BROWN-HEADED COWBIRDS IN CALIFORNIA: HISTORICAL PERSPECTIVES AND MANAGEMENT OPPORTUNITIES IN RIPARIAN HABITATS

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Two subspecies of Brown-headed Cowbird (*Molothrus ater*) now are known to breed in California. The Sagebrush Cowbird (*M. a. artemisiae*) has probably always been a rare summer resident in the Great Basin portions of California and a rare winter visitor in the remainder of the state (Grinnell 1915, Mailliard 1927). Although the abundance of this subspecies has increased, its distribution has remained constant. The status of the Dwarf Cowbird (*M. a. obscurus*), on the other hand, has changed remarkably during the past 120 years, and it is the latter subspecies that is apparently responsible for the substantial reduction in reproductive success of a number of Central Valley and Southern California passerines.

The Brown-headed Cowbird, a nest parasite, has been implicated in the decline of several species of small, open-cup-nesting passerines, including the Kirtland's Warbler (*Dendroica kirtlandii*) (Mayfield 1977a) in Michigan and the Least Bell's Vireo (*Vireo bellii pusillus*) in California (Goldwasser et al. 1980). Additionally, there is evidence that riparian species, nesting in linear habitats, are more vulnerable to parasitism than species nesting in more extensive habitats (Bleitz 1956, Brittingham and Temple 1983, Airola 1986). Rothstein et al. (1984) showed that cowbirds have expanded into the higher elevations of the Sierra Nevada, but the species' expansion in the lowlands has yet to be examined. This paper documents the spread of cowbirds in California, establishes the mechanism by which cowbirds can drive host species to extinction, and explores methods to control the adverse effects of cowbirds on riparian species.

STUDY AREA AND METHODS

I conducted a literature search and examined museum collections for nesting and specimen records of cowbirds in California west of the Sierra Nevada crest and the desert region north to Mono County. I also reviewed National Audubon Society Christmas Bird Count records and conducted field surveys to locate winter concentrations of cowbirds in central California.

RESULTS AND DISCUSSION

Historical Considerations

It is not known if the Dwarf Cowbird occurred along the Colorado River prior to 1870, when it was first recorded breeding there. However, there is only one record west of the Colorado River prior to 1870 (Table 1). According to the records, the Dwarf Cowbird's range expanded west and north at a rapid rate between 1900 and 1930 (Table 1, Figure 1). By 1925 cowbirds

Table 1 Representative First Records of Dwarf Cowbird Expansion 1850-1960

Year	Location	Reference
1862	E. side of Cuyamaca Mts., San Diego Co.	Cooper 1874
1870	Needles, San Bernardino Co.	Belding 1890
1889	San Bernardino, San Bernardino Co.	Wall 1919
1904	Santa Paula, Ventura Co.	Willett 1933
1905	Los Angeles, Los Angeles Co.	Willett 1933
1908	Mecca, Riverside Co.	Grinnell 1909
1908	Sespe, Ventura Co.	Santa Barbara Nat. Hist. Mus.
1910	Compton, Los Angeles Co.	Law 1910
1911	Bakersfield, Kern Co.	Swarth 1911
1913	Fresno, Fresno Co. (very rare)	Grinnell and Swarth 1913
1914	Buena Vista L., Kern Co.	Maillard 1914
1915	National City, San Diego Co.	Santa Barbara Nat. Hist. Mus.
1915	10 mi. W Santa Barbara, Santa Barbara Co.	Dawson 1916
1915	Snelling, Merced Co.	Grinnell and Storer 1924
1919	LeGrange, Stanislaus Co.	Grinnell and Storer 1924
1923	Livingston, Alameda Co.	La Jeunesse 1923
1926	Lake Merced, San Francisco Co.	Grinnell and Wyeth 1927
1931	Marysville, Yuba Co.	Neff 1931
1936	Inverness, Marin Co.	Grinnell and Miller 1944
1938	Monterey, Monterey Co.	*Bird-Lore* 1938
1941	Humboldt Co.	Talmadge 1948
1943	Hayfork and Hyampon, Trinity Co.	Grinnell and Miller 1944
1951	Coastal Klamath River, Del Norte Co.	*Audubon Field Notes* (AFN) 1951
1956	Dunsmuir, Siskiyou Co.	AFN 1956
1960	Yreka, Siskiyou Co.	AFN 1960

Table 2 Dates and Locations of Detailed Field Studies in Which No Dwarf Cowbirds Were Found

Date	Location	Reference
1870-1890	Central Valley, Stockton to Chico	Belding 1890
1895	Not found west of the Colorado River	Bendire 1895
1908	San Bernardino Mts.	Grinnell 1908
1913	San Jacinto Mts., Hemet to Banning	Grinnell and Swarth 1913
1916	Trinity and Siskiyou Mts.	Kellogg 1916
1924-1929	Red Bluff, Tehama Co.	Grinnell et al. 1930

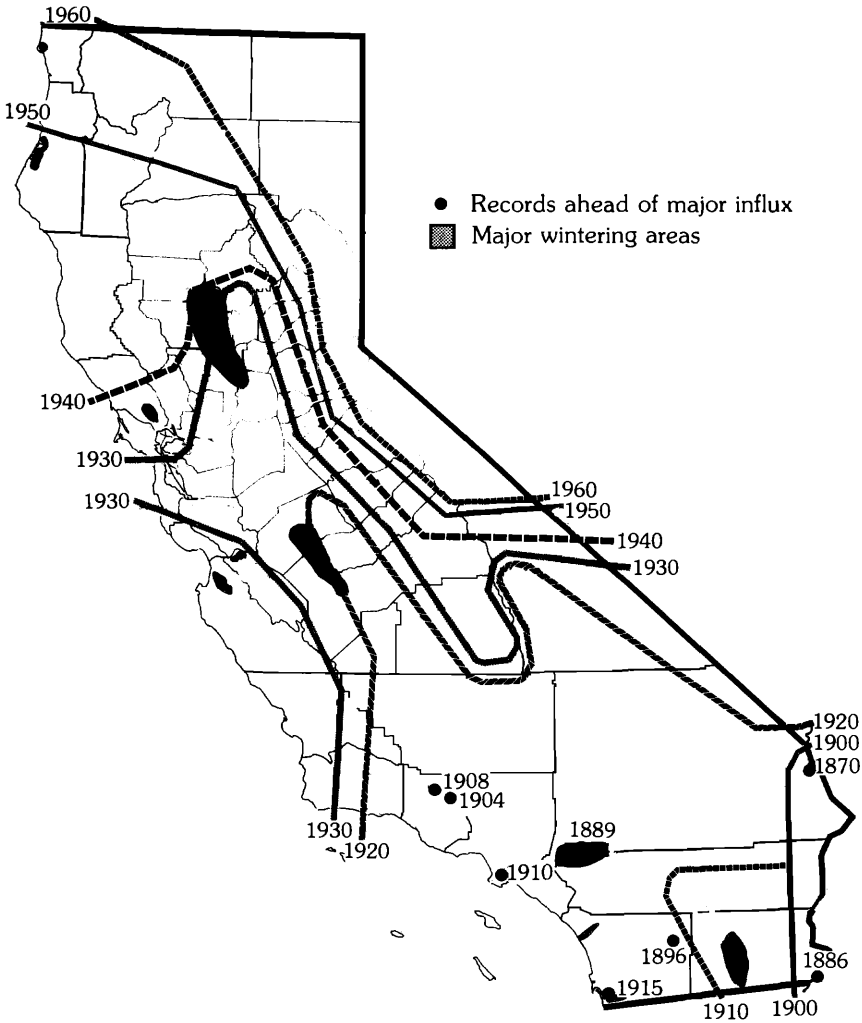

Figure 1. Expansion of the Brown-headed Cowbird's breeding range in California 1900-1960.

were common in the Los Angeles area and by 1930 extended their range to the San Francisco Bay area and the central Sacramento Valley. By 1941 they had expanded into Humboldt County and by 1960 they had reached Del Norte County, the Oregon border, and the highest meadows in the Sierra Nevada. In-depth studies document that cowbirds were absent from areas where they later became common (Table 2).

Numerous other records from the literature and museum collections, which are not presented in this paper, show a pattern of first records of Dwarf Brown-headed Cowbirds in an area followed 10 years later by the first major influx and 10 years after that by population saturation. This pattern suggests that pioneers found a ready source of hosts, reproduced successfully, and in turn provided future pioneers. Cowbirds have a high reproductive potential. For example. a population with a 55% yearly female mortality (Darley 1971), a laying rate of 12 female eggs (i.e., eggs that will produce females) per female per year (Payne 1976) and 25% egg success to fledging (Young 1963) would increase from 10 females to 100 females in 5 years.

Cowbird-Host Relationships

I use the case history of the Bell's Vireo to illustrate the relationship of cowbirds to their hosts. The Bell's Vireo is a small, open-cup nester that is very susceptible to cowbird parasitism (Goldwasser et al. 1980). The vireo's reaction to nest parasitism is either to desert the nest or accept the egg(s) (Barlow 1962). Nonparasitized vireo nests are more successful than parasitized ones. Parasitized nests rarely fledge either cowbird or vireo young (Wiens 1963). A regression analysis of the percentage of nests parasitized versus the percentage of egg success in eight studies shows an inverse relationship explaining 48% of the variance in egg success (Nice 1929, Pitelka and Koestner 1942, Mumford 1952, Nolan 1960, Overmire 1962, Barlow 1962, Wiens 1963, Goldwasser et al. 1980).

Using demographic analysis and the studies listed above, I calculated growth curves for four levels of parasitism: (1) 13%, the lowest rate known; (2) 30%, the average of the three lowest rates; (3) 48%, the average of the eight studies; and (4) 69%, the average of the two highest rates. I used an annual mortality rate of 40% of adults and an average of 2.55 female eggs per female per year (Barlow 1962). At a parasitism rate of 13%, a Bell's Vireo population would grow from 10 to 100 females in 6 years. A population with 30% parasitism would require 37 years to grow to 100 females, while 48% and 69% parasitism rates would lead to extinction in 18 and 8 years, respectively. Thus parasitism rates higher than 48% lead to extinction in a short time and parasitism rates higher than 30% lead to an unstable population that could suffer extinction caused by stochastic events.

Wintering Populations

Through field surveys and analysis of Christmas Bird Count data I located wintering concentrations of Brown-headed Cowbirds. Wintering cowbirds concentrate in rice fields, around dairies, and in feedlots. The main concentrations (Figure 1) are in the Sacramento Valley (U.S. Fish and Wildlife Service unpublished data, personal observation), the Imperial Valley (Christmas Bird

Counts), and in western Riverside (Christmas Bird Counts) and southwestern San Bernardino counties (Christmas Bird Counts).

Management Considerations

The problem of cowbird parasitism reducing host populations, especially in riparian habitats, has been documented. One management tool used to minimize parasitism is the trapping of cowbirds in the vicinity of nests of the affected species. This method, in which live cowbirds in the traps serve as decoys (Mayfield 1977b), has proved very successful in reducing parasitism and halting the decline of Kirtland's Warbler (Kelly and DeCapita 1982). It is, however, a labor-intensive method that may not necessarily capture the offending cowbirds.

Additional methods of direct control of cowbirds should be considered: (1) shooting on the breeding grounds; and (2) trapping on the wintering grounds. It is possible that in narrow, riparian habitats shooting might be more effective than trapping. Both male and female cowbirds can be attracted within shotgun range during the breeding season with taped recordings of a female (S. I. Rothstein pers. comm.). Females could then be shot selectively, leaving the males and an unbalanced sex ratio. The luring of cowbirds with recorded calls is a method that uses behavior related to breeding, so it is unlikely that any birds would be immune to the method, a problem that arises with trapping.

The other direct method is winter trapping at feedlots and dairies. Large traps baited with decoys have proved effective at catching large numbers of cowbirds (Crase et al. 1972). Cowbirds are particularly amenable to this method because of their behavior of concentrating in large numbers on the wintering grounds. Whether the cowbirds wintering in a certain area are the same as those breeding in that area is, however, still unknown. A winter banding program should be initiated to study cowbird movements and test the feasibility of winter trapping. If certain cowbird populations, such as those in southern California, prove to be resident, this method should be given careful consideration.

Habitat management to reduce the impact of cowbirds should also be studied and, if successful, implemented. These indirect methods include (1) elimination of grazing near riparian areas; (2) removal of feedlots, stables, and dairies; and (3) reforestation.

In certain areas the reduction of livestock grazing may be an effective way to control cowbird impacts. For example, if livestock use of mountain meadows were reduced or eliminated, reproductive success of sensitive riparian species such as Willow Flycatchers (*Empidonax traillii*) may be enhanced. The elimination of grazing allows grass to grow too tall to be suitable cowbird foraging habitat and it removes the large grazers with which cowbirds associate. This would also result in denser riparian habitats in which nests would be harder for cowbirds to find.

If feedlots, dairies, and stables were relocated away from riparian woodland, cowbird foraging habitat near the nesting areas of endangered species could be reduced. Cowbirds in the Sierra Nevada travel up to 6.7 km from foraging areas in meadows and pack stations to their hosts' nesting sites (Rothstein

et al. 1984). Similar radiotelemetry studies in lowland riparian sites could determine cowbird movement patterns from dairies to riparian sites.

In theory, birds nesting in narrow riparian corridors are more susceptible to cowbird parasitism than those nesting in broad habitats. If this principle is true, the parasitism rate could be lowered by increasing the width of the habitat through reforestation. There is probably a critical, but unknown, minimum width only above which this effect is evident. Recently, The Nature Conservancy's Kern River Preserve embarked on a reforestation project. The current preserve embraces 460 ha of which approximately 140 ha are now riparian forest, with the remainder in pasture and agriculture. In 1986 11 ha of willows and cottonwoods were planted and an additional 27 ha are slated for reforestation in 1987 (Bertin Anderson pers comm.). A total of 360 ha of riparian habitat may eventually be created in the preserve, increasing the average width of the riparian strip from the current 200 m to 750 m. The site is an ideal one on which to test the theory and determine whether reduction of parasitism through reforestation is feasible.

All of the above management techniques mentioned deserve careful study and research. Each site with its individual characteristics may be more conducive for use of a certain method or a combination of methods. Cowbirds have expanded their range and become a problem for a combination of reasons. The riparian species that they parasitize have lost vast tracts of nesting habitat, while habitat for cowbirds in the form of livestock pasture, irrigated agriculture, and forest clearings has increased concomitantly. Reforestation is the method that holds the most promise for long-term management of cowbird parasitism. It is appealing because it is a permanent solution and requires no continuing manpower or funding. In addition, such a program would benefit all bird species in the riparian community, not just the target species in a management plan.

ACKNOWLEDGMENTS

California Department of Fish and Game funded portions of this research. Ted Beedy, Alan Craig, Kay Franzreb, John Gustafson, and Mary Halterman all added greatly to the paper. Special thanks to Stephen Rothstein who read an earlier draft and provided valuable insight through comments and conversation.

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