Kansas Ornithological Society
BULLETIN
PUBLISHED QUARTERLY
Vol. 60 December, 2009 No. 4

FISH CROW (Corvus ossifragus) RANGE EXPANSION IN KANSAS

Tyler L. Hicks[1]
[1]*Washington State University Vancouver, Science Program, 14024 NE Salmon Creek Ave., Vancouver, WA 98686 (tyler_hicks@wsu.edu)*

ABSTRACT

The Fish Crow (*Corvus ossifragus*) has been expanding its range across North America. In the last quarter century the species has made significant advances into Kansas. Utilizing a wide variety of professional and amateur ornithologist's records I constructed a database of Fish Crow sightings in Kansas during the past 25 years. Utilizing this database and ArcGIS mapping systems I determined the phenology and mapped the current range of Fish Crow in Kansas. In addition, I calculated temporal and spatial rates of expansion for the Fish Crow across the state. I found over 480 individual Fish Crows have been recorded in 20 counties in the south-central and eastern regions of the state. Expansion across the state varied temporally and spatially with the majority of Fish Crow expansion taking place between 1999 and 2009. Expansion rates statewide averaged ~ 18 km/year. However, patterns and rates of expansion along river systems varied drastically.

INTRODUCTION

The Fish Crow (*Corvus ossifragus*) is a medium-sized, all-black corvid that can be found in forested riparian areas in eastern and south-central Kansas. Until recently their distribution was restricted to the far southeastern corner of the state, primarily along the Spring River drainage in Cherokee County (Thompson and Ely 1992). The species has been expanding its range for the past 50 years in Missouri and Oklahoma, where it was first documented in 1954 and 1955 respectfully and had spread to counties bordering Kansas by the mid-1980's (Wilhelm 1960, Baumgartner and Baumgartner 1992, Robbins and Easterla 1992). Over the last two decades the Fish Crow has colonized several drainage systems in Kansas.

The Fish Crow is a relative newcomer to Kansas being first recorded in Linn County in 1984 (Thompson and Ely 1992). No additional records were obtained until 1989 when it was first recorded in the Spring River drainage in Cherokee County (ibid). Two years later a nesting pair was observed at a heron rookery in Cherokee County (ibid). However, the Kansas Bird Records Committee (KBRC) did not remove it from the hypothetical list until 1997 when physical evidence was documented by Mark Corder (Pittman 1998).

The range expansion of Fish Crows has been documented throughout its range (Easterla 1965, Fink 1975, Wells and McGowan 1991, Robbins and Easterla 1992). However, little has been published recently on its expansion in the northwest portion of its range or on its expansion in Kansas. Herewith I provide an up to date detailed account of the species expansion and current range in Kansas.

METHODS

Records for Fish Crow in Kansas were gathered from several sources. These included the Kansas County Listing Project, the KSBIRDS listserv, Christmas Bird Count data (CBC), the Kansas Breeding Bird Atlas (KBBAT), the KBRC, eBird (eBird 2009), and a variety of past and current literature resources on Kansas birds (Thompson and Ely 1992, Busby and Zimmerman 2001, Janzen 2007). Data collected from observer reports included date, location, number of Fish Crows observed, observed breeding behavior, and identity of the observers. Records span from 1984 to July 2009. If the observer did not note the number of Fish Crows observed I applied a value of one and if a range of Fish Crow numbers was given I used the highest estimate. Records were compiled into a database. This database was used to determine the phenology and current range of the Fish Crow in Kansas. I then imported the Fish Crow database into ArcGIS (2009, 9.3, ESRI, Redlands, CA) and observation records were geo-referenced as precisely as possible by their descriptions. Abbreviations for observers can be found in the Acknowledgments.

Next, I identified drainage systems currently occupied by Fish Crows. Utilizing these data I created a detailed range map in Kansas. I identified "Confirmed Range" as areas, primarily waterways, where they had been observed during the breeding season and are presumed to have colonized. To these confirmed areas I applied a 9 km buffer of "Probable Range" where Fish Crows can likely be found breeding within appropriate habitat or could potentially spread to within one year. Finally, I applied a 45 km buffer to confirmed areas and identified these areas as "Potential Range". Within this range, I reasoned Fish Crow could potentially already be breeding, or could colonize appropriate habitat within the next five years. Buffer widths were determined from measures of gradual expansion rates of Fish Crow along the Arkansas River (see below).

I calculated the rate of expansion on a temporal and spatial scale using two methods. In order to monitor the temporal expansion I graphed a cumulative line graph of first occurrence by county across the 25 years. With this type of graph the steepest regions of the line represent periods of greatest expansion. In order to measure the spatial expansion I utilized the geo-referenced database and a suite of ArcGIS tools to determine the average rate of expansion in Kansas over the past two decades. This was accomplished by measuring the distance "as the crow flies" to the nearest state line or encounter from the previous year. Descriptive statistics for expansions rates were calculated in MiniTab (2007, 15.1.30, Minitab Inc., State College, PA).

RESULTS

From the previously mentioned sources I compiled 136 reports of Fish Crow in Kansas totaling a minimum of 480 individuals. Observations ranged from 3 February to 15 September with the bulk of reports occurring in April and May (Figure 1). Fish Crows were not recorded in Kansas during the mid-winter months. They were observed in 21 counties throughout the south-central and eastern regions of the state. Date of first occurrence and high counts were compiled for each county (Table 1). The largest number of Fish Crows observed on one day in Kansas was 40 recorded by Loyd Moore in Cherokee County in 1998. The largest single flock record was 19 by Leon Hicks in Derby, Sedgwick County on 2 May 2007. Jeff Calhoun recorded a similar size flock near Derby on 25 April 2009. Breeding has been confirmed in only two counties: Cherokee in 1989 (Thompson and Ely 1992) and Sedgwick in 2007 (author and Leon Hicks).

Fish Crows were recorded on eight major river systems including (clockwise from northeast Kansas) the: Kansas (Kaw), Marmaton, Spring, Neosho, Verdigris, Caney, Walnut, and the Arkansas Rivers (Figure 2). In addition, Fish Crows were associated with several smaller tributaries and other water impoundments (Figure 2).

The expansion of Fish Crow into the state on a temporal scale occurred relatively slowly during the first 15 years of its occurrence. From 1984 to 1998, Fish Crows were known from only one or two counties. During 1999, the species was found in three additional counties. By 2005, they had been recorded in 14 counties and by 2009 it was observed in 20 counties. Despite being in the state for 25 years the majority of expansion took place in the last decade from, 1999 to 2009 (Table 1, Figure 3).

The spatial expansion in Kansas was illustrated by 39 expansion events over the 25-year period. Expansion distances varied from 0.7 km to 77.0 km. The mean distance of expansion was 19.3 km (SE 3.0 km, N=39). The pattern of expansion differed across the state with a leap-frogging pattern typifying the eastern drainages and a more gradual expansion along the southern drainages. For example, expansion along the Arkansas River was well documented with the first record in southern Cowley County in 2000 (GY). The gradual progression northward continued with Fish Crows being first recorded in Sumner County in 2004 (MT and GY), in southern Sedgwick County in 2006 (author, PJ, LH), and in central Wichita in 2008 (MH). Over a nine year (2000-2008) period Fish Crows moved 76.4 km "as the crow flies" along the Arkansas River translating to an approximate expansion rate of 8.5 km/year.

Expansion along other Kansas rivers is more difficult to quantify as colonization took place in a leap-frog pattern. This pattern of expansion has been documented in Fish Crows colonizing Ithaca, New York (Wells and McGowan 1991). For example, Fish Crows colonized regions far from any previous reports in Douglas (2002), Greenwood (2002), Coffey (2005), and Osage (2009) counties. It should be noted that many drainages lack sufficient records to hypothesize on the pattern of expansion.

DISCUSSION

The recent establishment of Fish Crows in eastern and south-central Kansas has been clearly documented by professional and amateur ornithologists in the state. However, thorough documentation of this species in many southeastern counties has been lacking. This is likely a reflection of minimal birding activity by the few birders in the region. For example, Woodson County has no Fish Crow records, yet it is bordered on three or more sides by counties with records. In addition, many of these counties have only a few records. A more thorough survey of the region would be helpful in defining the full extent of the Fish Crow's colonization of the southeastern region of the state. Unfortunately, the KBBAT, which took place from 1992 to 1997, fell in the time period just prior to their major expansion in Kansas (Figure 3) (Busby and Zimmerman 2001).

Fish Crows appear to be an early spring migrant and summer resident in Kansas, arriving in late March or early April and departing by early August. However, a few individuals have been recorded in February and September. Our current understanding of Fish Crow migration is poor (McGowan 2001). In some far northern enclaves, such as in upstate New York, Fish Crows can be found during winter months (McGowan 2001). To date no mid-winter records for Fish Crow exist and it has yet to be recorded on a CBC in Kansas (NAS 2002). However, this may be due to the difficulty of separating Fish Crow from American Crow (*Corvus brachyrhynchos*) during the winter months when vocal activity is reduced

The majority of records come from major rivers or near water impoundments during April and May (Figures 1 and 2). Two factors likely contribute to the increased number of records of Fish Crow during this period. First, April and May fit into the known territory establishment period and nesting season for Fish Crows (McGowan 2001). As a result, Fish Crows are more likely to be detected, as they are more visually and aurally evident. Secondly, birders are more active in the eastern part of the state during the spring in search of Neotropical migrants, namely warblers. Despite the large number of detections during the nesting season there are few confirmed breeding records. The first nesting record was documented in a Great

Blue Heron (*Ardea herodias*) rookery in Cherokee County (Thompson and Ely 1992). No additional nesting behavior was noted until the author and LH observed Fish Crows nest building at the confluence of the Big Ditch and Arkansas River, also near a Great Blue Heron rookery, near Derby, Sedgwick County, in 2007. Fish Crows were again documented by JC and PJ nest building in this same vicinity in 2009.

The reasons for the recent expansion of Fish Crow across its range and in Kansas are still unknown. Fish Crows are known to be specialist on colonial waterbird eggs, especially those of herons, egrets, and cormorants (Burger and Hahn 1977, Shields and Parnell 1986, Post 1990, Post and Seals 1991). They are known to commonly nest within waterbird colonies and have serious impacts on the productivity of those colonies (Burger and Hahn 1977, Shields and Parnell 1986, Post 1990, Post and Seals 1991). Expansion may be partly related to two major events. First, egret and heron populations have recovered from hunting for plumes in the millinery trade at the turn of the 20th century (Fleury and Sherry 1995). With this recovery many egret and heron populations have spread inland from their strongholds on the Gulf Coast. Indeed, many species of waders such as Great Egret (*Ardea alba*), Snowy Egret (*Egretta thula*), and Little Blue Heron (*Egretta caerulea*) were once considered rare breeders in the Kansas less than a half-a-century ago, and are now considered common (Thompson and Ely 1989, Busby and Zimmerman 2001, Janzen 2007). Secondly, construction of numerous inland water impoundments has benefited colonial waterbirds, including Double-crested Cormorants (*Phalacrocorax auritus*), which now breed at a number of inland sites (Post 1988, Hatch 1995). It is possible that Fish Crows are following this food resource inland (Baumgartner and Baumgartner 1992). Certainly it is interesting that Kansas's only two confirmed breeding records come from within or near Great Blue Heron rookeries. In addition, one of the most remote reports of Fish Crow in Kansas comes from John Redmond Reservoir that possesses large wading bird nesting colonies, at least three Great Blue Heron rookeries with a total of approximately 75 nesting pairs (pers. comm. Tim Menard), and a nearby Double-crested Cormorant colony at Wolf Creek Reservoir (Busby and Zimmerman 2001).

Another possible explanation for Fish Crow range expansion is warming temperatures associated with global climate change. Undoubtedly, temperatures in the Central Plains States have been warming over the past century (IPCC 2007). However, Fish Crows have occupied comparatively cooler climates for the past century in the northeast United States (McGowan 2001). Nevertheless, indirect effects of climate change on Fish Crow expansion cannot be ruled out.

It is likely that Fish Crows will continue to expand its range in the state. Just how far they will expand is difficult to predict. They were recently recorded on the Platte River in eastern Nebraska (pers. comm. Joel Jorgensen). Fish Crow impacts on nesting birds have been documented elsewhere and their expansion into the state should be monitored. Birders should listen and watch for Fish Crows at heron rookeries and riparian areas within their potential range. In addition, birders should continue to report their sightings to the KBRC, eBird, or the KSBIRDS listserv so that the continued expansion can be documented.

ACKNOWLEDGEMENTS AND OBSERVERS

I'd like thank Jeff Calhoun, Leon Hicks, Pete Janzen, and Mark Robbins for their comments on the manuscript and to all those who submitted reports or documentation of Fish Crows to the KSBIRDS listserv, KBRC, or eBirds. The following individuals provided data for the manuscript either directly or through their use of the public domain, and those with abbreviations were directly referenced in text: Mike Andersen, Charles Anderson, Robert Antonio, Bill Busby, Ted Cabel, Jeff Calhoun (JC), Mark Corder (MC), Matt Gearhart (MG), Harry Gregory, Chet Gresham (CG), Kevin Groeneweg, Alan Godwin, Mike Heaney (MH), Lawrence Herbert, Rex Herndon, Leon Hicks (LH), Chris Hobbs (CH), Pete Janzen (PJ), Joel Jorgensen, Mark Land,

Catherine Lewis, Jim Malcom (JM), Bob Mangile (BM), Ed McCullough, Mick McHugh, Tim Menard, Cheryl Miller, Ed Miller, Aaron Mitchell, Loyd Moore (LM), Dan Mulhern (DM), Sebastian Patti (SP), Michael Patton, Brenda Smith-Patton, Brandon Percival, Galen Pittman, Mike Rader (MR), Mark Robbins(MRo), Steve Roels (SR), Travis Ross, Richard Rucker, John Schukman, Carolyn Schwab, David Seibel, Scott Seltman (SS), Dwight Shoup, Shawn Silliman, Norm Smith, M.W. Stoakes, Terry Swope, Max Thompson (MT), Edge Wade, Dave Williams, Chris Wood, Gene Young (GY). Lastly, I'd like to thank Washington State University –Vancouver, for providing research facilities.

LITERATURE CITED

Baumgartner, F.M., and A.M. Baumgartner. 1992. Oklahoma Bird Life. University of Oklahoma Press, Norman, OK.

Burger, J. and D.C. Hahn. 1977. Crow predation on Black-crowned Night Heron eggs. Wilson Bulletin 89: 350-351.

Busby, W.H. and J.L. Zimmerman. 2001. Kansas Breeding Bird Atlas. University Press of Kansas, Lawrence, KS.

Easterla, D.A. 1965. Range extension of the Fish Crow in Missouri. Wilson Bulletin 77: 297-298.

eBird. 2009. eBird: An online database of bird distribution and abundance [web application]. Version 2. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: Date [July 27, 2009]).

Fink, L.C. 1975. Changing status of the Fish Crow inland. Chat 39: 67-71.

Fleury, B.E. and T.W. Sherry. 1995. Long-term population trends of colonial wading birds in the southern United States: The impact of crayfish aquaculture on Louisiana populations. Auk 112: 613-632.

Hatch, J.J. 1995. Changing populations of Double-crested Cormorants. Colonial Waterbirds 18 (Spec. Publ. 1): 8-24.

IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Janzen, P. 2007. The Birds of Sedgwick County and Cheney Reservoir. Monograph I, Kansas Ornithological Society.

McGowan, K. J. 2001. Fish Crow (Corvus ossifragus), 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/589doi:10.2173/bna/589.

National Audubon Society. 2002. The Christmas Bird Count Historical Results [Online]. Available http://www.audubon.org/bird/cbc [July 18, 2009].

Pittman, G. 1998. 1997. Report of the Kansas Bird Records Committee. Kansas Ornithological Society Bulletin 49: 26-29.

Post, W. 1988. Spread of the Double-crested Cormorant into interior of the southeastern United States. Colonial Waterbirds 11: 115-116.

Post, W. 1990. Nest survival in a large ibis-heron colony during a three-year decline to extinction. Colonial Waterbirds 12: 50-61.

Post, W. and C.A. Seals. 1991. Breeding biology of a newly established Double-crested Cormorant population in South Carolina. Colonial Waterbirds 14:34-38.

Robbins, M.B. and D.A. Easterla. 1992. Birds of Missouri: Their distribution and abundance. University of Missouri Press, Columbia, MO.

Shields, M.A. and J.F. Parnell. 1986. Fish Crow predation on eggs of the White Ibis at Battery Island, North Carolina. Auk 103: 531-539.
Thompson, M.C. and C. Ely. 1989. Birds in Kansas. Vol. I. University of Kansas Museum of Natural History Public Education Series No. 11.
Thompson, M.C. and C. Ely. 1992. Birds in Kansas. Vol. II. University of Kansas Museum of Natural History Public Education Series No. 12.
Wells, J.V. and K.J. McGowan. 1991. Range expansion in Fish Crow (*Corvus ossifragus*): the Ithaca, NY, colony as an example. Kingbird 41: 73-82.
Wilhelm, E.J., Jr. 1960. The Fish Crow in easternmost Oklahoma. Wilson Bulletin 72: 405.

Table 1. First record dates and high counts for Fish Crow by county in Kansas. Observers initials correspond to names found in the Acknowledgments.

COUNTY	FIRST DATE	OBSERVERS	HIGH COUNT	HIGH COUNT DATE	OBSERVERS
Allen	11 July 2004	SS	1	Same	Same
Bourbon	15 June 2007	MR	4	Same	Same
Butler	15 September 2006	GY	2	Same	Same
Chatauqua	2 May 1999	GP	10	1 April 2007	PJ
Cherokee	1989	Unknown	40	3 May 1998	LM
Coffee	28 April 2005	MG	2	30 March 2008	JM
Cowley	28 April 2000	GY	12	20 May 2008	GY, MT
Crawford	12 May 2001	BM	12	Same	Same
Douglas	3 February 2002	MRo	3	27 April 2008	SR
Elk	11 April 2009	GY	5	Same	Same
Greenwood	12 April 2002	TH, CG	2	Same	Same
Johnson	4 April 2009	MG	3	Same	Same
Labette	24 August 2009	DM	1	Same	Same
Leavenworth	10 May 2003	MG	1	Same	Same
Linn	1984	Unknown	17	7 May 2005	CH
Montgomery	2 May 1999	GP	11	9 April 2000	TH, CG
Neosho	25 August 1999	DM	3	26 June 2004	PJ
Osage	19 June 2009	MG	1	Same	Same
Sedgwick	6 April 2006	PJ	19	7 May 2007	LH
Sumner	5 May 2004	MT	3	Same	Same
Wilson	26 June 2004	PJ	1	Same	Same

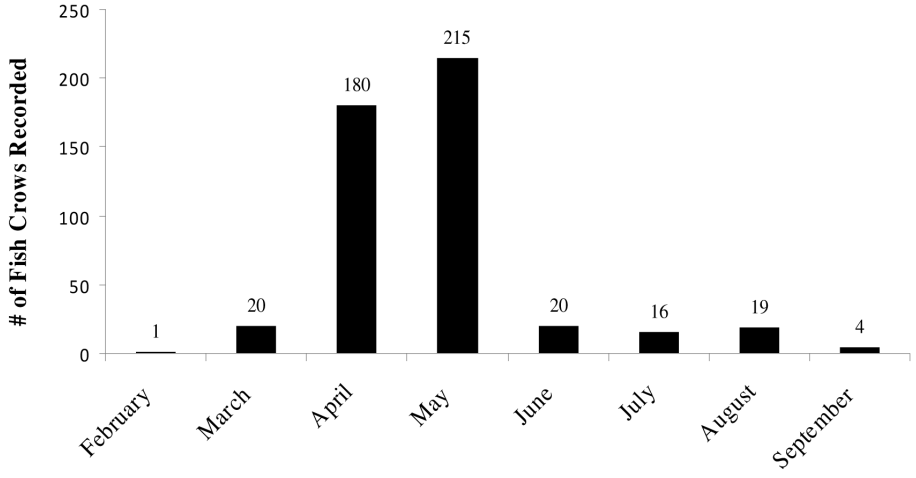

Fig. 1. A graph depicting the predominance of Fish Crow records in April and May in Kansas.

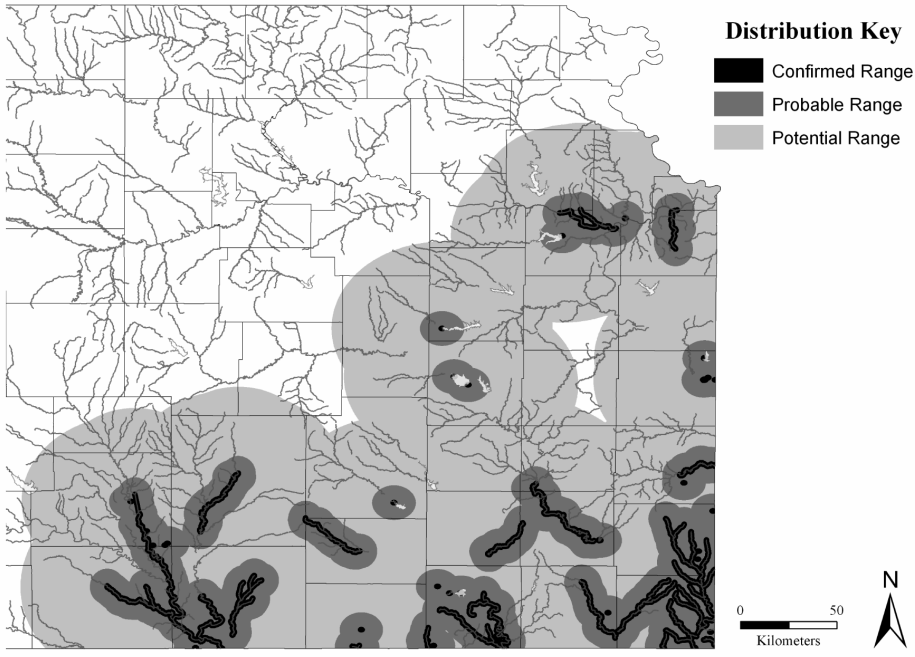

Fig. 2. A map depicting the confirmed (darkest shading), probable, and potential (lightest shading) range of Fish Crow in Kansas.

Fig. 3. A cumulative line graph of Kansas counties with Fish Crow records across a 25-year span (1984-2009) highlighting the period of expansion from 1999-2009.

MANUSCRIPTS NEEDED

The *KOS Bulletin* is the official peer-reviewed journal of the Kansas Ornithological Society which is published quarterly. The *KOS Bulletin* is devoted to the field study of birds in Kansas, although other suitable materials can be published. Featured Articles, and short notes of scientific or general interest are solicited; potential authors are encouraged to submit any materials that contribute to the understanding of birds in Kansas, including details for documentation of unusual or rare species. Authors are encouraged review the "Instructions to Authors" in the June 2007 issue of the *KOS Bulletin* (58[2]:24) prior to submitting manuscripts for review.

Eugene A. Young
Editor, KOS Bulletin
Northern Oklahoma College
1220 E. Grand, PO Box 310
Tonkawa, OK 74653-310
580-628-6482 (phone)
Eugene.Young@north-ok.edu
edkosbull@yahoo.com

ISSN-0022-8729 12/01/2009