

Review

Avoiding Anthropomorphic Drift in ‘One Biology’ and ‘One Welfare’

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Abstract

Integrative frameworks such as ‘One Welfare’ and ‘One Biology’ address the interconnect-edness of animal welfare, human wellbeing, and environmental conditions by emphasising systemic interactions and shared biological mechanisms across species. Although grounded in scientific evidence, these approaches risk conceptual anthropomorphisation, whereby human-centred assumptions, emotional narratives, or cultural norms influence interpretations of welfare, sentience, or sustainability. Such projections can undermine scientific objectivity, misrepresent species-specific needs, and weaken the frameworks’ applicability in research, policy, and practice. This paper critically examines how anthropomorphising concepts may arise within this context, distinguishing empirically supported biological continuity from unwarranted human-like attributions. It highlights the importance of pre-cise language, operational definitions, and comparative evidence to safeguard conceptual integrity. While both frameworks are fundamentally non-anthropomorphic, careless lan-guage and human-centred assumptions can compromise their scientific rigour and ethical coherence. Avoiding conceptual anthropomorphisation is therefore essential to maximise their value for robust welfare assessment, policy development, and sustainable practice.

Keywords: animal welfare; anthropomorphism; human wellbeing; sustainability

1. Introduction

Research on welfare and wellbeing across animals, humans, and their shared envi-ronments increasingly recognises the need for integrative approaches that move beyond narrow disciplinary boundaries [1]. Biological, social, and environmental processes are deeply interconnected, meaning that actions in one domain often generate consequences in others. Conventional frameworks that treat human health, animal welfare, and environ-mental management as separate areas risk ignoring these interdependencies and producing incomplete or ineffective interventions [2]. In response, integrative concepts such as ‘One Welfare’ and ‘One Biology’ have emerged, offering structured ways to understand and manage these complex relationships in a manner that is both scientifically informed and ethically grounded.

‘One Welfare’ focuses on the interconnectedness of animal welfare, human wellbeing, and environmental quality [3]. It recognises that welfare is not limited to individual species and that outcomes for humans and animals are mutually influential. This framework



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promotes approaches that simultaneously consider social, economic, and ecological dimensions, thereby supporting more holistic policy development, research design, and practical application [3]. For instance, improving livestock welfare can enhance worker satisfaction and community resilience, while responsible environmental management benefits both human and animal populations. In this way, ‘One Welfare’ reflects a systems-based understanding of welfare as an emergent property of interacting biological and social systems. Better animal welfare often reduces stress and injury risks for farm workers, improves job satisfaction through more positive human–animal interactions, and can increase productivity and economic stability. These benefits extend beyond individual farms, supporting local communities through more reliable livelihoods, reduced conflicts related to animal management, and stronger social cohesion among stakeholders [4,5].

‘One Biology’ complements this approach by grounding welfare and wellbeing within a framework of evolutionary and physiological continuity among species. It is based on the premise that core biological mechanisms, including cellular processes, neural systems, cognition, and affect, are largely conserved across taxa [6]. This perspective supports the use of biologically meaningful indicators that allow for cross-species comparison while still accounting for species-specific adaptations. By emphasising shared biological foundations, ‘One Biology’ provides both scientific and ethical justification for integrating insights from human and non-human research [6].

Despite their strengths, both frameworks face an ongoing challenge in the form of anthropomorphisation. Anthropomorphism, the attribution of human traits, emotions, or motivations to non-human entities, strongly influences how people interpret animal behaviour and welfare outcomes [7]. While it can promote empathy and ethical concern, uncritical anthropomorphism may undermine scientific accuracy, obscure species-specific needs, and lead to inappropriate interventions. Interpreting animal welfare solely through human perspectives can result in decisions that prioritise human preferences over biological or adaptive realities, potentially reducing effectiveness or causing harm [8].

A frequently cited example of anthropomorphic interpretation concerns the attribution of pain in animals. Humans often infer that animals experience pain in ways that resemble human subjective experiences, based on behavioural cues such as vocalisation, withdrawal, or facial expressions. This inference can be beneficial, as it promotes empathy and encourages welfare-oriented practices, for example in veterinary care or livestock management [9].

However, anthropomorphic interpretations may also oversimplify species-specific pain responses. Different species express discomfort using behavioural and physiological signals that may not align with human expectations, and reliance on human-centred pain indicators (e.g., facial expressions or vocalisations) can lead to both under- and over-estimation of animal suffering [10]. For instance, pain recognition methods such as grimace scoring depend on human scoring of facial action units and can be biased by subjective interpretation of cues that differ across species (e.g., rodents versus livestock) because animals vary in how they express discomfort [11,12]. Additionally, pain behaviours in so-called prey species may appear subtle or “stoic,” leading to under-recognition of suffering when observers expect overt signals; conversely, vocal or expressive behaviour in other species may be anthropomorphically interpreted as intense emotional distress even when the underlying physiology differs [11].

A less visible but equally important issue is conceptual anthropomorphisation. Abstract concepts such as welfare, sentience, or sustainability may be implicitly defined using human-centred standards [13]. When human cultural or emotional norms become the default reference point, the precision and applicability of ‘One Welfare’ and ‘One Biology’

are diminished. Such conceptual bias can weaken scientific rigor, distort ethical reasoning, and compromise policy relevance.

This review paper therefore aims to critically examine the risk of conceptual anthropomorphisation within ‘One Welfare’ and ‘One Biology’. By distinguishing biologically grounded commonalities from human-centred projections, it seeks to clarify how language, narratives, and assumptions can affect scientific and ethical integrity. Addressing these risks is essential if integrative frameworks are to reliably inform evidence-based welfare assessment, policy development, and sustainable practice.

2. The Concept of ‘One Welfare’

The ‘One Welfare’ paradigm has emerged over the past decade as a holistic conceptual framework that integrates animal welfare, human wellbeing, and environmental integrity within a single transdisciplinary approach. Developed as an extension of the ‘One Health’ movement, ‘One Welfare’ explicitly emphasises the links between animal welfare and broader social and ecological outcomes, thereby helping to bridge traditional disciplinary boundaries and inform policy, education, and research strategies [3]. Its development reflects growing recognition that welfare challenges cannot be effectively addressed in isolation from social, economic, and environmental contexts.

While ‘One Health’ focuses on the interdependence of human, animal, and ecosystem health, it has often been criticised for prioritising biomedical and human-centred outcomes. ‘One Welfare’ was articulated to complement and expand this agenda by embedding welfare and wellbeing as central concerns within interdisciplinary frameworks [3]. In doing so, it extends the scope of analysis into ethical, socio-economic, and environmental domains, acknowledging that health alone does not fully capture quality of life or the broader impacts of human–animal–environment interactions.

Formally, ‘One Welfare’ is defined as a framework highlighting the links between animal welfare, human wellbeing, and the environment. Encourages interdisciplinary collaboration, supports global policy goals such as sustainability, food security, and reduction in suffering, and complements ‘One Health’ by focusing on welfare outcomes beyond clinical health [3]. Conceptually, it proposes that changes in one domain can generate direct and indirect effects across the others. This multi-directional relationship challenges isolated approaches and promotes systems thinking, where welfare, health, economy, and ecology are understood as interconnected elements of broader social–ecological systems [1].

Recent scholarship emphasises that ‘One Welfare’ broadens the traditional focus of ‘One Health’ by incorporating welfare science, human psychology, socio-economic factors, and environmental sustainability into a single, interdependent framework [14,15]. Unlike ‘One Health,’ which primarily focuses on preventing disease transmission and protecting biological health across species, ‘One Welfare’ emphasises the quality of life and well-being of animals, humans, and ecosystems as interconnected outcomes. For example, improving livestock welfare can reduce stress and injury for workers, enhance job satisfaction, and support economic stability at the community level [4,5]. Similarly, environmental management practices that benefit biodiversity and ecosystem services directly influence the welfare of animals and the livelihoods of human populations [1]. By explicitly recognising these cross-domain interactions, the ‘One Welfare’ framework provides a systems-based approach to research design, policy development, and practical interventions, ensuring that welfare, health, and sustainability goals are addressed simultaneously rather than in isolation.

A bibliometric review mapping ‘One Welfare’ research from 2013 to 2024 [1] identified a steady increase in publications and several key thematic areas. These include policy, governance, and economic analysis; applied human–animal sciences linking animal care

practices to human outcomes; broader societal, economic, and environmental dimensions; and research on the human–animal bond and mental health. Empirical studies applying the framework to agricultural systems demonstrate that animal welfare is closely linked to farmer wellbeing and environmental conditions [16,17].

Beyond agriculture, ‘One Welfare’ has been applied to socio-economic vulnerability, animal abuse, and crisis contexts, including drought and the COVID-19 pandemic, highlighting its relevance for understanding compound stressors across domains [18,19]. Recent work also suggests that ‘One Welfare’ can support more integrated governance responses to zoonotic risks and environmental challenges [15]. Recent work has begun to conceptualise ‘One Welfare’ as a framework that not only complements but also extends governance approaches to zoonotic risks and environmental challenges. By explicitly linking animal welfare, human wellbeing, and environmental sustainability, One Welfare provides a systems-oriented lens for understanding how gaps in policy and institutional frameworks can undermine public health resilience and disease control. For example, Vidal et al. [15] show that shortcomings in animal welfare regulation and surveillance amplify zoonotic threats by creating porous interfaces among livestock, wildlife, humans, and vectors, underscoring the need for integrated governance that simultaneously addresses welfare, health, and ecological factors. Similarly, García Pinillos [20] highlights how the COVID-19 pandemic exposed interdependencies among animal welfare, human wellbeing, and environmental conditions, and calls for holistic responses that integrate welfare into zoonotic risk management. Embedding One Welfare within public health, environmental, and welfare policies supports coordinated strategies that address both emerging infectious diseases and broader ecological vulnerabilities, moving beyond siloed approaches toward more resilient, multi-sectoral governance. Overall, ‘One Welfare’ represents an increasingly influential integrative paradigm that acknowledges the links between welfare, wellbeing, and sustainability [1].

3. The Concept of ‘One Biology’

The concept of ‘One Biology’ has emerged in recent years as part of an integrative scientific and ethical paradigm that emphasises the fundamental biological continuity between humans and other animals. Central to ‘One Biology’ is the assertion that core biological principles, such as physiology, development, cellular function, cognition, and welfare-related systems, are conserved across species, despite variation in their expression [6]. This perspective challenges long-standing assumptions of human biological exceptionalism by situating humans within a shared evolutionary and biological framework.

Although ‘One Biology’ has not yet generated an extensive stand-alone body of literature, it is increasingly referenced alongside integrative frameworks such as ‘One Health’ and ‘One Welfare’. Within these contexts, ‘One Biology’ functions as a conceptual foundation for transdisciplinary research seeking to dismantle artificial boundaries between species in biological thinking. Its alignment with comparative, evolutionary, and integrative biology has attracted growing attention across ecological and animal welfare sciences [6,21].

The term ‘One Biology’ entered formal academic discourse relatively recently compared with ‘One Health’ and ‘One Welfare’. It was explicitly articulated by Tarazona et al. [6], who argued that biological principles are shared by humans and all other animals, with differences reflecting species- and individual-level variation rather than fundamentally distinct processes. This conceptualisation is grounded in two well-established scientific foundations. First, evolutionary continuity and homology demonstrate that metazoans share essential biological mechanisms, including genetic coding, cellular metabolism, immune function, neurophysiology, and stress responses, e.g., [15,16]. Second, the long-standing validity of comparative biology is evident in biomedical research, which routinely

relies on non-human models precisely because of these conserved mechanisms, interpreting interspecies differences as modifications of universal biological themes, e.g., [17,18].

A central implication of ‘One Biology’ is that investigations of human biology should be contextualised alongside those of other species [6]. Research into health, disease, cognition, stress, and welfare is strengthened (not weakened) by incorporating data from diverse organisms, as shared biological patterns generate insight across taxa [22]. Importantly, this does not imply biological equivalence, but rather continuity within diversity.

‘One Biology’ is most often discussed as complementary to ‘One Health’ and ‘One Welfare’. While ‘One Health’ focuses on interconnected health outcomes across humans, animals, and environments [23], and ‘One Welfare’ extends this to include wellbeing and ethical dimensions, ‘One Biology’ provides the shared biological rationale underpinning both frameworks [21]. Supporting evidence from comparative genomics, cognition, and physiology reinforces the premise that biological mechanisms are widely conserved across species [24–26]. In this way, ‘One Biology’ offers a unifying biological framework that supports integrative research, welfare assessment, and emerging discussions around sustainable and biologically grounded policy development [27,28].

4. The Concept of Anthropomorphism

Anthropomorphism, the attribution of human-like mental states, emotions or traits to non-human animals, has a long intellectual history and continues to influence research and interpretation in the biological sciences, especially in animal behaviour and welfare studies. Within scientific contexts, anthropomorphism intersects issues of methodology, interpretation and welfare assessment, with both constructive and problematic implications for understanding animal biology and behaviour. In biological contexts, anthropomorphism is typically defined as the projection of human emotional, cognitive or motivational states onto animals without rigorous empirical evidence for equivalent mental processes [7,29,30]. This occurs when scientists, animal caregivers or the public assume that animal behaviour reflects human-like experiences such as pride, guilt or complex reasoning. Although everyday language often uses anthropomorphic terms for convenience, scientific caution is required. Going beyond rhetorical shorthand, true anthropomorphic attribution implies an inference about an animal’s internal state that may lack independent justification based on species-specific biology.

Anthropomorphic interpretation also occurs when humans assign intentionality or moral meaning to animal behaviour; for example, wild animals’ predatory actions are often interpreted using human moral categories such as “cruelty” or “malice.” Studies show that attributing human-like characteristics to wildlife, including goals and intentions, can influence people’s ethical judgments about conservation and wildlife management, often reducing support for traditional lethal control strategies and increasing demands for compassionate policies that emphasise animal welfare [31–33].

Anthropomorphic perception often varies depending on the human–animal relationship. Companion animals are frequently interpreted through emotional and cognitive frameworks closely aligned with human social relationships, leading to increased empathy and protection, as close bonds can promote the attribution of human-like traits and emotional capacities. In contrast, farm animals are often perceived through more utilitarian frameworks, with lower levels of anthropomorphic attribution, which may reduce empathetic engagement and attenuate concern about welfare practices. These differences demonstrate that anthropomorphic tendencies are shaped not only by species characteristics but also by cultural and social contexts, including the nature of human–animal interactions and societal roles assigned to different animal categories [9,34].

Anthropomorphic framing is widely used in conservation communication, for example by portraying animals as possessing human-like personalities or emotional narratives. Such strategies have been shown experimentally to increase public empathy and support for wildlife conservation by enhancing emotional engagement and pro-environmental intentions [31,35]. However, conservation communication that foregrounds anthropomorphic or charismatic depictions also tends to skew public attention and support toward species that are visually appealing or emotionally relatable, potentially neglecting ecologically important but less charismatic taxa [36].

The debate over anthropomorphism in animal sciences is deeply rooted in the history of comparative psychology and ethology. A crucial methodological principle arising from this history is Morgan's Canon, formulated in the late 19th century by C. Lloyd Morgan [37], and asserting that: "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale." Morgan's Canon was intended to constrain unwarranted anthropomorphic explanations in scientific interpretation by favouring simpler, less assumption-laden explanations where possible. It remains a foundational heuristic in comparative animal cognition and behaviour, influencing how researchers construct hypotheses and evaluate evidence [37]. Critically, while Morgan's Canon reduces the risk of over-interpreting complex mental states in animals, some scholars argue that rigid application can itself be limiting when animals do possess advanced cognitive capacities comparable to humans in certain dimensions [38,39].

In animal psychology and behaviour research, anthropomorphism is treated both as a bias to be controlled and, paradoxically, as a heuristic tool. Reviews in comparative science caution that attributing human-like capacities (e.g., feelings of resentment or moral reasoning) to animals without robust evidence can lead scientists astray, mischaracterising species-specific behavioural mechanisms, e.g., [5]. This is especially pertinent in domains such as inequity aversion, prosocial behaviour or death responses, where human social cognition creates a natural interpretive bias [7]. A mindful approach is thus advocated: anthropomorphic language may be used if it is explicitly defined, justified and aligned with species-specific evidence rather than assumption. This helps maintain scientific rigour while recognising that animals may experience biologically meaningful affective states [7].

Anthropomorphism significantly influences animal welfare science. On one hand, attributing human-like experiences to animals can heighten empathy, motivating individuals and professionals to improve care standards. Empathy-driven concern can increase recognition of pain, distress or discomfort, thereby enhancing welfare outcomes. For example, owners who see dogs as capable of emotions like anxiety or "missing" an owner are more likely to attend to these states in welfare assessments [40]. On the other hand, inaccurate anthropomorphic attributions can compromise welfare when human preferences override species-specific needs. A systematic review of dog welfare highlighted how certain anthropomorphic practices, such as feeding inappropriate human foods or dressing animals, can have adverse physiological and behavioural effects (e.g., heat stress, malnutrition) [40]. Similarly, studies with horse carers reveal that anthropomorphic interpretations can distort welfare judgements, such as overvaluing longevity over species-appropriate quality of life or misidentifying behavioural indicators of pain due to human baselines for comfort [41].

Anthropomorphism exerts both positive and negative influences in animal science research: It can act as a heuristic to generate testable hypotheses about animal cognition and affective capacities. In areas where empirical evidence suggests high similarity between human and non-human processes, anthropomorphic framing may align with evolutionary continuity in neurobiology and behaviour, guiding research design [9]; It can also create bias, leading to misinterpretation of animal behaviour and over-attribution of human

constructs such as guilt or complex social motives where simpler mechanisms suffice. This is particularly problematic if it obscures species-specific adaptive strategies or leads to misleading conclusions about cognitive sophistication [7].

In welfare contexts, conflating human emotional ideals with animal needs can result in welfare decisions that satisfy human preferences rather than biological realities, potentially undermining animal wellbeing. Best practice in animal science involves explicit awareness and mitigation of anthropomorphic bias. Several approaches are recommended: As operational definitions, behavioural and cognitive states should be operationalised in terms of measurable, species-appropriate indicators rather than inferred human categories [41]; As comparative evidence, interpretations should be grounded in cross-species comparative evidence, using phylogenetic and neurobiological data where available [7,41]; finally as heuristic with caution approaches, anthropomorphic language may be deployed as a heuristic if it catalyses research questions, provided it is critically assessed and empirically validated [7]. As such, acknowledging empathy as a role in human–animal bonding can improve welfare engagement, but behavioural interpretations must be ecological and species-sensitive to avoid misattribution [9].

5. Discussion

Anthropomorphism has long shaped human understanding of animals and nature. In scientific, ethical and policy debates, anthropomorphism occupies an uneasy position as it can foster empathy and public engagement, yet it also risks distorting biological reality and undermining conceptual clarity. In recent years, integrative frameworks such as ‘One Biology’ and ‘One Welfare’ have gained prominence in discussions of animal welfare, human wellbeing and sustainability. These frameworks are explicitly grounded in biological continuity and systems thinking, yet they are frequently misunderstood as anthropomorphic in nature. This misunderstanding itself reflects a deeper problem: the anthropomorphisation not merely of animals, but of the concepts used to describe biological and ethical phenomena [42].

Anthropomorphism is most often discussed in relation to animals, where it refers to projecting human mental states, motivations or moral capacities onto non-human species. However, a more subtle and pervasive form occurs when abstract concepts, such as health, welfare, sentience or sustainability, are imbued with human-centred meanings not biologically justified. This form of anthropomorphisation does not merely misrepresent animals; it distorts the conceptual tools used to analyse biological systems [34].

Conceptual anthropomorphisation typically arises when human experience is treated as the default or normative reference point. Concepts are then implicitly defined by human social structures, cultural expectations or emotional responses rather than by empirically grounded biological criteria. This can lead to confusion between scientific description and moral evaluation, particularly in interdisciplinary frameworks that aim to integrate biology, ethics and policy [43,44].

Anthropomorphism is often treated as a general cognitive bias; however, research suggests that it arises from identifiable psychological and evolutionary mechanisms. Humans possess highly developed social cognition that evolved to interpret the intentions, emotions, and mental states of conspecifics. According to Urquiza-Haas and Kotrschal [45], this cognitive architecture is frequently extended to non-human animals, leading humans to attribute mental states and motivations to other species. Rather than representing a source of error solely, anthropomorphic thinking may serve as a heuristic that facilitates empathy and improves human ability to anticipate animal behaviour.

From an evolutionary perspective, such tendencies are not arbitrary but may represent an extension of mechanisms originally selected for navigating complex social environments. This

perspective aligns with von Uexküll's concept of "Umwelt", which proposes that each species perceives and interacts with the world through species-specific sensory and cognitive filters. Humans, therefore, interpret animal behaviour through an inherently human perceptual and conceptual framework, making some degree of anthropocentrism unavoidable.

Importantly, anthropomorphic interpretations may generate both beneficial and problematic consequences. In some contexts, they may foster concern for animal welfare and promote ethical engagement; however, inappropriate or uncritical anthropomorphism may result in misinterpretations of species-specific behavioural needs or ecological roles. The likelihood and impact of such misinterpretations vary across animal taxa, particularly depending on factors such as phylogenetic proximity to humans, behavioural similarity, and perceived emotional expressiveness. For example, anthropomorphism has been shown to support empathy and welfare engagement when applied thoughtfully in comparative affective research, but also to lead to welfare misreadings and behavioural misunderstandings when grounded in human-centric expectations rather than species-specific knowledge [7,46].

Recognising anthropomorphism as a structured and biologically grounded cognitive process allows for a more nuanced evaluation of its role in shaping human perceptions of animals and supports the development of communication and management strategies that balance empathy with scientific accuracy.

A common source of confusion is the assumption that recognising similarities between humans and other animals necessarily entails anthropomorphism. This assumption reflects an implicit belief that human traits are unique and that any recognition of shared capacities must therefore involve projection. However, acknowledging similarity based on empirical evidence is not anthropomorphic; it is biologically accurate [7,29].

Recognising that many animals experience pain is not anthropomorphism when pain is defined biologically as an aversive state associated with tissue damage and mediated by neural mechanisms. Anthropomorphism arises only when pain is assumed to carry the same subjective narratives, cultural meanings or reflective awareness that it may have for humans [47]. 'One Biology' requires this distinction: shared mechanisms must be acknowledged, while unwarranted assumptions about subjective experience must be avoided. Thus, 'One Biology' demands conceptual discipline. Similarities must be demonstrated, differences respected, and neither sentimental projection nor human exceptionalism allowed to dictate definitions.

The concepts of sentience and welfare are particularly vulnerable to anthropomorphisation. Sentience is defined as the capacity to have feelings, requiring certain levels of awareness and cognitive processing [48]. This capacity can be investigated through behavioural, neurological and physiological evidence across species. Anthropomorphisation occurs when sentience is equated with human-like traits such as language, self-reflection or moral reasoning, thereby excluding species that lack these traits but possess the capacity to suffer or experience pleasure.

Similarly, welfare is defined biologically as the state of an individual in relation to its attempts to cope with its environment [49]. This definition applies to all animals, including humans. However, welfare is often implicitly framed in terms of human lifestyles, emotional expressions or ideals of fulfilment. Such framing risks imposing human values onto animals whose biological needs and adaptive strategies differ markedly. Within the 'One Biology' framework, welfare and sentience are not moral metaphors but scientific concepts. Anthropomorphising them weakens both scientific assessment and ethical reasoning by substituting intuition for evidence.

From a 'One Biology' perspective, similarities in cognitive and affective mechanisms across species provide a scientifically grounded basis for generating hypotheses about

how various animals perceive and respond to their environment. Research in comparative cognition shows that many cognitive processes previously thought to be uniquely human are instead shared in simpler or analogous forms across a range of non-human species, suggesting continuity rather than a sharp cognitive divide between humans and other animals [25]. For example, non-human animals can exhibit behavioural and mental processes that parallel human cognition when appropriate measures are used, supporting the idea that evolutionary continuity underlies many cognitive phenomena [50]. Integrating human-typical empathy with species-specific behavioural and ecological knowledge can therefore be valuable: empathy can function as a heuristic that highlights potentially similar processes, while biological data ensure interpretations remain grounded in species-relevant contexts. This combined approach allows researchers to explore cross-species similarities without assuming identical mental experiences, advancing both comparative science and our understanding of animal welfare and cognition [25,50].

Despite its scientific grounding, 'One Welfare' is sometimes interpreted through an anthropomorphic perspective. This occurs when welfare is framed primarily in emotional or symbolic terms rather than as a measurable biological state [51]. Public discourse may rely on narratives of shared suffering, companionship or moral reciprocity between humans and animals, which, while emotionally compelling, can obscure the framework's analytical foundations [48].

Anthropomorphisation within 'One Welfare' can also manifest as the assumption that improving animal welfare requires providing animals with experiences that resemble human ideals, such as freedom of choice, aesthetic environments or social structures modelled on human society. While such features may benefit certain species, their value must be established empirically rather than assumed based on human preference [52]. Conversely, human welfare may be implicitly prioritised as conceptually superior, with animal welfare considered only instrumentally. This reintroduces anthropocentrism and undermines the integrative intent of 'One Welfare' [3].

Another risk lies in anthropomorphising relationships themselves. Human–animal relationships are often described using terms such as friendship, trust or loyalty. While these terms may capture observable behavioural patterns, they can mislead when used as the basis for welfare policy or ethical judgment. Good intentions and emotional attachment do not guarantee good welfare outcomes; structural conditions, management practices and environmental constraints are often more decisive [3].

Similarly, environmental components of 'One Welfare' are sometimes anthropomorphised by attributing welfare, suffering or moral status directly to ecosystems [53]. While environments are ethically valuable, welfare in the biological sense applies only to individuals capable of experiencing states of coping or distress. 'One Welfare' does not claim that environments have welfare, but that environmental degradation adversely affects the welfare of humans and animals who depend on them [54].

The anthropomorphisation of concepts has significant implications for ethics and policy. Policies shaped by anthropomorphic assumptions may prioritise symbolic actions over effective interventions or may respond to public sentiment rather than scientific evidence. Conversely, rejecting 'One Biology' or 'One Welfare' as "anthropomorphic" reflects a misunderstanding of their foundations and reinforces unjustified human exceptionalism [45,55].

Both frameworks support proportionate, evidence-based decision-making. They allow welfare trade-offs to be assessed transparently and encourage interventions delivering measurable improvements rather than human emotional intuitions. This is particularly important in food production, public health, disaster response and environmental management, where complex interactions need conceptual precision.

To preserve the integrity of ‘One Biology’ and ‘One Welfare’, careful attention must be paid to language, definitions and assumptions. Concepts such as welfare, health and sentience must retain consistent biological meaning across species, while allowing for species-specific differences in expression. Emotional engagement should be recognised as a motivational tool, not a substitute for scientific analysis. Education, research and communication play critical roles in preventing conceptual anthropomorphisation. Clear definitions, explicit distinctions between description and evaluation, and rigorous use of comparative evidence are essential.

6. Future Research Directions

Further research is required to strengthen the application of ‘One Welfare’ and ‘One Biology’ while minimising the risk of conceptual anthropomorphisation. Empirical studies should investigate how human-centred assumptions influence welfare assessment, management decisions and policy development across different contexts, including livestock production, companion animal care, conservation and environmental governance. Understanding how anthropomorphic framing affects outcomes would help identify where conceptual bias undermines biological accuracy and ethical effectiveness.

Methodological research is also needed to refine species-appropriate welfare and sentience indicators that are grounded in comparative biology while remaining sensitive to ecological and behavioural specificity. Developing assessment tools that integrate physiological, behavioural and cognitive measures within ‘One Biology’ and ‘One Welfare’ frameworks would improve consistency and scientific robustness.

In addition, interdisciplinary research should examine how language, education and public communication shape interpretations of welfare and biological similarity, particularly where emotional narratives may obscure scientific meaning. Finally, policy-focused studies evaluating the implementation of ‘One Welfare’ and ‘One Biology’ in governance frameworks could assess their capacity to support evidence-based, sustainable decision-making. Advancing these research aspects would help ensure that integrative welfare frameworks retain conceptual clarity, scientific rigour and practical relevance.

7. Conclusions

The concept of ‘One Welfare’ provides a valuable framework for understanding the interconnections between animal welfare, human wellbeing, and environmental conditions. Its effectiveness, however, depends on avoiding the anthropomorphisation of concepts that can obscure biological realities and weaken ethical reasoning. By grounding welfare in biological evidence rather than human emotions or cultural narratives, ‘One Welfare’ preserves conceptual clarity while still supporting meaningful moral concern. In the biological and animal sciences, anthropomorphism functions both as a methodological challenge and a limited conceptual tool. While it reflects natural human tendencies and genuine evolutionary continuities in affective and cognitive systems, uncritical anthropomorphism can bias scientific interpretation and compromise welfare assessment. Disciplines, such as comparative psychology, ethology, and welfare science, therefore stress the need for caution, clear definitions, and empirical validation when using human-like descriptions of animal states. Anthropomorphisation of abstract concepts poses a broader risk in discussions of biology, welfare, and sustainability. The frameworks of ‘One Biology’ and ‘One Welfare’ counter this risk by emphasising biological continuity and systems thinking rather than emotional projection or human exceptionalism. Avoiding anthropomorphisation is not a rejection of compassion but a requirement for responsible, evidence-based action that genuinely improves welfare outcomes.

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