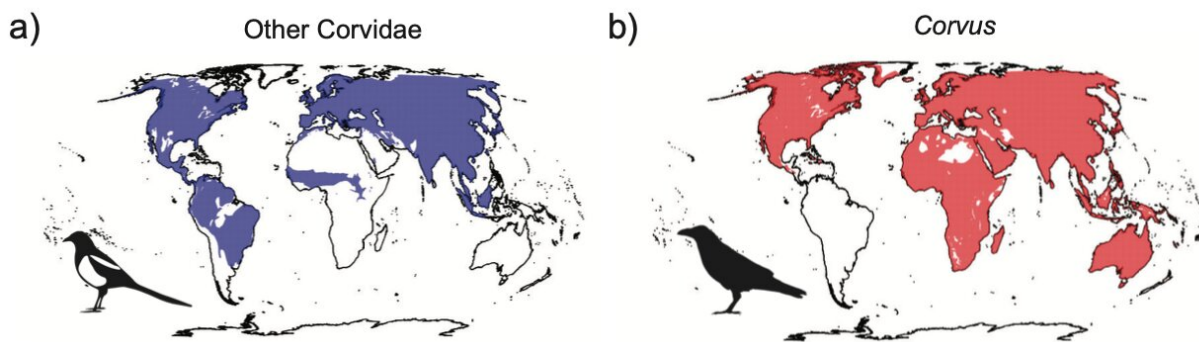


Brains and brawn helped crows and ravens take over the world

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World distributions of (a) all species of Corvidae excluding Corvus and (b) all species of Corvus. Credit: Botero laboratory at Washington University in St. Louis; *Nature Communications*.

Crows and ravens are well known for their black color and the harsh "caw" sound they make. They are intelligent birds that use tools, solve complex abstract problems and speak a volume of words.

But what is less well appreciated is how diverse they are. Their diversity is accompanied by their ability to live all over the world in a variety of habitats. In fact, they are one of the most widespread group of birds worldwide. Crows and ravens—part of the avian family of Corvids that also includes jays and magpies—underwent rapid global expansion, unlike other [family members](#) that stayed mostly within single continents.

What is their secret to this amazing planetary expansion?

They have great flying ability, which allows them to gain access to new places more easily. While their flying skills were key to their success, new research from Washington University in St. Louis also shows that big bodies and big brains played an important role in helping crows and ravens survive in the new climates they occupied.

The new study is published April 21 in *Nature Communications*.

"When we think about processes of global diversification, it is important to consider not just the ability to reach new places, but also the ability to survive once you get there. Our work suggests that crows and the ravens diversified both quickly and widely because they were particularly good at coping with different habitats," said Carlos Botero, assistant professor of biology in Arts & Sciences.

Three convenient traits

In the work led by first-author Joan Garcia-Porta, a postdoctoral research associate in biology in Arts & Sciences and now a fellow in the Department of Genetics at the University of Barcelona, the authors show that crows' and ravens' incredible ability to rapidly expand and diversify across the planet was driven by a specific combination of traits.

Using specimens housed in museums across Europe and the U.S., the scientists found that they have longer wing lengths, bigger body sizes and bigger relative brain sizes compared with other Corvids.

"We hypothesize that these three very convenient combinations of traits are what allowed this group of birds to colonize and diversify across the world," Garcia-Porta said.

Longer wings means higher flying capacities that allowed the birds to disperse across the world. Big brains relative to their bodies suggest that ancestral crows and ravens were behaviorally flexible. They were smarter than other Corvids and, therefore, able to figure out how to live in a new environment, increasing their chances of survival. Their bigger body size also gave them a competitive advantage over smaller species, helping them establish in a new place.

"We are excited with these new insights on how these birds were able to do things that even close relatives did not," Botero said. "It truly seems that their incredible behavioral flexibility may have played a major role in allowing these birds to survive initial periods of maladaptation and hang in there long enough for selection to catch up and produce a range of new species in the process."

New homes, new looks

Crows and ravens experienced high rates of trait evolution and speciation as they adapted to the many [different environments](#) they encountered during their rapid expansion across the planet. In fact, they had the highest rates compared with any other member of the family *Corvidae*.

Arrival in a new environment exposed them to new selective pressures. Their ability to live in the cold Arctic after moving from a tropical rainforest, for example, likely required very different strategies and traits.

"These new environments often favor tweaks to an organism's phenotype that facilitate survival and overall performance. That process is often known as optimizing selection," said Botero, who emphasized its potential importance in creating new species.

For crows and ravens, that meant acquiring new beak shapes that did not exist in any other Corvid, thereby increasing beak shape variation in the Corvidae family.

The scientists also found that they increased body size variation as they colonized new environments.

Garcia-Porta said: "Thanks to these amazing birds, we now understand a bit more the processes by which animals rapidly expand across the planet and how this geographic expansion translates to the production of new species with new morphologies."

"Niche expansion and adaptive divergence in the global radiation of crows and ravens" has been scheduled for publication in *Nature Communications* on the 21th April 2022.

More information: Niche expansion and adaptive divergence in the global radiation of crows and ravens, *Nature Communications* (2022).
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