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WHY DO RAVENS FEAR THEIR FOOD?<sup>1</sup>

BERND HEINRICH

Department of Zoology, University of Vermont, Burlington, VT 05405

*Key words:* Common Raven; *Corvus corax*; neophobia.

Numerous animals show shyness or neophobia at food and other things with which they are unfamiliar (Franchina and Gilley 1986, Jones 1986). Neophobia is predicted at food items which a specialist rarely uses, or which a generalist infrequently encounters.

Common Ravens, *Corvus corax*, are opportunistic feeders (Nelson 1934), which are often "bold and fearless" enough to harass mammalian carnivores and large predatory birds, and to hunt and successfully dispatch rabbits, young seals, and even caribou calves (Bent 1946). Sometimes the raven is also, relative to many other corvids, a carcass specialist (see Heinrich, in press for review). Both American Crows, *C. brachyrhynchos*, and Blue Jays, *Cyanocitta cristata*, feed at carcasses but they do not specialize on them. It might therefore be predicted that ravens would show little hesitation in utilizing carcasses, but that crows and Blue Jays would show considerable hesitation in doing so. Furthermore, a large powerful bird such as a raven should have less to fear than its smaller relatives and therefore have less reason to evolve neophobia at carcasses.

As part of another study involving the social foraging behavior of ravens in the winter in western Maine

(Heinrich 1988, in press) I provided a total of 135 meat piles and animal carcasses to ravens in the field, and the observations at these baits totalled 1,520 hr. I here report on apparent exaggerated bait shyness in ravens (relative to the jays and the crows) and speculate on the significance of the behavior.

Neither Blue Jays nor crows displayed interest in large (ungulate) intact carcasses. Ravens examined these carcasses, pecked them, removed the eyes, and then left them. No deer, moose, cattle, goat, or sheep carcasses attracted groups of ravens unless these baits had been cut open either by me or by coyotes. However, all three corvids fed on opened carcasses and slaughterhouse offal.

Ravens showed considerable hesitation before feeding. As indicated elsewhere in detail (Heinrich, in press), vagrant ravens did not approach some baits due to the presence of defending resident birds. However, ravens, who are notoriously difficult to capture at baits also appeared to fear the bait itself if they (or others) had not or were not already feeding there.

A raven approaching a new bait typically landed 5-10 m from it on the snow and then slowly walked toward it. It made frequent stops to examine it, unlike crows who scanned the surroundings instead. After coming to within 5 m of the carcass or other bait, the raven almost always made sudden violent vertical leaps assisted by one or more wing beats. It then approached a few more steps and again repeated the leaps. Finally, the gradually approaching raven delivered a peck at the bait and then invariably took flight, sometimes not returning for several hours. The same "jumping-jack"

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TABLE 1. Numbers of presentations of various species or objects to two different groups of two and four naive ravens. (Number of different species or kinds.)

Intact animals	Inanimate objects
Invertebrates 14 (8)	
Mammals 14 (7)	Edible 17 (9)
Birds 6 (5)	Inedible 16 (15)
Amphibians 2 (2)	

maneuvers were then repeated, but the bird now landed directly on the carcass where it continued to jump up and down in a seeming "dance" that sometimes lasted several minutes. No leaping occurred on subsequent visits to the bait after feeding had begun. Animals native to the area (one moose, one deer, one beaver, two hares) were pecked at within 7 hr ( $\bar{x}$  = 3.3 hr) of discovery, while animals probably unfamiliar to them (four Holstein cattle, two sheep) were not pecked at until 25–74 hr after discovery (see Heinrich 1988).

In contrast to ravens, Blue Jays (who might be expected to show much greater neophobia) showed relatively little hesitation before feeding. In over 10 instances, upon discovering an opened carcass, Blue Jays flew down and started feeding almost immediately (estimated within a minute or less). Crows were somewhat more hesitant than Blue Jays in approaching baits. However, after reaching the bait they also fed with little further hesitation. Like Blue Jays they never leaped as the ravens did, although they displayed nervousness or intention movements by lifting their wings and simultaneously spreading their tail feathers apart in short flicking motions.

Ravens have a history of persecution by humans in New England (Laughlin and Kibbe 1985) and elsewhere (Bent 1946), and they are still occasionally captured inadvertently in leg-hold traps set by local trappers for coyotes. I therefore speculated that the ravens' apparent exaggerated neophobia could be a learned response. To test whether the bait shyness is learned or innate I reared two groups of nestlings and kept one group in captivity for 11 months. I recorded the reactions of the hand-reared ravens to 22 different kinds of animals (36 different encounters) and 24 different kinds of inanimate objects (33 different encounters). The results were unambiguous. In all 69 staged encounters (Table 1) a bird which saw the object for the first time approached it and performed the characteristic jumping-jack maneuvers exactly as those observed in the wild birds in the field. (Animals with eyes visible were always first pecked near the rear.) After having encountered the object three or four times on separate occasions the jumping preliminaries ceased.

The ravens immediately (within minutes) approached any strange object placed into the cage, whether it was edible or not and whether or not they had within minutes fed to repletion. They also approached and similarly handled any object (edible or not) that was already present in the cage immediately after I had handled it. Large animal carcasses (raccoon or larger) were approached more hesitantly than small. (Note the hesitancy duration in the captive birds is not comparable to that of wild birds in the field, because

I had myself presented the objects, thereby likely giving the birds a signal that the objects were both of possible interest and not dangerous.) If the objects encountered were edible, then feeding and/or caching followed. However, birds fed to repletion showed no apparent diminution in interest to contact another new object presented.

In each of the two groups of four and two birds, one (presumed male) emerged as the "initiator" already at the time of fledging. In all 69 of the staged encounters, the initiator exclusively made the first contact with the strange object or new food and later also with familiar food. If the object proved to be food, and the initiator fed or cached, then the others also tried to feed, either by attempting to take food directly out of the initiator's bill, stealing it from his caches, or taking it from the source. The initiator always defended carcasses, but his defense waned within several minutes to half an hour and the others then fed. If the initiator did *not* feed from the object, then the others showed no apparent interest in it, even after the initiator left it. It appeared as though only one bird per group had "curiosity" about novel potential food items.

I, as the birds' keeper, served as the initiator for the (clearly dominant) initiators. For example, when the birds were 3½ months past fledging I unobtrusively left a handful of cooked rice on the aviary floor. No bird touched it until the next day after I had allowed the initiator to see me pick up this rice and I had held it up to him. After he went down to the ground to feed the others subsequently also fed. The birds were similarly induced to start feeding from various small road-kills.

The reluctance of the followers to feed was not due to fear of the more dominant birds; given two or more items of identical food, the followers tried first to take that which was defended, even attempting to take that out of the bill of the defending bird. Given ad libitum feeding, I saw no instance of a follower displacing an initiator from food, although the reverse occurred (for at least several minutes) in all of the 69 encounters. Clearly the initiators exhibited enhanced social status.

Hungry birds show other behavior. I introduced another bird which had not fed for a day and which was also of low status. It had been injured and was forcibly displaced from the preferred nocturnal roosting place used by the others. This bird on no occasion examined any novel item in its cage. However, on eight occasions it flew down to food and in a vocal aggressive display displaced the dominant (well-fed) birds.

The above data on hand-reared birds indicate that the apparently exaggerated bait shyness as displayed by feeding delay and jumping-jack maneuvers in New England ravens is innate, and it has bearing on social relationships. Learning, both through individual and social experience, was required to identify and to ascertain the safety and palatability of all food items.

The exaggerated neophobia could reflect selection from a long history of human persecution at baits. Alternately, to a carcass specialist a food item may simultaneously be a sleeping or a sick yet dangerous animal which could lash out in self-defense. The jumping-jack maneuvers may function in eliciting a reaction from live animals, letting the approaching bird know whether or not it is safe to try to feed. Perhaps an

uncautious approach in a palatable carcass specialist can be exploited by the evolution of death-feigning as a hunting strategy in a carnivore. Thus, the birds may need to be alert both during the approach to the bait, and also to prey type. More comparative data are needed to sort out the alternative explanations. Nevertheless, by whatever mechanism of evolution, the neophobia at bait argues for the existence of some real or imagined danger. The apparent eagerness and boldness of some (presumably male) satiated birds to meet this danger suggest that they gain some indirect payoff(s) from it, such as possibly one related to enhanced social status.

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## RAVENS OBSERVED KILLING ROOSTING KITTIWAKES<sup>1</sup>

DAVID F. PARMELEE AND JEAN M. PARMELEE

*Bell Museum of Natural History, University of Minnesota, Minneapolis, MN 55455*

**Key words:** *Predatory behavior; ravens; Corvus corax; roosting; kittiwakes; Rissa tridactyla.*

Under the auspices of the U.S. Fish and Wildlife Service, we conducted in 1987 a week-long survey of the birds in the southwest corner of Chagvan Bay (58°40'N, 161°47'W), Togiak National Wildlife Refuge, in the Bristol Bay-Kuskokwim Bay region of Alaska. We here report observing a pair of Common Ravens (*Corvus corax*) simultaneously attack and kill two roosting Black-legged Kittiwakes (*Rissa tridactyla*). Although this amounted to only a single sighting, firsthand observations of coordinated hunting tactics of this nature are so unusual that they would seem to merit special attention (D. Bruggers, pers. comm.; see also Montevecchi, *Z. Tierpsychol.* 49:136-141, 1979).

At least one pair of ravens and possibly more bred in the vicinity of Chagvan Bay. On 24 May we noted a remarkable predatory behavior of a pair that evidently was feeding young. In dim light, at 21:00, two ravens dropped straight down on a flock of several hundred Black-legged Kittiwakes that roosted with a few Glaucous-winged Gulls (*Larus glaucescens*) on an isolated mud flat at ebb tide near the entrance of the bay. Simultaneously, but about 40 m apart, each raven

descended onto a roosting kittiwake and attacked it viciously on the ground. Much jumping, jabbing, and flapping of wings followed until each kittiwake was subdued. All the other gulls meanwhile had risen above the fracas where they circled and called incessantly. Within approximately 3 min the majority settled quietly 50 m away on the same mud flat. A few individuals continued to harass the ravens with dive-bombing swoops, but none made contact. The ravens fed on their prey for about 20 min before flying off, but because of a water barrier we were unable to determine which parts were consumed. We watched one disappear on the face of a short but precipitous sea cliff where, on 26 May, Edward Weiss (pers. comm.) reported seeing a stick nest thought to be a raven's. Later that day we saw an adult raven fly from the huge nest of driftwood and twigs situated out of reach on a ledge 5 to 6 m above the beach.

W. A. Montevecchi (1979) earlier reported on predator-prey interactions between ravens and kittiwakes, but the prey taken by the ravens hunting singly and cooperatively in that study were exclusively kittiwake eggs and nestlings (see also Montevecchi *Condor* 80: 349, 1978). There were no instances of the hunting and killing of older kittiwakes as was the case at Chagvan Bay. Also, the antipredator behavior exhibited by the circling and dive-bombing kittiwakes contrasts with Cullen's (*Ibis* 99:275-302, 1957) and Montevecchi's (1978) earlier reports on the passive nature of the species.

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