despite these convincing reports no documentation of any kind was obtained.

The American Ornithologists Union (1995) lists the Texas status of Broad-billed Hummingbird as "casual breeder from Brewster County with scattered other records from central and eastern Texas". Prior to its removal from the TBRC "Review List", accepted records from the state included four from coastal Texas, seven from south Texas, three from east Texas, eight from central portions of the state and the Hill Country, and thirty-two from west Texas. Post 1941 historical

[1]E-mail: kelly.b.bryan@gmail.com

records (all undocumented) listed by the TBRC include ten reports from Big Bend National Park, one report each from Alpine and Presidio, two from Jeff Davis County and one from McAllen in Hidalgo County. The first fully recognized record for the species in Texas appears to be an adult male observed in Bentsen State Park, Hidalgo County on 23 June 1962 by H. P. Langridge (Webster 1962, Oberholser 1974).

Since 1993, a majority of the records in Texas have been reported from the Davis Mountains, an extensive mountain range in Jeff Davis County in the central portion of the Trans-Pecos region of west Texas. For elevations above 5,000 feet, the Davis Mountains cover approximately 1,500 square miles, and the habitat includes extensive montane woodlands. Most notable was an adult male that spent the spring and early summer at Bryan’s residence in Fort Davis (N30˜35.3’ W103˜53.8’), five out of six years from 1998 to 2003 (TBRC 2014). Then, in 2004, multiple individuals started showing up at the Eastman’s residence (N30˜37.2’ W104˜06.6’) in the heart of the Davis Mountains. The Eastman’s property is situated in an oak, pinyon, and juniper woodland at an elevation of 5,800 feet. Primary tree species there are gray oak (*Quercus grisea*), Emory oak (*Quercus emoryi*), Mexican pinyon (*Pinus cembroides*) and alligator juniper (*Juniperus deppeana*). The peak number of Broad-billed individuals, based on careful observation, was five in 2008, including three males and two females. On 20 August of that year Maryann photographed a juvenile Broad-billed Hummingbird that likely fledged from a local nest; however, those photographs were not able to show one of the key characteristics to determine a juvenile hummingbird’s exact age—the extent of grooving or corrugations in the upper mandible (Ortiz-Crespo 1972).

Finally, in 2010, all of the pieces of the breeding puzzle came together. Once again, male and female birds were present at their residence. In April, Marc and Maryann noted a female bird plucking cotton from a wire cage designed to provide nesting material for hummingbirds. An area search in the vast woodland surrounding their residence proved futile; however, during a banding session there on 10 June, two just-fledged juvenile birds were captured, banded and photographed, providing conclusive evidence that successful breeding had occurred. The two birds, one a male and one a female, were less than a week out of the nest and exhibited extensive fledgling characteristics including fresh plumage, fleshy gapes, and fully grooved bills (Pyle 1997). These birds continued coming to the feeders at that location for several weeks following their capture and banding. In fact, the juvenile male was recaptured almost a month later on 8 July 2010. The only other individual that was subsequently recaptured was an adult female that was originally banded on 6 May 2010 and recaptured on 22 Sep 2011. In total, eleven Broad-billed Hummingbirds have been captured and banded during the current study (Table 1).

Figure 1. (top to bottom) Adult male BBLH, female BBLH collecting cotton, juvenile female BBLH. Photo by Maryann Eastman.

Table 1. Broad-billed (BBLH) and White-eared (WEHU) Hummingbird banding data

Species	Band No.	Date	Location	Age	Sex	Wing	Tail	Culmen	Weight
BBLH	H48609	8 May 2009	Eastman residence	AHY	M	49.76	32.0	20.18	3.17
BBLH	H48610	28 May 2009	Fort Davis – Bryan residence	AHY	F	49.62	36.0	21.01	3.68
BBLH	L37801	6 May 2010	Eastman residence	AHY	F	49.21	30.0	19.73	3.16
BBLH	L37802	28 May 2010	Eastman residence	AHY	M	52.72	30.0	20.62	3.02
BBLH	L37804	10 Jun 2010	Eastman residence	HY	F	50.96	31.0	21.38	2.95
BBLH	L37805	10 Jun 2010	Eastman residence	HY	M	50.31	32.0	20.66	3.54
BBLH	L37806	15 Jul 2010	Eastman residence	AHY	F	49.65	30.5	21.49	3.20
BBLH	L40926	4 May 2011	Bryan cabin	AHY	M	51.23	33.0	20.52	3.54
BBLH	L40927	11 May 2011	Bryan cabin	AHY	M	49.28	30.0	18.76	n/a
BBLH	L40928	25 Jun 2011	Fort Davis – Bryan residence	AHY	F	51.11	30.0	22.72	3.20
BBLH	P04197	8 Jan 2014	Lajitas (Brewster County)	AHY	F	48.96	30.0	22.77	3.53
WEHU	R98801	13 Aug 2007	Bryan cabin	SY	M	53.01	34.0	16.53	3.86
WEHU	R98802	13 Aug 2007	Bryan cabin	SY	M	55.08	32.0	18.24	4.26
WEHU	R98803	13 Aug 2007	Bryan cabin	SY	F	52.04	30.0	16.92	3.33
WEHU	R98804	13 Aug 2007	Bryan cabin	SY	F	50.80	31.5	18.52	3.47
WEHU	R98805	13 Aug 2007	Bryan cabin	SY	M	55.01	33.0	18.10	3.92
WEHU	R98806	13 Aug 2007	Bryan cabin	SY	F	51.39	32.5	19.19	3.93
WEHU	H48611	29 May 2009	Bryan cabin	AHY	F	51.83	32.5	17.11	3.78
WEHU	H48612	9 Jun 2009	Bryan cabin	ASY	M	55.89	35.5	18.49	3.91
WEHU	H48613	26 Jun 2009	Bryan cabin	ASY	M	54.67	33.0	16.90	3.90
WEHU	H48614	9 Aug 2009	Bryan cabin	HY	M	56.94	35.0	17.40	3.94
WEHU	H48615	8 Sep 2009	Bryan cabin	HY	M	55.87	35.0	18.91	3.99
WEHU	H48669	28 Jun 2010	Bryan cabin	SY	F	50.21	33.0	21.93	3.38
WEHU	H48673	28 Jun 2010	Bryan cabin	ASY	M	57.40	36.0	18.28	3.75
WEHU	H48674	16 Jul 2010	Bryan cabin	SY	F	51.61	32.5	17.53	3.55
WEHU	H48675	16 Jul 2010	Bryan cabin	ASY	M	55.10	35.0	18.27	4.14
WEHU	H48676	27 Jul 2010	Bryan cabin	SY	M	55.01	35.5	17.69	3.96
WEHU	J08032	20 Aug 2014	Bryan cabin	SY	M	56.60	36.0	17.83	4.15

Lat-longs: Fort Davis N30˜35.3’ W103˜53.8’, Lajitas N29˜15.6’ W103˜53.8’, others listed previously.
Measurements in millimeters; weights in grams.

WHITE-EARED HUMMINGBIRD HISTORY AND STATUS

White-eared Hummingbird is primarily a resident species that occurs from Nicaragua north to the southwestern United States; altitudinal migration on a seasonal basis (in pursuit of shifting nectar resources) occurs throughout much of the bird’s primary range (Howell and Webb 1995, Williamson 2001, Arizmendi et al. 2010). However, populations entering the US in summer withdraw in fall and winter. This species was added to the Texas list on the basis of a specimen that was collected by T. F. Smith in the Chisos Mountains of southern Brewster County, along the trail between Boot

Spring and Laguna Meadow on 7 July 1937, in what is now Big Bend National Park (Oberholser 1974). The AOU (1995) lists the species as "resident (*error?-summer resident)* from southern Arizona, and recorded irregularly in summer (and probably breeding) in the mountains of southwestern New Mexico (Animas Mountains) and western Texas (Big Bend, Guadalupe Mountains)." Of the thirty-five accepted records for Texas, only four exist from locations outside of the Trans-Pecos region. Historical records within the region include sight observations from the Chisos Mountains in Big Bend National Park from July 1953, April 1963, and 17 July through 13 August 1967 (Wauer 1996). However, prior to 1993 only three documented records existed for Texas. In addition to the 1937 specimen the two other records were a bird present and photographed in Rio Grande City, Starr County from 14-16 July 1990 (Lasley and Sexton 1991) and a bird observed in Guadalupe Mountains National Park, Culbertson County, on 7 June 1991 (Lasley and Sexton 1991). Then in June 1993, Bryan was notified by Pansy Espy of Fort Davis that White-eared Hummingbirds were coming to feeders at the private residence of Clyde and Ruth Ann Smith in a remote canyon in the heart of the Davis Mountains. Ruth Ann stated that the birds showed up at some time in mid-May and Bryan was able to photograph three different individuals (including two adult females) in that area starting on 20 June (Lasley and Sexton 1993, Bryan and Karges 2001). Not only was this the first report of multiple individuals in the State, but one bird was clearly a sub-adult bird based on plumage characteristics (Williamson 2001). Albeit, the photographs were unable to discern any specific juvenile features, and evidence of breeding was mere speculation at the time.

From 1993 through 2005 White-eared Hummingbirds were observed on a fairly regular basis in that area of the Davis Mountains, primarily arriving in May and staying through early September. The only years without reports were 1998, 1999 and 2001. In 2005 Bryan was able to purchase some land nearby (N30˜37.6' W104˜07.9') and soon afterwards began capturing and banding hummingbirds there as part of the larger regional banding study mentioned previously. The habitat on the property was a mixture of ponderosa pine (*Pinus ponderosa*) with an understory of silver-leaf oak (*Quercus hypoleucoides*), Mexican pinyon, alligator juniper and Texas madrone (*Arbutus xalapensis*) at an elevation range from 6,200 ft. to 7,000 ft. The timing could not have been better because 2007 was a banner year for the species. An unprecedented fifteen or so individuals were observed and photographed during that summer (Lockwood et al. 2008). Many birds were clearly not adult birds, but were they juveniles? On 14 August 2007, Bryan along with Bob and Martha Sargent of Clay, Alabama set up for a banding session and captured six different White-eared Hummingbirds among fifty-five hummingbirds caught that day. The three males and three females caught and banded were all clearly sub-adult birds but lacked any juvenile characteristics that would help substantiate local breeding. All birds were judged to be SY (second year) individuals; they were clearly in full pre-basic molt (not post-juvenile molt), and their upper mandibles completely lacked corrugations (bill grooving). The birds in hand had almost certainly fledged from nests in 2006, but from where? Evidence was mounting that white-eareds were breeding in the Davis Mountains; yet critical details were missing.

In 2008 only a few White-eareds returned to the Davis Mountains and none were captured and banded. All that changed in 2009. First, an adult female was captured and banded on 29 May; for the first time evidence of breeding was in hand. She was clearly gravid (carrying an egg in her abdomen). Next, adult males were caught on 9 June 2009, 26 June 2009, and 3 July 2009. All were ASY (after second year) individuals, and the latter bird was previously banded. Bird #R99899 was one of the SY male birds initially banded in August of 2007, and for the first time we could confirm that birds returned to this area in consecutive years. Finally, on 9 August 2009 and again on 8 September 2009, just fledged juvenile birds were captured and banded. Both were males and were in fresh juvenile plumage with no molt present. Furthermore, both birds had fleshy gapes and their bills had 100% grooving. Both birds clearly fledged from nearby nests, likely within one week of their capture. The total number of White-eared Hummingbirds captured and banded during the current study is seventeen (Figure 2).

DISCUSSION

Unfortunately, both of the above species were affected by a devastating climatic event in West Texas that started in the fall of 2010. A severe

Figure 2. (top to bottom) Adult male WEHU, juvenile male WEHU in hand, juvenile male BBLH in hand. Photo by Kelly Bryan.

drought that peaked in 2011 enveloped most of the state, and was not broken (at least in West Texas) until the summer of 2012. In the upper elevations of the range, drought-killed trees were common. Then two additional events worked together to change the habitat in the Davis Mountains for the duration of our lifetimes. First, three severe wildfires burned through much of the mountain range, the first two (the Rockhouse and Tejano Canyon fires) in the spring and summer of 2011, and one (the Livermore Ranch fire) in the spring of 2012. These fires burned much hotter than normal, enhanced by the ongoing extreme drought conditions existing at the time. It was not uncommon for these fires to "crown" out in 100-foot tall trees, incinerating thousands of acres of woodland habitat. Then, the western pine-bark beetle moved in and attacked many of the remaining stands of ponderosa pine that managed to survive the drought and fires. In some areas the beetles killed 95% of living trees. Perhaps as a primary result of these three factors, Broad-billed Hummingbird observations were reduced to just a few scattered sightings in 2011, only two females in 2012, one male in 2013 and two birds (one male and one female at separate locations) in 2014. White-eared Hummingbird observations were reduced to one brief sighting in 2011, none in 2012, and a two-day observation in 2013. In 2014, it was encouraging to find three different individuals present at times from late May through early September. Time will tell whether or not these two species return to their pre-2011 status.

ACKNOWLEDGMENTS

Funding for this banding study provided (in-part) by West Texas Avian Research, Inc. Primary funding sources include donations and grants from private individuals, the Hummer/Bird Study Group, Inc. of Clay, Alabama, and the Ed Rachel Foundation of Corpus Christi, Texas. These data could not have been collected without the effort and support of our banding team that includes the authors, Donna Bryan, Carolyn Ohl-Johnson and other occasional helpers. Finally, we extend our thanks to Tony Gallucci and Fred Bassett for reviewing the manuscript and providing suggestions to improve its content.

LITERATURE CITED

American Ornithologists Union. 1998. The A.O.U. Checklist of North American Birds, seventh edition, as currently supplemented. Allen Press, Inc. Lawrence, Kansas.

Arizmendi, M. C., C. Rodriguez-Flores and C. Soberanes-Gonzalez. 2010. White-eared Hummingbird (*Hylocharis leucotis*), Neotropical Birds Online (T. S. Schulenberg, Editor). Ithaca: Cornell Lab of Ornithology

Bryan, K. B. 2002. Birds of the Trans-Pecos: A Field Checklist. Natural Resources Program, Texas Parks and Wildlife. PWD BK P4000-809.

Bryan, K. B. 2014. Hummingbirds of West Texas; A Quick Reference Guide to Status and Distribution. In www.westtexashummingbirds.com. ©1999, revised 15 January 2014.

Bryan, K. B. and J. P. Karges. 2001. Recent Bird Records in the Davis Mountains. Texas Birds 3: 40-53.

Bryan, K., T. Gallucci, G. Lasley, M. Lockwood and D. H. Riskind. 2006. A Checklist of Texas Birds, seventh edition. Natural Resource Program, Texas Parks and Wildlife Department, Austin, Texas. Technical Series No. 32.

Howell, S. N. G. and S. Webb. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford: Oxford University Press.

Lasley, G. W. and C. Sexton. 1991. American Birds 45: 1137-1139.

Lasley, G. W. and C. Sexton. 1993. American Birds 47: 1126-1127.

Lockwood, M. W., R. Pinkston and R. Weeks. 2008. American Birds 61: 610-611.

Lockwood, M. W. and B. Freeman. 2014. The TOS Handbook of Texas Birds, Second Edition, Revised. Texas A&M University Press, College Station, Texas.

Oberholser, H. C. 1974. The Bird Life of Texas. Edited by Edgar B. Kincaid, Jr. Austin: University of Texas Press (Corrie Herring Hooks Series # 1).

Ortiz-Crespo, F. I. 1972. A new method to separate immature and adult hummingbirds. Auk 89: 851-857.

Powers, D. R. and S. M. Wethington. 1999. Broad-billed Hummingbird (*Cynanthus latirostris*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology.

Pyle, P. 1997. Identification Guide to North American Birds, Part I, *Columbidae* to *Ploceidae*. Slate Creek Press, Bolinas, California.

Quillin, R. W. 1935. New bird records from Texas. Auk 52: 324-325.

Texas Bird Records Committee. 2014. Rare Birds of Texas—Master List of Review Species. Texas Ornithological Society.

Van Tyne, J. and G. M. Sutton. 1937. The Birds of Brewster County, Texas. Michigan Museum of Zoology Miscellaneous Publication No. 37.

Wauer, R. H. 1996. A Field Guide to the Birds of the Big Bend, second edition. Gulf Publishing Company, Houston.

Webster Jr., F. S. 1962. Audubon Field Notes 16: 492.

Williamson, S. L. 2001. A Field Guide to the Hummingbirds of North America. The Peterson Field Guide Series, Houghton Mifflin Co., New York.

FORGOTTEN TREASURE: THE ONLY SINGLE-STATE FIELD GUIDE BY ROGER TORY PETERSON

Randy Pinkston[1]

3505 Hemlock Court, Temple, TX 76502

Old field guides fascinate me. Especially old Peterson guides. The Peterson Texas guide was my first serious bird book—a Christmas gift from my aunt and uncle in 1971. My copy was a revised edition from 1963 and involved National Audubon sponsorship. It had the typical Peterson guide green cloth cover adorned with a Golden-cheeked Warbler. From that book I first learned the names of familiar species where I grew up on the upper Texas coast. Included were Louisiana Heron, Marsh Hawk, Upland Plover, Long- and Short-billed Marsh Wrens, and Water Pipit. Many years later I received the precursor to my first Peterson guide—the original one and only single-state field guide from 1960. That earlier book is the subject of this article.

While preparing the article I soon discovered that the book and its interesting history had been largely forgotten in the modern media era. Let's roll back the clock more than fifty years to a time when Peterson enjoyed a virtual monopoly on field guides. Of course, his guides enjoyed wide acclaim since they first appeared in 1934, but also Richard Pough's excellent guides were no longer in print and the Golden Guide by Chandler Robbins et al. had not yet come along. As early as 1954, and at the

[1]E-mail: drpinkston@sbcglobal.net

urging of the newly-formed Texas Ornithological Society (TOS), the commissioners of the Texas Game & Fish Commission (predecessor of today's Texas Parks & Wildlife Dept) approved a proposal that Peterson prepare a special field guide for Texas. This request was not, according to Peterson, to relieve Texas birders of that day from carrying two bird books—"one in each side pocket"—but rather an idealistic aim to begin "taking stock" of the state's wildlife resources so that they might be more wisely administered. Influential figures with the Game & Fish Commission were Howard Dodgen, Executive Director, and Everett T. Dawson, Director of Information and Education.

A sum of $60,000 was budgeted and, as with earlier Peterson guides, Houghton Mifflin Company would publish the new book with an initial run of 25,000 copies. Each copy had its "serial number" stamped in red ink on the front endpaper among Peterson's classic "Roadside Silhouettes" (Fig. 1). I now have two copies, nos. 1077 and 13153. (What is your number?) The asking price in 1960 was $3 postpaid (less than a latte nowadays!) and guides were available only by direct order from the Game & Fish Commission.

By all accounts the guide was immensely popular from the get-go among state and out-of-state birders alike. From a *Time* magazine review dated May 2, 1960, "Without advertising, and despite a sales system that seems designed to discourage all but the most determined customers, the *Texas Field Guide* has sold more than 6,000 copies—better than some bestselling novels."

Texas birders were thrilled and honored that Peterson would write a new guide covering only their state—the largest in avifauna if not in size.

Figure 1. Serial number stamped inside front cover of each copy.

Not surprisingly, the guide was valuable to birders working in adjacent New Mexico and southeast Arizona.

The guide's orange cloth cover is unique and the choice of a Gambel's Quail silhouette to adorn the cover is puzzling—perhaps a tilt to sportsmen rather than birders? Otherwise, the book is easily recognizable as a typical Peterson guide of that era—same general impression of size, shape, and so on (Fig. 2). The handsome gray dust jacket is illustrated with Whooping Crane, meadowlark, and scissor-tail. The guide covers 542 species of Texas birds, including 487 "regulars" and 55 "accidentals." The latter category is introduced in the text as "extremely unlikely that you will see any of these species in Texas," an amusing claim since several avid birders today have seen over 500 species in a single year! Included among the "accidentals" are Lesser Black-backed Gull, Anna's & Calliope Hummingbirds, Clay-colored Robin, and Hermit Warbler. None of these species today is worthy of "review" status. Nevertheless, perhaps without realizing it, Peterson's 1960 guide contains the state's earliest "Review List."

The regular species accounts differ little from those in Peterson's earlier eastern and western guides, including descriptions of field marks, similar species, vocals, habitat, and nest. Included among the regular species are Blue Goose and Mexican Duck, Harlan's Hawk, two flicker species, two Bushtit species, Audubon's and Myrtle Warblers, and three junco species. On the other hand, for those who worry that lumpers prevail in the modern era, the book lists only one species of *Aechmophorus* grebe and single Screech Owl, Whip-poor-will, Tropical-type Kingbird, Traill's and Western Flycatchers, Solitary Vireo, and Rufous-sided Towhee. Further, there are only two sapsucker species and Boat-tailed Grackle comprises both Boat-tailed and Great-tailed today. Other species seem downright bizarre by today's standards, e.g. Chukar and Coturnix (Migratory Quail), but were the focus of active introduction efforts in that day.

It is probably not an exaggeration that from its release in January 1960 through the early 1970s the Peterson Texas guide was the most complete and best-known reference covering the birds of Texas. Back in the day there were few published references on the state's birdlife. *The Bird Life of Texas* was still a work in progress when Oberholser died in 1963. Not until 1974 did that work appear under the editorial care of Edgar Kincaid. Peterson consulted state checklists by Strecker (1912) and Col. L.R. Wolfe (1956), in addition to numerous county and regional checklists. He combed the published literature of that day for anything pertaining to Texas records. Though the Texas Bird Records Committee wasn't formed until 1972, Peterson formed a sort of ad hoc committee with Edgar Kincaid and relied heavily on him for advice as to which records should be included "with caution" and which were "unsanitary."

The book's acknowledgements are extensive and include a lexicon of prominent Texas birders of the day—Edgar Kincaid and Colonel Wolfe already mentioned, Irby Davis, Connie Hagar, Arlie McKay, Warren Pulich, Fred Webster, George & Stephen Williams, and many others. Of course, most of these folks have passed on and are unfamiliar to today's younger birders. I can recall personal experiences with very few. But these local and regional experts played a key role in writing detailed range descriptions within Texas—a feature that was new to this book. Peterson also uses the TOS-created plan of dividing the state into eight natural or ecological regions that differs little from what we use today.

I'm fascinated by the contrast of selected range descriptions in the book with what we see today. Swallow-tailed Kite, Greater Prairie Chicken, White-winged Dove, and Cave Swallow are great examples, but perhaps pelagic birding has made the greatest strides since 1960. Only two shearwaters, Sooty and Audubon's, and no storm-petrels are included in the regular list. White-tailed is the only tropicbird listed, Pomarine the only jaeger, and Bridled Tern is not included even among the "accidentals." Similarly, Peterson was perhaps prophetic in his introduction with the statement, "There are still new discoveries to be made in the mountains of the Trans-Pecos, as indeed there are in many sections of west Texas." Consider the relatively recent discovery of multiple nesting tyrannids, including Buff-breasted, Dusky, Gray, and Dusky-capped Flycatchers, not to mention Greater Pewee.

The Texas guide includes 60 full-page plates, more than half of them in color (Fig. 3), and fully two-thirds of them appearing for the first time in this book. Many were subsequently used in Peterson's western guide revision. The so-called "Peterson System" of bird illustrations with key field marks indicated with arrows was the standard

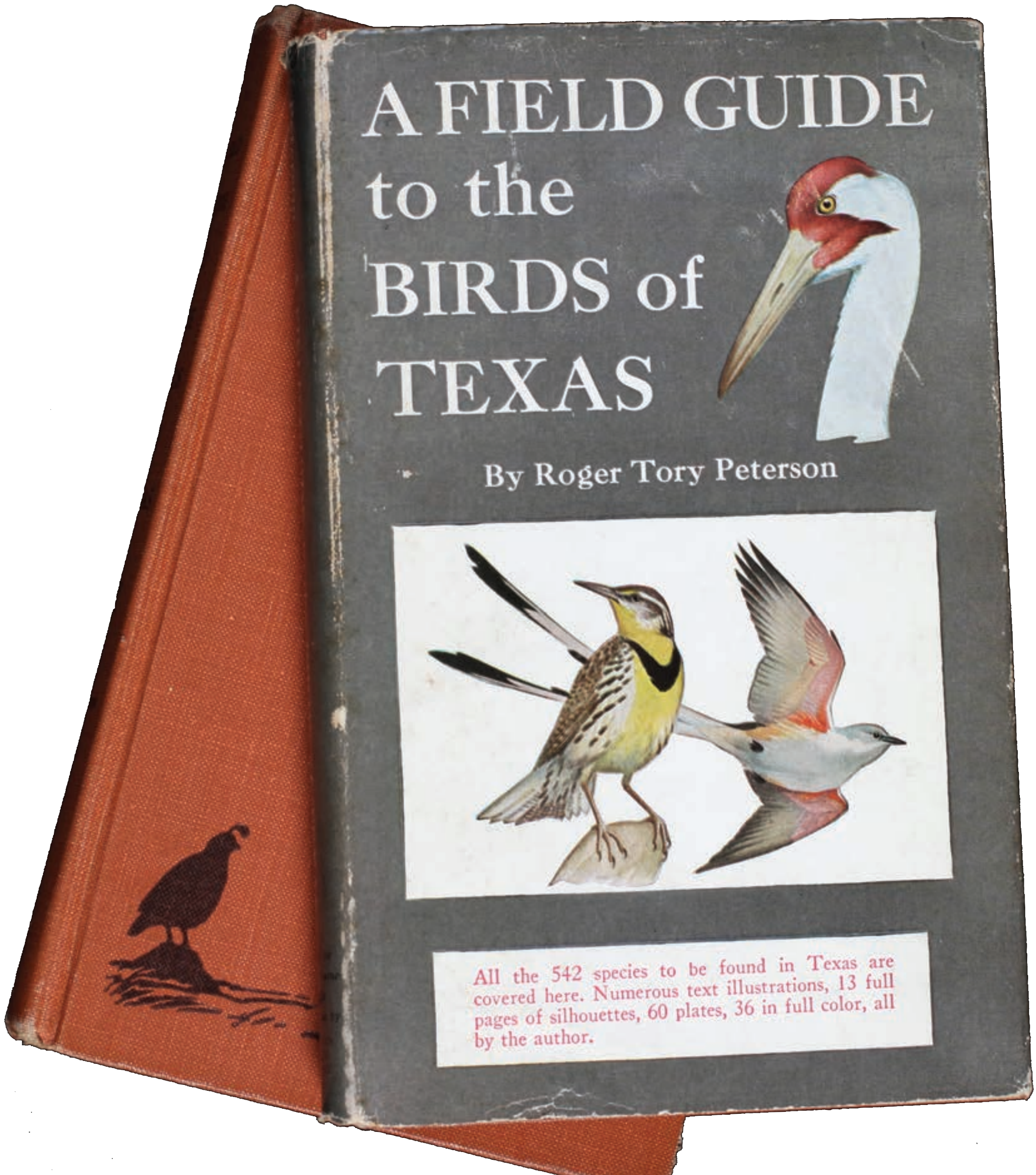


Figure 2. Peterson 1960 Texas guide with and without dust jacket.

of excellence from 1934 until David Sibley set the modern standard in 2000. (Roger Tory Peterson passed away in 1996.) Among my favorite plates in the Texas guide are the "Flycatchers," "Jays, Magpie, and Kingfishers," and "Western Warblers and some Texas Specialties." All of the plates are good, however. That "Coues' Flycatcher" misses the mark, and the "Beardless Flycatcher" illustration looks like a diminutive empid, are the only criticisms I can offer. The book also includes numerous text drawings and 13 pages of Peterson's classic silhouettes.

I'm told that Rose Ann and John Rowlett went to a TOS meeting in Rockport when they were

Figure 3. Sample color plates from the 1960 guide.

kids. Their dad drove them down from Austin and they visited Connie Hagar's Rockport Cottages. It was their first time ever on the Texas Coast. Roger Tory Peterson was also staying there. Rose Ann and John and others went birding and they found an injured Buff-breasted Sandpiper, which they caught. They brought it back to the house and Peterson painted the bird, and that is the one that ended up in the Texas field guide plates. It was the first time Peterson had studied detail on the whitish underwing. They took the sandpiper back the next day and released it. Indeed, close inspection of Plate 28 and the text on page 106 reveals Peterson's emphasis on the white underwing.

Though no longer in print, of course, these guides are not difficult to find from online booksellers. For those who are interested, I recently located multiple copies ranging in price from less than \$5 to \$75. For multiple reasons I would consider this fine book a worthy collector's item for all students of Texas ornithology. It has a unique history coincident with the origins of the TOS and represents a turning point in the state's perspective on natural resources at the highest levels. Further, its significance as the state "handbook" of birds until Oberholser appeared in 1974 cannot be underestimated. Add to this the art value alone which is common to all Peterson guides of the mid-twentieth century era.

ACKNOWLEDGMENTS

The author expresses special thanks to Dr. Stan Casto for providing multiple historical references as well as helpful comments in the preparation of this article. Thanks also to Dr. Keith Arnold, Fred Collins, John Coons, Victor Emanuel, Brush Freeman, Mark Lockwood, and John & Rose Ann Rowlett for their assistance. Rachel Chee-Chong graciously donated professional photography services.

LITERATURE CITED

Casto, S. D. A History of the Origin and First Decade of the Texas Ornithological Society, 1953-1963. Directory of the Texas Ornithological Society 1991-1993: 15-24.

Healer, L. 1960. Distribution of *A Field Guide to the Birds of Texas*. The South Plains Sportsman, in Lubbock Avalanche-Journal, 6 March 1960.

Nevin, D. 1960. Texas Just One Big Bird House. San Antonio Light, 3 April 1960.

Peterson, R. T. 1960. *A Field Guide to the Birds of Texas*. Boston: Houghton Mifflin.

Zimmerman, D. A. 1961. *A Field Guide to the Birds of Texas* by Roger Tory Peterson. The Wilson Bulletin 73: 108-110.

AVIAN PREDATION ON PURPLE MARTINS NESTING IN ARTIFICIAL HOUSING

James D. Ray[1]

Purple Martin Conservation Association, 301 Peninsula Drive, Erie, Pennsylvania, 16505

Avian predation on Purple Martins (*Progne subis*) at colonies using artificial housing may be significant in areas where populations of this songbird are low or declining (Great Lakes and New England states, some Gulf Coast states, Maritime provinces). Actual accounts of raids by avian predators on Purple Martins at artificial housing are largely absent from the peer-reviewed literature. Consequently, I summarized accounts found in the Purple Martin Conservation Association's *Purple Martin Update—A Quarterly Journal* as well as documented my own observations. I found accounts of raids in 20 articles and these and an additional eight articles promoted open locations and structural modifications to housing as means for mitigating losses of martins to predators. Great Horned Owls (*Bubo virginianus*) and Barred Owls (*Strix varia*) comprised over half of the accounts where a predator was identified. This information may be useful to local managers as well as those involved in conservation planning for the Purple Martin in areas where its status is of concern.

The visual and audio cues associated with colonial bird species can attract predators, including avian predators (Wittenberger and Hunt 1985; Brown and Brown 1996, Varela et al. 2007). While benefits of colonialism may compensate for costs such as increased competition for mates, nesting sites and food, and transmission of disease and ectoparasites (Alexander 1974; Hoogland and Sherman 1976; Wittenberg and Hunt 1985; Moller 1987) there is also evidence that predation risk is increased (Varela et al. 2007). Moreover, the effects of predation may be more substantial or of concern in regard to rare species or areas where populations are in decline.

The eastern subspecies of the Purple Martin (*Progne subis subis*) nests almost exclusively in artificial housing that includes those of conventional-style, multi-cavity birdhouse designs and of hollowed out gourds (Brown 1997). *P. s. arboicola*, the race of the western mountains and Pacific Northwest, are still found primarily in natural cavities, but are increasingly nesting in single-unit nestboxes and less commonly in housing typical of their eastern counterparts (Brown 1997, Kostka et al. 2008, Buker 2012).

The relatively recent shift in the eastern race's nesting tradition began prior to the arrival of the first European settlers when the derived benefits of their new existence encouraged the birds to nest

[1]E-mail: chiefbiologist@purplemartin.org

in larger, more tightly packed nesting aggregations (Brown 1997). Purple martins are quite vocal on and around their housing, including at night (Brown 1984, Brown 1997), thus making them potentially conspicuous to predators at all hours.

Birds are reported among predators of inflight Purple Martins (Brown 1997), and this includes the capture of adults or hatch-year martins by Peregrine Falcons (*Falco peregrinus*; Tordhoff 1993; J. D. Ray, unpublished data) and Great Blue Herons (*Ardea herodias*; Peleski 1990), capture of injured adults from a highway by a Merlin (*Falco columbarius*; Haug 1989), and the remains, along with bands and radio-transmitters from Purple Martins have been found during examination of owl pellets (Kramer et al. 2008).

There is a paucity of information in the peer-reviewed literature on avian predation on Purple Martins at nest sites consisting of artificial housing. However, accounts of predation and mitigation strategies are commonplace in education materials, trade publications, and social media. Information, including mitigation strategies, are important to managers given the dependence that the species has on man for nesting cavities and that the species is declining in portions of its range (Tautin 2009; Sauer et al. 2014). My objective was to summarize published reports of avian predation on Purple Martins nesting in artificial housing.

METHODS

I conducted a literature review and summarized accounts of avian predation on colonies of Purple Martins on and around artificial housing. This included a review of articles published in the Purple Martin Conservation Association's *Purple Martin Update—A Quarterly Journal*. Although cited often in manuscripts on Purple Martins in the scientific literature, these mostly semi-technical and popular-style articles are not readily discoverable through a search of the literature. I did not include the plethora of accounts from "letters to the editor" in the *Purple Martin Update—A Quarterly Journal*, nor the photos, videos, and accounts that an Internet search reveals. I do, however, include my own observations.

RESULTS AND DISCUSION

I found 20 publications documenting avian predation on Purple Martins on, and around, artificial housing (Table 1). Many of these, and an additional eight papers, also addressed mitigation strategies that minimize the predator's ability to launch a surprise attach or to reach into the compartments. Accounts ranged from Ohio and Florida, to Alberta and Washington, and included nine avian predator species (Table 1).

Barred and Great Horned Owls were the most common (54.5%) of avian predator accounts that were reported at the species level. Owls raided martin housing at night, and visual observations included the predator reaching in and grabbing birds as well as grabbing those that exited in attempts to flee (Table 1). The morning discovery of owl feathers along with martin decoys on the ground, ripped-open compartment doors, and broken gourd entrances and perch rods serve as further evidence of larger owl species (Hill 1988, Dellinger et al. 1999). Photographic evidence of raids by Barred Owls and Great Horned Owls was captured by Dingman (2004), Chambers (2008), Allnock (2012), Chamberlin (2012), McComb (2012), and in several photographs not associated with articles. Winegar (2005) and Undorfer (1997) reported Eastern Screech Owls (*Megascops asio*) nesting in Purple Martin housing. An editorial response to Undorfer (1997) stated that screech owls "had almost wiped out a colony in North Carolina." I saw no other specific mention of Screech Owls or those other than the Great Horned and Barred Owl.

The daytime raids by Cooper's Hawks (*Accipiter cooperii*) and Sharp-Shinned Hawks (*A. striatus*) were described by several authors (Wagner 1999, Seekamp 2011, Chamberlin 2012, Mangan 2009). They, and hawks "in general" (Tautin 2005, Mangan 2009, Gerteisen and Gerteisen 2013), would usually fly in and grab adult Purple Martins (Wagner 1999, Mangan 2009, Seekamp 2011, Chamberlin 2012) off of the porches of their housing. In the case of Cooper's Hawks, these attacks may be repeated as many as two or three times per day (Mangan 2009) and may involve one grabbing a house and beating its wings against it until it is able to grab an escaping martin (Wagner 1999).

Black-billed Magpies (*Pica hudsonia*; Bowditch 1990), Fish Crows (*Corvus ossifragus*; Moore 1989), and Greater Roadrunners (*Geococcyx californianus*; Green 1994) land on housing and grab nestlings that venture close to, or out of, cavity entrances. DeVilbiss and George (1989) and Justus (1996) recorded captures of Purple Martins by Mississippi Kites (*Ictinia mississippiensis*).

Table 1. Accounts in the *Purple Martin Update—A Quarterly Journal* of avian predation on Purple Martins on or near artificial housing (state).

Topic	Citations
Predation by Falcons and Hawks	
On housing	
Sharp-shinned Hawks	Seekamp 2011 (MN)
Cooper's Hawks	Wagner 1999 (FL), Mangan 2009 (AR), Chamberlin 2012 (OH)
Falcons and hawks (general)	Tautin 2005, Mangan 2009 (AR), Gerteisen and Gerteisen 2013 (FL)
Above or Near Housing	
Cooper's Hawk	Mangan 2009 (AR), Dingman 2013 (FL)
Mississippi Kite	Justus 1996 (AR)
Predation by Owls	
On housing	
Great-Horned Owls	Dipietro 1988 (MA), Dellinger et al. 1999 (OH), McComb 2007 (TN), Justus 2008 (AR), Chamberlin 2012 (OH/photos), Dingman 2013 (FL)
Barred Owls	Fecker et al. 1996 (AR), Taylor 1998, Dingman 2004 (FL/photos), McComb 2007 (TN, photos), Justus 2008 (AR), Dingman 2013 (FL)
Undetermined/Unspecified Owls	Wilkins 1993 (MN), Fecker et al. 1996 (KS), Tautin 2005, Buker 2012 (X)
Others	
On Housing	
Black-billed Magpie	Moore 1989 (Alberta)
Greater Roadrunners	Green 1994 (TX)
Fish Crows	Bowditch 1990 (FL)
Mitigation	
Placement of housing in open settings	Tautin 2005
Wire-cages/house-mounted guards	Bowditch 1990, Bowditch and Kowalski 1996, Kostka 1998a, Kotstka 1998b, Kotska 1998c, Taylor 1998, Wagner 1999, Dingman 2004, Tautin 2005, Moser 2006, Justus 2008, Jones 2009, Mangan 2009, Chamberlin 2012, Allnock 2012, Buker 2012, Dingman 2013, Gerteisen and Gerteisen 2013
Cavity depth and design	Wilkins 1993, Fecker et al. 1996, Rogillio 1996, Kostka1998a, Taylor 1998, Tautin 2005, Allnock 2012
Decoys	Purple Martin Conservation Association 2014

Personal Observations

Sharp-shinned Hawks pursue and appear to be fairly successful in catching Purple Martins near housing in situations where nearby trees and buildings allow a cryptic approach. In contrast, Purple Martins appear to detect, evade, and even pursue approaching birds-of-prey in more-open settings.

Avian predators appear to have the ability to recognize and seek out maiden-flight and recently fledged-juvenile Purple Martins. During the weeks that the neighborhood around a large colony is full of assembled broods, Mississippi Kites have suddenly began including that neighborhood during foraging activities. As the adult martins try to lead their broods back to the housing in the evenings, individuals or as many as a half a dozen kites at a time may chase a fledgling relentlessly, although I have yet to observe a martin captured. At a location where Great-Tailed Grackles (*Quiscalus mexicanus*) nested within 10 m of a martin colony, I have observed male grackles bolt out of the nest tree, intercept departing fledglings, and force them to the ground. These, and similar captures reported by others at the same location, resulted in the consumption of the martin. Grackles were not observed attempting this on adult Purple Martins.

American Kestrels (*Falco sparverius*) are said to grab nestlings from porches of martin housing (anecdotal reports). In 2014, a kestrel was observed laboriously carrying an adult Purple Martin from the direction of a street where weather-stressed individuals were lying about on the roadway's warmer surface during cold temperatures and high winds (J. M. Ray pers. comm.).

Predation by avian predators, particularly by owls, can be quite serious at individual Purple Martin colonies. Wilkins (1993) wrote of owls taking a bird or two each night and reports of total losses, possibly with abandonment involved, that have exceeded 100 birds (Hill 1989; Wilkins 1993, Fecker et al. 1996).

MANAGEMENT IMPLICATIONS

Raids by avian predators on Purple Martins can be problematic on small colonies, or even on large ones, particularly where owl raids are repeated and not thwarted by the addition of guards. Consistent raids or loss of broods can lead to the abandonment of the site by individual pairs and even the entire colony (Hill 1989).

Avian predation is unlikely to be a major factor on Purple Martin populations except where they are extremely low and in decline. Breeding Bird Survey data depicts that the Purple Martin is now in decline, rangewide (1966-2013; -0.9% yr^{-1} [-3.24, -0.45]; Sauer 2014) including statistically in 19 states and provinces. In particular the species is declining in the Great Lakes states and provinces, Gulf Coast and New England states, and the Maritime Provinces. Thus, it may be worthwhile to include strategies to mitigate avian predation on Purple Martin colonies as part of conservation plans in those areas.

There are mitigation strategies that can be effective for preventing avian predation on martin colonies. Owl guards or wooden decoys attached to housing, starling resistant entrances, deep cavities, off-set entrances and internal baffles are all effective strategies for reducing avian predation on Purple Martin colonies (Tautin 2005, others in Table 1). Although occasional losses to accipiters and falcons away from the housing cannot be avoided, and likely have little influence on a colony, maintaining an open area around martin housing reduces the chances of surprise attacks near the nesting site (Tautin 2005).

ACKNOWLEDGMENTS

I am grateful to Clint Boal and two anonymous reviewers for their reviews of early drafts of this manuscript, and to the many that I have cited from articles in the Purple Martin Update and those involved in its production through the years.

LITERATURE CITED

Alexander, R. D. 1974. The evolution of social behavior. Annual Review Ecological Systems 5: 325-383.

Allnock, R. 2012. Making houses safer for Purple Martins. Purple Martin Update 21(2): 18-20.

Bowditch, J. 1990. A way to stop crow & owl predation at Purple Martin houses. Purple Martin Update 2(3): 8-9.

Bowditch, J., and L. Kowalski. 1996. Owl guard updates: landlords share their designs for owl guards. Purple Martin Update 7(3): 27-28.

Brown, C. R. 1984. Vocalizations of the Purple Martin. Condor 86: 433-442.

Brown, C. R., and M. B. Brown. 1996. Coloniality in the Cliff Swallow: the effect of group size on social behavior. University of Chicago Press, Chicago.

Brown, C. 1997. Purple Martin (*Progne subis*). Birds Of North America. Philadelphia, PA: The American Ornithologists Union and The Academy of Natural Sciences.

Buker, K. 2012. Hosting Purple Martins in the Pacific Northwest. Purple Martin Update 21(3): 4-8.

Chamberlin, J. 2012. Protecting Purple Martins from owls. Purple Martin Update 21(4): 24-25.

Chambers, L. 2008. A nest check guide. Purple Martin Update 17(2): 26-27.

Dellinger, T., J. R. Hill, III, and L. Chambers. 1999. Martin mishaps: landlord awareness can prevent accidents. Purple Martin Update 10(1): 4-5, 11-13.

Dellinger, T. B., G. P. Dellinger, and R. L. Dellinger. 2000. Do owls attack Purple Martin decoys? Purple Martin Update 11(1): 29.

Dingman, M. 2004. Making and modifying owl gaurds: one landlord's ideas. Purple Martin Update 13(2): 12-13.

Dingman, M. 2013. Got owls? Quick cage guard. Purple Martin Update 22(2): 28-29.

Dipietro, J. 1988. Great Horned Owl preys on Purple Martin colony. Maryland Birdlife 44:4 0.

Gerteisen, D. and L. Gerteisen. 2013. The handy landlord: easy-to-make hawk guards. Purple Martin Update 22(2): 27.

Green, 1994. Roadrunner predation on Purple Martins. Purple Martin Update 5(4): 12.

Haug, E. 1989. Merlin feeding on road kills. Purple Martin Update 2(2): 28.

Hill, J. R., III. 1988. On becoming a biological sleuth: how to detect what is happening at your colony site. Purple Martin Update 1(4): 28-29.

Hill, J. R., III. 1989. 12 reasons why people loose their Purple Martins. Purple Martin Update 2(4): 28-29.

Hoogland, J. L., and P. W. Sherman. 1976. Advantages and disadvantages of Bank Swallow (*Riparia riparia*) coloniality. Ecological Monographs 46: 33-58.

Jones, E. P. R. 2009. Hawk and owl guards for gourds. Purple Martin Update 18(3): 26-27.

Justus, K. 1996. The Mississippi kite: Purple Martins are being included in this aerial hunter's diet. Purple Martin Update 7(3): 8-9.

Justus, K. 2008. The handy landlord: better owl guards for gourds. Purple Martin Update 17(4): 24-25.

Kostka, K. 1998a. Improving a Trio Castle: how to enlarge the compartments and add owl guards. Purple Martin Update 9(1): 6-7.

Kostka, K. 1998b. Making a good thing even better: A guide to modifying Trio Purple Martin houses. Purple Martin Update 9(3): 1-4.

Kostka, K. 1998c. Owl guards for gourds: A way to protect martin gourds from aerial predators. Purple Martin Update 9(4): 1.

Kostka, S., D. A. Airola, and G. Switzer. 2008. Recent use of nest boxes Purple Martins in Northern California. Purple Martin Update 17(3): 13–15.

Kramer, P. A., E. K. Pifer, S. A. Tarof, and C. Silverio. 2008. Radio transmitters found in owl pellets. Purple Martin Update 17(2): 28.

Mangan, T. Housing and safety enhancements. 2009. Purple Martin Update 18(4): 20-24.

McComb, W. R. 2007. The McComb colony story. Purple Martin Update 16(3): 22-23.

Moller, A. P. 1987. Advantages and disadvantages of coloniality in the swallow, Hirundo rustica. Animal Behavior 35: 819-832.

Moore, L. 1989. Mapgie 'heckles' martins. Purple Martin Update 2(2): 15.

Moser, R. C. 2006. My best home improvements. Purple Martin Update 15(1): 23.

Purple Martin Conservation Association. 2014. Double duty decoys. Purple Martin Update—A Quarterly Journal 23(3): 29.

Rogillio, C. 1996. How to predator proof your martin house. Purple Martin Update 7(2): 24-25.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966–2013. Version 01.30.2015 USGS Patuxent Wildlife Research Center, Laurel, MD.

Seekamp, R. 2011. What do Purple Martins remember? Purple Martin Update 20(2): 29.

Taylor, A. P. 1998. Converting the M12-K Musselman to have double-size compartments and owl gourds. Purple Martin Update 9(1): 5.

Tautin, J. 2005. Coping with avian predators at Purple Martin colonies. Purple Martin Update 14(2): 16-17.

Tautin, J., B. Cousens, K. Kostka, S. Kostka, and D. Airola. 2009. Addressing regional declines in Purple Martin populations. Proceedings of the 4th International Partners in Flight Conference: Tundra to Tropics: 82-87.

Tordhoff, H. B. 1993. Purple martins in the diet of the Peregrine Falcon. Purple Martin Update 4(2): 13.

Undorfer, M. C. 1997. Nestbox neighbors—Purple Martins and Screech Owls share nesting quarters. Purple Martin Update 8(3): 11-12.

Varela, S. A. M., E. Danchin, R. H. Wagner. 2007. European Society Evolutionary Biology 20: 1490-1503.

Varela, S. A. M., E. Danchin, R. H. WagnerR. 2007. Does predation select for or against avian coloniality? A comparative analysis. European Society Evolutionary Biology 20:1490-1503.

Wagner, C. 1999. Improving owl guards to deter hawk attacks. Purple Martin Update 10(2): 1.

Wilkins, D. 1993. Owl protection by cavity design. Purple Martin Update 4(2): 8-9.

Winegar, P. 2005. Eastern screech owls nest in gourd. Purple Martin Update 14(2): 25.

Wittenberger, J.F. and G.L. Hunt. 1985. The adaptive significance of coloniality in birds. Pp. 1-78, In, D. S. Farner, J. R. King and K. Parkes (eds.) Avian Biology VIII, Academic Press.

MISSISSIPPI KITE STANDING IN WATER SCAVENGING EARTHWORMS

Stephen Kasper[1]

[1]Lake Alan Henry Wildlife Mitigation Area, Parks and Recreation Department, City of Lubbock, Lubbock, Texas 79401

Mississippi Kites (*Ictinia mississippiensis*) migrate into Texas from early April to mid-May and are common summer residents on the Rolling Plains and High Plains (Lockwood and Freeman 2014). Across its summer breeding range, the species typically forages while soaring high in the air catching large flying insects (Sibley 2014) or hawking from exposed perches (Parker 1999), although it will also forage on the ground and even in shallow water (Gainer 1902; Parker 1999). An examination of 26 publications reporting the diets of the Mississippi Kite revealed that medium and

[1]E-mail: skasper@mail.ci.lubbock.tx.us

large sized insects dominate its diet numerically, although small numbers of vertebrate prey are also taken which include frogs, toads, lizards, small box turtles, snakes, small birds, bats, and small terrestrial mammals (Parker 1999; Sherrod 1978). The following report describes a rare foraging behavior for a previously undocumented dietary resource by a Mississippi Kite.

On 6 May 2014, I observed a male Mississippi Kite landing at the perimeter of Pond 4 at Lake Alan Henry Wildlife Mitigation Area (LAHWMA), ca. 6.5 km N, 14.5 km E of Justiceburg, Garza Co., Texas. It moved to the edge of the pond as if to drink and continued to walk directly into the water to about a third of the height of its tarsus. The kite then dipped almost its entire bill into the water (Fig. 1A) and stood upright with what appeared to be a large earthworm dangling from its bill (Fig. 1B). After consuming the earthworm, the Mississippi Kite moved laterally while still in the water and again dipped its bill into the water, retrieving and consuming another earthworm. This occurred one more time with a third earthworm being consumed. An obvious mud stain was left on the chest of the kite by one or both of the first two hanging earthworms (Fig. 1C).

When the water where the kite was wading was examined, two additional large earthworms were observed on the bottom of the shallow water, along with many very small to medium sized worms. Both of the obviously drowned large earthworms were collected and tentatively identified to the genus *Lumbricus*. At LAHWMA, Pond 4 is one of several ponds that are supplied with lake water by a pipe network and the valve had been fully opened a week prior to this observation. This caused the pond water level to rise ca. 5-10 cm and the sandy shore line to move outward ca. 2.5 m (based on the line of non-aquatic grasses that were now under water). In the newly flooded edge of the pond, earthworms were forced to the surface of the soil and subsequently drowned, leaving the carcasses lying on the bottom.

The Mississippi Kite was observed circling the pond several times and the shallow water was clear adjacent to where it landed, so the kite most likely saw the earthworms lying on the bottom of the pond. It scavenged an unusual but available resource by wading into water, which is a rare behavior for the Mississippi Kite (Parker 1999), and it did so without hesitation as if it had previously learned to forage in water. Moreover, earthworms, or any annelid worm, have not been previously documented in the diet of the Mississippi Kite (Parker 1999; Sherrod 1978), however during the breeding season, the species is known to be highly opportunistic, taking advantage of unusual prey (Parker 1999).

Figure 1. Male Mississippi Kite standing in shallow water, dipping its bill to the sandy bottom (A), and scavenging drowned earthworms (B), leaving a muddy stain on chest feathers (C). Photo by Stephen Kasper.

ACKNOWLEDGMENTS

I am most grateful to Kent Rylander for his comments and time in reviewing this manuscript.

LITERATURE CITED

Gainer, A. F. 1902. The Mississippi Kite (*Ictinia mississippiensis*). Osprey 1: 85-90.

Lockwood, M. W., and B. Freeman. 2014. The TOS Handbook of Texas Birds. 2nd edition, revised. Texas A&M University Press, College Station.

Parker, J. W. 1999. Mississippi Kite (*Ictinia mississippiensis*), The Birds of North America Online, http://bna.birds.cornell.edu/bna/species/402.

Sherrod, S. K. 1978. Diets of North American Falconiformes. Raptor Research 12: 49-121.

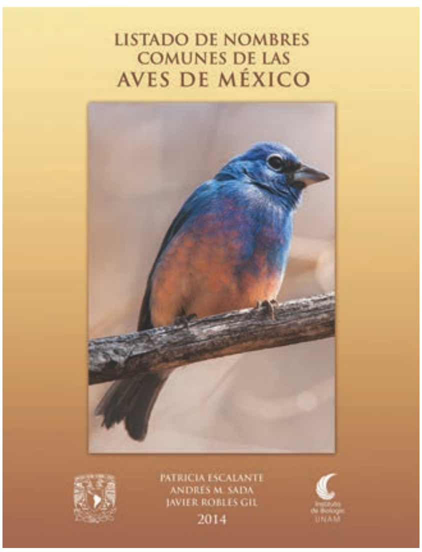
Sibley, D. A. 2014. The Sibley Guide to Birds. 2nd edition. Alfred A. Knopf Publ. Co., New York.

BOOK REVIEWS

LISTADO DE NOMBRES COMUNES DE LAS AVES DE MÉXICO

Patricia Escalante, Andrés M. Sada, and Javier Robles Gil

Universidad Nacional Autónoma de México, 2014
Available online at http://www.ibiologia.unam.mx/barra/publicaciones/Listado_Aves_2014_web.pdf.
Hardcopy available at CIPIMEX



Listado de Nombres Comunes de las Aves de México is a revision of the widely accepted 1996 edition. The authors have brought the list up to date by incorporating taxonomic changes necessitated by the continually changing views on how birds evolved. Revisions have always been the task of taxonomists who wish to take into account new morphological, behavioral, and molecular data. The *Listado* is a careful, scholarly work that includes meticulously documented synonyms and references.

Besides its value as an authoritative list of Mexican common names in Spanish, this list will appeal to readers who have a general interest in the history and significance of bird names. Perusal of the three columns—scientific name, Spanish common name, and English common name—allows the reader to conveniently compare some of the ways birds are named.

Many bird names are very old, as in the case of the shrike, whose name was coined even earlier than its first appearance in print in 1544; and several Spanish names were derived from indigenous languages, no doubt going back many centuries. One example is *guajolote* (the turkey), from Nahuatl.

The naming of some North American birds could be considered frivolous, and it is understandable why they were not translated literally from English into Spanish. For example, Lucy's Warbler was named by J. G. Cooper for the thirteen year old daughter of his friend Spencer F. Baird. The Spanish name for this bird is not patronymic but descriptive: *chipe rabadilla rufa*, "Rufous-rumped Warbler."

In some cases, all three names—scientific, English, and Spanish—are the same, as in *jacana*, which was derived from a Portuguese rendering of the tupi (Brazilian Amerindian) name for the bird.

In other cases, all three names have different origins. The scientific name of the Short-billed Pigeon *Patagioenas nigrirostris* is based on its black bill (*nigri*, "black" and *rostris*, "beak"). The English name refers to the size of its bill, and the Spanish name to its sad or melancholy call (*paloma triste*).

The English name for Anna's Hummingbird was simply taken from its scientific name, *Calypte anna*, which honored Anna, Duchess of Rivoli, a fact of minimal interest to most birders in the New World. The Spanish name is descriptive and more helpful: *colibrí cabeza roja* ("red-headed hummingbird").

Readers with any degree of proficiency in Spanish will find it interesting how different criteria are used for naming birds. I doubt there are any great insights to be gained from studying this list, but those of us who like languages will enjoy looking through it and appreciating what speakers of the two languages regard as important in a bird name.

—Kent Rylander, *Texas Tech University, Junction Campus. kent.rylander@mac.com*

Editor's comments: The American Ornithologists' Union does not endorse Spanish common names. For their rational see: http://www.museum.lsu.edu/~Remsen/SACCspanishnames.html.

BULLETIN OF THE TEXAS ORNITHOLOGICAL SOCIETY GUIDELINES FOR AUTHORS

SUBMISSION

For initial submission, e-mail one copy of the manuscript and photographs/illustrations1 to editor@ texasbirds.org (alternate e-mail jackeitniear@yahoo.com) or mail to Jack C. Eitniear, 218 Conway Drive, San Antonio, Texas 78209-1716. If you do not have access to the internet mail a DVD or CD containing a word processor version (MS WORD 1997-2003 preferred or OpenOffice 3.0) of the manuscript with all figures and tables, as separate documents

Submission Categories.—Manuscripts may be submitted as a Major Article or Short Communication. Major Articles generally are longer papers that are >5,000 character count including literature cited and figure captions, and excluding tables, figures, and spaces between characters. Manuscripts <5,000 characters in length including literature cited and figure captions, and excluding tables, figures, and spaces between characters will be considered Short Communications. Major articles must include an Abstract. The Editor may move a paper from one category to another at his discretion.

Multi-authored Submissions.—All authors should have contributed in a significant manner to designing and performing the research, writing the manuscript, and reading and approving the manuscript prior to submission.

Non-U.S. Submissions.—Authors whose native language is not English should ensure that colleagues fluent in English have critically reviewed their manuscript before submission.

GENERAL INSTRUCTIONS

(Carefully read and follow these instructions before submitting your manuscript. Papers that do not conform to these guidelines will be returned.)

Prepare manuscripts on 8.5 X 11 inch format with 1-inch margins. Double-space all text, including literature cited, figure captions, and tables. Insert page numbers top right beginning on the second page. Use a font size of at least 11 point. Consult a recent issue of the journal for correct format and style as you prepare your manuscript.

Write in the active voice whenever possible. Use U.S. English and spelling. Use *italics* instead of underlining (i. e., scientific names, third-level headings, and standard statistical symbols). Use Roman typeface (**not boldface**) throughout the manuscript.

Common and scientific names of bird species that occur in North and Middle America should follow the AOU *Check-list of North American Birds* (1998, 7th ed., and its supplements in *The Auk*; http://aou.org.whsites.net/ checklist/index). Names for other bird species should follow an appropriate standard (cite standard used). Use subspecific identification and list taxonomic authorities only when relevant. Give the scientific name at first mention of a species in the abstract and in the body of the paper. Capitalize common names of birds except when referred to as a group (i. e., Northern Cardinal, Golden-cheeked and Yellow warblers, vireos). Do not italicize family names.

The common names of other organisms are lower case except for proper names (i. e., yellow pine, Ashe juniper, Texas kangaroo rat).

Cite each figure and table in the text. Sequence tables and figures in the order cited. Use "figure" only outside of parentheses; otherwise, use "Fig." if singular, "Figs." if plural (i. e., Fig. 1, Figs. 2–3). To cite figures or tables from another work, write figure, fig., or table in lowercase (i. e., figure 2 in Jones 1980; Jones 1980:fig. 2; Jones 1987: table 5).

Use the following abbreviations: d (day), wk (week), mon (month), yr (year), sec (second), min (minute), h (hour); report temperature as °C (i. e., 15° C). In text months should be abbreviated (Jan, Feb, Mar, Apr, etc.) in figures and tables. Define and write out acronyms and abbreviations the first time they appear in text; abbreviate thereafter: "Second-year (SY) birds . . . We found SY birds in large numbers."

Present all measurements in metric units. Use continental dating (i. e., 15 August 2007), the 24-hour clock (i. e., 0500, 1230), and local standard time. Specify time as Standard Time (i. e., CST for Central

[1]Due to file restrictions by most e-mail systems we ask that you contact the editor regarding the best means to provide graphic support.

Standard Time) at first reference to time of day. **Study site location(s) should be identified by latitude and longitude.** Present latitude and longitude with one space between each element (i. e., 28° 07' N, 114° 31'W). If latitude and longitude are not available indicate the distance and direction from the nearest permanent location. Abbreviate and capitalize direction (i. e., north = N, southwest = SW, or 5 km W Abilene, Taylor County [but Taylor and Bexar counties]). Also capitalize regions such as South Texas or Southwest United States.

Numbers.—The conventions presented here revise what has often been called the "Scientific Number Style (SNS)". The SNS generally used words for 1-digit whole numbers (i.e., 9 = nine) and numerals for larger numbers (i.e., ten =10), a distinction that may be confusing and arbitrary. The revised SNS treats numbers more consistently by extending the use of numerals to most single-digit whole numbers that were previously expressed as words. This style allows all quantities to be expressed in a single manner, and because numerals have greater visual distinctiveness than words, it increases the profile of quantities in running text. The objective of emphasizing quantity with numerals is further facilitated by the use of words for numbers appearing in a context that is only secondarily quantitative, i.e., when a number's quantitative function has been subordinated to an essentially nonquantitative meaning or the number is used idiomatically. In these cases, use words to express numbers (i.e., the sixty-four-dollar question). However, the numbers zero and one present additional challenges. For these numbers, applying consistent logic (numerals for quantities and words otherwise) often increases tedium in making decisions about correct usage and creates an inconsistent appearance, primarily because "one" has a variety of functions and readers might not quickly grasp the logic. For example, "one" can be used in ways in which quantity is irrelevant: as a personal pronoun or synonym for "you" (i.e., "one must never forget that") or as an indefinite pronoun ("this one is preferred"). The usage of the numeral in these cases would possibly be confusing to a reader. "Zero" and "one" are also used in ways that are more like figures of speech than precise quantifications (i.e., "in one or both of the ….", "in any one year", "a zero-tolerance policy"). In addition the numeral"1" can be easily confused with the letters "l" and "I", particularly in running text, and the value"0" can be confused with the letter "O" or "o" used to designate a variable. Therefore simplicity and consistent appearance have been given priority for these 2 numbers.

Cardinal Numbers.—quantitative elements in scientific writing are of paramount importance because they lead the way to the findings. Use numerals rather than words to express whole and decimal numbers in text tables and figures. This practice increases their visibility and distinctiveness and emphasizes their enumerative function.

2 hypotheses   5 birds   65 trees   0.5 mm   5 times   8 samples

Also use numerals to designate mathematical relationships.

6:1   at 200X magnification   5-fold not five-fold

Use words in to represent numbers in 4 categories of exceptions:

(1) If a number begins a sentence, title, or heading, spell out the number or reword the sentence so the number appears elsewhere in the sentence.

Five eggs were in the nest, but the typical clutch size is 12. The nest contained 5 eggs, but the typical clutch size is 12.

(2) When 2 numbers are adjacent, spell out the first number and leave the second as a numeral or reword the sentence.

The sample area was divided into four 5 ha plots.

I divided my sample area into 4 plots containing 5 ha.

(3) For most general uses, spell out zero and one.

one of the species   was one of the most important   on the one hand

values approaching zero   one peak at 12-14 m, the other at 25-28 m.

However, express the whole numbers zero and one as numerals when they are directly connected to a unit of measure or a calculated value.

1 week   1 m   a mean of 0   1-digit numbers   when $z = 0$

Similarly, express zero and one as numerals when part of a series or closely linked to other numbers.

1 of 4 species   between 0 and 5   of these, 4 samples were…1 sample was… and 8 samples

(4) When a number is used idiomatically or within a figure of speech.

the one and only reason   a thousand and one possibilities   comparing one to the other

the two of them   one or two of these   an extra week or two of growth.

Ordinal Numbers

Ordinal numbers usually convey rank order, not quantity. Rather than expressing how many, ordinals often describe what, which, or sequence. Ordinals are more prose oriented than quantitative within the text and it is less important to express ordinal numbers as numerals.

1) Spell out single-digit ordinals used as adjectives or adverbs.
   the third chick hatched first discovered a third washings for the seventh time
2) The numeric form of 2-digit ordinals is less confusing, so express larger ordinals as numerals.
   the 20th century for a 15th time the 10th replication the 50th flock
3) Express single digit ordinals numerically if in a series linked with double-digit ordinals.
   The 5th, 6th, 10th, and 20th hypotheses were tested or We tested hypotheses 5, 6, 10, and 20

Zeros before Decimals.

For numbers less than 1.0, always use an initial zero before the decimal point.

0.05 not .05 P = 0.05 not P = .05

Numbers Combined with Units of Measure

1) Use a single space to separate a number and a subsequent alphabetic symbol
   235 g 1240 h 8 mm
2) Generally close up a number and a non alphabetic symbol whether it precedes or follows the number.
   45° for angles 45 °C for temperature ±9 35± <5 but P < 0.001
3) Geographic coordinate designation for latitude and longitude have a space between each unit.
   35º 44' 77" N
4) If the number and associated symbol or unit start a sentence, spell out the number and associated factor.
   Twenty-five percent of nests

Numeric Ranges, Dimensions, Series, and Placement of Units

1) When expressing a range of numbers in text, use the word to or through to connect the numbers. Alternatively, an en dash, which means to may be us3ed but only between 2 numbers that are not interrupted by words, mathematical operators, or symbols.
   Yielded −0.3 to +1.2 differences not −0.3−+1.2 differences 5 July to 20 July or 5-20 July not 5 July-20 July 1-12 m not 1 m – 12 m
2) When the word from precedes a range, do not substitute the en dash for to.
   From 3 to 4 nests not from 3-4 nests
3) The en dash represents only the word "to", when between precedes a range, use "and" between the numbers.
   between 5 and 18 March not between 5-18 March
4) When the range includes numbers of several digits, do not omit the leading digits from the second number in the range.
   between 2001 and 2012 not between 2001 and 12 nor 2001-12 1587-1612 m not 1587-12 m
5) A range of numbers and the accompanying unit can be expressed with a single unit symbol after the second number of the range, except when the symbol must be closed up to the number (i.e., percent symbol) or the unit symbol may be presented with both numbers of the range.
   5 to 12 cm or 5 cm to 12 cm 5 to 10 °C or 5 °C to 10 °C 20% to 30% or 20-30% not 20 to 30%
6) If a range begins a sentence, spell out the first number and present the second as a numeral; however if a nonalphabetic symbol (%), write out both units.
   Twelve to 15 ha not twelve to fifteen ha Ten percent to 20 percent of samples not Ten percent to 20% of samples
7) To prevent misunderstanding, avoid using "by" before a range; this may imply an amount change from an original value, rather than a range of values. growth increased 0.5 to 0.8 g/d (a range) or growth increased 0.5-0.8 g/d not growth increased by 0.5-0.8 g/d
8) To prevent a wrong conclusion by a reader, do not express 2 numbers preceded by words like "increase", "decrease", or "change". A range may be intended but the reader may conclude the first value as an initial value and the second as a new value.

increased from 2 cm/wk to 5 cm/ wk (Was the increase 2-5 cm or was the increase 3 cm?)
When changes are from one range to a new range, en dashes within each range is a better statement.
increased from 10-20 m to 15-30 m

9) For dimensions, use a mathematical symbol (not a lower case "x") or the word "by" to separate the measurements.
5 X 10 X 20 cm   5 cm X 10 cm X 20 cm   5 by 10 by 20 cm

10) For a series of numbers, present the unit after the last numeral only, except if the unit symbol must be set close to the number.
5, 8, 12, and 20 m   diameters of 6 and 8 mm   12%, 15%, and 25%   categories of <2, 2-4, and > 6 km

Descriptive Statistics

Variables are often reported in the text: the units and variability term should be unambiguous.
mean (SD) = 20% (2) or Mean of 20% (SD 2)   mean of 32 m (SD 5.3) not mean of 32 ± 5.3 m
mean of 5 g (SD ± 0.33)   mean (SE) = 25 m (0.24)

MANUSCRIPT

Assemble a manuscript for Major Articles in this sequence: title page, abstract, text (introduction, methods, results, and discussion), acknowledgments, literature cited, tables, figure captions, and figures. Short Communications need not be subdivided into sections (optional).

Title Page.—At top of page place running head for Major Article: author(s) name(s) in upper- and lowercase italics followed by shortened version of title (=45 characters) in caps and Roman type. The running head for Short Communications is RRH: SHORT COMMUNICATIONS.

Put title in all caps for a Major Article and a Short Communication. Follow with author name(s) with the first letter of the first name, middle initial and last name as a cap and all other letters in lower case.

Addresses of author(s) should be in italics and arranged from first to last at the time of the study. The current address (if different from above) of each author (first to last), any special essential information (i. e., deceased), and the corresponding author and e-mail address should be in a footnote. Use two-letter postal codes (i. e., TX) for U.S. states and Canadian provinces. Spell out countries except USA. Consult a recent issue if in doubt.

Abstract.—Heading should be caps, indented, and followed by a period, three dashes, and the first sentence of the abstract (ABSTRACT.—Text . . .). Only Major Articles have an abstract.

Text.—Text, except for headings, should be left justified. Indent each paragraph with a 0.5-inch tab. Text should began immediately after the abstract.

Up to three levels of headings may be used. First level: centered, all caps (includes METHODS, RESULTS, DISCUSSION, ACKNOWLEDGMENTS, and LITERATURE CITED). There is no heading for the Introduction. Second level: flush left, indent, capitalize initial letter of significant words and italicize all words. Third level: flush left, indent, capitalize the initial letter of each word, followed by a period, three dashes, and then the text. In Major Articles, use headers in this sequence: First level, third level, and then second level (if needed). *Keep headings to a minimum.* Major Articles typically contain all first-level headings. Short Communications may or may not have these headings, depending on the topic and length of paper. Typical headings under Methods may include "Study Area" and "Statistical Analyses." Consult a recent issue for examples.

METHOD
Study Species, Locations, and Recordings
Study Species, Locations, and Recordings.---

Each reference cited in text must be listed in Literature Cited section and vice versa. The exception is unpublished materials, which occur only in the text. Cite literature in text as follows:

- One author: Jones (1989) or (Smith 1989).
- Two authors: Jones and Smith (1989) or (Jones and Smith 1989)
- Three or more authors: Smith et al. (1989) or (Smith et al. 1989)

- Manuscripts accepted for publication but not published: Smith (in press), (Jones in press) or Jones (1998) if date known. "In Press" citations must be accepted for publication, with the name of journal or publisher included.
- Unpublished materials, including those in preparation, submitted, and in review:
  (1) By submitting author(s) use initials: (JTB unpubl. data), JTB (pers. obs.),
  (2) By non-submitting author(s): (J. T. Jones unpubl. data), (J. T. Jones and J. C. Smith pers. obs.), or J. T. Jones (pers. comm.). Do not use (J. T. Jones et al. unpubl. data); cite as (J. T. Jones unpubl. data).
- Within parentheses, order citations by date: (Jones 1989, Smith 1992, Franklin et al. 1996), (Franklin 1980; Jones 1983, 1990; Smith and Black 1984), (Delgado 1988a, b, c; Smith 2000).
- When citing a direct quote, insert the page number of the quote after the year: (Beck 1983:77).

Acknowledgments.—For individuals, use first, middle (initial) and last name (i. e., John T. Smith); abbreviate professional titles and institutions from individuals. Accepted manuscripts should acknowledge peer reviewers, if known. PLEASE INCLUDE COMPLETE FIRST NAME. THIS IS DIFFERENT THAN MOST JOURNALS

Literature Cited.—**Verify all entries against original sources,** especially journal titles, volume and page numbers, accents, diacritical marks, and spelling in languages other than English.

Cite references in alphabetical order by first, second, third, etc., authors' surnames and then by date. References by a single author precede multi-authored works by the same first author, regardless of date. List works by the same author(s) in chronological order, beginning with earliest date of publication. If a cited author has two works in same year, place in alphabetical order by first significant word in title; these works should be lettered consecutively (i. e., 2006a, 2006b). Write author names in upper case (i. e., SMITH, J. T. AND D. L. JONES, ...FRANKLIN, B. J., T. S. JEFFERSON, AND H. H. SMITH). Insert a period and space after each initial of an author's name.

Journal titles and place names should be written out in full and not abbreviated; do not use abbreviations for state, Editor, edition, number, Technical Coordinator, volume, version, but do abbreviate Incorporated (Inc.). Do not indicate the state in literature cited for books or technical papers or reports when the state is obvious (i. e., Texas A&M Press, College Station.). Do not add USA after states of the United States but indicate country for publications outside the United States. Cite papers from Current Ornithology, Studies in Avian Biology, and International Ornithological Congresses as journal articles. The following are examples of how article should be referenced in the Literature Cited section of a manuscript.

BIRDS OF NORTH AMERICA

(Hard copy version) Grzybowski, J. A. 1995. Black-capped Vireo (*Vireo atricapillus*). The Birds of North America, No. 181.

(Electronic version) *See Internet Sources*

BOOKS, CHAPTERS, THESES, DISSERTATIONS:

American Ornithologists' Union. 1998. Check-list Check-list of North American birds, 7th Edition. American Ornithologists' Union, Washington, D.C.

Oberholser, H. C. 1938. The bird life of Louisiana. Bulletin 28. Louisiana Department of Conservation, New Orleans.

Menge, R. M. 1965. The birds of Kentucky. Ornithological Monographs 3.

Bennett, P. M. and I. P. F. Owens. 2002. Evolutionary ecology of birds: life histories, mating systems, and extinction. Oxford University Press, New York, New York.

Bent, A. C. 1926. Jabiru. Pages 66–72 *in* Life histories of North American marsh birds. U.S. National Museum Bulletin, Number 135. [Reprinted 1963, Dover Publications, New York, New York].

Oberholser, H. C. 1974. *The bird life of Texas*. (E. B. Kincaid, Jr., Editor). Volume 1 (or 2 please specify) University of Texas Press, Austin.

Gallucci, T. L. 1978. The biological and taxonomic status of the White-winged Doves of the Big Bend of Texas. Thesis. Sul Ross State University, Alpine, Texas.

Small, M. 2007. Flow alteration of the Lower Rio Grande and White-winged Dove range expansion. Dissertation. Texas State University, San Marcos.

Kear, J. 1970. The adaptive radiation of parental care in waterfowl. Pages 357–392 *in* Social behavior in birds and mammals (J. H. Crook, Editor). Academic Press, London, United Kingdom.

Snow, D. W. 2001. Family Momotidae (motmots). Pages 264–285 *in* Handbook of the birds of the world, Volume 6: mousebirds to hornbills (J. del Hoyo, A. Elliot, and J. Sargatal, Editors). Lynx Edicions, Barcelona, Spain. SPSS INSTITUTE, INC. 2005. SPSS for Windows, version 13. SPSS Institute, Inc., Chicago, Illinois.

Zar, J. H. 1996. Biostatistical analysis, 3rd Edition. Prentice Hall, Upper Saddle River, New Jersey.

GOVERNMENT PUBLICATIONS:

Burns, R. M. and B. H. Honkala (Technical Coordinators). 1990. Silvics of North America, Volume 1: conifers, and Volume 2: hardwoods. Agriculture Handbook, USDA Forest Service, Washington, D.C.

Franzreb, K. E. 1990. Endangered and threatened wildlife and plants—determination of threatened status for the Northern Spotted Owl: final rule. Federal Register 55:26114–26194.

Huff, M. H., K. A. Betinger, H. L. Ferfuson, M. J. Brown, and B. Altman. 2000. A habitat-based point-count protocol for terrestrial birds, emphasizing Washington and Oregon. General Technical Report PNW-501, USDA Forest Service, Portland, Oregon.

JOURNAL, TRANSACTIONS AND PROCEEDINGS ARTICLES

Braun, C. E., D. R. Stevens, K. M. Giesen, and C. P. Melcher. 1991. Elk, White-tailed Ptarmigan and willow relationships: a management dilemma in Rocky Mountain National Park. Transactions of the North American Wildlife and Natural Resources Conference 56:74–85.

Maclean, G. L. 1976. Arid-zone ornithology in Africa and South America. Proceedings of the International Ornithological Congress 16:468–480.

Taylor, J. S., K. E. Church, and D. H. Rusch. 1999. Microhabitat selection by nesting and brood-rearing Northern Bobwhite in Kansas. Journal of Wildlife Management 63:686–6994.

Johnson, C. M. and G. A. Baldassarre. 1988. Aspects of the wintering ecology of Piping Plovers in coastal Alabama. Wilson Bulletin 100:214–223.

Parrish, J. D. 2000. Behavioral, energetic, and conservation implications of foraging plasticity during migration. Studies in Avian Biology 20:53–70.

INTERNET SOURCES

Davis, J. N. 1995. Hutton's Vireo (*Vireo huttoni*). The Birds of North America Online: http://bna.birds.cornell.edu/bna/species/189 (accessed 10 November 2012).

Sauer, J. R., J. E. Hines, and J. Fallown. 2003. The North American Breeding Bird Survey, results and analysis 1966–2003, version 2003.1. USGS Patuxent Wildlife Research Center, Laurel, Maryland. www.mbr-pwrc.usgs.gov/bbs/bbs.html (accessed 5 May 2004).

Wright, E. 2003. Ecological site description: sandy. Pages 1–5 in USDA, Natural Resources Conservation Service. Site ID: Ro77XC055NM. http://esis.sc.egov.usda.gov/.

Pitman, N. C. A. 2006. An overview of the Los Amigos watershed, Madre de Dios, southeastern Peru. September 2006 version of an unpublished report available from the author at npitman@amazonconservation.org

IN PRESS CITATIONS

Date unknown:

Miller, M. R., J. P. Fleskes, J. Y. Takekawa, D. C. Orthmeyer, M. L. Casazza, and W. M. Perry. In Press. Spring migration of Northern Pintails from California's Central Valley wintering area tracked with satellite telemetry: routes, timing, and destinations. Canadian Journal of Zoology.

Date known:

Decandido, R., R. O. Bierregaard, Jr., M.S. Martell, and K. L. Bildstein. 2006. Evidence of nighttime migration by Osprey (*Pandion haliaetus*) in eastern North America and Western Europe. Journal of Raptor Research. In Press.

Date and volume number known:

Poling, T. D. and S. E. Hayslette. 2006. Dietary overlap and foraging competition between Mourning Doves and Eurasian Collared-Doves. Journal of Wildlife Management 70:In

Tables and Appendices.—Each table and appendix must start on a new page and contain a title caption that is intelligible without recourse to the text. Titles usually indicate who, what, where and when. Kroodsma (2000;

Auk 117:1081–1083) provides suggestions to improve table and figure captions. Tables/appendices should supplement, not duplicate, material in the text or figures. Indent and double-space captions, beginning with Table 1 (if only one appendix is included, label as Appendix). Indicate footnotes by lower case superscript letters. Develop tables/appendices with your word processor's table format, not a tab-delimited format. Do not use vertical lines in tables/appendices. Include horizontal lines above and below the box head, and at end of table/appendix. Use the same font type and size as in text. Consult a recent issue for style and format.

Figures.—Type captions in paragraph form on a page separate from and preceding the figures. Indent and double-space captions, beginning with Fig. 1. Do not include symbols (lines, dots, triangles, etc.) in figure captions; either label them in a figure key or refer to them by name in the caption. Consult a recent issue for style and format.

Use a consistent font and style throughout; sans serif typeface is required (i. e., Arial, Helvetica, Univers). Do not use boldface font for figure keys and axis labels. Capitalize first word of figure keys and axis labels; all other words are lower case except proper nouns. Handwritten or typed symbols are not acceptable.

Routine illustrations are black-and-white half-tones (photographs), drawings, or graphs and color photographs. Copies of halftone figures and plates must be of good quality (final figures must be at least 300 dpi). Figures in the Bulletin are virtually identical to those submitted (little degradation occurs, but flaws will show). Thus, illustrations should be prepared to professional standards. Drawings should be on good-quality paper and allow for about 20% reduction. Do not submit originals larger than 8.5 X 11 inches in size, unless impractical to do otherwise. Illustrations should be prepared for one- or two-column width, keeping in mind dimensions of a page in the Bulletin. When possible, try to group closely related illustrations as panels in a single figure. In the initial submission of an article, figures should be submitted separate from the manuscript on computer disk. **Preference for submission of graphic support is by PDF or TIFF**. Photographs should be at least 1.5 MB in size for clear reproduction.

Maps.—Use Google maps ONLY as a last resort! Authors should use one of a number of cartographical software packages (Arcmap, Geocart, Ortelius). Maps should contain either an embedded key with a caption (as a separate WORD attachment)

Proofs, Reprints, and Page Charges.—Authors will receive page proofs (electronic PDF) for approval. Corrections must be returned via e-mail, fax, or courier to the Editorial Office within two weeks. Authors should not expect to make major modifications to their work at this stage. Authors should keep the Editor informed of e-mail address changes, so that proofs will not be delayed. The Bulletin requests that authors bear part or all of the cost of publishing their papers when grant, institutional, or personal funds are available for the purpose. **A minimum contribution of $35.00 a page is recommended.** Authors who do not have access to publication funds may request a waiver of this payment. Authors will receive a PDF copy of their paper to serve as a reprint for distribution to colleagues.

Tips for improving your manuscript (aka. common omissions from past authors).

– Always include running head and page number.
– Insert corresponding author's e-mail address at bottom of the first page with superscript referencing his/her name in author line.
– Note author's names are in upper case in Literature Cited section.
– Spell out complete names in Acknowledgment section.
– Avoid repetition of pronouns, nouns and verbs within the same sentence and/or paragraph (i. e., try not to start EVERY sentence with "We observed.....").
– Note the BNA accounts are available BOTH as hard copies and online documents. Be sure you cite the one you consulted.

If you have questions, contact the Editor (E-mail jclintoneitniear@gmail.com).

Jack C. Eitniear, Editor

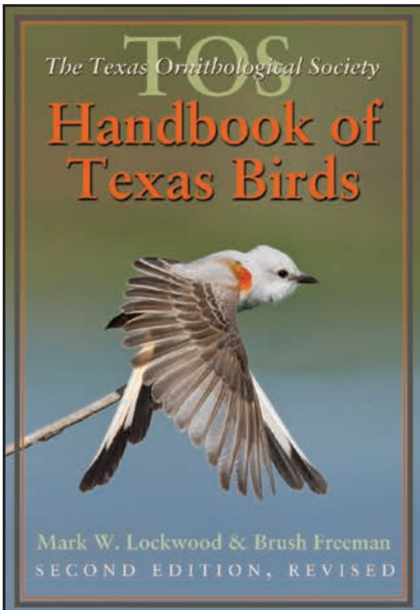
John T. Baccus, Associate Editor

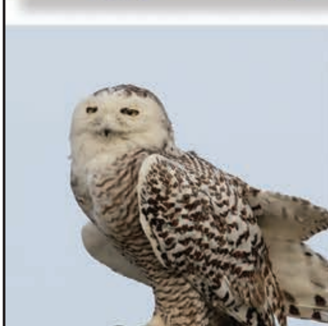
Rev. 05-Oct-2007

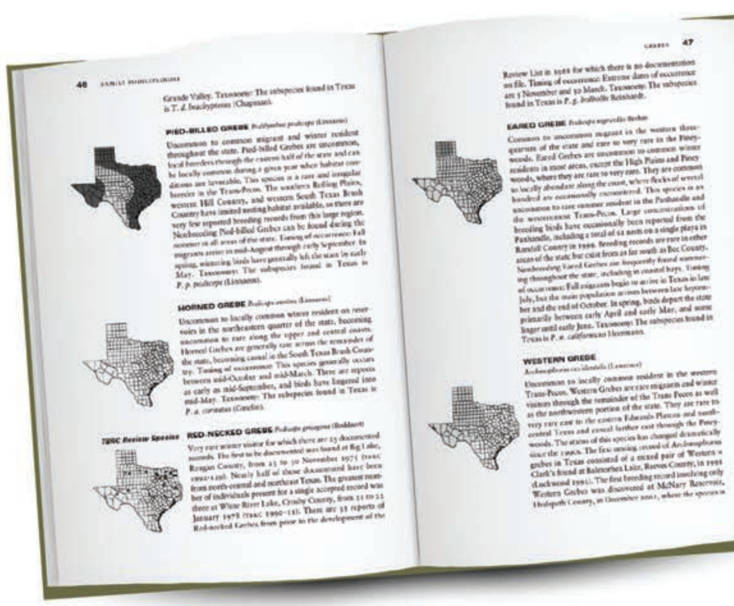
Rev. 01-Sept-2009

Rev. 01 Dec-2010

Rev. 01 Dec-2013


TOS
The Texas Ornithological Society
Handbook of Texas Birds
Mark W. Lockwood & Brush Freeman
SECOND EDITION, REVISED





Vol. 47. No. 1-2 December 2014 Pages 1-70

CONTENTS

MAJOR ARTICLES

SHORT COMMUNICATIONS

BOOK REVIEW

Painted Redstart photographed at a rest stop near Falfurrias, Texas. Photo Colette Micallef.

Jack Clinton Eitniear, Editor, E-mail: Bulletin@Texasbirds.org
Kent Rylander, Associate Editor, E-mail : kent.rylander@mac.com

Printed by Sheridan Press

BULLETIN OF THE TEXAS ORNITHOLOGICAL SOCIETY **Vol. 47 No. 1–2 December 2014**