Brainy not always best for birds

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Humans don't have a monopoly on being smart: many other animals, including birds, can solve problems and even make and use tools.

But does it always pay for animals to be brainy or are there hidden costs?

A recent study of great tits, published in Current Biology, gives an insight into the trade-offs between problem-solving abilities and other traits. The work was conducted by Ella Cole of Oxford University's Department of Zoology and Julie Morand-Ferron and led by John Quinn. OxSciBlog asked Ella about birds, brains, and strategies…

What makes great tits good for studying problem-solving?

"Great tits are well-known for their ability to problem-solve in order to find food, ranking among the top 20 most innovative avian species. This ability to solve novel problems or find new food sources may be one reason why great tits are able to survive in such a variety of different habitats.

In our work with the tits, we try to establish whether good and poor problem solvers differ in how they forage in the wild and how successful they are at reproducing. Our problem solving trials are carried out in captivity under standardised conditions. We therefore need to test large numbers of individuals as we cannot be certain how many birds we will be able to find again once they are released back into the wild.

Great tits are an excellent study species because they can be caught in large numbers, easily adapt to captive conditions and take to nest boxes allowing us to monitor their foraging behaviour and breeding success in the wild."

What links did you find between problem-solving and successfully raising offspring?

"We found that females that could problem-solve in captivity laid more eggs than their non-solving counterparts when released back into the wild. If their nests did not fail, these solvers also fledged more chicks than non-solvers.

Even though the quality of food fed to chicks did not differ between solvers and non-solvers, solvers had much smaller foraging ranges and foraged for less time each day than non-solvers, suggesting they may be generally more efficient at finding food.

Interestingly though, female problem-solvers were more likely to desert

their chicks than non-solving females, leading to no overall fitness difference between solvers and non-solvers. These findings provide the first convincing evidence that problem-solving abilities may influence reproductive success in wild populations."

What do your results tell us about the costs of being smart?

"Our finders suggest there may be costs as well as benefits to being smart. We find that problem solvers are more likely to desert their nests, which is a common adaptive behaviour amongst birds in response to unfavourable conditions.

Although their offspring will die, deserters can preserve their resources for themselves and therefore breed again when conditions may be more favourable. We show that desertion in our population may be a direct response to trapping by field workers – a procedure that is carried out in order to establish the identities of breeding birds (via reading their unique leg bands).

It is likely therefore that solvers may be more sensitive to human interference at the nest (which they are likely to perceive as a predation attempt), indicating that they are generally more cautious or anxious than non-solvers."

Why might 'being smart' not always be the best strategy?

"Being smart is costly. In humans, for example, the brain only accounts for 2% of an adult's body weight, but it consumes about 20% of the resting metabolic rate [Clarke and L. Sokoloff 1999].

As resources are limited in nature, energy spent on the brain must be diverted from something else such as maximising body size and strength. Therefore although in some environments it will pay to be brainy, in others animals may benefit instead by investing resources in being good at competing or fleeing predators.

Whether being smart is favoured by selection is therefore likely to depend on the specific selective pressures acting in a given environment. In a previous study we showed that problem solver great tits are poorer at competing for limited food resources than non-solvers, and in the current study we find that solvers may also be more timid. These correlations provide support for the idea that trade-offs may exist between problem-solving ability and other traits linked to fitness, and therefore that being smart may not always be the best strategy."

What further studies are needed to explore the link between 'smarts' and 'success' in great tits?

"Our paper provides an important first step to understanding how selection may act on individual variation in cognitive performance in animal populations. However, more work is needed to understand exactly how being a good problem solver helps animals do well in the wild: for example, are they better at finding novel food sources when most needed, or are they quicker generally at learning to cope with challenges in their environment?

Another useful area of research will be to further explore the costs of being smart. In our paper we show that solvers are more sensitive to disturbance at the nest than non-solvers, leading to high nest failure, but whether they also show a stronger response to natural predation attempts remains to be tested.

Finally, it will also be very interesting and informative to explore how different types of cognitive traits (such as learning ability) relate to fitness, and to test the prediction that the costs of being smart will lead to high cognitive performance only being favoured in environments that are especially cognitively demanding."

More information: www.sciencedirect.com/science/ … ii/S0960982212008767

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