730. Broom, D.M. 2019. Sentience. In: Choe, J.C. (ed.), *Encyclopedia of Animal Behavior, (2nd ed.).* vol. 1, pp. 131–133. Elsevier, Academic Press.

Sentience

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Abstract

Sentience means having the capacity to have feelings. This requires a level of awareness and cognitive ability. There is evidence for sophisticated cognitive concepts and for both positive and negative feelings in a wide range of nonhuman animals. The abilities necessary for sentience appear at a certain stage in humans, as in other species, and brain damage can result in those abilities being lost so not all humans are sentient. Sentient animals include fish and other vertebrates, as well as some molluscs and decapod crustaceans. Most people today consider that their moral obligations extend to many animal species. Moral decisions about abortion, euthanasia, and the various ways we protect animals should take into account the research findings about sentience.

Keywords

Animal welfare; Awareness; Cognition; Consciousness; Feelings; Sentience

The Concept of Sentience

The term sentience has generally been used to mean that the individual has the capacity to experience one or more of the various states we call feelings (DeGrazia, 1996; Kirkwood, 2006). This capacity of the brain involves awareness and cognitive ability. Recent studies of behavior, awareness and feelings in humans and other animals has provided evidence for the presence of cognitive ability and emotional reactions. New methods allow advances in the study of brain mechanisms, for example, electroencephalography (EEG), positron-emission tomography (PET-scanning), magneto-encephalography (MEG), and frequency-modulated magnetic resonance imaging (fMRI).

Sentience implies having a range of abilities, not just feelings. Abilities associated with sentience, including some necessary cognitive abilities, require definition and evidence. A sentient being is one that has some ability: to evaluate the actions of others in relation to itself and third parties, to remember some of its own actions and their consequences, to assess risks and benefits, to have some feelings, and to have some degree of awareness (Broom, 2006, 2014). The concept of sentience has some parallels with ideas of the soul or psyche that have often been used to propose that humans are fundamentally different from other animals. Current research on the components of sentience shows that humans share cognitive and emotional abilities with many other animals.

Which Humans are Sentient?

The idea that races of people alive today differ in their level of brain function is now known to be incorrect. There is also no evidence for differences between races in sensory abilities and feelings, for example, the capacity to feel pain. The variation of human ability within each race is much greater than the variation across races. Similarly, the idea that early humans were primitive in every way and very different from modern humans is not supported by archaeological or other evidence.

When human cognitive and other abilities are compared with those of other species, conclusions have to be qualified in relation to the very young and some of the injured or old. At birth, a human child may have the potential to carry out impressive cognitive tasks later in life but has far less actual ability than many other animals have. A person who has suffered substantial brain damage after an accident or a person with advanced senile dementia may be much less able than the companion dog or the magpie in the garden. Sentience is a capacity that normally grows during human development; it can also diminish and be lost. The same is true for other sentient species. The concept of sentience is relevant to ethical decisions, for example, about how individuals should be treated, abortion, killing young at birth or hatching, and the use of anaesthetics and analgesics (Broom, 2014).

Morality and Attitudes to Others

Moral behavior is a successful strategy used by both human and nonhuman animals living in stable, long-lasting social groups (Kummer, 1978; de Waal, 1996; Broom, 2003). The more efficient the information exchange amongst individuals, the more frequently moral behavior succeeds and the less frequently competitive behavior that harms others will succeed. Cognition, emotion, and awareness all facilitate efficient communication and learning about the environment. They also make it easier to identify other sentient beings and increase the likelihood that they will be considered the subjects of moral actions.

If we use a living animal in a way that gives us some benefit, we have some obligations to that animal. It is better for strategies for living to be based on our obligations rather than to involve the concept of rights. This is because many "rights" can result in harm to others. The idea that animals used by people should not be treated like inanimate possessions and should be protected from actions that might cause suffering is very old and widespread in human society. The term sentient is now used in legislation about animals. The European Union Treaty of Lisbon (European Union, 2007) says in the course of a statement about animal protection and welfare (Article 6b), "since animals are sentient beings...." This wording had the intention to protect the animals commonly used by humans: For example, on farms, in the laboratory, or as companions. It came about because public concern about animal welfare has increased in many countries during the last 30 years and especially in the last 10 years (Broom and Fraser, 2015).

Cognition, Feelings, Awareness and Motivation

Feelings require cognitive processes and a certain level of awareness (Mendl and Paul, 2004), with some components of sentience being dependent upon cognitive ability. The cognitive abilities of humans and other animals depend on the quality of their brain function, but this is often not clearly related to brain size, nor are high levels of cognitive ability confined to one kind of brain structure. People often assume, incorrectly, that small animals, animals with small brains, cold-blooded animals, and animals with brain structures different from those of humans cannot have complex concepts and behavior. Much recent research has demonstrated that a wide range of animals have substantial cognitive ability, irrespective of size. For example, when primate cognition is claimed to be unique in some way, there is often subsequent work on other species such as dogs, pigs, corvids, and parrots that demonstrates they also have such cognitive capacities (Shettleworth, 2009). Estimates of brain sophistication should take account of function rather than anatomy alone because animals vary in the parts of the brain that have complex analytical functions. Although some mammals have high-level functions in the cerebral cortex, a comparable level of analysis occurs in areas of the striatum in birds and in a variety of brain regions in fish, cephalopods, and other animal groups (Broom, 2007, 2014).

In recent years there have been many studies of cognitive ability that lead to the conclusions that: (a) hardly any ability is uniquely human, (b) the best bird brains allow greater cognitive abilities than any mammal except man, (c) learning by fish can be very complex, and (d) cognition in cephalopods, jumping spiders, ants, and bees is much more sophisticated than we had previously thought. Communicating using symbols is possible for many animals, so many components of language are not confined to humans. Using information from a mirror has been demonstrated in humans, chimpanzees, capuchin monkeys, pigs, elephants, dolphins, parrots, and magpies. The existence of a concept of future events is evident from work on many farm, companion, and other animals. There have been studies indicating capacities for metacognition (i.e. knowing what you know) in humans, monkeys and dolphins. Tool use and other comparably complex innovative behaviors have been demonstrated in many species of primates, birds, and fish.

Emotion, which has long been viewed as necessarily separate from intellectual activity, is now shown to be a facilitator of learning and a consequence of learning (Rolls, 2005; Paul *et al.*, 2005). Indeed, the evaluation of welfare can make use of this, for example, in studies of cognitive bias. All of the terms used to describe affective state, such as feelings, emotion, mood, pain, suffering, and pleasure require careful definition. For example, a feeling is a brain activity that involves at least perceptual awareness; it is associated with a life-regulating system and recognizable by the individual when it recurs, and it may change behavior or act as a reinforcer in learning. Feelings, such as pain and fear, are now thought to be widespread in mammals, birds, fish, cephalopods and some other molluscs, and in decapod crustacea (Elwood, 2012; Broom, 2013; Mather, 2013).

There are several levels of awareness in individuals and in different phylogenetic groups of animals. Awareness has been categorized as ranging from unawareness to perceptual, cognitive, assessment, and executive awareness (Sommerville and Broom, 1998). A related concept, being conscious, is best considered as just the negative of being unconscious rather than as a synonym of awareness. Some key aspects of awareness are awareness of the actions of others, of one's own actions, of the interactions between one's own and others' actions, of the future, of the self, and of others having concepts (Mendl and Paul, 2008). To behave morally, brain functioning requires some degree of recognition, awareness, decision-making, and feelings. The decision-making depends on the existence of a motivational system.

There is a widespread desire for most people and certain nonhuman animals to be specially protected, either because they are considered to have some intrinsic value or because it is considered wrong for their welfare to be poor. In deciding whether the killing of a human embryo is justified, whether a brain-damaged or senile person should be allowed to die, which animals should be killed for human use, and for which animals we have concern about welfare, many people take account of the cognitive and emotional functioning of the individual. The question of the sentience of the individual is important in such decisions. Which animals should be protected? Should the range of protected animals be limited to warm-blooded animals or vertebrate animals, or should it be extended to any of the invertebrate groups? Should protection begin at the point of formation of egg or sperm or zygote, on hatching

from an egg or birth in the case of mammals, or should it begin at some point during fetal or embryonic development (EFSA, 2005)? At what point in development should there be protection, and in practice, immature forms of which kinds of animals could be protected? Does sentience mean that the individual has interests?

See also: **Animal Welfare and Conservation:** Indicators of Good Welfare; Welfare and Interactions between Humans and Companion Animals. **Landmark studies:** Frustration in Hens. **Methodology:** Assessment of Welfare and Needs. **Overview Essays:** Welfare concepts.

References

Broom, D.M., 2003. The Evolution of Morality and Religion. Cambridge University Press, Cambridge, p. 259.
Broom, D.M., 2006. The evolution of morality. Applied Animal Behaviour Science 100, 20–28.
Broom, D.M., 2007. Cognitive ability and sentience: Which aquatic animals should be protected? Diseases in Aquatic Organisms 75, 99–108.
Broom, D.M., 2013. The welfare of invertebrate animals such as insects, spiders, snails and worms. In: van der Kemp, T.A., Lachance, M. (Eds.), Animal Suffering: From Science to Law, International Symposium. Éditions Yvon Blais, Paris.
Broom, D.M., 2014. Sentience and Animal Welfare. CABI, Wallingford, p. 200.
Broom, D.M., Fraser, A.F., 2015. Domestic Animal Behaviour and Welfare, fifth ed. CABI, Wallingford, p. 472.
DeGrazia, D., 1996. Taking Animals Seriously. Cambridge University Press, Cambridge.
de Waal, F., 1996. Good Natured. Harvard University Press, Cambridge, MA.
EFSA, 2005. Aspects of the biology and welfare of animals used for experimental and other scientific purposes (Report and Opinion). The EFSA Journal 292, 1–136.
Elwood, R.W., 2012. Evidence for pain in decapod crustaceans. Animal Welfare 21 (S2), 23–27.
European Union, 2007. Treaty of Lisbon. Retrieved from: http://eur-lex.europa.eu/legal-content/EN/TXT/?Uri=uriserv:OJ.C_.2007.306.01.0001.01.ENG.
Kirkwood, J.K., 2006. The distribution of the capacity for sentience in the animal kingdom. In: Turner, J., D'Silva, J. (Eds.), Animals, Ethics and Trade: The Challenge of Animal Sentience. Compassion in World Farming Trust, Petersfield, pp. 12–26.
Kummer, H., 1978. Analogs of morality among non-human primates. In: Stent, G.S. (Ed.), Morality as a Biological Phenomenon. University of California Press, Berkeley and Los Angeles, pp. 31–47.
Mather, J.A., 2013. Do cephalopods have pain and suffering? In: van der Kemp, T.A., Lachance, M. (Eds.), Animal Suffering: From Science to Law, International Symposium. Éditions Yvon Blais, Paris.
Mendl, M., Paul, E.S., 2004. Consciousness, emotion and animal welfare: Insights from cognitive science. Animal Welfare 13, 17–25.
Mendl, M., Paul, E.S., 2008. Do animals live in the present? Current evidence and implications for welfare. Applied Animal Behaviour Science 113, 357–382.
Paul, E.S., Harding, E.J., Mendl, M., 2005. Measuring emotional processes in animals: The utility of a cognitive approach. Neuroscience and Biobehavioral Reviews 29, 469–491.
Rolls, E.T., 2005. Emotion Explained. Oxford University Press, Oxford.
Shettleworth, S.J., 2009. Cognition, Evolution and Behavior, second ed. Oxford University Press, Oxford.
Sommerville, B.A., Broom, D.M., 1998. Olfactory awareness. Applied Animal Behaviour Science 57, 269–286.