

particular relationships of arctic predator-prey populations have been reported for jaegers (especially *Stercorarius pomarinus*) and Short-eared Owls (*Asio flammeus*) in Alaska (Pitelka et al. 1955) and for several avian predators in Scandinavia (Hagen 1965, 1969).

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THE COMMON CROW, *CORVUS BRACHYRHYNCHOS*, IN THE GREAT BASIN

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Johnston (1961) in his work, "The biosystematics of American crows," presented a map showing the breeding distribution of three species of North American crows. Concerning the Common Crow (*Corvus brachyrhynchus*) it is noted that the region of North America known as the Great Basin has been left blank. Johnston purposely did this since he was unable to locate and examine a single specimen from the area. He stated that "Common Crows breed sparingly in the Great Basin region, so until sufficient numbers of specimens are available from southern Idaho, Utah and Nevada, their subspecific allocation must remain undetermined."

Common Crows inhabiting the Great Basin were reported as early as 1867 by Ridgway (1877) who collected one male from the Truckee Meadows, Nevada. Henshaw (1874) reported two crows in the vicinity of Provo, Utah, in 1872; and Hoffman (1881) reported their occurrence in Big Smoky Valley and near Bull Run Mountain, both in central Nevada. Some residents of the Great Basin contend that crows were not abundant until early in the 1930's, an observation supported by the literature. Gabrielson (1949) reported 500 Common Crows on 20 August 1933 eating buffalo berries in Paradise Valley, Nevada, and several hundred on 19 August 1938 at the head of the Humboldt River in Nevada.

Several areas within the Great Basin presently support thousands of wintering Common Crows, but reports consist primarily of brief notes scattered through various faunistic studies (Hanna 1904; Linsdale 1936, 1951; van Rossem 1936; Alcorn 1946; Richards and White 1963).

The purpose of this study was to determine the subspecies of the Common Crow nesting in the Great Basin and collect information on its distribution during the summer and winter.

PROCEDURES

Specimens were collected wherever possible throughout the Great Basin. Only adult breeding birds taken from the immediate vicinity of their nests were used to determine the subspecific identity. A sample of crows wintering in Utah Valley (central Utah) was also taken and compared with the breeding birds. As with breeding birds, only adults were selected for measurement. Separation of immature birds from adults was based on information provided by Emlen (1936), and males and females were analyzed separately. Lengths of wing chord, tail, tarsus, and bill were used to determine the subspecies. Procedures for measuring these characteristics were patterned closely after those used by Johnston (1961).

RESULTS

Subspecific identity. The data obtained from 29 adult breeding birds collected in the Great Basin (table 1) were compared with the pooled means calculated from the data on the Common Crow presented by Johnston (1961). The wing chord and tarsal lengths of Great Basin specimens are well within the range expected for eastern crows, *C. b. brachyrhynchus* (table 2). Although the tail lengths of Great Basin specimens are somewhat longer, they still fall within the upper extremes for the eastern crow. Bill lengths constitute an exception to the resemblance to the eastern race. Breeding specimens from the Great Basin in this case more closely resemble the western crow, *C. b. hesperis* (table 2). An examination of a sample of 14 adult crows wintering in the Great Basin shows that in all categories they resemble the eastern race (tables 1, 2). Despite the discrepancy in bill length in the breeding specimens, the bulk of the data indicates that Common Crows inhabiting the Great Basin represent the larger eastern race, *C. b. brachyrhynchus* rather than the smaller western race, *C. b. hesperis*.

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TABLE 1. Measures (mm) of four characteristics of 43 adult crows inhabiting the Great Basin.

	Breeding (n = 29)		Wintering (n = 14)	
	♂♂	♀♀	♂♂	♀♀
Wing chord				
\bar{x}	317.1	305.1	319.0	306.3
SE	2.75	1.56	2.53	1.42
range	300-330	297-314	312-314	300-311
Tail				
\bar{x}	184.2	177.8	187.4	180.7
SE	1.97	1.16	1.30	1.84
range	175-190	173-189	180-190	175-189
Tarsus				
\bar{x}	58.1	54.0	59.1	56.7
SE	.44	.66	.03	.75
range	56.0-60.0	46.0-58.0	58.0-60.0	54.4-58.5
Bill ^a				
\bar{x}	33.1	31.7	37.4	34.1
SE	.40	.38	.53	.55
range	31.1-36.1	28.6-34.0	35.5-40.0	32.0-36.5

^a Anterior edge of nostril to tip.

Summer distribution. The occurrence of Common Crows in the Great Basin during the breeding season was restricted almost entirely to riparian habitats, consisting of valleys with meandering streams bordered by dense growths of trees, especially willows (*Salix* sp.). Open meadows nearby seemed to be necessary for breeding populations of crows. The following river systems exhibit this type of habitat and included the principal nesting areas within the Great Basin: Bear River, Rich County; Provo River, Wasatch County; Lost Creek near Croydon, Morgan County (all in Utah); and Humboldt River, Reese River, and Marys River in Nevada.

In Nevada, crows also utilized a habitat quite different from the riparian type already described. In Big Smoky Valley and Grass Valley (central Nevada) the birds nested in small "oases" generally consisting of small springs that supplied enough water to maintain some dense growths of buffalo berries (*Shepherdia* sp.) or willows. Here again there were adjacent open meadows. These "oases" were often no more than a few acres surrounded by desert for many miles. Agriculture as such was not evident, and man's occupation of the area consisted of a few ranches sparsely scattered over the valley floor.

The trees most often used as nesting sites were those forming dense thickets, such as willow, hawthorn (*Crataegus* sp.), and buffalo berry. Of the three, willows were used most frequently, probably due to their wider distribution within the Great Basin. Narrowleaf cottonwood (*Populus angustifolia*), black locust (*Robinia pseudoacacia*), and quaking aspen (*Populus tremuloides*) were sometimes used.

Winter distribution. Winter distribution was similar to that of the summer, since river valleys were the areas primarily utilized. One major difference was the movement of crows into several areas in Utah not extensively used during the summer. In October large flocks moved into Utah Valley, Cache Valley, the Brigham City-Ogden area, and the St. George area.

High concentrations of birds in winter did not seem to occur in Nevada. Merlin McCole and Molly McGee, residents of central Nevada, stated (pers. comm.) that breeding birds seem to remain in the same areas

TABLE 2. Comparison of mean lengths (mm) of wing chord, tail, tarsus, and bill of Great Basin eastern crows (*C. b. brachyrhynchos*), and western crows (*C. b. hesperis*).

	Great Basin			
	Breeding	Wintering	Eastern	Western
Males				
Wing chord	317.1	319.0	313.1	294.0
Tail	184.2	187.43	175.5	161.8
Tarsus	58.1	59.14	59.2	52.6
Bill ^a	33.1	37.43	36.3	33.4
Females				
Wing chord	305.1	306.3	302.7	281.3
Tail	177.8	180.7	168.4	153.9
Tarsus	54.0	56.7	56.8	50.0
Bill ^a	31.7	34.1	34.1	31.8

^a Anterior edge of nostril to tip.

throughout the year. This was supported by Ned K. Johnson (unpubl. MS) who rated the crow as a common permanent resident of western Nevada and suggested that there was no evidence to support Linsdale's (1936) idea that there may be more crows in Nevada during the winter than any other season.

Crows wintering in the Great Basin generally roosted in dense stands of willows and tamarix (*Tamarix pentandra*) growing close to water, although other roosting sites were observed. During the winter of 1965-66, a flock of crows utilized the coniferous trees in the cemetery at Provo, Utah, and Hayward (1948) estimated that a thousand or more crows roosted in hackberry in Slide Canyon, Utah County. Although crows in winter were commonly seen feeding in fields and orchards, they were more concentrated in the vicinity of garbage dumps and livestock feeding yards. Other crows made regular visits to drive-in cafes and movies where they picked up food scraps.

DISCUSSION

Several reports (Emlen 1938, 1940; Good 1952; and Johnston 1961) show that the distribution and habitat preferences of Common Crows are closely associated with agriculture. Good (1952) concluded that the center of abundance for Common Crows in North America was in the great wheat and corn belts of the central states; and Johnston (1961) offered "farmland with adjoining woodland" as one phrase best representing their habitat preference. One of the few major farmland areas of the Great Basin, the Wasatch Front in Utah, supported thousands of wintering crows, but surprisingly few nesting birds. In contrast, along the river systems where breeding populations of crows were the highest, ranching was the predominant type of agriculture. Perhaps the most striking feature of crow distribution in the Great Basin was their occurrence in areas dominated by desert scrub with no agricultural land within miles, as was true in central Nevada.

The conclusion that eastern crows breed and winter in the Great Basin suggests that the breeding range of this subspecies should be extended westward to include the presently accepted boundaries of the Great Basin area. This would help fill in the space left by Johnston (1961), who (because of a lack of specimens) was uncertain as to what subspecies actually did occupy this vast desert area of western North America.

SUMMARY

The mensural data from 29 adult breeding specimens and 14 adult wintering specimens of the Common Crow collected from the Great Basin area of western North America were compared with those for crows inhabiting other areas of North America. The data obtained indicated that the crows inhabiting the Great Basin belong to the eastern race, *C. b. brachyrhynchos* Brehm, and not the western race, *C. b. hesperis* Ridgway.

The breeding range of the crow in the Great Basin was restricted almost entirely to riparian habitats. The Bear River in Utah, and the Humboldt River, Reese River, and Marys River in Nevada are stream drainages supporting some of the largest populations of breeding crows. In Nevada, however, crows were also found inhabiting small "oases" surrounded by desert shrub.

The winter distribution of crows in the Great Basin exhibited two contrasting patterns. One pattern was characterized by a heavy concentration along the Wasatch Front in Utah, the other by the relative lack of concentrations in Nevada.

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SOCIAL RELATIONSHIPS AMONG MOUNTAIN CHICKADEES (*PARUS GAMBELI*)

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Previous studies of dominance-subordination responses in Chickadees, *Parus* spp. (reviewed by Dixon, *Condor* 67:291, 1965), have not demonstrated conclusively that the straight-line "peck-right" relationships obtain throughout the range of a particular flock. Data gathered in northern Utah in recent years clarify these intraflock relationships in the Mountain Chickadee (*Parus gambeli*).

Flock structure in Mountain Chickadees was studied in a mixed aspen-conifer forest at an elevation of 7300 ft approximately 30 mi. NE of Logan, Cache County, Utah. The population of individually marked chickadees at this locality has been under surveillance since 1961 (Dixon, MS). Data presented here were gathered on 80 trips to the field between 7 October 1967 and 14 April 1969. Birds were color-banded and their rectrices painted with model airplane dope to facilitate individual recognition. Dominance-subordination relationships were determined from ob-

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servations at eight feeding stations at which only one bird could feed at a time. These stations consisted of a walnut (with the shell partially removed) suspended from a thin wire.

Three classes of interaction were tallied: (1) supplanting of one bird by another, (2) withdrawal upon detecting an approaching bird several meters distant, and (3) chasing. In the tables and figure the categories are combined, although most interactions (209 of 265) were supplanting attacks. If a supplanting occurred during a chase it was tallied separately from the chase itself.

During the winter of 1967-1968 two males (subsequently referred to as MA and MB) traveled together on the study area. They were seen with one another on 13 days between 6 January and 1 April. One female (FA) also traveled with the two males that winter. None of these was known to have inhabited the area prior to October 1967. Both males were still on the area at the termination of this study. That winter MA was dominant over MB in the three observed encounters; the same relationship was firmly established the following winter.

In the breeding season of 1968 only one possible boundary skirmish between MA and MB was observed. Thus, locations of territories were estimated from the positions of all sightings of the birds. MA occupied most of what had been the preceding winter flock's range. MB used one edge of the winter flock range and some adjacent terrain (fig. 1). MA paired with FA, MB paired with a female (FB) banded 7 May

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