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JOAH MADDEN, PhD
MEASURING AND INTERPRETING INDIVIDUAL DIFFERENCES IN COGNITIVE ABILITIES

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Understanding how cognitive abilities evolve is a long-standing question in biology. Comparative studies can help identify circumstances under which novel abilities emerge, but to understand how selection (natural or sexual) sifts or exaggerates such abilities it is necessary to study individual differences and their attendant fitness consequences. This individual-focussed approach is potentially very powerful and has formed the basis of the field of behavioural ecology. However, when applied to cognitive abilities, measuring and interpreting individual differences and understanding the fitness consequences can be problematic. Measuring defined psychological abilities requires tasks that explicitly target these cognitive processes while minimising confounds of alternative cognitive and non-cognitive explanations. Discriminating individual differences in task performance can be complicated by the testing of many individuals when the measure of performance is probabilistic (likelihood of getting a test right or wrong). Explaining individual differences requires a detailed understanding of prior experiences, including very subtle and short term events occurring early in life. The fitness consequences associated with a particular cognitive ability may be highly dependent on the environmental conditions that the individual faces and these may fluctuate over time and space. The fitness consequences may also accrue in multiple or unexpected ways that are not initially considered to relate to the ability. Cognitive ability is commonly viewed from an anthropocentric perspective as a trait for which quicker, bigger, more powerful, 'cleverer' is always better, yet this is not necessary and individuals may also benefit from 'lower' levels of performance. I describe results from my work on pheasants Phasianus colchicus which illuminate these common problems encountered in studying the evolution of cognition and propose refinements to the way that we measure and interpret individual differences in cognitive abilities and their associated fitness consequences.

Joah Madden is an Associate Professor in the Centre for Research in Animal Behaviour at the University of Exeter where he leads the Pheasant Ecology and Cognition group. The group practices both 'blue skies' and applied research, with strong links between the two strands. This research includes: 1) understanding how cognitive abilities (including learning, memory and executive control) develop over individual's lifespans; 2) what the fitness consequences (survival and reproduction success) of such abilities are for individuals; 3) developing management and husbandry of artificially reared pheasants that produces birds better able to survive release; and 4) establishing the wider consequences of mass release of gamebirds for the UK farmland ecosystem. This work has been conducted with funding from the Royal Society, the GWCT, various private shooting estates and the European Research Council. More broadly, he has worked on a range of questions relating to behavioural ecology; specifically models of sexual selection, inter and intra-specific communication, social living and cooperation. This has involved fieldwork in Australia, the UK, Finland, the USA and South Africa looking at bowerbirds, cuckoos, cowbirds and meerkats.