

SCIENCE



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**THE THREE-EYED RAVEN: CORVID INTELLIGENCE ON AND
BEYOND THE SCREEN (PG 23)**

THE THREE EYED-RAVEN

CORVID INTELLIGENCE ON AND BEYOND THE SCREEN



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WARNING: MAJOR SPOILERS AHEAD

The ominous cawing of the sleek, obsidian-colored Three-Eyed Raven haunts Bran Stark's dreams. The bird, as if taunting the youngest Stark boy with his destiny, represents all that is known, and will be known, about the Seven Kingdoms. In Game of Thrones, the Three-Eyed Raven is an ancient "greenseer," capable of seeing the past, present, and future. Though

this creature does not stick out in the fantastic world of GoT, the choice to portray this omniscient, elusive character as a raven may be rooted in the raven's natural intelligence beyond the screen.

Annd....Ravenclaw!

Elsewhere in popular media, ravens have

gained a reputation for being smart. For example, J. K. Rowling named the Hogwarts house known for intelligence after the raven. Anecdotally, ravens and crows, which belong to the family known as corvids, are known to be cunning, and to communicate with their peers about resources and possible dangers.

These observations of corvid intelligence have been backed by animal behavior research as well. Ravens as young as four months have been shown to exhibit advanced planning and decision making, and their abilities have been compared to that of chimpanzees. Several studies found that ravens will

challenge cognitive skills can solve. For example, differentiating friend from foe based on past interactions, or determining who may be worth befriending.

Notably, some corvid species also exhibit what we might colloquially call “selflessness”—individuals will bring food to their partner or interfere in a conflict. This type of behavior is what animal behavior researchers call “prosociality.” “Prosociality” refers to an individual choosing to help another individual. In non-human primates like chimpanzees, the evolution of prosocial behavior is often

"ravens in nature derive their power from social relationships, and the ability to recognize and maintain these valuable relationships"

forego an immediate food reward if they know the initial reward can be exchanged for a more desirable reward at a later time (Dufour et al. 2012). This awareness of time does appear to live up to portrayal of the Three-Eyed Raven. However, the true ingenuity of crows, ravens, and related species is unveiled when we observe interactions between individual birds.

An unkindness of ravens

You may be familiar with two different measures of intelligence in humans—IQ, or Intelligence Quotient, and EQ, or Emotional Quotient. The former measures a wide range of cognitive skills, such as logic and problem-solving. On the other hand, the latter measures social awareness and the ability of an individual to perceive and respond to their own emotions as well as the emotions of others. While tests of intelligence, such as tool use tasks and delayed reward tasks, are very interesting in the context of human intelligence, they may not be as ecologically relevant in animals whose survival is dependent on a wide range of ecological factors.

The Three-Eyed Raven in GoT is the last greenseer, and has lived for a thousand years connected to an ancient tree. By all measures, the Three-Eyed Raven is a loner. Unlike their on-screen counterpart, ravens in nature are not solitary. Among the 120 different species of corvids, levels of sociality range from monogamous pairs to territorial family groups (Clayton and Emery 2007). In the context of living with others, social intelligence is likely more important for corvids. Group living presents unique

hypothesized to have arisen due to the requirement of group members providing care for offspring that are not their own (Horn et al. 2016). In other words, prosocial behavior is beneficial for animals who breed cooperatively. This poses a conundrum for understanding prosocial behavior in corvids, which are not cooperative breeders. What factors, then, influence when corvid species act prosocially?

One study food-sharing behavior in a corvid species called jackdaws suggests that some corvids appear to share food with those that have given food to them in the past (de Kort, Emery, and Clayton 2006). In addition, Dr. Selvino de Kort and his colleagues at Manchester Metropolitan University found that the recipient birds’ actions play a role in frequency of sharing (2006). Notably, begging behavior elicited more food sharing from the “donor.”

In another study of food sharing behavior in pinyon jays, two researchers at the University of Nebraska-Lincoln, Dr. Juan Duque and Dr. Jeffrey Stevens experimentally manipulated pairs of male pinyon jays. With only one individual in each pair having access to food, the researchers were able to test whether male pinyon jays were more likely to “donate” food to those that have given them food in the past (Duque and Stevens 2016). Unlike Dr. de Kort’s findings, Duque and Stevens did not find evidence to support the hypothesis that pinyon jays use outcomes of past interactions to help them decide when to share food.

Prosocial behavior can extend beyond sharing food. For example, in one study focusing on conflict

resolution, Dr. Orlaith Fraser and Dr. Thomas Bugnyar at the University of Vienna looked at the frequency of individuals interfering in a conflict between two other individuals. Fraser and Bugnyar first established that the birds did not follow a “rule of thumb” when interfering in conflicts, or engaging in “agonistic support.” For example, they did not always support the aggressor or the victim by the default (Fraser and Bugnyar 2012). Next, they looked at the dynamics of each conflict to determine whether there was reciprocity in agonistic support,



meaning individual birds are more likely to support birds that have supported them in the past. No reciprocity was found, but the researchers did find that the ravens were more likely to support those that preened them, their kin, and more dominant individuals of the flock.

Interestingly, a separate study conducted by Drs. Fraser and Bugnyar found that ravens sometimes choose to reconcile with opponents that they have “argued” with (2011). The likelihood of reconciliation was significantly associated with the quality of the relationship between the two ravens in question before the disagreement occurred. High quality relationships were determined by sitting near each other and preening each other, which is analogous to grooming in primates and other mammals (Fraser and Bugnyar 2011). This study shows that ravens are able to distinguish which relationships are valuable, and therefore should be maintained through reconciliation after conflicts.

It appears that prosocial behavior is a way for corvids to build stronger relationships with others in a way that offsets the costs of group living. The strategies used for post-conflict resolution by ravens closely mirrors those used by chimpanzees to decrease the distress caused by aggressive encounters with group members. Though the connection between strong social networks and

mortality has not been studied in corvid species specifically, studies of other animals provide valuable hints. In baboons, infant survival and adult life-expectancy both increase with greater social integration (Tung et al. 2016). Similarly, strong social bonds in feral horses is associated with increased birthrates, survival rates, and even decreased harassment from males (Cameron, Setsaas, and Linklater 2009). In the context of corvids, prosocial behavior may not be the result of tit-for-tat calculations, but an indication of a high degree of social intelligence that has far-reaching rewards over their lifespan.

Though ravens, and corvids more generally, may not be able to time travel and to see the future like the Three-Eyed Raven, these studies of corvid social behavior suggest these birds are highly “diplomatic.” Bran Stark, in becoming the Three-Eyed Raven, also fulfills his destiny as the ruler of the Six Kingdoms. His fitness as a ruler is partly due to his awareness of the past, the present and the future. Unlike the original Three-Eyed Raven, Bran is not alone. Trusted friends and advisors surround him. In a similar manner, ravens in nature derive their power from social relationships, and the ability to recognize and maintain these valuable relationships through food sharing, agonistic support, and reconciliation. Thus, the root of corvid intelligence is social intelligence, and how social intelligence can be used to solve the problems associated with group living.

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