

Commensal-Mutualistic Association Between the Common Raven and Domestic Horse in the Sierra Nevada Foothills of Central California

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Common Ravens (*Corvus corax*) are generalist omnivores that consume several kinds of arthropods, small vertebrates, carrion, and plant material. Accordingly, they incorporate a wide variety of clever strategies to procure and capture such a wide variety of food items (Heinrich 1999, Boarman and Heinrich 2020). Although Common Ravens typically search for food by scanning an area while walking on the ground or pursuing prey in flight, they sometimes exploit opportunistic relationships with other organisms to enhance their foraging success (Boarman and Heinrich 2020). Interspecific feeding associations documented for Common Ravens include trailing gray wolves (*Canis lupus*) to scavenge the remains of their prey (Mech 1970, Peterson 1977, Heinrich 1999, Stahler et al. 2002), pilfering and absconding with prey and food caches of another species (Murie 1940, Zirrer 1945, Heinrich 1999), and feeding on insects on and within cattle excrement (Engel and Young 1989). Here, I describe observations of a previously unreported interspecific feeding association in Common Ravens.

My observations occurred in the western foothills of the Sierra Nevada 8 km (5 mi) west of Coarsegold, Madera County, California (Lat. 37.25 Long. - 119.78; elevation 400 m [1200 ft]). Vegetation at the site consists of blue oak (*Quercus douglasii*) foothill grassland, and livestock grazing is the primary land-use in the area. A water trough near a dwelling is filled and maintained to provide water for two free-ranging horses (*Equus caballus*): an adopted male feral mustang and a female grade (i.e., mixed-breed) horse that was rescued after it fled from a wildfire in central California. Both horses are untamed, and wary and mostly unapproachable by humans. Neither horse tolerates the presence of dogs or cats.

On 10 June 2021 at around 07:20, I observed the two horses grazing on grasses and forbs and licking a mineral block near the water trough. They recently had finished their morning drinking routine. At about the same time, a pair of Common Ravens arrived to drink from the trough. After drinking, the ravens foraged near the trough in a random strutting fashion with intermittent pecking at food items on the ground. After a few minutes, the

two ravens flew to the top rail of a four-rail fence where they remained perched for a short time. Then, seemingly without hesitation, one of the ravens flew from its perch directly toward the mustang, which was standing one meter away. The raven landed on the back of the mustang and perched motionless on its croup (i.e., rump). After viewing the encounter through a window, I tried to maneuver for an unobstructed view. The raven noticed my movements and became spooked and flew from the horse. The entire perching event lasted about one minute. The mustang remained nonchalant and still throughout the encounter. At no time did the horse show any surprise, discontent, or aggression toward the raven and instead did not noticeably acknowledge its presence on its back.

Later the same day at about 18:20, both horses and what appeared to be the same pair of Common Ravens reappeared near the water trough. The horses grazed and the ravens perched on the rail fence when one of the ravens flew directly toward the horses and landed on the back of the grade horse. As in the previous encounter with the mustang, the raven perched motionlessly on the back of the horse near its croup while eliciting no reaction from the horse. In this instance, however, after about 15 seconds of perching the raven began rapidly pecking the back of the horse.

The pecking action was identical to that witnessed during earlier feeding episodes on the ground, and clearly indicated the bird was feeding from the surface of the horse. The presence of the raven on the horse, including the pecking at the back, did not provoke or even get the attention of the horse. The raven remained on the back of the horse for about 45 seconds until it was frightened away by my movements. After the raven flushed, I inspected the back of the horse and observed a swarm of unidentified flies (Order: Diptera) above and on the surface of the skin, suggesting that the raven was foraging on them.

Over the next four months, both horses visited the trough daily and a pair of ravens resembling and presumed to be the same individuals involved in the 10 June observations were seen at or near the trough on numerous occasions. During this time, the horses and ravens frequently were observed simultaneously at the trough; however, additional interactions between the two species were not noted.

Then on 14 October 2021 at 12:10, with both horses and the pair of ravens near the trough, I observed one of the ravens flying to the back of the mustang, this time landing and perching near the horse's withers (i.e., ridge between shoulder blades) and again drawing no response from the horse (Figure 1). After about 15 seconds of perching, the raven began pecking at the base of the neck in a feeding fashion similar to that observed on 10 June. The raven pecked for about 5 seconds, paused, and stood upright for about five

seconds. Then it inserted its bill into the mane, where it prodded around slowly and methodically in a manner that resembled preening (Figure 2). The raven continued to glean material from around the mane, intermittently pausing and leveling itself while swallowing (Figure 3). This alternation of foraging around the mane and posturing upright continued for about the next 90 seconds until the bird ultimately flew from the horse.



Figure 1. Common Raven perched atop a mustang, 14 October 2021.

Photo by Franklin Yancey



Figure 2. Common Raven foraging through the mane of the mustang. 14 October 2021.

Photo by Franklin Yancey

Immediately after the raven flew from the mustang, I inspected the horse around the foraging site for potential food items. I noted and photographed what appeared to be a single type of fly (similar to the ones noted on 10 June) around the withers, but could not find any slow moving or stationary, nonvolant invertebrates that the raven might have been feeding on around or

within the mane. In addition, there were no open wounds or sores noted in the area. Photographs of the flies were submitted to the Bohart Museum of Entomology at the University of California, Davis where they were identified as face flies (*Musca autumnalis*; S. Letana, pers comm.). These flies are considered non-biting, but are known to have other detrimental effects on livestock, including horses (Boxler 2015).



Figure 3. Common Raven standing upright on the mustang, apparently swallowing food items gleaned from its mane. 14 October 2021.

Photo by Franklin Yancey

This type of interspecific relationship between the Common Raven and domestic horse appears to be a *cleaning association* and is known among several bird species and large mammals in both the New and Old worlds (Sazima et al. 2012, Mikula et al. 2018). Cleaning associations involve a “cleaner” and a “client,” with the cleaner typically foraging on items on the surface of the client (Sazima et al. 2012). Common Ravens have not been previously implicated in such a relationship.

Intuitively, it appears that this apparent raven-horse cleaning association is an example of mutualism (i.e., a symbiotic relationship between two species that benefits both individuals) because the raven seems to be capitalizing on a readily accessible food source, and the horse presumably is benefitting from a reduced parasite load. Presumed mutualism, however, may be more complicated than it appears and may not represent mutualism at all (Weeks 2000). For example, Red-billed Oxpeckers (*Buphagus erythrorhynchus*) are well-known for cleaning associations with many large African mammals, such as giraffes (*Giraffa sp.*), African buffalos (*Syncerus caffer*), and several antelope species (Craig 2020). In this association, the behaviors of the cleaner (oxpecker) and client (mammal) appear similar to those of the raven-horse association I observed.

The oxpecker-mammal relationships were long regarded as mutualistic (Moreau 1933, van Someren 1951, Bezuidenhout and Stutterheim 1980, Mundy 1993) until it was determined that although the oxpeckers benefit from the food they acquire, the mammal client may not experience a reduction in parasite load, and thus may not always benefit from the association (Weeks 2000). Moreover, the cleaner-birds may benefit not only from parasite consumption, but also from ingesting blood from open wounds, dead skin tissue, and ear wax, the effects of which on the client are not well-understood (Weeks 1999, 2000; Sazima et al. 2012). If feeding on any of these items by oxpeckers is detrimental to the mammal, the relationship would be partly parasitic (Weeks 2000). Nunn et al. (2011) concluded that the oxpecker-mammal relationship generally is mutualistic, but with a component of opportunistic parasitism.

Although the cleaner-birds in some of the other documented bird-horse cleaning associations are known to consume blood and tissue from open wounds of their mammal clients (Sazima et al. 2012), in this instance there were no open wounds present on the back of either horse near where a raven was seen pecking or perched. Therefore, these observed Common Raven-domestic horse interactions had no parasitic component. Because there is no definitive evidence that the horses experienced a reduction in parasites or other benefit from the ravens, I follow Mikula et al. (2018) and tentatively refer to this association as commensal-mutualistic. This term is used to describe such a bird-mammal association where it is not possible to determine if the interaction is commensalism (a symbiotic relationship between two species that is beneficial to one and is of no consequence to the other) or mutualism (Mikula et al. 2018). Additional observations and detailed studies would be needed to fully understand and definitively classify this relationship.

It is interesting that, given the abundance and widespread sympatric occurrence of Common Ravens and domestic horses, this commensal-mutualistic relationship involving these two species has not been previously reported. Although there is no previous evidence of Common Ravens serving as cleaners, several congeners, including the Pied Crow (*C. albus*), Cape Crow (*C. capensis*), White-necked Raven (*C. albicollis*; Dean and Macdonald 1981), and Fan-tailed Raven (*C. rhipidurus*; Lewis 1989), have been implicated in similar relationships with large mammals. Additionally, it appears that domestic horses are well-adapted to this phenomenon in general. Domestic horses have been reported serving as clients for a variety of bird species, during which the birds fed on flies, ticks, blood, and dead tissue (Sazima et al. 2012). Further, both horses involved in this incident accepted a raven perching or pecking on its back without a response or reaction, suggesting a predisposition to this kind of interaction. With the option of many other

effective feeding strategies from which to select, Common Ravens probably resort to this foraging behavior only rarely and opportunistically. The species' capacity to incorporate several strategies into their foraging repertoire has contributed to their ability to adapt to the wide range of environments they are known to occupy (Boarman and Heinrich 2020).

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LITERATURE CITED

- Bezuidenhout, J.D., and C.J. Stutterheim. 1980. A critical evaluation of the role played by the Red-billed Oxpecker *Buphagus erythrorhynchus* in the biological control of ticks. *Onderstepoort Journal of Veterinary Research* 47:51-75.
- Boarman, W.I. and B. Heinrich. 2020. Common Raven (*Corvus corax*), version 1.0. In *Birds of the World* (S.M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.comrav.01>
- Boxler, D.J. 2015. The face fly. NebGuide, University of Nebraska-Lincoln Extension, Institute of Agriculture and Natural Resources, G1204.
- Craig, A.J.F. 2020. Red-billed Oxpecker (*Buphagus erythrorhynchus*), version 1.0. In *Birds of the World* (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.reboxp1.01>
- Dean, W.R.J. and I.A.W. Macdonald. 1981. A review of African birds feeding in association with mammals. *Ostrich* 52:135-155.
- Engel, K.A. and L.S. Young. 1989. Spatial and temporal patterns in the diet of Common Ravens in southwestern Idaho. *Condor* 91:372-378.
- Heinrich, B. 1999. *Mind of the Raven*. HarperCollins, New York.
- Lewis, A.D. 1989. Notes on two ravens *Corvus* spp. in Kenya. *Scopus* 13:129-131.
- Mech, L.D. 1970. *The Wolf: The Ecology and Behavior of an Endangered Species*. University of Minnesota Press, Minneapolis.
- Mikula, P., J. Hadrava, T. Albrecht, and P. Tryjanowski. 2018. Large-scale assessment of commensalistic-mutualistic associations between African birds and herbivorous mammals using internet photos. *PeerJ* 6:e4520;DOI 10.7717/peerj.4520

- Moreau, R.E. 1933. The food of the Red-billed Oxpecker, *Buphagus erythrorhynchus* (Stanley). Bulletin of Entomological Research 24:325-335.
- Mundy, P.J. 1993. Notes on oxpeckers. Honeyguide 39:108-112.
- Murie, A. 1940. Ecology of the coyote in the Yellowstone. Fauna of the National Parks of the United States Bulletin 4:1-206.
- Nunn, C.L., V.O. Ezenwa, C. Arnold, and W.D. Koenig. 2011. Mutualism or parasitism? Using a phylogenetic approach to characterize the oxpecker-ungulate relationship. Evolution 65:1297–1304.
- Peterson, R.O. 1977. Wolf ecology and prey relationships on Isle Royale. National Park Service Scientific Monograph Series 11:1-210
- Sazima, C., P. Jordano, P.R. Guimarães, Jr., S.F. Dos Reis, and I. Sazima. 2012. Cleaning associations between birds and herbivorous mammals in Brazil: structure and complexity. Auk 129:36-43.
- Stahler, D., B. Heinrich, and D. Smith. 2002. Common ravens, *Corvus corax*, preferentially associate with grey wolves, *Canis lupus*, as a foraging strategy in winter. Animal Behaviour 64:283-290.
- van Someren, V.D. 1951. The Red-billed Oxpecker and its relation to stock in Kenya. The East African Agricultural Journal 17:1-11.
- Weeks, P. 1999. Interactions between Red-billed Oxpeckers, *Buphagus erythrorhynchus*, and domestic cattle, *Bos taurus*, in Zimbabwe. Animal Behaviour 58:1253-1259.
- Weeks, P. 2000. Red-billed Oxpeckers: vampires or tickbirds? Behavioral Ecology 11:154-160.
- Zirrer, F. 1945. The raven. Passenger Pigeon 7:61-67.