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Review

Cognitive ability and awareness in domestic animals and decisions about obligations to animals☆

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ABSTRACT

Observation of behaviour, especially social behaviour, and experimental studies of learning and brain function give us information about the complexity of concepts that animals have. In order to learn to obtain a resource or carry out an action, domestic animals may: relate stimuli such as human words to the reward, perform sequences of actions including navigation or detours, discriminate amongst other individuals, copy the actions of other individuals, distinguish between individuals who do or do not have information, or communicate so as to cause humans or other animals to carry out actions. Some parrots, that are accustomed to humans but not domesticated, can use words to have specific meanings. In some cases, stimuli, individuals or actions are remembered for days, weeks or years. Events likely to occur in the future may be predicted and changes over time taken into account. Scientific evidence for the needs of animals depends, in part, on studies assessing motivational strength whose methodology depends on the cognitive ability of the animals.

Recognition and learning may be associated with changes in physiology, behaviour and positive or negative feelings. Learning and other complex behaviour can result in affect and affect can alter cognition. The demonstration of cognitive bias gives indications about affect and welfare but should be interpreted in the light of other information. All of the information mentioned so far helps to provide evidence about sentience and the level of awareness. The term sentience implies a range of abilities, not just the capacity to have some feelings. The reluctance of scientists to attribute complex abilities and feelings to non-humans has slowed the development of this area of science.

Most people consider that they have obligations to some animals. However, they might protect animals because they consider that an animal has an intrinsic value, or because of their concern for its welfare. In social species, there has been selection promoting moral systems that might result in behaviours such as attempts to avoid harm to others, collaboration and other altruistic behaviour. An evaluation of such behaviour may provide one of the criteria for decisions about whether or not to protect animals of a particular species. Other criteria may be: whether or not the animal is known as an individual, similarity to humans, level of awareness, extent of feelings, being large, being rare, being useful or having aesthetic quality for humans. Cognitive ability should also be considered when designing methods of enriching the environments of captive animals.

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Contents

1. Introduction: the dangers of Occam's razor

Why are animal welfare scientists studying cognition and awareness? Has this subject anything to do with veterinary, animal production or other biological teaching and research? It does have relevance because attitudes to animals are affected by people's evaluations of the animals' abilities. If they are considered to be stupid and unaware, they are more likely to be treated as objects than as individuals. A key question in relation to our use of farm companion, laboratory and other animals is how we should consider the moral and intellectual status of animals, for example sheep, cattle, horses, dogs, cats, chickens, parrots, rats, mice, fish and some invertebrates?

The scientific study of animal welfare is raising questions about scientific methods and concepts. For example, can we talk about awareness, mental aspects of needs, or feelings such as pain, fear and pleasure in non-human animals? If so, for what animals can we use such terms? Some parts of the scientific establishment, largely those who are not behavioural biologists and who are more human-oriented in their research aims, are scornful of any attempt to do so and animal welfare scientists may be academically disadvantaged if they attribute complex abilities to non-humans. With which concepts and arguments will knowledge progress best and how should concepts referring to awareness, etc. be used? This question is considered by Broom (2003) and some of the arguments are explained in this paper.

The brains of humans and of those animals domesticated by humans are very complex and our information about brain function, whilst improving, is still limited. One approach to science when considering the functioning of biological systems is to apply Occam's razor or Lloyd Morgan's canon. These approaches require that simple explanations for phenomena should be considered first and more complex explanations used only if the simpler ones are not satisfactory. Where there are several explanations for brain systems, some simpler and some more complex, if the Occam's razor approach is used it may never be possible to justify a complex explanation. However, given the nature of the brain, it may be that the simple explanations are wrong and the complex explanations right. Future knowledge may be needed to be completely sure of this. In these circumstances, it could be misleading, and it could slow down progress in science, to insist on accepting the simple explanation. I consider that this has happened for many years and that the development of our understanding of brain-based phenomena has been harmed by such attitudes. Some of those who use animals for food production or sport deny complex brain functioning, including feelings, in animals perhaps because knowledge of this might prevent aspects of the usage. It may be that some scientists use the argument requiring that simple explanations must be used because the demonstration of high level abilities in the animal subjects of their own research could prevent them from conducting such studies or lead to public condemnation of their work. We should deal with complex explanations without arbitrary avoidance of terms associated with them but we should be rigorous in our investigations of the phenomena, defining terms carefully and using all necessary controls.

Some of the more sophisticated concepts that animals may have are discussed below, with examples from experimental studies and some thoughts about consequences for our obligations to those animals that we use. Domestication was defined by Price (1984, 2002) as that process by which a population of animals becomes adapted to man and to the captive environment by some combination of genetic changes occurring over generations and environmentally induced developmental events recurring during each generation. By this definition the common farmed and companion animals, with the exception of those that have not been bred and modified in captivity, would be called domesticated. Many parrots and other birds kept in captivity, most turtles and tortoises, some farmed fur-bearing animals, and most aquarium fish species would not be included.

2. Learning

Learning is one of the ways in which animals are affected by their environment. A definition is: learning is a change in the brain, which results in behaviour being modified for longer than a few seconds, as a consequence of information from outside the brain (Broom and Johnson, 1993). The term brain in this definition refers to an aggregation of nervous tissue in which some transfer and analysis of information and integration with motor output can occur, and is normally the most complex of such aggregations in the individual. What kinds and complexities of learning are possible for domestic animals and how does their ability compare with other species? Can they discriminate individuals, remember their social qualities and learn about