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Crows Do Not Use Automobiles as Nutcrackers: Putting an Anecdote to the Test

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The cognitive abilities and intelligence of crows and other corvids have been the focus of much research and speculation, including a recent finding that New Caledonian Crows (*Corvus moneduloides*) manufacture hook-tools (Hunt 1996). In many cases only a single instance of the putative intelligent behavior has been observed (e.g. Montevecchi 1978, Andersson 1989). One behavior, the use of automobiles to crack open nuts, has been cited repeatedly as an example of corvid resourcefulness and adaptability (e.g. Beck 1980:127, Hunt 1996). There are only two original reports of this behavior in the literature, both based on single observations of Western American Crows (*Corvus brachyrhynchos hesperis*) that dropped hard-shelled fruits onto paved roads and ate them after they were crushed by passing cars (Maple 1974, Grobecker and Pietsch 1978). Many species of birds, including at least six corvids, regularly drop food items onto hard surfaces to expose edible parts (Zach 1979). Consequently, the apparent behavior of crows using cars to crack nuts may be an incidental byproduct of using paved surfaces to open hard-shelled food. We conducted observations of crows feeding on walnuts (*Juglans regia* and *J. hindsii*) to determine whether crows behave in such a way as to facilitate the crushing of nuts by cars.

Observations occurred at two locations in Davis, California, the site of Maple's (1974) original report of crows using cars as "nutcrackers." During autumn and winter in Davis, crows frequently attempt to open walnuts on paved surfaces by dropping them from a height or striking partly cracked nuts with their bills while holding them with their feet. One site where this occurred was Birch Lane, which had moderate traffic (mean of 39.8 vehicles/lane/h during observation periods) and approximately 50 large walnut trees along a two-block stretch. Observations were made here for 16.3 h on eight days between 24 October and 5 November 1995. The other study site was 6 km away at Russell Boulevard, which had heavier traffic (mean of 155 vehicles/lane/h during observations), and approximately 100 walnut trees along a stretch of 1.5 km. Observations were made at Russell Boulevard for 8.9 h on six days from 3 to 9 January 1996. Data were gathered by one or two observers using 10× binoculars from distances of 50 to 100 m. All birds were unmarked, but we believe that hundreds or thousands of different birds were present in the study area, because at least 10,000 crows roosted nearby (P. Gorenzel pers. comm.), and we frequently saw flocks of 10–40 crows arriving at and leaving the study sites.

To determine if walnut-eating crows used passing cars as nutcrackers, we observed their foraging behavior in the presence and absence of approaching cars. Observation periods began when one or more crows with walnuts stood on the road in the presence of an approaching car that was in the same lane as the crow. We recorded the occurrence of four behaviors during the time the car approached the birds: (1) Arrive (crow with walnut joins original crow[s] on same lane of road as approaching car); (2) Drop (airborne crow drops walnut onto same lane of road as approaching car); (3) Depart (crow that had nut on road in same lane as approaching car flies away); and (4) Relinquish (departing crow leaves nut on road). Note that Relinquish is a subset of Depart. We recorded these behaviors for any crows that were present at the start of each observation period and any that joined the original birds while the car was approaching. Each observation period was terminated when the car passed the original location of the crows. We also recorded the duration of each observation period ($\bar{x}$ = 9.5 ± SD of 0.4 s at Birch Lane; $\bar{x}$ = 5.1 ± 0.4 s at Russell Boulevard), which varied depending on the car's speed. We conducted 100 observation periods at each site. For each of our 200 observation periods, we also had a matched observation period in which we recorded the occurrence of the same four behaviors described above, for the same length of time (±1 s) but in the absence of an approaching car. Each pair of observation periods was matched for number of crows with walnuts present in the road at the start of the observation period ($\bar{x}$ = 1.2 ± 0.5 at Birch Lane; $\bar{x}$ = 1.1 ± 0.3 at Russell Boulevard), and the car-present observation period and its matched car-absent observation period were made within 1 h of each other on the same 50-m stretch of road. When traffic was low, we drove our own car toward crows that were in the road with walnuts. To avoid being hit by approaching cars, crows had to depart before the end of car-present observation periods, whereas they had the option to stay on the road during the car-absent observations.

If crows use cars to open walnuts, then they should place nuts in the paths of oncoming cars and should not remove them when cars approach. Thus, the frequency of the behaviors Arrive and Drop should be

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TABLE 1. Total number of crows originally present at start of observations, frequency of behaviors Arrive and Drop, and percentage of crows leaving road that relinquished nuts in the presence or absence of cars.

	No. crows present	Arrive[a]	Drop[b]	% Relinquish[c]
Car present	231	13	16	13.6
Car absent	231	13	19	18.5
P-value		>0.9[d]	>0.7[d]	>0.2[e]
Power[f]		>0.8	>0.9	>0.9

[a] Crow lands on road with walnut.
[b] Crow drops walnut in road.
[c] Percentage of departing crows that leave walnut in road.
[d] Two-tailed probability using binomial distribution.
[e] $\chi^2 = 1.21$, df = 1.
[f] Probability of rejecting the null hypothesis given an effect size of 25% (from Cohen 1988).

greater during car-present observations than during car-absent observations, and the proportion of departing crows that relinquish their walnuts also should be greater when cars are present. Each of these alternatives was tested separately, and support for any one of them would have suggested that crows use cars to facilitate the opening of walnuts. Because the results from the two sites yielded the same conclusions for each of the alternatives described above, we combined all data to increase statistical power.

Crows were no more likely to arrive with walnuts, or to drop walnuts on the road, when a car was approaching than when one was not approaching (Table 1). In addition, among crows that left the roadway during the observation periods, the proportion that relinquished their walnuts was not significantly different in the presence of an approaching car (13.6%; n = 235) than in the absence of one (18.5%; n = 92; Table 1). Thus, for all three hypotheses, the results were the same whether cars were present or absent, or they tended to be in the opposite direction from that predicted if crows were using cars to crack walnuts.

Because we failed to reject the null hypothesis in all three comparisons, we calculated the power of each statistical test. Power analysis requires that one postulate the size of the difference in the populations being compared that would indicate biological relevance. Thus, we arbitrarily assumed that differences in crow behavior when cars were present versus absent should be ≥25%. The power of our tests was quite high (Table 1), suggesting that we are correct in concluding that crows behave the same whether or not approaching cars are present.

It is easy to see why a casual observer might conclude that crows intentionally drop walnuts in front of cars. In Davis, crows often are seen dropping or eating walnuts on busy streets, and they frequently remain with their nuts until just before the car passes. When drivers hit walnuts with their cars (which, incidentally, never happened during our 200 car-present observations), crows can be seen descending to eat the crushed nuts. However, our observations suggest that crows merely are using the hard road surface to facilitate opening walnuts, and their interactions with cars are incidental. Indeed, we frequently saw crows dropping walnuts on hard surfaces where moving cars were not present, such as rooftops, sidewalks, vacant parking lots, and abandoned roads.

Although we cannot conclude that crows never intentionally use a moving car to facilitate opening of hard-shelled food, our observations indicate that it does not occur regularly in Davis (where it was first reported and where many residents still believe that it occurs; Maple 1974, Cristol et al. pers. obs.). In fact, using cars as nutcrackers might not be advantageous to crows. When a nut is crushed by a car, a single bird can no longer monopolize the nut, because the meat adheres firmly to the road surface. Competition among crows for walnuts is very intense and affects foraging behavior (Cristol and Switzer unpubl. data). Any walnut left on the road typically is stolen quickly by another crow. In addition, two species that normally are incapable of competing for intact walnuts, Yellow-billed Magpies (*Pica nuttalli*) and Brewer's Blackbirds (*Euphagus cyanocephalus*), often were observed joining crows at walnuts that had been crushed. Although crows can be extremely resourceful and appear to behave as optimal foragers when eating walnuts and other hard-shelled food (Zach 1979, Richardson and Verbeek 1986, Switzer and Cristol unpubl. data), their putative exploitation of moving cars is not adequately documented and should not be cited as an example of avian intelligence or adaptability.

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Black-capped Chickadees and Red-breasted Nuthatches "Weigh" Sunflower Seeds

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Chickadees and nuthatches that come to feeders in the winter commonly select a seed and then fly off with it to hammer it open in a secluded spot (Lima 1985). Given that flying to and from an open feeder may be risky (Barkan 1990) as well as cost time and energy, a bird feeding on sunflower seeds should discriminate among seeds and select those that provide the most food reward (Lima 1985). However, sunflower seeds are enclosed in hulls, and many seed hulls are empty, even though they may be of similar size and appearance to filled hulls. Nevertheless, seed size and shape are criteria used by birds for seed choice (Willson 1972). Here, we demonstrate that Black-capped Chickadees (*Parus atricapillus*) and Red-breasted Nuthatches (*Sitta canadensis*) take sunflower seeds selectively and discriminate between them on the basis of heft.

This study was conducted in January 1996 at two sites near Weld, Franklin County, Maine. Site 1 was a feeder erected in the forest for the first time at the beginning of this study. Site 2 was a nearby (0.8 km away) pre-existing feeder that had already been continuously supplied with sunflower seeds and that was frequented by at least 50 chickadees and more than 6 nuthatches throughout this study. The nuthatch observations were made at this site only. We experimented with five types of striped sunflower seeds of similar linear dimensions: (1) normal (randomly chosen, filled, unshelled), (2) empty (resembled normal but with contents removed), (3) filled (empty seeds filled with Bondex plaster of Paris), (4) large, and (5) small. Average masses ($\pm$SD) of regular (unaltered), empty, filled, large, and small seeds were 73 $\pm$ 21.9, 25 $\pm$ 10.0, 127 $\pm$ 28.1, 104 $\pm$ 31.6, and 43 $\pm$ 12.2 mg, respectively.

In order to test whether the birds weighed seeds, we removed the normal feeder (with unmanipulated striped sunflower seeds where the birds fed just prior to any one test) and simultaneously provided two piles of similar seeds 20 cm apart on a feeding board. The positions of seed piles were regularly shifted on the feeding boards in repeated trials. Tests consisted of: (1) normal versus empty, (2) normal versus filled, and (3) large versus small seeds. Because different birds visited our feeding boards we recorded the seed pile visited, how many seeds were discarded (picked up and flung aside), and how many were taken. We assumed the birds had prior experience with empty versus small and large filled seeds. We predicted that if the birds discriminated seeds on the basis of mass, then they should discard empty seeds and show high preference for heavier plaster-of-Paris filled seeds, and possibly also discriminate smaller differences in mass (e.g. normal vs. plaster-filled seeds, and small vs. large seeds).

Red-breasted Nuthatch.—We recorded 11 nuthatch visits to the normal seeds in the normal versus empty seeds experiment. During six of these visits the birds did not discard any seeds, and only once did they discard more than two seeds. The number of visits to the empty seeds was nearly identical (10). However, in this case all but one visit involved discards. In one visit a bird discarded 9 seeds in a row, and in 7 of the 10 visits, the nuthatches did not take any seeds from the pile with empties. The mean number of seeds discarded per visit was 0.73 $\pm$ SD of 0.90 for normal and 2.82 $\pm$ 0.54 for empty seeds, a significant difference ($t = 2.24$, df = 19, $P < 0.05$).

In the converse experiment, when nuthatches were exposed to normal versus filled seeds, they again selectively took the heavier seeds. They discarded seeds in 14 of 21 visits to the normal pile, and in 10 of 20 visits to the pile of heavy seeds. Almost every visit to both types of seed concluded with taking (leaving with) a seed. Mean numbers of seeds discarded were 2.14 pm 2.13 for unaltered and 0.75 $\pm$ 0.91 for heavy