



TABLE Explainer



Animal welfare and ethics in food and agriculture

August 2024

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TABLE



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Suggested citation

Blaxter, Tamsin, Elina Åsbjer & Walter Fraanje. 2024. Animal welfare and ethics in food and agriculture. Oxford, UK; Uppsala, Sweden; Wageningen, the Netherlands: TABLE. <https://doi.org/10.56661/f2d8f4c7>.

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Funded by

The Quadrature Climate Foundation; The Swedish University of Agricultural Sciences; Wageningen University and Research; The Oxford Martin School

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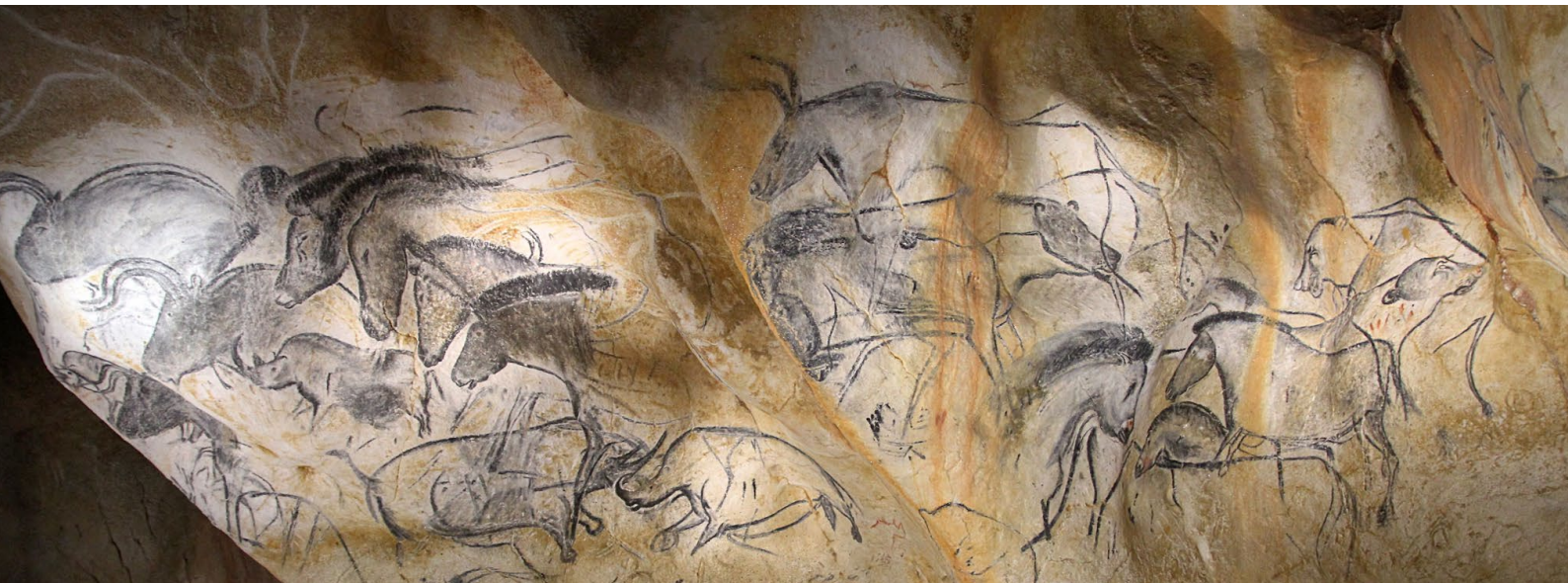
1 Introduction

1.1 Preamble

We use the word 'animal' in deeply contradictory ways. On the one hand, humans are animals. We share many physical traits with other animals, often assume that they are like us, and easily fall into relating to them as if they were humans. On the other hand, we most commonly use the word 'animal' to distinguish what *isn't* human from what is. If someone reports seeing 'an animal', the only animal you can be pretty sure they don't mean is a human; if someone's behaviour is 'animalistic', it is inhuman.

This contradiction plays out in the great many ways we relate to non-human animals. Non-human animals can be pests to be exterminated, prey to be hunted, models of human bodies on which to perform experiments, neighbours and competitors, ornaments, status symbols, companions, labourers, religious icons and, of course, food. Some species take only one role in human life, but many can occupy multiple roles. Some of these relationships, such as those with companion animals, imply that the humans involved think of the non-human animals as like themselves, experiencing the world in similar ways. Many others are acceptable only on the understanding that non-human animals are not like us, at least in terms of moral status. What kinds of feelings and other conscious experiences do non-human animals have? Some answers to this are deeply uncomfortable to contemplate in the context of certain 'uses' of animals. Does this matter? (How) should we take the interests of other animals into account in our dealings with them? And what should we do with the huge range of conflicting beliefs, emotional responses and practical entanglements on the human side of the equation?

Humans have been struggling with these questions for a long time. But we live in a time unlike any before it, and the scope and urgency of issues of animal ethics have changed. At any moment, the global food system contains hundreds of billions of live animals that are used for the production of meat, milk and other animal-sourced products. Each year an even greater number of them are slaughtered to find their way into food products, as the average age of farmed animals such as pigs and chickens at slaughter tends to be only months or weeks. Terrestrial vertebrates kept as livestock outmass their wild counterparts many times over (see Figure 1). The scale at which livestock are kept and slaughtered for the purpose of food production and the conditions under which this happens are recurring topics of debate in discussions about food, a debate that often is heated and polarised.



Valette, Claude. "Panel of the Horses, Chauvet Cave (Replica)." *World History Encyclopedia*.

Questions of animal ethics don't exist in a vacuum, but are woven through debates on other pressing issues. What place for animals in achieving a sustainable food system? How should we prioritise the interests of non-human animals relative to human food security? or human health? or livelihoods? or the preservation of traditional cultures? In some cases we find synergies but in many others trade-offs, and debates over animal ethics inherit tensions and polarisation from other conflicts.

This explainer will try to articulate different perspectives on the rights and wrongs of animals in the food system and to identify the assumptions that underpin them and the ethical thinking on which they are built. It will also look at the practical question of how animal welfare is measured and monitored, before exploring why these debates are so polarised and how they might be moved forward. It will focus on Western intellectual traditions and discourse in the Global North for two reasons: the gargantuan scale of industrialised animal agriculture is the source of much of the urgency of these ethical questions, and this form of agriculture has its roots in the Western world; and doing full justice to all other traditions of thinking about non-human animals is too large a task for one explainer.

A note on terms

The relationship between *animal ethics* and *animal welfare science* is understood differently by different stakeholders. For those working in *animal welfare science*, the goal of the field is to provide evidence on how to assess and what determines *animal welfare* (defined variously—see 3). It is then up to wider society to decide what to do with that information—i.e. to make ethical decisions. In this frame, *animal welfare science* is a discipline that answers empirical questions relevant to *animal ethics* but is separate from it, and does not assume any specific ethical stance.

At the same time, *(animal) welfarism* is used in philosophy and activism with various overlapping meanings all of which do entail ethical stances:

1. an ethical framework in which welfare is the only relevant consideration (particularly to the exclusion of animal death);
2. utilitarianism as opposed to deontology/animal rights in animal ethics (see 4.2) (e.g. [Leuven 2017](#));
3. a position that some harm to animals is acceptable within a framework which works to minimise it ([Bekoff 2009](#); [Anonymous 2018](#));
4. an incremental approach to animal activism which focuses on achieving better treatment of animals but doesn't aim for complete abolition of meat consumption or other forms of animal exploitation—often in the context of the critique that such an approach is counterproductive for and incompatible with abolitionism ([Chiesa 2016](#)); also called the *animal welfare position* ([Francione 2016](#));
5. and, specifically in the formulation *new welfarism*, pursuing such an incremental approach as a practical route towards an abolitionist goal (see 6.3) ([Taylor 1999](#); [Francione & Kunstler 2012](#); [De Villiers 2017](#)).

These differing uses create some tension. To illustrate, an abolitionist activist might say that "[w]elfare ... seems like betrayal to animals" ([Taylor 1999](#): 40). We could read this use of *welfare* simply as a shorthand for *animal welfarism* under definition (3) above, but it also reflects the imputation of such an ethical stance to a 'mainstream' of people working to improve the lives of domesticated animals—including those in *animal welfare science*. This is at odds with a view of *animal welfare science* as a purely empirical discipline, but also with the actual ethical stances of many animal welfare scientists.

1.2 Why should we care about the ethics of animal agriculture?

It is a near-universal moral conviction that we owe particular attention towards those in our care. The animals we keep for food rely on us for feed, shelter, safety from predators—they are undeniably in our care. So, if we trust this conviction, as a society we have a special duty to consider their welfare (see 4.2.3). A related argument is that most animals kept for food have been modified by humans through many generations of selective breeding and couldn't thrive in the wild, giving us a special duty to them. Even if we don't accept a *special* responsibility towards animals in the food system, for most people we do have some duty to do good by or avoid harming non-human animals, in at least some circumstances. If we have any such responsibility at all then the sheer scale of animal life in the food system presents pressing ethical questions.

At the time of writing, the food system contains perhaps thirty-two billion captive terrestrial vertebrates. The vast majority of these are of only a few species: chickens, cattle, sheep, ducks, goats, pigs.¹ Billions of animals are also kept in aquaculture systems (Naylor et al. 2021).² The global production of animals raised for food has increased approximately tenfold since 1960 (see Figure 3). One effect of this enormous growth is that the biomass of mammals in the food system exceeds that of wild non-human mammals by an order of magnitude, and human biomass by a factor of around two. For birds, the biomass of domesticated animals is more than twice that of wild animals (see Figure 1). If we care about the welfare of *any* non-human animals, we should pay attention to animals in the food system, both for their own sake and for the sake of the wild animals whose habitats that system encroaches upon.

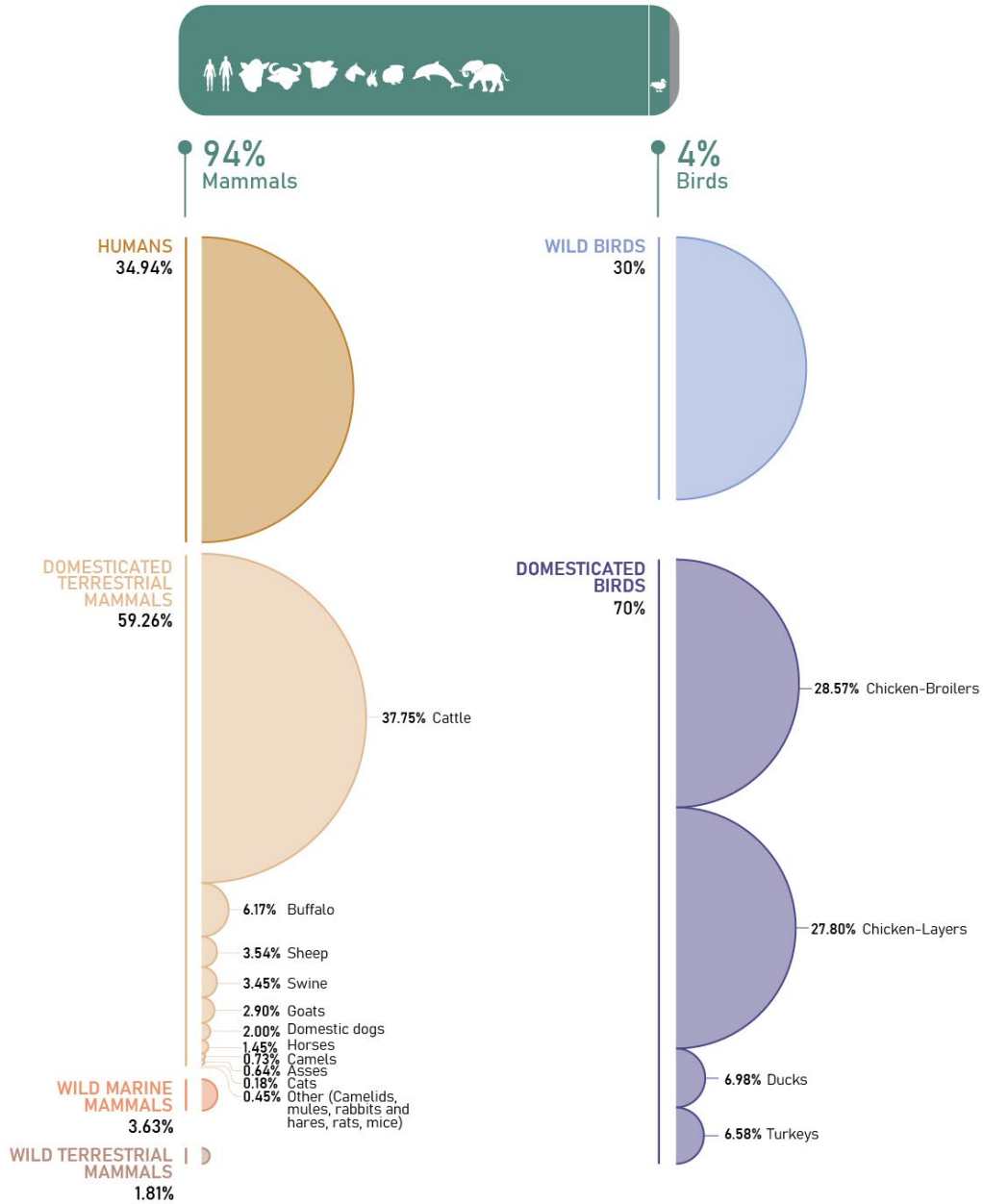
Many farmed animals also experience conditions entirely unlike their wild counterparts, and some of these conditions (such as extreme crowding, separation of parents and offspring, physical mutilations) are sources of suffering. Thus, whether due to our having a special moral duty towards them, the conditions under which they live, or simply due to the numbers involved, many consider questions around animals in the food system to be among the most important in animal ethics.



"A modern day factory farm" Photo in the Texas series by taylorandayumi on Flickr

- 1 These six species make up 96% of the individual terrestrial animals kept as livestock. For more detail, see Figure 2.
- 2 Specific numbers are much harder to come by for aquaculture for several reasons: only production weight tends to be reported; species diversity is much greater; bodyweight and growth speed vary hugely between species; and harvest (slaughter) weight varies much more between systems than for terrestrial animals. Nevertheless, it is possible to get an impressionistic sense from FAO's FishStat production data (Food and Agriculture Organization of the United Nations 2021). In 2021, 5.9x10¹⁰kg of fish were produced in aquaculture systems. Of these, the largest contributing species (10% total production weight) was the grass carp, *Ctenopharyngodon idella*; assuming 25kg/fish at harvest weight, this might represent around 240 million individuals. The second largest contributor (8% total production weight) was the silver carp, *Hypophthalmichthys molitrix*, which with a harvest weight of 500-1000g might represent around 6 billion individuals. Following a similar methodology, fishcount.org.uk suggests a total estimate of 51-167 billion fish slaughtered in aquaculture in 2017, supported by between 462 billion and 1.12 trillion wild-caught fish used for feed annually (Mood & Brooke 2019a; Mood & Brooke 2019b). To this could be added a similar number of wild-caught fish for human consumption, half a trillion farmed crustaceans (Mood & Brooke 2019c), and somewhere between 4 and 72 trillion wild-caught crustaceans, mostly *Acetes japonicus* shrimp (Romero Waldhorn & Autric 2022).

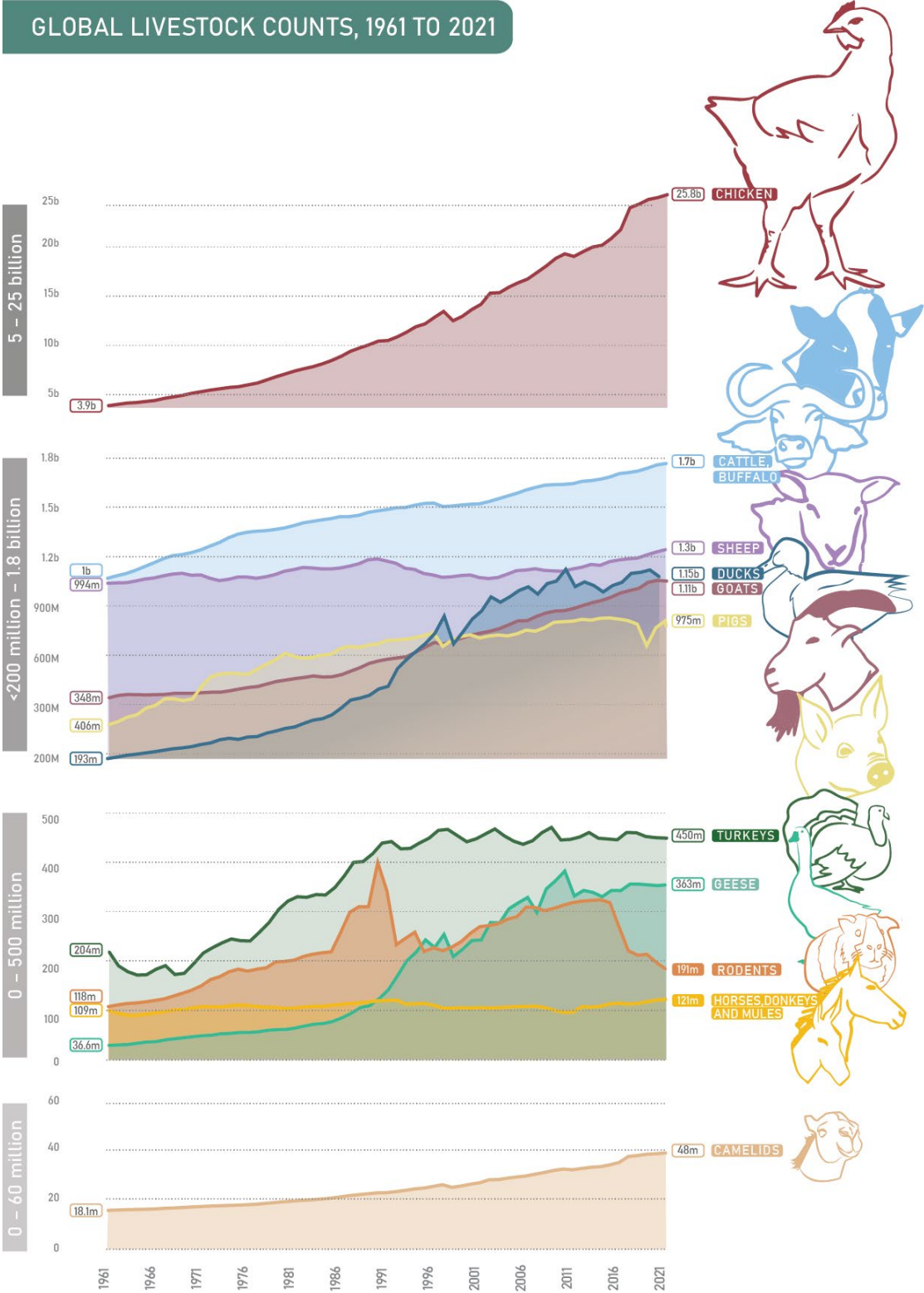
BIOMASS OF THE WORLD'S MAMMALS AND BIRDS



Sources: Bar-On et al. 2018, available at www.pnas.org/doi/10.1073/pnas.1711842115
 Greenspoon et al. 2023, available at www.pnas.org/doi/10.1073/pnas.2204892120

Figure 1: Distribution of mammal and bird biomass³ on Earth, separated into wild and domesticated
 (Designed by *Roberta Aita*)

³ Reviewer Eze Paez notes that this figure distorts the picture in some ways. For most ethicists, what matters are individuals, not biomass. For several reasons, the choice of mammals and birds rather than some larger group and the choice of biomass rather than numbers of individuals exaggerate human influence and minimise the natural world: the majority of wild vertebrates are fish and the majority of wild animals are invertebrates; most wild vertebrates are physically smaller than most domesticated vertebrates. See Tomasik (2019) for a review of estimates. However, looking through the lens of (particularly terrestrial) biomass enables us to get an impression of the extent of human influence on the biosphere, and terrestrial vertebrates give us the most direct comparisons for the species we generally eat.



Sources: Food and Agriculture Organisation of the United Nations. FAOStat. License: CC BY-NC-SA 3.0 IGO. Extracted from: <https://www.fao.org/faostat/en/>. Data of Access: 23rd May 2023.

Figure 2: Number of living farmed terrestrial animals at any given point by year and species. (Designed by *Roberta Aita*)

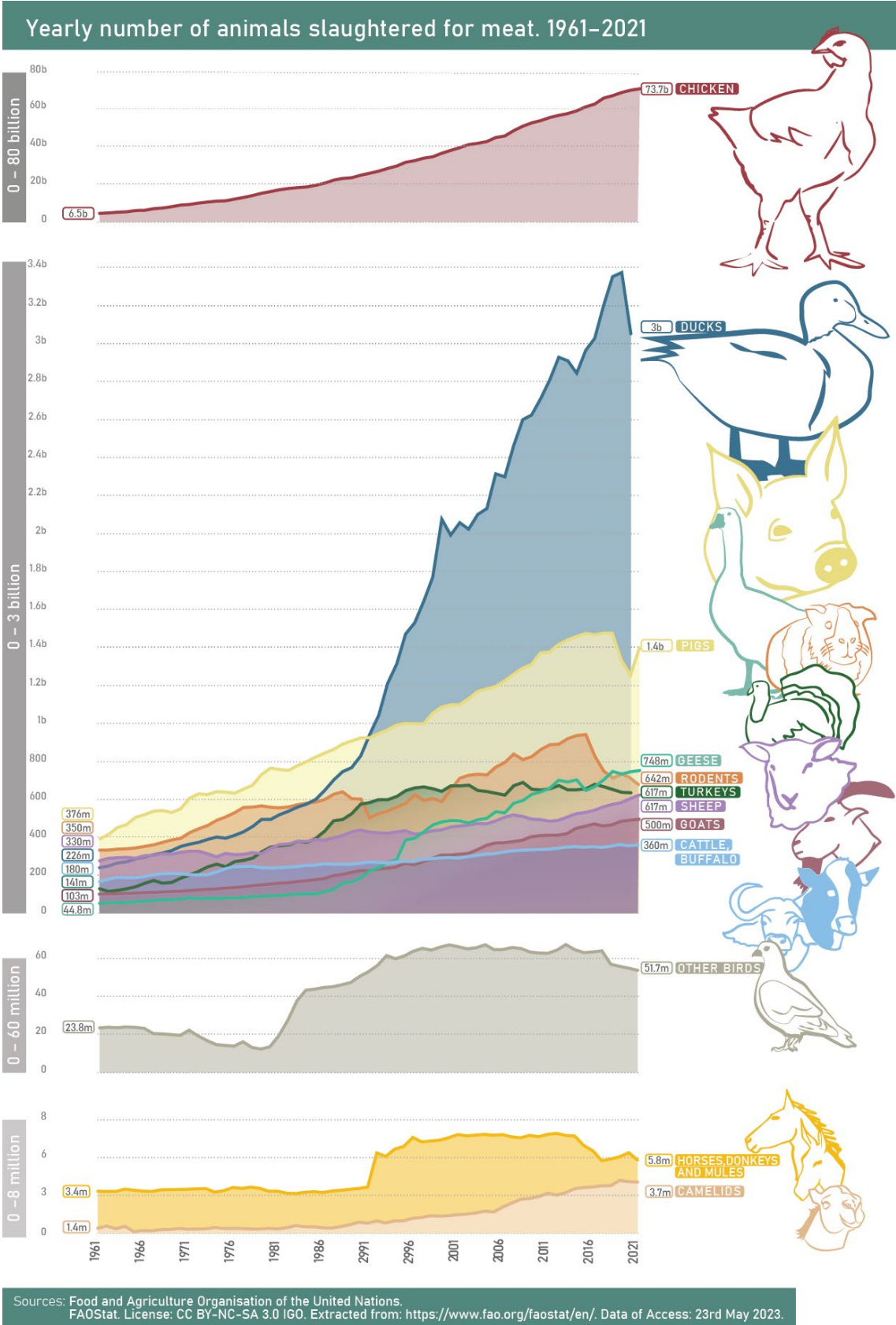


Figure 3: Number of farmed terrestrial animals slaughtered per year by species. (Designed by Roberta Aita)

2 Perspectives on animal welfare

2.1 What do most people think?

There is a wide range of different positions on the ethics of livestock production among publics and experts around the world. A radical perspective argues that all forms of livestock production should be abandoned on ethical grounds. There are various ways to argue for this *abolitionist* position (see 4.2) but in short we can say that it is the position we arrive at if we judge the harms of livestock production (suffering, death, etc.) to be so great and so hard to mitigate that the only acceptable solution is to end livestock farming entirely. For some people this position might apply to all animal species, and for some only to certain species (for example, consider the arguments made for the recent ban on the dog meat trade in South Korea; [Shin 2024](#)). Some animal advocacy groups explicitly espouse abolitionism,⁴ and some survey findings imply that these views may be supported by a substantial minority of the public in some countries.⁵ However, if we assume that people who hold an abolitionist position would enact their beliefs e.g. by abstaining from consuming animal products, we might infer much lower support for abolitionism.⁶

At the other end of the spectrum, we find the position that animal welfare in livestock production is an unimportant or even nonexistent ethical consideration. In popular public thinking this might reflect non-belief in animal sentience and experience; in academic philosophy, under certain *contractarian* views, which hold that only those able to engage in social contracts are of moral relevance, only humans are considered (see 4.2.3 below). Only a very small number of people position themselves at this end of the spectrum when asked in surveys,⁷ although one might argue that revealed preferences imply far higher support.

4 Prominent examples include the Farm Animal Rights Movement (FARM), Animal Outlook, Animal Rising and Direct Action Everywhere (DxE).

5 For example, a 2015 Gallup poll found that 32% of a random sample of 1024 US adults supported the statement "Animals should have the exact same rights as people to be free from harm and exploitation" ([Riffkin 2015](#)). Since keeping humans captive for food production would be a violation of human rights, this implies an abolitionist stance on animal agriculture. Whether such an inference is actually justified is quite another question.

6 That is, we could reason that all abolitionists would follow a vegan diet. Since there are other potential reasons to abstain from animal-source foods, the proportion of people following a vegan diet would suggest an upper bound for support for abolitionism. Some studies with relatively high quality data find rates of veganism around 2% in the UK and US ([YouGov plc. 2022](#); [Stahler & Mangels 2022](#)), 0.3±2.0% in Slovenia ([Gabrijelčič Blenkuš et al. 2009](#)), close to 0% in Colombia ([Meneses-Urrea et al. 2023](#)). Work on university students from China, Iran, South Korea and eight European countries in 2009 found that 0.4% (14) self-reported as vegan ([Izmirli & Phillips 2011](#)). Lower quality research on online consumers carried out by NielsenIQ found higher rates, ranging from 2% to 9%, with higher rates in Asia, the Pacific, Africa and Latin America than Europe and North America ([The Nielsen Company 2016](#); [Vanderlee et al. 2022](#)).

7 For example, a 2015 Gallup poll found that only 3% of a random sample of 1024 US adults supported the statement "Animals don't need much protection from harm and exploitation since they are just animals" ([Riffkin 2015](#)).



The only difference is your perception, photo by Alisdare Hickson on Flickr

Between these extremes exists a landscape of different viewpoints on animal ethics and the importance of welfare in livestock production, and it is in this grey area that most people are found. This complex ethical terrain consists of different views on what 'good' animal welfare is, what aspects of animal welfare matter most, the threshold at which poor welfare is unacceptable, and how questions about non-human animals should be ranked relative to other goals such as food provision, economic prosperity, human pleasure, and human freedom of choice.

2.2 The long view

Attitudes to animals in food-production have to be seen in the context of food habits. Historian Richard Bulliet maps different kinds of relationships human societies can have with their prey animals. In hunter-gatherer societies, animals form an important part of cosmologies and killing and meat-eating are understood as reciprocal exchanges with the non-human world. At the other end of the scale, in postdomestic societies meat-eating is hugely increased, yet contact with prey animals becomes minimal, slaughter is hidden, and ritual and spiritual meaning are absent (Bulliet 2007). Meat-eating and slaughter have become more likely to provoke disgust and moral polemic in wealthy societies over the last two centuries. Food practices like ethical vegetarianism and veganism have arisen, and justificatory and mitigatory narratives and practises have grown in response (animal welfare science itself; 'happy meat'; anti-veganism; Paleo and Carnivore diets; etc.; Leroy & Praet 2017; Lennerz et al. 2021; Aguilera-Carnerero & Carretero-González 2021; Trauth 2021; Gregson, Piazza & Boyd 2022; Gregson, Piazza & Shaw 2024). It is worth understanding, then, that current contestations around the ethics of meat-eating and animal agriculture reflect our particular moment in history.

2.3 The relevance of production systems

The global livestock sector contains many different production systems—almost any statement about the whole will miss crucial detail. There are differences in farm size, number of animals per area, species of animals, landless indoor vs pasture-based systems (intensive vs extensive systems), types of animal feed, housing and management practices, transport and slaughter conditions, and so on. These are just a few of many factors that make up the diversity of systems, and each has implications for welfare.

One family of production systems, however, has long formed a central thread in discussions of the ethics of livestock production: 'factory farming'. Industrial-scale intensive production systems expanded during the second half of the 20th century, and the writing of British animal welfare activist Ruth Harrison (notably in *Animal Machines*, 1964) and others during the 1960s and 1970s drew attention to welfare concerns particular to these systems. Harrison coined the term 'factory farms' to refer to the use of gestation crates for sows and battery cages for laying hens, but the term has since become a cultural shorthand for ethical concerns about modern intensive livestock agriculture. Where before Harrison's work the animal protection movement had focused on deliberate acts of cruelty by individuals, this new view saw cruelty as a feature of whole systems (Fraser 2009: 63): industrialised treatment of animals was seen as unavoidably cruel, and a return to pre-industrial extensive methods envisioned as a salve. Fast forward half a century, and it is still a common position to oppose 'factory farming' (more or less vaguely defined) without calling for the abolition of animal agriculture as a whole. This position is espoused by major animal advocacy groups such as Compassion in World Farming (CIWF) and the Animal Welfare Institute (AWI).

Such a perspective sits within a larger discussion about the goods and bads of industrialisation in the food system and wider society (see 3.2). A countervailing research tradition suggests that both intensive and extensive production systems bring their own particular challenges and benefits for animal welfare (Temple & Manteca 2020). Nevertheless, there is a core insight in singling out 'factory farming'. The drives to increase productivity and profitability do always create some resource competition with other considerations (for money, time, space). There are trade-offs between human and animal interests, as well as trade-offs between protecting animals from e.g. diseases, and meeting other needs providing them the possibility of a more natural life (although see 3.1 and 6.3). Welfare issues arising from these trade-offs have been a central motivation for more than half a century of animal activism.



Layer Chickens, photo by chayakorn on Adobe Stock

3 What is 'animal welfare'?

3.1 Animal welfare and animal welfare science

The modern science of animal welfare arose out of a growing concern for the welfare of animals kept for research purposes and the expansion of intensive, industrialised farming systems of the 20th century (see 2.3). Animal welfare science is premised on the idea that it is possible to objectively assess how good or poor welfare is and promote good welfare (Mellor, Patterson-Kane & Stafford 2009; Broom & Johnson 2019). Research in veterinary medicine and disease control, nutrition, environmental needs, pain, cognition and ethology, as well as management procedures have all contributed to animal welfare, but animal welfare science is also a research area of its own: since many factors contribute to the state of the animal, animal welfare science relies on research in many other fields.

Those working in and around animal welfare science are often motivated not only by the belief that trade-offs between good lives for animals and goods for humans can be minimised or avoided, but crucially also that synergies exist: that there are interventions to make animal lives better that *also* make human lives better (see 6.3 below). Animal welfare science is also motivated by a claim that the field has already made gains: that increasing scientific understanding of the perspectives and experiences of non-human animals *has* led to raising minimum acceptable welfare standards for captive animals, and will continue to do so (Mellor & Webster 2014).

3.2 Defining animal welfare

Defining animal welfare is contentious, and different stakeholder groups prefer particular definitions over others. Animal welfare scientists David Fraser and David Mellor have identified three broad 'orientations' towards animal welfare in the thinking of philosophers, veterinarians, social commentators, and the general public: **biological function**, **affective state** and **natural living** (Fraser 2008; Fraser 2009: 65–71; Mellor 2016). These do not represent an exhaustive list of possible concerns related to welfare, nor are they mutually exclusive, but they do offer a useful framework to categorise many stakeholders' thinking. The **biological function** orientation focuses on (usually negative) physiological states and physical functions. In this orientation, good animal welfare is about avoiding disease and injury and meeting physical needs. In the **affective state** orientation, animal welfare is determined by the internal experiences (feelings, 'affective states') of an individual animal (Broom 1996; Bracke, Spruijt & Metz 1999). An animal with good welfare, in this orientation, experiences more positive states (pleasure, satisfaction, comfort) and fewer negative states (pain, fear, frustration). Finally, in the **natural living** orientation, animal welfare is seen in terms of the typical experiences and behaviours of animals living in the contexts in which they evolved: an animal has good welfare if it can perform its full range of instinctive behaviours, and poor welfare if it cannot. These three orientations towards animal welfare in public discourse are values differences rather than different beliefs about objective reality. They are related to cultural threads connecting attitudes on a wider range of issues which date back at least two centuries (Fraser 2008).

Just as there are differences among non-scientists, various definitions of animal welfare have been put forward over time by animal welfare scientists (see Table 1). Much progress has been made in resolving the definitional question of the field since its inception; for example, few definitions now include elements of the natural living orientation, which is argued to be relevant only because it affects physical health and/or subjective experiences (Broom 1996; Broom 2011; Browning 2020; Dawkins 2023). Nevertheless, remaining definitional differences can still result in conflicting judgements about specific cases, practices or systems (Weary & Robbins 2019; Veasey

2022). For Fraser, writing in 2008, the values-based orientations towards animal welfare observed among the general public are also useful in understanding differences among animal welfare scientists. He writes that "the science that we do to assess and improve animal welfare, is influenced by value-based ideas about what is important or desirable for animals to have a good life" (Fraser 2008). In other words, part of the reason that scientists use different definitions of animal welfare is that they come to the field with different values and so prioritise different things: the disagreement is not one that science can fully resolve, but partly philosophical. Note that some welfare scientists strongly disagree with this point, and, even if the point is accepted, to say that differences are not *fully* resolvable is not to say that new empirical evidence has not hugely increased consensus.

Seen in terms of Fraser's orientations, we find two major groups of definitions: those entirely based in the affective state orientation (such as those of Bracke, Duncan, Shorb and Mellor in Table 1) and those which include elements of both the affective state and biological function orientations (such as Broom, the World Organisation for Animal Health, and Dawkins in Table 1). In the first group, scholars argue that physical states are relevant to welfare only when they cause suffering or pleasure. There might be other ethical objections to poor health that didn't cause suffering, but this wouldn't be a *welfare* problem per se (Bracke, Spruijt & Metz 1999; Shorb 2020). In the second group, scholars do see such situations as welfare problems.



Cattle grazing in a silvopasture, photo by USDA NRCS on Flickr

Departing from the model of simple declarative definitions, Marian Dawkins suggests that all *improvements* in animal welfare can be identified by answering two questions: (1) will it improve animal health? and (2) will it give animals something they want? (Dawkins 2008). This 'definition' is similar to those of the second group described above, but is argued to have two particular advantages not captured in the three orientations. Firstly, it operates on a minimum of assumptions: definitions of welfare based on affective states must assume unobservable, subjective experiences, whereas what an animal *wants* is demonstrable behaviourally (Dawkins 2017b). Secondly, it points towards a specific practical approach to welfare research: that of observing behaviour to understand preferences. In the last two decades, this has become a major component of welfare science.

Table 1: Some definitions of animal welfare

"the welfare of an individual is its state as regards its attempts to cope with its environment" (Broom 1986; Broom 1996; Broom 2021); often found (in some form) outside the scientific literature (e.g. Wild Welfare undated; EAZA Welfare Forum 2024)
welfare refers to "the physical and mental state of an animal in relation to the conditions in which it lives and dies" (World Organisation for Animal Health undated; World Organisation for Animal Health 2024; Keeling et al. 2019)
(1) will it improve animal health? and (2) will it give animals something they want? (Dawkins 2008)
"welfare depends on how the animal feels" (Duncan 1993)
welfare is "the quality of an animal's life as it is experienced by an individual animal" (Bracke, Spruijt & Metz 1999)
an animal's welfare is "fully determined by its emotional states, including their sign (positive or negative), intensity and duration" (Bracke 2001: 45)
"overall affective experience in the mental domain equates to the welfare status of the animals" (Mellor 2017)
welfare refers to "the aggregate quality of an individual's subjective experiences over a given time period" (Shorb 2020)

3.3 Assessing animal welfare

There are many different tools for assessing animal welfare and the factors which influence it. At their simplest, and at the border with 'definitions' of welfare, we find short lists of the factors which might influence good or bad welfare. The most influential of these, particularly in Europe and North America, has been the **five freedoms**, first derived from the work of the UK Brambell Committee in the mid 1960s, refined, and then later developed into the **five domains** model in the 1990s (see Table 2). The five freedoms or five domains are often cited by welfare organisations alongside or in lieu of a declarative definition of welfare (e.g. World Organisation for Animal Health undated; Burn & Animal Welfare Foundation 2020; World Animal Protection 2022).

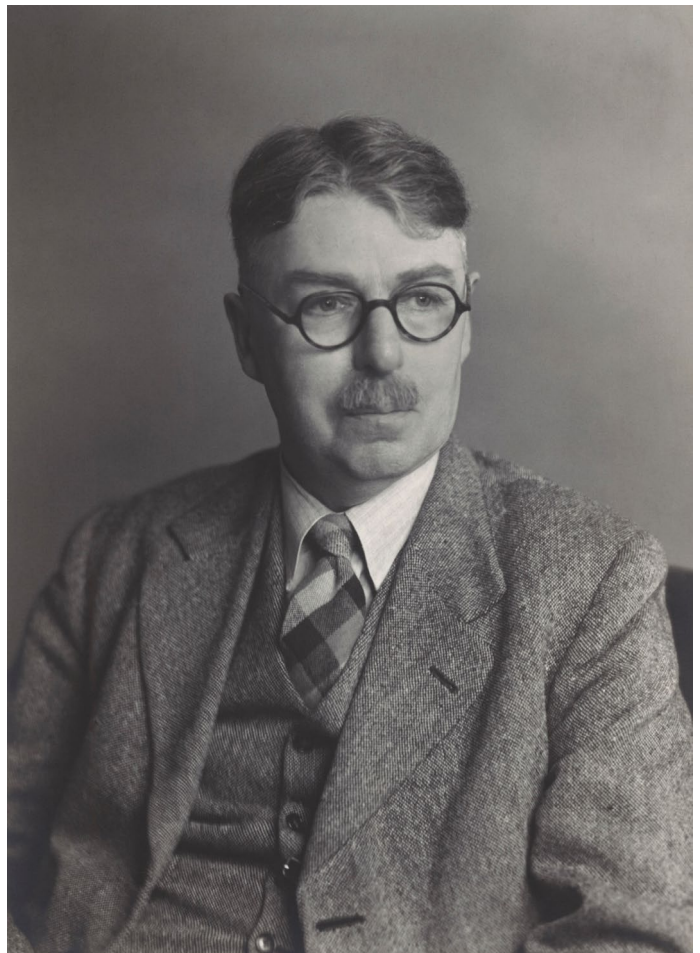
Table 2: Five freedoms over time

good welfare is...		
freedom to stand up, lie down, turn around, groom themselves and stretch their limbs	freedom from: 1. hunger and thirst, 2. discomfort, 3. pain, injury and disease, 4. and fear and distress; and freedom to: 5. express (most) natural behaviours.	a balance between the absence of negative experience and the presence of positive experience in: 1. nutrition 2. environment 3. health 4. behaviour 5. and mental state.
Brambell et al. (1965)	Farm Animal Welfare Council (1979)	Mellor & Reid (1994)

A huge body of research has explored more specific approaches to assessing animal welfare over the last three decades. We can think about these in three groups of indicators:

- physical indicators of physical health;
- biomarkers of affective states;
- and behavioural indicators of affective states.

Of these, physical indicators of physical health are the most straightforward. The presence of injuries and symptoms of disease are often a focus of schemes to regulate animal welfare (see 3.4), and systemic signs like plumage condition, or rates of enzymes which indicate tissue damage, can also be used to indicate overall physical health. If we define animal welfare to include physical health (the biological function orientation) then these are very direct ways to assess welfare, whereas if welfare is defined only in terms of subjective experience (affective state orientation) then these are only indirect measures (physical ailments usually cause suffering)—but even in the latter case, there is little disagreement that these are an important part of welfare assessment.



Francis William Rogers Brambell, photo by Walter Stoneman. Bromide print, 1954, NPG x165461, © National Portrait Gallery, London

The most widely researched biomarkers of affective states are levels of glucocorticoids (mainly cortisol and corticosterone) in the blood, used as indicators of stress: more 'stress hormones' suggests lower welfare. This approach may initially seem appealing as being close to a direct measure of an internal, affective state, but in reality it brings a number of problems. Glucocorticoids are associated with negative affective states, but also with some positive ones like excitement. They are part of an adaptive system, and will return to low levels in situations of chronic stress. They also have various other, physical functions (Mormède et al. 2007; D'Eath et al. 2009; Ralph & Tilbrook 2016). All of these factors complicate interpretation of these indicators.

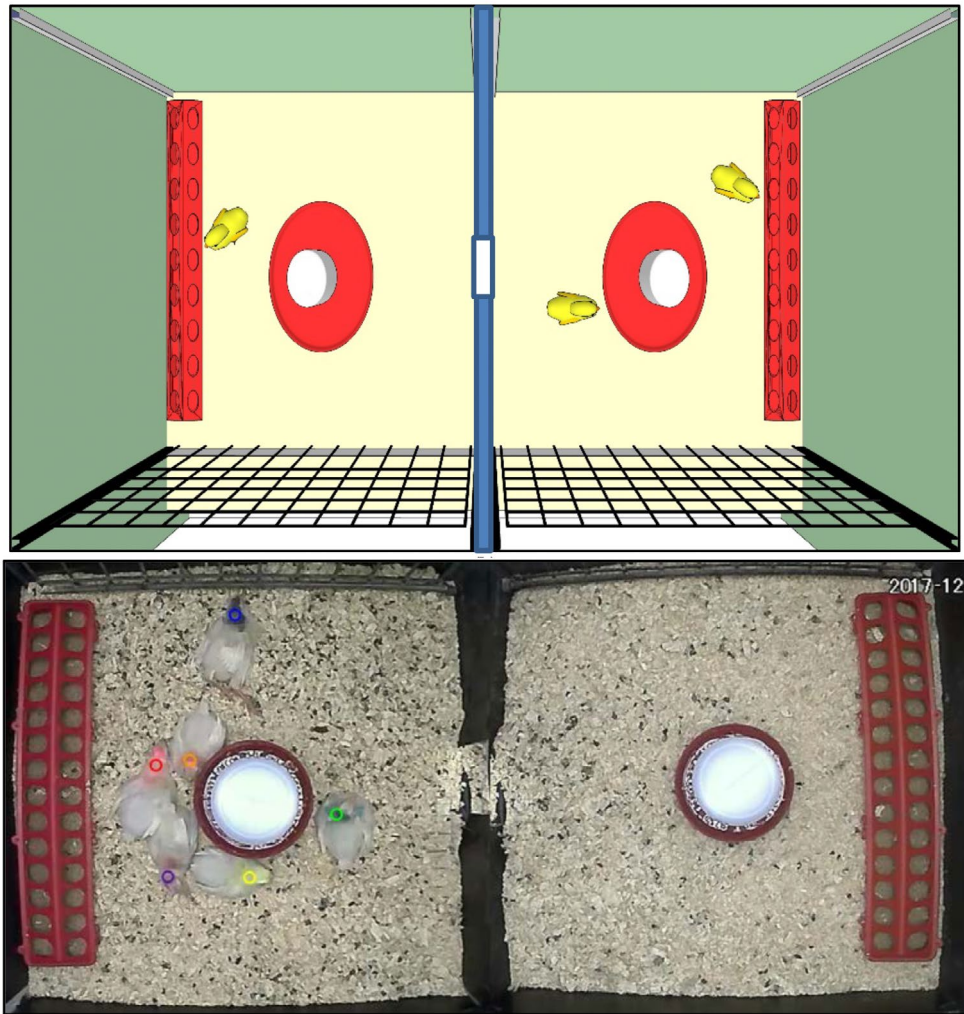
Many behavioural indicators of good and bad welfare have also been investigated. A common approach is to identify a behaviour believed to indicate good or poor welfare, and validate its use as a measure by showing that it is correlated with an already-accepted welfare indicator. Examples include reduced mobility and more time spent sitting when injured, rates of stereotypies (repeated, non-functional and sometimes harmful behaviours) when confined in small spaces, and high motivation to obtain food when hungry. Some other examples of straightforward behavioural welfare indicators include frequency of conflict and physically harming conspecifics, and rates of self-comforting behaviours (D'Eath et al. 2009; Riber, Casey-Trott & Herskin 2018; Kauselmann et al. 2021).

One important strand of work on behavioural indicators of welfare uses optimism or pessimism in an animal's responses to their environment and the stimuli they encounter to infer mood-like states. In simple terms, the underlying theory here argues that it is evolutionarily adaptive to become more pessimistic and therefore cautious after having negative experiences, and that this is mediated by low mood (Mendl & Paul 2020).⁸ As with other behavioural indicators, this has been validated by correlation with established welfare indicators: for example, calves experiencing post-operative pain are more pessimistic than those who have been given appropriate painkillers (Neave et al. 2013). It can also be validated through exploration of the effect of psychoactive drugs whose effects on humans are well understood, such as antidepressants, anxiolytics, depressants and anxiogenics (Neville et al. 2020).

Having validated that a measure (whether a biomarker, a behaviour, or even a physical state) is indeed an indicator of welfare, it can then be used in further studies, either to validate other potential new welfare indicators, or to explore the effects of husbandry on welfare (e.g. Stratmann et al. 2015; Kauselmann et al. 2021). All stages of such work benefit from being undertaken in commercial contexts and with commercial collaborators, so that the situations examined are as close as possible to those that animals in the food system really face (Dawkins 2012b).

Choice and motivation also play an important role in assessment of animal welfare. Not only can we use non-human animals' choices as expressions of their preferences, and the strength of their motivations as indicators of their wants and needs, we also recognise that having a sense of choice, control and agency is itself a factor in welfare. This has been emphasised by many of the authors already mentioned and is central in the concept of "a life worth living", developed by James Yeates and further elaborated by Mellor (Yeates 2011; Mellor 2016). This leads us to the question of the overall picture: we need to assess the balance of negatives and positives in the life of the individual as a whole and over the long term, not just see contributing factors in isolation in the moment (Broom 2023). This big picture, inevitably, is much harder to assess.

⁸ Although in reality these approaches were inspired by the well-established finding that humans are more optimistic when happy and more pessimistic when unhappy, and the theoretical explanation was established later. This could be considered an example of critical anthropomorphism, cf. 5.



Schematic representation and photograph of choice experiment used to determine chicken lighting preferences. Cited from Figures 3b and 4, Liu et al. 2018.

3.4 Regulating animal welfare

Legal constraints on the ways in which farmed animals can be treated vary hugely from country to country, both in terms of how they are encoded in law ([Global Animal Law Association 2023](#)) and how high the minimum acceptable standard is. On top of these legal minimums is a patchwork of regional, national and international organisations (both for- and non-profits) offering certification for producers who achieve a higher level of welfare than the local legal minimum. These can be understood as a market mechanism for improving animal welfare, since they allow consumers to express a preference and pay a premium for better welfare ([Scrinis, Parker & Carey 2017](#)). Both official regulation and voluntary certification rely on regular assessments of on-farm animal welfare, since a level of non-compliance is common ([Lundmark Hedman et al. 2018](#); [Berg & Frida Lundmark 2020](#); also e.g. [Cooper 2016](#)). This may be undertaken by inspectors from authorities or third party auditing organisations or by veterinary professionals; may assess the welfare of individual animals or of groups (such as by recording the number of animals suffering from specific problems); and may assess welfare by animal-based measures, available resources (such as the space available per animal), or management practices.

Three examples of voluntarily schemes are the EU-Commission-funded Welfare Quality® (WQ) scoring systems for different species (e.g. for pigs: Welfare Quality 2008; [Blokhuys et al. 2010](#)); Organic standards, which are largely encoded in law but administered by NGOs in the UK and EU countries; and the Global Animal Partnership certification scheme (GAP), a US-based non-profit originally started by supermarket chain Whole Foods Market, now funded through fees from participating producers and through charitable donations ([Global Animal Partnership 2021](#): 27).

Much of the regulation of the welfare of animals in the food system relies on research into welfare assessment. Compared with 19th and early 20th century laws against animal cruelty which were inspired by intuitive understandings of what constituted cruelty, there has been a growing expectation that formal constraints (whether legal or voluntary) should be underpinned by a scientific rationale and evidence base. Better evidence for what leads to poor welfare has often played a role in creating new legal constraints on husbandry by feeding into legislative processes or providing tools for advocates and activists. This has happened, for example, with bans on conventional cages for hens in the EU and some US states, and bans on farrowing crates in Switzerland, Norway and Sweden and limitations on use elsewhere ([Appleby 2003](#); [Shields, Shapiro & Rowan 2017](#); [Baxter et al. 2022](#)). This is not to suggest, however, that there is perfect alignment between current scientific understanding of animal welfare and the design of regulations or certification schemes.

Another point of interaction between animal welfare science and legal and voluntary welfare regulation is the measurement of the effectiveness of these schemes. Bartlett et al., using WQ as an instrument, find that different welfare certification schemes in the UK (Organic, Red Tractor, RSPCA, free range, woodland) have substantially different welfare outcomes ([Bartlett et al. 2023](#)). They also find that all labelled products achieve better welfare outcomes than those without a label, confirming the idea that the law provides a minimum which certification schemes improve on.



Veterinarian checking pigs, photo by dusanpetkovic1 on Adobe Stock

4 Underlying theories of animal ethics

Animal welfare science provides tools for identifying good and bad welfare, but it doesn't tell us what to do with that information. Should we care about animals and their welfare, and why so? In what ways is it acceptable to use them? How should we navigate trade-offs between the interests of non-human animals and humans, or between their different interests? Laws and regulations provide one set of answers to these questions, but one which reflects the outcome of negotiations between human stakeholders with their own differing interests and access to power. Philosophers of animal ethics attempt to provide a more reasoned and transparent set of answers.

4.1 Historical context

The way people think about human-animal relationships in the western world has roots in both Classical philosophy and Christian theology, both of which placed humans above non-human animals in a hierarchy of beings. In the Old Testament, this superiority was justified because humans were created in the image of God and given dominion over animals (Genesis 1:26). For Aristotle, humans' superior position was justified by animals' lack of reasoning and rationality, in spite of their being able to feel and act towards goals (Grumett 2019).⁹ These ideas were woven together by later Christian thinkers. Thomas Aquinas (13th century) saw animals as lower than humans and argued that using them was morally justified because it was their divine purpose (Summa Theologiae II-II.Q64.A1), although he also warned that cruelty to them could lead to cruelty to humans. René Descartes (17th century) went further, claiming that animals were automata, lacking not only rationality but also sensation and internal experience, and so were entirely without moral status. Immanuel Kant (18th century) argued that humans have only indirect duties towards non-human animals, while sharing with Aquinas the concern that cruelty to animals might desensitise us to cruelty to humans.

In later centuries, theologians came to give animals more moral status within this framework, with the 'dominion' of the Old Testament expanded to include a duty of stewardship. For example, Cardinal John Henry Newman (19th century) argued that "[c]ruelty to animals [is] as if we did not love God, their Maker" because to love God was to love all His works (Newman 2000: 133)—although for Newman this argument extended also to plants.

4.2 Modern theories of animal ethics

Ethical theories differ on who or what 'possesses moral status' and so should be extended moral concern—in other words, on who matters. This can be described in terms of 'centrism'. *Anthropocentrism* only attributes moral status to humans, while *sentientism* attributes moral status to all 'sentient' beings—those with the capacity to feel. *Biocentrism* goes further, making all living organisms objects of moral concern whether sentient or not, and *ecocentrism* attributes moral status also to whole ecosystems.

In addition to differences about who or what possesses moral status, ethicists differ on how they determine which actions are right and wrong. Some focus on the action, some on the consequences, some on relationships, some on the person acting. All such theories reflect and explain intuitions that most people share to some degree, and so there is overlap in their recommendations for how we treat animals. There are, however, also substantial differences, and even where conclusions are similar, the theories disagree on how we should justify our actions. In the space of animal ethics, two important normative theories are rights theory and utilitarianism.

⁹ Not all classical philosophers agreed with this position. Pythagoras and some Neoplatonists, like Porphyry, practised and supported vegetarianism. Porphyry argued that non-human animals possessed souls and should be subject to the same principles of justice as humans. Nevertheless, Aristotelian ethics (along with Stoicism) had more influence on later Christian thought, and so are key to understanding the historical context of western philosophy.

4.2.1 Animal rights

Do non-human animals have rights, and if so, are those rights equal to the rights we assign to humans? Can they be fulfilled in the current system of food production? And what duties do humans have to respect such rights? These are questions which animal rights theories attempt to answer.

Animal rights theories are part of the wider family of 'deontological' ethical theories, theories which describe ethics in terms of rights and duties. A prominent example of animal rights theory is found in the work of philosopher Tom Regan, who suggested the concept of the 'subject-of-a-life': an experiencing subject at the centre of a unique life narrative. The criteria for being a subject-of-a-life in Regan's framework include sentience and internal experience (an emotional life, beliefs and desires, feelings of pleasure and pain), as well as cognitive requirements (a sense of the future, psychophysical identity over time, ability to act in service of goals, a preference for better welfare) (Regan 1984: 243). Entities that fulfil the criteria for being a subject-of-a-life have an inherent value. From this inherent value would follow moral rights, which ought to be respected, and such entities should never be treated merely as 'means to an end' (a framing taken from Kant although Kant applied it only to humans). Not all philosophers of animal rights use exactly the same language, but nevertheless apply similar or parallel arguments to identify a (potentially even larger) set of animals with rights.

In an animal rights perspective, ending a life is typically a serious violation of a (human or non-human) animal's rights, so killing animals within the food system (e.g. for meat, or culling due to decreased productivity or as surplus) could not usually be justified. Constraint and confinement, preventing animals from choosing preferred behaviours, early separation of offspring from mothers, and pain and stress from transport, disease, injuries, procedures like dehorning/disbudding and beak trimming, and slaughter, would all violate animals' rights. Within the context of the food system, such actions would be to treat animals as means to an end. While most or all livestock farming violates *some* rights, 'factory farming' causes rights violations at massive scale and so is particularly objectionable (DeGrazia 1996: 281–287). The concept of animal 'dignity' has become a subject of lively debate over the last two decades. Scholars who argue that dignity is a useful concept point out that people often talk about degrading, dishonouring, demeaning and defiling non-human animals, and suggest we can deepen our understanding of the relationships between humans and non-humans by exploring these ideas. Recognising non-human dignity might extend the elements of intensive farming that are understood as violations to include things like artificial insemination, constant observation, or altering bodies in extreme ways. Critics suggest that this is unhelpful anthropomorphism (see 5) or that it doesn't add anything that isn't already described by other moral concepts. See Coghlan (2023) for a summary of the debate.

Even within an animal rights framework, there are situations in which eating and even farming animals might be acceptable: situations of survival and necessity. Philosopher Angus Taylor argues that we can think of all sentient animals as having the right to pursue their own 'vital needs', defined as whatever is required not just for survival and but also for physical and psychological well-being ('living vigorously'). When humans can only pursue their own vital needs by violating the rights of other animals, this becomes acceptable (Taylor 1996). Such an argument shows how a rights-based, broadly abolitionist view can judge animal-source food consumption and animal agriculture differently in contexts where other options are available for survival compared with situations of poverty and fragility.

Legal rights for non-human animals?

Achieving *legal* rights for animals is a goal pursued by some animal activists, such as the US-based Nonhuman Rights Project (NhRP). The assumption behind this strategy is that granting at least some non-human animals legal personhood could set off a revolutionary shift in how society permits them to be treated. Academics and legal activists in this space often base their arguments on analogies with the historical extension of legal personhood and rights to wider and wider groups of humans, particularly to slaves (Wise 2007; Wise & Goodall 2014). NhRP pursued US legal cases in 2013-2015 trying to establish personhood for captive chimps, and in 2021 trying to establish personhood for a captive elephant. All of these cases failed, although in the 2021 case, two of seven judges on the New York State Court of Appeals wrote dissenting opinions in favour of granting Happy the elephant writ of habeas corpus and both the majority and the dissent accepted that the law imposes a duty to treat nonhuman animals with dignity (DiFiore, Wilson & Rivera 2022).

In some other jurisdictions, the strategy has achieved more success, such as in the cases of an orangutan and a chimp granted limited legal personhood in Argentina in 2014 and 2016 (Zimmer 2017). Both Swiss (since 1992) and Indian (since 2014) law recognise and protect animal dignity in some form, and in both countries this has contributed to legal decisions to protect animals (Radhakrishnan & Ghose 2014; Singh 2015; Bolliger 2016; Schneider 2020).

This form of activism has mostly focused on great apes, cetaceans and elephants, animals with particularly human-like intelligence *and* which are particularly sympathetic in the public imagination, excluding the animals most commonly eaten for meat. Nevertheless, the thinking behind it extends to farmed animals (Wise 2007). It is also worth noting that pursuing legal rights as a strategy doesn't necessarily imply being motivated by 'animal rights' as an ethical framework. Achieving legal rights could be an effective way to create transformative change in the treatment of nonhuman animals regardless of beliefs about *why* such a change was desirable (for example, see Comstock et al. 2022).



Judge Mahmohan Singh of the High Court of Delhi ruled in 2015 that birds have a fundamental right to fly and cannot be caged. Singh 2015. Lovebirds at local bird market, photo by David Davis on Adobe Stock

4.2.2 Utilitarianism

In 1780, philosopher Jeremy Bentham wrote: "The question is not, Can they *reason*? nor Can they *talk*? but, can they *suffer*?" (Bentham 1823: §17.1.4). From this motivating thought modern utilitarianism was founded and has later become a dominant view in animal keeping, influencing both management procedures and legislation.

Utilitarianism is the most prominent of a family of ethical theories known as *consequentialist* theories: frameworks in which the rightness of an action is determined by its consequences. Different utilitarians suggest different prerequisites for being entitled to moral consideration, but the capacity for suffering and enjoyment is a common one (*sentientism*). Peter Singer, a well-known utilitarian animal ethicist, states that "if a being suffers, there can be no moral justification for refusing to take that suffering into consideration" (Singer 2015: 38). However, the claim that a group of animals must be taken into account is not to claim that they all have the same interests. For example, Bentham argued that although both humans and non-human animals have an interest in not suffering, only humans have an interest in not dying because animals have none of the "long-protracted anticipations of future misery" that humans do (Bentham 1823: §17.1.4).

Where an animal rights philosopher would try to identify what rights might be violated by agricultural treatment of animals, and regard any rights violations as rendering an action unethical, a utilitarian would try to identify all the consequences of an action, both positive and negative, to determine whether it was allowable. The actions we should pursue are those which lead to the most *utility* (the term for the good in these theories). Utility is defined differently in different variants of utilitarianism: to maximise utility might be to minimise suffering (*negative utilitarianism*), to maximise happiness (*hedonistic utilitarianism*), to maximise the satisfaction of individual preferences (*preference utilitarianism*), or have some more complicated definition.

Animal rights frameworks are often associated with abolitionist positions on animal ethics. By contrast, the livestock industry is sometimes described in public discourse as operating in a utilitarian frame, accepting the premise that animal welfare and animal suffering are just some among many ethical considerations and might be outweighed by human health, taste, and aesthetic and economic interests depending on the situation. As a result of this perception, utilitarianism is sometimes criticised as being a weak or apologist framework (Haynes 2008). Yet utilitarian philosophers of animal ethics argue that equal consideration of the interests of the suffering beings involved leads to the rejection of most animal farming—an abolitionist position (Milburn 2021). Indeed, utilitarian scholars criticise the suggestion that 'utilitarianism' is a good description of the moral logic of the animal industries and scientists who support them at all, suggesting instead that they and much of the general public implicitly assume a principle of "utilitarianism for animals, Kantianism for people": animals' interests get weighed up against each other only after the rights and interests of humans are accepted as inviolable (Caviola et al. 2021). Such a distinction could not be justified in formal utilitarian ethics.

4.2.3 The relational view, contractarianism and virtue ethics

Three further frameworks which we will cover in less detail are relational and virtue ethics and contractarianism. In relational views, ethical demands on actors depend not only on who (or what) they are, but also on their relationships. The stark differences in how we treat different animals have been a source of pithy aphorisms and titles for many different writers—consider "Some we love, some hate, some we eat" (Herzog 2022), or "Why We Love Dogs, Eat Pigs, and Wear Cows" (Joy 2020). These quotes illustrate how our different relationships with animals lead to differences in how they are reared and treated in different cultures. Such differences can also be found between how we think of domesticated and of wild animals (Keulartz 2020; Fraanje & Garnett 2022). In utilitarianism and animal rights theory, these are contradictions to be solved, whereas in a relational view, animals' moral statuses really do differ according to the relationship they have with humans: as pets, farm animals,

research animals, pests, wild animals, etc. Since companion animals have special relationships with humans, they also possess special moral status. Farmers would have special obligations to the farm animals in their care, while the responsibilities among consumers for the welfare of the animals they eat are more contested.

In contractarianism all moral duties come from (usually implicit or metaphorical) 'contracts' with other rational beings. In this theory, most argue that animals which cannot speak or make rational agreements cannot have moral status, but harming non-human animals might be upsetting or culturally taboo and thereby breach the contract between humans (Cudd & Eftekhari 2021). Exceptions are sometimes created by positing that other humans' preferences for the treatment of specific animals could be the source of direct moral status for those animals ("I'll only agree to share a moral community with you if you agree to treat my dog as possessing moral status"). However such exceptions are limited compared with the moral status assigned to animals in other ethical frameworks. In other forms of relational ethics, relationships are defined in terms of power: we have special moral obligations with those made vulnerable to or dependent on us. Such approaches typically assign stronger moral status to a much larger group of animals than contractarianism (e.g. Palmer 2010; Burgess-Jackson 2017).

In virtue ethics, the focus is on our moral character: we should concentrate not on the nature or consequences of individual actions, but on how to be good people or live good lives. Arguments about whether (or which) non-human animals have moral status are less important than in other frameworks. If we act cruelly, exploitatively, or uncompassionately towards animals which can experience good or poor wellbeing, these acts are vices because of what they say about our own characters. Virtue ethicists often critique other frameworks as reductive, and push towards very expansive views of what considerations we should take into account when making moral decisions. We should consider how best to avoid many vices, such as cruelty, wastefulness, and disrespect, and embody many virtues, such as courage, justice, compassion, honesty, and temperance. Such a nuanced framework is unlikely to arrive at a fully abolitionist position on animal agriculture or a fully permissive one (Hursthouse 2012).

4.2.4 Summarising ethical theories

In summary, different ethical theories come with different perspectives as to what or who matters and what 'good' means and how it can be achieved; these are summarised in Table 3. Note that these frameworks are not necessarily mutually exclusive, and many theorists acknowledge valid insights from multiple theories (*ethical pluralism*).

Table 3: Summary of ethical theories

	Who counts?	What is the right thing to do?
Animal rights	contested: all animals that pass some sensate and cognitive threshold, or all sentient beings	respect rights
Utilitarianism	all sentient beings	maximise utility
Relational ethics	animals with whom we have special relationships	fulfil obligations derived from those relationships
Virtue ethics	all sentient beings	be a virtuous agent

Do fish feel pain?

In animal welfare science, in many ethical frameworks, and sometimes in law, sentience—the ability to feel—is a prerequisite for consideration. This has led to hotly contested debates about whether some categories of animal are sentient, and particularly whether they feel pain. For fish, the debate among experts has largely resolved to a consensus that fish are sentient and do feel pain (Braithwaite 2010; Sneddon 2015; Braithwaite & Droege 2016; Broom 2016; contra Key 2016) and a majority of the public share this view in countries that have been surveyed (e.g. 78% of a sample of 4446 US adults, Dullaghan, Wildeford & Moss 2021; or 67% of a sample of 2173 UK adults, Moore 2021). The expert debate has moved to focus on the sentience of invertebrates, with increasing consensus in favour of cephalopod sentience, and mounting evidence for decapods and insects (Klein & Barron 2016; Baracchi & Baciadonna 2020; Birch et al. 2021; Gibbons et al. 2022). Work on decapods has particular relevance for food system debates because shrimp are probably the animals eaten by humans in the largest numbers (Romero Waldhorn & Autric 2022) (also see footnotes 2 and 3), and work on insects is important for discourse around 'alternative proteins' (Aiking & De Boer 2019).

In all of these debates it is helpful to understand *why* we are arguing about certain categories of animals and not others. One possible answer is practical, while the other reflects a cognitive bias. Firstly and straightforwardly, establishing sentience requires that a certain evidentiary threshold be reached and some groups of animals are far better studied than others (see discussion in Birch et al. 2021). Secondly, we tend to assume a hierarchy of animals by their (dis)similarity to humans, with humans at the top and those most dissimilar and/or most distantly related to us at the bottom. Above some line, it is assumed, the threshold for moral consideration is reached, and below it, it is not. This hierarchy can be grounded in evolutionary arguments (e.g. moral considerability is dependent on the experience of pain, this requires a neocortex, and only mammals have evolved a neocortex: Key 2016; though note that humans born without a neocortex appear to be conscious and experience pain, cf. Merker 2007) or in religious belief (if human beings were made in the image of god, then only those beings similar to us have whatever properties bestow ethical importance). Pushing back against this hierarchical view, scholars have argued that convergent evolution, neurological plasticity and radically distinct *Umwelten* (see 5) all complicate the evolutionary arguments, and evidence from behaviour suggests that a capacity for suffering extends very broadly through the animal kingdom. Nevertheless contradictions in our practices remain that more or less reflect the hierarchical view.



The Missing Claw, photo by Rick Cameron on Flickr

5 Anthropomorphism

'Anthropomorphism', assigning human traits to non-human beings or objects, is often criticised both by ethologists and veterinarians: in the scientific literature, the word carries an implicit critique of cognitive bias. In this perspective, anthropomorphism is the *error* of attributing human-like traits to non-human animals, and is a dangerous distraction from evidence-based animal husbandry.

To understand this, we need to give rich consideration to animal perspectives. Each species or individual has their own Umwelt (Uexküll 2001): their self-centred world, experienced through their particular senses, cognitive functions and perspectives. A tree may be experienced in many different ways depending on whether you are an insect, a bird, a dog or a human. It might be an object or a place; might be thought of primarily in terms of visual appearance, particular smells, or through some other sense; it might be timeless, or have grown within one lifetime. Inevitably, humans tend to think about the world from an anthropocentric perspective—in terms of the human Umwelt.

By taking an anthropocentric perspective and using anthropomorphism, human preferences may be wrongly attributed to animals, with implications for welfare. Examples include clothing dogs (because humans like to be clothed) and causing them to overheat, feeding dogs and cats home-cooked foods instead of preformulated pet foods (because humans prefer home-cooked meals) and depriving them of important nutrients (Mota-Rojas et al. 2021), and worrying about the welfare of animals kept outdoors in weather conditions for which they are well-adapted but humans would find intolerable. Anthropomorphic interpretations of animal behaviour can lead to misconceptions about an animal's perception and wellbeing. For example, teeth-baring expresses fear, submission or aggression in non-human primates but may resemble smiling (Mota-Rojas et al. 2021); some species appear calm when they are actually terrified or distressed (Pacharinsak et al. 2022). Anthropomorphic misconceptions in these contexts can then lead to poor husbandry (Serpell 2019).



Sheep in a frosty field, photo by Tamsin Blaxter

For much of the twentieth century, the culture of scientific research into non-human animals was shaped by a concern that unconscious anthropomorphism would lead to non-objectivity; this concern influenced the Behaviourist school, which focused strictly on observation of behaviour without any consideration of internal experience. However, constraining our interpretations in this way may lead us to other inaccuracies. Primatologist Franz de Waal argued that if we refuse to see similarities between humans and animals we risk missing something fundamental about both, a concept he dubbed 'anthropodenial' (Waal 1999).

An example of the interplay between anthropomorphism and anthropodenial concerns the capacity to experience pain. Today we think it is obvious that most animals experience pain, but this was not the case just a few decades ago when surgery was done on experimental animals (and human babies) without anaesthetic or pain relief (Phillips 1993; Rodkey & Pillai Riddell 2013). We could say in retrospect that cultural beliefs about the cognitive supremacy of adult humans and the rights of humans to use non-humans overrode our capacity to anthropomorphise (or simply empathise), resulting in anthropodenial and harmful practices. Increased knowledge in neuroscience and endocrinology has combined with cultural change to validate our intuitive understanding that if we ourselves had been put through the same situation and had the same behavioural responses, we would be feeling pain and suffering. Such cultural change can be seen as playing a role in the rise of the modern animal rights movement and animal welfare science. Conversely, changes in practices may have *facilitated* changes in beliefs: if it is necessary for practitioners to rationalise away obvious pain responses in animals in their care in order that conventional practices be justifiable, this will result in reduced belief in animal mind (see 6.1 below).

This leads us to an alternative perspective, in which anthropomorphism is seen as a skill and understood in terms of theory of mind. Humans want to understand each others' thoughts and emotions: this is a social skill, and throughout history this capacity to mirror other people's thoughts and emotions has been important for survival, since it can help us predict behaviour and risks associated with social contacts. It is therefore instinctive (to varying degrees) for the human mind to try to understand other beings and describe their emotions or intentions, and this extends to non-human animals: our own internal experience is used as a partial model to better understand and predict animal emotions and intentions.

Trying to unite these conflicting observations, 'critical anthropomorphism' is a method that leverages human experiences as sentient beings while using scientific findings, knowledge about the species and individual, species-specific behaviour, neuroscience etc., to be critical in our interpretation. This may allow us to learn more from objective scientific studies (Morton, Berghardt & Smith 1990). Critical anthropomorphism has been influential in both animal welfare science and animal ethics, but in both cases the debate continues (Wynne 2004; Dawkins 2012a; Karlsson 2012). Some researchers argue that the pendulum has swung too far, and anthropomorphism has corrupted the scientific validity of much work on animals.¹⁰ There is perhaps less controversy about the claim that anthropomorphism should be utilised by scientists as a *communicative* tool in fields such as conservation (Chan 2012; Tam, Lee & Chao 2013).

¹⁰ "[Anthropomorphism] is in danger of rotting away the very fabric of ethology" (Dawkins 2012a: 27); "this new wave of anthropomorphism threatened the very scientific basis of the study of animal behaviour itself" (Dawkins 2012a: 26).

6 Why are discussions about animal welfare in the food system so polarised?

Animal ethics and animal welfare are some of the most polarising topics in food system discussions. Many of the reasons for this have already been touched upon. It is possible for two interlocutors both to be acting from principled ethical positions, but with such differences in how they define 'good' that each is acting unethically from the other's perspective (see examples in Table 4). It is also possible for two interlocutors to be acting in similar ethical frameworks, but for differences in where boundaries are set (for example, in which species are seen as sentient or cognitively complex enough to deserve moral status) or in how different interests are weighed against each other to lead to very different judgements. An example of this can be seen in the difference between utilitarian philosophers who take an abolitionist stance on animal agriculture and industry scientists who might be genuinely concerned about minimising animal suffering but still place a higher priority on human interests. Beyond underlying ethical frameworks, there can also be differences in conceptions of animal welfare (such as taking biological function, affective state, or natural living orientations) which lead to different ideas of what it might look like to prioritise an animal's interests. Finally, there are legitimate differences on how to interpret the scientific evidence on the sensory and cognitive capacities of some animals (see Do fish feel pain?, above) and on what effect different interventions have on welfare, even when the philosophical framework and definition of welfare are held in common. All of these can lead people to very different judgements about what is good or acceptable, creating a great deal of space for conflict and polarisation.

Table 4: Contrasting perspectives on actions

Action	Favourable	Unfavourable
'Open rescue' tactics pursued by animal rights groups like Direct Action Everywhere (DxE)	Animal rights perspective: compelled to act to defend animals' rights to self-determination and against torture	Anthropocentric deontological perspective: rights of other humans outweigh obligations to behave well towards animals; this violates farmers' property rights
Intensifying poultry production to reduce cost of food	Anthropocentric utilitarian perspective: this will mitigate food poverty and human nutritional deficiency diseases; non-human animals' morally relevant capacities (e.g. for suffering) are lower	Sentientist utilitarian perspective: many extra lives of constraint and suffering will be lived to ease the suffering of a smaller number of humans
Shift from eating extensively farmed beef to fish caught from sustainable fisheries	Ecocentric perspective: crucial to mitigate damage to ecosystems from high land use and high carbon emissions of beef	Biocentric perspective: many individual fish caught en-masse and killed slowly by suffocation and incidental injuries entails far more suffering than a single cow slaughtered relatively humanely to feed many people

6.1 Who is qualified to speak?

People also approach these debates from different contexts and with different lived experiences. Those with a background in livestock production have the benefit of direct experience to draw on, and access to the evidence needed for a realistic assessment of animal welfare in farm settings. To such an interlocutor, those outside the sector might seem to be arguing from a place of ignorance. However, to an abolitionist, these arguments might cut the other way: someone working in livestock production has a personal vested interest (whether economic or purely in terms of identity protection) in livestock agriculture being found morally acceptable. Because they have only interacted with them in captivity, they also have a reduced ("de-animalised": [Harfeld et al. 2016](#)) understanding of what the animals in question are like and what kinds of experiences and behaviours they are capable of. Thus conflicts about agricultural methods and welfare provisions can take the form of conflicts about who is a legitimate speaker for non-human animals and the humans who deal with them: pragmatist vs ingénue or compromised vs principled; anthropodenialist vs anthropomorphist; a scientist, a philosopher, a farmer or an activist.

Research into the relationships between past experiences with non-human animals and current attitudes finds some consistent patterns. One is that experience with pet-keeping is associated with stricter ethical stances towards non-human animals (placing greater moral demands on humans), whilst experience with livestock in food-system contexts is associated with laxer stances. Different researchers offer different explanatory categorisations: urban-rural divide ([Serpell 2005](#); [Knight et al. 2004](#); [Morrison, Maust-Mohl & Charlton 2021](#)); type of activities undertaken with animals ([Bjerke, Ødegårdstuen & Kaltenborn 1998](#)); animal species ([Mueller 2014](#)); types of relationships ([Kellert & Westervelt 1983](#); [Bjerke, Ødegårdstuen & Kaltenborn 1998](#); [Boogaard, Oosting & Bock 2006](#); [Morrison, Maust-Mohl & Charlton 2021](#)). What we see is a cluster of correlated predictors: rural, species kept as livestock, food systems contexts and activities vs urban, species kept as pets, caring and entertainment contexts and activities. It is hard to know exactly which factor explains different attitudes.



Worker on pig farm, photo by hedgehog94 on [Adobe Stock](#)

These patterns could be framed simply as reflecting comfort with cultural practices (like hunting and slaughter) which respondents observe in their own communities, without any underlying difference in ethical frameworks. However, other patterns in these studies do offer further hints: attitudes towards all morally contested practices tend to be correlated, and also correlated with belief in animal mind and higher rating of animal cognitive capacities (Knight et al. 2004; Morrison, Maust-Mohl & Charlton 2021). In light of this research, it has been argued that shrinking involvement with livestock and increasing experience of pet keeping have *caused* changes in societal attitudes to animal ethics (Serpell & Paul 2002; Busch et al. 2022).

Do such changed attitudes matter for non-human animals? More positive *views* of animal protection do not automatically or uniformly imply better *consequences*. For all their good intentions, emotionally-involved pet keepers might have a greater tendency towards errors of anthropomorphism and less informed husbandry knowledge than those in agriculture (Wolfensohn & Honess 2007). However research shows that pet keeping in childhood at an individual level is associated with higher levels of meat avoidance in adulthood mediated by ethical views (Paul & Serpell 1993; Rothgerber & Mican 2014; Heiss & Hormes 2018; but contra Busch et al. 2022), and it is harder to argue against the supposition that this has positive consequences for non-human animals.

6.2 Personal stakes and intersections with other topics

There are also wider assumptions and other priorities that go beyond farm-animal welfare but intersect with it due to the place of livestock production in human societies (see Figure 4). These include how food provision, economic prosperity, climate change, the biodiversity crisis and other environmental dangers are evaluated, as well as assessments of the feasibility of achieving more or less revolutionary changes. Positions on animal ethics, then, relate to a much wider life context.

For example, for one actor, their own starving child might present a moral call to action so great as to render animal ethics questions irrelevant if meat is available to eat. For another, the plight of undernourished and malnourished people trapped in poverty across the world might do the same. For a third, however, working from an understanding of the biodiversity and climate crises as existential, these concerns with *present* suffering might fade into the background next to the scale of a threat to all future life on earth. For a fourth, driven by empathy with eighty billion captive animals slaughtered for food every year, the scale of that collective moral claim might overshadow all others, whether the human or the hypothetical future. All of these may be principled ethical positions, and all felt very deeply.

DISCUSSIONS ABOUT LIVESTOCK ANIMALS IN THE WIDER CONTEXT OF DISCUSSIONS ABOUT ANIMALS



Figure 4: Discussions about the treatment of animals in the food system sit within a much wider context of views on our relations to different animal categories, the animal world in general, and fundamentally our relationship to the natural world. Note that the boundaries of these categories can be blurry and that the categories themselves are culturally dependent (this conception of the natural world is itself very much a product of Western thought).

(Designed by [Roberta Aita](#))

These differences in priorities matter only insofar as there are trade-offs between goods for animals and other goods—however, this is clearly often the case. Taking the issue of trade-offs with environmental impacts as an example, we find a complex picture. In many respects, systems that have the lowest environmental impacts tend to raise more animal ethics concerns (Dawkins 2012a). Selective breeding for faster growth, higher production and more efficient feed conversion leads to health problems (e.g. Fernyhough et al. 2020); intensive, indoor systems often have lower emissions but allow fewer opportunities to express natural behaviours; high stocking density reduces land use but raises the risk of disease and conflict (Meseret 2016); poultry systems generally have far lower environmental impacts than ruminant systems, depending on geographical context, but also tend to score worse on welfare—and require far more deaths for the same quantity of meat (Chan, Franks & Hayek 2022; De Boer & Aiking 2022). Particularly considering physical health, there are countervailing arguments (Llonch et al. 2015)—certainly, stressed, ill animals grow more slowly and are less likely to survive to slaughter age, rendering the system less environmentally efficient (see further 6.3). Such trade-offs are made harder to evaluate because of the lack of a unified quantitative measure of animal welfare (see 3.4 above), and work towards such a measure has partly been motivated by a desire to include animal ethics considerations in LCAs. Increasing corporate consolidation in the food system has also made it harder to have effective dialogue and achieve political change around these ethical trade-offs, since the entities with the greatest wealth, power, and stake in the status quo are abstractions not fully subject to human moral and social norms (Howard 2021).

Alongside these trade-offs, however, is a striking synergy: diets high in animal source foods tend to have greater environmental impacts than nutritionally equivalent diets excluding or low in ASFs, and so shifting to low-ASF diets and accordingly reducing the number of farmed animals would achieve both environmental and animal ethics goals. In this space, some scholars have begun to explore the idea that animal ethics arguments might have greater appeal to voters than environmental arguments as a reason to decrease meat consumption (Perino & Schwickert 2023; Saha 2023).

6.3 Breaking the deadlock

Two sets of arguments are sometimes used to break or bypass deadlock around animal welfare debates: one type concerning win-win scenarios for non-human animals and humans (especially those with vested interests in animal agriculture), and one identifying specific systems on which more agreement can be found.

In the first case, it is sometimes possible to argue that animal welfare is important from a purely human perspective. For example, reduction of antibiotic use in agriculture lowers the likelihood of antibiotic-resistant pathogens affecting humans, and might be helped by improving animal welfare (Dawkins 2017a; Vissers, Saatkamp & Oude Lansink 2021). Physically healthier animals tend to have better welfare (however defined) and are less likely to die prematurely; less stressed animals might produce better meat; consumers might be willing to pay more for certified high-welfare products; in all three cases, a factor associated with better welfare leads to greater profitability for agricultural businesses (Dawkins 2017a; Lawrence & Vigors 2020). The One Health and One Welfare frameworks, which promote research into and policy building on positive connections between human, non-human animal, and environmental health and welfare (Evans & Leighton 2014; Deem, Lane-deGraaf & Rayhel 2019; Pinillos 2018; Tarazona, Ceballos & Broom 2019; García Pinillos 2021), have great institutional support, demonstrating how such 'win-win' scenarios can allow both sides of a debate to agree to move forward with changes in practice. However, there are realistic limits to these arguments. For one thing, they rule out many potential improvements for animals which involve unavoidable trade-offs. For another, these arguments tend to be used to argue for compromise positions and incremental changes,¹¹ which may be seen as distasteful by those at the abolitionist end of the moral scale.

¹¹ In the abstract, it is possible to construct arguments in this mould that support abolitionism; for example, ending animal agriculture would hugely increase the amount of food that could be produced from current farmland (or equivalently hugely decrease the amount of land needed to feed humanity) (Aleksandrowicz et al. 2016; Ritchie 2021), which could make it much easier to feed the world's poor. However, such an argument fails to take account of the self-described priorities of actual stakeholder groups.

In the second case, it might be possible to identify production systems which are so widely vilified on ethical grounds that it is possible to achieve broad consensus against them. Here we return to 'factory farming': large scale intensive livestock agriculture. As mentioned above, public concern with the imputed cruel excesses of such production methods played an important role in the development of both animal welfare science and the animal rights movement in the latter half of the twentieth century. The term 'factory farming' has strong negative connotations for many people, and where major animal welfare gains have been made in the last few decades these have sometimes been by raising public awareness of such systems (an example is the 'mainstreaming' of free range eggs in the UK; cf. [Chintakayala et al. 2018](#)). However, framing discourse around an emotive and ill-defined term may risk further polarising what is already a fractious debate.

Both of the approaches described here are forms of incrementalism or 'non-ideal ethics', where those motivated by ethical issues in the treatment of animals pursue compromise goals or argue for small, additive improvements, instead of directly championing their ideal outcomes. All such approaches face some criticisms: they may undermine the trust of stakeholders who come to see them as dishonest; they may lead to stagnation after the most high-profile problems are dealt with; and they may be understood as implicitly endorsing much of the status quo ([Eskens 2021](#)).

7 Conclusions

Two, overlapping intellectual traditions sit somewhat uneasily alongside each other in this explainer: that of animal welfare science, and that of philosophical animal ethics. Both offer invaluable insights for those involved in animal food production. Animal welfare science continues to add more and more sophistication to our understanding of what a good life for different animals looks like, how it can be approximated in conditions of captivity, and how, in practice, outcomes might be assessed and monitored. Animal ethics challenges us to explore our own values, interrogate our beliefs about our responsibility for other animals, and think through which of our necessities, pleasures and goals are worth their lives.

We find ourselves in a period of history when attitudes towards livestock animals are deeply contested and these contestations rest on stark differences in perspective. Some consume a great deal of animal foods, and a few none. Some have extensive experience of and investment in livestock keeping, while many, especially in the Global North, experience it only through its products. For some, animal foods are a rare luxury and nutritional essential, while for others they are a daily default. Many come to these questions via other debates—about the impacts of animal farming on climate or biodiversity, about dietary health, rural poverty, or international development.

With such diverse experiences to draw on and priorities to defend, it is no surprise that ethical questions about non-human animals in the food system are emotive and debates so polarised. Yet there are inescapable reasons to pay attention to these topics. Never before have wealthy societies been so alienated from the realities of food production or the experiences of other beings. At the same time, human decisions have never before had the power to shape so many non-human lives. It is only through honest engagement with the whole spectrum of these debates that we may achieve change and, perhaps, greater consensus on the place of non-human animals in our societies.

8 References

- Aguilera-Carnerero, Carmen & Margarita Carretero-González. 2021. The vegan myth: The rhetoric of online anti-veganism. In Laura Wright (ed.), *The Routledge handbook of vegan studies*, 354–365. Abingdon, Oxon ; New York, NY: Routledge.
- Aiking, H. & J. De Boer. 2019. Protein and sustainability – the potential of insects. *Journal of Insects as Food and Feed* 5(1). 3–8. <https://doi.org/10.3920/JIFF2018.0011>.
- Aleksandrowicz, Lukasz, Rosemary Green, Edward J. M. Joy, Pete Smith & Andy Haines. 2016. The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review. (Ed.) Andrea S. Wiley. *PLOS ONE* 11(11). e0165797. <https://doi.org/10.1371/journal.pone.0165797>.
- Anonymous. 2018. Animal welfare. European Society of Dog and Animal Welfare. *ESDAW Blog*. <https://www.esdaw.eu/animal-welfarism.html>. (20 February, 2024).
- Appleby, Michael C. 2003. The European Union Ban on Conventional Cages for Laying Hens: History and Prospects. *Journal of Applied Animal Welfare Science* 6(2). 103–121. https://doi.org/10.1207/S15327604JAWS0602_03.
- Baracchi, David & Luigi Baciadonna. 2020. Insect sentience and the rise of a new inclusive ethics. *Animal Sentience* 5(29). <https://doi.org/10.51291/2377-7478.1604>.
- Bartlett, Harriet, Andrew Balmford, Mark A. Holmes & James L. N. Wood. 2023. Advancing the quantitative characterization of farm animal welfare. *Proceedings of the Royal Society B: Biological Sciences* 290(1995). 20230120. <https://doi.org/10.1098/rspb.2023.0120>.
- Baxter, Emma M., Vivi A. Moustsen, Sébastien Goumon, Gudrun Illmann & Sandra A. Edwards. 2022. Transitioning from crates to free farrowing: A roadmap to navigate key decisions. *Frontiers in Veterinary Science* 9. 998192. <https://doi.org/10.3389/fvets.2022.998192>.
- Bekoff, Marc. 2009. Animal Emotions, Animal Sentience, Animal Welfare, and Animal Rights. *Psychology Today*. <https://www.psychologytoday.com/intl/blog/animal-emotions/200909/animal-emotions-animal-sentience-animal-welfare-and-animal-rights>. (20 February, 2024).
- Bentham, Jeremy. 1823. *An Introduction to the Principles of Morals and Legislation. A New Edition, corrected by the Author*. <https://earlymoderntexts.com/authors/bentham>.
- Berg, Charlotte & Hedman Frida Lundmark. 2020. Compliance with animal welfare regulations: drivers and consequences. *CABI Reviews PAVSNR202015025*. <https://doi.org/10.1079/PAVSNR202015025>.
- Birch, Jonathan, Charlotte Burn, Alexandra Schnell, Heather Browning & Andrew Crump. 2021. *Review of the Evidence of Sentience in Cephalopod Molluscs and Decapod Crustaceans*. London, UK: London School of Economics and Political Science. <https://www.lse.ac.uk/business/consulting/assets/documents/Sentience-in-Cephalopod-Molluscs-and-Decapod-Crustaceans-Final-Report-November-2021.pdf>. (21 February, 2024).
- Bjerke, Tore, Toril S. Ødegårdstuen & Bjørn P. Kaltenborn. 1998. Attitudes Toward Animals Among Norwegian Adolescents. *Anthrozoös* 11(2). 79–86. <https://doi.org/10.2752/089279398787000742>.
- Blokhuis, H. J., I. Veissier, M. Miele & B. Jones. 2010. The Welfare Quality® project and beyond: Safeguarding farm animal well-being. *Acta Agriculturae Scandinavica, Section A - Animal Science* 60(3). 129–140. <https://doi.org/10.1080/09064702.2010.523480>.
- Bolliger, Gieri. 2016. Legal Protection of Animal Dignity in Switzerland: Status Quo and Future Perspectives. *Animal Law* 22(2). 311–395.

- Boogaard, B.K., S.J. Oosting & B.B. Bock. 2006. Elements of societal perception of farm animal welfare: A quantitative study in The Netherlands. *Livestock Science* 104(1–2). 13–22. <https://doi.org/10.1016/j.livsci.2006.02.010>.
- Bracke, M. B. M. 2001. *Modelling of animal welfare: the development of a decision support system to assess the welfare status of pregnant sows*. Wageningen: Wageningen Universiteit Ph.D. <https://www.wur.nl/en/publication-details.htm?publicationId=publication-way-313232333234>. (27 November, 2023).
- Bracke, M.B.M., B.M. Spruijt & J.H.M. Metz. 1999. Overall animal welfare assessment reviewed. Part 1: Is it possible? *Netherlands Journal of Agricultural Science* 279–291. <https://doi.org/10.18174/njas.v47i3.466>.
- Braithwaite, Victoria. 2010. *Do fish feel pain?* Oxford: Oxford University Press.
- Braithwaite, Victoria A. & Paula Droege. 2016. Why human pain can't tell us whether fish feel pain. *Animal Sentience* 1(3). <https://doi.org/10.51291/2377-7478.1041>.
- Brambell, F.W. Rogers, D.S. Barbour, Lady Barnett, T.K. Ewer, Alec Hobson, H. Pitchforth, Walter R. Smith, W.H. Thorpe & F.J.W. Winship. 1965. *Report of the Technical Committee to Enquire into the Welfare of Animals kept under Intensive Livestock Husbandry System*. Command Papers. London: Secretary of State for Scotland and Minister of Agriculture, Fisheries and Food. <https://edepot.wur.nl/134379>. (11 March, 2024).
- Broom, D.M. 1986. Indicators of poor welfare. *British Veterinary Journal* 142(6). 524–526. [https://doi.org/10.1016/0007-1935\(86\)90109-0](https://doi.org/10.1016/0007-1935(86)90109-0).
- Broom, Donald M. 1996. Animal Welfare Defined in Terms of Attempts to Cope with the Environment. *Acta Agriculturae Scandinavica, Section A - Animal Science Supplementum* 27. 22–28.
- Broom, Donald M. 2011. A History of Animal Welfare Science. *Acta Biotheoretica* 59(2). 121–137. <https://doi.org/10.1007/s10441-011-9123-3>.
- Broom, Donald M. 2016. Fish brains and behaviour indicate capacity for feeling pain. *Animal Sentience* 1(3). <https://doi.org/10.51291/2377-7478.1031>.
- Broom, Donald M. 2021. Welfare in a moral world. In *Broom and Fraser's domestic animal behaviour and welfare*, 401–403. 6th edn. UK: CABI. <https://doi.org/10.1079/9781789249835.0042>.
- Broom, Donald M. 2023. Can positive welfare counterbalance negative and can net welfare be assessed? *Frontiers in Animal Science* 4. 1101957. <https://doi.org/10.3389/fanim.2023.1101957>.
- Broom, Donald M. & Ken G. Johnson. 2019. Ethics: Considering World Issues. In *Stress and Animal Welfare* (Animal Welfare), vol. 19, 193–210. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-32153-6_8.
- Browning, Heather. 2020. *If I Could Talk to the Animals: Measuring Subjective Animal Welfare*. The Australian National University. <https://doi.org/10.25911/5F1572FB1B5BE>.
- Bulliet, Richard W. 2007. *Hunters, herders, and hamburgers: the past and future of human-animal relationships*. New York, NY: Columbia Univ. Press.
- Burgess-Jackson, Keith. 2017. Doing Right By Our Animal Companions. In Clare Palmer (ed.), *Animal Rights*. 1st edn. Routledge. <https://doi.org/10.4324/9781315262529>.
- Burn, Charlotte & Animal Welfare Foundation. 2020. *What is animal welfare?* London: Animal Welfare Foundation. <http://www.animalwelfarefoundation.org.uk/wp-content/uploads/2020/09/What-is-animal-welfare.pdf>.
- Busch, G, A Schütz, S Hölker & A Spiller. 2022. Is pet ownership associated with values and attitudes towards animals? *Animal Welfare* 31(4). 447–454. <https://doi.org/10.7120/09627286.31.4.011>.

- Caviola, Lucius, Guy Kahane, Jim A. C. Everett, Elliot Teperman, Julian Savulescu & Nadira S. Faber. 2021. Utilitarianism for animals, Kantianism for people? Harming animals and humans for the greater good. *Journal of Experimental Psychology: General* 150(5). 1008–1039. <https://doi.org/10.1037/xge0000988>.
- Chan, Alvin A. Y.-H. 2012. Anthropomorphism as a conservation tool. *Biodiversity and Conservation* 21(7). 1889–1892. <https://doi.org/10.1007/s10531-012-0274-6>.
- Chan, Iris, Becca Franks & Matthew N. Hayek. 2022. The 'sustainability gap' of US broiler chicken production: trade-offs between welfare, land use and consumption. *Royal Society Open Science* 9(6). 210478. <https://doi.org/10.1098/rsos.210478>.
- Chiesa, Luis A. 2016. Animal rights unraveled: Why abolitionism collapses into welfarism and what it means for animal ethics. *Georgetown Environmental Law Review* 28. 557–587.
- Chintakayala, Phani Kumar, William Young, Ralf Barkemeyer & Michelle A. Morris. 2018. Breaking niche sustainable products into the mainstream: Organic milk and free-range eggs. *Business Strategy and the Environment* 27(7). 1039–1051. <https://doi.org/10.1002/bse.2050>.
- Coghlan, Simon. 2023. An irreducible understanding of animal dignity. *Journal of Social Philosophy* josp.12543. <https://doi.org/10.1111/josp.12543>.
- Comstock, Gary, Adam Lerner, Macarena Montes Franceschini & Peter Singer. 2022. Orangutans are persons with rights: Amicus Curiae brief in the Sandai case, requested by the Interspecies Justice Foundation. <https://philpapers.org/rec/COMOAP-4>. (29 May, 2024).
- Cooper, Richard. 2016. Improving the welfare of calves at castration and disbudding / dehorning in the UK. *Livestock* 21(2). 84–90. <https://doi.org/10.12968/live.2016.21.2.84>.
- Cudd, Ann & Seena Eftekhari. 2021. Contractarianism. In Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*. Winter 2021. Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/win2021/entries/contractarianism/>.
- Dawkins, Marian Stamp. 2008. The Science of Animal Suffering. *Ethology* 114(10). 937–945. <https://doi.org/10.1111/j.1439-0310.2008.01557.x>.
- Dawkins, Marian Stamp. 2012a. *Why animals matter: animal consciousness, animal welfare, and human well-being*. New York (N.Y.): Oxford university press.
- Dawkins, Marian Stamp. 2012b. Commercial scale research and assessment of poultry welfare. *British Poultry Science* 53(1). 1–6. <https://doi.org/10.1080/00071668.2011.628640>.
- Dawkins, Marian Stamp. 2017a. Animal welfare and efficient farming: is conflict inevitable? *Animal Production Science* 57(2). 201. <https://doi.org/10.1071/AN15383>.
- Dawkins, Marian Stamp. 2017b. Animal welfare with and without consciousness. *Journal of Zoology* 301(1). 1–10. <https://doi.org/10.1111/jzo.12434>.
- Dawkins, Marian Stamp. 2023. Natural Behaviour Is Not Enough: Farm Animal Welfare Needs Modern Answers to Tinbergen's Four Questions. *Animals* 13(6). 988. <https://doi.org/10.3390/ani13060988>.
- De Boer, Joop & Harry Aiking. 2022. Considering how farm animal welfare concerns may contribute to more sustainable diets. *Appetite* 168. 105786. <https://doi.org/10.1016/j.appet.2021.105786>.
- De Villiers, Jan-Harm. 2017. Animal Rights Theory, Animal Welfarism and the ~'New Welfarist' Amalgamation: A Critical Perspective. *Southern African Public Law* 30(2). 406–433. <https://doi.org/10.25159/2522-6800/3587>.

- D'Eath, Richard B., Bert J. Tolcamp, Ilias Kyriazakis & Alistair B. Lawrence. 2009. 'Freedom from hunger' and preventing obesity: the animal welfare implications of reducing food quantity or quality. *Animal Behaviour* 77(2). 275–288. <https://doi.org/10.1016/j.anbehav.2008.10.028>.
- Deem, Sharon L., Kelly E. Lane-deGraaf & Elizabeth A. Rayhel. 2019. *Introduction to One Health: an interdisciplinary approach to planetary health*. Hoboken, NJ: Wiley-Blackwell.
- DeGrazia, David. 1996. *Taking Animals Seriously: Mental Life and Moral Status*. 1st edn. Cambridge University Press. <https://doi.org/10.1017/CBO9781139172967>.
- DiFiore, Janet, Rowan D. Wilson & Jenny Rivera. 2022. *Nonhuman Rights Project, Inc., &c., Appellant, v. James J. Breheny, &c., et al., Respondents*. <https://www.nycourts.gov/ctapps/Decisions/2022/Jun22/52opn22-Decision.pdf>.
- Dullaghan, Neil, Peter Wildeford & David Moss. 2021. *Rethink Priorities poll: US attitudes towards insects*. San Francisco, California: Rethink Priorities. <https://rethinkpriorities.org/publications/us-attitudes-towards-insects>.
- Duncan, Ian JH. 1993. Welfare is to do with what animals feel. *Journal of agricultural and environmental ethics* 6(2). 8–14.
- EAZA Welfare Forum. 2024. What is welfare? *EAZA: European Association of Zoos and Aquaria*. <https://www.eaza.net/about-us/areas-of-activity/animal-welfare/>. (4 March, 2024).
- Eskens, Erno. 2021. Comment: Animals in 'Non-Ideal Ethics' and 'No-Deal Ethics.' In Bernice Bovenkerk & Jozef Keulartz (eds.), *Animals in our midst: the challenges of co-existing with animals in the anthropocene* (The International Library of Environmental, Agricultural and Food Ethics 33), 275–284. Cham: Springer. (30 May, 2024).
- Evans, B.R. & F.A. Leighton. 2014. A history of One Health: -EN- A history of One Health -FR- Histoire du concept « Une seule santé » -ES- Historia de «Una sola salud». *Revue Scientifique et Technique de l'OIE* 33(2). 413–420. <https://doi.org/10.20506/rst.33.2.2298>.
- Farm Animal Welfare Council. 1979. Press statement. The National Archives. <https://webarchive.nationalarchives.gov.uk/ukgwa/20121007104210/http://www.fawc.org.uk/pdf/fivefreedoms1979.pdf>. (11 March, 2024).
- Fernyhough, Mia, Christine J. Nicol, Teun Van De Braak, Michael J. Toscano & Morten Tønnessen. 2020. The Ethics of Laying Hen Genetics. *Journal of Agricultural and Environmental Ethics* 33(1). 15–36. <https://doi.org/10.1007/s10806-019-09810-2>.
- Food and Agriculture Organization of the United Nations. 2021. FishStat. <https://www.fao.org/fishery/en/fishstat>. (24 November, 2023).
- Fraanje, Walter & Tara Garnett. 2022. *Rewilding and its implications for agriculture*. TABLE. <https://doi.org/10.56661/2aa26681>.
- Francione, Gary L. 2016. Animal welfare and the moral value of nonhuman animals. In *Certain humans, certain animals: attitudes in the long term*, 57–72. Lund: Pufendorfinstitutet, Lunds universitet.
- Francione, Gary L. & William M. Kunstler. 2012. *Animals Property & The Law*. Philadelphia: Temple University Press.
- Fraser, David. 2008. Understanding animal welfare. *Acta Veterinaria Scandinavica* 50(S1). S1. <https://doi.org/10.1186/1751-0147-50-S1-S1>.
- Fraser, David. 2009. *Understanding Animal Welfare*. Chichester: John Wiley & Sons.
- Gabrijelčič Blenkuš, Mojca, Matej Gregorič, Blanka Tivadar, Verena Koch, Stojan Kostanjevec, Vida Fajdiga Turk, Aleksandra Žalar, et al. 2009. *Prehrambene navade odraslih prebivalcev Slovenije z vidika varovanja zdravja*. (Trans.) Breda Zužič Žerjal. Ljubljana: Pedagoška fakulteta.

- García Pinillos, Rebeca. 2021. One welfare impacts of COVID-19 – A summary of key highlights within the one welfare framework. *Applied Animal Behaviour Science* 236. 105262. <https://doi.org/10.1016/j.applanim.2021.105262>.
- Gibbons, Matilda, Andrew Crump, Meghan Barrett, Sajedah Sarlak, Jonathan Birch & Lars Chittka. 2022. Can insects feel pain? A review of the neural and behavioural evidence. In *Advances in Insect Physiology*, vol. 63, 155–229. Elsevier. <https://doi.org/10.1016/bs.aiip.2022.10.001>.
- Global Animal Law Association. 2023. Legislation database: Animal legislations in the world at national level. <https://www.globalanimallaw.org/database/national/index.html>. (28 November, 2023).
- Global Animal Partnership. 2021. *Global Animal Partnership Annual Report 2021*. (Global Animal Law Association 2023).
- Gregson, Rebecca, Jared Piazza & Ryan L. Boyd. 2022. 'Against the cult of veganism': Unpacking the social psychology and ideology of anti-vegans. *Appetite* 178. 106143. <https://doi.org/10.1016/j.appet.2022.106143>.
- Gregson, Rebecca, Jared Piazza & Heather Shaw. 2024. Is being anti-vegan a distinct dietarian identity? An investigation with omnivores, vegans, and self-identified "anti-vegans." *Appetite* 192. 107126. <https://doi.org/10.1016/j.appet.2023.107126>.
- Grumett, David. 2019. Aristotle's Ethics and Farm Animal Welfare. *Journal of Agricultural and Environmental Ethics* 32(2). 321–333. <https://doi.org/10.1007/s10806-019-09776-1>.
- Harfeld, Jes Lynning, Cécile Cornou, Anna Kornum & Mickey Gjerris. 2016. Seeing the Animal: On the Ethical Implications of De-animalization in Intensive Animal Production Systems. *Journal of Agricultural and Environmental Ethics* 29(3). 407–423. <https://doi.org/10.1007/s10806-016-9611-1>.
- Harrison, Ruth. 1964. *Animal machines; the new factory farming industry*. London: Stuart.
- Haynes, Richard P. 2008. *Animal welfare: competing conceptions and their ethical implications*. New York: Springer.
- Heiss, Sydney & Julia M. Hormes. 2018. Ethical concerns regarding animal use mediate the relationship between variety of pets owned in childhood and vegetarianism in adulthood. *Appetite* 123. 43–48. <https://doi.org/10.1016/j.appet.2017.12.005>.
- Herzog, Hal. 2022. *Some we love, some we hate, some we eat: why it's so hard to think straight about animals*. S.I.: Harper Perennial.
- Howard, Philip H. 2021. *Concentration and power in the food system: who controls what we eat?* Revised edition. London: Bloomsbury Academic.
- Hursthouse, Rosalind. 2012. Virtue Ethics and the Treatment of Animals. In Tom L. Beauchamp & R. G. Frey (eds.), *The Oxford Handbook of Animal Ethics*, 119–143. 1st edn. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780195371963.013.0005>.
- Izmirlı, Serdar & Clive J.C. Phillips. 2011. The relationship between student consumption of animal products and attitudes to animals in Europe and Asia. *British Food Journal* 113(3). 436–450. <https://doi.org/10.1108/00070701111116482>.
- Joy, Melanie. 2020. *Why we love dogs, eat pigs, and wear cows: an introduction to carnism*. 10th anniversary edition. Newburyport, MA: Red Wheel.
- Karlsson, Fredrik. 2012. Critical Anthropomorphism and Animal Ethics. *Journal of Agricultural and Environmental Ethics* 25(5). 707–720. <https://doi.org/10.1007/s10806-011-9349-8>.

- Kauselmann, Karen, E. Tobias Krause, Benedikt Glitz, Eva Gallmann, Hansjörg Schrade & Lars Schrader. 2021. Effect of plant-based enrichment materials on exploration in rearing and fattening pigs (*Sus scrofa domesticus*). *Applied Animal Behaviour Science* 236. 105261. <https://doi.org/10.1016/j.applanim.2021.105261>.
- Keeling, Linda, Håkan Tunón, Gabriela Olmos Antillón, Charlotte Berg, Mike Jones, Leopoldo Stuardo, Janice Swanson, Anna Wallenbeck, Christoph Winckler & Harry Blokhuis. 2019. Animal Welfare and the United Nations Sustainable Development Goals. *Frontiers in Veterinary Science* 6. 336. <https://doi.org/10.3389/fvets.2019.00336>.
- Kellert, Stephen R. & Miriam O. Westervelt. 1983. *Childrens' attitudes, knowledge and behaviors towards animals*. Phase V. U.S. Department of the Interior: Fish and Wildlife Service. <https://babel.hathitrust.org/cgi/pt?id=umn.31951p00646640j>. (1 December, 2023).
- Keulartz, Jozef. 2020. Philosophical Boundary Work for Wildlife Conservation. In Evelyn Brister & Robert Frodeman (eds.), *A Guide to Field Philosophy*, 127–142. 1st edn. Routledge. <https://doi.org/10.4324/9781351169080-9>.
- Key, Brian. 2016. Why fish do not feel pain. *Animal Sentience* 1(3). <https://doi.org/10.51291/2377-7478.1011>.
- Klein, Colin & Andrew B. Barron. 2016. Insects have the capacity for subjective experience. *Animal Sentience* 1(9). <https://doi.org/10.51291/2377-7478.1113>.
- Knight, Sarah, Aldert Vrij, Julie Cherryman & Karl Nunkoosing. 2004. Attitudes towards animal use and belief in animal mind. *Anthrozoös* 17(1). 43–62. <https://doi.org/10.2752/089279304786991945>.
- Lawrence, Alistair & Belinda Vigors. 2020. Farm animal welfare: origins, and interplay with economics and policy. In Bouda Vosough Ahmadi, Dominic Moran & Rick D'Eath (eds.), *The economics of farm animal welfare: theory, evidence and policy*, 1–29. 1st edn. UK: CABI. <https://doi.org/10.1079/9781786392312.0001>.
- Lennerz, Belinda S, Jacob T Mey, Owen H Henn & David S Ludwig. 2021. Behavioral Characteristics and Self-Reported Health Status among 2029 Adults Consuming a "Carnivore Diet." *Current Developments in Nutrition* 5(12). nzab133. <https://doi.org/10.1093/cdn/nzab133>.
- Leroy, Frédéric & Istvan Praet. 2017. Animal Killing and Postdomestic Meat Production. *Journal of Agricultural and Environmental Ethics* 30(1). 67–86. <https://doi.org/10.1007/s10806-017-9654-y>.
- Leuven, Joost. 2017. The Theory and Practice of Contemporary Animal Rights Activism. *Krisis* (2). 2–13.
- Liu, Kai, Kailao Wang, Tao Fei, Lilong Chai & Hongwei Xin. 2018. Computer Vision-Based Animal Preference Assessment – Do Laying Hen Chicks Prefer Light with UVA Radiation? In 2018 Detroit, Michigan July 29 - August 1, 2018. American Society of Agricultural and Biological Engineers. <https://doi.org/10.13031/aim.201800193>.
- Llonch, P., A.B. Lawrence, M.J. Haskell, I. Blanco-Penedo & S.P. Turner. 2015. The need for a quantitative assessment of animal welfare trade-offs in climate change mitigation scenarios. *Advances in Animal Biosciences* 6(1). 9–11. <https://doi.org/10.1017/S2040470014000405>.
- Lundmark Hedman, Frida, Jan Hultgren, Helena Röcklinsberg, Birgitta Wahlberg & Charlotte Berg. 2018. Non-Compliance and Follow-Up in Swedish Official and Private Animal Welfare Control of Dairy Cows. *Animals* 8(5). 72. <https://doi.org/10.3390/ani8050072>.
- Mellor, David. 2016. Updating Animal Welfare Thinking: Moving beyond the "Five Freedoms" towards "A Life Worth Living." *Animals* 6(3). 21. <https://doi.org/10.3390/ani6030021>.
- Mellor, David. 2017. Operational Details of the Five Domains Model and Its Key Applications to the Assessment and Management of Animal Welfare. *Animals* 7(12). 60. <https://doi.org/10.3390/ani7080060>.

- Mellor, David J., Emily Patterson-Kane & Kevin J. Stafford. 2009. *The sciences of animal welfare*. Oxford: Wiley-Blackwell.
- Mellor, David J. & C. S. W. Reid. 1994. *Concepts of animal well-being and predicting the impact of procedures on experimental animals*. Palmerston North, New Zealand: Department of Physiology and Anatomy, Massey University. <https://www.wellbeingintlstudiesrepository.org/cgi/viewcontent.cgi?article=1006&context=expawel>.
- Mellor, D.J. & J. Webster. 2014. Development of animal welfare understanding drives change in minimum welfare standards: -EN- Development of animal welfare understanding drives change in minimum welfare standards -FR- L'évolution des idées sur le bien-être animal, un facteur de changement pour la mise en place de normes minimales en la matière -ES- Una mejor comprensión del bienestar animal induce cambios en las normas mínimas de bienestar. *Revue Scientifique et Technique de l'OIE* 33(1). 121–130. <https://doi.org/10.20506/rst.33.1.2258>.
- Mendl, Michael & Elizabeth S. Paul. 2020. Animal affect and decision-making. *Neuroscience & Biobehavioral Reviews* 112. 144–163. <https://doi.org/10.1016/j.neubiorev.2020.01.025>.
- Meneses-Urrea, Luz Adriana, Manuel Vaquero-Abellán, Dolly Villegas Arenas, Narly Benachi Sandoval, Mauricio Hernández-Carrillo & Guillermo Molina-Recio. 2023. Association between Cervical Cancer and Dietary Patterns in Colombia. *Nutrients* 15(23). 4889. <https://doi.org/10.3390/nu15234889>.
- Merker, Bjorn. 2007. Consciousness without a cerebral cortex: A challenge for neuroscience and medicine. *Behavioral and Brain Sciences* 30(1). 63–81. <https://doi.org/10.1017/S0140525X07000891>.
- Meseret, Selam. 2016. A review of poultry welfare in conventional production system. *Livestock Research for Rural Development* 28. #234.
- Milburn, Josh. 2021. The analytic philosophers: Peter Singer's *Animal Liberation* and Tom Regan's *The Case for Animal Rights*. In Laura Wright (ed.), *The Routledge handbook of vegan studies*, 39–49. Abingdon, Oxon ; New York, NY: Routledge.
- Mood, A. & P. Brooke. 2019a. Estimated numbers of individuals in global aquaculture production (FAO) of fish species (2017). fishcount.org.uk. <http://fishcount.org.uk/studydatascreens2/2017/numbers-of-farmed-fish-AO-2017.php?sort2/full>. (18 December, 2023).
- Mood, A. & P. Brooke. 2019b. Estimated numbers of individuals in annual global capture tonnage (FAO) of fish species used for reduction to fishmeal & fish oil (2007-2016). fishcount.org.uk. <http://fishcount.org.uk/studydatascreens/2016/numbers-of-fish-caught-for-fishmeal2016.php>. (18 December, 2023).
- Mood, A. & P. Brooke. 2019c. Numbers of farmed decapod crustaceans. fishcount.org.uk. <https://fishcount.org.uk/fish-count-estimates-2/numbers-of-farmed-decapod-crustaceans>. (18 December, 2023).
- Moore, Gareth. 2021. Survey shows public backing for new fish slaughter laws. *Fishfarming Expert*. <https://www.fishfarmingexpert.com/fish-slaughter-scottish-salmon-company-scottish-sea-farms/survey-shows-public-backing-for-new-fish-slaughter-laws/1379402>. (6 December, 2023).
- Mormède, Pierre, Stéphane Andanson, Benoit Aupérin, Bonne Beerda, Daniel Guémené, Jens Malmkvist, Xavier Manteca, et al. 2007. Exploration of the hypothalamic–pituitary–adrenal function as a tool to evaluate animal welfare. *Physiology & Behavior* 92(3). 317–339. <https://doi.org/10.1016/j.physbeh.2006.12.003>.
- Morrison, Rachel, Maria Maust-Mohl & Kelly Charlton. 2021. Friend, Foe, or Food: What Influences Students' Attitudes Toward Animals? *Anthrozoös* 34(2). 187–200. <https://doi.org/10.1080/08927936.2021.1885137>.

- Morton, David B., Gordon M. Berghardt & Jane A. Smith. 1990. Animals, science, and ethics -- Section III. Critical anthropomorphism, animal suffering, and the ecological context. *The Hastings Center Report* 20(3). S13-19.
- Mota-Rojas, Daniel, Chiara Mariti, Andrea Zdeinert, Giacomo Riggio, Patricia Mora-Medina, Alondra del Mar Reyes, Angelo Gazzano, et al. 2021. Anthropomorphism and Its Adverse Effects on the Distress and Welfare of Companion Animals. *Animals* 11(11). 3263. <https://doi.org/10.3390/ani11113263>.
- Mueller, Megan K. 2014. The Relationship between Types of Human–Animal Interaction and Attitudes about Animals: An Exploratory Study. *Anthrozoös* 27(2). 295–308. <https://doi.org/10.2752/175303714X13903827487728>.
- Naylor, Rosamond L., Ronald W. Hardy, Alejandro H. Buschmann, Simon R. Bush, Ling Cao, Dane H. Klinger, David C. Little, Jane Lubchenco, Sandra E. Shumway & Max Troell. 2021. A 20-year retrospective review of global aquaculture. *Nature* 591(7851). 551–563. <https://doi.org/10.1038/s41586-021-03308-6>.
- Neave, Heather W., Rolnei R. Daros, João H. C. Costa, Marina A. G. Von Keyserlingk & Daniel M. Weary. 2013. Pain and Pessimism: Dairy Calves Exhibit Negative Judgement Bias following Hot-Iron Disbudding. (Ed.) Martine Hausberger. *PLoS ONE* 8(12). e80556. <https://doi.org/10.1371/journal.pone.0080556>.
- Neville, Vikki, Shinichi Nakagawa, Josefina Zidar, Elizabeth S. Paul, Malgorzata Lagisz, Melissa Bateson, Hanne Løvlie & Michael Mendl. 2020. Pharmacological manipulations of judgement bias: A systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews* 108. 269–286. <https://doi.org/10.1016/j.neubiorev.2019.11.008>.
- Newman, John Henry. 2000. *The works of Cardinal John Henry Newman. 2: Sermon notes of John Henry Cardinal Newman 1849 - 1878 / ed. by fathers of the Birmingham Oratory. With an introd. and notes by James Tolhurst.* (Ed.) James Tolhurst. Leominster: Gracewing [u.a.].
- Pacharinsak, Cholawat, Patrick Sharp, Anne Zintzsch & Sara Fuochi. 2022. Recognition of pain, distress, and suffering. In *Practical Handbook on the 3Rs in the Context of the Directive 2010/63/EU*, 181–205. Elsevier. <https://doi.org/10.1016/B978-0-12-821180-9.00005-2>.
- Palmer, Clare. 2010. *Animal ethics in context*. New York: Columbia University Press.
- Paul, E S & J A Serpell. 1993. Childhood Pet Keeping and Humane Attitudes in Young Adulthood. *Animal Welfare* 2(4). 321–337. <https://doi.org/10.1017/S0962728600016109>.
- Perino, Grischa & Henrike Schwickert. 2023. Animal welfare is a stronger determinant of public support for meat taxation than climate change mitigation in Germany. *Nature Food* 4(2). 160–169. <https://doi.org/10.1038/s43016-023-00696-y>.
- Phillips, Mary T. 1993. Savages, Drunks, and Lab Animals: The Researcher's Perception of Pain. *Society & Animals* 1(1). 61–81. <https://doi.org/10.1163/156853093X00154>.
- Pinillos, Rebeca Garcia. 2018. *One welfare: a framework to improve animal welfare and human well-being*. Wallingford, Oxfordshire, UK ; Boston, MA, USA: CABI.
- Radhakrishnan, K.S. Panicker & Pinaki Chandra Ghose. 2014. *Animal Welfare Board of India Vs. A. Nagaraja and Ors.* <https://indiankanoon.org/doc/96915158/>.
- Ralph, C. R. & A. J. Tilbrook. 2016. INVITED REVIEW: The usefulness of measuring glucocorticoids for assessing animal welfare. *Journal of Animal Science* 94(2). 457–470. <https://doi.org/10.2527/jas.2015-9645>.
- Regan, Tom. 1984. *The case for animal rights*. London: Routledge and Kegan Paul.
- Riber, Anja B., Teresa M. Casey-Trott & Mette S. Herskin. 2018. The Influence of Keel Bone Damage on Welfare of Laying Hens. *Frontiers in Veterinary Science* 5. 6. <https://doi.org/10.3389/fvets.2018.00006>.

- Riffkin, Rebecca. 2015. In U.S., More Say Animals Should Have Same Rights as People. *Gallup*. <https://news.gallup.com/poll/183275/say-animals-rights-people.aspx>. (14 March, 2023).
- Ritchie, Hannah. 2021. If the world adopted a plant-based diet, we would reduce global agricultural land use from 4 to 1 billion hectares. *Our World in Data*. <https://ourworldindata.org/land-use-diets>. (29 May, 2024).
- Rodkey, Elissa N. & Rebecca Pillai Riddell. 2013. The Infancy of Infant Pain Research: The Experimental Origins of Infant Pain Denial. *The Journal of Pain* 14(4). 338–350. <https://doi.org/10.1016/j.jpain.2012.12.017>.
- Romero Waldhorn, Daniela & Elisa Autric. 2022. *Shrimp: The animals most commonly used and killed for food production*. Preprint. Open Science Framework. <https://doi.org/10.31219/osf.io/b8n3t>.
- Rothgerber, Hank & Frances Mican. 2014. Childhood pet ownership, attachment to pets, and subsequent meat avoidance. The mediating role of empathy toward animals. *Appetite* 79. 11–17. <https://doi.org/10.1016/j.appet.2014.03.032>.
- Saha, Sparsha. 2023. Why don't politicians talk about meat? The political psychology of human-animal relations in elections. *Frontiers in Psychology* 14. 1021013. <https://doi.org/10.3389/fpsyg.2023.1021013>.
- Schneider, Kevin. 2020. The Case of Laxmi the Elephant and Animal Rights in India. *The NhRP blog*. <https://www.nonhumanrights.org/blog/laxmi-animal-rights-india/>. (29 May, 2024).
- Scrinis, Gyorgy, Christine Parker & Rachel Carey. 2017. The Caged Chicken or the Free-Range Egg? The Regulatory and Market Dynamics of Layer-Hen Welfare in the UK, Australia and the USA. *Journal of Agricultural and Environmental Ethics* 30(6). 783–808. <https://doi.org/10.1007/s10806-017-9699-y>.
- Serpell, Ja. 2019. How happy is your pet? The problem of subjectivity in the assessment of companion animal welfare. *Animal Welfare* 28(1). 57–66. <https://doi.org/10.7120/09627286.28.1.057>.
- Serpell, James A. 2005. Factors Influencing Veterinary Students' Career Choices and Attitudes to Animals. *Journal of Veterinary Medical Education* 32(4). 491–496. <https://doi.org/10.3138/jvme.32.4.491>.
- Serpell, James & Elizabeth Paul. 2002. Pets and the development of positive attitudes to animals. In Aubrey Manning & James Serpell (eds.), *Animals and Human Society Changing Perspectives*, 127–144. 1st edn. Hoboken: Taylor and Francis. (1 December, 2023).
- Shields, Sara, Paul Shapiro & Andrew Rowan. 2017. A Decade of Progress toward Ending the Intensive Confinement of Farm Animals in the United States. *Animals* 7(12). 40. <https://doi.org/10.3390/ani7050040>.
- Shin, Hyonhee. 2024. South Korea passes bill to ban consumption of dog meat. *Reuters*. <https://www.reuters.com/world/asia-pacific/south-koreas-parliament-expected-pass-bill-ban-dog-meat-trade-2024-01-09/>.
- Shorb, Cameron Meyer. 2020. Our definition of welfare. *Wild Animal Initiative*. "welfare" to refer to the aggregate quality of an individual's subjective experiences over a given time period. (11 March, 2024).
- Singer, Peter. 2015. *Animal Liberation*. Open Road Media.
- Singh, Manmohan. 2015. *People for Animals versus Md Mohazzim & Anr*. <https://indiankanoon.org/doc/163664556/>. (29 May, 2024).
- Sneddon, Lynne U. 2015. Pain in aquatic animals. *Journal of Experimental Biology* 218(7). 967–976. <https://doi.org/10.1242/jeb.088823>.
- Stahler, Charles & Reed Mangels. 2022. *How many vegetarians and vegans are there?* The Vegetarian Resource Group. <https://www.vrg.org/nutshell/CulturedMeatYouGov2022.pdf>. (11 January, 2024).

Stratmann, Ariane, Ernst K. F. Fröhlich, Alexandra Harlander-Matauschek, Lars Schrader, Michael J. Toscano, Hanno Würbel & Sabine G. Gebhardt-Henrich. 2015. Soft Perches in an Aviary System Reduce Incidence of Keel Bone Damage in Laying Hens. (Ed.) Cédric Sueur. *PLOS ONE* 10(3). e0122568.

<https://doi.org/10.1371/journal.pone.0122568>.

Tam, Kim-Pong, Sau-Lai Lee & Melody Manchi Chao. 2013. Saving Mr. Nature: Anthropomorphism enhances connectedness to and protectiveness toward nature. *Journal of Experimental Social Psychology* 49(3). 514–521.

<https://doi.org/10.1016/j.jesp.2013.02.001>.

Tarazona, Ariel M, Maria C Ceballos & Donald M Broom. 2019. Human Relationships with Domestic and Other Animals: One Health, One Welfare, One Biology. *Animals* 10(1). 43. <https://doi.org/10.3390/ani10010043>.

Taylor, Nicole. 1999. Whither rights? Animal rights and the rise of new welfarism. *Animal Issues* 3(1). 27–42.

Temple, Déborah & Xavier Manteca. 2020. Animal Welfare in Extensive Production Systems Is Still an Area of Concern. *Frontiers in Sustainable Food Systems* 4. 545902. <https://doi.org/10.3389/fsufs.2020.545902>.

The Nielsen Company. 2016. *What's in our food and on our mind: Ingredient and dining-out trends around the world*. <https://nutrimento.pt/activeapp/wp-content/uploads/2016/09/global-ingredient-and-out-of-home-dining-trends-aug-2016.pdf>. (2 March, 2024).

Tomasik, Brian. 2019. How Many Wild Animals Are There? *Essays on Reducing Suffering*.

<https://reducing-suffering.org/how-many-wild-animals-are-there/>. (19 February, 2024).

Trauth, Erin. 2021. "Friends don't let friends eat tofu": A rhetorical analysis of fast food corporation "anti-vegan-options" advertisements. In Laura Wright (ed.), *The Routledge handbook of vegan studies*, 343–354. Abingdon, Oxon ; New York, NY: Routledge.

Uexküll, Jakob Von (ed.). 2001. An introduction to Umwelt. *semi* 2001(134). 107–110.

<https://doi.org/10.1515/semi.2001.017>.

Vanderlee, Lana, Clara Gómez-Donoso, Rachel B Acton, Samantha Goodman, Sharon I Kirkpatrick, Tarra Penney, Christina A Roberto, Gary Sacks, Martin White & David Hammond. 2022. Meat-Reduced Dietary Practices and Efforts in 5 Countries: Analysis of Cross-Sectional Surveys in 2018 and 2019. *The Journal of Nutrition* 152. 57S-66S. <https://doi.org/10.1093/jn/nxac057>.

Veasey, Jake S. 2022. Differing animal welfare conceptions and what they mean for the future of zoos and aquariums, insights from an animal welfare audit. *Zoo Biology* 41(4). 292–307. <https://doi.org/10.1002/zoo.21677>.

Vissers, Luuk S.M., Helmut W. Saatkamp & Alfons G.J.M. Oude Lansink. 2021. Analysis of synergies and trade-offs between animal welfare, ammonia emission, particulate matter emission and antibiotic use in Dutch broiler production systems. *Agricultural Systems* 189. 103070. <https://doi.org/10.1016/j.agsy.2021.103070>.

Waal, Frans B. M. de. 1999. Anthropomorphism and Anthropodenial: Consistency in Our Thinking about Humans and Other Animals. *Philosophical Topics*. University of Arkansas Press 27(1). 255–280.

Weary, Dm & Ja Robbins. 2019. Understanding the multiple conceptions of animal welfare. *Animal Welfare* 28(1). 33–40. <https://doi.org/10.7120/09627286.28.1.033>.

Welfare Quality. 2008. *Welfare Quality® Assessment protocol for pigs (sows and piglets, growing and finishing pigs)*. Lelystad, The Netherlands: Welfare Quality Consortium®.

http://www.welfarequalitynetwork.net/media/1018/pig_protocol.pdf. (27 November, 2023).

Wild Welfare. undated. Animal Welfare. *Wild Welfare*. <https://wildwelfare.org/animal-welfare/>. (4 March, 2024).

- Wise, Steven & Jane Goodall. 2014. *Rattling the cage: toward legal rights for animals*. New York: Da Capo Press.
- Wise, Steven M. 2007. An Argument for the Basic Legal Rights of Farmed Animals. *Michigan Law Review First Impressions* 106. 133–137.
- Wolfensohn, S & P Honess. 2007. Laboratory animal, pet animal, farm animal, wild animal: which gets the best deal? *Animal Welfare* 16(S1). 117–123. <https://doi.org/10.1017/S096272860003181X>.
- World Animal Protection. 2022. What is animal welfare and why is it important? *News*. <https://www.worldanimalprotection.org.au/news/animal-welfare-and-why-important/>. (11 March, 2024).
- World Organisation for Animal Health. undated. Animal Welfare. *World Organisation for Animal Health (founded as OIE)*. <https://www.woah.org/en/what-we-do/animal-health-and-welfare/animal-welfare/>. (21 November, 2023).
- World Organisation for Animal Health. 2024. *Animal welfare: a vital asset for a more sustainable world*. <https://www.woah.org/app/uploads/2024/01/en-woah-visionpaper-animalwelfare.pdf>. (11 March, 2024).
- Wynne, Clive D. L. 2004. The perils of anthropomorphism. *Nature* 428(6983). 606–606. <https://doi.org/10.1038/428606a>.
- Yeates, Jw. 2011. Is 'a life worth living' a concept worth having? *Animal Welfare* 20(3). 397–406. <https://doi.org/10.1017/S0962728600002955>.
- YouGov plc. 2022. *YouGov - Vegan-only in January*. YouGov. <https://docs.cdn.yougov.com/ksydfiqjue/YouGov%20-%20Vegan-only%20January.pdf>.
- Zimmer, Markus. 2017. From the Executive Editor: Extending Court-Protected Legal Person Status to Non-Human Entities. *International Journal for Court Administration* 8(2). iii–v.