

## 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.

## ACKNOWLEDGMENTS

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## LITERATURE CITED

- ALCORN, J. R. 1946. The birds of Lahontan Valley, Nevada. *Condor* 48:129-138.  
 EMLEN, J. T., JR. 1936. Age determination in the American Crow. *Condor* 38:99-102.

## 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-

- EMLEN, J. T., JR. 1938. Midwinter distribution of the American Crow in New York state. *Ecology* 19:264-275.  
 EMLEN, J. T., JR. 1940. The midwinter distribution of the crow in California. *Condor* 42:287-294.  
 GABRIELSON, I. N. 1949. Bird notes from Nevada. *Condor* 51:179-187.  
 GOOD, E. E. 1952. The life history of the American Crow (*Corvus brachyrhynchos* Brehm). Unpubl. Ph.D. thesis, Ohio State University, Columbus, Ohio.  
 HANNA, W. C. 1904. Nevada notes. *Condor* 6:47-48, 76-77.  
 HAYWARD, C. L. 1948. Biotic communities of the Wasatch chaparral, Utah. *Ecol. Monogr.* 18:473-506.  
 HENSHAW, H. W. 1874. List of birds of Utah. *Ann. Lyceum Nat. Hist., New York*, 11:1-14.  
 HOFFMAN, W. J. 1881. Annotated list of the birds of Nevada. *Bull. U.S. Geog. Surv. Terr.* (VI) 2:203-256.  
 JOHNSTON, D. W. 1961. The biosystematics of American crows. Univ. Washington Press, Seattle, Wash.  
 LINDSALE, J. M. 1936. The birds of Nevada. *Pacific Coast Avifauna* 23:1-145.  
 LINDSALE, J. M. 1951. A list of birds of Nevada. *Condor* 53:228-249.  
 RICHARDS, G. L., AND C. M. WHITE. 1963. Common Crow nesting in Utah. *Condor* 65:530-531.  
 RIDGWAY, R. 1877. United States geological exploration of the fortieth parallel. Clarence King, Geologist-in-charge. Part III. *Ornithology*. p. 301-669.  
 VAN ROSSEM, A. J. 1936. Birds of the Charleston mountains, Nevada. *Pacific Coast Avifauna* 24:1-65.

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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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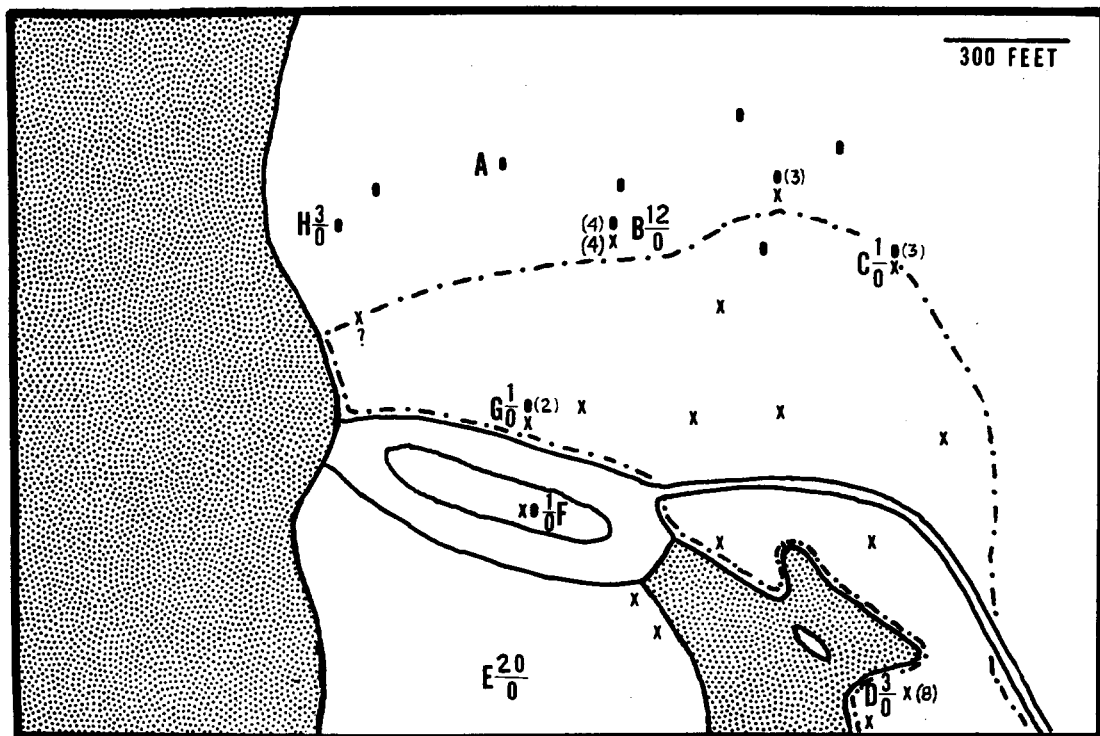


FIGURE 1. Map of the study area. Letters designate feeding stations. Ratios beside letters indicate the outcome of encounters between male A and male B during winter 1968–1969 (male A dominant in all cases). Dot-dash line indicates 1968 breeding territory boundary of male A. Breeding season sighting locations are indicated by X's for male A, by solid ovals for male B. Dotted area represents non-wooded terrain; white areas (except for road and parking lot) are wooded.

1968. FA was not seen after 18 June 1968 and there is no evidence that she and MA were successful in rearing a brood. We do not have evidence of successful breeding by MB and his mate, although she was present as a member of the flock the following winter.

The winter of 1968–1969 found MA, MB, FB, and a female (FC) banded 17 September 1968 traveling together. MA was dominant over MB in all encounters (41) observed. This included encounters at seven of eight utilized feeding stations (fig. 1). Three of these (C, D, G) were on what had been MA's breeding territory, two (B, H) were on what had been MB's breeding territory, and one (E) was in another flock's winter range on what had been a third bird's breeding territory. Whether one station (F) was in the same category as E, or was on part of MA's previous territory, was not certain. It is interesting that there was a high frequency of encounters on the "neutral ground" at E. Also, confirming Dixon's 1965 findings, MA was subordinate to the male of the other flock (one male and one female) at station E, but the situation was reversed on MA's winter flock range. Two stations (H, A) were newly established this winter in order to obtain data from what had been MB's breeding territory. Although no encounters were observed at station A, MB avoided confrontation while MA was feeding there on three days in January (i.e., MB was present but did not approach to feed when MA was present).

Thus, in 41 encounters, MA, dominant the preceding winter and holder of most of the preceding winter's flock range as breeding territory, retained his dominance at all sites, including those on MB's breeding territory of the previous summer.

Besides the relationship observed between the two males during the winter of 1968–1969, the flock showed a straight-line dominance hierarchy at all stations where encounters occurred (table 1).

TABLE 1. Summary of feeding station encounters among members of a four-bird flock of Mountain Chickadees during winter 1968–1969.

Winner	Loser			Total Wins
	MB	FB	FC	
Station B <sup>a</sup> (66)				
MA	12	14	7	33
MB	—	5	4	9
FB	0	—	24	24
Station E (82)				
MA	20	21	6	47
MB	—	10	9	19
FB	1	—	15	16
Station G (46)				
MA	1	8	11	20
MB	—	6	6	12
FB	0	—	14	14
All 8 stations (265)				
MA	41	58	34	133
MB	—	38	26	64
FB	1	—	67	68

<sup>a</sup> Station B on MB's breeding territory; E on neutral ground; G on MA's breeding territory.

From our findings it is apparent that among Mountain Chickadees an important principle of intraflock integration is the peck-right system. Unlike the situation in Steller's Jays (Brown, Condor 65:460, 1964) and perhaps in other birds (Marler and Hamilton, Mechanisms of animal behavior. Wiley, New York, 1966. p. 173), site-related dominance does not seem

to be a factor operating at the intraflock level, but is important between flocks.

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## PRESERVATION OF MAUI'S ENDANGERED FOREST BIRDS

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Of 56 perching birds (suborder Passeres) found exclusively in the Hawaiian Islands, 10 are known from Maui (Amadon 1950). However, since the Oo (*Moho* sp.) disappeared on Maui before a specimen was collected, only nine have been specifically described. Information on population status of Maui's native forest birds is summarized in table 1 (Banko 1967, 1968).

While definitive data on population size and range of Maui's native forest birds do not exist, none of Maui's historically rare birds (Oo, Akepa, Crested Honeycreeper, Nukupuu, Parrotbill, Ou) have been observed outside Haleakala's windward slopes. Populations of the latter four species are judged by US

Department of Interior (1968) and International Union for Conservation of Nature (1968) to be in danger of extinction.

The Crested Honeycreeper has been seen a number of times in recent years at high elevations on windward slopes of Haleakala (Richards and Baldwin 1953; Kridler 1966; Banko 1968; Vogl, pers. comm.). This interesting bird apparently disappeared on Molokai, its only other range, sometime after 1907 when it was last reported. Maui Nukupuu was rediscovered and Parrotbill was reported for the second time this century from Kipahulu Valley, windward Haleakala (Banko 1968). The Ou has not been recorded from Maui since 1901 and may not now occur there. In addition to these four endangered birds, the Maui Akepa has been reported only once this century, in 1950 (Richards and Baldwin, op. cit.). The Maui Akepa should therefore be considered endangered if, in fact, a population still exists.

It is thus apparent that except for the Alakai Swamp area of Kauai, whose wilderness characteristics are protected by state law, no other Hawaiian forest of

TABLE 1. Checklist of Maui's native perching birds.

Species or race	Conservation status	Provisional status	Reported on Haleakala
Historically resident on Maui and other islands			
Hawaiian Amakihi <i>Loxops virens wilsoni</i> (Rothschild)	unlisted USDI <sup>a</sup> IUCN <sup>b</sup>	abundant	1967
Ou <i>Psittirostra psittacea</i> (Gmelin)	endangered USDI IUCN	possibly extinct	1901
Apapane <i>Himatione sanguinea sanguinea</i> (Gmelin)	unlisted USDI IUCN	abundant	1967
Crested Honeycreeper <i>Palmeria dolei</i> (Wilson)	endangered USDI IUCN	endangered	1969
Iiwi <i>Vestiaria coccinea</i> (Forster)	unlisted USDI IUCN	common	1967
Exclusively resident on Maui			
Maui Creeper <i>Loxops maculata newtoni</i> (Rothschild)	unlisted, USDI endangered, IUCN	undetermined	1969
Maui Akepa <i>Loxops coccinea ochracea</i> Rothschild	unlisted USDI IUCN	endangered	1950
Maui Nukupuu <i>Hemignathus lucidus affinus</i> Rothschild	endangered USDI IUCN	endangered	1967
Maui Parrotbill <i>Pseudonestor xanthophrys</i> Rothschild	endangered USDI IUCN	endangered	1967

<sup>a</sup> US Department of the Interior.

<sup>b</sup> International Union for Conservation of Nature.