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DAMAGED WESTERN FLYCATCHER EGGS IN NESTS CONTAINING BROWN-HEADED COWBIRD CHICKS

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The young of many brood parasites behave in ways that harm the host young with which they share a nest. By ejecting or injuring their nestmates, they reduce competition for parental care. To our knowledge, no specific anti-host behavior has been reported for chicks of the Brown-headed Cowbird (*Molothrus ater*). Instead, the young parasite's advantage over nestmates is usually attributed to its hatching earlier than the hosts, to the preferential treatment it receives because of its larger size, and possibly to damage done to the host young by accidental trampling (Friedmann 1963).

While studying the nesting of the Western Flycatcher (*Empidonax difficilis*) near Missoula, Montana, we noticed damaged flycatcher eggs in nests containing cowbird chicks. We describe here the incidence and extent of this damage to the flycatcher eggs, and consider several hypotheses concerning its cause.

OBSERVATIONS

Of 12 incubated Western Flycatcher nests with known contents, 5 were parasitized. One parasitized nest was difficult to reach and was checked only irregularly, and a second was destroyed during incubation. Of the seven unparasitized nests, four were relatively inaccessible, and one was destroyed before hatching.

Hatching of the host eggs was delayed in the two most crowded parasitized nests, occurring two to four days after the end of the normal incubation period of 14 to 15 days (Davis et al. 1963). Incubation heat to host eggs may have been reduced both by "shading" by the larger cowbird egg, and by the reduction in incubation time following hatching of the cowbird chick on day 11 or 12. In one case, a host egg rolled inside a piece of the shell from which the cowbird had emerged, adhered to it, and was subsequently partly insulated from incubation heat. As a result of the delay in host hatching, host eggs were still present in the nest up to six days after the cowbird chick had hatched.

Damage included "nicks," superficial chips on otherwise intact shell, and "dents," depressions of the shell surface covered by a mosaic of shell fragments adhering to the shell membrane. The membrane was exposed where isolated fragments had fallen off, but in no case was the membrane ruptured. The smallest dents were less than 2 mm in diameter, with steeply sloping sides. The most severely damaged eggs had several dents. In some cases, the dents were distinct, even located on opposite sides of the egg. In other cases, the dents were contiguous or overlapping, extending over much of the upper surface of the egg.

We found at least one damaged flycatcher egg in each of the three accessible parasitized nests that survived to hatching. Damage was seen only during the one or two days before host hatching (Table 1). No similar damage

was seen in any of the unparasitized nests, including two that were checked on the day prior to hatching.

No damage was seen on the two infertile host eggs in parasitized nests (Table 1). One of these eggs remained in the nest after the cowbird chick had fledged, still without sign of damage.

The severity of damage was correlated with the age of the cowbird chick (Table 1). Small nicks were present on an egg in a nest with a cowbird as young as two days old, but extensive damage was not seen until the chick was five days old.

In no case did flycatcher young remain in the nest with the cowbird chick for as long as two days after host hatching. Most of the host eggs disappeared within a day or two after they showed signs of hatching. We assumed them to have produced young that subsequently died and were removed by the parents.

DISCUSSION

We can offer several possible explanations for the damage observed.

(1) *Visitors to the nest.* Animals visiting the nest would have an opportunity to damage eggs. Possible visitors include predators and adult female cowbirds (Mayfield 1961). Either of these, however, could have pierced or removed the eggs, rather than just nicking them. Neither would be expected to leave the eggs in the nest and return to inflict more damage at a later time.

(2) *Accidental trampling by the cowbird chick.* Sharply localized damage like the early nicks and small, steeply inclined dents could not have been caused by crushing under the cowbird's weight. The absence of damage to infertile eggs suggests that damage was related to activity of an emerging chick within the egg, rather than to random accidental crushing. However, the shells of the infertile eggs may have been stronger than the other shells because no minerals had been extracted by a developing chick.

(3) *Damage to the shell by the emerging chick, later dented inward by trampling by the cowbird chick.* The occurrence of isolated damage on opposite sides of some eggs and the variation in the location of damage from one egg to another suggest that the damage to the shell was not related to normal hatching activity.

(4) *Damage by a host parent pecking at hatching eggs.* The two nests with the heaviest damage were abnormally late in hatching. Intervention by a host parent in response to abnormal hatching is a possibility. In the less crowded third nest, however, hatching occurred in the normal interval and damage was slight. No damage was seen in unparasitized nests.

(5) *Pecking by the cowbird chick directed at cues produced by emerging chicks.* Possible stimuli include vibrations and sounds resulting from prehatching vocalizations or movements. This hypothesis is consistent with all the evidence presented.

Pecking and biting of nestmates occurs in at least two other brood parasites. Young of the Lesser Honeyguide (*Indicator minor*) bear hooks on the end of the premaxilla and mandible which are driven into the host young in savage "grasping" bites (Friedmann 1955). Attacks by a honeyguide on its second day after hatching left a newly hatched host chick covered with specks of blood. Young honeyguides also attacked eggs, but were unable to puncture them. Young of the Striped Cuckoo (*Tapera naevia*) are equipped with bill hooks similar to, but much smaller than, those of the Lesser Honeyguide (Morton and Farabaugh 1979). Twisting bites by a cuckoo only three days old caused subcutaneous hemorrhages and open wounds, and the host chick died within 24 h of hatching.

TABLE 1. Chronology of damage to host eggs in three Western Flycatcher nests, each containing a cowbird chick. Descriptions are given from the first detection of damage to the last day when viable eggs were present in the nest.

Date	Age of cowbird chick (days) ^a	Days since incubation began	Number of host eggs in nest	Damage to host eggs			
				Egg 1	Egg 2	Egg 3	Egg 4
<u>Nest 49</u>							
25 July	5	16	4	Shell dented and chipped; membrane exposed along U-shaped area; on opposite side of egg, one isolated dent	One dent, chips of shell missing	Two isolated dents	No chipping or denting ^b
<u>Nest 55J^c</u>							
27 July	4	16	2	Three dents (1 to 2 mm) and a few nicks	A few tiny nicks		
29 July	6	18		Several coalesced dents and two isolated dents	Tiny nicks, shell cracked, hatching		
30 July ^d	7	19		Downhill from fallen nest	Gone		
<u>Nest W</u>							
29 July	2	13-14	2	One dent (1 mm)	No chipping or denting ^e		
30 July	3	14-15		Cracked across, hatching			

^a Minimum estimate of age; chick may have been up to one day older.

^b An undeveloped egg with a translucent shell, over half full of fluid which moved freely when the egg was tilted. This egg failed to hatch and remained in the nest at the time the cowbird chick fledged.

^c Nest also contained a second cowbird egg, which failed to hatch.

^d Nest fell about 1 m from niche in sandbank to base of roadcut. The host parents continued to feed the cowbird next to the fallen nest for at least two days.

^e A dead flycatcher egg that had been punctured and contained only a remnant of dry material.

Directed pecking at such an early age would be unusual for an altricial passerine chick. However, young of the Giant Cowbird (*Scaphidura oryzivora*) begin pecking at moving objects shortly after their eyes open, and can preen nestmates and accurately snap at small moving objects by the age of five days (Smith 1968).

If young cowbirds do behave aggressively toward host eggs (and, presumably, toward host young), why has evidence of this tendency not been detected during the many studies conducted on other host species? Pecks delivered in a typical host nest are well hidden from direct observation, and detection depends on noticing damaged eggs or young.

Our first notice of damaged eggs did not result from especially careful or detailed examination. On the contrary, even a casual glance into the nest would have revealed the large U-shaped area of crushed shell on one of the eggs, and the sharp dents on another. However, we did not see such severe denting until the cowbird was at least four days old, after 16 days of incubation. The persistence of viable eggs in the nest at that stage may be atypical. Most of the cowbird's hosts have incubation periods shorter than that of the Western Flycatcher and their eggs would have hatched. In others, the disruption of development resulting from reduced incubation for the four or five days since the emergence of the cowbird may be fatal. In such cases, none of the host eggs may hatch, as happened in all the parasitized nests of *Empidonax* flycatchers studied by Walkinshaw (1961). If these eggs died before producing the appropriate prehatching cues, lack of damage on such eggs would be consistent with our hypothesis.

For most hosts, hatching occurs within four days of the cowbird's emergence, and pecks would be delivered at chicks rather than at eggs. If the young were still blind and naked when effective pecks began, damage would be conspicuous, but the host young would be at such a compet-

itive disadvantage that they would seldom remain long in the nest. For example, in 69 parasitized nests of the Eastern Phoebe (*Sayornis phoebe*), host eggs usually hatched when the cowbird was four days old, yet no damage to eggs or young was seen (Klaas 1975). Effective pecks would just have begun, and any dented eggs would soon have hatched. Young phoebes usually disappeared within 24 to 48 h of hatching in a nest with a cowbird nestling (Klaas, pers. comm.).

If the host young were covered with down or feathers when pecking began, and were closer to the cowbird in size and development, they would be more likely to remain in the nest longer, but signs of injury would be partially concealed. For example, eggs of the Kirtland's Warbler (*Dendroica kirtlandii*) hatch two days after cowbirds in parasitized nests, and may live several days, even long enough to fledge (Mayfield 1960). Effective pecks would not begin until the host was in its third day, and damage short of severe lacerations would soon be obscured by the developing plumage.

Although damage may be inconspicuous in many cases, if aggression by nestling cowbirds is widespread, detectable damage must have occurred in many nests under study. A tendency to damage host eggs could be peculiar to this local population of cowbirds. In fact, all three of the affected nests were located on adjacent territories and all the cowbird chicks hatched within a week, suggesting that they all might have been produced by a single female.

The nature and timing of egg damage in Western Flycatcher nests suggest that (1) damage was caused by pecking by the cowbird chick, (2) pecking was directed at cues produced by emerging chicks, and (3) the cowbird's ability to deliver effective pecks increased with age. We hypothesize that damaging pecks may be delivered to young after hatching. In the absence of direct observation of cowbird chicks pecking nestmates, these suggestions remain conjectural. However, the occurrence of a relatively simple

anti-host behavior such as pecking at host eggs and young would not be unexpected in an obligate brood parasite such as the Brown-headed Cowbird.

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LITERATURE CITED

- DAVIS, J., G. F. FISLER, AND B. S. DAVIS. 1963. The breeding biology of the Western Flycatcher. *Condor* 65:337-382.
- FRIEDMANN, H. 1955. The honey guides. U.S. Natl. Mus. Bull. 208.
- FRIEDMANN, H. 1963. Host relations of the parasitic cowbirds. U.S. Natl. Mus. Bull. 233.
- KLAAS, E. E. 1975. Cowbird parasitism and nesting success in the Eastern Phoebe. Occas. Pap. Univ. Kansas Mus. Nat. Hist. 41.
- MAYFIELD, H. F. 1960. The Kirtland's Warbler. Cranbrook Inst. of Science, Bloomfield Hills, MI.
- MAYFIELD, H. F. 1961. Vestiges of a proprietary interest in nests by the Brown-headed Cowbird parasitizing the Kirtland's Warbler. *Auk* 78:162-166.
- MORTON, E. S., AND S. M. FARABAUGH. 1979. Infanticide and other adaptations of the nestling Striped Cuckoo *Tapera naevia*. *Ibis* 121:212-213.
- SMITH, N. G. 1968. The advantage of being parasitized. *Nature (Lond.)* 219:690-694.
- WALKINSHAW, L. H. 1961. The effect of parasitism by the Brown-headed Cowbird on *Epidonax* flycatchers in Michigan. *Auk* 78:266-268.

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Birding Nantucket.—E. F. Andrews and K. T. Blackshaw. [1983?] 35 p. \$4.00 plus \$1.00 postage and handling from P.O. Box 1182, Nantucket, MA 02554. This is a birder's guide to species and their occurrence on Nantucket Island off the coast of Massachusetts. The body of this little booklet consists of graphs of seasonal abundance, and a table of habitat preferences. It includes recommended seasonal trips and a list of accidentals. Maps of habitat distribution and birding locations. Selected references. Engaging drawings by Susan R. Blackshaw.—J. Tate.

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