

RANGE EXPANSION IN FISH CROW (*Corvus ossifragus*): THE ITHACA, NY, COLONY AS AN EXAMPLE

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The dynamics of colonization and range expansion are poorly understood in most bird species. The establishment of a colony of Fish Crow (*Corvus ossifragus*) in Ithaca, Tompkins County, New York is an interesting and perhaps instructive example of this process. This paper examines the history of this colony and comments on the dynamics of range expansion in Fish Crow.

Fish Crow occurs along the Atlantic Coast of North America from Massachusetts south to Florida, across the Gulf Coast to Texas, and inland along major rivers to Arkansas, Tennessee, Kentucky, Missouri, Oklahoma, and Illinois (AOU 1983). In New York, they traditionally have been found along coastal regions of Long Island and up the Hudson River to Poughkeepsie on the east bank and to Esopus, 16 km north, on the west bank (Bull 1974; Bonney 1988). Fish Crow shows a strong preference for habitats near water and is rarely seen any distance from such areas (AOU 1983). Although the movements of this species have not been well studied, it is thought that some northern populations may withdraw south in winter (Bull 1974, McNair 1985). Most populations, however, are largely sedentary (Bull 1974).

HISTORY OF THE ITHACA FISH CROW COLONY

In March 1974, a Fish Crow was discovered in Ithaca, New York, (Comar 1974) 200 km (125 miles) from the nearest known breeding site along the Hudson River in southeastern New York. Its identification was verified by comparing the bird's taped vocalizations with known Fish Crow calls. This bird was last reported on 9 May of that year (Comar 1974). A Fish Crow found in Ithaca in March 1975 was joined by a second bird from May through July, raising the possibility of breeding (Kibbe 1975). Reports continued sporadically from 1976 to 1978 (Benning 1976a, 1976b, 1977, 1978, McIlroy 1976).

In 1979, six Fish Crow were present (Cayuga Lake Basin Record Cards, Cornell Lab of Ornithology), with one pair observed carrying nesting material in early May. The birds were later seen on a nest located in a

White Pine (*Pinus strobus*) in the Cayuga Heights section of Ithaca (McIlroy 1979). The nesting attempt apparently failed, since no young were observed in the nest (Benning 1979). However, in September two young were reported from Stewart Park on the south end of Cayuga Lake, two miles west of Cayuga Heights (Cayuga Lake Basin Record Cards, Cornell Lab of Ornithology), indicating at least one other nest was present. Four birds remained in Ithaca until at least 17 Nov 1979 (Benning 1980a). From 1980 to 1988, three or four pairs of Fish Crow were noted during the breeding season each year (Benning 1980b, 1981a, 1981b, 1981c, 1982a, 1982b, 1983a, 1983b, Clements 1984a, 1984b, Kibbe and Boise 1984a, 1984b, 1986, Melin 1986a, 1986b, 1987a, 1987b, 1988). Several nests were located during this period, and although no observed nest succeeded, fledged young were observed in 1981 (Cayuga Lake Basin Record Cards, Cornell Lab of Ornithology) and 1984 (Clements 1985), and a bird of the year was found in 1988 (McGowan pers. obs.).

Fish Crow was first observed on the 1 Jan 1982 Ithaca Christmas Bird Count (CBC) with three observed (Confer 1982). Two to four have been seen on each CBC since that time, with one exception. A surprising count of 16 was reported on the 1 Jan 1988 count (Butcher 1988), twice as many as the previous maximum observed at any time in Ithaca; eight were present in 1983 (Benning 1983a).

In the summer 1988 we began systematic observations of Fish Crow in Ithaca. Five were present in Stewart Park in July, 1988, where they had been observed throughout the winter. Six were seen in Stewart Park in April 1989, and 5 or 6 were present in Cayuga Heights in May. In the beginning of 1989, McGowan began a study of both American Crow (*Corvus brachyrhynchos*) and Fish Crow in the Ithaca area. He discovered three temporally sequential Fish Crow nests, all of which failed. A fourth nest (fate unknown) was reported at the same time as the third nest, and juveniles were observed in Stewart Park in August, indicating at least two and perhaps three breeding pairs were present that year. Six Fish Crow were counted in April 1990. McGowan found and banded young in two successful nests, and was aware of two other possible nests that season. One of the latter was successful, as an unbanded juvenile was present at Stewart Park in August 1990 with one banded young and eight adults. Again, three or four breeding pairs were present in the area.

The maximum number of Fish Crow reported from Ithaca each year is shown in Figure 1. It should be noted that during this entire period no other Fish Crow colonies have become established anywhere in the area, although Fish Crow was reported inland on Christmas Bird Counts at Binghamton (Bemont 1987, 1990) and Clinton (Hurd 1989, 1990), have been reported as possible breeders in Vestal (Bonney 1988), and have been reported in other seasons at scattered points across upstate New York (below).

DYNAMICS OF RANGE EXPANSION

A population can expand its range by one of three ways. In the first (Figure 2A), which we have termed *gradual* or *creeping* range expansion, areas along the range edge are colonized without skipping over large areas of suitable habitat. In the second (Figure 2B), which we have called *leapfrogging* range expansion, substantial sections of apparently suitable habitat are skipped and an area at some distance from the range edge is colonized. After a colony has been founded, the unoccupied habitat

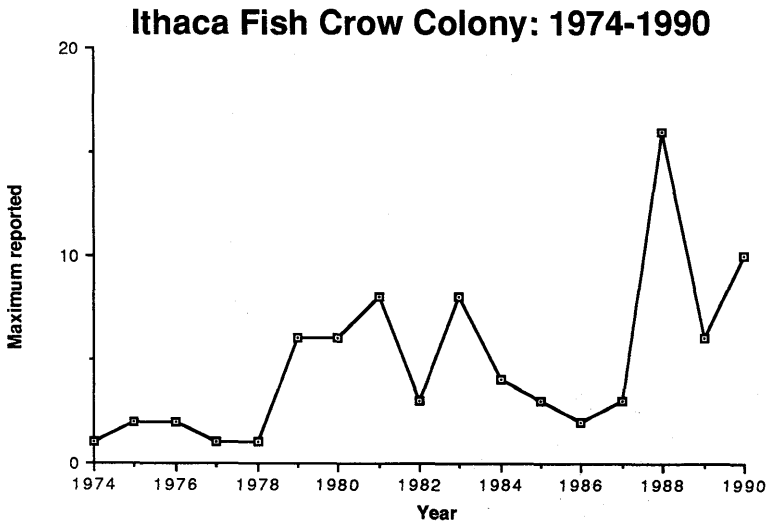
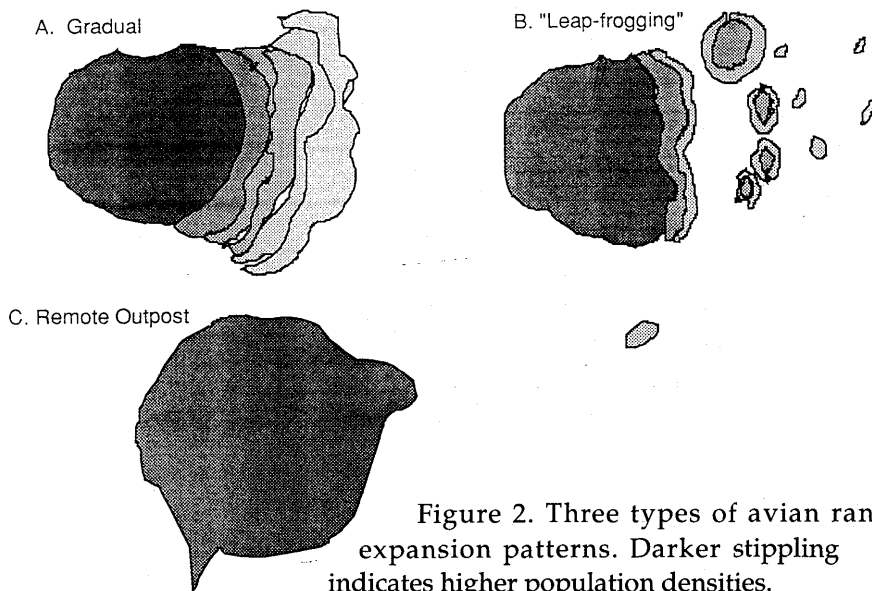


Figure 1. Maximum number of Fish Crow recorded in the Ithaca colony from 1974 to 1990. Pre-1988 data are from the literature (see text for citations).

between may be filled from both directions. It is important to note that a pattern of range expansion by noncontiguous colonization events is not necessarily an example of leapfrogging. Leapfrogging range expansion occurs only when areas of available habitat between colonies are unoccupied. If no suitable habitat is present between colonies, such range expansion would be an example of gradual or creeping range expansion. The third pattern of range expansion (Figure 2C), which we have termed *remote outpost colonization*, also involves establishment of a colony at some distance from the former range edge but in this pattern the area between the colony and the range edge remains unoccupied. The first two types of expansion occur when a population is numerically increasing while the last type can occur when a population is increasing, stable, or even decreasing.

To understand which type of range expansion pattern fits the Ithaca Fish Crow colony, we must examine the status and distributional history of Fish Crow throughout its range. Fish Crow has expanded inland along the rivers of the Mississippi drainage in Arkansas (James and Neal 1986), Oklahoma (Sutton 1967, Wood and Schnell 1984, Grzybowski 1990), Missouri, Illinois, and Kentucky (Mengel 1965, Peterjohn 1988), and has recently occurred in Kansas (Grzybowski 1990). Expansion up major rivers has been noted in Alabama (Jackson 1990),



Georgia (Burleigh 1958), South Carolina and North Carolina (Fink 1975, Potter *et al.* 1980), Virginia (Larner *et al.* 1979, Meanley 1981), West Virginia (Hall 1979), Maryland (DeGraef *et al.* 1980), and Pennsylvania (Poole 1964, DeGraef *et al.* 1980). Northward coastal expansion was reported from Massachusetts and Maine (Vickery 1978). In Maine, Fish Crow was not officially added to the state list until 1978 (Cannell 1982). Breeding was confirmed at Brunswick, Maine, in 1985 (Tingley 1985), approximately 240 km (150 miles) from the prior range limit in Massachusetts. Birds were discovered nest building in Portland, Maine, in 1988 (Despres and Wells 1988), midway between the Brunswick colony and its Massachusetts range. Increasing numbers have been noted in western Massachusetts as well (Nikula 1983).

In New York, expansion along river systems has been reported (Kibbe 1987, Bonney 1988). During the New York State Breeding Bird Atlas period (1980-1985), breeding was confirmed on the Hudson River at East Greenbush, 48 km (30 mi) north of the previously reported range limit (Bonney 1988), and possible breeding was noted near the Susquehanna River in Vestal 40 km southeast of Ithaca and 5-10 km north of the Pennsylvania border (Bonney 1988).

For a population to expand its range, some individuals must leave the original range limits. Therefore, it is instructive to examine patterns of vagrancy in Fish Crow. In New York state, vagrant birds have been reported at Braddock Bay (Kibbe 1987), Derby Hill (Kibbe and Boise 1984a, 1986), Elmira (Kingbird 1967, in Comar 1974), Hamlin Beach State Park (Kibbe and Boise 1984b), Montezuma (Kibbe and Boise 1984a), in the Utica-Rome area (D. Evans pers. comm.), and, early in this century, at Geneva (Eaton 1914). Vagrants have also been recorded in Ontario, Nova Scotia, Vermont (DeSante and Pyle 1986), and Indiana (Peterjohn 1988). All New York localities are at least 55 km (35 miles) from the nearest known range limit at the time of the record. Other localities are at least 160 km (100 miles) from the known range boundary of Fish Crow.

It is clear that Fish Crow is expanding its range throughout its entire range and that vagrancy is not unprecedented in the species. In this context it appears that the Ithaca Fish Crow colony is an example of a leapfrogging range expansion pattern, and that this pattern is generally common to the species wherever it is extending its range. For example, in Maine (Tingley 1985, Despres and Wells 1988), New York (Bonney 1988), and Virginia (Meanley 1981) new colonies were established large

distances from previous breeding range limits. The Ithaca colony is unusual, however, in that it is not along a major river system like inland colonies. More Fish Crow colonies may well become established in upstate New York and the future colonization of the shore of Lake Ontario seems likely.

The difficulties in distinguishing Fish Crow from American Crow could affect our interpretation of range expansion patterns. Although differing in size and some subtle plumage characteristics, Fish Crow is essentially indistinguishable in the field from American Crow except by voice. American Crow has a wide range of vocalizations that include calls that can be mistaken for Fish Crow calls. Not only can the begging calls of young American Crow cause confusion with Fish Crow, but so can the begging calls of courting female American Crow (McGowan pers. obs.). The latter vocalization occurs in the early spring when observers sometimes assume that American Crow do not make sounds that could be mistaken for Fish Crow. The only absolutely diagnostic Fish Crow call is a double-noted "Uh-Uh." This call is never given by American Crow. Therefore, two problems exist: silent Fish Crow can be mistaken for American Crow, and begging American Crow can be mistaken for Fish Crow. Despite this problem we feel that the records we have cited are indicative of the true range expansion pattern in Fish Crow. Range expansion has been reported repeatedly throughout the species' range, and we have cited only records that have been reviewed by some process.

We have shown evidence from examination of range changes that Fish Crow has increased in abundance. Robbins *et al.* (1986), using Breeding Bird Survey data, also documented increases in Fish Crow populations throughout the species range during the period 1965-1979. Many other North American and European corvids have shown steady increases in this century. American Crow has increased significantly in eastern North America (Robbins *et al.* 1986) and is expanding its range northwest into Alaska (Gibson 1986, Gibson *et al.* 1987). Common Raven (*Corvus corax*) populations are on the rise over the entire North American continent (Robbins *et al.* 1986), reinvading areas they historically occupied and colonizing new localities (Knight and Call 1980). Mexican Crow (*Corvus imparatus*) has spread north into Texas (Arvin *et al.* 1975, Tyler 1976). Blue Jay (*Cyanocitta cristata*) also has increased (Bock and Lepthien 1976, Smith 1978), perhaps due to the

proliferation of bird feeding stations. In Great Britain, Eurasian Jackdaw (*Corvus monedula*) populations are expanding (Parslow 1967, Sharrock 1976). A recent influx of that species into northeastern North America (Smith 1985, Yank and Aubry 1985) may be linked to this increase. Because corvids often prey on the eggs and young of other species, some authors have suggested that recent population declines in certain North American passerines could be related to the increase in corvid populations (Terborgh 1989).

Examination of range expansion and shrinkage is an under used method for following population trends (Wilcove and Terborgh 1984). Most indices of population trends, such as analyses of Christmas Bird Counts and Breeding Bird Surveys, are based on measures of abundance within a fixed area. With the increase in breeding bird atlas projects completed or in progress throughout North America, changes in range patterns will become easier to document. Such analysis should become an integral part of our efforts to understand and manage bird species.

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