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ADDITIONAL DATA ON THE HOST RELATIONS OF THE PARASITIC COWBIRDS

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Publication of my 1963 book (see bibliography) on this subject prompted a number of observers to send me their records of the two North American species of cowbirds, the brown-headed and the bronzed, with the request that I bring out a supplement to it. To this data I have added a few recently published records to make the present paper as useful as possible. In all cases the reader should consult my 1963 book for full data.

Brown-Headed Cowbird

Molothrus ater

The hosts of this wide-ranging cowbird now include two new species, one of which, the spotted sandpiper, can only be looked upon as an "accidental" victim. (Occasional additions to the list of ill-adapted hosts do occur but are without biological significance. They mean only that a cowbird with an egg to be laid may lay it in an unsuitable nest if a suitable one is not available.) A real, but by no means new, problem is raised by new data on Bell's vireo and the cardinal as cowbird hosts: how to treat quantitatively with statistical significance rapidly and unevenly changing total blocks of record data while maintaining a relative appraisal among the frequently victimized fosterers. No workable solution to this difficult question has yet been found.

For many years I have been trying to interest biometricians in the problem of estimating the quantitative aspects of the host-parasite relationship in many of the frequent fosterers, but the number of variables has discouraged the few who even began to survey the problem. Scott's recent data on the cardinal, discussed below, has caused,

in the light of earlier knowledge, such a major reevaluation of this particular host with respect to the parasite that it may be cited as further justification of the reluctance of the biometricians. The data on Bell's vireo presented in this paper is another case in point. With the recently renewed interest in the total complex of problems surrounding the parasitic breeding biology of the cowbirds (see Wiens, 1963, and Young, 1963), it is possible that some sound quantitative evaluation of this situation may be forthcoming.

Spotted sandpiper

Actitis macularia (Linnaeus)

This bird may be added to the list of "freak" cases of cowbird parasitism. Turner (1964, p. 518) reported finding a nest of this sandpiper containing one cowbird egg (*M. a. artemisiae*) at Edmonton, Alberta.

Dusky flycatcher

Empidonax oberholseri Phillips

This little known species is an addition to the known hosts of the brown-headed cowbird (subspecies *artemisiae*). J. Stuart Rowley (in litt.) collected a nest containing two eggs of the dusky flycatcher and one of the cowbird at Virginia Lakes, Mono County, California, on June 19, 1940.

Black-capped chickadee

Parus atricapillus Linnaeus

Another instance of cowbird parasitism on the nominate race of this chickadee was recorded by Root (1961, p. 43) from North Andover, Massachusetts, July 15, 1961. It involved a fledged cowbird repeatedly fed by a black-capped chickadee.

Wrentit

Chamaea fasciata (Gambel)

T. R. Howell observed a young fledgling cowbird repeatedly fed by a wrentit at Pacific Palisades, Los Angeles, July 27, 1963. The record refers to the race *henshawii* of the host and *obscurus* of the parasite. The increase in the cowbird population in southern California will probably make the wrentit a fairly common victim of its parasitism.

Bushtit

Psaltriparus minimus (Townsend)

On July 14, 1963, at Los Angeles, T. R. Howell examined a deserted nest of a bushtit that contained a mummified carcass of an almost fledged bushtit, part of a shell of a bushtit egg, and about one-half of the shell of a cowbird egg (*M. a. obscurus*). The last had a yellow crusty inner coating of dried yolk and presumably did not hatch.

Ruby-crowned kinglet

Regulus calendula (Linnaeus)

Another instance of cowbird parasitism on this infrequently used host has been reported. At Virginia Lake, Mono County, California, 9,400 feet, a pair of these birds was seen feeding a fledged young cowbird (race *artemisiae*) (Shepard, 1962, pp. 505-506). This is the second time this host has been reported rearing the young of the parasite.

Mockingbird

Mimus polyglottos (Linnaeus)

Although the mockingbird had been reported as an infrequent victim of the brown-headed cowbird in a number of areas, it was never found to rear the young parasite. Recently Webster (1964) reported that Dr. Pauline Jones found this host (race *leucopterus*) rearing a young cowbird (*obscurus*) in southern Texas.

Cedar waxwing

Bombycilla cedrorum Vieillot

The cedar waxwing has been parasitized relatively infrequently, but in July of two successive years, 1964 and 1965, four parasitized nests were found in or near Waterloo County, Ontario, Canada, by Mr. Robert Pickering. Each contained one egg of the brown-headed cowbird and four of the host. The unusual incidence of parasitism is seen in proper perspective when we recall that in a fairly similar locality in southern Quebec, Terrill found four parasitized nests (out of a total of 329 waxwing nests examined) during a period of 50 years. Dr. Johan Ottow told me of the new cases, which bring the total number of records from 18 to 22.

Black-capped vireo

Vireo atricapilla Woodhouse

Graber's study (1961) greatly extends our knowledge of this vireo. She reported on 76 nests in which a total of 243 vireo eggs were deposited. Of these, 134, or 55.1 percent, were lost before hatching, and of these 134 Graber considered cowbird parasitism accounted for 97, or 72.3 percent. In addition, eight vireo chicks were lost because of the presence of cowbird chicks in the nests. The percentage of parasitism of the 76 nests is not given, but it must have been considerable as Graber wrote that, ". . . during the nestling period, as during laying, the chief loss was due to cowbird parasitism. In all cases in which a cowbird chick occupied the nest, no vireo chicks survived. . . ."

Bell's vireo

Vireo bellii Audubon

Additional data on this frequent victim of the cowbird is included only to emphasize the statistically unsatisfactory nature of present methods of evaluating the quantitative aspects of host-parasite relations. In my 1963 summary (pp. 84-85) I noted some 82 instances of cowbird parasitism on Bell's vireo, but added ". . . these constitute only a fraction of the number that lie back of the numerous estimates put forward by various authors . . ." (i.e., authors who explicitly mentioned a number of instances but added loose statements to the effect that the vireo was victimized far more frequently in their area). Since then I have learned of nearly half as many cases more, no less than 28 from two papers alone (Ely, 1957, unpublished thesis; Overmire, 1962). The increase is not a measure of any change in the relationship between the vireo and the cowbird but merely an indication of additional observation and more increments to the recorded data.

Dwarf vireo

Vireo nanus Nelson

Three more cases of parasitism of this vireo at Irapuato, Guanajuato, Mexico, have been found in the Moore collection by Dr. J. W. Hardy. These, and the one noted in my 1963 book (p. 83), were found within one week, June 17 to 26, 1943, indicating a high frequency of parasitism locally.

Swainson's warbler

Limnothlypis swainsonii (Audubon)

To Kirn's 1917 record of this warbler as a cowbird host in Copan County, Oklahoma (Friedmann, 1963, p. 92), Vaiden (1962, p. 2) added a second instance, found in Bolivar County, Mississippi, and in 1963 still another in Mississippi. He suggested that the Swainson's warbler may prove to be a regular and not infrequent host of the cowbird in the area around Rosedale, Mississippi.

Grace's warbler

Dendroica graciae Baird

On June 30, 1954, near the Grand Canyon village, south rim of Grand Canyon, Arizona, George A. Hall (in litt. March 11, 1964) observed a pair of Grace's warblers feeding a fledged young brown-headed cowbird (*M. a. obscurus*).

Golden-cheeked warbler

Dendroica chrysoparia Sclater and Salvin

Warren M. Pulich (1965, p. 548) reported that of 19 nests examined by him in a 70-acre tract in the Edwards plateau country of Texas, 15 were found to contain eggs or young of the cowbird. He also had at that time seven other records in addition to the nine listed in my 1963 account.

Cardinal

Richmondia cardinalis (Linnaeus)

The status of the cardinal as a cowbird fosterer varies greatly in different parts of its range, much more than in most host species. The recent study of Scott (1963) in the vicinity of London, Ontario, presents the most extreme situation yet recorded, with an incidence of parasitism of over 60 percent and a greater number of instances (113) than previously known to me (75) from the total range of the cardinal. Out of 187 cardinal nests examined, 113 contained eggs of the cowbird, a truly astonishing figure. This indicates how very tentative all estimates of frequency really are, as the cardinal suddenly becomes the 10th most frequently recorded host (previously estimated as the 23rd). In spite of 188 records of cowbird parasitism known to me, I do not think the cardinal is victimized more frequently than such species as Traill's flycatcher, Bell's vireo, yellow-throated vireo, or

field sparrow, for each of which the total reported instances is less than this number.

House finch

Carpodacus mexicanus (Müller)

Recently Wauer (1964, p. 299) noted a fledgling cowbird (race *obscurus*) being fed by a house finch on June 17, 1960, in the Panamint Mountains, California. It has been noted as an occasional victim of the cowbird by a number of observers, but this is the first report that it can and does rear the young of the parasite.

Sharp-tailed sparrow

Ammospiza caudacuta (Gmelin)

Oscar M. Root (in litt., November 1964) reported a nest with four eggs of the host and one of the brown-headed cowbird (*M. a. artemisiae*) found on June 20, 1962, in Dixon's slough, Gorrie School District, Brandon, Manitoba, by John Lane. The only previously reported instance did not give date or locality (Friedmann, 1963, p. 157).

Lesser goldfinch

Spinus psaltria (Say)

In addition to a few records of the lesser goldfinch as a cowbird host in California (race *S. p. hesperophilus*) and one in Texas (near Austin, race *S. p. psaltria*), a second in Texas, from Beeville, has been reported (Webster, 1964).

Lark bunting

Calamospiza melanocorys Stejneger

Since my 1963 account (p. 153), the lark bunting has been found to be a cowbird host in Saskatchewan as well as North Dakota. In 1963, near Moose Jaw, Saskatchewan, George Fairchild (in litt., November 27, 1964) found four nests of this bird, three of which were parasitized.

Oregon junco

Junco oreganus (Townsend)

Previously known as a victim of the cowbird in British Columbia (race *J. o. montanus*) and in California (race *J. o. pinosus*), the Oregon junco has since been found parasitized near Dishman, Wash-

ington, by Rogers (1964), who reported two nests, each with two eggs of the parasite. The Washington records refer to the race *J. o. montanus*. This junco is probably becoming increasingly used as a host as the cowbird expands its range in the Northwest.

Olive sparrow

Arremonops rufivirgata (Lawrence)

To the few records of this sparrow as a host of the dwarf race of the brown-headed cowbird in southern Texas may be added one more, found at Beeville and reported by Webster (1964). The nest also contained eggs of the bronzed cowbird (see p. 10).

Song sparrow

Melospiza melodia (Wilson)

Crossin (1965) has recorded the race *fallax* of the song sparrow as a host of the brown-headed cowbird near Tucson, Arizona. However, if the ranges of the races of the host are correctly given in the last edition of the A.U.O. checklist, we must refer this record to the race *saltonis* and not to *fallax*, just as the Wyoming record of "*fallax*" listed in my 1963 account (p. 169) must refer to *juddi*.

Bronzed Cowbird

Tangavius aeneus

The following host data involves five kinds of birds not previously reported as cowbird victims. The host catalog of the bronzed cowbird now includes 56 species, or 69 species and subspecies, of birds.

Happy wren

Thryothorus felix Sclater

J. Stuart Rowley (in litt.) found on July 3, 1965, about 4 miles north of Putla, Oazaca, Mexico, 3,200 feet elevation, a nest of this wren containing three eggs of its own and one of the bronzed cowbird, all nearly ready to hatch. Judging by the locality, this record must refer to the nominate race of the wren and to the southwestern race *assimilis* of the cowbird. This wren (subspecies *pallidus*) had been recorded once as a host of the bronzed cowbird (race *milleri*); the present record is therefore the first for *Thryothorus f. felix* as a host and for *Tangavius a. assimilis* as a parasite of this wren.

Mockingbird

Mimus polyglottos (Linnaeus)

To the one previous report of the mockingbird (*M. p. leucopterus*) as a victim of the nominate race of the bronzed cowbird, Webster (1963, p. 471) added a nest, found at San Benito, Texas, containing the surprisingly large combination of eight eggs of the parasite and two of the host. Since mockingbirds are seldom imposed upon by either the bronzed or the brown-headed cowbird but are frequently parasitized in South America by the shiny cowbird, each additional report is an opportunity for critical study.

Rufous-backed robin

*Turdus rufo-palliatu*s Lafresnaye

Previously unrecorded as a host of the bronzed cowbird, this robin has been found parasitized in southern Mexico. J. Stuart Rowley (in litt.) reported that on June 18, 1965, at Oaxaca City, Oaxaca, 5,000 feet elevation, he found, about 10 feet up in a small tree, a nest of this species containing three robin and two bronzed cowbird eggs. The record involves the nominate race of the host and the race *assimilis* of the parasite.

Russet nightingale-thrush

Catharus occidentalis Sclater

J. Stuart Rowley (in litt.) found a nest of this thrush containing two eggs of its own and one of the bronzed cowbird at Rio Molino, near San Miguel Suchixepc, in the Sierra Madre del Sur of southern Oaxaca, Mexico, 7,300 feet elevation, on April 29, 1962. This is the first report of this thrush as a victim of the bronzed cowbird (*T. a. assimilis*). The record was published by Rowley and Orr (1964, p. 311).

Orange-billed nightingale-thrush

Catharus aurantiirostris (Hartlaub)

A third record of this thrush as a host of the bronzed cowbird is reported: a nest with one egg of the host and two of the bronzed cowbird was collected 5 miles east of Cuernavaca, Morelos, May 29, 1962, by J. Stuart Rowley (see Friedmann, 1963, p. 180).

Flame-colored tanager

Piranga bidentata (Swainson)

This tanager has been added to the known hosts of the bronzed cowbird by Hall (1965), who saw a fledgling of the parasite, just out of the nest, being fed by a male of this host on June 24, 1959, near Rancho Miramar Chico, near Zilitla, San Luis Potosi, Mexico. On geographic grounds, this record must refer to the race *P. b. sanguinolenta* of the host and to the race *T. a. aeneus* of the parasite.

Red ant-tanager

Habia rubica (Vieillot)

Previously unrecorded as a victim of the bronzed cowbird, this ant-tanager was found by J. Stuart Rowley (in litt.) to be parasitized in Oaxaca, Mexico, where on June 12 and 14, 1963, he observed two such instances. One nest, found 19 miles north of Puerto Escondida, contained three eggs of the host and one of the parasite; the other, found 2½ miles north of San Gabriel Mixtepec, held one punctured egg of the ant-tanager, one infertile egg of the bronzed cowbird, and one egg of the latter ready to hatch. The records refer to the subspecies *H. r. affinis*, the Pacific slope race of the host, and the race *T. a. assimilis* of the parasite.

Lichtenstein's oriole

Icterus gularis (Wagler)

Webster (1962) notes that the bronzed cowbird has become well established around San Antonio, Texas, where it now parasitizes the race *I. g. tamaulipensis* of this oriole as well as other species of orioles. No indication is given of the number of such cases reported in that region.

Cardinal

Richmondia cardinalis (Linnaeus)

All previous records of the cardinal serving as host for the bronzed cowbird in eastern and southern Texas are of single or moderate numbers of eggs of the parasite. Recently Webster (1963, p. 471) cited three instances in which the intensity of parasitism was very heavy, the nests containing from six to eight cowbird eggs each. He also noted four other records, as well as Blacklock's experience in the Nueces Bay area of southern Texas, where almost every cardinal's

nest examined held one or more eggs of the bronzed cowbird. Webster's records apparently refer to the subspecies *magnirostris* of the cardinal, while Blacklock's involve the race *canicauda*.

Sclater's towhee

Pipilo albicollis Sclater

Two more instances of parasitism of this towhee by the bronzed cowbird are reported by J. Stuart Rowley, both found in Oaxaca, Mexico, in July, one in 1962 and one in 1963.

Olive sparrow

Arremonops rufivirgata (Lawrence)

A third record of the olive sparrow as a victim of the bronzed cowbird is reported from Beeville, Texas, by Webster (1964). This instance is the same as that listed under the brown-headed cowbird in this paper, as the nest contained eggs of both species of parasites.

Song sparrow

Melospiza melodia (Wilson)

Previously, a single race (*M. m. mexicana*) of the song sparrow was known to be victimized by the bronzed cowbird. However, Dickerman (1963) has divided the song sparrows of the Mexican plateau area into a number of races which appear, from his ample material, to be valid. The host records from Mexico City listed in my 1963 report (p. 188) must now be considered as *M. m. azteca*, while the one record from Ciudad Tlaxcala would be *M. m. mexicana*.

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