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Sentience and animal welfare: New thoughts and controversies

Response to Commentary on [Broom](#) on *Animal Welfare*

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Abstract: Sentience involves having some degree of awareness but awareness of self is not as complex as some people believe. Fully functioning vertebrate animals, and some invertebrates, are sentient but neither humans nor non-humans are sentient early in development or if brain-damaged. Feelings are valuable adaptive mechanisms and an important part of welfare but are not all of welfare so the term welfare refers to all animals, not just to sentient animals. We have much to learn about what non-human animals want from us, the functioning of the more complex aspects of their brains and of our brains and how we should treat animals of each species. Animal welfare science will continue to play a major part in determining how we fulfill our obligations to the animals with which we interact.

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Introduction. It was a privilege to read the erudite commentaries of so many distinguished persons about the ideas presented in *Sentience and Animal Welfare* ([Broom](#), 2016, Broom, 2014). I respond here to some of the issues raised in these commentaries. At a time when there are rapid developments in our ability to use imaging to record brain function while an individual is behaving — and to evaluate cognitive ability, awareness, feelings and emotions — discussion of these subjects in relation to a wide range of species is important. Scientists and philosophers should address the issues raised and inform the public so that there is more widespread knowledge about animal functioning. People will then be better able to decide about their attitudes to animals and what treatments of animals are right or wrong.

What is sentience? Some commentators agree that sentience is usefully defined (Section 1.3 and glossary, Broom, 2006) as “having the awareness and cognitive ability necessary to have feelings.” However, the further explanation: “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” elicits from [Rowlands](#) the observation that to demand all of these capabilities, especially including concepts of self as part of awareness, could limit unreasonably the range of animals considered to be sentient. However, after considering the evidence presented in the

book, I conclude that all vertebrate animals and some molluscs and crustaceans are sentient even with the inclusion of “some degree of awareness.” My definition of awareness as “a state during which concepts of environment, of self and of self in relation to environment result from complex brain analysis of sensory stimuli or constructs based on memory,” is discussed further and the limited way in which some authors have used “self-awareness” is criticized (e.g., Section 6.6). Some concept of self is needed in order to avoid damaging one’s own body and to take account of one’s own capabilities. All of these animals have this ability, even if they could not be demonstrated to recognize their own image in a mirror; so they are not excluded by the reference to awareness.

As [Durham](#) and [Rolle](#) note, the abilities needed in order to be sentient are important subjects (Chapters 4-7 and 9) and many different methodologies are useful for assessing sentience and welfare. I agree with Durham about the importance of methods developed by psychologists in assessing animal welfare and identifying animal needs. The use of operant methodologies for evaluating needs was pioneered by [Duncan](#) and others and is continuing to be very important in animal welfare research. However, measures that might be distorted by human reporting are clearly less reliable than those that cannot be thus distorted, so some social psychology methods give information about human attitudes but are less useful in measuring animal welfare. While complex explanatory concepts should be used for complex phenomena and parsimony in explanation can sometimes lead to errors (Sections 4.12 and 10.4), evaluating the reliability of data is key to being able to make deductions about the concepts.

One theme of the book (Chapter 9) is commented on by [Rolle](#) (“under certain conditions, humans can have lower cognitive and sentient functions than non-human animals”) and also by [Chandrasekera](#). The sophistication of behaviour that some domestic animals and garden birds show, and the complexity of concepts that these individuals must have, is greater than that which is possible for some humans. Hence the dividing line between human and non-human functioning is blurred. This conclusion is reached by scientific logic. [Clarke](#) emphasizes that studies of sentience and welfare are serious scientific endeavours and notes that, while many scientists are reluctant to agree with this view and are unwilling to publish work in these areas in the highest status scientific journals, evidence like that accumulated in this book is making their position untenable.

Is welfare limited to sentient beings? As he has stated in many previous publications (e.g., Duncan, 1993, 2006), [Duncan](#) expresses his view that sentience in an individual is a prerequisite for the use of the term welfare, that is, that he would not refer to the welfare of a non-sentient being. Duncan has been a major contributor to improving our understanding about the feelings of animals. Although I did not use the word sentience in publications until about 15 years ago, there is much discussion of it in Broom (2003), and Duncan is mistaken in suggesting that I did not write about feelings until recently. In two papers on welfare in 1991, two papers on the evolution of feelings, and all of my books, I have emphasized the importance of feelings as biological mechanisms helping individuals to cope with their environment and hence as being a key part of welfare (Broom, 1991a, 1991b, 1998, 2001, 2003; Fraser and Broom 1990; Broom and Johnson, 1993; Broom and Fraser, 2015).

As explained in Section 3.2, “although feelings are an important part of welfare, welfare involves more than feelings; consider the examples of an individual with a broken leg but asleep, an addict who has just taken heroin, an individual greatly affected by disease but unaware of it, or an injured individual whose pain system does not function (Broom, 1991b, 1998).” I suggest that most people would want to use the word welfare for humans and all other animals at all times, even if the individual was incapable of having feelings because of having a less complex brain, or because of being at an early stage of brain development such as a four-month-old human fetus, or because of decline in brain function resulting from a disease such as Alzheimer’s.

[Duncan](#) refers to “three schools of thought on what animal welfare is about”: subjective experience and feelings, biological functioning, and natural living. I see these as ideas that the general public might have but I believe that those who have read the writings of Duncan, Fraser (2008), and others would see that biological functioning includes feelings, so there is no dichotomy, and the concept of what is natural has to be considered carefully. As explained in section 3.3.5 and Chapter 1 of Broom and Fraser (2015), natural conditions and mechanisms have affected the needs of animals, but naturalness should not contribute to the definition of welfare. These logical failings also apply to the diagram with three overlapping rings by Appleby (1999) that refers to the same three supposed aspects of welfare. [Donaldson and Kymlicka](#) agree that what is natural is not necessarily good for welfare.

When assessing the welfare of animals (Chapter 8), the measures are designed to find out how well the individual is coping with the world around it. This includes measures of negative feelings and other responses or effects; but much current research is also aimed at assessing how good welfare is. Good welfare, and the associated positive feelings, might be measured by the extent of behaviours, such as play, or physiological changes such as oxytocin concentration, or activity in particular regions of the brain, or other measures of body condition and health. We need to combine the measures of feelings, as adaptive changes, with other adaptive changes.

A pragmatic problem with [Duncan](#)’s position is evident from changes in opinions since the 1960s. Fifty years ago, many people would have considered only humans to be sentient, and there are many today who have this view. Using Duncan’s position, these people would not use the term welfare for any companion, farm or laboratory animal. Similarly, using Duncan’s definition, many people today would not refer to the welfare of fish. It is more logical and more useful for welfare to mean the state of an individual as regards its attempts to cope with its environment and hence for the word to be applicable to all animals, whether sentient or not. Inanimate objects and plants do not have a nervous system or brain and they cannot show behaviour or have coping systems, so we do not talk about their welfare.

The concepts of sentience and welfare do not have to be overlapping to be usable. Most people find that the term welfare, as defined in Section 3.2 and above, is simple to understand and use. This definition is used in E.U. scientific reports and by the World Organization for Animal Health (OIE, 2011), as discussed in Section 3.2 and by Broom (2015). [Rowlands](#) agrees that “sentience is a plausible sufficient condition for moral standing.” He argues that we should not just consider pleasure and pain but also what motivates animals and all aspects of how they are functioning.

How different are humans, monkeys, birds and fish? [Copeland](#) and [Clarke](#) both emphasise a key theme of *Sentience and Animal Welfare*, namely, that the differences between humans and other vertebrate animals are smaller than most people believe. Recent information about fish extends the work of Duncan, Portavella, and others (Sneddon et al., 2003, Chandroo et al., 2004, Portavella et al., 2004) showing that fish have fear and pain behaviour, and that in their brains there are areas with functions that closely parallel those of the amygdala and hippocampus in mammals (see also [Key](#)). Brain areas, for example, the medial and lateral telencephalic pallium, process emotion and learning. Kawakami and colleagues have shown that zebrafish, learning from a fear situation, have brain activity in the habenula and other areas and that transgenic fish who lack such areas, or normal fish treated with a neurotoxin that targets such areas, cannot respond to and learn from fear responses (Asakawa et al., 2008, Agetsuma et al., 2010, Muto et al., 2013, Kawakami, personal communication). In general, primates have been shown to have impressive cognitive abilities. However, recent learning studies (Salwiczek et al., 2012, Pepperberg and Hartsfield, 2014) show that cleaner wrasse fish and parrots perform better in a complex learning task, in which they have to learn to discriminate reliable from ephemeral food sources, better than chimpanzees, orangutans and capuchin monkeys.

How well can we communicate with non-human animals? The desirability of finding out more about communication within other species, about how to communicate better with individuals of other species, and about how to spread information about them is discussed by [Copeland](#). The scientific writing style, like that in *Sentience and Animal Welfare*, is not always easy to follow, as [Sammarco](#) and [Duncan](#) rightly point out. The story-telling approach advocated by Copeland might not convince the cynical, but it would inform the average person much better than a book with every fact and opinion backed up by quoting references. Story-telling helps the reader and it is good to support science with anecdote, provided that the anecdote is true and representative of such animals and there is no unwarranted interpretation of the observation. The difficulties of the animal welfare scientist are exemplified by the criticism of a whole E.U. scientific report leveled by some influential scientists because it included one reference to material only available on the Internet and not in a refereed scientific journal.

An interesting question raised by [Donaldson and Kymlicka](#) is “what sorts of relations do domestic animals want to have with us?” The most “successful” land animals in the world are those that depend on humans. For example the chicken is by far the most successful bird species. However, the preferences of the individual chicken should be considered, as should all of the factors that affect its welfare, while humans control its living conditions. This argument is not just relevant to farm animals. Investigation of animal welfare makes it clear that the use of animals for human companionship is sometimes very negative in its consequences for the animals’ welfare. Many caged companion animals show clear evidence of poor welfare and would not remain with humans if they had the option to leave.

Can the way of thinking about animals be changed further? In Section 1.2 and other parts of this book, as well as at length in Broom (2003), the way in which most people refer to and think about non-human animals is challenged. The very use of the term “non-human animals” rather than just “animals” is different from the writing of most

people. As Midgely (1978) wrote, "We are not just rather like animals, we are animals." The many ways in which human attitudes and actions are anthropocentric is worth pointing out and criticizing. It is perhaps such critiques of peoples' thinking that led [Chandrasekera](#) to call *Sentience and Animal Welfare* "intellectually engaging and morally disturbing at the same time" and to say that it "will lead you to develop an appreciation for the profound inadequacies of your own species."

As [Sammarco](#) explains, concern about welfare is progressing, but early societies might have had many of the same concerns. [Duncan](#) also draws attention to reference to the sentience and feelings of animals in accounts written long before those mentioned in Chapter 3. Some early ideas of this kind are discussed by Broom (2003, 2011) and Fraser (2008).

[Clarke](#) sees potential for books like this one to change public opinion and government policies. One example is the changes in society like those discussed in Section 11.3, referring to the public "pulling" for change in the extent of use of sustainable systems, including good welfare measures in animals, rather than the animal production industry "pushing" their own agenda. [Donaldson and Kymlicka](#) agree with the arguments in Chapter 3 and Sections 11.5 and 11.8 that animal ethics should be informed by scientific findings on sentience and animal welfare. However, they question the suggestion that a principal aim should be to improve animal welfare within animal usage systems rather than eliminating such systems. They suggest that animal welfare science is affected by being funded by commercial sources or government bodies that defend or promote agriculture. I find that almost all animal welfare science is objective and independent of such aims. Most funding comes from governments and only a small proportion from the animal industry or animal protection society sources that have an agenda to defend. My policy has always been to accept research funding only if all results can be published with no modification or veto from the sponsor.

Efforts that result in changing animal production methods in ways that improve animal welfare are widely regarded as desirable in a society where the animal usage is continuing. However, some animal usage has ceased, in part because there was evidence from research indicating poor welfare, for example, fur farming and cosmetics testing in many countries. Much more important in my view are the changes affecting millions of animals such as bans on keeping calves in crates; sows tethered or in stalls; and hens in battery cages; and methods of animal handling, transport and killing that result in poor welfare. As [Chandrasekera](#) advocates, animal welfare standards based on scientific evidence are now needed whenever animals are used.

Freedoms, rights and obligations. The idea in Sections 2.5 and 7.3, supported by [Duncan](#), is that the "five freedoms" are problematical: that they are now useful only in preliminary thinking about how animals should be treated and should not be considered as a key part of thinking about animal welfare because our knowledge of animal needs and how to assess welfare have progressed substantially. However, [Duncan](#) considers that the concepts of rights and obligations are "opposite sides of the same coin." To a large extent this is true but an important problem, described in Sections 2.3 and 2.4 and by Broom (2003), is that the concept of rights is used to justify some harmful actions. Rights are not "dismissed" in either book, but it is argued that it is better to think in

terms of your obligations than in terms of your rights. This view is also supported by [Sammarco](#).

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