COORDINATORS:
Irina Frasin • George Bodi • Cătălina Daniela Răducu

EXPLORING CONNECTIONS, HIERARCHIES AND TRANSFORMATIONS IN MORE-THAN-HUMAN WORLDS

Anthrozoology Studies

Presa Universitară Clujeană

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Director: Codruţa Săcelean
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E-mail: editura@ubbcluj.ro
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Introduction

Irina Frasin*

Recent events and phenomena make it more clear to us than ever that we are living on a planet with rapidly changing living conditions. The balance that made possible the flourishing of life as we know it is shifting. The immense living web full of wonderful creatures who inhabit the Earth and contribute to its richness and support this balance is suffering. The Anthropocene created issues, problems and challenges for humanity and our fellow more-than-human earthlings who share this planet. We are keenly aware that we are agents of change, at times reshaping our world beyond recognition, bringing about pollution, intoxicated atmosphere, and global warming. But unfortunately, rationally acknowledging our impact is not sufficient to bring about change. We need to reach deeper, to go beyond our favoured human-centred way of seeing the world and truly meet the other beings in this extensive network of life and interconnections.

When we slowly begin to open toward different ways of being, when we admire the tremendous complexity of other ways of life and existence, when we discover the worlds of our fellow earthlings, defined by their specific sensory capacities, where our access is limited, we are growing hope for change. The studies collected in the present volume invite you to think about those whom, until recently, we labelled irrelevant, inconsequential, or insignificant others - such as most non-human animals, and how exploring their worlds has begun to change our perspective. When we analyse the various and different

* "Gheorghe Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch; Email: irinaada@gmail.com

ways in which all of us, human and non-human, are affected by climate change and the disruption of usual life cycles, we ultimately re-discover our shared vulnerability and also our sense of belonging. And by becoming keen explorers of these other beings and their complex worlds, we are motivated to find ways to heal our connections, re-thinking affiliations, and re-discover our shared sources of sanity and balance.

The book opens with an invitation to question and re-think our own humanity and animality, not in a dualistic manner, as we are so used to, but in an inclusive way. **Marco Adda** writes about *zoosomatics*, a new practice that embraces interspecies relationality and challenges anthropocentric paradigms. A new way of knowing is brought to the fore, reminding us that we are also complex beings and not just rational agents. We were culturally taught to doubt our senses and question our emotions as being misleading and unreliable. But when we let ourselves re-connect to our emotions, sensibility, sensoriality, corporeality, we get the chance to become attuned, responsive and aware of the interdependence and interconnectedness of all life. Questioning our human limitations and exploring the worlds and senses of other fellow beings, this chapter challenges you to explore new ways of getting beyond the human-animal divide and re-discover reciprocity and empathy.

The next study, signed by **Liviu Adrian Măgurianu** and **Daniel Măgurianu**, takes us a step further in this direction by exploring ways in which the other animals have been our teachers, models and incessant sources of inspiration. Animals have different senses and ways of perceiving and shaping their worlds; they have instructive and fascinating ways to adapt to the strangest and harshest (from our perspective) environments on the planet, and these insights made us look up to them for ways to find solutions, adapt and improve our technologies. From medical treatments and devices to engineering

masterpieces, animals played such an important role, but unfortunately, they didn't always receive credit for their part in the process. This chapter reminds us of some important animal-inspired inventions and urges us to always think about our *silent teachers*. But sometimes, as we see from the next chapter, animals, their societies and group organization served not as models but as justifications for our own oppressive and unjust cultural and social norms. **Cătălina Daniela Răducu** invites us to see our political systems, hierarchies and leadership values through the lens of evolutionary biology, primatology and gender studies. Contested by many as being *unnatural*, female leadership is well represented across different species, many mammals and even some of our closest primate relatives. Violence, war and male-dominated hierarchies are not intrinsic to our nature and political success. Critically thinking about how we got to this *status quo* proves very useful for clearing our minds of stereotypes and prejudice and prepares us to open our hearts towards new imaginings.

The following two chapters concentrate on legal and political discussions around our relationship with the other species. **Cosmin Mărtinaș** and **Jetlira Selmani** focus on animal work and the legal recognition of it. As we have previously seen, animals have been our models, inspiration and constant companions and, all along history, they have worked by our side, served us in times of war and peace and helped shape our society and economy into what they are today. But for their huge contribution they received poor recognition. And even today, when we begin to acknowledge their presence and role, their work is still not recognized or legislated properly. The authors bring significant aspects of animal work and exploitation into our focus and urge us to re-think about things that we usually take for granted. The next study, signed by **Lavinia Andreea Bejan,** is a thoughtful analysis of the United Nations' Sustainable Development Goals, where the

author highlights the parts regarding other species and the attention (or lack of) given to the other animals. Discussing sustainable development is unavoidable to acknowledge the finitude of nature and its resources. But it is also of utmost importance to build a more inclusive vision of the future where "we", as so beautifully suggested by the author, would refer to all sentient beings and "our world" will truly name not only the "human world" by that of "all life".

The next chapter, in line with the protection of nature and its inhabitants, brings to the fore shark-fishing practices in the Bahamas, where fishing still exists, even after being banned. **Sarah Oxley Heaney** and **Cristina Zenato** take us into a fascinating and, at the same time, troubling journey into the underwater world of sharks. We discover the uncomfortable truths about illegal fishing but, most of all, we are face to face with the suffering of sharks and the humans who deeply care about them. Unable, as a society, to recognize the truly deep meaning of such bonds, we are condemned to face the results of our neglect and ignorance. But beyond suffering, absence and mistreatment, hope still prevails as the authors so beautifully state that small, meaningful actions have the potential to change the world.

The next three chapters focus on dogs and the dog-human relationship. Central as they are in our life today, dogs get plenty of attention. They are our constant companions, our work colleagues and our entertaining friends. But in fact, the more we know about them, the more we feel there is even more to discover, and our friendship story with the dogs continues to unravel. **Anna L. Arnaudova-Otouzbirova** invites us to better understand fear-induced aggression in our dogs. Aggressive behaviour is a stigma, condemning our dogs to misunderstanding and sometimes neglect. Focusing on it may help both caregivers and dogs live better, more balanced and fulfilled lives. The study of **Gabriela Munteanu** focuses on dogs' perceptual universe, especially their sense of sight. We all know dogs live in a

landscape of smells, and they heavily rely on their sense of smell and hearing to orient in the world. But also, dogs' vision, although less studied, is extremely important when it comes to better understanding them and better living side by side. **Kinga Szabo** concentrates on how dogs communicate with their humans using body postures and also their gaze. Looking each other in the eyes is important for deepening our bonds, but also for getting attention and communicating without words.

In the last chapter of the book **Irina Frasin** asks us to think about our companion animals in their most vulnerable moments, when they get old and sick, and when they need us more than ever. Reflecting on palliative care, quality of life issues and ethically important questions regarding end-of-life care and our responsibility, this chapter is an opportunity for finding ways to build more symmetrical relationships with our animal companions, both more compassionate and more just.

In the end, when we get face to face with our fellow earthlings, we have a chance to alter our perceptions and change our human-centred focus. This book invites you to discover the fascinating worlds of other creatures and their special relationships with us, humans, and challenges you to try doing the same in everyday life. Looking with curiosity, respect and awe at the wonders of life and seeing the other beings as special and unique, leading meaningful, interesting lives is holding the promise of a different future for us all. And not in the least, we will then be able to discover our true humanity, beyond ages of cultural and power struggles. Looking beyond our anthropocentric ideologies, we may find that we underestimated our fellow earth dwellers to our detriment, missing the chance to understand how amazing nature truly is and to discover our rightful place in it.

Zoosomatics: Animal Resonance and Shared Perceptions

Marco Adda*

Abstract

Zoosomatics emerges at the convergence of multiple disciplines, offering a multidimensional framework to explore and value human–nonhuman animal interaction. At its core, zoosomatics proposes an embodied process that foregrounds sensory experience, movement, and affective resonance as vital means of engaging with nonhuman life. Rather than approaching animals through symbolic, representational, or scientific abstraction alone, zoosomatics fosters a direct, bodily mode of knowing that emphasises co-presence and interspecies relationality. This approach challenges anthropocentric paradigms by repositioning the human from a detached observer to a participant in an extended field of ecological entanglement. As both a pedagogical and epistemological medium, zoosomatics reconsiders embodied practice as a mode of inquiry and world-making. It aligns with posthumanism and deep ecological thought. It emphasises the interconnectedness of life and the ethical imperative of responsiveness to other species through felt experience. Rediscovering animality, zoosomatics contributes to developing interspecies sensitivity and care, expanding the ethical and imaginative possibilities for living with and learning from nonhuman beings.

Keywords

zoosomatics, bodymind, ecosomatics, perception, ethology, posthumanism, human-animal interaction, animality, anthrozoology

Zoosomatics invites a transformative re-embodiment of human experience through the sensory, spatial, and kinetic modalities of nonhuman[1] animals. The term fuses two conceptual domains: *zoo*

* Independent Researcher; AEDC Anthrozoology Education Dogs Canines; Human-Animal Interaction Research Lab, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania. Email: marcogerardoadda@gmail.com

[1] In this essay, the expressions "nonhuman" or "other-than-human" are used interchangeably.

(from the Greek *zōon*, meaning animal) and *somatics* (from the Greek *sōma*, body), implying a bodily practice grounded in animal modes. It enquires about the processes of our bodies, senses, and movements when informed by nonhuman animals' sensory orientations, spatial dynamics, and movement qualities. Hence, *zoosomatics* is about opening the bodymind to alternative logics of perception, presence, and relation, and practitioners can access unfamiliar rhythms, activate dormant bodily intelligences, and cultivate a more relational mode of being that blurs the boundaries between species and challenges anthropocentric notions of identity and agency.

This paper focuses on the conceptual framework of *zoosomatics*. The term—and its practices—emerge from years of exploration at the junction of human embodiment and animal presence. My engagement with this inquiry is rooted in a long-standing involvement in anthrozoology and animal behaviour studies, and equally in decades of somatic training, theatre practice, and actor coaching. I facilitate workshops across diverse geographies and cultural environments in these contexts, each revealing new facets of how the human bodymind listens, adapts, and attends to interspecies presence. Parallel to this work, my lifelong practice of martial arts—particularly traditions grounded in animal forms—has opened deep channels of inquiry into the possibility of becoming-other through movement, providing an avenue to investigate how animality can be enacted, embodied, and transformed within the human sensorium. In these practices, animals are not simply metaphors or styles; they are not performed or represented. They are invited. What arises is not an aesthetic shape, but rhythms, tensions, and forms of knowing. Animals are living, dynamic vehicles for alternative modes of sensing, responding, and inhabiting the world.

Through these converging lines of experience, I began to observe and experiment with integrating animal behaviours, movements and sensibilities into somatic work as a mode of inquiry. This phenomenological engagement revealed the tremendous potential that such practices have in expanding proprioception, altering habitual motor patterns, and evoking new layers of attention and empathy. As a trainer and facilitator, I have witnessed how engaging animality within the body can catalyse shifts in human awareness toward the self and other species. It is this space of resonance—between human and nonhuman animal, between body and environment, between form and expression—that *zoosomatics* seeks to investigate and articulate.

Throughout zoosomatic work, practitioners often report unexpected shifts: a renewed sensitivity to sound and vibration, an altered spatial awareness, a reconfiguration of emotional tone, an awakened intuitive state, and a spread sense of wellbeing, among others. For example:

> The day after the masterclass, I felt the need to crawl on the floor at home. I wanted to roll on the ground and walk like an animal, and my body was fully activated and my feet were finally alive." *(Tristana, personal communication, May 2024)*
>
> On the days following the masterclass, I noticed that I was observing animals and insects in their movement and behaviour very closely, almost like I was feeling what the animal was doing and how she or he was moving. I was experiencing a stronger sense of empathy with that animal". *(Enrica, personal communication, May 2024)*

Zoosomatics workshop in Trieste, Italy, May 2024. Photo: Marco Adda.

These accounts are traces of somatic reconfiguration. They point to the transformative capacities of interspecies resonance, where movement, attention, and emotion realign through shared perception. When animality enters—or is reawakened from within—the human body pulses, coils, expands, bounces, absorbs, listens, and waits. It drives the body to its edges and beyond, drawing attention inward and outward into relation. When animality moves through us, we begin to move and perceive differently through the world.

Rather than detailing specific practices or methods, which I have begun to outline elsewhere (Adda 2024)—and which I will develop further in the future—this contribution examines the conceptual ground upon which *zoosomatics* stands. The aim is to delineate the conceptual contours of *zoosomatics* as both an analytical framework and a field of inquiry. At the same time, this work seeks to locate *zoosomatics* within the broader conversations surrounding the body and perception, as well as within contemporary discussions about animals and interspecies relations.

Moreover, the aim is to highlight the multidisciplinary currents within which *zoosomatics* finds both fertile terrain and reflective resonance. Rather than being shaped by external influences in a linear manner, *zoosomatics* mirrors—and is mirrored by—diverse epistemologies, ranging from somatic practices and performing arts to phenomenology, anthropology, neurosciences, animal studies, posthumanism, and ecological thought. In this contribution, we will briefly review some of these currents and voices. This is by no means an exhaustive overview; rather, it is intended as a conceptual orientation, offering the reader a sense of the foundations and directions that *zoosomatics* can open, inhabit, and contribute to.

On one hand, *zoosomatics* offers a lens to revisit pre-existing practices, such as martial arts, yoga, performance training, and calisthenic training, which draw on animal forms and sensory modalities. On the other hand, it serves as a generative epistemological space for investigating emergent questions related to embodiment, interspecies relationality, affective attunement, and ecological consciousness. In this dual capacity, *zoosomatics* provides both a means of integrating disseminated practices and a ground for advancing new somatic, ethical, and theoretical explorations. This includes articulating how *zoosomatics* intersects with—or runs parallel to—broader philosophical currents that question the human-animal divide, foreground the body as a site of knowledge, and expand our understanding of relationality and perception. In doing so, this work aims to contribute to an ongoing dialogue about how the human-animal divide can be rethought through the lens of multispecies entanglement and, in this case, affective embodiment. Here, such a divide becomes porous, perception expands beyond anthropocentric norms, and the ethical dimensions of embodiment are reimagined through lived encounter. The aim is to articulate a practice space—a threshold, an opening, an invitation—for practitioners, scholars, and

thinkers to engage *zoosomatics* as a generative tool: a way to rethink somatic practices through the pulse of animality, and to explore human and nonhuman entanglements in ways that are embodied, experiential, and affectively rich. In doing so, *zoosomatics* may offer new pathways for dwelling in a more responsive, reciprocal, and interwoven world.

The Long Trajectory

The relationship between humans and other species is foundational to our history and development. Across human evolution, nonhuman animals have acted as both models and sources of inspiration, shaping human innovation, movement, perception, and modes of expression. From the earliest traces of our ancestry, nonhuman animals have acted as more than mere companions or competitors: they have served as ontological mirrors, perceptual provocateurs, and kinetic models. The human capacity to imagine flying, swimming, leaping, or climbing finds its roots in physical potential and a long-standing practice of interspecies observation and co-presence (see DeMello 2012; Marchesini 2022; Shepard 1996). Animality shaped how we move, perceive, communicate[2] and create. In this light, human distinctiveness—conjectured as autonomous or exceptional—emerges instead as deeply co-constituted through the continuous presence of other-than-human lives.

[2] The patterned vocalisations of other animals, for instance, may well have catalysed early iterations of music or proto-language, suggesting that the roots of human expression are at least partially co-authored. See Dissanayake, Ellen. 2000. *Art and Intimacy: How the Arts Began*. Seattle: University of Washington Press; Taylor, Hollis. 2017. *Is Birdsong Music? Outback Encounters with an Australian Songbird*. Bloomington: Indiana University Press.

Despite the deep interconnection, the rise of anthropocentric worldviews—accelerated during the Renaissance and the Enlightenment—has imposed a hierarchical separation between humans and other animals. Cartesian dualism, which posited animals as automata devoid of mind or soul, set forth human exceptionalism (Descartes 1637/2006). This perspective is further entrenched throughout the Anthropocene, an epoch characterised by intensified human impact on the biosphere (Crutzen & Stoermer 2000).

Recent decades, however, have seen a rupture in this narrative. The so-called "animal turn" across the humanities and social sciences signals not simply a renewed interest in animals, but a fundamental rethinking of the human. This shift troubles the boundaries between species, opening conceptual and ethical space for cohabitation, entanglement, and multispecies accountability (Burt 2002; Weil 2012). Fields as varied as philosophy, literary theory, environmental humanities, and ethology are increasingly attuned to the presence of nonhuman animals not as background noise, but as interlocutors in shared lifeworlds (Rowan et al. 2021). Anthrozoology, in particular, foregrounds this multidimensional relationality, mapping the affective, symbolic, and practical interactions that shape human-nonhuman animal relations across time and culture (see Serpell 2006). Posthumanism takes this discourse further. It advocates for the decentring of the human—what is also termed post-anthropocentrism—emphasising relationality, multispecies agency, and the dismantling of human–animal dichotomies (Haraway 2008; Wolfe 2010; Ferrando 2019), as we shall see further in the discussion.

Cultural Roots of Embodied Animality

A crucial—though often underappreciated—dimension of human-nonhuman animal relationality emerges through embodied animality, incorporating animal movements, behaviours, and

energetics within human corporeal traditions. This interplay is not merely metaphorical but somatically inscribed, echoing through martial disciplines, ritual choreographies, and embodied knowledge systems across cultures and historical epochs. In such contexts, human movement does not simply imitate the animal but is modulated and informed by animal presence—both real and imaginal—as a source of affective, kinetic, and perceptual attunement.

Martial arts offer a particularly vivid terrain for this phenomenon. Certain traditions openly adopt animal forms as core structural and pedagogical components, drawing, for example, on the stealth of the feline, the sinuousness of the serpent, the nimbleness of the monkey, or the grace of birds to cultivate nuanced physical intelligences and psychological dispositions. This is evident in Chinese martial arts employing animal forms (Adda 2022b; de Almeida 2022; Phillips and Mroz 2016). These are not decorative steps but patterns through which practitioners reconfigure proprioception, response thresholds, and intercorporeal[3] awareness.

Ritual dances and ceremonial performances reveal parallel dynamics. Ethnographic and performative studies illustrate how animals are not simply represented but *inhabited*—with their movements, gestures, and vocalisations integrated into collective acts of transmission and transformation (Kaeppler 2000; Desmond 1997). Such enactments may serve aesthetic or theatrical purposes and function as ecological pedagogy. They also articulate cosmological

[3] Marratto, investigating *Merleau-Ponty's work,* offers an in-depth analysis of subjectivity arising from the dynamic interplay between one's own body and the bodies of others, emphasising that our sense of self is co-constituted through these embodied relationships (see Marratto, Scott L. 2012. *The Intercorporeal Self: Merleau-Ponty on Subjectivity*. Albany: State University of New York Press). What if these embodied relationships are with nonhuman animals? What sense of self emerges? These are core *zoosomatics* inquiries.

views and enact rites of passage or communal healing (see Turner 1969; Bird-David 1999). Animal forms in these contexts become co-constituents of human cultural expression, shaping how communities relate to the more-than-human world and themselves.

These practices resist—and indeed subvert—the epistemic scaffolding inherited from Cartesian dualism, which partitions body from mind, culture from nature, human from animal. In contrast, the relational logic embedded in these corporeal traditions points to porous boundaries and reciprocal becoming. It foregrounds the nonhuman animal as neither object nor metaphor, but as a dynamic participant in shaping embodied human consciousness[4] across historical periods and cultural contexts (Ingold 2000; Viveiros de Castro 2004). This orientation waves toward rethinking knowledge itself, not as an abstracted and disembodied phenomenon, but as interspecies and somatically rooted. In other words, to move with and through the animal disrupts anthropocentric ontologies and epistemologies, opening toward other ways of sensing, knowing, and being in the world.

Perception, Sensing and Zoosomatic Resonance

The Cartesian substances, long foundational in Western thought, were increasingly challenged in the 20th century, especially within

[4] The term *consciousness* is contested and multifaceted. Across academic disciplines, no singular definition prevails; its meanings diverge significantly across cognitive science, phenomenology, anthropology, and philosophy of mind. These debates become particularly charged when consciousness is extended beyond the human or approached through non-dualist, relational ontologies. In this paper, *consciousness* is employed in a broad and situated sense, referring to modes of embodied awareness and perceptual engagement, often co-shaped through interspecies and somatic encounters. This usage aligns with posthumanism and decolonial perspectives that reconceive cognition not as a uniquely human faculty but as a relational process, ecologically embedded and entangled with the more-than-human.

disciplines that emphasised the felt experience of movement. Fields such as dance, theatre, and somatic practices became crucial spaces for exploring the integration of movement, sensation, perception, consciousness, and expression, and for disrupting the primacy of the brain (Shusterman 2008). In these contexts, the body emerges not merely as an instrument of the mind but as a thinking, sensing, and expressive entity in its own right. Pioneers such as Rudolf Laban and Mary Wigman in dance, and Konstantin Stanislavski, Jerzy Grotowski, and Eugenio Barba in theatre—among many others—reconceived the body as a site of inquiry and knowledge production. The concept of bodymind articulates the inseparability of mental and physical processes (Zarrilli 2009, 2002), and various somatic methodologies—such as the Feldenkrais Method and the Alexander Technique—have advanced practices that refine self-perception and kinaesthetic intelligence, challenging dominant cognitive paradigms by shifting epistemological focus from the brain to the whole organism (see Hanna 1976; Eddy 2009). These developments resonate with *zoosomatics*, which explores how human somatic awareness can be transformed through relational attunement with animal bodies and existences. Meaningful interaction arises from sensing co-presence, extending the bodymind into an interspecies field of reciprocity. *Zoosomatics* thus aligns with the transition from a psychophysical model to what Camilleri (2020) calls the post-psychophysical bodyworld: a performative, ecological entanglement of bodies, spaces, and, for our discussion, nonhuman agencies.

Let us now consider a range of perspectives that contribute to a deeper understanding of the issues at stake.

Maxine Sheets-Johnstone repositions the body not as a passive vessel for cognition, but as a dynamic, sensing, and self-moving being, fundamentally engaged with the world through movement (Sheets-

Johnstone 2011). Likewise, her notion of animated forms invites recognition of all living creatures—human and nonhuman—as expressive, motile bodies whose meanings and subjectivities are revealed not through language, but through the qualitative textures of movement. In *zoosomatics*, these ideas encourage practitioners to attune to the kinaesthetic intelligence shared across species, emphasising perception through movement rather than detached observation. This framework dissolves hierarchical divides between human and animal, fostering instead a felt dialogue of motion, presence, and affective resonance, where movement becomes both the medium and message of interspecies communication. Sheets-Johnstone thus provides a critique of mind-centred embodiment theories and a vital affirmation of movement as the ground of being, perception, and connection—essential insights for a somatically grounded, ethically attuned interspecies practice[5].

Merleau-Ponty recognised perception as an active, embodied engagement with the world rather than a passive reception of stimuli. The "lived body" is the primary site of perception and experience (Merleau-Ponty 1962). Building on this phenomenological foundation,

[5] Sheets-Johnstone articulates a compelling critique of the term "embodiment", particularly concerned with its passive connotation, as if the body is merely a container into which consciousness or mind are inserted. In her *The Primacy of Movement*, she rightly argues that such language often fails to capture the dynamic, kinetic reality of the lived body as it moves, senses, and generates meaning from within. Nonetheless, I continue to use the term embodiment here, not to denote a static condition, but as a processual, relational, and sensorial becoming that foregrounds movement, perception, and interspecies affectivity. While I share Sheets-Johnstone's concern that the term can obscure the primacy of movement and reiterate the separation of mind and body, I retain it to signal a broader ecological and pedagogical stance in which bodies, or forms—human and nonhuman—are understood not only as moving, but as moved, in reciprocal flows of responsiveness, resonance, and meaning-making.

Thomas Csordas (1994) proposed embodiment as a methodological approach in anthropology, where the body is the existential ground of culture and self. Csordas views perception as culturally mediated and rooted in the sensorium—the bodily senses that apprehend and interpret the world.

Tim Ingold challenges representational models of perception by proposing an ecological view in which perception arises through embodied movement and lived engagement with the environment. Drawing on Heidegger's concept of "dwelling" (1951), Ingold argues that humans—and all sentient beings—are immersed in their surroundings, growing into textures, rhythms, and affordances through ongoing participation. In this relational ontology, perception and knowledge emerge not from detachment but from dwelling—continuous, situated activity defined by a dynamic, attuned interplay between beings and their environment (Ingold 2000, 2011). David Howes's sensory anthropology further expands this view by showing how the senses are culturally constructed and variable, challenging Western primacy of vision (Howes 2005).

At the intersection of embodiment and ecology, deep ecology—an environmental philosophy and social movement—has profoundly influenced ecosomatic practices. Deep ecology critiques anthropocentrism by emphasising the intrinsic value of all beings and

the interconnectedness of life. Ecosomatics[6] emphasises the body as a site of relationality and ecological awareness, enabling direct, felt experience of what Arne Næss (1995) terms the "ecological self." David Abram (1996) extends this perspective by integrating deep ecology with phenomenology and embodied perception, laying the groundwork for how we sense and move within ecological systems.

Bruno Latour's reconfiguration of the modern nature/culture divide also underpins *zoosomatics*, particularly through his insistence on the agency of nonhuman entities and the entanglement of humans within multispecies networks (Latour 2004). He proposes a relational ontology where forms emerge through dynamic assemblages of movement, perception, and encounter (Latour 2014). *Zoosomatics* thus emerges as a situated practice of knowing-with rather than knowing-about, fostering an embodied relationality that is ethically attuned and ontologically porous.

Zoosomatic discourse also draws on Derrida's deconstruction of the human/animal divide, emphasising animals' embodied existence beyond linguistic or cognitive capacities and challenging the exclusivity of human subjectivity (Derrida 2008). Engaging Derrida's approach, *zoosomatics* reimagines human and animal corporeality as a

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[6] *Zoosomatics* and ecosomatics share intertwined developments. While ecosomatics often centres on the body's relationship to landscapes, natural elements, and broader ecologies, *zoosomatics* focuses on the sensorial, affective, and kinetic relationship between human and animal bodies. As ecosomatics does mostly with the vegetal world, *zoosomatics* does with nonhuman animals and fosters a form of embodied resonance that gives rise, as for ecosomatics, to ethical responsiveness: By moving with and through animality, one becomes more perceptive of the presence, needs, and vulnerabilities of other species. In both cases, sensitivity emerges not from intellectual understanding alone, but from direct bodily experience, through which we become more open to care for the nonhuman, not out of moral obligation, but through a felt sense of co-presence.

shared site of existence and ethical accountability. This reveals a liminal zone where the animal body constitutes the human, shaping gestures, affective responses, and modes of presence. The reverse possibility, that is, the human body influencing the "becoming" of the nonhuman animal, remains an open question within zoosomatic inquiry.

In continuity with philosophical and anthropological views, neuroscience deepens our understanding of lived experience and sensory engagement. Antonio Damasio (1999) highlights that "core" consciousness emerges from the brain's mapping of bodily states, especially those linked to emotion and homeostasis. Similarly, Craig (2002) stresses interoception—the awareness of internal bodily signals—as essential to forming a subjective self, grounding consciousness firmly in the body's ongoing regulation and feelings.

In recent decades, biotensegrity has transformed our view of bodily structure, emphasising continuous tension held by discontinuous compression (Levin 1980; Scarr 2014). Moving beyond the linear, lever-based musculoskeletal model, biotensegrity offers a systems-oriented perspective in which stability and mobility emerge from distributed tension within the fascial network. This aligns closely with zoosomatic practice, which regards the bodymind not as a mechanical assembly but as a living, sensing organism shaped by its relational environment. Central to this perspective is fascia—the body-wide connective tissue web—understood as structural support and a sensory interface. Rich in mechanoreceptors and interoceptive nerve endings, fascia is crucial in movement awareness, spatial perception, and affective tone (Schleip et al. 2012). It becomes a site of animal resonance—a medium through which the body can attune to and express nonhuman movement principles. Thus, biotensegrity and fascial intelligence form part of the anatomical and epistemological ground of *zoosomatics*. They allow us to conceive of movement not as

isolated action, but as the expression of a relational, adaptive field, where perception, tension, and morphology co-emerge. Through this lens, human movement is situated within a larger web of interspecies continuities.

These insights form the basis for a more integrative understanding of the sensorial body as a site where the world is both sensed and constituted, inviting us to reconsider perception as an intersubjective, embodied phenomenon. Our capacity to resonate with other-than-human animals' presence, affect, and movement emerges from a deeply embedded somatosensory intelligence. *Zoosomatics* develops as a theoretical and practical advance toward an integrative model of interspecies perception and consciousness.

Anthropomorphism, Zoomorphism, Anthropodenial, Posthumanism

Anthropomorphism—attributing human traits, emotions, or intentions to nonhuman animals—has long been viewed with scepticism in scientific discourse. It has been dismissed as a projection that obscures objective understanding, often criticised for lacking empirical rigour (Kennedy 1992). Especially during the rise of behaviourism (starting early in the twentieth century), attributing conscious or emotional states to animals was seen as unscientific or sentimental. However, this stance faded with the advent of ethology and subsequent cognitive ethology and affective neuroscience, which provided empirical grounds for reconsidering animal minds (Griffin 1976, 1984; Bekoff 2002; Panksepp 2005). Scholars increasingly argue that a total rejection of anthropomorphism may hinder our capacity to recognise continuity across species and empathically engage with animals' experiences (de Waal 1999). In fact, rather than entirely erroneous, anthropomorphism may reflect a natural cognitive inclination rooted in our evolutionary sociality. Human beings are wired to interpret behaviour through intentional and emotional

frameworks. Denying this interpretative mode altogether may result in anthropodenial

> […] the a priori rejection of shared characteristics between humans and animals […] wilful blindness to the human-like characteristics of animals or the animal-like characteristics of ourselves […] It reflects a pre-Darwinian antipathy to the profound similarities between human and animal behaviour (e.g., maternal care, sexual behaviour, power seeking) noticed by anyone with an open mind. (de Waal 2006, 65)

While anthropomorphism risks over-attributing human traits to animals, anthropodenial under-attributes them, dismissing clear behavioural, neurological, or emotional parallels because of a rigid insistence on human uniqueness. When applied critically and with awareness of its limitations, anthropomorphism can function as a heuristic entry point into understanding animal sentience and subjectivity. Its considered use can bridge the experiential gap between humans and nonhuman animals, featuring relationality (Bruni et al. 2018; Servais 2018). Those reflections invite a form of "critical anthropomorphism" (Burghardt 2007), where human analogies are used cautiously and always tethered to species-specific ecological and behavioural knowledge. In this way, anthropomorphism becomes not a distortion but a methodological tool that acknowledges embeddedness in evolutionary, emotional, and perceptual continua.

The opposite tendency to anthropomorphism—zoomorphism—also deserves attention. Derived from the Greek *zōon* (animal) and *morphē* (form), zoomorphism refers to attributing nonhuman animal characteristics, behaviours, or forms to humans, objects, deities, or abstract concepts. This course is particularly evident in mythologies,

arts, and rituals, where animals often symbolise specific traits or divine presences (see Crist 1999; Daston and Mitman 2005). Such projections appear not only in symbolic representations, but also in everyday language and cultural narratives—e.g., "sly as a fox" or "strong as an ox." While zoomorphism can risk simplifying or essentialising human and animal characteristics, it also speaks to an ancient impulse to understand ourselves in relation to other life forms. Zoomorphism—like anthropomorphism—can be seen as a transactional instrument rather than a final interpretive act. Zoomorphic operations often serve as stepping-stones toward deeper experiential encounters, especially when followed by embodied engagement. Thus, instead of viewing zoomorphism merely as a fallacy or error, it may be reinterpreted, particularly within embodied practices, as part of a developmental process of interspecies attunement. This is where *zoosomatics* offers a significant contribution. Rooted in embodied animality, it creates a space in which human bodies engage with animal presences not only through imaginative or symbolic means, but through somatic resonance, co-motion, and intercorporeal sensing:

> […] how else explain why in hearing or reading descriptions of bodily comportments and corporeal and intercorporeal behaviors, whether those offered by primatologists, novelists, or Foucault, we need no interpreter, but know immediately — in our bones — what it is to stare and be stared at, what it is to be tall or large, what it is to walk in an assured, majestic manner or with a bold step, what it is to charge like a bull. (Sheets-Johnstone 2011, 304)

Hence, *zoosomatics* helps negotiate and elaborate anthropomorphism and zoomorphism, providing a terrain to explore

and perceive other-than-human animals via human embodied experience. Rather than projecting meaning *onto* animals or appropriating their forms *into* human frameworks, *zoosomatics* invites a reciprocal process of "becoming-with" (Haraway 2008), where relational understanding emerges through movement, breath, rhythm, and embodied attention. This somatic relationality fosters an ethics of encounter—a mode of interspecies communication that resists anthropocentric dominance and symbolic abstraction (Varela et al. 1991; Abram 1996; Manning 2016).

Ultimately, *zoosomatics* seek not to deny the human tendency toward metaphor and identification, but to redirect it through lived, sensory-based processes that honour difference while exploring connection. It becomes a robust framework for navigating the tensions between sameness and alterity, projection and presence, self and other. Through *zoosomatics*, humans explore the essential characteristics of being a living, sensing being, rather than attempting to become a different species or merely replicate their behaviour. In other words, *zoosomatics* advocates for a respectful "encounter" between species, where humans can meet and be inspired by nonhuman animals without projecting human intentions or assuming animal ones. Empathy, sensory awareness, and ecological connection foster interspecies understanding.

Zoosomatics intersects deeply with posthuman discourse by offering an embodied approach that challenges anthropocentric conceptions of identity, knowledge, and relationality. Drawing on the premise that the human is not a fixed, superior category but a fluid, interspecies manifestation, zoosomatic practice emphasises movement, sensation, and co-presence as tools for undoing the human/animal divide. In posthumanism, as articulated by thinkers such as Rosi Braidotti and Francesca Ferrando, the notion of the "human" is deconstructed as a historically contingent, culturally

loaded category tied to Eurocentric, colonial, and patriarchal narratives (Braidotti 2013; Ferrando 2019). *Zoosomatics* responds to this by inviting practitioners to engage in bodily practices that foreground animality, not as something to be overcome or suppressed, but as a vital and intelligent dimension of being.

By moving like animals, sensing through non-typically-human modalities, zoosomatic work enacts a relational ethics rooted in mutual shaping. This process allows for reconfiguring subjectivity, moving from the autonomous and rational self toward a porous, interconnected existence. Barad's (2007) concept of intra-action is also echoed here, as *zoosomatics* reveals that agency is not located within the individual but emerges through dynamic, embodied relationships between species, environments, and material forces.

Those perspectives reopen the possibility for humans to be animals —and, via human animality, for animals to be humans— not by erasing the boundaries between species, but by inhabiting the interstitial space where sensory, emotional, and kinetic resonances occur. It invites us to consider embodiment not as uniquely human, but as a shared modality of existence, where animality pulses within the human bodymind. This expression of posthumanism does not idealise the animal, nor diminish the human. Instead, it destabilises the anthropocentric frame by allowing animal presence and knowledge to permeate human perception and expression. In this light, animality is integrated—or perhaps re-integrated—not only as an object of inquiry, but as a lived, somatic potential. It must be explored, felt, questioned, and enacted through embodied practice, creating a field of mutual becoming that challenges the long-standing separation between humans and other animals.

Reclaiming Animality

Animality is profoundly inherent in humans. We are part of the animal kingdom, sharing deep biological, behavioural, and emotional homologies with other species (Panksepp 2005; Preston and de Waal 2002). Over time, however, we have distanced ourselves from this reality. The belief that we stand apart from —and above— the rest of the animal world has led to a gradual disconnect, not only from other animals but also from and within our own bodies, resulting in a sense of isolation and even a fragmented experience of being (Abram 1996). Despite this, humans possess an innate capacity for empathy and resonance with other living beings. This ability is deeply embodied; a "felt sense" (Gendlin 1978; De Jaegher 2013) that can be re-awakened and cultivated by consciously exploring animal-like movements, sounds, or breathing patterns. In doing so, dormant aspects of our animal nature find new forms of self-expression that feel both novel and ancient, familiar yet long forgotten. This reactivation invites what we might call an "eco-reciprocity," a renewed somatic dialogue reattuned to the rhythms, signals, and forms of expression integral to other living beings and natural personae (Kohn 2013).

Incorporating animality into human movement is not an act of borrowing but a form of homecoming. The movements of crane, tiger, snake, dolphin, bison, chimp, gorilla, mantis, eagle, whale, spider, and shark—among many others—act as vectors of return and transformation. Each species brings a unique form of somatic intelligence: The coiling elasticity of a snake, the sudden directional shift of a shark, the aerial "stillness" of a bird. These distinctive movements offer rich lessons in body awareness and spatial orientation. Through practice, these animal forms can become vehicles for perceptual expansion, inviting to explore new ways of relating to the world. They offer opportunities to reconfigure how we experience tension, space, time and gravity, among other principles, helping us to

challenge habitual patterns of movement and perception. By engaging with these forms, we cultivate a deeper connection with ourselves, expanding awareness of our environment. That also fosters greater empathy for the animals we embody.

Relevant to say, not all animals resonate equally with all practitioners. Cultural frameworks, personal histories, symbolic systems, and media imaginaries profoundly shape which animals evoke somatic recognition, attraction, or resistance. For example, spiders may serve as a rich source of inspiration in contemporary dance, where their multi-limbed articulation opens up new movement logics, and traditional dances such as the Tarantella from the Puglia region, which historically emerged as a ritualistic response to spider bites. Conversely, in contexts marked by strong spider aversion, like urban settings where fear and discomfort around spiders prevail, drawing artistic inspiration from spiders may be unwelcome or rejected. In other words, cultural and ideological value systems influence and sometimes constrain which animal forms are allowed to "enter" the human sensorium. However, the reverse may also occur, namely, animal resonances can disrupt normative frames, inviting practitioners (and communities) to question inherited hierarchies, psychological and behavioural encryptions. In this sense, somatic encounters with animality carry the transformative potential of moving, thinking, valuing, and relating, and can impact individuals and societies.

Zoosomatics is about entering into a respectful somatic dialogue. As clarified earlier, such exploration is not a modern invention but is deeply rooted in human culture. Across times and geographies, animal forms have helped humans express hidden or heightened aspects of their species' distinctiveness. While most humans have disassociated from animality, *zoosomatics* invites us to return, not backwards, but inwards and across. It reminds us that other animals have always

supported our journey of self-discovery. They have always been there, not only in the ecological world, but in our dreams, archetypes, and movements. They continue to guide us—if we listen—showing us who we are, where we are headed, and how we can live with greater responsibility toward ourselves, other species, and the planet we share.

The engagement with other species shaped our skills, perceptions, instincts, and technologies, making animality an inseparable "presence" within human life. By learning from animals, humans improved survival strategies and developed social structures, collaborative approaches, and adaptive methods. Biomimicry is a modern term for a very ancient practice: Humans have been observing and emulating animals to innovate tools, techniques, and structures for thousands of years. Birds and insects, for example, have inspired everything from aerodynamic designs in aviation to sonar technology based on echolocation in bats and dolphins. Engineers study animal locomotion to design efficient robots, while architects draw inspiration from natural structures, such as the intricate constructions of termite mounds. Each innovation is a further tribute to how deeply ingrained animals—*silent teachers*—are in the human imagination and practical world (Măgurianu and Măgurianu 2024). This learning process does more than shape individual skills and technologies; it reflects "animality" as embedded in human nature.

Zoosomatics builds on this inheritance, offering a means to intentionally recover these connections, reawakening the animal presence within ourselves, honouring the countless ways other species have taught and inspired us. It allows to resonate and reconnect with a vast, shared legacy of interspecies continuity, knowledge, and creativity. Such approach to animality fosters a profound sense of ecological belonging, reminding us—somatically—that human existence is interwoven with other beings' lives and intelligences.

Conclusions

Zoosomatics is maturing through initiatives like the IPPT (International Platform for Performer Training) in 2023, the Anthrozoology Symposium in 2024, the AIP (Anthrozoology as International Practice) Conference in 2025, the Genius Loci International Symposium of Ecosomatic Arts in 2025, and other conference presentations and workshops where participants explore interspecies embodiment through movement, voice, and sensory experience. Its development is also evident in practice-based writings such as *Leaving the Cave* (Adda 2022a), *Actor's Score, Martial Arts and Animality: From the Animal Turn to Zoosomatics* (Adda 2024), and forthcoming publications. Looking ahead, *zoosomatics* offers fertile ground for applications in education, human–animal studies, the arts, and somatic therapies. It also holds promise in animal sanctuaries and bioparks, supporting ethical engagement and multispecies learning.[7]

At its core, *zoosomatics* emerges from deeply felt connections—what might be called *zoosomatic resonance*. These are the embodied bonds humans form with animals, not just as guardians, researchers, or companions, but through sensory and affective attunement. The work of Jane Goodall with chimpanzees (1986) and Marc Bekoff on

[7] *Zoosomatics* in the performing arts also intersects with the work of Una Chaudhuri, whose theorisation of *zooēsis* explores how live performance can restore an animal's presence—not as spectacle, but as sentient being—on the stage. Chaudhuri challenges the representational mode—where animals appear as props or illustrations—and instead invites a performative encounter that reengages our affective and sensory intimacy with animal life (see Chaudhuri, Una. 2016. *The Stage Lives of Animals. Zooesis and Performance*, London-New York, Routledge). Similarly, Gabrielle Moleta's practice-based work engages bodies in multispecies dialogue, often through performative installations and somatic workshops in shared ecological settings. Her choreography foregrounds the unpredictable emergence of nonhuman agency—a site where human and nonhuman bodies co-respond in real time. Those experiences align with zoosomatic aims by emphasising presence, embodiment, and interspecies mutuality in performance spaces.

animal emotions (2007) are core example of how empathy can bridge the human–nonhuman divide. Nevertheless, cultural narratives often undermine such connections, reducing animals to metaphors and reinforcing species hierarchies (Wolfe 2002). *Zoosomatics* offers a framework to reclaim and articulate these lived, intercorporeal affinities.

In an age of ecological urgency, encounters with nonhuman animals are not only ethical questions but existential invitations. These moments ask us not to observe or dominate, but to *feel-with*, *move-with*, and *become-with*. Resonance arises through breaths, motions, flesh, skin, and shared spaces, and it is not metaphorical. It shifts perceptions, awakens empathy, and attunes us to the lives around us. In reconnecting with our animality, we soften boundaries and begin to sense *with*, rather than *about*, other beings. This embodied realisation cultivates an experiential ethics—an attuned, responsive awareness of interdependence. *Zoosomatics* nurtures this wisdom: a sensing intelligence that strengthens our responsibility toward other species and kindles a living commitment to honour and protect the diversity of life.

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Silent Teachers.
Nature's Lessons in Technological Design

Daniel-Oliver Măgurianu *, Liviu Adrian Măgurianu**

Abstract

Creativity is a gift that homo sapiens have been proud to possess since the discovery of fire. Language and revolutionary innovation help us develop the technologies of the future. But inspiration has not manifested itself without some support or model in nature. It is natural for nature to inspire technology. The problem is that this inspiration is little known or publicised. In this article, we would like to present some interesting examples of how animals have contributed to the development of technology throughout the ages. From medicine to state-of-the-art fighter jets, animals continue to be a life-saving source of inspiration. From this point of view/perspective, we believe that animals deserve much more appreciation and respect when we consider/considering that without them, technology would not have been able to save many human lives or provide us with the everyday comforts we all enjoy. Animals, on the other hand, use their own technology to survive without destroying the balance of ecosystems. In this area of environmental protection, we should also learn from animals, who seem to be our silent, patient and inspiring teachers without taking any credit.

Keywords

creativity, inspiration, nature, animals

Human beings' desire to approximate, even minimally, some of the daily performances observed in animals can be traced back to the very beginnings of Homo sapiens' existence, who presumably attempted to imitate certain sounds, craft specific tools or weapons, and develop various forms of camouflage. Homo sapiens likely drew inspiration from the effectiveness observed in wild animals to survive or hunt. These sources of inspiration may have significantly

* Ensorinstituut, Oostende, België; Email: mdanieloliver@yahoo.com

** "Gheorghe Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch; Email: liviu.magurianu@acadiasi.ro

contributed to the development of the human brain. It can be argued that social-cultural/sociocultural and technological advancements have always been propelled by the animal and plant worlds.

Starting from ancient Greece, with the well-known legend of Icarus (De Myttenaere 2023), which dramatically expresses humanity's longing to fly, we can also reflect briefly on the great painter and scientist Leonardo da Vinci, who drew in detail the earliest helicopters, airplanes, parachutes, tanks, anemometers, the first robot, the first diving suit, and other details of the human body viewed from both inside and outside ("Leonardo Da Vinci Inventions" 2014). The human capacity for observation and imitation represents one of the abilities developed over time; however, most great discoveries have been inspired by nature—the animal and plant kingdoms.

Returning to the modern era, we observe a more pronounced technological leap inspired by the animal kingdom. Of course, this leap could only be supported by an ancient foundation. An impressive artifact housed at the British Museum is a glass cup representing King Lycurgus, dragged into the underworld by Ambrosia. Surprisingly, when illuminated from the exterior, the cup appears green; when lit from the inside, it appears red, while King Lycurgus is depicted in violet ("Lycurgus Cup - an Overview | ScienceDirect Topics" n.d.).

King Lycurgus attempted to kill Ambrosia, a devotee of the god Dionysus. Nevertheless, she called upon Mother Earth and was subsequently transformed into a vine. She then entwined herself around the king, holding him captive. This scene is depicted on the Lycurgus Cup. Dionysus, Pan, and a satyr are shown mocking and tormenting the condemned king, who became entangled in Ambrosia's vine over his arrogance.

It was believed that the theme of this myth—the triumph of Dionysus over Lycurgus—might have been chosen to refer to a contemporary political event, specifically the defeat of Emperor

Licinius (who reigned from 308 to 324 AD) by Constantine in 324 AD. Transmission electron microscopy analysis revealed the presence of tiny metallic particles, typically 50–100 nm in diameter. X-ray analysis showed that these nanoparticles are composed of a silver-gold alloy, with a silver-to-gold ratio of approximately 7:3, additionally containing about 10% copper. The identification of particles within the silver-gold alloy confirms the earlier hypothesis that the dichroic effect is caused by colloidal metal. Furthermore, besides these metallic particles, the glass was found to contain numerous small particles (15–100 nm), which proved to be sodium chloride particles. The chlorine likely originates from mineral salts used to increase alkalinity during glass production (Freestone et al., 2007). This nanoparticle-based model was discovered by the Romans and may have been inspired by the colours observed on butterfly wings, which operate on the same principle.

Even more interesting is that this principle is now employed to create metasurfaces or metamaterials used as decoders of wireless brainwaves transmitted from one person to another, both facing a computer. In this way, the first attempts at telepathic transmission of simple information via brain waves have been carried out (Ma et al., 2022).

At the same time, researchers and engineers have taken inspiration from butterfly wings to develop solar panels with properties similar to those of metamaterials, thereby saving energy and significantly improving efficiency, as these engineers state: "The colours of butterfly wings are not created by dyes but are made up of tiny nanostructures that manipulate and filter reflected light, creating the wide variety of colours we see on their wings. In our FES project, we create tiny nanostructures capable of manipulating light for transmission purposes. They can be designed to exhibit asymmetric transmission" ("Future Energy Systems" 2023).

Mosquitoes and Injections

Mosquitoes, the smallest insects in our daily lives, have served as sources of inspiration in medicine through their well-known bites. The goal has always been to develop bites that do not cause pain and are minimally invasive, representing an ideal for any medical intervention. A minimally invasive needle is highly desirable in many treatments, such as biopsy, transdermal drug delivery, neural interfaces, and lancets for puncturing and bleeding in diabetics. In particular, diabetics need to draw blood for measuring glucose levels, which is essential for health monitoring. Their skin is pricked with the solid metallic needle of a straight lancet to induce small bleeding, which is painful.

The mosquito's proboscis should serve as a good model for painless insertion. The proboscis is composed of several parts: the labium, labrum, pharynx, two maxillae, and two mandibles. Accordingly, combined needles have been manufactured, consisting of a central straight needle and two outer serrated needles, mimicking the labrum (the upper lip in insects and mammals) and the two maxillae of the mosquito. Previous observations by authors have described the cooperative insertion movement of the mosquito's proboscis, where the central and outer needles advance alternately, with vibration frequencies reaching several tens of Hz, while the three needles gradually move forward. The efficacy of inserting these needles cooperatively has been confirmed experimentally (Izumi et al., 2011). It appears that these model-based needles, inspired by the mosquito, are very effective in prostate biopsies (Li et al., 2020).

Bioluminescent Fireflies

To remain within the insect domain, fireflies represent an ideal model for the development of highly efficient LED lights. Insect lanterns feature microstructures or asymmetric microscopic

projections that emit light. Researchers at Penn State University discovered that by adding microstructures to the surface of LEDs—typically characterized by symmetric projections—and replacing the symmetric structure with an asymmetric structure having an obtuse angle, a new surface is created that allows more light to escape. This innovation enhances the light extraction efficiency by 90%, making the LEDs more effective (Chen et al., 2019).

Shells and Adhesive

Incredible solutions inspired by nature abound in anything connected to life. Molluscs, specifically shells, form the basis for the development of the strongest adhesive known on the market. Researchers have unravelled how mussels adhere to wet surfaces. They created a biomimetic polymer model containing proteins with the amino acid DOPA, which ensures the adhesive's strong adherence. In a study published in the journal ACS Applied Materials & Interfaces, scientists observed that this glue functioned ten times better than other commercial adhesives when used to bond polished aluminium (North, Del Grosso, and Wilker 2017).

Woodpecker – A Perpetual Shock Absorber

The noise made by a bird when searching for worms inside tree bark is familiar and commonplace to us all. When we hear this sound in the forest, we know it's a woodpecker. We cannot approach too close to observe how these birds manage to extract worms from trees, and thus we may not question how, after hundreds or thousands of strikes, their brains do not perceive the consequences of these impacts. Modern research has uncovered the secret of shock absorption in these birds, leading to the application of this knowledge in the manufacturing of black boxes for airplane cockpits, making them much more resistant. The black box is the only device that remains intact after an airplane

crash or explosion. Researchers have discovered that four structures in the woodpecker's skull are responsible for absorbing mechanical shocks. These are: its tough but elastic beak; a support structure for the tongue, elastic and ribbed, extending behind the skull, called the hyoid; a spongy bone area within the skull; and how the skull and cerebrospinal fluid interact to suppress vibrations (Marks 2011).

Based on these analyses, a new shock absorption system has been designed to protect commercial devices affected by unwanted mechanical vibrations of high weight and frequency. This system consists of micro-lenses compressed within two metal chambers and a viscoelastic layer fixed with steel screws, inspired biomechanically by the spongy bone contained within the skull of the woodpecker, which is encompassed by the hyoid. A more recent study highlighted lesser-studied and entirely new aspects. The initial shock absorption was identified as the spongy bone of the woodpecker's skull, which is especially well-developed in the frontal region, immediately behind the naso-frontal joint connecting the upper beak and the brain. Impact energy might also be absorbed through eccentric or isometric contraction of the lower beak muscles (e.g., the protractor pterygoid muscle) if the lower beak is pushed posteriorly relative to the skull at impact. However, this shock absorption could negatively affect the efficiency of wood penetration, since the woodpecker would need to strike harder to compensate for energy absorption.

Using mechanical models, researchers concluded that the woodpecker's head functions as a rigid hammer during pecking. Consequently, the spongy bone regions on both the impact side and the opposite side of the brain likely play an important role in "resisting" impact forces rather than in "absorbing" impact energy through elastic deformation. Nonetheless, a key issue for further study is the brain's protective mechanisms in these birds, as even small cranial contusions require repair or preventive mechanisms, especially

since such impacts occur continuously. These mechanisms include reducing brain jarring through the limited space of cerebrospinal fluid observed in woodpeckers, hypothetical compression of the neck veins to increase cranial blood pressure, and damage repair through proteins involved in stabilizing neuronal microtubules within the frontal lobes of the woodpecker's brain (Van Wassenbergh et al. 2022). These new studies demystifying shock absorption in woodpeckers open new perspectives on brain efficiency and nature in general—a nature that, throughout any era of technological advancement, continually surpasses researchers' imagination.

Camels, Masters of Evaporation

A true desert survivor is the camel. No other animal surpasses the efficiency of this mammal. Researchers have wondered which physiological abilities allow camels to achieve such performance, and they have discovered that these animals conserve water by cooling the air they exhale during the night, extracting water vapor from the expired air, and absorbing and retaining water molecules from the surrounding air. Michael Pawlyn of the Sahara Forest Project explains that the project will be inspired by how a camel's nostrils evaporate and condense humidity to cool the animal, and by how desert beetles that dive into fog are capable of capturing water from the hot desert night air (Smith 2012).

Camels can reduce water loss caused by evaporation in the respiratory tract in two ways: by lowering the temperature of the exhaled air and by removing water vapor from this air. Their nasal membranes are coated with a special water-absorption substance that extracts moisture from the air, functioning similarly to the cooling coils of a dehumidifier. An overall saving of 68% of the water normally lost through respiration occurs during both the cooling and drying phases of the respiratory cycle. Researchers have proposed developing a

system based on these principles, capable of producing water by cooling hot air (Shahda, Abd Elhafeez, and El Mokadem 2018).

The Hummingbird—a Modern Helicopter

Hummingbirds, another wonder of nature, have the ability to hover, perform stationary flight, and even fly backwards. Researchers at Stanford University and Wageningen University published a study after observing the torsional coupling of the wings in 12 different hummingbird species. They found that the ratio between wing length and width determines the bird's ability to sustain power during flight. These discoveries revealed that, compared to the most advanced helicopter rotors, hummingbirds achieve better efficiency. Researchers are already contemplating how to replicate this performance in modern, cutting-edge helicopters. This design demonstrates that less rotor power is required to achieve greater efficiency (Kruyt et al. 2014).

Giraffe, a Specialist in Varicose Vein Prevention

Another animal that has inspired physicians in the treatment of varicose veins and other blood circulation problems is the giraffe. Unlike humans, giraffe skin is not elastic on the legs but is considerably more rigid. Due to the high density of inelastic collagen fibres and the relatively thick upper layer of the skin, giraffes experience increased tissue pressure. This promotes lymphatic and venous reflux. As a result, giraffes exhibit a natural, continuous compression ("Giraffes and Compression Stockings - Nature's Role Model for Circaid® | Medi," n.d.). Such compression methods are currently used in the treatment of venous ulcers through multiple bandages, a technique that has recently been refined (Meaume et al. 2023). These clinical studies, conducted by teams of doctors in France, have proven to be both effective and more cost-efficient (Senet et al. 2022).

Water Spiders, a Diver's Future Ally

Although water spiders spend most of their time underwater, they need air to breathe. When submerged, a bubble of air is captured by a dense layer of hydrophobic hairs on their abdomen and legs, giving their abdomen a silvery appearance. The spider even uses an oxygen reservoir: it constructs a silk-made bubble filled with air, anchored to aquatic plants or other submerged objects. The air reserves are continuously recycled with oxygen through two methods: the first involves bringing the bubble to the surface, where air molecules are retained by hair threads forming a film of air; the second is a highly advanced process in which oxygen is replenished through osmotic pressure, as the structure of the bubble walls allows gas exchange with the surrounding water (Wikipedia 2025). It has been observed that Argyroneta aquatica anchors its silk thread in contact with the substrate within a trapped air bubble maintained around the spider by an arrangement of superhydrophobic hairs (Schaber, Grawe, and Gorb, 2023).

Inspired by water spiders, researchers at the University of Rochester created a metal structure so hydrophobic or superhydrophobic that it refuses to sink, no matter how often it is forced into water or how much it is damaged. They designed a structure in which the surfaces treated on two parallel aluminium plates are oriented inward, rather than outward, thus being sealed and protected from external wear and abrasion. The surfaces are spaced at an appropriate distance to capture and retain enough air to maintain flotation—essentially forming a waterproof compartment. The superhydrophobic surfaces will prevent water from entering even when the structure is forced underwater ("Spiders and Ants Inspire Metal that Won't Sink" 2019).

The Blue Heron and High-speed Trains

The blue heron has successfully addressed the issue of air resistance entering tunnels and the sonic boom produced upon exit by Japanese high-speed trains. On March 22, 1997, the 500 series Shinkansen train was put into operation, and it was observed that air resistance was reduced by 30%. Consequently, energy consumption decreased proportionally, speed increased to 300 km/h, and, importantly for the residents of the city, the train became significantly quieter (Cireasa 2021). Subsequent studies confirmed the advantages of this bird's natural design, which allows it to plunge into water without splashing. The blue heron exhibits morphological adaptations related to aquatic feeding. Moreover, the shape of the beak in aquatic species produces less hydrodynamic resistance compared to terrestrial species, with measurements indicating a lower peak deceleration during water impact in simulations. These aquatic birds have demonstrated adaptive advantages over other terrestrial species.

Both the shape of the beak and the shape of the frontal zone of the bird, generally wider than the beak, contributes to diving. Analyses demonstrate that a rapid increase in the frontal surface area at the beak-head transition generates the greatest resistance forces, and this transition is the smoothest in the blue heron (Crandell, Howe, and Falkingham 2019).

Sharks and Bacteria

Sharks are renowned for their survival capabilities and adaptability. While medical researchers have extensively studied these species, it appears that navigation scientists have discovered something extraordinary in dolphin skin, leading to applications both in navigation and medicine. This remarkable property of shark skin is due to the presence of small, ridged, serrated scales called placoids, which enable them to move swiftly through water. More importantly,

these structures prevent microbial growth; their nearly diamond-shaped microstructures drastically reduce the available surface area for microbial development.

By comparing other species such as whales, it is easy to observe that whales are covered with scales, whereas sharks have intact skin. Shark skin is equipped with so-called dermal denticles—extremely small structures that effectively control turbulent vortex formation, reducing impulsive transfer and shear stress, thus decreasing water resistance. By mimicking the shark skin structure, researchers have constructed surfaces that are more effective in preventing bacterial adhesion. The "Sharkskin" effect has garnered attention from NASA, the US Navy, Airbus, Boeing, and other industry giants. Reducing fluid resistance can also benefit wind turbines, microfluidics, and the petroleum pipeline industry in preventing fouling (Xu, Yang, and Zhang, 2021).

These properties have been reproduced by Sharklet, a company that produces adhesive films for environments such as hospitals, where reducing bacterial transfer is essential. The film utilizes a diamond-riblet pattern inspired by shark scales—validated by Dr. Anthony Brennan, who determined that it is textured to discourage microorganism sedimentation—creating a safer and more hygienic environment (“Sharklet Technologies, Inc.,” n.d.). The topography of shark skin is well-known for its antibacterial properties due to its unique pattern. A 2022 study identified the antibacterial potential and drug delivery capabilities of chitosan membranes mimicking shark skin, aiming to assess how this topology influences biofilm formation on medicated polymer membranes. Chitosan membranes (CH) loaded with Ampicillin, sodium salt, and caffeic acid phenethyl ester (CAPE) were fabricated. The bacteria/bacterium tested was Staphylococcus aureus (Gram-positive), and human dermal fibroblasts (HDFa) and keratinocytes (HaCaT) were used as cell line models in

cytocompatibility tests. Results regarding drug release, bacterial biofilm growth, and inflammation ratios demonstrated the superiority of shark skin topography in controlling drug release rates and significantly reducing biofilm formation (Rostami et al. 2022).

The Peregrine Falcon, an Unparalleled Test Pilot

The peregrine falcon is a medium-sized raptor renowned for its incredible high-speed dives. It can reach speeds of up to 350 km/h during its stoops, placing it among the fastest animals on the planet. Such velocity requires numerous adaptations, including some less obvious, such as the redirection of airflow within the nostrils for respiration. The force of air entering the nostrils at 350 km/h would make breathing difficult. To prevent this, the falcon's nostrils contain bony tubercles that act as deflectors, regulating the safe passage of air into the respiratory system. The presence of these bony tubercles in the falcon's nose slows down the airflow, increasing air pressure and allowing air to be effectively drawn into the body. The design of the peregrine falcon's nostrils has inspired the shaping of intake cones for supersonic jet engines ("News: Nose Dive: Falcons," n.d.).

An innovative early warning system, utilizing the anatomy and structural design of the falcon's wings—such as sensors on the aircraft fuselage—is one of many enhancements inspired by this bird. If an engine begins to fail, sensors can alert the pilot about reduced airflow. This technology is influenced by the falcon's feathers, which vibrate when airflow is compromised. Falcons dive at such high speeds that, if the angle deviates slightly, nerves within their bodies notify the bird that it may lose control and crash. Dense filaments modify the airflow near the surface of the aircraft to reduce drag, and they can also alert the pilot if intervention is needed to prevent an accident (Team 2017).

The Self-Cleaning Effect of Lotus Leaves

This special design of lotus leaves allows for self-cleaning. It involves tiny epicuticular wax crystals on the leaf surface, which enable the plant to clean itself because water adheres more strongly to dirt particles than to the leaf surface itself. Botanists studied this mechanism and suggested potential applications for certain types of paints. Thus, Willem Barthlott patented the Lotus effect in 1955, and today, a paint called Lotusan is available commercially (Lenau, Metze, and Hesselberg 2018).

The Collection of Fog by the Namib Desert Beetle

Namib desert beetles are capable of extracting liquid water in the form of droplets from the morning fog in arid air. It appears that the surface of their wings is equipped with both hydrophilic and hydrophobic regions. Water droplets present in the fog form on the sharp, hydrophobic areas, and when they reach a certain size, they roll across the wings and enter directly into the beetle's mouth, which is notably positioned on its head. Engineers Parker and Lawrence, who discovered this phenomenon, developed applications such as fog-capture tents made by depositing superhydrophobic nanoparticles onto a mesh placed over a hydrophilic copper sheet. The prototype proved to be an effective method for fog harvesting, with excellent anti-corrosion capabilities (Lenau, Metze, and Hesselberg 2018).

The Burrowing Crab: An Educational Perspective

The Pacific Emerita Analoga, commonly known as the burrowing crab, is a decapod crustacean capable of excavating in sandy substrates to conceal itself or store food. This species inhabits coastal regions along the western shores of North America. In these "wave zones"—shallow areas subjected to the up-and-down motion of surf—the crab can rapidly burrow into saturated sand within seconds, and it can

repeatedly excavate and re-emerge at different locations along the shoreline. With a burrowing speed of approximately 1 cm/sec, these crabs are four times faster than the fastest bivalve molluscs. Inspired by the remarkable performance of this crab, a team of engineers developed the EMBUR—Emerita Burrowing Robot—a robotic system equipped with legs capable of vertical excavation in granular strata via two pairs of appendages, functionally analogous to the crab's limb groups (Treers et al. 2022).

Numerous examples demonstrate the extensive and growing influence of both the vegetal and animal kingdoms as sources of technological inspiration. Historically, technological advancements have often drawn from biological models, recognizing that life and evolution embody sophisticated mechanisms—highly advanced "technology" beyond human comprehension. It is a tribute to researchers who discover and harness these biological sources of inspiration. Analogous to a master's thesis or a doctoral dissertation, which explicitly acknowledges the supervisor, technological innovations should also credit their biological origins—namely, the species or animals that inspired the design. For instance, a decade ago, engineers admired high-speed trains departing from Brussels, crossing beneath the English Channel, and appreciated the aerodynamics of the locomotive. It was only later revealed that the shape of the blue gull served as the inspiration for that aerodynamic design. Consequently, high-speed trains should not only bear names like Thalys or TGV but also honour the blue gull as a source of inspiration.

The more we learn about animals, the more we develop an appreciation for them, fostering empathy and reducing prejudices. Recognizing the biological roots of technological innovations enhances our admiration for nature's ingenuity and may promote greater conservation and respect for biodiversity.

The influence of nature extends beyond the field of technology and also encompasses psychology. Animal-assisted therapy (AAT) has become widely recognized for its beneficial effects on individuals, with the mere presence of animals providing psychological support. In this domain, the contribution of various animals, especially domestic ones, is invaluable; these animals are often acknowledged as co-therapists in therapeutic settings. However, even within this context, there is a risk that humans exploit animals' involvement for personal gain—particularly with wild animals, such as dolphins.

Research into dolphin-assisted therapy (DAT) indicates that dolphins do not possess any unique qualities compared to other domesticated animals; moreover, the purported extraordinary healing effects claimed by specialized institutes are not supported by scientific evidence. Given that wild animals, such as dolphins, are used in captivity for therapy sessions, both the safety of clients and the well-being of the animals cannot be assured. The fact that DAT is conducted by unregulated therapists in dolphin parks further increases the risk of exploited animals, clients, and their families. Additionally, DAT is expensive and lacks verifiable outcomes for participating children. Numerous studies have demonstrated that dolphin therapy is not more effective than therapy with other animals, which are more affordable and accessible.

Considering safety and ethical concerns, the authors advise parents, practitioners, and advocacy groups, especially within the autism community, to exercise caution in recommending and promoting DAT for autism spectrum disorder (ASD) and other conditions (Chhatwani and Winterling 2021).

Regarding children with Down syndrome, research shows that DAT programs can lead to significant improvements in "verbalization" and "recognition of individuals," while "impulsivity" tends to decrease. No substantial changes have been observed in other

parameters. Notably, verbal skills continued to improve over a six-month follow-up period, whereas "recognition of individuals" experienced a slight decline (Griffioen and Enders-Slegers 2014). To better assess the validity of DAT interventions, further studies using alternative animals for similar populations or issues—such as autism or Down syndrome—would be valuable.

We believe that the effects of such therapies should not be outright dismissed if evidence suggests their benefits. While current studies may not fully adhere to rigorous scientific standards, this does not necessarily negate their value; instead, it highlights the need for continued research and refinement (Griffioen et al. 2019).

What can truly be contested are the potential abuses inflicted upon dolphins, considering that they are wild animals that naturally seek to live freely; the qualifications of therapists involved in such programs; and the exorbitant cost of these therapies, which restricts access for many children. Necessary studies should be conducted according to rigorous scientific standards if the true interests are the healing of children and the welfare of the dolphins.

For instance, some criticisms focus on the fact that the observed benefits may not solely be attributed to the dolphins themselves but also to other factors often overlooked, yet potentially significant. Children not only interact with dolphins; they also play on the beach in a sunny environment, experiencing the excitement of travel and an engaging stay, with the entire family enjoying a holiday—providing opportunities to foster familial bonds in pleasant circumstances. Consequently, the validity of the therapeutic effects can be continuously challenged if researchers fail to acknowledge the multiple components involved in the intervention (Candelieri 2018).

Numerous domesticated animals play an influential role as co-therapists in paediatric recuperative interventions. Dogs are the most common therapeutic animals; however, scientific literature and

historical records also indicate the use of cats, guinea pigs, cockatoos, African parrots, horses, chickens, pot-bellied pigs, llamas, goats, and donkeys in therapeutic settings (Fiksdal, Houlihan, and Barnes 2012).

Psychologically, animals can teach us compassion, how to live in the present, how to be grateful for what we have, how to exercise patience, listen to our instincts, embrace silence, play, forgive, love, stay loyal and devoted, work as a team, understand our interconnectedness, appreciate family, grow, develop resilience, foster creativity, and even comprehend mortality. Fundamentally, animals have been and will remain humble, patient, silent teachers—unknown and forgiving—who suffer in silence and always forgive.

Reflecting on these traits, we realize that they essentially define love as described so beautifully in the Bible and other sacred texts. Ultimately, we can affirm that even love itself is something we learn from animals.

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On Women and Other Primates: The Female Leadership Paradox

Cătălina-Daniela Răducu*

"The other primates hold up a mirror to ourselves,
which allows us to see gender in a different light.
They aren't us, however, and so they offer a comparison,
not a model for us to emulate" (de Waal 2025, 17)

Abstract

This article addresses the topic of female leadership in human and nonhuman primates; I argue that, although widely used, direct comparisons between humans and primates not only reveal gender differences in leadership but also serve to justify gender inequality in complex modern human societies. As recent evidence from evolutionary biology shows, some differences and potential obstacles are rooted in the evolutionary history of mammals generally and primates specifically; nevertheless, many possibilities for female leadership exist, including those that are often ignored in operationalized definitions of leadership. In line with the limitations highlighted by researchers in this field, my analysis reveals, at the same time, that other obstacles to female leadership are superficial, as they are rooted in recent cultural traditions. I will show that a direct comparison with other primates, notably chimpanzees, is too simplistic a strategy and tells us more about the gender ideology of our moment than about gender differences in humans and their relevance to leadership.

Keywords

dominance, females, gender roles, leadership, primates, power, sex differences

Although arguments from biology were used in the past to justify men's dominance over women and to preserve the status quo in a patriarchal society, today, more and more data from evolutionary biology show the necessity to overcome simplistic natural explanations

* Senior Researcher, Gheorghe Zane Institute for Economic and Social Research, Romanian Academy, Iași Branch; Email: cathy_raducu2001@yahoo.com

of the current status of gender relations. Going beyond the surface of such explanations is also justice done to science itself, as we shall see in the following pages, because the latest developments in evolutionary biology and primatology stress the importance of integrating the evolutionary and social science perspectives in understanding gender differences.

Supporters of biological determinism, leaning on data drawn from evolutionary theory, argued in the 20th century that our origins not only determine but also justify gender arrangements that may seem unjust for women in modern societies. They stressed that whatever other explanation we try to find for the behavioral differences between women and men, we will always come back to what is biologically given and cannot be changed; from this given, we must start in understanding gender relations. Patrick Geddes and Arthur Thompson's dubious argument meant to justify behavioral differences between men and women and the prohibition of women's political rights, according to which what has been decided since the advent of protozoa cannot be undone by an act of Parliament, is notorious (Moi 1999, 18), but not in the least singular. For theorists like them, from biology to behavior would be only one step. In contrast, feminists have drawn attention to the fact that the importance of the biological differences between women and men has been exaggerated, with the express intention of disadvantaging women. They have emphasized that the raw, biological material is shaped by human social intervention: "social discrimination produces in women moral and intellectual effects so profound that they seem to be caused by nature." (de Beauvoir 1972, 18)

Chimpanzee Politics

By the end of the 20th century, an argument as the one offered by Geddes and Thompson would have seemed amusing at best, if not

outrageous. However, in a famous article published in *Foreign Policy* in 1998, eminent international relations theorist Francis Fukuyama used data from the primatology of his era to argue that despite the progress women have made, men will continue to play the dominant role in society. On this occasion he put forward a sententious statement similar to Geddes' and Thomson's contention: "what is bred in the bone cannot be altered easily by changes in culture and ideology" (Fukuyama 1998, 28) His discussion starts accusing feminists of claiming that certain traits more observable in men than in women are entirely the product of patriarchal culture: "The problem with the feminist view is that it sees these attitudes toward violence, power, and status as *wholly* the products of a patriarchal culture, whereas in fact it appears that they are rooted in biology" (1998, 27) (emphasis mine). Leaving aside that even the radical feminists (as we shall see in the following pages) do not deny the existence of sex differences, but only condemn their exacerbation meant to justify and reinforce patriarchy, Fukuyama seems to perform here exactly what feminism has condemned all along. He starts from the observation that certain traits observed more strongly in men than in women are "rooted in biology", announces that these attitudes are "harder to change in men and consequently in societies", and concludes that "despite the rise of women, men will continue to play a major, if not dominant, part in the governance of postindustrial countries, not to mention the less-developed ones". (1998, 27)

Although he states twice in his article (1998, 31, 39) that "biology is not destiny", Francis Fukuyama in fact reinforces biological determinism. He does so, however, in a subtler, sophistic manner, founding his argument on the analogy to our closest (according to him) species in nature. He invokes the chimpanzees at Gombe National Park in Tanzania to justify the need for male dominance in politics, especially international politics, arguing that "the realm of war and

international politics in particular will remain controlled by men for longer than many feminists would like". (1998, 27)

While Fukuyama recognizes the plasticity of gender roles: "male attitudes on a host of issues from child-rearing and housework to 'getting in touch with your feelings,' have changed dramatically in the past couple of generations due to social pressure" (1998, 36), he warns that efforts to fully feminize men will never be successful. It is not clear what he means when he mentions efforts to "fully feminize young men", but the underlying presupposition seems to be that there is a concentrated effort to strip men of their masculinity and turn them into feminine, peaceful versions of themselves. In contrast, according to him, men, in virtue of their ancestral origins, are naturally inclined towards violence: "the line from chimp to modern man is continuous" (1998, 27).

Because "only chimps and humans seem to have a proclivity for routinely murdering peers" (1998, 25) and male chimps and male humans are very similar in the way they form coalitions seeking to achieve and maintain dominance in status hierarchies, it seems correct to conclude that "male tendencies to band together for competitive purposes, seek to dominate status hierarchies, and act out aggressive fantasies toward one another can be rechanneled but never eliminated" (1998, 36).

This tendency will be especially present in war, which is the exclusive domain of males. The basic social problem that any society faces, Fukuyama instructs us, is to control the aggressive tendencies of its young men (1998, 34). One solution might be to constrain those impulses through a web of norms, laws, agreements, contracts, etc., as proposed by the feminists (1998, 34). Another solution would be redirecting these tendencies to external aggression, as in hunter-gatherer societies, where "*older men in the community have generally been responsible for socializing younger ones by ritualizing their aggression*, often

by redirecting it towards enemies outside the community" (1998, 34, emphasis mine).

But this very observation implies that there is more to men's proclivity to war than just biology. In fact, societies across time and space have gone to extreme lengths in glorifying war and socializing men, but not women, into effective warriors. In contrast to Fukuyama's bread-in-the-bone contention, other scholars such as Joshua Goldstein or Barbara Ehrenreich highlight almost the opposite of the common wisdom: "Biology provides diverse potentials, and cultures limit, select, and channel them" (Goldstein 2001, 2). While one reason to explain the male near-monopoly on warfare is biological, resting on men's advantage in upper body strengths, inherited from our primate ancestors, another explanation is "cultural, or at least as purely cultural as one can be: in many, if not most, human societies, male initiation rites feature acts of violence committed by or on the initiates, and one of the most common of these rites has been participation in battle. (…) In fact, the very purpose of male initiation rites is to distinguish biological maleness, which undoubtedly includes a healthy desire for self-preservation, from cultural manhood." (Ehrenreich 1999, 119).

This suggests that there is a large step from what may be biological innate leanings toward individual aggression to ritualized, socially sanctioned, institutionalized warfare. (Ehrenreich 1999, 118) Transforming men into warriors necessitates highly organized practices meant to inhibit the natural inclination for self-preservation, as Western history shows that "individual men have gone to near-suicidal lengths to avoid participating in wars – cutting off limbs or fingers or risking execution by deserting" (Ehrenreich 1999, 118). For instance, before the advent of the nationalist armies of the nineteenth century, desertion rates in European armies were so high that, at certain times, almost an entire army "would vanish into thin air"; even in the supposedly highly motivated armies of the twentieth century

democracies "few men can bring themselves to shoot directly at individual enemies" (Ehrenreich 1999, 119).

This means that key social and cultural influences are used to enhance a supposed biological proclivity towards war and to suppress the biological desire of self-preservation. Contra Fukuyama, "war does not come naturally in men (from biology), so warriors require intense socialization and training in order to fight effectively. Gender identity becomes a tool with which society induces men to fight" (Goldstein 2001, 252-253). Fukuyama's warning against the danger of fully feminizing men in contemporary societies suggests a need to maintain rigid gender roles and an association of leadership with masculinity; this need becomes obvious in the practice among male soldiers of feminizing their enemies to "encode domination," which reinforces the militarized masculine stereotype (Goldstein 2001, 406).

As primatologist Frans de Waal maintains, the impact of such culturally constructed gender identities is tremendous on men socialized to act, think, and feel like soldiers. There are both individual and societal costs to this construction. At the individual level, "in raising boys into men, we can ask ourselves (…) whether we are producing warriors, and if so at what cost to the boy. We may be surprised to see how high the cost is, even if the boy never goes on to fight a war" (de Waal 2005, 411). At a societal level, de Waal highlights the existence of a complex war system involving a higher cost for lower classes. Since male privilege has always been most pronounced in the upper echelons of society, men and women from the lower classes have been equally exploited, mistreated, and impoverished. In terms of war, he maintains, throughout history, the destiny of millions of young men has been an undignified and premature exit from life. He confesses: "in retrospect, I have mixed feelings about my years as a Boy Scout. It all seemed innocent enough, but we did an awful lot of saluting, lining up in drills, stamping feet, and earning badges. The military ethos was

considered good for a boy's character, but at the same time the Scouts' motto 'Be Prepared!' related very much to war. By promoting discipline, teamwork, and conformity, the Scouts essentially molded boys into cannon fodder. The Shakespearian dogs of war were always begging to be fed." (de Waal 2025, 210)

De Waal goes on to say that in modern times, we tend to forget this sad and distressing history of maleness when "every boy could be called upon to make the ultimate sacrifice. Objection was not only 'unmanly' but a criminal offense. And *power was always in the hands of older men*" (de Waal 2025, 210, emphasis mine). The gender balance of war in such a system, ironically, seems to incline towards an advantage of women over men: "No nation would ever march one or two hundred thousand women to probable slaughter by the enemy. But young men were deemed of little value. Graveyards with endless rows of white crosses testify to the carnage. From the cynical (and Darwinian) perspective of older men, women are assets to be kept near and safe, whereas young men can be sent off to perish in distant lands for questionable causes. They are expendable." (de Waal 2025, 210)

The Gender Security Dilemma

But if the current system is so detrimental to men, what are the prospects for change? Is there space for a less war-driven alternative in socializing men? The answer is no, because "in the rough-and-tumble world of international politics, it could be dangerous to raise kinder, gentler boys – a practice akin to unilateral disarmament". (Evangelista 2003, 331)

This assumption is implied in Fukuyama's argumentation and would be the ultimate reason why men should still hold power in the world. He claims that the feminization of politics in developed democracies has already provoked a less status- and military power-oriented world. While he admits that this shift might be good for the

relations between the states in the so-called democratic zone of peace (Fukuyama 1998, 35), he warns that "in anything but a totally feminized world, feminized policies could be a liability" (Fukuyama 1998, 36).

This logic resonates with a game-theoretic model of armed races used in international relations, which may be summarized as follows: *If every country were disarmed, the world could be at peace. Because we fear that one country might threaten peace by secretly arming, every country must retain weapons for its security. Therefore, a peaceful world is not possible*. Fukuyama's "fear of feminization is thus a variant of the traditional concern about the danger of disarmament, reflected in the so-called security dilemma" (Evangelista 2003, 328), further complicated with a demographic twist. He anticipates that the populations of the democratic world will soon be dominated by elderly women (Fukuyama 1998, 38) and that a much larger and poorer part of the world will consist of states in Africa, the Middle East, and South Asia with young, growing populations, led mostly by "young, ambitious, unconstrained men" (1998, 36). Therefore, he concludes, "masculine policies will still be required, though not necessarily masculine leaders" (1998, 37).

In light of the extensive social practices involved in men's preparation for war, Fukuyama's affirmation that "gender roles are not simply socially constructed but rooted in genetics" (1998, 36) sounds suspect at the least. Contra Fukuyama, a closer look at how gendered differences in competition for leadership positions are shaped by norms of expected behaviour proves revealing. Cross-culturally, manhood is portrayed as something to be earned more than womanhood, and societies that experience greater inter-group conflict are more likely to portray manhood in this way; they impose costly initiation rites of passage on young men to test their manhood, due to benefits to male coalition-building in the context of war. Although

these norms might reflect evolved, gender-specific motivations, they are not determined by them: "the more that prestigious political positions in society are monopolized by men, the more they may be likely to promote norms and build institutions that exacerbate and canalize gender differences in competition, coalition-building, or even desire for political leadership." (Smith et al. 2021, 11).

While not completely wrong, Fukuyama's affirmation about gender roles is misleading, for it does not properly assess how much is biology and how much is cultural construction in men's alleged propensity towards war. Rather, it serves to reinforce his conclusion that, instead of trying to feminize men fully, modern, technological societies should accept biologically grounded nature as a given and seek to constrain it through institutions, laws and norms, especially since they can re-channel this drive in men by offering them arenas in which they can achieve social status not through violence, but through socially productive activity. He writes: "It does not always work, but it is better than living like animals" (Fukuyama 1998, 40). His arguments are striking, revealing at the same time anthropocentrism, anthropodenial, and exceptionalism. According to him, we are similar to animals; the resemblances are to be embraced when justifying men's superiority over women; nevertheless, they are to be discarded when we design societies, because we humans are different than animals and we'd better not live like them.

A different strategy might be to look at the current war system and see that it is not simply lethal intergroup violence, as in chimpanzees' case, but a complex system of interrelated ways in which societies organize themselves to participate in potential and actual wars, including military spending and attitudes about war, in addition to actual standing military forces and actual fighting (Goldstein 2001, 3). Statements according to which 'feminizing' men would be a liability or 'it is better than living like animals' are, by far, neither valid nor

sufficient arguments for maintaining the current system. When we understand that war is not simply intergroup violence, but a complex system designed by humans, the possibility of change comes to light: "in a feedback system with multiple causality, leverage at various points affects the whole system… The war system is not set in stone, nor driven by any simple formula, but it is alive, complex and changeable. Complex systems hold many possibilities, as biology demonstrates" (Goldstein 2001, 413).

More than 20 years on, as this article was drafted, neither of Fukuyama's predictions has proven to be true. Firstly, across all contemporary industrialized societies, women remain underrepresented in boardrooms and governments, holding fewer than 6% of CEO positions in S&P 500 companies, and fewer than 5% of national political leadership positions in the world. And while this gender gap has been narrowing, the challenges women face in climbing the political ladder remain substantial: "a male bias in top positions of leadership is a 'near cross-cultural universal'." (Smith et al. 2021, 1)

Secondly, at least two major wars are currently underway in the world: one in Europe and one in the Middle East. The states involved in those wars are run by 70+ years old male leaders; they are supported by leaders of rich democratic states who are, most of them, male. There is only one young male (40+ years old) head of state involved in war, but he does not fit the pattern of 'young, ambitious, unconstrained man'. If anything, the current state of affairs seems to validate the de Waal-inspired conclusion that *power is still in the hands of old men* (de Waal 2025, 210, emphasis mine).

Feminism and Evolutionary Biology

The current state of affairs suggests that more complex and nuanced explanations are needed to understand the persistent gender

gap in leadership. The need to integrate data from evolutionary biology and feminist theory was anticipated by feminist evolutionary biologist Barbara Smuts because, according to her, both of these disciplines focus on power and sex. She stressed, before Francis Fukuyama, how important it was to acknowledge the role of biology in the origins of patriarchy: "evolutionary theory not only considers how men exercise power over women, but also investigates the deeper question of why males want power over females in the first place, which feminists tend to take as a given". (Smuts 1995, 2). She maintains that the origins of patriarchy lie far back in time, long before the development of agriculture, civilization, capitalism, or other similar phenomena, suggesting that patriarchy is the product of reproduction strategies typically shown by male primates, which in humans have undergone *unusually effective elaboration* (Smuts 1995, 2, emphasis mine). This suggests that there is more than a single step from primates to humans, and far more elaboration (which involves complex cultural practices), in terms of male leadership, than Fukuyama seemed ready to accept. In her view, evolutionary theory does not imply genetic determinism or that patriarchy is inevitable, because humans have evolved the capacity to express a wide range of possible behaviors (Smuts 1995, 20).

As evidenced by modern, small-scale societies (such as the Yanomamo Indians of the Amazon forest vs. the Aka pygmies of central Africa), there is a tremendous variation in behavioral patterns. Among the Yanomamo, lethal fighting between men and violent coercion of women are commonplace; at the other extreme, among the Aka pygmies, violence between men and women is very rare. While Yanomamo men try to obtain several wives and are rarely involved in childcare, Aka men typically marry monogamously and show more involvement in child-rearing than men in any other human society. Common ancestral heritage does not explain the actual differences:

"there is no evidence to indicate that Yanomamo and Aka men behave differently because of different genes. At the proximate level, these differences must result from the very different experiences boys and girls have growing up in these two cultures, and from the differences in the ecological and social environment encountered by adults." (Smuts 1995, 21) Rather, this kind of evidence indicates that humans are not "genetically programmed" to coerce and control women, and that women are not "genetically programmed" to accept subordinate status (Smuts 1995, 21).

Smuts identifies six factors that have influenced the evolution of human gender inequality:

1. *A reduction in female allies*: "among ancestral hominids, female ability to resist male aggression was compromised by reduced social support from kin and female allies", due to patrilocality (the majority of traditional human societies show a pattern of female dispersal). (Smuts 1995, 13).

2. *Elaboration of male-male alliances*: "over the course of human evolution, male-male alliances became increasingly well-developed. These alliances were often directed against females, and they increased male power over females." (Smuts 1995, 13)

3. *Increased male control over resources*: "over the course of human evolution, and particularly since the advent of agriculture and animal husbandry, males gained control over resources that females need to survive and reproduce. This increased male ability to control and coerce females." (Smuts 1995, 15) Smuts maintains that male-male alliances and male control over resources interacted in a positive feedback loop (Smuts 1995, 15-16).

4. *Increased hierarchy formation among men*: "over the course of evolution, male sociopolitical arrangements increased the variance in male wealth and power and perpetuated family differentials across generations." (Smuts 1995, 17)

5. *Female strategies that reinforce male control over females*: "in pursuing their material and reproductive interests, women often engage in behaviours that promote male resource control and male control over female sexuality. Thus, women as well as men contribute to the perpetuation of patriarchy." (Smuts 1995, 18)

6. *The evolution of language and its power to create ideology*: "the evolution of the capacity for language allowed males to consolidate and increase their control over females because it enabled the creation and propagation of ideologies of male dominance/female subordinance and male supremacy/female inferiority." (Smuts 1995, 19) According to Smuts, the evolution of the capacity for language facilitated further development of male-male alliances, male control over resources and the development of hierarchical relationships among men; language also enabled humans to develop and promulgate views of societies that supported their interests; ideologies were born, and "gender ideologies probably were among the first ideologies ever invented" (Smuts 1995, 19).

Smuts' theory echoes radical feminist theorist Catharine MacKinnon's explanation for the evolution of patriarchy: "on the first day, difference was; on the second day, a division was created upon it; on the third day, irrational instances of domination arose". (MacKinnon 1987, 34). The question of gender equity is, thus, ultimately, a question related to who holds the power to use biological differences as justification for the socially constructed hierarchies: "Here, on the first day that matters, dominance was achieved, probably by force. By the second day, division along the same lines had to be relatively firmly in place. On the third day, if not sooner, differences were demarcated, together with social systems to exaggerate them in perception and in fact, because the systematically differential delivery of benefits and deprivations required making no mistake about who was who." (MacKinnon 1987, 40)

This is consistent with De Waals's view that "the genders are not now and have never been equal for as long as we can remember. Women get the short end of the stick in our society and in almost every other one." (de Waal 2025, 12) But this does not mean that we should justify existing human gender relations by invoking our primate heritage. We should not use stereotypical views of our fellow primates to defend inequalities in human society, and promulgate over and over that male supremacy is the natural order. One such stereotypical view is, for instance, that of a male monkey boss who 'owns' the females, who spend their lives making babies and following his orders. According to De Waal, the main inspiration for this view was a baboon study, conducted one century ago, that had major flaws and gave rise to a dubious metaphor that "hit the public like a barbed arrow that proved impossible to dislodge despite all the contrary information gathered since then" (de Waal 2025, 14). By studying our kin, the great apes, de Waal maintains, a more nuanced picture emerges, one in which "males exert less control than imagined" (de Waal 2025, 14).

Female Leadership

Catharine MacKinnon suggested that we should take a step back and reexamine a highly gendered society where male virtues are coined as desirable (MacKinnon 1987, 36). While power as dominance was commonly endorsed as the only option, evolutionary biology and primatology show nowadays that there are other ways to hold power in nature that are undervalued in our society. Recent studies (Van Vugt and Smith 2019; Smith et al. 2020; Smith et al. 2021) argue for a comparative-evolutionary approach that integrates seemingly divergent perspectives from the biological, social, and cognitive sciences. Accumulating evidence from diverse fields, these authors assert that a combination of factors, including evolutionary history, developmental experience and hormonal/physiological and

psychological mechanisms, as well as contextual factors interact with individual traits of leaders and followers' preferences to favor the emergence of two leadership styles: prestige and dominance (Van Vugt and Smith 2019, 952). These styles have contrasting expressions, functions, and histories.

Dominance is defined as a formalized relationship between a dominant and a subordinate individual in which the latter repeatedly signals to the former an understanding that the dominant is able to win fights and has priority over resources over the subordinate (Van Vugt 2006). Furthermore, as formalized submission and dominance are based upon the ability for a dominant individual to exert power using physical force or aggression (Lewis 2002), studies show that there is "remarkably little evidence of leadership based exclusively upon physical force in non-human mammals" (Smith et al. 2020, 2). Authors such as Smith et al. stress that "studying the evolutionary forces shaping leadership is important because it offers insights into the circumstances during which natural selection favors individuals to lead when participating in collective behaviours, and understanding the costs and benefits of these behaviours may help to explain why observed social structures and traits of leaders persist in human societies today" (Smith 2020, 2). Whereas foundational studies suggested that non-human groups were typically led by one or a few consistent dominant animals (as in humans), "emerging evidence indicates that multiple individuals often occupy leadership roles, which is a case of distributed leadership" (Smith 2020, 3; Strandburg-Peshkin et al. 2016, Strandburg-Peshkin et al. 2018. In mammalian societies, leaders exercise group-level decisions in a variety of ways, and leadership in nonhuman mammals is "often decentralized and much more fluid" (Smith 2023, 575).

A recent comparative analysis of 76 non-human species spanning eight biological orders within the class Mammalia revealed that

intersexual power is variable across species, with eight of the 76 species exhibiting strong, female-based leadership (Smith et al. 2020). Also, in primates, intersexual power is highly variable. As shown by a recent analysis by Lewis (2018), every major extant clade includes at least one primate species that is not male-dominant. This focus on power understood exclusively as dominance points towards an initial bias in interpreting evidence from the natural world through a human lens; it appears that "traditional operationalizations of leadership are themselves male-biased," as Smith et al. point out (2020, 1).

Although female power occurs throughout primates and other animals, even in male-dominant societies, the phenomenon was treated as 'exceptional' and was termed as an "evolutionary puzzle" (Jolly 1984, Wright 1999), and part of the "lemur syndrome" (Kappeler and Schäffler 2008), revealing an "implicit assumption that male power is the norm, ancestral for primates generally, and not requiring broader explanation" (Lewis 2018, 536). Therefore, the legacy of patriarchy persists in scholars', especially primatologists' use of language and implicit assumptions about intersexual power: "terms associated with female dominance, as 'puzzle', 'syndrome' and 'domestication' are often not neutral and reinforce the assumption that powerful females and nonaggressive or submissive males are exceptional. Furhermore, the use of the terms 'masculinized' and 'feminized' to characterize sex-specific behaviour in a species assumes that there are universal forms of male and female behaviour that can be recognized independent of the cultural assumptions of the researcher." (Lewis 2018, 539) It turns out, science operates with analogies and terms that have a clear cultural influence.

As recent evidence shows, in nonhuman mammals, "leaders typically emerge via patterns that closely mirror prestige in human societies" (Smith 2023, 575). One of the most important findings of the comparative study on 76 social species of nonhuman mammals was

that, although rare, in female-led societies such as killer whales, lions, spotted hiennas, bonobos, lemurs and elephants, leaders emerge without coercion and followers benefit from the social support and/or ecological support from elder females (Smith 2018). In some of these societies, "female leadership emerges from female alliances and kinship networks, emphasizing more subtle forms of achieving leadership". (Peter M. Kappeler et al. 2019, 160)

Among these species, probably the most relevant to humans are bonobos; along with common chimpanzees, they are the closest living relatives of modern humans. As opposed to chimpanzees, whose leadership is whole-male biased, bonobos have female-based leadership characterized by peaceful social interactions. In contrast to most mammals, coalitions of female bonobos are socially dominant over individual male bonobos. Bonobos, like chimpanzees and humans, differ from most mammals in that females disperse whereas males remain in their home group (Smith et al. 2020). Females lead in group travel, in determining how food is distributed within groups. Notably, they lead in group conflict-resolution, acting as peace-keepers through sexual contact, making 'love, not war' (de Waal 1995). Their peaceful nature extends to between-group encounters: although they show a high level of tolerance to members of neighbouring groups; if conflicts do emerge, both sexes lead attacks.

As Smith et al. observe, "overall, bonobos offer an interesting model of female leadership because of their peaceful style of leadership, acting to resolve conflicts in multiple domains and using female-based alliances to gain power within their groups. These patterns suggest that peaceful leadership styles of females may, on average, benefit group members – including males – by reducing the conflicts within groups and, instead, promoting cooperation. They also suggest that human organizations therefore may benefit from

considering how leadership styles influence patterns of group stability, morale and efficiency." (Smith et al. 2020, 7)

In Frans de Waal's words: "Chimpanzees and bonobos are both anthropoid apes, both genetically extremely close to us, but they are surprisingly different in behavior. Chimpanzee society is aggressive, territorial, and run by males. Bonobos are peaceful, sex-loving, and female-dominated. How much more unalike can two apes get? Bonobos give the lie to the idea that knowing more about our fellow primates is bound to reinforce gender stereotypes". (de Waal 2025, 19)

Conclusions

While in modern, complex societies dominant leadership is often the norm favoring the ascendancy of men into top leadership roles (van Vught, in Peter Kappeler et al. 2019, 162), as suggested by Francis Fukuyama's 'bread-in-the-bone' argument, understanding leadership within a comparative context can correct initial male bias in the operationalization of leadership and offer new insights into its deep evolutionary origins, inform our understanding of its general principles, and inform our decisions to promote equity in access to leadership positions in human societies (Smith 2023, 575).

Also, while we still lack an agreed-upon definition of leadership across disciplines, because some definitions equate leadership with dominance and others with prestige and individual differences in the abilities of certain individuals to influence collective behaviour, the implicit assumption that a single individual, typically male, controls group decisions is "naïve and does not match the empirical evidence from studies of mammalian societies" (Kappeler et al. 2019, 162). A more diverse pattern characterized by social power shared by multiple individuals to various extents in different adaptive contexts emerges from the synthesis of existing data, indicating "that gender and leadership cannot be studied meaningfully via adopting a simplistic,

binary framework (male vs. female; leader vs. follower)." (Kappeler et al. 2019, 162)

In addition to that, the structure of modern organizations in societies with multiple layers of hierarchy is an evolutionary novelty. Large-scale complex societies emerged after the agricultural revolution (cca. 10000 years ago), while humans have been around for at least 2.5 million years; almost 99% of human evolutionary history took place in small-scale, relatively egalitarian societies (von Rueden and van Vugt 2015, Dyble et al., 2015), where women wielded more political influence. The large, complex modern organizations we live in today present an evolutionary mismatch that may facilitate men but restrict women from fulfilling their leadership potential (van Vugt and Ronay 2014). These hierarchical structures, called 'glass pyramids', are the products of recent cultural traditions and are not set in stone: as a cultural species, we humans are able to select for our human future and get rid of glass ceilings and pyramids, if we want (Smith et al. 2020, 11).

We can conclude, therefore, that the topic of female leadership is intellectually challenging, and modern research in various disciplines has only scratched the surface. However, drawing direct comparisons between other species, especially primates, and humans, in order to reveal gender differences and reinforce the status quo, is too simplistic a strategy and tells us much more about the gender ideology of the moment than about the origin of the differences themselves. This conclusion is in line with Frans de Waal's observation that the other primates hold up a mirror to ourselves, which allows us to see gender in a different light. They aren't us, however, and so they offer a comparison, "not a model for us to emulate" (de Waal 2025, 17). Contra Fukuyama's contention that "the line from chimp to modern man is continuous" (Fukuyama 1998, 27), bonobos and chimpanzees reveal different sides of ourselves: "we have a bit of each ape inside us, while

in addition we've had several million years to evolve our own unique traits" (de Waal 2025, 19).

If anything, the study of our primate relatives shows that some purported sex differences have proven impossible to confirm, while those that do exist are often less straightforward than imagined. Moreover, "whether the push for gender equality will succeed doesn't hinge on the outcome of the eternal debate about real or imagined sex differences. Equality doesn't require similarity. People can be different and still deserve exactly the same rights and opportunities. So an exploration of how the sexes differ in both human and other primates in no way validates the status quo". (de Waal 2025, 24)

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Ethical Considerations for Non-Human Animal Work and Its Limited Legal Recognition in the European Union

Cosmin Mărtinaș*, Jetlira Selmani**

Abstract

From draught animals to mounts, from therapy to the military, humans have devised new ways of exploiting the abilities of non-human animals and refining existing ones in order to ensure that they bring the greatest utility to humans. While philosophical discourse increasingly acknowledges animals as sentient beings with morally relevant interests, legal systems remain reticent to grant them formal rights. This article explores the ethical implications and legal limitations (in European law) surrounding the use of animals as workers. The first part analyses the moral contradictions inherent to participation in animal exploitation, drawing from Marxist and abolitionist perspectives. The second part examines the fragmented legal recognition of animal sentience and proposes a normative reframing of animal work as potentially constituting servitude or forced labour under existing legal standards. Together, these analyses call for an ethical and legal framework that moves beyond welfare to recognize the structural exploitation of animal labour.

Keywords

animal exploitation, alienation, animal labour, animal sentience, EU animal law, servitude, forced labour

Ethical Considerations for Non-Human Animal Work (*Cosmin Mărtinaș*)

Conditions of Non-Human Animals at Work

We can begin our inquiry on the ethics of non-human animal work by supposing that the use of non-human animals as workers in

* master student in philosophy at Alexandru Ioan Cuza University of Iași (UAIC), Romania; Email: martinascosmin02@gmail.com

** master student in Law at the Free University of Brussels (Université Libre de Bruxelles), Belgium; Email: selmanijetlira@gmail.com

itself does not present contradictions. We must continue by taking into account the conditions under which this use offers non-human animal workers a decent workplace. Taking all of animal kin as a homogenous group would fail to account for the wide range of different non-human animals that can perform labour. The same wide range of different modes of being would make it impractical to analyse all of them individually. Hence, we will take into account only a few examples in order to illustrate the sort of considerations necessary for the ethical use of non-human animals for work. Among these considerations we can begin with those related to the senses of the various animals that might be used as workers.

It is widely known that a lot of animals, as species other than human, have more developed senses of smell or sight. These senses, of course, vary in precision and range among individuals, but we will make generalisations based on species for the purpose of simplicity, acknowledging that this methodology might, and will, lead us to hasty generalisations.

For example, dogs have a finer sense of smell. If humans were to work in an environment that irritates their smell, with or without the deterioration of their health, we would recognise that those are not "humane" working conditions. Thus, if they are to use non-human animals as workers and proper working conditions are considered necessary, then "the employers" must, somehow, ensure that the work environment does not present itself with an odour that is irritating to the worker. As the range of possible olfactory perception of non-human animals does not perfectly overlap with that of humans, and can itself be problematic for humans to determine, only after it is understood, then some sort of machinery must be used in order for humans to determine whether the workplace does not irritate the non-human worker in some way. The fact of being unpleasant could be, for example, related to the territorial nature of some animals, the smell

might make them feel as if they are in the territory of rival groups or individuals. Other considerations related to this are those present in workplaces such as hospitals and medical clinics, in which the staff usually wear masks and other protective gear, in order to prevent catching or spreading diseases, infections or bacteria.

Similar considerations apply to the sense of sight. If humans work in an environment in which the light is too bright or too dim, we accept that those are not proper conditions for working. Thus, providing non-human animal workers with an adequate level of brightness must take into account both the range of wavelength that their eyes can perceive and the intensity present at the workplace.

One more consideration that we will mention is that concerning the wake hours and sleep schedule of various animals. Generally, the regular workday of humans consists of an 8-hour shift. Much more than that can be rightfully considered exploitation in the case of more demanding activities. Humans are also considered to have better endurance than a lot of other species, whose activity may be better represented by a burst of energy use followed by a period of rest. Hence, also taking into account the number of hours of sleep per day generally needed, based loosely on species and more precisely on individual, it would be "inhumane" to make a non-human animal work for 8 hours per work-day if they need to sleep more or have a burst-rest behaviour, rather than an endurance one. This is not to say that the human 8-hour workday is adequate in itself either, or that it is "humane", especially in more demanding activities, i.e. we do not have reasons to consider the human 8-hour workday as normative.

One more idea that we will mention, but leave mostly unexplored, is that of "democracy at the workplace", the idea that the workers have a say regarding the way the workplace is run through democratic processes. Presupposing democratically run workplaces offer benefits to the well-being of the workers, it remains unclear how

such practices could be implemented in the case of non-human animals without the ability to properly communicate to them what is the goal of the economic process, how it is structured, how can it be improved, how the working conditions can be improved, how the work can be optimised, etc.

If these considerations seem absurd or overzealous, we must ask ourselves whether considering the needs of workers is not an endeavour that we want, or feel the need, to take part in before proceeding to employ someone. As these considerations alone cannot do justice to the complexity of other animals, they can at most take the role of a starting point for a more in-depth review of the needs of non-human animals.

Precondition for Non-Human Animal Work: Teleology

Putting aside the considerations mentioned above, we must continue the inquiry about animal work by asking what the purpose is of integrating non-human animals in the process of creating commodities or providing services. In other words, what is the end to which non-human animals are used in various economic processes, *i.e*. an investigation of the ethical *implications* of non-human animal work.

We can begin this inquiry with the optimistic idea that economic processes are performed in order to increase welfare. For example, it can be argued that "economics is about people's lives, and development economics is supposed to be about improving those lives" (Nussbaum 2022). For now, we will accept this position in order to examine where it leads in regard to the use of animals as workers. We will begin with the case in which non-human animals are exploited as workers with the purpose of improving the lives of human animals, as this will illuminate us in regard to the situation in which the welfare interests of non-human animals are being taken into account, in addition to human animal welfare.

We will look at one example and then illustrate the considerations at play. In the discussion about effective altruism and the training of dogs in order to aid blind humans, Peter Singer mentions that "it costs about $40,000 to supply one person in the United States with a guide dog; most of the expense is incurred in training the dog and the recipient. But the cost of preventing someone from going blind because of trachoma, the most common cause of preventable blindness, is in the range of $20-$100. If you do the math, you will see the choice we face is to provide one person with a guide dog or prevent anywhere between four hundred and two thousand cases of blindness in the developing countries" (Singer 2015b). Hence, at least in the case of training dogs for blind humans, the end of human welfare is at odds with reality. If the end of human welfare is to be pursued, then the dog shall be left alone, and the many blind humans shall receive aid, instead of the inefficient use of resources for the sake of using a dog in the process. However, perhaps due to a pursuit of contradictory sentiments, *i.e.* the sentiment of "taming" or "conquering" "nature" or "beasts" and the sentiment of being "in touch with nature", the human welfare goal takes a secondary position or plays the role of a smokescreen in order to justify the exploitation of non-human animals. Thus, not even human welfare is being searched for in this situation.

Instead of analysing the situation mentioned above through the belief that, especially under capitalism, the goal of economic processes is the welfare of the population, we can do so through the idea that said economic processes are performed under the profit incentive. It becomes apparent why, profit-wise, it is preferable to exploit a dog for $40,000, and to supply him to a blind human that can afford such costs, instead of curing the poor from blindness.

Under capitalism, the worker takes part in economic processes through the process of wage labour, and is ideally provided with certain rights and protections, such as a minimum wage, a maximum

number of hours of work per day, paid maternal leave, paid sick leave, etc. In the case mentioned above, it is not clear how much of that $40,000 would go or should go to the dog as wage and benefits. Non-human animals would be working for a wage, generally provided in the form of human currency that has no meaning for non-human animals, unless they were somehow taught, beforehand, how to count cash and learn how to use this currency, wages would not make sense. Besides the difficulties in establishing animal worker unions that would bargain for better working conditions and better wages, there is one more problem tied to the very nature of using others, especially non-human animals, for work, which we will explore next.

Precondition for Non-Human Animal Work: Worker-Employer Association

We understand the worker-employer association as a bilateral agreement between the worker and the employer. By this, it should be understood that the worker *willingly* signs an employment contract that is *willingly* offered by the employer. At least when it comes to "developed" nations, slavery has been abolished. Thus, even if the protections and rights usually offered to workers could be provided to non-human animal workers, which in itself is a difficult task if we take into account the considerations mentioned above, we run into the bigger problem of non-human animal agency.

Though we have mentioned slavery, it is possible that animal work resembles child labour to a larger extent. In the discussion of animal welfare and animal rights, especially when the lack of the ability of animals to speak like humans is being brought up as a reason to suspect that animals cannot suffer, important figures in the animal rights movement mention the fact that the lack of this ability in children or infants does not imply that their rights or welfare does not matter morally. For example, Peter Singer argues that "states like pain

are more primitive and have nothing to do with language" and that "human infants and young children are unable to use language. Are we to deny that a year-old child can suffer?" (Singer 2015a) Tom Regan also compares the moral status of young children to that of non-human animals on a number of occasions. For example, in the context of the discussion about the harm of death: "though young children, like animals of comparable mental development, arguably lack any conception of their long-term welfare, lack the ability to formulate categorical desires, and lack any sense of their own mortality, the untimely death of either is a harm." (Regan 2004) These comparisons are not meant to suggest identical subjects, but rather to illustrate similarities between the *moral status* of non-human animals and that of young humans. Relevant to our discussion is the generally accepted belief that non-human animals, like human children, have limited agency caused by their limits regarding communication, and a limited understanding of the world, amongst other factors. If we accept that the moral status of non-human animals has considerable similarities to that of young humans, then animal work should be considered to be similar in morality to child labour.

A Civil Union or an Adoptive Parent

We will mention that, in the case of human children, it is expected that they will eventually develop their understanding of the world and become capable of making informed decisions on their own. The same is not generally believed about non-human animals. We must examine, then, who is justified in making decisions for children and what are some of the restrictions for the decisions made for them before they can make informed decisions on their own. In the case of human children, decisions are made by their legal guardians, usually their parents, grandparents, other relatives or adoptive parents. The guardians are allowed to make, for example, health-related decisions. These

decisions, however, must be in the interest of the child. For example, it is generally accepted that it is moral for parents to decide that their children shall undergo a surgical operation in order to cure them of some disease or problem, but it is understood without saying that it would not be moral for a parent to sell their children's organs for profit. Another manner in which humans are allowed to make decisions for others is in the cases of marriage and civil union. Amongst other benefits, these grant the ability to make health-related decisions if one party is no longer capable of doing so. What neither parenthood nor civil union grants is the right to make work-related decisions, more explicitly, the right to sign an employment contract on behalf of the other.

In the case of child labour, we will mention that it does not encompass household tasks such as children or adolescents having to clean their room; these tasks are in the interest of the young human. The case of labour for survival is more complicated. For example, if a young human shall work in order to secure food, this is undeniably in their interest. However, this creates an impossibility, a contradiction, in the case of non-human animals. When humans want to adopt children, hence becoming their legal guardians, they must demonstrate that they have enough resources to take care of the child. It is not apparent why this consideration shouldn't be applied to humans adopting non-human animals. If humans must have enough resources to provide the animal with adequate nutrition, shelter, etc., in order to become their legal guardians, then it follows that the involuntary work of said animal is strictly forbidden; for if the animal has access to adequate nutrition, shelter etc., then the legal guardians cannot entertain that it is in the interest of the non-human animal for them to work.

If, however, the relationship between a human guardian and a non-human animal should be considered more similar to that of a civil

union, then it would be problematic to establish the union in the first place. These are bilateral agreements that grant both sides decision-making power in the case that one party loses it. For it to be a bilateral agreement, it is necessary that both the human and the non-human animal have agency in order to join the agreement. But if we consider that the non-human animal has agency, then it follows that they shall be the ones making work-related decisions for themselves, thus rendering the human in the union incapable of making this decision. Here we arrive at non-human animals as "pets", who already have relations with humans.

"Pets" receive more care and empathy from humans but are not themselves exempt from exploitation. We must not exclude the idea that the pet-system, as a mode of human-animal interactions, is not in itself a problematic manner of conducting relations. The pet-system is hardly and rarely a bilateral agreement, as it presents an incommensurable imbalance of power, and only considers "the pet" as some*thing* related to the human, and not the animal in themselves. As we hinted above, "pet" and even "companion", as substitutes for some "other than non-human animals", only participate in the idea that non-human animals are to be viewed only in regard to the role they play for humans, not who they are in themselves. Due to the contradiction mentioned above, "the owner" status, as a privileged position, seems not to be, in itself, enough to provide the human with the moral right to decide if his "pet" must work.

The Exploitation of the Many by the Few

What Karl Marx and Frederick Engels describe as "the exploitation of the many by the few" (Marx and Engels 2015) is hardly ever more accurate than in the context of the interactions between human and non-human animals. This description is accurate in any

form of animal-related economic activity, especially animal agriculture.

In the context of animal work, "class" antagonism is most apparent. Not only are the many animals the subject of exploitation for the accumulation of capital in the hands of the human capitalists, but they are also being exploited for the pleasure and satisfaction of human workers. Workers might argue that, without eating animals (meat especially), they would lack the energy needed to perform their hard work, which is itself being exploited in order to extract the profit of the capitalists.

This is to say that regardless of class and beyond culture and material conditions, non-human animals are being exploited. There will be questions concerning the interaction between non-human animals and human animals for a long time, yet the first hurdle that humanity seems to face is that of exploitation. It must be made clear that the recognition of the existence and gravity of exploitation is not enough. Non-human animals most certainly do not suffer less from exploitation only because the exploiter feels empathy for the exploited, and it is yet to be proven that empathy alone can justify the use without consent.

Not even the idea that "nothing changes" through personal abstinence from participation in exploitation can justify it. Only that personal abstinence in and by itself is not enough, and that systemic changes must necessarily be adopted if we are to live with minimum moral consideration for non-human animals.

The universal status quo appears to be that of exploitation. Regardless of class, non-human animals are being exploited: for profit by those who seek it, for pleasure by those who desire it. Regardless of material conditions, non-human animals are being exploited: because of "necessity" by some, in spite of possibility by most. Regardless of

culture, non-human animals are being exploited: through indifference by many, in spite of acknowledgement by others.

We may believe that an inter-species or multi-species society is preferable to the status-quo, which appears to be the case if we take into account the increased level of animal welfare expected in such a community compared to that of non-human animals in the status-quo society; but not even these conditions are enough to justify the use of non-human animals as workers. It is clear that such community is yet to be established, but the idea of non-human animals as full citizens or co-citizens, that somehow should, or must, participate in society by some sort of work, has its grounding in a problematic understanding of the world: on an imperialist anthropocentric understanding of the world. Humans, as colonisers, have established themselves on land inhabited by various non-human animals without their consent, and, in addition to that, consider that non-human animals should or must contribute to *their* society and take part in *their* economic endeavours. This involuntary participation in human economic activities, within terms imposed by the coloniser and under an incredible imbalance of power, can only be acceptable if we uphold that imperialism or colonialism, in their many and various forms, are morally justified activities.

Humans are self-made experts in exploitation and, even in the 21st century, still have higher education that instructs those who take part in it about the system of non-human animal exploitation, how it operates, and how to optimize it. This fact reminds us that exploitation is institutionalized, and that the problem has a systemic side. Therefore, individual abstinence from participation in animal exploitation, though necessary, is not enough by itself.

From "Mechanical Machine" to "Cog in the Machine"; Alienation

Humans have generally overcome the "automata" view of non-human animals championed by figures such as Descartes and Malebranche. However, by participating in practices such as non-human animal work, humans only demonstrate that they have moved from viewing non-human animals as "mechanical machines" to viewing them as "cogs in the machine".

Humans cannot feel how non-human animal workers as concrete individuals feel. However, we can examine the general process and patterns of alienation that human animal workers undergo in order to understand and avoid participating in the establishment of a mass system of exploiting non-human animals as workers, as consensual participants in human economic activities.

We will loosely discuss four aspects of alienation, noting that they are interconnected. We will use, as a starting point, the understanding of alienation discussed by Karl Marx in his *Economic and philosophic manuscripts of 1844* (Marx 1988), but we will adapt it for the case of non-human animals. Because non-human animals are still to be used in mass as workers and, therefore, the effects of alienation on non-human animals cannot be seen yet, it is improbable that the aspects of alienation can be properly divided in order to finely understand their nuances. Hence, what follows must be seen only as a primitive analysis.

1. The worker`s relation to the product of labour. For now, most animals are legally considered "things" that can be owned. The products obtained by work are owned by those humans who own the means of production. As if it was not enough that some farm animals are means of production themselves, that are privately or personally owned, and some farm animals are themselves the products owned privately and meant to be sold, another type of non-human animals is on the rise regarding their numbers: the non-human animal worker

who will not own the product of their labour because they do not personally or collectively own: the land, the machineries etc. Therefore, not only do animals not have the right to own things generally, but even if they did, that could not by itself guarantee that they would be the actual owners of their fruits of labour.

2. The worker`s relation to their species. The belief that animals are here for us, as one of the peaks of human-centric teleological thinking, is, in fact, an unverifiable idea that must presuppose its claims in order to prove them. A naturalistic perspective can hardly, if at all, demonstrate that the "nature" or "essence" of animals generally contains the necessity, predisposition, or will, to work for any other species. The work for other species, then, only acts as the means of fulfilling the needs of the other species and would entail coercion – forced labour – and alienation from their species.

3. The relationship between workers. The interaction of non-human animal workers under the human regime depends solely on the will of the humans. The non-human animal workers are chosen for proximity and ability by the human owner, and not by their common interest. Hence, the only thing in common that non-human animals have in a certain workplace is that they have been chosen for exploitation by external forces. This commonality itself supposes that non-human animal workers would have non-human animal peers. The absence of said peers would be problematic, as it would eliminate the possibility of forming meaningful relations with other non-human animal workers from the very onset.

4. The relationship between the worker and society. Non-human animal workers produce for a foreign society and take part in the economic processes of an alien kin. It is possible that non-human animals ought to be considered as co-citizens or full citizens, but some questions must arise: we may want to co-exist with them, but do they want to co-exist with us? If they don't, then we should not use them. If

they do: it is clear that citizens have the right to work, but we can doubt that citizens have the obligation to work. If they don't have the obligation to work, then we run into the considerations mentioned above regarding the ability to sign the employment contract.

It is rather strange to presume some sort of "hypothetical consent" by non-human animals to participate in the human society in general and the human economic machine in particular. Not even the abolition of private property could undermine the personal ownership of animals. Non-human animal workers, as property of individual humans, cannot even have the slightest hope of happiness that human workers do. Non-human animals, as property of individual humans, couldn't "escape" work and go home and discuss with their relatives about their jobs, their interests and their hopes, for at home they are greeted by their exploiters, their owners, their employer, their "adoptive parent", their care-giver – all in one person. Non-human animals cannot be expected to "pull themselves up by their bootstraps" and work hard enough to gain financial freedom or freedom more generally. Not only do non-human animals usually not wear boots, but they cannot be properly explained how to make more money or how the system works, they cannot study to get a better job, they cannot work harder to get a promotion, *i.e.* they are expected to be unable to improve their material conditions.

To be a foreign animal in a foreign society and be coerced or forced to work in and for the economic system of a society that only takes into account your surface level needs and treats you as second-class citizen: this is the experience of a non-human animal worker.

From *having your consciousness invalidated and your preferences and desires not being taken into account* to *having your consciousness recognized but your preferences and desires still not being taken into account*: this is what it means to go from "mechanical machine" to "cog in the machine".

Considerations for the Non-Human Animal Liberation Limits

The welfare problem: in the case of human slaves, improving the "working" conditions does not remove the power from the slave owner to end the life of the slave if the slave is no longer profitable. The rights problem: in the case of human slaves, granting them the right to life and other rights does not, in itself, eliminate the institution of slavery and cannot destroy the power imbalance between the slave and the owner: it only removes *some* power from the owner, without questioning the practice of owning someone else. The abolitionist problem: the abolition of slavery did not put an end to racism and did not compensate, in any meaningful way, for the setbacks of the formerly enslaved, or otherwise disregarded populations, whose struggles are being passed down generationally to this day. The true emancipation of formerly disadvantaged groups, such as women, Black people, Roma people, and others, is still seen in some societies as "extreme".

In the case of non-human animals, these issues have not seen as much progress either. Though some welfare issues are being challenged legally in the case of some non-human animals, only for a limited number of species, generally "pets", is the problem of the right to life not considered to be "extreme". But, as we have briefly explored above, this problem is still being posed only because of the relationship between these other species and humans, and not for the non-human animals in themselves. The right to life of non-human animals does not stop them from being exploited; it will only make sure that they will be exploited, and generally treated poorly, for the full length of their natural lives. The complete abolition of animal exploitation, though a noble goal that is wrongly considered to be "extremist", is not enough either. Abolition cannot by itself put an end to speciesism and would not be able to secure the right to self-determination for non-human animals. Self-determination means that it is not humans who decide

the fate of non-human animals, and it is not humans who impose the limits of their emancipation.

Living Machines: Animal Labour and European Legislation (*Jetlira Selmani)*

> *The work of an animal is work without subject. The sow functions as a machine, but it functions in a sentient fashion, it is a living machine; we can`t walk all over it, but we can, in the pig farm itself, electrocute it in a box that capable engineers have designed for the purpose, and leave its body to compost in the farmyard, also using equipment designed for the purpose*.
> —Porcher 2014

Historically, animals have been classified as legal objects rather than legal subjects (Gaius 1904). Unlike human beings, who acquire legal personality—and thereby rights and responsibilities—at birth, nonhuman animals have traditionally been excluded from this framework. A justification for this has been the historical consideration of animals as *automata*, i.e., soulless objects (Descartes, 17th century), justifying their status as property.

Today, the legal status of nonhuman animals is in an ambivalent legal juncture, reflecting both normative progress and conceptual stagnation. As scientific understanding has advanced, a broad consensus has emerged that animals are sentient beings capable of experiencing emotions, pain, and consciousness, similarly to humans. *The Cambridge Declaration on Consciousness* affirmed that non-human animals possess the neurological substrates necessary to support conscious experience (Low 2012). It is this scientific recognition that prompted growing legal and philosophical scrutiny of animals' historical legal status and the (in)sufficiency of their protections (Singer 1975; Regan 1983; Cavaleri 1994; Coetzee 1999; Horta 2022). For

example, Wise argues that sentient non-human animals—particularly great apes—possess sufficient cognitive complexity to merit legal personhood and access to fundamental protections such as *habeas corpus* (2007). In response to such developments, the legal recognition of animal sentience has evolved—slowly, but progressively—across Europe.

Several European legislations now explicitly acknowledge animal sentience: Germany (Article 20a), Luxembourg (Article 11bis), Slovenia (Article 72), and Belgium (Article 7bis) have incorporated such recognition into their constitutional frameworks. While some Member States, such as Romania, do not provide constitutional protection, they nonetheless recognise sentience through legislation. For instance, Romania's Law 205/2004 on the protection of animals acknowledges both psychological suffering (Article 6) and the requirement to meet animals' basic physical needs (Article 5).

Thus, even where sentience is not constitutionally enshrined, it is increasingly recognised at the statutory level, indicating a gradual but meaningful shift in the legal status of animals across European countries. This shift is also reflected in the broader development of animal welfare regulation at the European level, shaped by the initiatives of two distinct institutions: the Council of Europe and the European Union (EU). The Council of Europe was the pioneer in this area, adopting a series of international conventions aimed at harmonising and promoting animal welfare standards among its Member States. Since 1968, it has introduced five major conventions: the European Convention for the Protection of Animals during International Transport (1968, revised 2003), the Convention for the Protection of Animals kept for Farming Purposes (1976), the Convention for the Protection of Animals for Slaughter (1979), the European Convention for the Protection of Pet Animals (1987), and the Convention for the Protection of Vertebrate Animals used for

Experimental and Other Scientific Purposes (1986, entered into force 1989) (Council of Europe 2024).

Since the 1970s, the principles set forth in the Council of Europe's animal welfare conventions have gradually been incorporated into EU law through a series of directives and regulations. The most concrete expression of this evolution is Article 13 of the Treaty on the Functioning of the European Union (TFEU), introduced by the Treaty of Lisbon in 2009. It states that:

> In formulating and implementing the Union's agriculture, fisheries, transport, internal market, research and technological development and space policies, the Union and the Member States shall, since animals are sentient beings, pay full regard to the welfare requirements of animals.

Article 13 TFEU represents a significant symbolic acknowledgment of animal welfare, which consists of *a legitimate public interest objective*, according to the Court of Justice of the European Union (CJEU) (2015).

The article's position in the Treaty and wording is presented as a cross-cutting political objective intended to influence EU action in all areas (Psychogiopoulou 2022). However, it is limited in scope: it applies only to a defined set of policy areas (agriculture, fisheries, transport, internal market, research, and space) and is subject to an express exemption allowing Member States to maintain cultural, religious, and traditional practices that may contradict animal welfare aims. For instance, foie gras production is defended as a cultural tradition in both France and Hungary (European Parliament 2020).

According to Psychogiopoulou (2022), unlike Articles 8–12, Article 13 is not a *horizontal clause* capable of establishing objectives of general interest that may justify limitations on fundamental (human) rights (CJEU *Deutsches Weintor* 2012)—objectives which, by their very nature, are in tension with the fundamental interests of non-human

animals. This includes the interest, as sentient beings, in not being exploited, for example by being used in scientific experiments or deployed in police or military duties where exposure to harm is routine. In addition, animal welfare is not listed among the Union's values or objectives in Articles 2 or 3 TEU. And Article 13 does not function as a legal basis for secondary legislation, establishing any new competences on the EU's behalf. As such, its normative force is limited (Sowery 2018).

This weak legal status—lacking in force and function—has direct implications when assessed through the lens of legal theory.

It is analytically relevant to distinguish between three dimensions of a legal norm: validity, legitimacy, and effectiveness. A legal provision can only be considered normatively robust if it satisfies all three. First, legal validity refers to conformity with constitutional or treaty requirements and the hierarchy of norms (Kelsen 1967). Second, legitimacy involves the law's acceptance by the public, typically ensured through democratic processes and alignment with prevailing moral and societal values (Habermas 1996). Third, effectiveness requires that the provision can be applied in practice and achieve its intended outcomes (Hart 1994). These three elements form a so-called "virtuous circle", in which each reinforces the others, thereby strengthening the overall coherence and authority of the legal system.

This ideal is not presently met. Clearly, Article 13, which recognises animals as sentient beings and obliges the Union and Member States to *pay full regard to the welfare requirements of animals* in certain policy areas, frequently lacks practical effectiveness. Its limited scope and absence of direct applicability very often mean that competing human or economic interests take precedence over animal welfare concerns.

This imbalance is illustrated in *Tierbefreier e.V. v. Germany* where the European Court of Human Rights (ECtHR) (2014) upheld an

injunction against the dissemination of undercover footage revealing animal cruelty in a research facility. Although the material aimed to raise public awareness of ethically troubling practices, the Court prioritised the protection of the company's commercial reputation. The outcome underscores how animal welfare provisions, despite their formal recognition in EU primary law, may remain ineffective when confronted with entrenched human interests.

A comparable conclusion may be drawn from the judgment in *PETA Deutschland v. Germany* (ECtHR 2012). PETA ran a marketing campaign entitled *The Holocaust on your plate,* to raise awareness of the suffering inflicted on animals by the food industry and to encourage people to refrain from the use of animal products. The campaign controversially juxtaposed images of animals in industrial farming conditions with those of human victims of the Holocaust, accompanied by the statement: "When it comes to animals, everyone becomes a Nazi". Germany's Central Council of Jews sought an injunction, arguing that the campaign violated the dignity of Holocaust victims and trivialised their suffering. The domestic courts initially agreed and granted the injunction. Although a lower court later found that the campaign did not explicitly demean Holocaust victims, it nevertheless held that the comparison was arbitrary and unacceptable due to the elevated constitutional status of human dignity under Article 1(1) of the German Basic Law (*PETA Deutschland v. Germany*, ECtHR 2009). Yet, the Court ruled unanimously in favour of Germany. It found that while the campaign was important for the public interest, it had *instrumentalized* the suffering of Jews for the protection of animals, leading to a violation of their personal rights. It, therefore, considered that PETA's interest in the publication of the disputed campaign had to be ceded.

Yet, animals continue to be instrumentalized across virtually all aspects of human life: they serve, among other roles, as food,

experimental subjects in pharmaceutical and military development, sources of clothing, means of transportation, entertainment, emotional companionship, and essential aids for persons with disabilities. This deep-rooted, profit-driven relationship contrasts with the evolution of society, which is increasingly demanding a stronger legal commitment to animal welfare at EU level.

More than 1.2 million EU citizens have supported the European Citizens' Initiative (ECI) to end animal testing in cosmetics (European Commission, 2023). Similarly, the *End the Cage Age* initiative, which calls for a ban on cage use for farmed animals such as rabbits, pullets, broilers, quail, ducks, and geese, has received nearly 1.4 million signatures (European Commission 2020). The 'Stop Vivisection' campaign also garnered over 1.3 million signatures (European Commission 2015). These initiatives reflect a clear shift in how animals are morally perceived and a growing EU consensus for stronger legal protections, even when these clash with human, economic, or scientific interests. Yet, the law has yet to meaningfully alter the underlying problem: in 2022 alone, 8.39 million animals were used for the first time in research across the EU-27 and Norway (European Commission 2024) and over 300 million farm animals are still caged every year (Eurogroup for animals n.d.).

The enduring anthropocentric framework of EU and Member State legislation often prevents the realisation of substantive animal protection, highlighting a significant disconnect between public values and legal implementation (Sowery, 2018).

As a consequence, European animal welfare legislation, while legally valid, frequently lacks both legitimacy and effectiveness in light of contemporary societal values, as evidenced by the widespread support for several ECIs.

More significantly, it fails to address one of the most profound and under-examined dimensions of the human–animal relationship: the role of animals as workers within society.

Work is generally defined as activity involving *pay, the denial of leisure, effort, social contribution, the fulfilment of needs, or the production of an external result or benefit* (Tyssedal 2025). Without embarking on a purely conceptual analysis, as this point is dealt with in the first part of this article, it is clear that many animals perform tasks that meet these criteria. Military dogs like Belgian Malinois and German Shepherds assist in search and rescue, explosive detection, border control (Ensminger 2012; Border Violence Monitoring Network, 2020); police horses are used in crowd control and ceremonial duties (Munsters et al. 2013); zoo animals (regulated under Directive 1999/22/EC) and circus animals perform for entertainment (banned in 23 out of 27 member states; European Parliament 2023); guide dogs, service dogs and signal dogs assist persons with disabilities (European Commission 2019); others (mice, fish, rats, birds, cats, dogs, monkeys, etc.) are used in scientific research (European Commission 2024). In all these cases, their efforts produce external results, economic benefits and make a significant contribution to society.

Recognising animals as sentient and individual beings, this article proposes a normative hypothesis for consideration: that animal work may be interpreted, from a legal perspective, as a form of servitude or forced labour, raising significant ethical and legal concerns. Hence, the need for the development of a legal framework in which animal labour is acknowledged, regulated, and protected, drawing inspiration from human labour rights. Such a framework could serve to align EU law with the evolving ethical consciousness of European society regarding animal sentience. As well as lead the road to redressing the structural invisibility of animal labour within Union law.

Under existing law, servitude is understood as a condition in which an individual is compelled to provide services through coercion (1), combined with the obligation to reside on another's property (2) and the impossibility of altering one's status (3) (Weatherburn 2021). This interpretation was affirmed *in Van Droogenbroeck v. Belgium* (ECtHR 1982) and further developed in *Siliadin v. Franc*e (ECtHR 2005), where the ECtHR identified these three elements as constitutive of servitude under Article 4(1) of the ECHR. The Court has clarified the third condition, positing that it must be evaluated subjectively, from the perspective of the individual involved. *In C.N. and V. v. the United Kingdom* (ECtHR 2012), it stated:

> The fundamental element which distinguishes servitude from forced or compulsory labour, within the meaning of Article 4 of the Convention, consists in the feeling of the victims that their condition is unchangeable, and that the situation is not likely to improve.

Article 4(2) of the ECHR prohibits forced labour, but this prohibition is not absolute: certain forms of work imposed by the State are excluded, such as military service or civic obligations. The definition of forced labour adopted by the EU (Council of the European Union, 2024) is based on that of Convention No. 29 of the International Labour Organisation (ILO), Article 2(1) (1930), namely: "all work or service which is exacted from any person under the threat of a penalty and for which the person has not offered himself or herself voluntarily." Two key elements stand out: the absence of consent and the imposition of work under coercion, i.e., without the person's will.

Case law has interpreted *involuntariness* broadly. In *Van der Mussele v Belgium,* as an excessive or disproportionate burden imposed on the person (ECtHR 1983). In *Chowdury and Others v. Greece* (ECtHR 2017), the ECtHR recognised that extreme dependency—such as for

food, shelter, or medical assistance—may constitute coercive conditions.

It is an irrefutable fact that nonhuman animals, as sentient beings, are capable of experiencing pain, stress and discomfort in the face of this imposition. This raises concerns not only regarding the ethical implications of animal 'employment', but also the legal foundations on which it rests, given that the current legal framework does not address the concept of animal work or connect it in any way to animal welfare, particularly in sectors such as agriculture, safety, healthcare and transport (Article 13 TFEU). In contrast, human labour is subject to extensive protections under EU law, including the Charter of Fundamental Rights of the European Union and directives such as the Working Time Directive 2003/88/EC, which guarantee fair working conditions, health and safety, rest periods, and protection against exploitation (European Union 2000; European Union 2003), none of which apply to animals, despite their analogous roles in certain contexts.

Given that animals are incapable of offering voluntary consent and often perform labour under conditions of complete dependency, it may be argued that their situation aligns with the legal characterisation of forced labour. Moreover, when animals are expected to reside with and serve the same human for the entirety of their lives—without any legal mechanism to alter this status—parallels to servitude become difficult to ignore.

Drawing parallels between animal labour and human labour might raise objections, as the two can be understood to belong to distinct normative and ontological categories. Karl Marx maintained that animals act out of instinct and survival needs, whereas humans engage in conscious, cooperative production—endowed with the capacity for governance, language, and self-reflective labour (Marx [1844] 1988). From this perspective, animals cannot be seen as

participants in social or political life, nor as agents capable of deriving meaning from work (Benton 1988). As Marx stated, "an animal produces only itself, whilst man reproduces the whole of nature," and it is "conscious life activity [that] distinguishes man immediately from animal life activity" (Marx and Engels 1996–1998). While it is argued that Marx's intention was not to establish a strict human–animal dualism (the animal analogy served to highlight the socially constructed nature of capitalist estrangement from labour; Stache 2018). This analysis suggests that the human–animal dualism related to labour remains deeply embedded in the European legal structure.

However, Porcher reconceptualizes work not merely as a means to production but as a way of living together, participating in the same social environment (Porcher 2014). She argues that animals engaged in work—such as herding dogs, draft horses, or dairy cows—do not follow rigid, mechanistic orders. They interpret tasks, adapt to contexts, and act according to their individual capacities and relational motivations. For her, this constitutes a form of *subjective agency*, whereby animals contribute meaningfully and cooperatively to joint work processes with humans (Porcher and Bouëre, 2017). She contends that recognising animals as co-workers (to humans), rather than mere objects of care, is rooted in the concept of mutual respect (Porcher 2014).

This view aligns with the work of Blattner, Coulter, and Kymlicka (2019), who argue that the failure to recognise certain groups—such as women, migrants, or people with disabilities—as legitimate workers has historically led to their exclusion from systems of social recognition, legal protection, and membership. The same risk now applies to animals whose labour remains unacknowledged and unregulated, while creating value to *people, economies, societies and corporate interests* (Coulter 2016).

From a legal perspective, the formal recognition of animals as workers, rather than servants or tools, opens the possibility of extending labour law principles in a manner adapted to their welfare (Shaw 2018). Coulter (2016) proposes assessing animals' engagement with work through a continuum of suffering and enjoyment: animals, like humans, can exercise agency and may derive satisfaction from certain forms of labour. She cites the example of elite racehorses, who may appear to enjoy their work.

Labour legislation could thus be reimagined from a similar perspective, placing emphasis on animals' welfare and their potential for fulfilment in work. Though admittedly speculative, this framework would move towards recognising the intrinsic value of animals as coworkers and their role as social and economic participants. However, as it was argued in the first part of this article, regulating animal labour presents significant challenges: it is difficult to establish genuine consent, and it may be more prudent, under *the precautionary principle*, to avoid animal labour altogether. From this abolitionist perspective, legal reforms risk legitimizing exploitation under the guise of protection. This article does not pretend to resolve this tension but sees legal recognition as a possible first step towards improving protections, even within an imperfect system.

As Blattner et al. (2019) note, the distinction between inhumane and humane treatment does not lie solely in the presence of consent—especially in cases involving vulnerable beings—but rather in the existence of a robust legal and regulatory framework that defines the limits and conditions of acceptable work.

Thus, if the use of animal labour is to persist—and it undoubtedly will across various sectors—it is imperative that it not be allowed to fall into servitude or forced labour, amounting to exploitation and modern-day slavery. As Porcher (2014) sharply noted, unless a change occurs, animal labour exists in a legal vacuum that permits their

treatment as sentient machines: used, optimised, and ultimately discarded.

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Limits of the Sustainable Development Goals in Protecting Animals. Ideas for the Future

Lavinia Andreea Bejan *

Abstract

The United Nations' Sustainable Development Goals and the subsequent targets are part of an agenda conceived as 'a plan of action for people, planet and prosperity', as stated in its preamble. A concern for animals and their protection may be identified in this Agenda, mostly, but not only, falling under the umbrella of protecting the 'planet'. In this paper, I aim to provide an overview of how the care for animals is included (or not) in the 17 goals and 169 targets that seek 'Transforming our world', to identify the past and current limitations of the global agenda as reflected in this type of soft law-goals approach, as well as to bring together some ideas for the future of animal protection under such goals and targets.

Keywords

animal protection, biodiversity, ecosystems, 'One Health, One Welfare', Sustainable Development Goals (SDGs)

Introduction

In 2015, the United Nations, by Resolution of the General Assembly, adopted the document called 'Transforming our world: the 2030 Agenda for Sustainable Development' (2030 Agenda), which is conceived as 'a plan of action for people, planet and prosperity' (Preamble) with the general aim of eradicating poverty, including extreme poverty. This "historic promise to secure the rights and well-being of everyone on a healthy, thriving planet" is seen as "the world's roadmap for ending poverty, protecting the planet and tackling inequalities" (UN, n.d.). The Agenda builds on the previous 'Millenium Development Goals' (2000), seeking to 'address their

* "Gheorghe Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch; Email: lavinia.andreea.bejan@gmail.com

unfinished business' with an intention to 'heal and secure our planet', while also pledging that 'no one will be left behind' (2030 Agenda, Preamble). The 2030 Agenda includes 17 Sustainable Development Goals (SDGs) and 169 subsequent targets generally addressing five areas of critical importance for humanity and the planet, namely 'people', 'planet', 'prosperity', 'peace', and 'partnership' (the '5Ps'). The SDGs "reflect an understanding that sustainable development everywhere must integrate economic growth, social well-being and environmental protection" (UN, n.d.). The SDGs and subsequent targets are thus integrated, indivisible and interlinked, following the idea that "Sustainable development recognizes that eradicating poverty in all its forms and dimensions, combating inequality within and among countries, preserving the planet, creating sustained, inclusive and sustainable economic growth and fostering social inclusion are linked to each other and are interdependent" (pt. 13).

In this context, the present paper is looking at the approach of the 2030 Agenda and its goals and targets on animal care, animal welfare and animal protection, in an attempt to identify whether, how and to what extent these global ambitions are inclusive of other-than-human needs. Reflecting on the idea of 'transforming our world', *whose* world is the world that 'we' are attempting to transform? The paper will thus seek to discuss the limitations of the 2030 Agenda, particularly its human-centric approach, as well as to promote some ideas for the future of animal protection as reflected in this type of 'goals' approach.

SDGs: Universalism and Human-Centeredness

The 2030 Agenda, with its goals and targets, has a strong claim to universalism, both conceptually and from the perspective of its acceptance and implementation. It has been negotiated and accepted by all UN member states, namely all the states of the world. It is

declared a 'universal Agenda', it includes "universal goals and targets which involve the entire world" (Preamble; pt. 5) and its entire content regards 'universal' ambitions – universal peace, universal respect for human rights and human dignity, universal literacy, universal access to quality education, universal health coverage and access to quality health care, universal and equitable access to safe and affordable drinking water for all, universal access to green spaces, etc. Moreover, its ambitions generally regard 'all people' or 'all human beings', who are thus the main beneficiaries of its provisions.

In terms of implementation, the 2030 Agenda applies to all the states of the world, which, together with 'all stakeholders, acting in collaborative partnership' (Preamble), are to implement its provisions. Partnership and participation are required from all the states, all the stakeholders, as well as all the people, in an attempt to bring together national governments, the private sector (ranging from micro-enterprises to cooperatives and to multinationals), civil society and philanthropic organizations, the entire United Nations system, as well as other actors (pt. 39, pt. 42). Accordingly, the means of implementation of the Agenda, goals and targets are also conceived as universal. While the SDGs and targets thus have a global nature and are universally applicable, they also take into account and respect different national realities, capacities, levels of development, national policies and priorities. The targets are defined as 'aspirational and global', guiding each government in setting national targets to support the 'global level of ambition', while also considering national circumstances (pt. 55).

The 2030 Agenda and subsequent goals and targets are also fundamentally people-centred, as expressly mentioned in the document (pt. 2) and reflected in the statement that it is 'an Agenda of the people, by the people, and for the people' (pt. 52). The document broadly references human beings, human dignity, human rights,

human race, human person, human potential, human progress, human health, human settlements, human well-being, and, generally speaking, humanity. Concerning the area of critical importance represented by 'people', the document expresses an ambition to end poverty and hunger and to ensure that 'all human beings can fulfil their potential in dignity and equality and in a healthy environment' (Preamble).

The dignity of the human person is recognized as fundamental, and the goals and targets are to be met 'for all nations and peoples and for all segments of society', with an attempt to 'reach the furthest behind first' (pt. 4). There is also a significant focus on the idea of 'leaving no one behind', of empowering the vulnerable and global solidarity with the poorest and with those in vulnerable situations (pt. 8, pt. 23, pt. 39), and this is also applicable to 'people', or, better said, 'our people' (as expressively stated in pt. 34).

The Concern for Animals – In General Terms

As can already be seen, the preoccupation for humans is not the sole concern of the 2030 Agenda, its goals and its targets. The 'planet' is also significantly referenced as a major point of interest, sometimes in standalone references, and other times by direct references to human needs. Even the area of critical importance represented by 'people' is described in a way which includes environmental concerns, and the same may be said by the area represented by 'prosperity', which is described as commitment to "ensure that all human beings can enjoy prosperous and fulfilling lives", but also that "economic, social and technological progress occurs in harmony with nature". Moreover, the 'planet' represents a distinctive area of critical importance. In this sense, a commitment is expressed "to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking

urgent action on climate change" (Agenda 2030, Preamble). The document also mentions, among its aims, the intention to ensure the lasting protection of the planet and its natural resources (pt. 3). Also, its vision references, among others, a world where human habitats are safe, resilient and sustainable (pt. 7), and where the patterns of consumption and production and use of all natural resources are also sustainable, regardless of the source of such natural resources (air, land, rivers, lakes, aquifers, oceans, seas, etc.). Moreover, in this envisioned world, the development and the application of technology are climate-sensitive, respect biodiversity and are resilient, humanity lives in harmony with nature, and wildlife and other living species are protected (pt. 9).

In this sense, the 2030 Agenda recognizes that social and economic development depends on the sustainable management of our planet's natural resources and thus expresses a determination to conserve and sustainably use the oceans and seas, freshwater resources, as well as forests, mountains and drylands, and to protect biodiversity, ecosystems and wildlife. A commitment is also expressed to tackle water pollution, desertification, land degradation and drought (pt. 33), as well as to reduce the negative impacts of urban activities and of chemicals which are hazardous for both human health and the environment (pt. 34).

While, in general terms, a care for the well-being of animals is mostly reflected in the preoccupation for biodiversity, wildlife, preservation of species, etc., the intentions and ambitions of Agenda 2030 concerning the 'planet' does reflect a significant interest for nature and the environment, and such an interest is definitely more extended than in the previous 'Millenium Goals'. The goals and targets, conceived in more specific terms, express more varied points of concern regarding animals.

The Concern for Animals – Specificities in the Goals & Targets

Positive effects on the lives of animals may be reached by the fulfilment of SDGs such as Goal 2, 'Zero Hunger', Goal 6, 'Clean Water and Sanitation', Goal 11, 'Sustainable Cities and Communities', Goal 12, 'Responsible Consumption and Production', Goal 14, 'Life below Water', and Goal 15, 'Life on Land'.

SDG 2 aims to 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture'. While the general concern of this goal is human-oriented and regards ending hunger and malnutrition, certain targets are related to animals, seen as resources for reaching this goal. Accordingly, target 2.4 is to ensure, by 2030, sustainable food production systems, as well as to implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality. Maintaining ecosystems and ensuring the sustainability of food production systems thus both contribute to human well-being and are positive measures for the well-being of animals. Target 2.5 is to maintain, by 2030, the genetic diversity of seeds, cultivated plants and farmed and domesticated animals, as well as their related wild species, including through soundly managed and diversified seed and plant banks, and this is to be achieved at all levels – national, regional and international. This target expresses a more direct concern for the well-being of animals in the form of species preservation, and it regards farmed, domesticated and related wild species. Target 2a is to increase investment in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks, with the purpose of enhancing agricultural productive capacity in developing countries, in particular least developed countries. Again, while the scope of this goal is ending human hunger, this is to be

achieved by means of sustainable agriculture and food production, which includes a concern for the animals.

Another SDG that rather regards human well-being but also involves a care for nature and animals is Goal 6, 'Ensure availability and sustainable management of water and sanitation for all', which references ecosystems, in the sense of protecting and restoring water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes (target 6.6).

In a similar approach, Goal 11, 'Make cities and human settlements inclusive, safe, resilient and sustainable', targets, among others, to strengthen the efforts to protect and safeguard the world's cultural and natural heritage (11.4), as well as to support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning. The concern for the environment is again related to the preoccupation for humans and their settlements.

SDG 12, 'Ensure sustainable consumption and production patterns', targets, among others, to achieve the sustainable management and efficient use of natural resources (12.2). If animals are seen as 'natural resources' to be 'used', then this target is also beneficial to them. Moreover, this goal implies the achievement of environmentally sound management of chemicals and all wastes, and significantly reducing their release to air, water and soil in order to minimize their adverse impacts on human health and the environment (12.4), which does show a distinctive concern for the environment. Also, target 12.5, to substantially reduce waste generation through prevention, reduction, recycling and reuse, may positively impact ecosystems and animals that suffer due to poor waste generation. Goal 12 also plans to ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles

in harmony with nature (target 12.8), and this idea of harmony with nature is beneficial to both humans and other forms of life.

A more direct concern for other-than-human life is seen in SDG 14, 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development', the first target of which is to prevent and significantly reduce marine pollution of all kinds (14.1). It also plans to sustainably manage and protect marine and coastal ecosystems, in order to avoid significant adverse impacts, including by strengthening their resilience, and to take action for their restoration in order to achieve healthy and productive oceans (14.2). This goal implies minimizing and addressing the impacts of ocean acidification (14.3), as well as the conservation of at least 10 per cent of coastal and marine areas (14.5). It also targets to increase scientific knowledge, develop research capacity and transfer marine technology, in order to improve ocean health (14.a) and to enhance the conservation and sustainable use of oceans and their resources (14.c). Moreover, reaching this goal is expected to have a positive influence on animal 'resources' by its targets related to fishing. In this sense, target 14.4. aims to effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing, as well as destructive fishing practices, and implement science-based management plans, in order to restore fish stocks, at least to levels that can produce maximum sustainable yield as determined by the biological characteristics of the fishes. This reference of the biological characteristics of the various species shows a type of concern that goes beyond the interest for human well-being and expresses an adjustment of human well-being to the particularities that are to be found in the animal world. In a similar way, target 14.6 aims to prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, as well as eliminate subsidies that contribute to illegal, unreported and

unregulated fishing. Accordingly, human interests are to be met with limits that take into consideration the non-human animals, as well.

Another goal that references nature and animals to a greater extent is SDG 15, to 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'. It seeks to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands (target 15.1), halt deforestation, restore degraded forests and substantially increase afforestation and reforestation (target 15.2), and combat desertification (target 15.3), all of which would subsequently positively impact the well-being of animals as well. Under this goal, it is also intended to take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and protect and prevent the extinction of threatened species (target 15.5), as well as to promote fair and equitable sharing of the benefits arising from the utilization of genetic resources, and promote appropriate access to such resources (15.6). There is also an aim to act urgently to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products (15.7), and all of this shows an interest in species conservation and welfare. SDG 15 also targets to integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts (15.9), mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems (15.a), mobilize significant resources to finance sustainable forest management (15.b), and enhance global support for efforts to combat poaching and trafficking of protected species (15.c). A significant question mark is raised by target 15.8, namely, to introduce measures to prevent the introduction and

significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species. In this case, to what extent human intervention has benefits for the other forms of life, and how to balance the interests of various forms of non-human life, is a question that hopefully the professionals in the field will be showing adequate concern.

Approaches, Proposals for the Future and Discussions

A preoccupation with the well-being, welfare and protection of animals is noticed in the language and approach of the 2030 Agenda, its goals and targets. For the most part, this is noticed in more general references to the 'planet', 'nature' or 'environment', but also in more applied concerns for 'biodiversity' or conservation of species. Much of the language regarding animals, however, views them as 'food', 'products' or 'natural resources', and only rarely are they considered in their intrinsic value. This small-proportion orientation towards animal well-being in itself is particularly noticed when it comes to overfishing and the discourse on biodiversity. The document remains people-oriented, and animals are mostly considered insofar as they benefit humans or can be 'used' by them.

Many relevant organizations dedicated to animal health and welfare seem to argue that animal welfare deserves better consideration in the SDGs since animals themselves contribute to SDGs. 'World Organization for Animal Health (WOAH) published a presentation provided by Isaiah Otieno, Civil Society Unit, UNEP, which highly supports this approach.

The presentation shows that animals are key in poverty eradication by sustaining communities via ecotourism, by representing a source of income for poor families through trade, or by providing food, and thus food stability, and therefore contribute to the achievement of SDG 1, 'No Poverty'. The 'One Health' approach, as

"an acknowledgement that the health and welfare of human, animals and ecosystems are interconnected" (Otieno 2020), is supported in connection to SDG 3, 'Good Health and Well-Being', in the sense that, with good animal welfare policies and their enforcement, many of the zoonotic diseases will be mitigated. The animals' role in SDG 4, 'Quality Education', is also considered, through the fact that communities may tap into the wildlife and domestic animal potential and realize some income that with enable them to provide better education for their children, and also through the fact that intact ecosystems represent a vital learning opportunity for the future generations. Animals also contribute to SDG 5 on 'Gender Equality', helping women by taking off duties that are gender differentiated, such as fetching water or ploughing. It is shown that, when women own animals in Africa and Asia, their social and financial capacities are improved, enabling them to have space for other activities and improving their freedom. Animals are also shown to play a role in water conservation and replenishment, as is the case with beavers creating wetlands that replenish freshwater aquifers, and thus contribute to the achievement of SDG 6, 'Clean Water and Sanitation'. Animals are also considered in connection to SDG 8, 'Decent Work and Economic Growth', by the fact that the reduction of industrial livestock and encouragement of small-scale sustainable livestock production will lead to a better distribution of wealth to the poorest in society, who are practicing small-scale livestock farming – which also contributes to the achievement of SDG 10, 'Reduced Inequalities'. With regard to SDG 11, 'Sustainable Cities and Communities', it is shown that "sustainable cities need sustainable supply of food which can only be achieved by better animal welfare" (Otieno 2020), and that the much-needed fresh air can only be achieved by ensuring thriving biodiversity. Animals also contribute to the fulfilment of SDG 13, 'Climate Action', through the way they regulate greenhouse gas, their seed dispersal and

regeneration of the tropical trees and forests, and the ability of the marine life to address climate change and thus prevent global biodiversity loss. Marine life, moreover, sustains humans "by providing food and economic activity to earn a living" (Otieno 2020), thus also helping with the fulfilment of SDG 14, 'Life below Water'. Moreover, it is shown that "All the life on land interdepend on each other. The plants depend on the animals for pollination, animals depend on the plants for food and as their habitat. Humans depend on both the plants and the animals", and it's important that this ecosystem is maintained "to be able to manage climate change, thus increase food security and eradicate poverty". Accordingly, "by taking care of environment, humans will be assuring our own survival" (Otieno 2020).

The organization 'Health for Animals' also shows that, to meet the challenges ahead, as well as deliver upon the SDGs, our world must consider the role of animals. "Outbreaks of livestock disease can reduce production of meat, milk and eggs, leading to shortages of these nutrient-rich foods. Meanwhile, pathogens in wildlife can cross over into vulnerable populations of people and domestic animals, as we saw with Covid-19. Our future is clearly intertwined with animals and the environment", shows the organization. As in the previous example, the 'One Health' approached regarding people, animals, and environment is encouraged, as "what affects one, will affect the others" and this is why "improving the health of animals can strengthen efforts to achieve key SDGs by 2030" (Health for Animals, n.d.). In the organization's opinion, healthy animals can contribute to key goals such as SDG 1, 'No Poverty', SDG 2, 'Zero Hunger' and SDG 8, 'Decent Work and Economic Growth', by the fact that livestock provide "an irreplaceable pathway out of poverty for a billion people, while offering valuable nutrition for communities". They also contribute to SDG 3, 'Good Health and Well-Being', as "pets provide faithful support during

difficult, stressful times", and to SDG 12, 'Responsible Consumption and Production', and 13, 'Climate Action', through their smaller environmental footprint (Health for Animals, n.d.).

'Animal Welfare Observatory' is another entity that dealt with the connection between animal welfare and the SDGs, and they believe that the former contributes to the latter particularly regarding SDG 3, 'Good Health and Well-Being', SDG 9, 'Industry, Innovation, and Infrastructure', SDG 12, 'Responsible Consumption and Production', SDG 13, 'Climate Action', SDG 14, 'Life below Water', and SDG 15, 'Life on Land'. Their approach is one of 'a new paradigm of sustainable production', namely "A food system free from intensive farming that ensures animal welfare, and positively impacts human health, socio-economic development, and environmental protection", which is necessary due to "People's growing concern about the origin of their food, scientific considerations questioning current animal production systems, and ethical viewpoints that reject animal suffering as acceptable practice" (Donoso 2024).

The 'International Fund for Animal Welfare' (IFAW) also published a report on the critical role of animals in achieving the SDGs, generally showing how animals and their habitats play a key role in human well-being and the SDGs, and addressing specifically SDG 2, 'Zero Hunger', SDG 3, 'Good Health and Well-Being', SDG 4, 'Quality Education', SDG 5, 'Gender Equality', SDG 8, 'Decent Work and Economic Growth', SDG 13, 'Climate Action', SDG 14, 'Life below Water', and SDG 15, 'Life on Land'. The organization shows that "animals, both domestic and wild, contribute significantly to human development, and their welfare supports human well-being in all its forms, both material and non-material", and that animals are 'a link between people and the environment', and will thus play a key role in achieving a sustainable future (IFAW 2022, 38). The organization has thus formulated a series of recommendations for policymakers. First of

all, they recommend the adoption of a 'One Health, One Welfare' approach, by integrating animal welfare, wildlife conservation and habitat protection into human health and sustainable development policy and planning. Secondly, they recommend the inclusion of animals in disaster planning and disaster risk reduction efforts. Thirdly, they speak of the adoption of more sustainable agricultural and fisheries practices and reducing animal consumption in order to prevent biodiversity loss through land use change, combat climate change and reduce pandemic risk. Fourthly, they recommend support for global efforts that aim to expand and protect habitat for wild animals, while connecting existing protected lands and oceans (IFAW 2022, 38).

The inclusion of a 'One Health, One Welfare' approach in the future of the SDGs (or a similar global policy method) is thus widely supported. The UN Global Sustainable Development Report (GSDR) 2019, the first such report, identified a number of key issues missing from the Goals, and one of these is animal welfare. The report thus states that "The clear links between human health and well-being and animal welfare is increasingly being recognized in ethics – and rights-based frameworks", and that "Strong governance should safeguard the well-being of both wildlife and domesticated animals with rules on animal welfare embedded in transnational trade" (GSDR 2019, 117). The second GSDR, in 2023, also advocates for recognizing the linkages between human and animal health and the environment (GSDR 2023, 109), which is an important step in advancing more clearly a 'One Health, One Welfare' approach, yet animal welfare is no longer expressly referenced. However, concerning sustainable food systems and nutrition patterns, it does call for reforming food production and promoting healthier diets by discouraging overconsumption of animal-based foods. For the future, expressly embedding a 'One Health, One Welfare' approach, where 'One Health' acknowledges the

interconnectedness of human, animal, and environmental health, and 'One Welfare' connects human welfare, social welfare and animal welfare (Colonius and Earley, 2013) would be highly desirable for improving animal protection.

However, this approach, alongside the approach that shows how animals contribute to the SDGs, as opposed to how the SDGs should be working for animals, is rather accepting of the idea of 'animal use', and seems to mostly challenge the manners in which such 'use' is to be managed – namely, sustainably. Of course, this approach is preferable to the one where there are no limits to human behaviour towards animals, yet it is not the only option.

In this sense, the work of the 'SDG18 Coalition', which seeks to bring about an 18th SDG, 'Zero Animal Exploitation', is a representative example. Believing that the SDGs failed to address the key issue of animal exploitation, this coalition, started by the 'Beyond Cruelty Foundation' and including, in the meantime, other organizations, businesses, local and regional government and non-governmental entities, aims to demonstrate, instead, how the food system and other forms of animal exploitation are undermining the UN SDGs. They are supporting the ideas that animal exploitation has resulted in significant repercussions on the earth's climate, water, and natural habitats, and contributes greatly to zoonotic pandemics, that the agriculture industry (in particular grazing for cows raised for beef and livestock feed crops) is one of the primary causes of deforestation, and that it leads to excessive greenhouse gas emissions, scarcity-weighted water usage, land degradation, and nutrient pollution, amongst other negative effects. They accordingly aim to motivate nations, organizations, and individuals around the world to adopt policies that seek to reduce and eliminate humans' reliance on animals altogether (SDG 18 Coalition, n.d.). Their concerns essentially have a moral foundation. However, they are only taking into consideration certain

SDGs as referring to animals (14, 'Life on Land', and 15, 'Life below Water'), while there are many more, and have not yet proposed the content (or targets) for such a goal, which makes the limits of their intentions unknown at the moment.

Extending the discourse on animal welfare, animal health, and animal well-being in the future, in the upcoming form of the SDGs or a similar endeavour, either by a 'One Health, One Welfare' approach, or, better yet, justified by the intrinsic value of animal beings, is highly desirable. By that time, however, there are plenty of justifications in the existing 2030 Agenda that may represent a basis for action and policies regarding the care and protection of animals. Certain provisions and language may be interpreted to allow for and even encourage such action, such as the references to 'all life'. For instance, the first point in the vision of the 2030 Agenda mentions "a world free of poverty, hunger, disease and want, where all life can thrive" (pt. 7), and 'all life' may very well be said to include 'animal life'. Also, in the Preamble of the document, it is mentioned that, "If we realize our ambitions across the full extent of the Agenda, the lives of all will be profoundly improved and our world will be transformed for the better". Again, 'the lives of all' does not necessarily mean 'the lives of all humans'. Broader interpretations of such provisions may even today represent grounds for policies, partnerships, legislation, projects or other endeavours aimed at protecting animal life. Still, the following document similar to the 2030 Agenda or the enhanced approach past 2030 could use better conceptualization and more language on 'all life', 'harmony with nature', and it could also include animals in the idea of 'all segments of society' (pt. 4), which need not be understood as only referencing human society. Extending and enhancing the concern for 'all life' and including animals, conceptually speaking, in 'all segments of society' would better justify and subsume the inclusion of more

adequate means of protection for animals, so that humanity can effectively live in harmony with nature.

Conclusions

The UN 2030 Agenda 'Transforming our world' and subsequent goals and targets recognizes the environment as one of the three dimensions of sustainable development, alongside the economic and the social, and seeks to address areas of critical importance for both humanity and the planet – with the 'planet' being one of these core concerns. The document has been accepted and adopted by all the states of the world, and applies to all of them, and is highly reflective of a universalistic approach, involving, allegedly, the entire world. However, its human-centrism makes it rather clear that this 'entire world', 'our world', is rather the human world, as 'all people' and 'all human beings' are the main beneficiaries of its provisions.

Accordingly, many of the references regarding the planet, the environment or nature are subsumed to human-oriented goals, and the protection of the planet and its 'resources' is often approached by its benefit to humans. Still, the planet is recognized as a distinctive area of critical importance, and several provisions also seem to support its protection 'for the sake of itself', such as those aimed at protecting biodiversity and ecosystems, species preservation, or the recognition of the importance of the biological characteristics of various species, thus limiting human access and use of such species. While, generally speaking, animals are seen as 'resources' to be 'used', such use, however, is not unlimited, and it is to be performed in 'sustainable' ways, which indicates that human interests are to be met with limits that also take into consideration the non-human animals.

There is a strong tendency to explain the importance of the need to better consider animal well-being, welfare and protection in the future by showing how animals themselves contribute to the

achievement of the SDGs. While the interconnectedness between animals (human or non-human) is welcome to be elaborated on, and there is nothing negative in pointing it out, perhaps it would be even more welcome to focus less on what animals are doing for 'us', and support better welfare and protection of animals for their intrinsic value. In the same sense, by acknowledging that 'our world' is not only the 'human world' and that 'all life' also means 'animal life', and by switching the focus from 'all human beings' to 'all living beings', there may be a stronger foundation for future action and policies regarding the care and protection of animals, so that 'harmony with nature' has better odds at being achieved.

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‘Listening’ for Silent Killers: Hooked on Holidays

Sarah Oxley Heaney*, Cristina Zenato**

Abstract

The Bahamas is a popular destination for American-celebrated holidays such as the 4th of July and Thanksgiving. Although shark-fishing is in the Bahamas, the number of hooks removed from Caribbean reef sharks by ‘shark-listener’, Cristina Zenato, increases during such holidays. Fishing aquatic-anymal bodies for entertainment is a globally accepted and popular act in human-anymal[1] recreational tourist activities. While (human) friends and family members gather, garnered with refreshments and fishing equipment, poised for a day of enjoyment and human-bonding, this normalised, often fiercely defended activity, directly aims to result in aquatic-anymal injury or death. Since Bahamian shark-fishing is illegal, and the sharks in this presentation are untracked, there is uncertainty as to whether these sharks are hooked within or outside of Bahamian waters. However, illegal activity has been evidenced occurring within Bahamian waters, notably during 2020 when an American family made headlines for illicitly catching, cooking, and consuming a shark on their Bahamian vacation-home BBQ. Recreational fishing disregards any notion that aquatic-anymals may be bonded members of their own aquatic-anymal families, but also integral parts of human-aquatic-anymal bonds. One notable example of such interspecies bonds is demonstrated between ‘shark listener’, Cristina Zenato and the group of sharks she has dived with for over 30 years. This paper explores current academic literature and contrasts findings with ‘shark-listening’ bonds, the hook removal process, and the hooking effects on sharks. The article further touches on Cristina’s feelings of anxiety due potential harm caused to sharks by recreational-fishing; the unravelling of shark-human kinship bonds when sharks disappear, and her subsequent feelings of grief and loss.

Keywords

shark-human bonds, anthrozoology, recreational fishing, unconventional relationships

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* University of Exeter, Devon, United Kingdom; Email: sh750@exeter.ac.uk

** People of the Water; Email: czenato@gmail.com

[1] I acknowledge the contested use of the term ‘animal’ which normatively applies to only animals that are non-human. However, as the prefix ‘non’ ‘others’ all other animal species, here I utilise Kemmerer’s (2006, 1) term “Anymal” as a form of “verbal activism”.

Introduction

This paper features work in progress towards my PhD in anthrozoology, borrowing from participatory action research techniques (Freire 2018; Lewin 1946), I'm collaborating with Cristina Zenato, the self-described 'shark listener'. Cristina has dedicated 30 years to co-evolving and maintaining unconventional, shark-human relationships (which will hence be referred to as 'shark-listening' relationships), with generations of sharks at a particular site in the Bahamas, where some of the relationships have lasted up to 15 years[2,3]. This article examines how societally sanctioned recreational fishing practices disrupt 'shark-listening' relationships. Disruptions which come in the form of the potential, insidious lethal effect of fishing hooks embedded on, and within, shark bodies, and Cristina's anxiety and grief, which stems from the pernicious, societally institutionalised activity. Although *human* grief over the loss of morethanhuman-anymal bonds, particularly companion-anymal kinship bonds (Charles 2014; Schmitz, Love, and Tabler 2024), has become more widely accepted (DeMello 2016; Redmalm 2016), a disenfranchising taboo is[4] still imposed when considering the upheaval of both aquatic-anymal-*only* bonds, and the less conventional aquatic-anymal - human relationships. Cristina tells me:

> "I have been diving the same locations in the Bahamas for the last 30 years and have formed a relationship between myself and a shiver of Caribbean Reef sharks. I

[2] Links to Cristina's work are found here: www.cristinazenato.com; https://www.instagram.com/cristinazenato/?hl=en; https://www.facebook.com/media/ set/?set=a.10151274925420081.

[3] The lifespan of a Caribbean reef shark (*Carcharhinus perezi*) is currently determined as being between 9.6 years (Carlson et al. 2021) and 25 years (Department of Environment (DoE) Cayman Islands Government, n.d.), but gaps in knowledge concerning lifespans remain.

[4] Research is needed on whether this is a predominantly 'Western' taboo.

> consider the sharks part of my family. They live 15-18 years. As I have been diving with them for 30 years, I have already lost some members of my [shark] family. One of the hardest things is not being able to say goodbye. While I have watched some sharks die from suspected cancer, others have simply not returned to the dive site. There are no goodbyes to my sharks. I don't know, when I see them, whether it may be the last time. I wish I had an answer, even if I could just find them dead."

This last line strikes me, I had not considered the act of their disappearing. Why do they not return? Are they killed, if so, by what or whom? Are they predated, diseased, or 'just old'? Do they simply relocate? While the answers to these questions are beyond the scope of this paper, research has identified gaps in knowledge concerning the Caribbean reef shark (*Carcharhinus perezi*) as a species (and certainly as individuals), including spatial and temporal data (for example, see Kohler et al. 2023; Brooks et al. 2013). There is even less data for those residing in the Bahamas (for example, see Campbell et al. 2024), and as far as we are aware, beyond knowledge currently possessed for this shiver[5]. Figure 1 shows Cristina and some members of the shark-listening shiver.

Figure 1. Cristina and some of the 'shark-listening' shiver

[5] A shiver of sharks is the collective noun used to describe a group of sharks.

Listening to 'Mere Fish'

Reflecting on my research, I contemplate the likely response from people if companion-anymals, 'wildlife'[6], or even farm anymals were regularly found with hooks embedded within or on their bodies. What would we think if these anymal categories were being hooked for sport? No doubt many of us would be horrified at the lack of compassion, the suffering, and call for an end to such so-called entertainment. Now, if I introduce the word 'fish' or 'shark', how diminished would the protestation be? Whose opinion would change because they are "'mere fish'" (Wadiwel 2019, 220)? While this question is beyond the scope of this article, we ask the reader to reflect on your own stance towards sharks and other fish[7].

Both longline[8] and recreational fishing are banned in the Bahamas, however, there is evidence of illegal longline fishing occurring within the country's waters. In 2014, it was noted that increasing amounts of fishing line, hooks, and cables had washed up on beaches in Southern Abaco Island, which likely indicates an increase of long-line fishing activity. It is suspected the long-line fishing vessels come from international locations, arriving at night to avoid detection and prosecution ('Shark Laws in Bahamas | Shark

[6] I recognise the problem with defining the term 'wildlife' but use it here as an umbrella term with the definition taken from Andrew M. Lemieux (2014, 2) "Wildlife includes all forms of non-domesticated plants and animals living in the wild", although this leaves further issues with other undefined terms.

[7] Readers can contribute to this research if they wish by giving their perspectives on all things related to sharks, especially, of course, anything related to shark listening and this paper. Please join the conversation here https://padlet.com/kissingsharks/SilentKillers

[8] "The Bahamas enacted the Restriction on Long-Line Fishing Amendment in 1993, which prohibits the possession and use of long-line fishing equipment. Long-line fishing in this amendment is defined as fishing by line or cable with not less than ten hooks and the line extending, or cable extending, beyond twenty yards." https://sharkangels.org/shark-laws-loopholes/bahamas/

Angels' 2021). While there's no tagging of the shark-listening shiver[9]. Due to the size and type of hook Cristina typically removes from individuals in the shiver (Figure 2), she suspects recreational fishing is the cause. Such hooks are consistent with the type that recreational fishers use to catch non-cartilaginous fish.

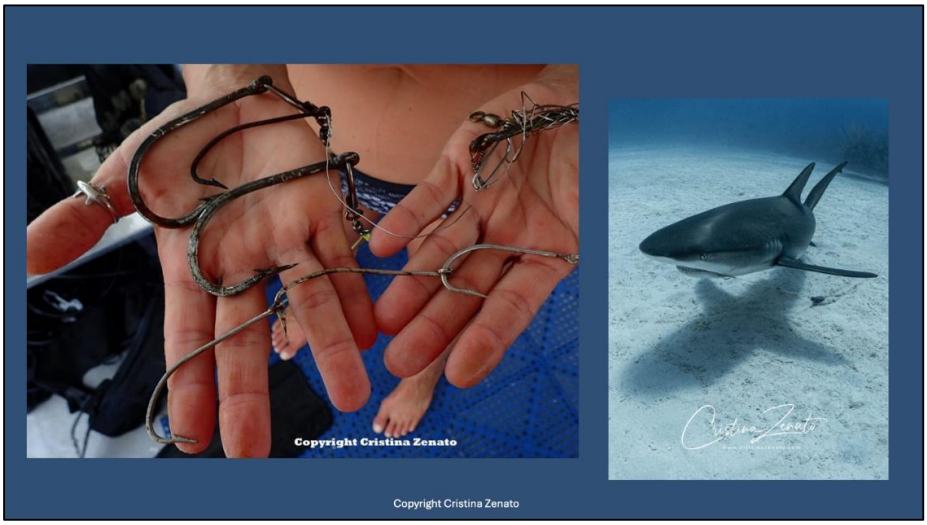

Figure 2. An example of hooks removed from individual sharks in the 'shark-listening' shiver by Cristina

However, an added complication is that research scientists in the Bahamas also hook sharks during research (for example, see Brooks et al. 2012; Bouyoucos et al. 2018; Campbell et al. 2024; Heupel and Simpfendorfer 2010) and also globally (for example, see Heupel and Simpfendorfer 2010), some of which results in shark deaths (Hammerschlag and Sulikowski 2011).

Compared to recreational fishing, which utilises techniques which require the sharks to be out of the water to remove hooks (often

[9] Bureaucracy and lack of funding scuppered a previous attempt to tag members of the shark-listening shiver.

including sharks being hauled onto boats for example see Mcclellan Press et al. 2015, 'shark-listening' hook removal occurs in-water, without capture, and as such the hook removal techniques require an unorthodox, intimate contact with the sharks in the 'shark-listening' shiver. While describing each technique is beyond the remit of this paper, Figures 3 and 4 illustrate Cristina removing a hook from inside Foggy Eye's mouth[10].

Figure 3. Hook removal from Foggy Eye. © Kewin Lorenzen[11]

[10] Before the reader continues, a reflexive exercise may be interesting. What are your reactions to Figure 3 below? People's reactions to Cristina's work on social media are for another paper, but perhaps reflect on your perspectives and biases (if you have any) while reading this article. Please join the conversation on the padlet: https://padlet.com/kissingsharks/SilentKillers if you wish to contribute your perspective towards this research.

[11] The figure shows stills from the video for convenience, the full video can be found here: https://vimeo.com/72742972

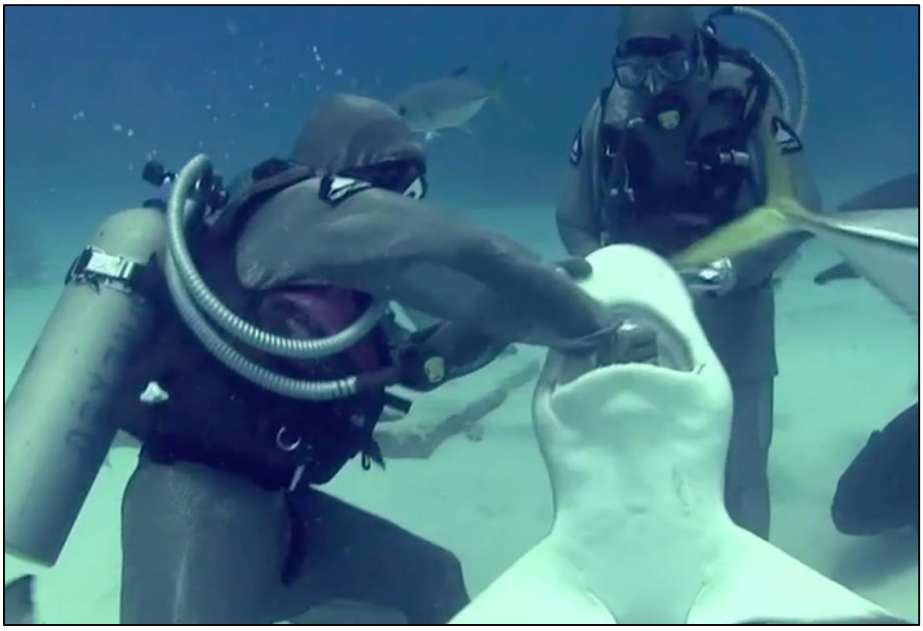

Figure 4. A video still image of Cristina removing a hook from Foggy Eye.
© Cristina Zenato

To more fully understand the impact of individual sharks, Cristina and I are compiling a log of hooked sharks, to determine which sharks were hooked and when. While we don't have the figures yet, Cristina explains:

> "The amount of hooks the sharks are hooked with depends on the human presence. So, in the wintertime, we have less hooks, and in the summertime, we have more hooks because humans are more active."

She describes the aftermath of recreational fishing activity that occurs on the Fourth of July, in the Bahamas, on the shark-listening shiver community:

> "For many, July 4th it's a time of celebration… the results of July 4th are of cleaning up. Every year, after this weekend, sharks on Shark Junction come back covered in hooks. Yesterday was no exception. We went from two

sharks with two small hooks, to six sharks with new hooks and horrific metal lines, one of them with a giant weight dragging below the shark. I was able to remove two, one hook from Crook and one from Peggy. Nacho and Hook had massive lures coming out of their mouths, while Half-Baked has a hook with line. A new girl, we have been noticing for the last few weeks but not named yet, was also dragging a line and lure, while Forficula has a line coming out of her gills. It is so upsetting that one weekend can cause such a mess in a small population of protected sharks. It should wake us up to what's happening to the rest of the sharks in the world. It is time we recognise our impact, big or small, on these creatures and their well-being" (Zenato 2023) (Figure 5).

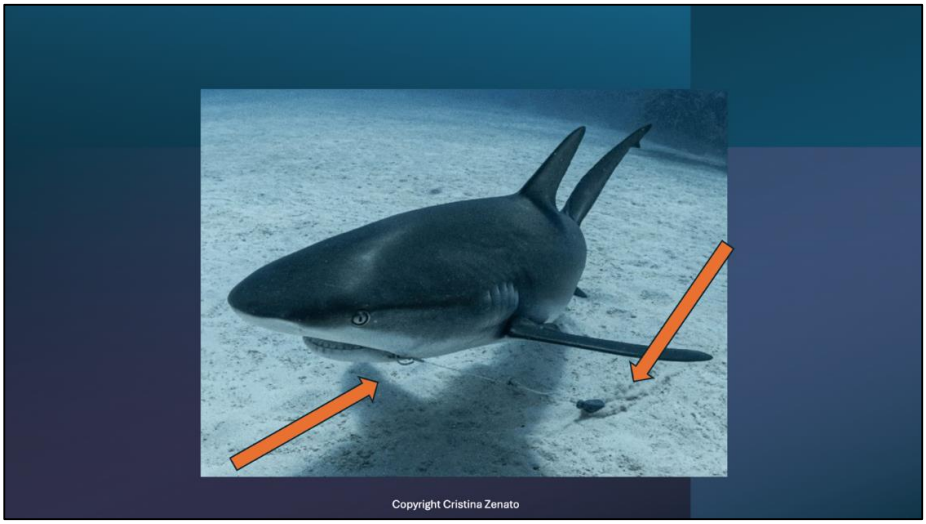

Figure 5. Forficula carrying a hook and line.

Aim to Maim

Cristina voices discomfort: "I am unable sometimes to remove them effectively and I am sad that there is such a disregard for the

sharks, as if their pain and suffering is not of concern." Despite fishers' concern for conservation (Cameron et al. 2023; Cooke et al. 2006; Gallagher, Cooke, and Hammerschlag 2016; Granek et al. 2008), recreational fishers, as a group, do not extend this regard to the individual aquatic anymals they target and catch. Subsequently, while the shiver is negatively affected by hooking, even if unintentionally, research shows recreational fishers find benefits from the activity. From social bonding (Brownscombe et al. 2019; Henry and Lyle 2003), entertainment (Wadiwel 2019), relaxation (Fedler and Ditton 1994; Henry and Lyle 2003), finding peace in nature (Holland and Ditton 1992), to human-centred health and therapeutic advantages (McManus et al. 2011). While human kin come together, bonding through recreational fishing, this often ethically unchallenged, activity socially normalised through its promotion by government institutions (Office of the Secretary of State for Scotland 2023; NOAA Fisheries 2025), arguably deliberately *aims* (and certainly cannot bypass), aquatic-anymal injury or death Wadiwel 2019 despite anglers often claiming this is *not* the intent (Balon 2000). These recreational and tourist pastimes (Wadiwel 2019; Ditton, Holland, and Anderson 2002) deem the harm wielded onto the targeted aquatic-anymal as "innocuous" (Wadiwel 2019, 206) "predation directed at fishes" (ibid, 208), simply collateral damage of recreational "intersubjective violence" (Wadiwel 2019, 217).

Such violence is represented in the box (Figure 6) Cristina shows me, given to her in 2015 in China at an anti-finning conference. The 300+ hooks removed from the shiver symbolise the mutual trust and attentiveness to compassion within the unconventional shark-listening relationships that have co-developed over the years.

Figure 6. *The Box of Hope* shows 300+ hooks Cristina has removed from the shark-listening shiver. © Cristina Zenato

Hooks – Silent Killers

As I read the literature concerning sharks and fishing hooks, one thing strikes me, Cristina is only able to remove hooks she is aware of, i.e. the ones she can see and reach. Hooks wield not only external visible harm to shark bodies but an insidious, internal violence and currently there are no diagnostics to reveal these silent killers. The term 'silent killer' is used in anthropocentric medicine to refer to "a disease or disorder, or a biological, chemical, or ***physical agent*** [emphasis added], that is capable of causing death without first producing noticeable or recognizable symptoms." (Oxford English Dictionary, n.d.). The term has also been used when referring to various morethanhumans, including diseases in companion anymals (Baneth 2006); pesticides in birds (Carson 1962), the effect of hydrogen sulphide

on aqua-cultured shrimp (Kasper et al. 2022), endocrine-disrupting chemicals in wild primate populations (Anca and Wallis 2024). The term is equally applicable to hooks embedded within shark bodies where the undetected presence of these hooks perpetuates a form of latent violence, slowly inflicting harm on the shark over time. I wonder about these silent killers, hooks that may lurk undetected within the shiver. Is it possible some of the shark-listening shiver have internal hooks? What does published research reveal about this potential phenomenon?

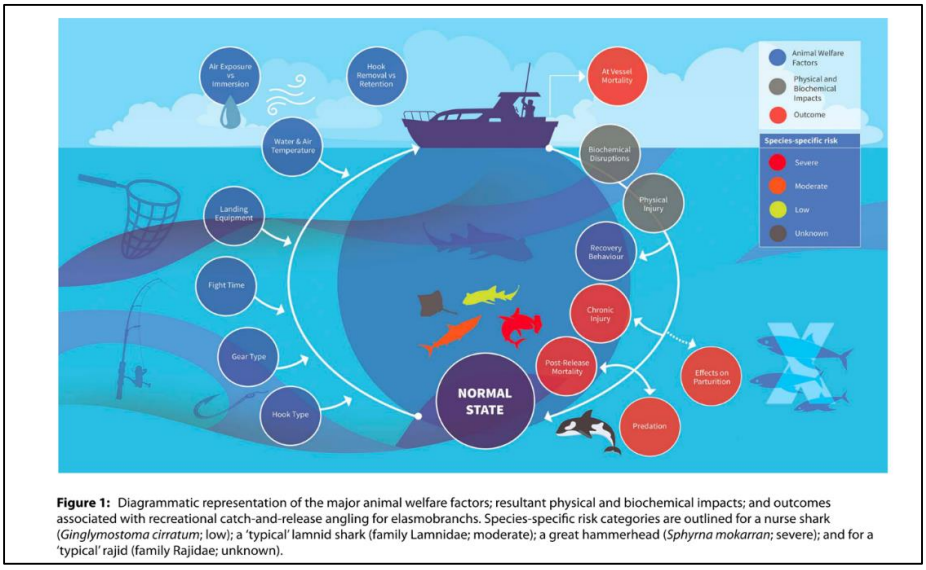

Figure 7. Welfare factors of elasmobranch catch-and-release science, (Cameron et al. 2023, 2)

Shark-centred research, which examines the effects of fishing hooks that remain in sharks' bodies, uses the term 'retained fishing gear'. In their review of elasmobranch catch-and-release science, Cameron et al. (2023, 2) illustrate the welfare factors in Figure 7 and report "[a] range of anymal welfare implications" including injury and stress "from "the process of capture", "handling (often including

removal from the water and exposure to air)" and release. These impacts Cameron et al. (2023, 2) say, can be broadly categorised as resulting from the "physical injury and/or the biochemical disruptions associated with this process", with consequences ranging "from relatively minor short-term impairments to mortality" (also see Wosnick et al. 2017).

I think back to the shark-listening shiver and realise that sharks returning to the dive site with a hook reflects only one part of the trauma they endure. The shark has perhaps experienced stress during the fishing retrieval 'fight' (for example, see Skomal 2006) and may have been handled by being taken out of the water for line cutting or attempted hook removal. Such trauma is referred to as *sublethal* consequences and can include physiological stress and physical trauma (for example see Skomal 2006; Kneebone et al. 2013). However, the fight is often considered a "thrill" (Skomal 2006, 126), an important component of the recreational fishing 'pastime' (Wadiwel 2019). As Cristina points out: "Sharks are not a game to play with, they fight for their lives as someone on the boat is having a 'great time'".

Hooking Impacts

Cristina gives an example of post-hooking impacts on a shark body, which starkly contrasts the distancing language such as 'retained fishing gear' and 'sublethal effects'. One of the sharks in the shark-listening shiver is Grandma, a 2,69 metre (eight-foot 10 inch) shark whom Cristina has been diving with for fifteen years. Grandma has a permanent injury in her lower jaw (Figures 8 and 9).

Figure 8. Grandma with her long-term jaw injury

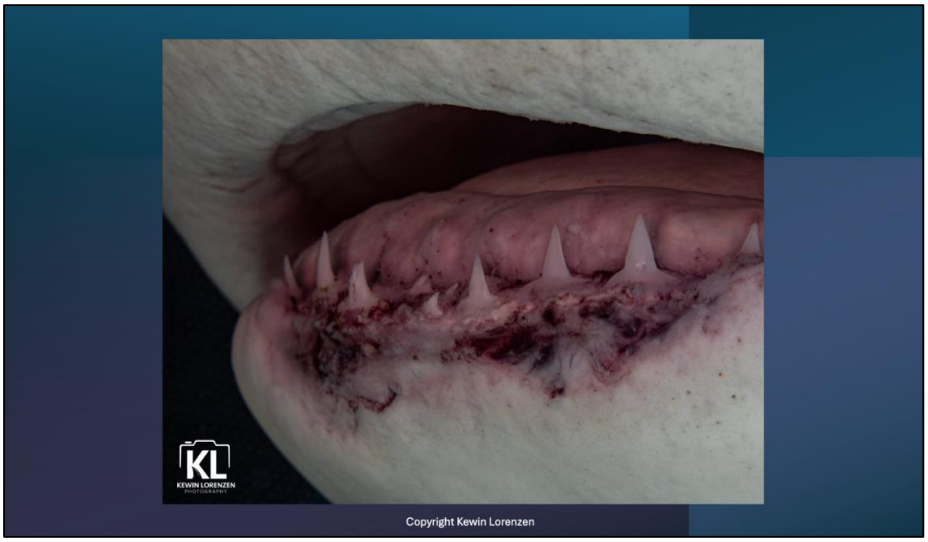

Figure 9. Close-up of Grandma's long-term jaw injury

"This distinct feature is the most identifying mark on the fly for Grandma; it has not always been there; it appeared five years ago. The flesh around the bottom jaw is slightly pulled back, showing the teeth in their entirety and creating a permanent infection. Grandma deals

with it pretty well; at times, it's bigger, and at times it's smaller, but it never goes away. One of the theories behind this stretch is that a hook became stuck in the area and pulled hard enough to leave the damage." (Zenato 2021).

I can't help but wonder how many sharks are affected by retained hooks. There are only a few studies that show sub-lethal hook injuries on sharks. Figure 10 (Bansemer and Bennett 2010, 99) shows the damage a retained hook in a grey nurse shark's jaw caused over a period of just over 18 months. Their research shows not only how sharks can be left with permanent deformities, but also the length of time they are left to suffer with 'retained fishing gear'.

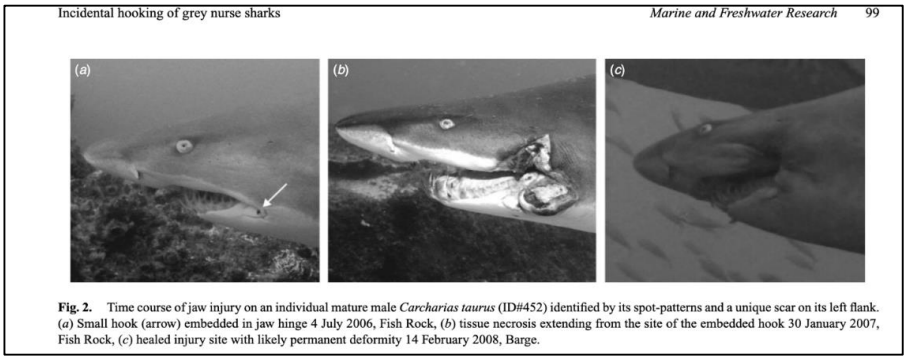

Figure 10. Australian grey nurse shark (*Carcharias taurus*) hooking injury recorded over 19 months (Bansemer and Bennett 2010, 99)

Post-release mortality is another of the welfare factors included in Cameron et al.'s (2023) diagram, Figure 7. The non-return of sharks to the shark-listening shiver is a constant concern for Cristina and during my search for research on post-release mortality on *Carcharhinus perezi*, I come across Binstock et al.s' (2023, 1) research which states mortality from catch and release may not be immediate: "[p]ost-release mortality estimates ranged from 0% for bull and tiger sharks to 45.5% for blacktip sharks. Of the two great hammerheads,

one died within 30 minutes post-release while the other exhibited mortality characteristics 14 days after release."

However, it appears there is a research gap on the survivability of Caribbean Reef sharks from any type of fishing[12]. Brooks' et al.'s (2012, 1) thesis states "[d]espite its abundance and common interactions with fisheries, there has been no investigation into the capture driven stress physiology of this species to date". Subsequent species studies reveal that *Carcharhinus perezi* are vulnerable to fishing capture, although the long-term effects are unknown (for example, see Bouyoucos et al. 2018; Kohler et al. 2023; Brooks et al. 2013). These studies focused on longline fishing. In their 2023 study, Cameron et al. focused on catch-and-release consequences studies on sharks, which "directly addressed impacts of catch-and-release angling" (2023, 2). They revealed large data gaps with only 23 catch-and-release studies on Carcharhiniformes, 12 studies on Lamniformes, 4 on Rajiformes, 3 on Rhinopristiformes and 1 on Orectolobiformes. "Other elasmobranch orders, including Squaliformes and Squatiniformes, were not found to be represented by any catch-and-release studies" (ibid, 10). Neither were any individuals in the species *Carcharhinus perezi* included. So, there is currently no scientific data on how long Caribbean Reef Sharks take to recover or die or how long they suffer. Could the non-return of a shark to the shiver be due to post-release mortality?

Hook Types

One of the other factors mentioned by Cameron et al. (2023, 7) is hook type. They tell us "[a]lthough there are a multitude of different 'hook-types' available to recreational anglers, these can usually be

[12] Research predominantly focuses on longline capture, of which there is a paucity of data. Research on recreational fishing of *Carcarhinus perezi* is even more scant.

simplified to one of the **two most common hook-types; the traditional j-hook and the circle-hook** [emphasis added]". The common types found by Cristina are indeed J and circle hooks shown in Figure 11.

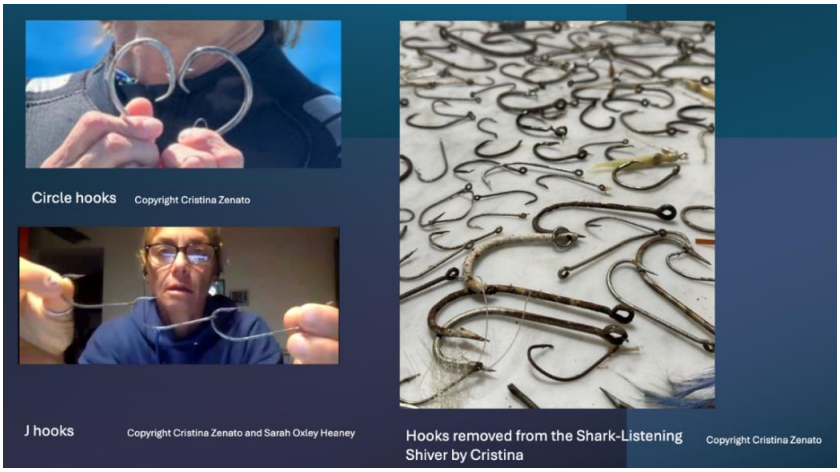

Figure 11. Cristina illustrating removed J and circle hooks

Literature describes how certain hook types are designed to reduce negative effects on aquatic anymals, including sharks. J hooks are considered easier to swallow and so more likely to get hooked in the digestive tract of target fish and expected to cause more deaths (Santos et al. 2023). Whereas circle hooks are intended to hook mainly outside the body, in the jaw, fins or gills, which supposedly leads to decreased post-release mortality (Favaro and Côté 2013), although there is a debate on whether this is true for sharks (see Santos et al. 2023, 2).

How does this correlate to findings? My first challenge is finding literature that specifically addresses this question for sharks, furthermore for non-pelagic and then for individuals of the species *Carcharinus perezi*. Again, there are gaps in data. Santos et al. (2023) acknowledge large gaps in data for retention and mortality rates for

pelagic sharks[13]. In their review, amongst the "40 relevant references" (Santos et al. 2023, 5) they found on 12 species of pelagic sharks they found "mixed results when comparing retention rates of elasmobranchs caught on circle hooks relative to J-hooks in shallow pelagic longlines" (Santos et al. 2023, 10). Cameron et al. (2023, 11) conclude: "there has been comparatively little research on long-term consequences of recreational angling, such as those stemming from hook retention**.** Beyond the obvious expense and difficulty associated with prolonged monitoring periods, any assessment of the wider population-level impact is also likely to be hampered by a lack of available information on the rates of hook retention for most recreational fisheries targeting elasmobranchs**."** These articles reference mortality post external hooking, which, as previously mentioned, is only part of the problem. Hooks swallowed and retained inside the body are potential 'silent killers'. So, I search for hooks found in shark necropsies.

Cameron et al.'s (2023) review tells us hooks have been found swallowed and caught in the gut, and gives examples. Kilfoil et al. (2017, 286) report the death of a Sand Tiger Shark (Figure 12), caused by internal haemorrhaging due to a circle hook "circle hook lodged in the stomach".

Figure 4. Sand Tiger mortality found at Delaware Seashore State Park on August 28, 2012, on a state beach by D. A. Fox, Delaware State University. Probable cause of death determined to be 20/0 circle hook (highlighted by white circle) that caused massive hemorrhaging. Photo credit: Danielle Haulsee.

Figure 12. illustrates the death of a Sand Tiger Shark from a circle hook (Kilfoil et al. 2017, 286)

[13] *Caracharhinus perezi* are a non-pelagic species.

Figure 1 Longfin mako shark; pericardial mass (size outlined by black circle) cut open to visualise the circle hook *in situ*. Inset: circle hook and scale in in/cm.

Figure 13. Mortality due to a retained circle hook in a longfin mako shark *Isurus paucus* (Guitart-Manday) (Adams et al. 2014)

Adam et al.'s (2015) article reports the necropsy of a female longfin mako shark (Figure 13), which found long-term inflammation of the heart and surrounding tissue, caused by a circle hook. There were also signs of infection, scarring and blood clots, and the liver showed severe damage. Furthermore, her ovaries had undeveloped eggs and there were blockages to organs including the gills, due to necrotic tissue.

Other studies have shown: a "severely damaged oesophagus" of a short fin mako shark "due to an internal hook" (Mucientes and Queiroz 2019, 7); damage to internal organs, such as a lacerated liver and chronic health issues (Borucinska et al. 2002). These articles highlight the perniciousness of hook migration, causing increased damage, silent and slow "intersubjective violence" (Wadiwel 2019, 217). Borucinska et al.'s (2002, 515) study showed six blue sharks were found to have "hooks were embedded within the distal oesophagus…. perforated the gastric wall… and lacerated the liver" They go on to conclude "The hooks were surrounded by excessive fibronecrotic tissue which" eroded "the normal anatomical structures" and three sharks with hooks in their oesophagus had caused "partial luminal

obstruction"[14] . All sharks had peritonitis and bacterial infection (Borucinska et al. 2002, 515).

Otway et al (2021) show hooks can be inside the shark's body long enough to become mineralized, forming what is called an enterolith (Figures 14 and 15). Enteroliths are formed when hooks migrate through body walls (for example stomach to intestines) with the lines sometimes attached leading to, in the case of an emaciated sandbar shark caused by the mineralized hook and line, "the invasion of GI tract bacteria into the systemic circulation and abdominal cavity leading to infection and disease in line with previous studies (Borucinska et al., 2001, 2002, 2003)" (Otway et al. 2021, 247). Nurse sharks (*Carcharias taurus*) can be particularly susceptible to hooking meant for teleosts, leading to

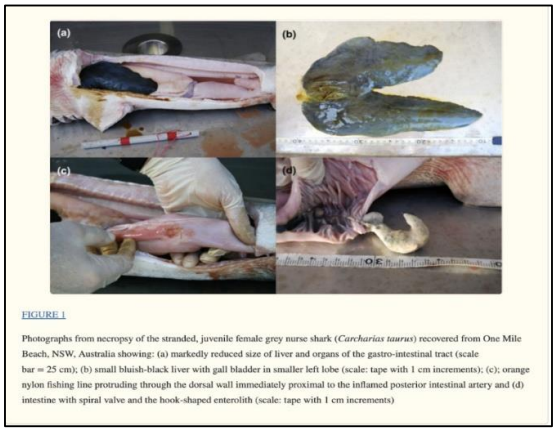

Figure 14. Enterolith extracted from a juvenile, female, grey nurse shark (Otway et al. 2021)

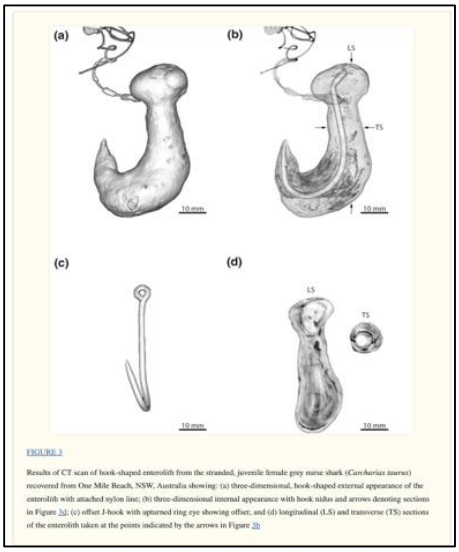

Figure 15. Enterolith extracted from a juvenile, female, grey nurse shark (Otway et al. 2021)

[14] The luminal is part of the gastric system

"sharks being released with hooks in their GI tract causing localized tissue trauma, bacterial infection, chronic pathologies and ultimately death" (Otway et al. 2021, 241). My understanding of this biological language, is the hook went into her stomach, migrated into the intestine, perforating the boundary between the stomach and the intestine creating bacteria in the GI tract creating infection, so she couldn't eat enough and as due to starvation, ingested seawater which in part created the 'enterolith'.

Starved Sharks

Sharks found emaciated are described as having become anorexic (Otway et al. 2021, 242) due to migrated retained hooks. These hooks can cause infection and/or blockage, or fistulas, and sharks with no food in their GI tracts have been documented at least twice in literature (Monreal-Pawlowsky et al. 2016; Thornton et al. 2012). Where sharks have been deliberately starved or "experimentally fasted" (Otway et al. 2021, 246), they have also been shown to ingest small amounts of seawater (see Otway et al. 2021 for details), and this seawater aids in mineralising the hook (Otway et al. 2021, 246). With regards to the female nurse shark, Otway et al. (2021, 247) say "[t]he absence of food items, GI tract stasis and the occurrence of monohydrocalcite in the HSE suggests a history of seawater drinking and anorexia in the stranded shark". Adams et al.'s (2014, 626) study showed the retained circle hook had migrated to the shark's heart, where an embolism and "cardiovasular collapse" was the likely cause of death after "debilitating disease", and "prevented the shark from feeding and culminated in stranding".

This makes me reflect on Cristina's description of seeing sharks with signs of emaciation, lack of eating, signs of discomfort, and I wonder if this could indicate hooks held within the shark's body. Had sharks in the shiver, in fact, been carrying silent killers? Are some of them carrying them now?

The above research all describes hook removal from dead sharks, whose bodies were deliberately sought out or found, collected and

examined. How many are researching hooks in sharks and conducting shark necropsies? There is very little academic research I could find on removal from live sharks, visible or not.

I could find only two reported cases of hooks being removed surgically from live sharks, one of which was an aquarium-captive shark. One hook from the liver in 2011 (Lécu et al. 2011, 259) (Figure 16) and one from the oesophagus in 2016 (Figure 17) (Smith, Matthews, and Cliff 2016, 3). One of the sharks, Lécu et al. believe was from being fed a conger already carrying a hook internally by aquarium staff.

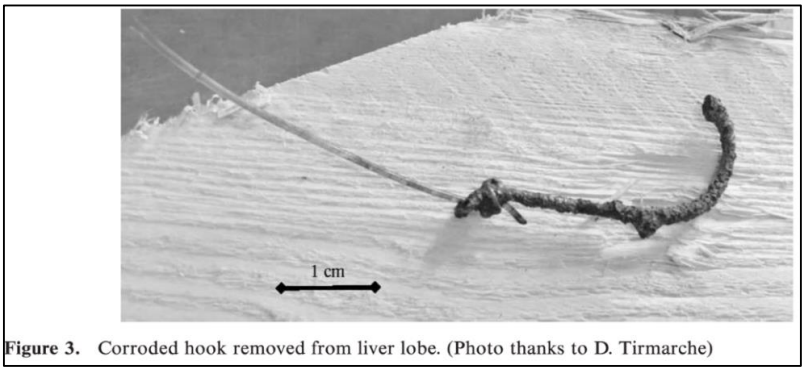

Figure 16. Corroded hook removed from liver of captive shark in 2011 (Lécu et al. 2011, 259)

Figure 17. Hook removed from the oesophagus of a juvenile Nursehound shark (*Scyliorhinus stellaris*) in 2016 (Smith, Matthews, and Cliff 2016, 3).

Furthermore, the 2021 paper says this is the *first* example of an enterolith in a marine anymal – the first one *found* may be more accurate – how many sharks and other aquatic individuals are actually affected? Are there any research attempts to understand whether and how many sharks carry internal hooks? Aquatic One Health frameworks (for example, see Norman et al. 2023) require development, especially from a non-anthropocentric standpoint (i.e. focusing on conservation rather than a shark-interests-centred approach), the desire and technological diagnostic abilities do not currently exist to find hooks embedded within free-living shark bodies. This again raises the question of how many sharks are affected? The research gaps in long-term hooking consequences and number of sharks affected have been previously mentioned. However, some studies show the issue is potentially widespread. Bansemer and Bennett's (2010, 97) article, whose Australian study lasted from 2006-2008, showed of the 673 nurse sharks (*Carcharias taurus*) sharks they identified, "113 sharks were identified with signs of 119 incidences of hooking." Borucinska et al.'s (2002, 515) study, which caught and landed 211 blue sharks, *Prionace glauca* (L.), claimed "This is the first report of the prevalence and pathology of retained fishing hooks in a large number of wild-caught sharks"and revealed "[f]ishing hooks retained from previous capture events were found in 6 of 211 blue sharks".

Endless Violence

'Previous capture events' illustrates that sharks are not only experiencing hooking "intersubjective violence" (Wadiwel 2019, 217), trauma and exposure to the risk of hook ingestion once, but multiple times. As previously mentioned, Cristina and I are working on a log to determine, amongst other things, how often individual sharks have been hooked. Bègue et al. (2020, 3) show how a female Tiger shark was

hooked multiple times over a period of 7.6 years, with one hook retained over that entire period (see Figure 18).

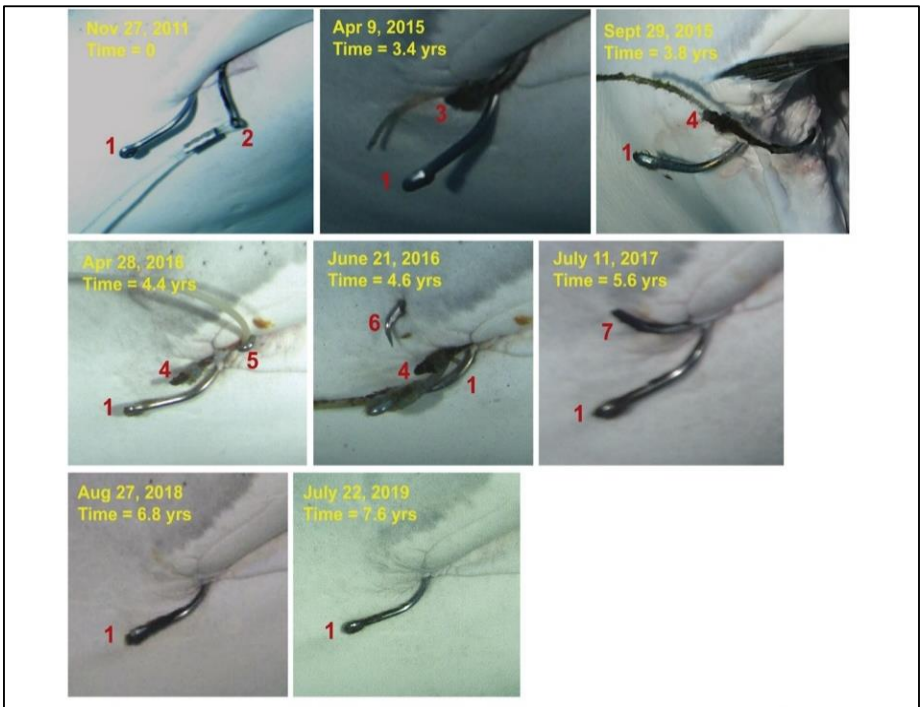

Fig. 1. Images of hooks (identified individually by red numbers) embedded in the jaw of a female tiger shark (*Galeocerdo cuvier*) (#T08 F,total length 2.0 m in 2011, 3.5 m in 2019) at 7 intervals over a 7.6 year period. Note stainless-steel hook #1 persisted in good condition throughout the time-series whereas 6 other corrodible hooks were shed over the same time period. Photo credit April 28, 2016 and June 21, 2016: Jérome Alix, July 22, 2019: Cyrille Mulard. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Figure 18. Bègue et al. (2020, 3) illustrate female tiger shark hooked multiple times over a period of 7.6 years.

Bègue et al (2020, 1) go on to say, "longline fishers and observers often report catching [pelagic] sharks with several (up to 7) longline hooks embedded in their jaws, suggesting individuals survive multiple interactions with fishing gear". Brunnschweiler, Huveneers, and Borucinska (2017) (Figure 19) describe how the lower jaw of a female bull shark (*Carcharhinus leucas*) was deformed and carried necrotic tissue over a seven-year period due to multiple hooking events.

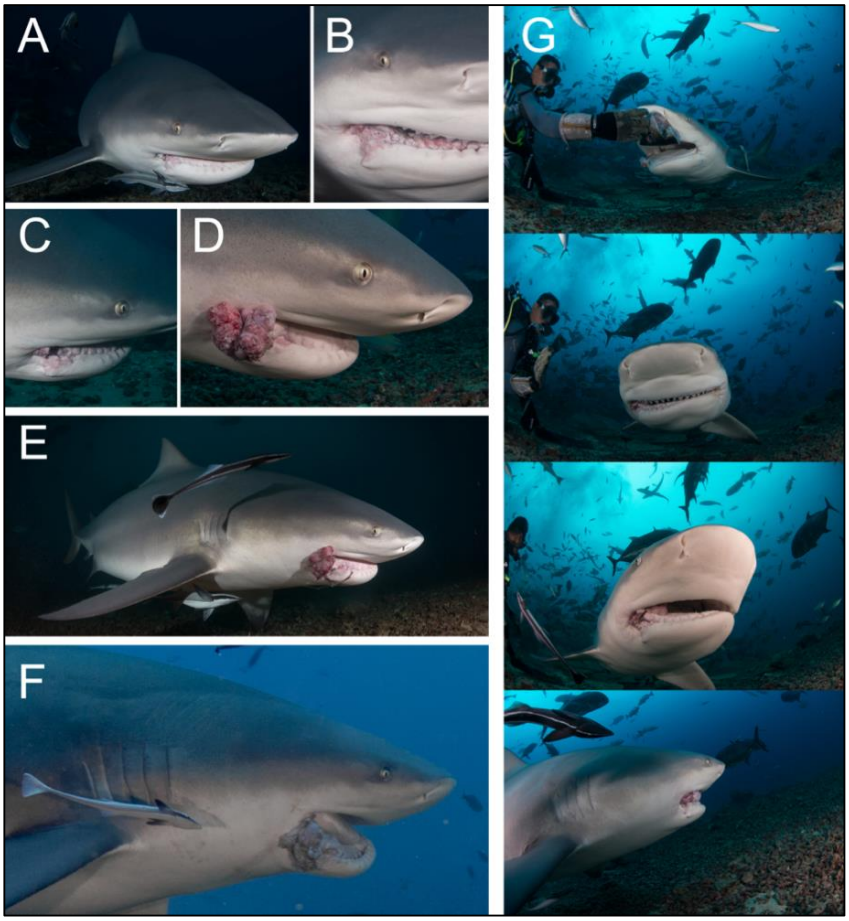

Figure 19. The research of Brunnschweiler, Huveneers, and Borucinska (2017) illustrate the deformed lower jaw of a female bull shark (*Carcharinus leucas*) over a seven-year period

Unquantified Recreational Damage

Bègue et al (2020, 1) extrapolate from research on *commercial* pelagic longline fishing that "millions of hooks [may be] embedded in sharks worldwide." I couldn't find data for the estimated number of retained hooks in *recreationally caught* shark individuals globally. Kilfoil et al. (2017) conclude that while commercial fisheries are documented to be a contributing factor to marine life populations, there is growing evidence that recreational fishing is showing this

activity is not an innocuous 'harmless' pastime, as often presented. Adams et al. (2014, 626) declare "[t]here are very limited data regarding the post- release survival of hooked sharks" and it appears there's even less regarding unknown numbers of hooks remaining on or in shark bodies. The study by Bègue et al. (2020, 2) on tiger sharks (*Galeocerdo cuvier*), at a site off Tahiti claimed "[t]his study demonstrates that shark ecotourism data can provide unique insights into …. the long-term fate of residual hooks in free-ranging sharks… that cannot be achieved to date using other methods." More longitudinal, non-lethal studies are required to address the gaps in data on hook retention and impact on sharks. The unconventional shark-listening relationships spanning 30 years offer an opportunity for reflective and planned future studies on the short and long-term hooking effects on individual Caribbean Reef sharks and Nurse sharks (*Ginglymostoma cirratum*), both part of the 'shark-listening' shiver.

Ambiguous Loss and Disenfranchised Grief

As mentioned earlier, although sharks are protected in the Bahamas, they are still fished. Furthermore, data on the range of individuals of the *Carcharhinus perezi* species is limited (Kohler et al. 2023, 2)[15]. There is certainly no data that we are aware of on the shark-listening shiver, and plans to tag some of the individuals in order to track their ranges failed to manifest. There's no data on how far the

[15] *Carcharhinus perezi* are reported to maintain site fidelity with a 'dispersal' range radiating from that site. Spatiotemporal population structure for *C. perezi* has been conducted at Cape Eleuthera in the Bahamas over a period of 3 years where *C. perezi* travelled up to 8km but a mean distance of 1.77 km (Brooks et al. 2013). "On rare occasions, roundtrip excursions > 100 km one-way have been recorded in The Bahamas (Bimini Biological Field Station, unpublished data)" (Talwar et al. 2022, 55). "However, based on a weight of evidence approach, we suggest *C. perezi* exhibits year-round residency at relatively small spatial scales (i.e., up to tens of kilometers) in The Bahamas" (Talwar et al. 2022, 55).

shiver members travel, perhaps into waters where they are not protected. Until further data is sought, it is uncertain who is hooking the shark-listening shiver and why. Cristina explains her commitment to hook removal:

> "For the world you may be one person, but for one person you may be the world."
>
> This is how I feel when I remove hooks from sharks. I know I am making the difference for that one shark, one hook at the time. And that to me, means the world. Yesterday we had the opportunity to clean up a little mess, three hooks, one double hook with a weight of 250gr attached to it.
>
> Life is made of small meaningful actions."
>
> (Zenato 2022)

But life is also made up of meaningless, thoughtless actions and families fishing sharks for entertainment, bragging, and bonding may have consequences for the ungrieveable and those who love them. Sharks are fished recreationally, not only accidentally, but deliberately and illegally in the Bahamas, as shown by a case in 2020 where an American family holidaying in the Bahamas boasted on social media how they intentionally fished and barbequed a shark, and only were sorry they were caught (see Oxley Heaney 2023). Wadiwel (2019, 220) reminds us, many people consider sharks as "'mere fish'" and so the casual fishing of a shark body has repercussions unlikely to be of concern to recreational fishers. This is despite research showing many anglers to be interested in and supporting conservation (Cameron et al. 2023; Arlinghaus et al. 2007; Gallagher, Cooke, and Hammerschlag 2016; Granek et al. 2008) and catch and release having been promoted for decades as an anthropocentrically-oriented attempt at conservation and 'sustainability' (Arlinghaus et al. 2007; Heard et al. 2016; Sims and Danylchuk 2017). Institutional support of these perspectives is

entrenched, despite there being proven environmental biocentric issues (Wadiwel 2019).

Regularly diving with sharks is a privilege Cristina recognises and treasures. However, the physical, economic and emotional investment to dive with the shiver is weighty. While research, albeit limited, indicates seasonal movements for some individual sharks on some Bahamian sites (for example, see Brooks et al. 2013), Cristina has not noticed the same seasonal movements at Shark Junction. However, some of the sharks in the shiver have not been seen for more than a year, then subsequently returned, while others only appear when they have a hook[16]. While Cristina is aware and pragmatic about the movements and often unpredictable presence of the sharks, such absences lead to anxiety and grief. When I ask how Cristina copes with sharks that do not return, how long she waits in hope for their return, and whether she has any kind of remembrance ritual to say goodbye, she says:

> "I keep looking into the blue hoping that I can see her[17] swimming back. I do this every dive, every day until I think she is gone and then maybe one day I make my peace with it. I just wish I had an answer, even if it means finding her body dead on the ocean floor. In reality I never have closure. I would love to know if she went somewhere else, if she died, but in the end I can never say goodbye to my sharks and when they go they take a piece of my heart with them."

[16] Some sharks appear, have their hook removed, then only return to shark junction with another hook, but are seen on neighbouring dive sites.
[17] Most of the sharks in the shark-listening shiver are female.

This ambiguous loss (Boss 2002), again, is applied almost exclusively to human scenarios, although it has been applied to some scenarios when humans lose members of their multi-species families (Bussolari et al. 2022). Such loss is defined as being "caused when loved ones suddenly vanish" (Boss 2002, s39) leading to an unresolved grief. Boss (2002 s40) says this leaves the grieving in a "frozen" state, both "stressful and often tormenting" (Boss 1999, 5). Such grief resists allowing any ritual to say goodbye, as hope amplifies guilt and slices through any attempt at 'closure[18]. It's not only ambiguous loss Cristina must cope with but also the disenfranchised grief that involves the judgement of whether sharks have lives that are worth being "grieveable" (Butler 2016). Authors such as Kenneth J. Doka (1989) and Hurn (2024) write about such disenfranchised grief, and society creates spaces and mechanisms (for example, see DeMello 2016), for people to mark and grieve the loss of morethanhuman-anymals that were significant to them. However, while cats and dogs are firmly accepted into the 'worth grieving for' category (for example, see Planchon et al. 2002), some societies are beginning to accept that humans *may* grieve for individuals from other species that are creeping into the fringes. Guinea pigs (García 2019), mice (Hurn 2024), rats (Nelson 2018), jumping spiders (Smallspidertok 2023), and some reptiles (Azevedo et al. 2022) are becoming increasingly represented as worth grieving for. Even 'pet' fish (Gopnik 2006) have started to make the grade of "being grievable" (Butler 2021, 185). 'Being grievable' is a term Butler neologised to mean those who are eligible to be grieved; whether their deaths will be "marked or mourned" (ibid.), it may seem odd to some people that anyone could consider a shark eligible for 'being grieveable'. However, as we have seen, Cristina thinks sharks are most

[18] I acknowledge that 'closure' is a contested concept, for example see Melnick and Roos (2007)

definitely eligible to be grieved. Just as she considers the dogs she lives with as part of her multispecies family, she too, considers sharks she has relationships with as kin[19]. So, Cristina contends with these two forms of grief and, to compound the situation, her bodily status as a female in a male-dominated industry even further closes any space within which she feels she can freely express her grief as gender-enforced roles marginalise women (for example, see Heinerth 2015; 2016).

Killing Kinship

Commercial fishing has been long accepted as having negative impacts on marine populations (Botsford, Castilla, and Peterson 1997; Pauly et al. 2003; Worm et al. 2013) however over the last decade or so questions have been asked about the effect of recreational fishing on marine populations (Freire et al. 2020; Gallagher, Cooke, and Hammerschlag 2016). The tourist demand for fish in the Bahamas stems from recreational fishing and consumption by stopover and cruise ship visitors in the form of food was 9,100 t/year in 2010 (Smith and Zeller 2016, 128). The number of individual anymals is not counted, which disregards, intentionally or not, the value of their lives. Aquatic anymals, including marine fish, lack welfare protection and as such may be subjected to suffering, including that rendered by recreational (including tourist) fishing. Abdullah, Lee, and Carr (2022, 6) explain how the morethanhuman-anymal is "disempowered" in the tourist experience, as morethanhuman-anymals don't enter the experience due to their own free will. "Power and public perception are interconnected and reinforce marginalisation in tourism destinations" he says.

[19] For more on multispecies kin see D. J. Haraway (2016)

Wadiwel (2019, 208) frames recreational fishing as a "peculiar form of human predation directed at fishes", "[a] unique hunting enterprise" (2019, 207), seen by the majority as an "innocuous" (2019, 206) predation of "'mere fish'" (2019, 220). However, for those affected by the consequences of such violence, the impact is far from innocuous, and our anthropocentric worldviews often deny and marginalize such effects. However, Cristina has decided to "make kin" (Haraway 2015, 159) with the shark-listening shiver. "They are my family" she declares. These unconventional kinships meaning the fishers who carry out the act of recreational fishing, not only affect the hooked shark individuals (whose voices we will attempt to access in future work), their own circle of kin (Figure 20), but, as we have seen, Cristina.

While the bonds within shark-listening unconventional relationships evolve and shift with losses and additions to the shiver community, Cristina continues compassionate care for the shiver, through hook removal.

Today a new, young female approaches. She allows Cristina to touch her and remove the hook (Figure 21).

Cristina and this new, young female shark, together challenge the "violent anthropocentricism" (Wadiwel 2019, 206) framings wielded towards sharks. Anthropocentric representations of sharks straddle simultaneously being personified as maneaters (Neff 2015), guardians needed to protect ecosystems for human-centred needs (for example, see Shiffman et al. 2021), and "mere fish" (Wadiwel 2019, 220), whose lives are routinely institutionally invisibilised[20].

[20] One of the mechanisms used to invisibilise fish is through their bodies being described as tonnage and being caught at sea, out of range of a more rigorous scrutiny affordable to land animals.

Figure 20. Cristina and the shark-listening shiver.

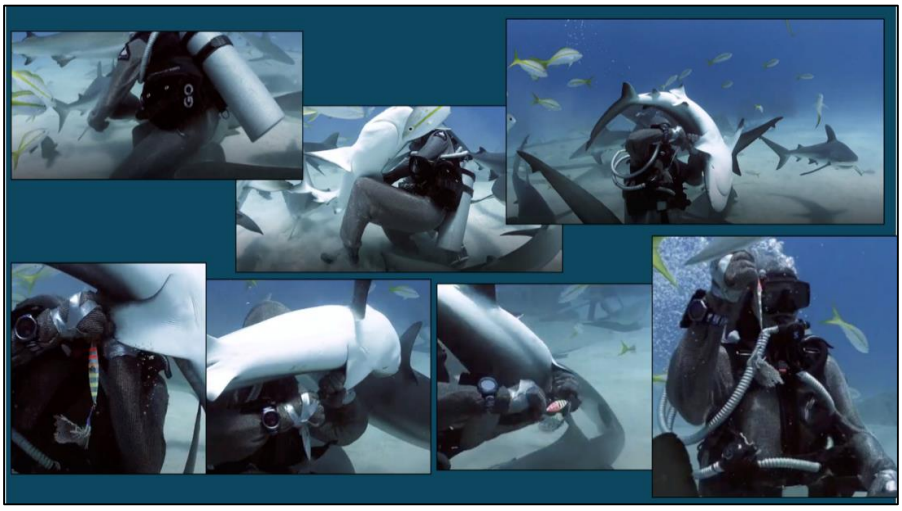

Figure 21. Cristina removing a hook from Floppy. Unnamed as she has not returned since her hook removal. @Kewin Lorenzen

We reflect on that as we share with you the last dates Cristina saw some of the shiver:

The kinship with Stompy (Figure 22) dates back to 2011. At least a dozen hooks were removed from Stompy. She was last seen in the summer of 2023.

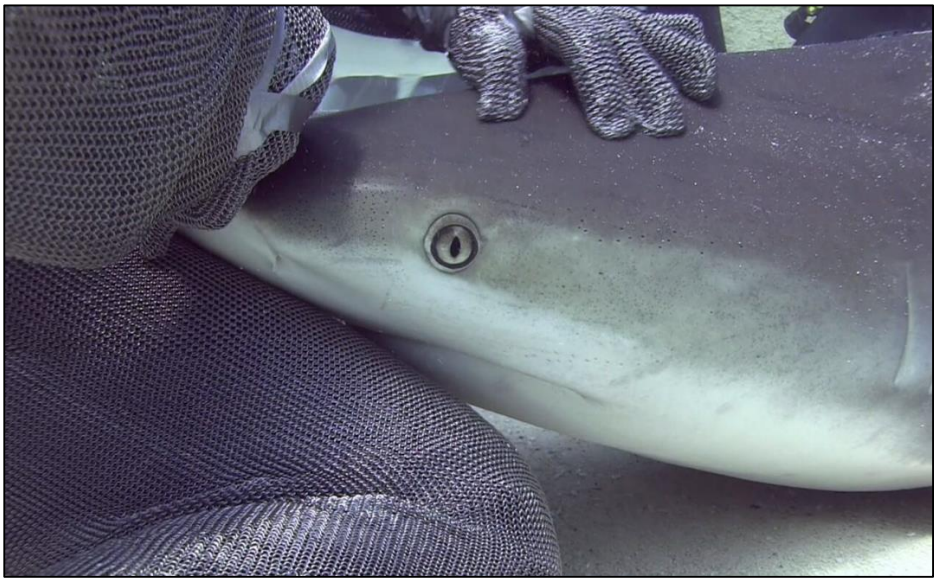

Figure 22. Stompy resting in Cristina's lap. © Kewin Lorenzen

Grandma (Figure 23) and Cristina's kinship started in 2009, with over 30 hooks removed. Grandma was last seen in the summer of 2024. Foggy eye (Figure 23) and Cristina began their unconventional relationship in 2007. She was last seen in 2019 and had allowed over 40 hooks to be removed from her body.

Figure 23. Grandma (left) and Foggy Eye (right) resting on Cristina's knees. © Cristina Zenato.

Final Thoughts

We leave you with a thought from Cristina:

> "These small actions have now become big actions. By removing one hook from one shark, the message transfers to others. From people telling me that they have stopped fishing 'for fun', that they no longer catch and release sharks, but have started advocating for shark conservation; to people who have changed the way they eat and want to learn more about the sources of their food. So, one small action is now expanding to the world."

129 million fish will be caught today globally in recreational fishing activities[21]. How many carry silent killers? How many times

[21] This figure is extrapolated from the paper by Steven J. Cooke and Ian G. Cowx (2004), which estimates that 47.10 billion fish are recreationally landed each year.

will the individuals in the shark-listening shiver be hooked this holiday season?

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Understanding Canine Fear-induced Aggression

Anna L. Arnaudova-Otouzbirova *

Abstract

Throughout human history, the domestic dog (Canis lupus familiaris) has been a reliable helper and companion to humans, performing a wide range of tasks. With the variety of roles attributed to canines today, dogs often find themselves confronted with unfamiliar environments or unpredictable surroundings. These occasionally involve stressful stimuli to which a dog may react with fear or anxiety. The resulting fear-induced aggression may pose a serious risk to both people and animals and eventually raise welfare concerns for the aggressive animal itself. This theoretical study focuses on several major factors that trigger canine fear-induced aggression, while also discussing its manifestation and possible misinterpretation, and addressing potential treatment and management options.

Keywords

dogs, fear-induced aggression, interpretation, management options

The domestic dog *(Canis lupus familiaris*) has been an integral part of human society for many years across a diversity of cultures. In today's world, dogs perform a variety of tasks in their many roles as companion animals, service dogs, therapy dogs, guide dogs, etc. Many dogs are occasionally faced with unfamiliar surroundings and stressful stimuli, which may trigger anxiety or fearful reactions that eventually result in displays of aggressive behaviour (Rooney *et al.* 2016). Canine aggression is not only a serious threat to people and animals but also a potential welfare concern for the aggressive animal itself (Wormald *et al.* 2016; Flint *et al.* 2017). Aggression is cited as the most common reason for the relinquishment of companion animals (Coe *et al.* 2014), which not only disrupts the human-animal bond but additionally increases the likelihood of euthanasia for these dogs (Polo *et al.* 2015; Flint *et al.* 2017). Even though aggression arising from fear is

* Trakia University, Bulgaria; Email: anna.arnaudova@trakia-uni.bg

implicated in a significant number of dog attacks, little attention has been given to this phenomenon and fear-induced aggression remains in need of further research (Ley *et al.* 2007; Willen *et al.* 2019).

Canine Aggression

A study of publications on canine aggression reveals the existence of various definitions of aggression. According to Overall (2013), aggression is a context-specific appropriate or inappropriate threat or challenge that is ultimately resolved by combat or deference. Even though this definition sounds plausible, it remains in need of some clarification. The terms 'appropriate' and 'inappropriate' should be considered from a human point of view only, since animal behaviour, including the behaviour of dogs, is triggered by both external and internal stimuli and can neither be discussed nor explained through anthropomorphic, morally-indicative categories.

Lockwood (2017), on the other hand, refers to aggression as one component of agonistic behaviours that serves to regulate individuals' ability to compete for various resources. This definition takes into account social competition and dogs as highly social animals do compete for various resources (food, territory, access to a mate, etc.). However, reducing canine aggression to resource competition might be problematic and fails to explain other displays of aggressive behaviour, such as those related to fear, pain, or the protection of offspring.

Most authors, however, seem to agree that aggression is a stimulus-specific response exhibited under certain conditions, which involves threatening and aggressive displays, such as growling, barking, snarling, lip-lifting, snapping, biting, etc. (Borchelt 1983; Bowen and Heath 2005; McGreevy and Calnon 2010; Sueda and Malamed 2014).

When considering types of canine aggression, Flint *et al.* (2017) distinguish between two major categories depending upon the motivating factors involved (fear, territoriality, or dominance) and the target of aggression (owners, strangers, or other dogs).

A similar, though slightly different, classification based on literature studies is offered by Lockwood (2017) who also identifies types of canine aggression in accordance with the implied motive of behaviour (predatory, maternal, protective, territorial, dominance or play) and its target (familiar and unfamiliar dogs or people), but adds a third factor of context to which pain and fear-elicited aggression are attributed.

Arguably, as in the examples above, fear-elicited aggression can be discussed in terms of its context e.g., the specific startling stimuli a dog reacts to, and its motivational drive – fear, as a negative affective state which triggers the aggressive behaviour.

This type of aggression has been referred to as 'fear aggression' (Overall 2013), 'fear-induced aggression' (Young 1982; King *et al.*, 2003; Bowen and Heath 2005; Willen *et al.* 2019), 'fear-elicited aggression' (Borchelt 1983), 'fear-motivated aggression' (Mertens 2004; Haug 2008), and 'fear-related aggression' (Lindsay 2001). These terms will be used interchangeably in the current article as synonymous expressions.

Anxiety, Fear, and Aggression

Many aggressive dogs display fear or anxiety (Borchelt 1983), which are evolutionary important mechanisms for survival of animals in the wild (Tiira *et al.* 2016). Yet, the fact that they constitute the most common underlying cause for biting in dogs (Dinwoodie *et al.* 2019) necessitates a more detailed study of their nature.

Bowen and Heath (2005) argue that fear and anxiety have similarities and differences and that both may function as emotional motivational triggers for aggression. Anxiety as an affective state

occurs when an animal anticipates a negative outcome or a threat, and arises from the interplay of genetics and experiential learning (McPeake and Mills 2017).

Unlike anxiety, fear is an increased emotional stress response in a situation when a stimulus is perceived as a potential danger (Greenfield 2013). It can be viewed as an apprehension of a stimulus, object or event, and is similarly influenced by genetics, learning and experience (Bowen and Heath 2005).

According to research findings, fearful dogs, exhibiting either social (towards people and other dogs) or non-social fear, are more likely to be aggressive when compared to non-fearful dogs (Tiira *et al.* 2016), and the probability of such dogs to bite is very high (Young 1982). Such aggressive displays are often described as 'unpredictable' by owners (Young 1982), and their understanding requires good knowledge of canine behaviour and body language.

Recognising Signs of Fear-induced Aggression

When experiencing fear, animals attempt to repel or escape from the aversive situation and may exhibit one of four behavioural patterns: freeze, fiddle out (show displacement and self-appeasement behaviour), flight or fight (Bowen and Heath 2005; Greenfield 2013). They develop the so-called 'fear-potentiated startle response' which makes them extremely sensitive and reactive to even the slightest movement or noise (Bowen and Heath 2005). If avoidance or appeasement proves ineffective, a fearful dog may display signs of fear-induced aggression.

Displacement behavioural signs, for example, may include: turning the head away, averting eyes, lip licking, yawning, holding up a paw, etc. (Greenfield 2013), whereas initial warning vocal signs can involve: snarling, growling, or barking (Young 1982; Overall 2013). In addition, certain body postures and facial expressions are indicative of canine fear-related aggression (Figure 1). Signs of fear are often linked to raised hackles, lowered body and head, tail tucked underneath, years pinned back, wrinkled muzzle, horizontal and then vertical lip retraction, dilated pupils, cowering and remaining near the owner, as well as staring at the source of the fear (Luescher and Reisner 2008; Overall 2013; Greenfield 2013; Sueda and Malamed 2014).

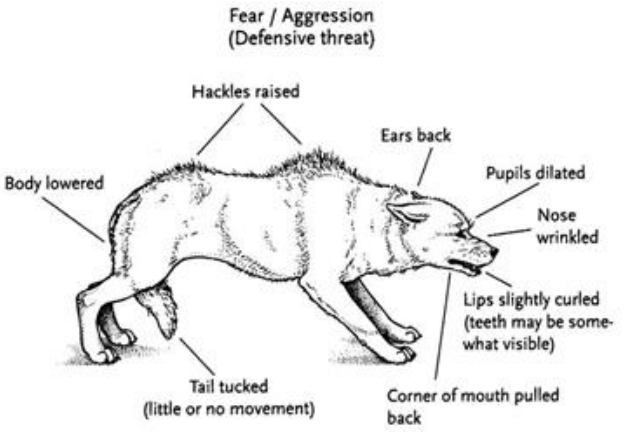

Figure 1: Warning signals of canine fear-induced (leadchanges.net/how-to-recognise-fear-aggression-in-a-dogs-body-language/)

Physiological signs are related to increased heart and respiratory rate, higher cortisol levels, rigidity and muscle tension, shaking, salivation, occasional uncontrolled defecation or urination (Bowen and Heath 2005; Overall 2013). It should be noted, however, that not all dogs with fear-elicited aggression show fearful behaviour before an attack. If initial signals have passed unnoticed, efforts to appease are misunderstood, the fear-evoking stimulus is persistent or approaching, or if the trigger is repeatedly encountered, the dog may quickly shift from avoidance to aggression and become more confident and straightforward over time (Bowen and Heath 2005; Sueda and

Malamed 2014). This difference or change in behavioural patterns might be the reason why fear-related aggression is called either 'defensive' (Young 1982) or 'offensive' (Haug 2008), besides being occasionally interpreted incorrectly.

Misinterpretation of Fear-induced Aggression

Fear-related aggression might be inappropriately named 'territorial aggression' or 'dominance aggression.' Lindsay (2001) provides a thorough explanation of possible reasons for such misinterpretations. Fearful dogs are territorially sensitive and may become extremely anxious and reactive under the threat of territorial intrusion. Thus, aggression becomes a means for the dog to defend itself, and although it can be related to territorial aggression, the difference is that instead of aiming at establishing territorial boundaries, the purpose of a fearful dog is to secure a route of escape. Lindsay argues that both defensive and offensive aggression can be alternately present in the same individual and draws an interesting parallel between fear-related and dominance aggression. Both types of aggression imply motivational drives for establishing control either over a threatening or over a frustrating social situation. They differ in the preliminary signs displayed by dogs prior to an attack as well as in the severity of the attack. A dominant aggressor may inflict a severe, angry bite without noticeable signs, whereas a fearful dog will bite only hard enough to escape the fear-inducing situation after a significant display of ample threats.

Sound understanding of canine fear-elicited aggression, however, requires investigation into the underlying causes for this behaviour.

Factors Contributing to Fear-induced Aggression in Dogs

There are many factors that can contribute to the development of fearful reactions and eventually to fear-induced aggression in dogs. These factors include genetics, learning and experience, certain medical conditions, and biological variables.

The impact of genetics

According to Rooney *et al.* (2016), genetically inherited characteristics predetermine a dog's reaction in fear-provoking situations. Animals display different coping styles, some being seemingly more overtly fearful than others. Borchelt (1983) argues that pure-bred dogs are more likely to be aggressive in comparison to mixed-breed dogs, which might be the result of purposeful selection for dominance aggression in certain breeds.

Another link to genetics is revealed in a study conducted by Stone *et al.* (2016), emphasising certain correlations between a dog's morphological features and its fearfulness. The authors found out that some heavier and shorter breeds, such as the terrier types, showed more aggression towards unfamiliar human-like objects, probably due to the selection process in producing dogs valued for their ability to seize and kill prey and their tenacity. On the other hand, lighter, dolichocephalic dogs exhibited prolonged fear, possibly as a consequence of their poorer central vision, making them more suspicious and vulnerable to attack from a frontally approaching danger.

Two different studies on breed-specific traits for fearfulness and aggressiveness conducted by Duffy *et al.* (2008) and Polo *et al.* (2015) indicate that selection for particular behavioural traits places some dogs at risk for developing inappropriate aggression and that terriers, as well as working and herding breeds seem to be more likely to bite in comparison to sporting breeds and hounds. There is, nonetheless,

no consensus on the heritability of fear aggression (Overall 2013). What should be taken into account is the fact that making predictions based on a dog's breed alone can result in jumping to the wrong conclusion since behavioural characteristics, and fear-induced aggression in particular, are influenced by experience and learning (Bollen and Horowitz 2008), and each dog needs to be assessed on an individual basis (Duffy *et al.* 2008).

Learning and experience

Fear-elicited aggression may be due to a lack of habituation to novel or seemingly startling stimuli as well as to a lack of experience in complex environments involving a lot of different noises (Bowen and Heath 2005). Additionally, dogs with fear-induced aggression might have been inappropriately socialised to people and other dogs, and consequently respond with fear and aggression or both (Unshelm 1997; Haug 2008).

Some authors stress the negative impact of prenatal and postnatal stress on a dog's personality (Haug 2008; Rooney *et al.* 2016), as well as the effect of stress at weaning on a dog's temperament. Early separation, before 8 weeks of age, has been found to cause fearfulness and high reactivity in dogs (Overall 2013), whereas a more gradual process of weaning by means of repeated short-term separation from the mother may reduce fear and stress in young puppies (Rooney *et al.* 2016).

The early stages of the socialisation period, known as the 'critical period' (from approximately 3 to 7 weeks of age), are essential for the development of social relationships, and the slightest experience can have a lasting effect on canine behaviour (Nott 1992). Other researchers refer to a larger span of the socialisation period, from 3 to 12 weeks of age, and call it a particularly sensitive period in a puppy's development (Polo *et al.* 2008; Overall 2013). During this period,

characterised by high plasticity of the brain, the discovery of novel environments and involvement in playful social interactions with humans and conspecifics can make a dog less fearful in the future.

Conversely, negative experiences, especially those related to feelings of pain during routine veterinary checks, nail-clippings or vaccinations, restraint involving chaining and tethering, training based on physical punishment, ill treatment, abuse, etc. may contribute to stress and provoke fear which is likely to escalate to aggression (Overall 2013; Lockwood 2017).

Interestingly, some research articles focus on the interdependence between a dog's temperament and the personality type of its owner (Dodman *et al.* 2018; Gobbo and Zupan 2020), drawing the overall conclusion that fearfully aggressive dogs have owners who are more emotionally unstable and unpredictable and less extroverted.

Notwithstanding the above findings, displays of fear-related aggression in dogs may be influenced by other, non-social factors as well, such as biological variables and current medical conditions.

Biological variables and medical conditions

Some biological variables, including sex, spay/neuter status, health, diet, and nutritional status, have been found to affect aggressive displays. Borchelt (1983) argues that aggression is generally more predominant in intact male dogs but that fear-elicited aggression overall is less affected by sex. Dietary variations, on the other hand, especially those related to biochemical changes in the hypothalamic-pituitary-adrenal (HPA) axis and the level of serotonin, may affect some forms of aggression. More important, however, remains the question of a dog's health status since several medical conditions can trigger fear-induced aggression. These may involve injuries, as well as chronic or acute illness causing pain, irritability and discomfort,

neurological conditions or sensory deficits (Sueda and Malamed 2014). An aging dog, for instance, may become fearful and aggressive due to impaired vision or hearing and a growing fear of uncertainty (Overall 2013). Any pathology disrupting the functioning of the central nervous system should be considered as a possible trigger for aggressive behaviour (McGreevy and Calnon 2010).

Internal Mechanisms of Fear-induced Aggression

Autonomic, neuroendocrine, and muscular responses are involved in the physiology of fear (Bowen and Heath 2005; Lindsay 2005). The amygdala, the hippocampus and the hypothalamus play a significant role while the prefrontal cortex has a modulatory function. The sympathetic arousal triggers the release of epinephrine (adrenaline) and norepinephrine (noradrenaline) into the blood by the adrenal medulla. Epinephrine leads to an increase in heart rate, which signifies danger; the body is prepared for the fight-or-flight response; subsequently, the dog reacts offensively or defensively. The release of cortisol, which increases blood glucose levels, has an adaptive function, but its elevated level for prolonged periods of time may have detrimental effects on the body. Fear-induced aggression, for example, seriously affects the HPA axis, causes accelerated aging of body cells, and is likely to decrease longevity in dogs (Dreschel 2010). Arguably, dogs displaying aggression arising from fear may experience significant stress-related health issues, and their quality of life may suffer substantially. To achieve any improvements, dog owners, handlers, veterinarians and dog trainers need to consider possible prevention, treatment, and management options.

Prevention, Treatment, and Management Options

Preventing the development of canine fear-related aggression is of paramount importance for dogs and the people interacting with

them. Good prevention techniques should address the appropriate socialisation of young dogs, as well as the improvement of people's understanding of canine behaviour and body language.

Exposing a puppy to complex but positive environments is crucial during the sensitive period of a dog's development (Bowen and Heath 2005). Introduction to novel, potentially startling stimuli, especially in the presence of a calm and previously habituated dog, can be beneficial and decrease the likelihood of a fearful response (Overall 2013; Rooney *et al.* 2016). Positive interaction with people and other dogs to enhance socialization is necessary, too.

In cases when a dog has begun to show signs of fear-induced aggression, correct identification of these preliminary warning signals is required to avoid the risk of injury-related incidents (Tami and Gallagher 2009). Many attacks can be avoided if dog owners and people in general are better educated and able to understand canine body language. This can prove difficult, considering the fact that domestication has reduced the complexity of warning signals and people have additionally complicated dogs' ability to communicate, by means of selectively altering their physique by cropping their ears and docking their tails (Lockwood 2017).

Since children are the most common victims of dog bites, a good prevention strategy might include developing age-appropriate school programs, using videos or other educational materials, as well as familiarising parents and children with canine warning signals (Polo *et al.* 2015).

For dogs with fear-induced aggression, the first and most important step is to identify the fear-eliciting stimuli (Bowen and Heath 2005). Such stimuli should be avoided in the first place until behaviour modification plans are developed to deal with the fearfully aggressive behaviour.

Initially, the dog may be trained to wear a muzzle or a face harness so that the owner or handler can achieve better control in a fear-provoking situation and to avoid unwanted attacks. These precautions, however, will fail to reduce the sensation of fear experienced by the dog; therefore, the use of different, more adequate and effective measures is required. Among these, the most common and useful methods which directly address the problematic behaviour involve desensitisation and counterconditioning (Young 1982; Bowen and Heath 2005; Overall 2013; Sueda and Malamed 2014; Rooney *et al.*, 2016). Gradual exposure of the dog to the frightening stimulus from a distance can habituate the dog to its presence. Success can be achieved provided that the exposure to the stimulus (sound, person or object) is minimal and does not cause a fearful reaction. Thus, by means of desensitisation, the dog learns to accept the stimulus with no aversive emotional effect. This technique is often paired with counterconditioning to produce a new positive association with the already desensitised stimulus. For this purpose, food and play can be used so that, the next time the dog hears or sees the stimulus, a positive rather than a negative event will be anticipated.

In addition, flooding is sometimes mentioned but is not usually considered a good treatment option (Young 1982; Overall 2013; Sueda and Malamed 2014). Extensive exposure to the fear-provoking stimulus until the fear response subsides is not recommended because it can exacerbate the problem. So can the use of physical punishment, which may produce particularly damaging effects via stress-related changes (Lindsay 2005).

Once probable medical conditions have been ruled out, anti-anxiety drugs, known as anxiolytics, can be used in combination with behavioural modification techniques. Medication should be used with caution under the strict supervision of a veterinarian because fear is considered to be a major motivational factor both in the expression and

in the inhibition of aggressive behaviour (Lindsay 2001). Hence, the use of certain drugs, such as diazepam, amitriptyline, clomipramine, etc., can reduce fear and anxiety and, by disinhibiting aggression, may paradoxically result in its escalation (Luescher and Reisner 2008).

To avoid undesired effects, other alternative methods involving the use of pheromone therapy and dietary supplements may be applied. The dog appeasing pheromone, for example, has been found to be effective in treating canine fear of unfamiliar people in the home (Bowen and Heath 2005) while omega-3 fatty acids prevent damage to neurons and some calming supplements (Calmex, Harmonese, l-theanine, etc.) may promote calm behaviours through inhibition.

It is important for dog owners and handlers to remember that good results can be achieved with patience, consistency, a positive attitude, and the professional help of behavioural experts and veterinarians.

In conclusion, it can be argued that fear-induced aggression is a behavioural response triggered by the interplay of external factors and internal mechanisms which predetermine a dog's reaction in a particular situation. As the very name suggests, it is elicited by fear and anxiety and may have adaptive value within the context of the fight-or-flight response. Prolonged fear and stress can have detrimental consequences and may lead to poor welfare and a shortened lifespan of the individual animal concerned. This type of fear, like other forms of behaviour, is influenced by genetics, learning and experience, and despite its clear manifestation signals, may sometimes be misinterpreted as territorial or dominance aggression. Applying appropriate prevention, treatment, and management techniques is of paramount importance for the fearfully aggressive dogs and their owners/handlers, as well as for other dogs and people that might be accidentally involved.

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Do Dogs See That Too? Reflections on Canine Perception of Visual Illusions

Gabriela Munteanu*

Abstract

The present paper presents a brief review of the literature regarding dogs' susceptibility to some of the most studied visual illusions (e.g., the Kanizsa's Triangle, the Ebbinghaus illusion, the Delboeuf illusion). References to some related studies testing the susceptibility of other species to these illusions have also been included, in order to provide a broader context and perspective on the findings. We focus on the different testing methods applied in the reviewed studies, while also critically analyzing the different settings and different reward systems involved, and how these factors might have influenced the final results. Further considerations are given to the importance of understanding dogs' susceptibility to such illusions, particularly in relation to search and rescue dogs, because their perception of what they see can impact their safety.

Keywords

perception, illusion, dogs, vision, susceptibility

Introduction

The perception of visual illusions has been of interest to scientists for several decades and has been investigated in humans (adults, individuals with different disorders, children etc.) as well as in various other species of fish - guppies, redtail splitfin and bamboo sharks (Agrillo et al. 2020), reptiles - red-footed tortoise and bearded dragon (Santacà et al. 2019), birds - grey parrots (Pepperberg 2017) or pigeons (Nakamura, Watanabe, and Fujita 2008), in capuchin monkeys (Suganuma et al. 2007), chimpanzees (Fagot and Tomonaga 2001) etc.

* University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania; Email: gabriela.cocean@student.usamvcluj.ro

Before exploring the research on how dogs perceive visual illusions, however, it is essential to touch on some fundamental aspects of canine vision and visual perception. A key study by Miller and Murphy (1995) has been widely cited in the literature and is paramount for understanding aspects such as visual acuity, colour perception, and motion detection. However, Byosiere et al. (2017) note that advances in our understanding of canine vision and visual perception since that study have been relatively modest. This somewhat limited progress may be partly attributable to the substantial morphological differences among dog breeds, particularly variations in facial morphology, which appear to have an impact on visual processing (Byosiere et al. 2017).

We will briefly highlight a few important points, beginning with Miller and Murphy's (1995) observation that, due to differences in visual characteristics across species, dogs likely perceive the world in a way that differs from human perception. They further explain that descriptions of nonhuman species' visual abilities are often framed through the lens of human vision, which may not fully capture the true nature of how animals see. Canine vision is remarkably adaptable across diverse environmental conditions, being particularly well adapted to dim light / low-light environments (Miller and Murphy 1995). Dogs also exhibit a heightened sensitivity to motion detection, surpassing that of humans, although they tend to be less proficient at discerning details in a static pose (Miller and Murphy 1995; Pongrácz et al. 2017). Dogs possess a dichromatic colour vision system (Miller and Murphy 1995), yet the precise capabilities and limitations of canine colour perception continue to be a subject of debate (Byosiere et al. 2017). In addition, evidence suggests that dogs' brightness discrimination is approximately half as effective as that of humans, and their overall visual acuity is estimated to be four to eight times lower (Pongrácz et al. 2017).

Visual perception occurs when the brain processes and interprets visual information received from the retina, enabling an individual to perceive and navigate their external environment (Byosiere et al. 2017). The question of how different species perceive the world remains a central focus in animal cognition research (Miletto Petrazzini, Bisazza, and Agrillo 2017). Specifically, the nature of dogs' perception of the physical environment, how it aligns with or diverges from that of humans or other species, remains an open question (Byosiere et al. 2017).

Keep, Zulch, and Wilkinson (2018) note that a significant amount of research on canine perception has focused on auditory and olfactory abilities, with comparatively little attention given to visual perception. This may be due, in part, to findings suggesting that dogs rely more heavily on their senses of smell and hearing, while their visual capabilities are generally considered less developed relative to those of humans (Pongrácz et al. 2017).

Visual perception does not always provide a direct representation of physical reality; rather, it is influenced by prior experiences and cognitive processes that subtly modify the raw sensory input. As Fuss, Bleckmann, and Schluessel (2014) or Byosiere et al. (2017) describe, the brain adjusts or "corrects" an image, not necessarily because such a correction is required, but because it assumes the most probable interpretation based on past experience. Those stimuli that consistently lead to distortions in perception and induce misperception are commonly referred to as visual illusions (Lõoke et al. 2021).

Visual illusions have been extensively used in research as they can provide insight into the cognitive and psychological processes that shape perception (Keep, Zulch, and Wilkinson 2018). Additionally, they serve as a valuable tool for comparing perceptual mechanisms across species. The central idea behind this approach is that if two species exhibit similar or different responses to visual illusions, this

may reflect underlying similarities or differences in how their perceptual systems function (Miletto Petrazzini, Bisazza, and Agrillo 2017).

At the same time, there is evidence suggesting that the way animals perceive the world may vary significantly between species (Feng et al. 2017). This, however, implies that their perceptual experiences may not only differ from those of humans but may do so in ways that are more complex than previously assumed.

In humans, visual illusions seem to be deeply ingrained in perceptual processing, making them unavoidable, even when one is consciously aware of the illusion, perception remains unchanged (Feng et al. 2017; Byosiere et al. 2017). Whether animals experience illusions in a similar way remains an open question, but if they do, it would suggest that their perception, like that of humans, involves active interpretation rather than passive reception of sensory input.

This raises a broader issue: do animals possess cognitive mechanisms that modify their perception of reality, or do they perceive the world as a direct, unaltered representation? Some researchers have framed this debate as a binary choice, positioning animal perception as either human-like or mechanistic. However, such a perspective oversimplifies a complex phenomenon. Rather than forcing perception into an either-or framework, could we hypothesize that it is likely that animals have distinct perceptual processes that differ from both human cognition and "artificial" /automated systems? However, this remains an open question for now, as more nuanced approaches are necessary to understand how various species interpret their environments.

Reflections on Broader Implications

A better understanding of canine visual perception has significant implications for *working dogs* across various disciplines,

including search and rescue, guide work, detection, protection, herding, and assistance tasks (Feng et al. 2017; Byosiere et al. 2017). These highly trained dogs develop specialized skills through rigorous training programs, and optimizing these programs requires an evidence-based approach grounded in the dog's perceptual reality rather than assumptions based on human vision. As Keep et al. (2018) aptly note, training methodologies should be designed from the dog's perspective rather than the human's, especially if there is a chance these perspectives diverge.

Visual perception plays a critical yet often underestimated role in search and rescue (SAR). While olfaction is undoubtedly the primary sense guiding SAR dogs toward a victim, vision remains essential for navigation, decision-making, and locating accessible paths to the target.

Dora and Marvin, two search and rescue dogs from Cluj-Napoca, Romania

Rubble search, for instance, requires dogs to move efficiently through unstable environments, detecting visual cues that signal safe or hazardous pathways. SAR handlers often attempt to assess the terrain from their dog's viewpoint, positioning themselves lower when sending the dog to predict what their dog might see. However, this is inherently limited by the fundamental differences between human and canine vision. Without a precise understanding of how dogs process depth, contrast, and obstacles in chaotic environments, we may be unknowingly introducing challenges or risks that could be mitigated through better-informed strategies.

This challenge extends beyond rubble searches. While many SAR deployments involve area searches in more open terrains, the landscapes can be equally complex, filled with visual obstacles that affect how the dog navigates towards a subject. For SAR handlers, ensuring the safety and effectiveness of their dogs is paramount. However, achieving this goal requires continuous inquiry and adaptation, drawing insights from both scientific research and practical experience.

Considerations on Studies of Dogs' Susceptibility to Visual Illusions

A fast search for "animal" and "visual illusions" on PubMed yields over 588 results in English, a number that has increased significantly in recent years (however, as one can easily note, several of these studies are not in fact referring to our topic of interest). In 2017, Feng et al. conducted a review examining the susceptibility of various species to visual illusions and identified 289 relevant studies on PubMed using keywords such as "visual", "optical", and "illusion in nonhuman animals". From this dataset, the authors selected 31 papers (presenting 34 studies) that specifically investigated responses to six types of illusions across 13 species, ranging from primates to birds, as well as marine species. Their analysis revealed that in 25 of these

studies, animals exhibited susceptibility to illusions in a manner similar to humans. In four studies, no susceptibility was reported, while five studies found that animals perceived the illusions in the opposite way to humans. These findings suggest that nonhuman animals do not merely process visual stimuli in a mechanical fashion but rather interpret them, even if their interpretations can differ from those of humans.

However, the authors caution that the current body of research may not fully capture the extent of animal perception. They highlight a potential publication bias, as studies reporting the presence of illusory effects are more likely to be published than those finding no such effects (Feng et al. 2017). This raises the possibility that the apparent prevalence of illusion susceptibility in animals could be, at least in part, an artifact of selective reporting.

Returning to the case of dogs, a search for "dog", "canine" and "visual illusions" on PubMed yielded only 30 results, with more than half not directly relevant to the topic, reflecting the limited research available on canine susceptibility to visual illusions. Despite the relative scarcity of studies, the findings that do exist present a diverse range of results, similar to that signaled by Feng et al. in 2017. Some studies suggest that dogs do not exhibit susceptibility to certain illusions, while others indicate that they do. When susceptibility is reported, it sometimes aligns with human perception and, in other cases, follows an entirely opposite pattern.

One possible explanation for these divergences can also lie in methodological differences – as Feng et al. (2017) point out, variations in experimental design can lead to differing outcomes. To better understand these discrepancies, I examined the methodologies used in six key studies on dogs and visual illusions (Table 1). For comparative purposes, I also consulted research papers on related topics, including studies on dogs' preference for global versus local choices (Mongillo et

al. 2017) and experiments on face recognition in canines (Pitteri et al. 2014) and some studies conducted on other species, including an investigation into perceptual processing in humans and chimpanzees (Fagot and Tomonaga 2001) and a study on visual perception in sharks (Fuss, Bleckmann, and Schluessel, 2014).

Table 1. Summary of findings in the six key studies.

Study	Illusion/s	Susceptibility
Byosiere et al. 2017	Ebbinghaus–Titchener and Delboeuf	Ebbinghaus–Titchener – yes, opposite to humans Delboeuf – no
Miletto Petrazzini, Bisazza, and Agrillo, 2017	Delboeuf	No
Keep, Zulch, and Wilkinson 2018	Müller-Lyer	Yes, similarly to humans
Byosiere et al. 2019	Ehrenstein	Yes, similarly to humans
Lõoke et al. 2020	Solitaire	No
Lõoke et al. 2021	Kanizsa's triangle	Yes

Some of the illusions discussed in these studies fall under the category of *contour illusions*, also known as *fiction illusions*, where the brain perceives elements that do not physically exist. These illusions rely on the brain's ability to "fill in" missing visual information, creating the perception of shapes and edges that are not actually present in the presented stimulus. Such illusions are the *Ehrenstein illusion*, in which a faint, illusory circle appears at the intersections of radial lines, and the *Kanizsa figures*, where strategically arranged Pac-Man-like shapes give rise to the perception of a nonexistent shape, such as a triangle, in the analyzed paper. The study of such a "*perceptual filling-in of figures*" is considered valuable for understanding how different species, including dogs, process visual information and construct their perception of the world (Byosiere et al. 2019).

In contrast, other analyzed illusions fall within the category of *distorting illusions*, which involve systematic misjudgments of size, length, curvature, angle, etc. These illusions manipulate spatial perception, leading to distortions in how objects appear relative to their actual physical properties. For instance, the *Müller-Lyer illusion* demonstrates how arrow-like endings at the tips of lines can create the false impression that one line is longer than another, even when they are of equal length. Further examples include the *Delboeuf illusion* and the *Ebbinghaus–Titchener illusion*, both of which manipulate size perception by placing a central circle within one surrounding ring or several other circles, leading to the illusion that the central circle is either larger or smaller than its actual dimensions. The *Solitaire illusion* plays with numerosity perception, arranging two groups of dots in a way that makes one group appear more numerous than the other, despite both containing the same number of elements.

In most of the reviewed studies, the experimental **setup** consisted of a controlled environment, typically a dedicated space within a laboratory or a quiet room in the university. An exception to this was the study by Miletto Petrazzini, Bisazza, and Agrillo (2017), in which testing took place in the dogs' home environments. Notably, this study also included shelter dogs, which were tested within their individual pens, and found no significant difference in performance between pet dogs and shelter dogs.

The **experimental apparatus** used across the studies differed notably. Two studies incorporated food plates as part of the illusion presentation. In Miletto Petrazzini, Bisazza, and Agrillo's study, the Delboeuf illusion was tested by placing a circular arrangement of food at the center of the plates, while Lõoke et al. (2020) investigated the Solitaire illusion using two plates containing sausage slices arranged in different configurations. Keep, Zulch, and Wilkinson (2018) used a type of elaborated wooden box with a touchscreen, while Lõoke et al.

(2021) employed two touchscreen monitors placed in a quiet room. Additionally, a specialized device, the "*Canine Nose-Touch Testing Apparatus*" was developed for the Byosiere et al. 2017 study. This apparatus integrated touchscreens displaying the illusion stimuli and also included an automated treat dispenser to reinforce correct responses. The same setup was later utilized in the team's 2019 experiment, ensuring methodological consistency across their investigations.

Participant characteristics and selection criteria. The composition of the test groups varied across studies, both in terms of sample size and participant characteristics. Sample sizes ranged from as few as six dogs to as many as forty. In four of the studies, the test groups were more heterogenic and included dogs of different breeds. For example, the Lõoke et al. 2021 study involved six dogs (three mixed-breed dogs, two Golden Retrievers, and one Whippet), while Keep, Zulch, and Wilkinson (2018) worked with seven pet dogs of various breeds, including two Border Collies, two Siberian Huskies, a Labrador Retriever, a Belgian Malinois, and a Cocker Spaniel. Miletto Petrazzini, Bisazza, and Agrillo (2017) tested 13 dogs of varying breeds (mostly mixed-breed dogs). In an earlier study, Lõoke et al. (2020) worked with an expanded sample, of 40 dogs, comprising 11 mixed-breed individuals, with the remainder representing various purebred dogs.

In contrast, Byosiere et al. (2017) employed a more homogeneous sample, using eight Lagotto Romagnolos that were bred and owned by the same individual. This approach ensured a shared genetic background and uniform living conditions, possibly favoring comparisons among individuals. The selection also minimized prior experimental exposure, as none of these dogs had participated in previous research, as opposed to other studies, such as that by Keep, Zulch, and Wilkinson (2018) in which some of the dogs had been

involved before in other types of discrimination studies. The individuals from the 2017 study by Byosiere et al. were later included in the team's 2019 Ehrenstein illusion experiment.

Lõoke et al. (2021) explicitly state that dogs had been selected based on health status, willingness to participate in a laboratory setting, and high food motivation; compared to the 2020 study, the criterion of willingness to work in a laboratory setting was newly introduced. While it is reasonable to assume that all studies excluded sick or unwell dogs, explicitly stating this criterion adds transparency. Similarly, Byosiere et al. (2019) note that their participants underwent an eye examination prior to the experiment to rule out potential visual impairments. However, not all studies mentioned whether such screenings were performed, leaving some uncertainty regarding the consistency of visual acuity across test subjects.

All studies provided additional demographic details, such as age and gender. Notably, only two studies explored whether these factors influenced dogs' susceptibility to visual illusions. In the Kanizsa triangle experiment (Lõoke et al. 2021) the authors hypothesized a negative correlation between age and susceptibility, but this observation was based on a single individual, rendering it insufficient for drawing definitive conclusions, whereas Miletto Petrazzini, Bisazza, and Agrillo (2017) noted that no correlation could be established between the dogs' age and their performance.

Details on feeding schedules and their potential impact on motivation were inconsistently reported. Keep, Zulch, and Wilkinson (2018) and Lõoke et al. (2021) were the only authors to explicitly document food intake during training and testing periods. In the first study, dogs remained on their normal feeding schedule, while in the second study, they were only fed the evening prior to testing to ensure heightened food motivation. This variation in feeding protocols could

potentially influence performance, yet it was not uniformly controlled across studies.

Notably, only Byosiere et al. (2017) provided insights into the dogs' engagement, reporting that the subjects were enthusiastic and appeared to enjoy the experimental task (referred to as the "circle game"). However, no other studies explicitly addressed enjoyment of the tasks (only in terms of maintaining the motivation to continue) or potential stress, thus leaving open the question of whether factors such as higher engagement, anxiety or frustration might have influenced performance across different settings and methodologies.

The presence and role of **experimenters** and guardians also varied across the studies. In half of the studies reviewed, dogs were handled exclusively by unfamiliar experimenters, minimizing potential biases associated with prior relationships, but that could have influenced, however, the dogs' emotional state. In two studies, owners were present alongside experimenters, potentially providing a source of calmness or comfort. In Miletto Petrazzini, Bisazza, and Agrillo's experiment, which took place in the owners' homes, the owners were naturally involved, potentially introducing additional variables related to familiarity and environmental comfort.

Despite these differences in experimental setups, all studies acknowledged the potential influence that both guardians and experimenters could have on the dogs' choices. Various strategies were employed to mitigate this risk. For example, one approach (Lõoke et al. 2020) involved having the experimenter wear sunglasses and keep their hands clasped against their chest after presenting the food plates, in a try to ensure that no unintentional gaze or gestural cues were given. Another method (Byosiere et al. 2017, 2019) involved two experimenters: one individual handled the dog without seeing the stimuli, while a second experimenter recorded the choices but remained out of sight from the dog (however, once in the Canine Nose-

Touch Testing Apparatus, the dog could see none of the experimenters. Again, these methodological precautions aimed to reduce the risk of inadvertent cueing and strengthen the validity of the results.

The experimental timeline and training protocols varied considerably across studies. As Lõoke et al. (2021) note, most research on visual illusions in dogs employs a two-alternative choice task, typically preceded by a pre-training phase. During this phase, dogs are trained to discriminate a specific figure or line, which is later incorporated into the illusion-based test conditions.

However, this structured pre-training approach is less relevant when the experimental setup involves food-based choices rather than abstract visual stimuli. Miletto Petrazzini, Bisazza, and Agrillo (2017) highlight that extensive training had been a standard prerequisite in research on canine perception of illusions. The authors referred to the *"spontaneous preference paradigm"* and alternative methodologies that favored observing spontaneous, untrained behaviors; thus, dogs were simply presented with two options, and their natural selection was recorded – a feasible approach given that the stimuli involved were actually food.

In this study, focused on the Delboeuf illusion, the dogs were initially presented with two identical plates differing only in the quantity of food. As expected by the authors, given strong evidence in the literature supporting dogs' ability to distinguish between different amounts of food, the subjects reliably selected the plate with the larger quantity. The test phase introduced a critical variation: the two plates now differed in size, but each contained the same amount of food. If dogs were susceptible to the Delboeuf illusion, they were expected to select the plate that appeared fuller, that is, the smaller plate with the same portion of food. However, results showed that their choices did not significantly deviate from chance, suggesting that they were not

strongly influenced by this particular illusion (Miletto Petrazzini, Bisazza, and Agrillo 2017).

In contrast to food-based paradigms, studies employing touchscreen monitors (Keep, Zulch, and Wilkinson 2018; Byosiere et al. 2017, 2019; Lõoke et al. 2021) required a much more structured training process. These studies required an extensive pre-training phase, starting with target training, where dogs were conditioned to interact with the touchscreen. Even if dogs had prior experience with target signaling, they still had to learn to associate their response with the positive stimulus in a controlled manner. For example, in the study by Byosiere et al. (2017), the pre-training phase lasted four months (and included several short sessions per day performed with the help of trainers), reflecting the complexity of ensuring that dogs could reliably recognize and discriminate between the training stimuli.

Across touchscreen-based studies, only those dogs that reached predefined success criteria, typically an accuracy rate of 80-90% in correctly identifying the trained stimulus, in a given number of consecutive trials/sessions, were advanced to the actual test trials.

During the test phase, the dogs from the analyzed studies were presented with both the illusion stimulus and a control stimulus to assess whether their previously learned discrimination ability transferred to the new conditions. This phase is crucial for evaluating whether dogs perceive the illusion or their responses are influenced by alternative cognitive strategies.

However, Pepperberg (2023) - an author involved in the study of avian illusory perception, including the Kanizsa illusion (Pepperberg 2017) - emphasized that pretraining can significantly influence results and therefore advises caution. The author highlighted some concerns in Lõoke et al.'s study on dogs' susceptibility to the Kanizsa Triangle, suggesting that dogs' responses may have been shaped by prior training rather than a true susceptibility to the illusion (choosing 60º

angles, not so much the triangle). Additionally, Pepperberg noted the lack of transparency regarding some dogs requiring retraining, making it difficult to assess whether their test performance was affected by prior learning experiences. Lõoke et al. (2024) later responded to Pepperberg's critique by acknowledging the possibility that dogs may have relied on local cues during training, but argue that this explanation is unlikely and suggest that their success in the test phase was not solely due to pretraining biases. They point out that previous research suggests dogs tend to favor global over local processing in visual tasks, a fact that we could also verify in the studies by Pitteri et al. (2014) and Mongillo et al. (2017).

While these experiments contribute to our understanding of canine perception, it is crucial to also consider the **motivation** driving the dogs' participation. Unlike human participants, who may engage in experiments for the sake of curiosity or abstract reasoning, dogs require consistent reinforcement to maintain engagement. The reward structures used across the analyzed studies varied significantly, particularly between training and testing phases, potentially influencing the dogs' decision-making processes and overall performance.

During training, all studies employed a form of **positive reinforcement** when the dogs selected the "correct" (positive) stimulus. However, the reward delivery differed quite a lot. In the studies led by Byosiere, rewards were dispensed automatically via a treat dispenser, whereas in other experiments, experimenters delivered treats either by placing them in a bowl behind the starting point or tossing them on the ground. The precise location of the reward was not always clearly specified, raising questions about potential spatial conditioning effects. Notably, in the 2021 study by Looke et al., the dogs also received verbal praise from the experimenter

Handling the choice of the negative stimulus also varied considerably across studies. For Lõoke et al. (2021), a negative choice simply meant that the dog was recalled without receiving a reward, and the training session continued. The same happened when the dog did not make any choice for one minute. In the studies by Byosiere et al. (2017, 2019), negative choices also resulted in no immediate reward; the stimuli were removed from the screens, and the dog was directed back to the experimenter. However, in the 2017 experiment, upon returning to the starting point, the dog could randomly receive a treat, regardless of its prior choice (positive or negative stimulus). The authors argue that this system was designed to maintain motivation, even when performance was suboptimal.

While the intention is understandable, this approach raises concerns. Random reinforcement at the starting point could introduce ambiguity into the learning process, potentially encouraging dogs to prioritize returning to the handler/experimenter rather than engaging with the task. There is a risk that dogs might adopt a rapid, indiscriminate selection strategy rather than processing the presented stimuli - choosing a stimulus quickly, just to return for the possibility of receiving a reward from the human, not the automatic dispenser. A more effective strategy might involve adjusting task difficulty in response to errors, allowing the dog to succeed on an easier version of the trial before returning to the more difficult discrimination task. This could enhance motivation while maintaining clarity in the learning process, although it might add some time to the process.

In the study by Keep, Zulch, and Wilkinson, selecting the positive stimulus triggered a high-pitched tone and a reward, which was, again, placed by an experimenter in a bowl behind the starting point. While the placement of the reward in this fixed location behind the dog might have influenced response patterns, as I have mentioned above, the use of auditory cues added another layer of reinforcement, hence,

confusion might be less probable. Choosing the negative stimulus resulted in a low-pitched tone and a red screen for 2-5 seconds before the next trial began. This is an interesting choice given the known limitations of canine color perception, as dogs perceive red as a dull yellow-grayish tone, so the expected effectiveness of this visual feedback in signaling incorrect choices remains unclear.

However, one particularly valuable aspect applied by Keep, Zulch, and Wilkinson was the inclusion of **correction trials**, wherein the dog could repeat the task until making the positive choice and thus receiving a reward. This approach likely reinforced learning and maintained motivation by allowing the dog to adjust its response strategy based on previous errors. However, this is not necessarily a premiere, since Fagot and Tomonaga (2001) had also used correction trials in their study on chimpanzees to help keep them engaged and mitigate the effects of too many non-reinforced trials.

The testing phase brought some changes in reinforcement (and potential confounds) as the variation in reward strategies became even more pronounced during this phase. Byosiere et al. (2017, 2019) employed **randomized reinforcement** during test trials, aiming to prevent the reinforcement of a particular response pattern. While this approach follows a logical experimental rationale- ensuring that dogs do not simply learn to associate a specific choice with a guaranteed reward- it also introduces a potential conceptual conflict. If the goal is to determine whether a dog perceives an illusion, training it to signal a specific shape (e.g., a circle or a triangle) and then sometimes rewarding it for **not** signaling the shape during testing could also create inconsistency in the process. This also raises the question: *why* would the dog choose one stimulus over another unless it was associated with a positive outcome? And finally, is the dog making a *perceptual judgment*, or is it adapting to a shifting reinforcement pattern?

Additionally, in Byosiere's earlier study, the dogs also received randomized rewards from the experimenter upon returning to the starting point, a fact not signaled in the 2019 experiment. Still, as the authors themselves acknowledge, it remains challenging to determine whether the dogs responded to the contours of the illusion or relied on an alternative strategy. This underscores the importance of an experimental design that minimizes ambiguity, ensuring that the results can be confidently attributed to perceptual processing rather than external factors.

Lõoke et al. (2021) also applied a **random reinforcement** principle during testing (reinforcing randomly in half of the trials, regardless of the choice – positive or negative) but without the additional reward at the starting point, reducing potential motivational conflicts. In contrast, Keep, Zulch, and Wilkinson (2018) took a different approach - **removing reinforcement entirely** during test trials, meaning that dogs received no reward, even when selecting the positive stimulus. This method had also been used by Fuss, Bleckmann, and Schluessel (2014), who did not reward the sharks during transfer trials, to ensure that no learning occurred in response to the new situation.

Thus, the variation in reward systems across these studies shows that some dogs received inconsistent rewards while others were never rewarded during testing. Some other dogs were always rewarded, regardless of their response, in a study by Mongillo et al. (2017) which, however, did not focus on visual illusions but on a different discrimination task. This method, while ensuring continued engagement in the process, risks removing the predictability necessary for dogs to apply the established association with the targeted stimulus.

Having identified all these differences in experimental setups and methodologies, it is essential to also consider additional factors that

may have influenced the results – especially given the substantial variability observed across studies.

One key consideration, as noted by Feng and colleagues (2017), is the possible role of species-specific visual abilities in determining susceptibility to geometric illusions. Visual acuity, depth perception, and the ability to discern fine details at different distances all vary significantly between species. In the case of dogs, the authors even reference studies highlighting structural differences in the visual processing regions of the brain between brachycephalic and non-brachycephalic breeds. Such anatomical variations could potentially influence how different breeds perceive visual illusions and should be accounted for in experimental design.

Similarly, Pongrácz et al. (2017) argue that canine visual perception is often overlooked when designing illusion-based experiments, as many studies default to visual stimuli optimized for human perception. To illustrate this point, the authors used an image manipulation program to alter an image, based on what is known about canine vision - adjusting color, brightness, and resolution. When this altered image was presented to human participants, their performance in detecting the illusion declined, suggesting that the "effectiveness" of visual illusions may depend on species-specific perceptual mechanisms. This finding underscores the necessity of tailoring experimental conditions to the sensory capabilities of dogs, and continuously refining methodologies as scientific understanding of canine vision advances.

Despite clear evidence that human and canine vision differ, few studies have actively adjusted their experimental designs to accommodate these differences (Pongrácz et al. 2017). Among the analyzed research, only two studies made deliberate efforts to optimize the stimuli. Byosiere et al. (2017) took into account canine color perception when presenting the Ebbinghaus–Titchener illusion, opting

for blue and yellow hues, which dogs are known to perceive more vividly. Meanwhile, Lõoke et al. (2021) prioritized clarity by selecting a figure ratio reported to elicit a strong perceptual effect, but they considered this effect in humans. However, the authors also acknowledged the potential limitations of this approach, citing previous findings, that the support ratio influenced susceptibility to the Kanizsa triangle illusion in both humans and rhesus monkeys (Lõoke et al. 2021).

Ultimately, Pongrácz et al. (2017) provide a reminder that dogs may perceive experimental stimuli in fundamentally different ways than humans do, stating that: *"any unaccounted difference between the visual perception of dogs and humans could result in dogs perceiving the visual stimuli in a way not anticipated by the researchers."* This highlights the importance of maintaining an open and adaptive approach to experimental design, one that does not merely translate human-based paradigms to canine subjects but instead actively considers the unique perceptual world of dogs.

Conclusions

This review highlights the complexity of canine visual perception and the methodological challenges associated with studying it. While dogs' reliance on olfaction and hearing has often overshadowed research into their visual processing, the available studies indicate that their perception of visual illusions, and by extension, their broader visual cognition, is nuanced and complex.

The discrepancies observed in dogs' susceptibility to visual illusions underscore the influence of experimental design, stimulus presentation, and methodological controls. Discrepancies between food-based and touchscreen experiments, variations in reward structures, and differences in pre-training requirements could have all contributed to the diverse findings in the literature. Standardizing

methodologies, ensuring rigorous controls for experimenter influence, and incorporating ecological validity into experimental design will be critical for advancing our understanding of canine vision.

The study of visual perception in dogs can offer valuable insights, but we must ensure that our testing is rigorous and that we are not the ones connecting the dots. Besides, rather than fitting canine perception into a strictly human or mechanistic framework, future research should continue to explore the unique ways in which dogs process visual information.

Beyond academic inquiry, these findings hold practical implications for working dogs in fields such as search and rescue, detection, assistance work, etc. A more precise understanding of canine visual processing can enhance training protocols, improve safety in operational settings, and maximize the effectiveness of working dogs by aligning training with their true perceptual abilities rather than human assumptions, optimizing performance while reducing cognitive strain.

As a search and rescue handler, I have witnessed firsthand how handlers strive to refine their understanding by reading, discussing, and experimenting to find better solutions, much like researchers in the scientific community. This drive to further understand how working dogs perceive and navigate their environments is what led me to further my academic studies in the matter. By bridging the gap between scientific research and practical approaches, we can not only enhance training methodologies but also improve the safety, efficiency, and well-being of these remarkable dogs that work alongside us.

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Silent Conversations: Investigating Gaze Alternation in Domestic Dogs

Kinga Szabó *

Abstract

Gaze alternation has been the focus of many scientific studies across various species, including dogs. While many studies have confirmed that dogs use gaze alternation in human-directed contexts, their intentionality remains a topic of debate. Many authors believe that adapting one's behaviour based on the audience's attention is considered intentional communication; however, associative learning might be sufficient to account for this behaviour. Additionally, limited research has compared dogs' use of gaze alternation to that of children. This paper aims to provide a brief review of the literature on dogs' use of gaze alternation, focusing on its intentionality and comparing it to the gaze alternation observed in children, with an assessment of whether dogs are sensitive to the audience's attention stance. Expected outcomes include a deeper understanding of the cognitive processes behind dogs' gaze alternation and its parallels with human development. This understanding has significant applied value for dog trainers, other professionals, and guardians, as it can enhance functional human-dog interactions and aid in preventing cruelty towards dogs, thereby promoting overall animal welfare.

Keywords

gaze alternation, dogs, intentional communication

Introduction

Humans have shared a unique bond with dogs since ancient times, yet only recently have dogs become a focus of scientific research (Prato-Previde and Marshall-Pescini 2014). In addition to advancing our understanding of dog cognition, researchers are increasingly using dogs as a model species to gain insight into cognitive processes, in both

* Ethology & Human-Animal Interactions, Faculty of Animal Science and Biotechnologies, University of Agronomic Sciences and Veterinary Medicine of Cluj-Napoca; Email: kinga.szabo@student.usamvcluj.ro

humans and other non-human species (Bensky, Gosling, and Sinn 2013). In today's world, dogs have a cognitively demanding role, including companionship, which requires them to learn and apply various social and environmental cues (Bensky, Gosling, and Sinn 2013). Researchers hypothesize that domestication has not only altered their physical traits but also their cognitive processes, enabling them to adapt to diverse human-assigned roles (Bensky, Gosling, and Sinn 2013). Dogs do not just act as a response to human behaviour, but they also learned to communicate with humans by producing communication signals directed at humans to achieve their own behavioural goals (Miklósi et al. 2003). Since the behaviour of looking is very important in initiating and maintaining communicative interactions among humans, it's believed that dogs' tendency to look at human faces has resulted in complex forms of communication between dogs and humans, that wolves are unable to develop, even with prolonged socialization (Miklósi et al. 2003). Research suggests that dogs use gaze to communicate with humans, but the frequency of this behaviour may vary based on reinforcement history, indicating a role for associative learning (Bensky, Gosling, and Sinn 2013). Scientific debates exist regarding canine social cognition, especially around its origins and underlying behavioural mechanisms (Bensky, Gosling, and Sinn 2013). Regarding the debate about the origins of canine social cognition, Reid (2009) highlights the importance of both the phylogenetic and ontogenetic components that contributed to the dogs' well-developed social cognition skills. Regarding the second debate about the behavioural mechanisms, some research shows that the dog's social ability could be potentially explained by associative learning during the dog's lifetime (Barrera, Mustaca, and Bentosela 2011; Bentosela et al. 2008; Elgier et al. 2009), while others argue that dogs' social cognitive abilities reflect sophisticated cognitive processes and cite studies that show dogs interpret human cues as referential

communication signals (Bräuer, Call, and Tomasello 2004; Miklósi et al. 1998; Marshall-Pescini et al. 2013).

This paper aims to review relevant literature, to explore whether dogs' use of gaze alternation is an intentional communicative act and how it compares to similar behaviours in children. Additionally, it seeks to examine whether dogs are attentive to the audience's level of engagement and attentional stance. Understanding how dogs use gaze alternation to communicate with humans – and educating guardians and pet professionals about this – can create conditions that allow dogs to express themselves more effectively and increase their choices in daily interactions. This is important for real-life dog-human interactions, as guardians often make decisions for their pets based on assumptions about their dogs' preferences – assumptions that may not always align with the dog's true needs or desires. This understanding has significant applied value for not only pet guardians but also for dog trainers, veterinarians, and other pet professionals, as it can improve functional human-dog interactions and communications. This can also aid in preventing animal cruelty, especially towards dogs, thereby promoting overall animal welfare.

Overview of Gaze Alternation

Visual signals are important for both humans and non-human vertebrates in gathering information and conveying their emotional states to others (Emery 2000). They are also a crucial part of dog-human communication; working dogs were likely bred for their ability to interpret human communication signals, including visual signals (Schwab and Huber 2006). For effective visual communication, attention is essential: it ensures signals are reliably transferred from sender to receiver, either by establishing attention first or by checking afterward (Miklósi et al. 2000). Attention can be described by two components, the first component is shared attention mechanism

(SAM), while the second component is eye contact (Schwab and Huber 2006). SAM is a neurocognitive mechanism for detecting if you and another organism are jointly attending to the same object or event (Baron-Cohen and Swettenham 1996). SAM is expressed by either following another's gaze or directing their attention to an object or event, accompanied by visible cues, as turning the eye, head, or whole body towards the object/event and using gestures, such as pointing (Schwab and Huber 2006). Emery (2000) also highlighted that gaze in primates often involves more than just the eyes; the position of the entire head can serve as an indicator of a person's direction of attention (Emery 2000). This was also confirmed in dogs, as beside the use of gaze, dogs are also likely to indicate objects using their body orientations (Miklósi et al. 2000). The second component of attention is eye contact (Schwab and Huber 2006), which has been linked to attention as a fundamental component of communication (Schwab and Huber 2006 based on Gomez 1991). Attentional states in communication are indicated by observable signals, such as body posture, head orientation, and gaze direction (Schwab and Huber 2006). Researchers have explored animals' comprehension of communicative cues by using gestures such as pointing, gazing, and glancing to guide their attention toward specific objects; while most animals tested (for example: horses, domestic goats, grey seal) understood humans' pointing gestures, they failed to understand glancing or gazing (Schwab and Huber 2006). Chimpanzees can understand pointing after some training; however, there is a debate around their ability to use gazing and glancing as referential communication cues (Call, Agnetta, and Tomasello 2000). This does not seem to be the case in dogs, as the majority of the dogs seems to use many different visual cues performed by humans, such as pointing and gazing (Hare, Call, and Tomasello 1998; McKinley and Sambrook 2000; Miklósi et al. 1998; Soproni et al. 2001, 2002). Besides dogs

understanding the visual signals performed by humans, they are also performing visual signals themselves, such as pointing with their body orientation, gazing, gaze alternation (gaze at the caregiver followed by gaze at the object of interest, or the other way around), and auditive signals such as barking (Miklósi et al. 2000). In a 1998 study, Hare, Call, and Tomasello (1998) found that dogs are able to point with their body orientation to help a naive human locate hidden food, also their frequent barking during the experiment was interpreted as attention getting behaviour (Hare, Call, and Tomasello 1998).

In 2000, Miklósi and colleagues investigated the dogs' ability to engage in functional referential communication with their guardians (in this review paper, I will use guardian and caretaker to refer to the dogs' legal owners). They were investigating "showing" behaviour, which is consisting of directional element regarding an external object (a food bowl with food or toy), and an attention getting element to direct the audience's attention to the informer or the sender (Miklósi et al. 2000). They had three conditions tested, out of which two were control for the motivational effects of the food and the guardian (petting condition and dog-alone condition) and one was the actual experimental situation where the dog saw a helper/hider (family member) hide the food where they couldn't reach (hiding condition) (Miklósi et al. 2000). Miklósi's team was interested to see if the dogs were engaging in any showing behaviours when the guardian is present, so they coded behaviours such as gazing, mouth licking, vocalization, sniffing, standing, walking, etc. from all three conditions. For each of the three conditions (marked with letters A, B, and C), three sessions were recorded (marked with numbers 1, 2 and 3), both the guardian and the experimenter who coded the behaviours were naive regarding the location of the hidden food: A. Petting condition: 1. the guardian is sitting and reading for one minute while the dog was also in the room, 2. familiar person (hider) pets the dog for 30 seconds and

leaves, 3. the guardian is sitting and reading for one minute while the dog was also in the room, ignoring the dog; B. Dog-alone condition: 1. the guardian is sitting and reading for one minute while the dog was also in the room, 2. familiar person enters the room and shows the dog the food item, hides it in one of the food bowls making sure the dog witnesses the hiding and leaves, 3. The dog is alone in the room for 1 minute; C. Hiding condition: 1. the guardian is sitting and reading for one minute while the dog was also in the room, 2. familiar person enters the room and shows the dog the food item, hides it in one of the food bowls making sure the dog witnesses the hiding and leaves, 3. The guardian enters the room and reads for a minute, after this the guardian will give the dog the hidden food item, provided they found out the location of the food (Miklósi et al. 2000). The results showed no significant difference in the dogs' behaviour in the petting condition, researchers concluded that there was no significant effect of a familiar person on the dogs' behaviour (Miklósi et al. 2000). In the dog-alone condition, vocalizations were increased and directed towards the door, looking towards the food increased and looking towards where the guardian previously was decreased, no other differences were found (Miklósi et al. 2000). The notable increase in vocalization during session three of the dog-alone condition could suggest that these dogs may have been experiencing some degree of separation-related stress or anxiety, or perhaps a level of barrier frustration. There were significant differences in the hiding condition: the duration of standing beside the door decreased, the frequence of gazing was significantly increased toward the guardian and toward the bowl containing the hidden food, also the sniffing towards to bowl and mouth licking behaviour also increased in session 3 on the hiding condition compared to session one (Miklósi et al. 2000). In the hiding condition, half of the participants vocalized in session 3, which is a significant increase compared to session one where they all remained silent; all vocalizations occurred

together with gazing behaviour toward guardian or food bowl (Miklósi et al. 2000). Miklósi's team analysed the gaze alternations, and they concluded that gaze alternation only happened in the hiding condition, and eight out of ten dogs started the gaze alternation by looking at their guardians first followed by gazing at the hidden food; they also noted that ten out of ten guardians were successful in locating the hidden food based on the dogs' indications. This was a small study with only 10 dog participants; however, it clearly shows the dogs' ability and tendency to perform "showing" behaviour, producing attention-getting behaviours and directional signals (Miklósi et al. 2000).

Bensky, Gosling, and Sinn (2013) also investigated the literature on dog cognition and concluded that dogs have a strong tendency to look at humans; especially when faced with a problem-solving task, dogs would alternate their gaze between the human and the object/unsolvable task at hand (this was also concluded by Miklósi et al. 2000). Researchers also looked into the possibility of age and breed differences when it comes to dog-to-human communication; Passalacqua and colleagues (2011) found that dogs as young as 2 months old would also engage in gazing toward humans and gaze alternating behaviours, however the duration of the gaze and the gaze alternation increased significantly in adult dogs, suggesting that the inclination of using this behaviour is changing during the dogs development. The authors did not find any proof of breed difference in gazing at 2-months old dogs; however, they found breed difference in adult dogs: herding/hunting dogs engaged in significantly more gazing behaviour than the same age molossoid (i.e. mastiff-type dogs) and primitive breed group dogs that were evaluated (Passalacqua et al. 2011). These findings also suggest that the selection of dogs for different purposes might influence their ability to communicate with humans (Passalacqua et al. 2011). A very recent study by Riemer, Bonorand, and Stolzlechner (2024) demonstrated that dogs as young as

6-7 weeks of age would alternate their gaze between the human and the object in two different contexts (unsolvable task and novel object test).

Intentionality vs. Associative Learning

Some researchers argue that the dogs' social abilities for understanding human communicative cues could be potentially explained by associative learning during the dog's lifetime (Barrera, Mustaca, and Bentosela 2011; Bentosela et al. 2008; Elgier et al. 2009), while others argue that dogs' social cognitive abilities reflect sophisticated cognitive processes and dogs are able to interpret human cues as referential communication signals (Bräuer, Call, and Tomasello 2004; Miklósi et al. 1998; Marshall-Pescini et al. 2013). Gaunet and Deputte (2011) noted "in apes, four criteria are set to explore referential and intentional communication: (1) successive visual orienting between a partner and distant targets, (2) the presence of apparent attention-getting behaviours, (3) the requirement of an audience to exhibit the behaviours, and (4) the influence of the direction of attention of an observer on the behaviours" (Gaunet and Deputte 2011). In their study, they aimed to investigate whether the behaviours dogs use to communicate with humans meet these criteria for referential and intentional communication. In addition to investigating gazing and gaze alternation behaviours, they also examined whether dogs would use their bodies as a local enhancement cue, exploring if this could be considered a referential and intentional communicative act (Gaunet and Deputte 2011). The initial habituation period with the apparatus was followed by the experimental stage, where dogs witnessed their toys being hidden in a container that could be opened only by the guardians (Gaunet and Deputte 2011). The authors analysed how the dogs' behaviour changed (gazing at the target, gazing at the guardian, gaze alternation between target and guardian, the position of the dog

compared to the location of the target) in the 30 seconds trials, in three conditions (later marked with numbers 1, 2 and 3), with four heights of the target(container with our without toy) were tested (on the ground, at paw level, at dog's head height and an inaccessible height above the dog's height) (Gaunet and Deputte 2011). The three conditions were: 1. "Toy and owner present": tested all 4 levels of height, which gave information of the dog's signalling behaviour when both the toy and the human are present, 2. "Toy present": only the ground level was tested, and this condition controls for motivational effect, since the signalling behaviours that emerge in this condition should be interpreted as motivation toward the toy, and 3. "Owner present": only the ground level was tested, without toy; this controls for the dogs behaviour when their guardian is present in the absence of a toy, can be considered a baseline (Gaunet and Deputte 2011). Each trial was videotaped and the dogs' behaviour (vocalization, contact with guardian, mouth licking, gazing toward human, gazing toward the toy, gaze alternation between guardian and toy/container, and gaze alternations between guardian and door when the toy was behind the door, dogs' positions in the room) was recorded and analysed (Gaunet and Deputte 2011). Results show that the number of gaze alterations and the duration of gazing behaviours were significantly higher in the "Toy and owner present" condition, relative to the other two conditions, dogs spent more time close to the container when both the owner and the toy were present (Gaunet and Deputte 2011). These findings confirm that gazing behaviour at the container and gaze alternations can be considered intentional and referential communicative behaviours (Gaunet and Deputte 2011). Moreover, the study shows "first time that another behaviour, the position of the dog, which acts as a local enhancement cue, has part of these properties" (Gaunet and Deputte 2011, 10).

Comparison to Children's Gaze Alternation

Gaze alternation typically emerges around 10 months of age in human children (Beuker et al. 2013; Carpenter et al. 1998), in contrast to our closest relatives, bonobos (Pan paniscus) and chimpanzees (Pan troglodytes), who do not start gaze alternating between an object of interest and an observer until much later, often reaching this behaviour only in adulthood (Lucca, MacLean, and Hare 2018). As mentioned about, Passalacqua and colleagues (2011) found that dogs as young as 2 months old would already engage in gazing toward humans and gaze alternating behaviours, however the duration of the gaze and the gaze alternation is increasing significantly in adult dogs, suggesting that the inclination of using this behaviour is changing during the dog's development.

Not many studies compared dogs and children regarding gaze alternation as a referential communicative act; most studies compared dogs and children in their comprehension of communicative cues (Marshall-Pescini et al. 2013). An example of such comparisons is a 2009 study by Lakatos and colleagues, which examined how adult dogs and children aged 2 and 3 understood different pointing gestures; besides pointing with the finger, they used various body parts, like the elbow, knee, and leg (Lakatos et al. 2009). They concluded that 3-year-old children performed significantly better than both adult dogs and 2-year-old children; however, the functional abilities of adult dogs in understanding humans' pointing gestures were comparable to those of 2-year-old children (Lakatos et al. 2009). Other studies investigated dogs' comprehension of communicative cues and the dogs' use of gazing (Miklósi, Topál, and Csányi 2004; Bräuer, Call, and Tomasello 2004; Call et al. 2003; Gácsi et al. 2004; Miklósi et al. 2000; Soproni et al. 2001, 2002; Virányi et al. 2004), however, only a few studies have examined dogs' *use of communicative cues* in comparison to young children. One example is Virányi and colleagues (2006), who compared

how dogs and toddlers use communicative cues through a non-verbal knowledge attribution test. Dogs and children were required to show the helper where the location of the toy was (which was out of reach of both dogs and children) and where the helper could find the tool needed to get to the toy. Both species demonstrated their sensitivity to the presence/absence of the helper, however, dogs were more likely to indicate the location of the toy, but they had difficulties showing the location of the tool. In a more recent study, Marshall-Pescini and colleagues (2013) aimed to determine whether dogs and toddlers would use gaze alternation similarly in an unsolvable task paradigm and to assess if both species would consider the attention stance of the audience. This study included 53 dogs accompanied by their guardians and 59 toddlers accompanied by their nursery teachers. Throughout their paper, the dog's guardians and the toddler's nursery teachers were named "caregivers", I will do the same in this paper as well. The test consisted of three solvable and one unsolvable trial for both species. The criterion to be tested in the unsolvable trial was to solve at least twice the solvable tasks. The apparatus in this study was a transparent container placed upside down over a toy/food, on a wooden board, for both species. The container was movable in the solvable trials, and it was screwed down on the wooden board in the unsolvable trials. Mendes, Resende, and Savalli in their 2021 review, analysed 35 studies regarding their usage of the unsolvable task paradigm in canines, focusing on their different methodology, apparatuses, number of trials and their different interpretation of looking back/gaze alternation. Upon their review of 35 studies, the authors 'propose that the apparatus used is the wooden board with just one plastic container attached to it, with solvable trials followed by the unsolvable trial; that three solvable trials are presented to dogs; that both the caretaker (when existent) and an experimenter are present during the experiment; and that the optimal duration for the

unsolvable trial is 1 min.' (Mendes, Resende, and Savalli 2021, 13). These recommendations, which are very close to the used methods by Marshall-Pescini and colleagues (2013), suggest that the selected methodology and procedure were well thought out and interpreted. In the above-mentioned study, to assess the sensitivity of dogs and toddlers to the audience's attention stance, both species were distributed in two groups: Experimenter attentive (Exp-att.) and experimenter back-turned (Exp-back); the caregivers were attentive in both groups. Results show increased gaze alternation between the apparatus and the caregiver in both species once the task became unsolvable; toddlers also presented an increase in pointing behaviour. Both species turned out to consider the attentional stance of the audience. Altogether, the results suggest that both species use gaze alternation as an intentional and referential communicative act, and they both consider the need for an attentive audience (Marshall-Pescini et al. 2013). While this study initially started with a pilot experiment, where both the experimenter and the caregiver turned their backs to the container, this was not carried out due to the children's discomfort. Striano and Rochat (2000) had similar findings when, in their initial pilot study, children refused to participate and showed stress signals when the caregiver was also turning their backs to the container. In Striano and Rochat's (2000) study, the researchers compared 7- and 10-month-old infants' gazing behaviours toward an adult stranger, who was either attentive or inattentive, while the infants encountered a series of events (barking of a toy dog). The infants were tested in one of two conditions: look toward (the experimenter looked silently toward the infant; if the infant looked toward the experimenter, they responded with a simple "yes!" or "wow!") and look away (the experimenter turned approximately 45 degrees sideways relative to the child, reading a book, not responding to any gaze of the infant). In each condition, the experimenter placed a toy dog on the table, which

barked for 2 seconds, every 30 seconds. 68% of the 10-month-old infants were excluded from the look away condition compared to the 33% that were excluded from the look toward condition, due to 'excessive fussing'. Notably, the shared factor in both studies was the absence of parents during the experiments. In the Striano and Rochat (2000) study, the parents remained out of sight and silent, while in the Marshall-Pescini and colleagues (2013) study, the children only had their nursery teacher with them. This raises the question of whether the children were displaying stress signals because their parents were not present. The authors of the study acknowledged this question, suggesting the possibility that the results might have been influenced by the identity of the caregiver in the children's experiments.

Sensitivity to Audience Attention

Research on children and pre-verbal toddler communication shows that they are able to consider the audience's attentional state as early as around 10 months of age (Carpenter et al. 1998; Striano and Rochat 2000). Studies have shown that dogs are sensitive to the attentional stance of their audience, whether it is a conspecific (Horowitz 2009) or a human audience (Marshall-Pescini et al. 2013). Horowitz (2009) demonstrated that dogs are sensitive to their audience's attentional stance when engaged in play behaviours with their conspecifics. The author reports that dogs sent play signals almost exclusively when the playmate was facing them, and attention-getter behaviour was observed when the playmate was turned away (Horowitz 2009). The intensity of these attention-getters matched the level of the playmate's inattentiveness, with stronger signals used when the playmate was more distracted; this suggests that dogs are attentive to their conspecifics' focus and adjust their behaviour to engage them, similar to how humans use "attention" in interactions (Horowitz 2009). Besides being attentive to their conspecifics'

attentional stance, dogs seem to be attentive to humans' attentional states as well. Schwab and Huber (2006) concluded that dogs pay attention to their guardians' attentional state; in their experiment, the dogs were told to lie down and their behaviours were recorded while the guardian engaged in one of 5 behaviours (owner looked at them, read a book, watched TV, turned his or her back on them, or left the room). The research showed that dogs were staying in the "down" position most often and for longer during the condition in which their guardian was watching them, compared to the other conditions where the guardian was not paying attention (read a book, watched TV, turned his or her back on them, or left the room).

In conclusion, both dogs and human children appear to be attuned to the attentional stance of their audience. This sensitivity is supported by the findings from the studies discussed above (Virányi et al. 2006; Marshall-Pescini et al. 2013), where both species showed an ability to account for the audience's attentional focus.

Implications for Dog Training and Welfare

This review of the literature provides a deeper understanding of dogs' comprehension of communicative cues and also their use of gaze, gaze alternation and body position as referential and intentional communication towards humans, while being sensitive to the humans' attentional stances. This understanding has significant applied value not only for dog guardians but also for trainers, veterinarians, groomers, and other professionals, as it can enhance functional human-dog interactions and aid in preventing cruelty towards dogs, thereby promoting overall animal welfare. The real-life application of this paper is understanding dogs' communication methods, which can lead to a deeper understanding of their behaviour, allowing for care that better aligns with dogs' needs and potentially reducing conflicts. This knowledge could also give dogs more agency and choice, as humans

become more attentive to what dogs may be signalling through gaze alternation. As a result, dogs' lives could become more enriched, and their overall welfare improved. Also, understanding that dogs use gaze alternation and other communicative cues intentionally, could help dog guardians and trainers communicate more effectively with their dogs. This can lead to more successful training outcomes as humans become better at reading and responding to dogs' signals. By acknowledging the dog's intentionality during communicative behaviours, we can also promote the dogs' autonomy and choices. Recognizing that dogs communicate preferences and intentions means that guardians need to reconsider assumptions about what dogs want or need. This could lead to more individualized care and enriched environments that align with each dog's unique needs.

Discussions

Marshall-Pescini and colleagues (2013) noted a lack of attention-getting behaviours from both species, toddlers and dogs. They stated that attention getting behaviours would have been a better support of their findings, that is both dogs and human children are considering the attentional stance of the audience, if the subjects actively showed attention getting behaviour towards the inattentive experimenter, then alternating their gaze between the apparatus and the "newly attentive" experimenter. While I agree that attention-getting behaviour would have been a clear indication of their awareness of the experimenter's attentional stance, I believe the lack of attention-getting behaviour could be a result of the identity of the inattentive person. I hypothesize that both dogs and children prefer turning to their familiar person (guardian, teacher, parent) rather than to a stranger when facing an unsolvable task. However, additional research is needed, involving scenarios where the experimenter remains attentive while the caregivers turn their backs. This would help assess whether dogs and

children alter their strategies and potentially start using more attention-getting behaviours to gain humans' attention.

There is another perspective that warrants further investigation in dogs' gaze behaviour during unsolvable tasks. This is especially relevant because a recent study by Lazzaroni and colleagues (2020) suggests that interpreting dogs' gaze or looking back as a 'communicative act' may be overestimated. The researchers used a variation of the unsolvable task paradigm, they tested four conditions (social condition with an unknown experimenter; asocial condition, meaning the subject alone; 'dummy' human condition; and object condition with a big sheet of cardboard) on two different populations of dogs (pet dogs and free-ranging dogs in Morocco). They found similar results at the latency of which both populations of dogs looked back at the human, the 'dummy' human and at the object (Lazzaroni et al. 2020). They found that pet dogs looked back for longer at the human compared to the free-ranging dogs, however the authors interpreted this as pet dogs could be more attracted to the humans and/or they might have stronger reinforcement history/association between human and food, compared to the free-ranging dogs (Lazzaroni et al. 2020).

Conclusions

This review paper highlights the complex nature of dogs' gazing behaviour and gaze alternation as referential and intentional communicative behaviours, which aligns with early communicative behaviours observed in young children. The findings suggest that dogs are sensitive to the attentional stance of both conspecific and human audiences, which could stem from both associative learning and evolutionary adaptations due to domestication. Understanding these behaviours might help dog guardians, trainers, and other pet professionals to improve human-dog interactions, enhancing dogs'

welfare by ensuring that their needs and preferences are considered in everyday interactions, instead of functioning on assumptions. By understanding the dogs' attempts to communicate with us, we could reduce frustration and stress, which could also contribute to the dogs' welfare. This knowledge reinforces the importance of treating dogs not only as companions but as social partners with their own means of communication.

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Palliative Care, Animal Emotions and Ethical Dilemmas. An Essay on the Need for Developing Networks of Care[1]

Irina Frasin *

Abstract

When we share our lives with animal companions, we are not always enjoying only good days and the benefits of togetherness. Sometimes we are faced with difficult decisions, stress, pain and illness and the struggle to find the best solutions for a peaceful way forward. In my article I will be addressing the multiple facets of palliative care for our companion animals. When we center our attention on the quality of life, the means we have available to assess it become of utmost importance. I will be focusing mainly on the attention needed for the emotional lives of the other animals and also on the ethical aspects involved in difficult decision-making in these complicated circumstances.

Keywords

end-of-life care, palliative care, hospice, emotions, wellbeing, ethics, human-animal bond

Introduction

All animals around us make our lives richer, more colorful and more interesting as we make efforts to discover them, to understand who they are and how they live their lives. And fortunately, animals are all around us, always present. And more than understanding them, the effort made to know them also reminds us of our own humanity,

[1] I dedicate this study to my beloved Mini-Poof (Pufica), a cat with disabilities who is bravely fighting cancer and whose love of life is an inspiration for all those who know her.

* "Gheorghe Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch; Email: irinaada@gmail.com

animality, vulnerability, and interdependence. In short, it makes us more caring and empathetic human beings.

Speaking about, for, to, or of animals is always hard and provocative. But to understand the Otherness of the other animal species is both a challenge and an opportunity. It is challenging to know if, and when, our hypothesis, the way we conduct our studies are reflecting the understanding of the other animals or are mirroring our own thoughts. The effort to be less anthropocentric is necessary but also difficult and demanding. We know it is possible to meet the absolute other, to know him/her, acknowledge his/her individual presence, to make an effort to understand him/her. But more than knowing, we have the chance to love them, to build bridges and finally discover we are not so far apart.

For a very long time in our history, the other animals held mainly instrumental value, they were good for us as long as they were useful. This is unfortunately still true today when we talk of animals exploited in farms, laboratories and other industries that continue to see animals as mere property and existing only for human use[2]. Thus, for these animals we cannot talk of basic medical care (if we exclude the treatments needed to keep animals alive and the humans in contact with them safe – as much as considered possible[3]). So, for the following chapter, we will focus exclusively on companion animals and the advanced medical care available for them.

But until recently, even companion animals were considered (and sometimes unfortunately they still are) in the old paradigm and as far

[2] Discussing these issues is a different matter. I focused more on these matters in previous studies (Frasin 2020; 2021) and I will continue to do so until we build a more equitable system for all.

[3] Of course, without impeding on profit. For more on animal exploitation, see Nilbert (2013); for more on animal suffering in farms, see Aaltola (2012).

as they had only an instrumental value, their worth was naturally calculated as what they can do for us, what they can serve us for. In this order of things, animals with disabilities or diseases or nearing the end of their lives were put down out of simple economic calculation. And unfortunately, this practice was largely accepted, and it still is very common[4]. Today, when we gradually recognize and accept that animals are valuable in themselves, as living sentient beings, we have started to shift this perspective. More than that, companion animals always had an emotional value, and today it is almost understood, for most of us, that they are part of the family. So, taking care of them when they get old, when they get debilitating diseases, is or should be understood. It is obvious that this is putting financial stress on the family budget, but this should be (although unfortunately it is not always the case) the least of the problems. More important and more difficult is finding the veterinary medical assistance needed for very special cases, and even harder than that, the decision until when it is humane or recommended to continue the palliative care. These very hard and intricate decisions will be discussed in the pages to follow.

Comfort over Cure. Focusing on the Quality of Life

When faced with difficult situations of animals in severe distress, critically and incurably ill, for a very long time, euthanasia was considered the humane solution. In certain cases, it still may be the compassionate decision to make. But today, with the progress of veterinary medicine[5] and its instruments and medication, there are also other possibilities to consider.

[4] For example, in the case of the racehorses, or other animals whose value we still calculate in what they bring us in financial terms, but also in the case of companion animals, whose guardians still see them as counting on the benefits they bring.

[5] The standards of advanced veterinary care can be comparable to human medical care.

First and foremost, we need to begin with some definitions because palliative care[6], hospice care and end-of-life care are sometimes held to have similar and/or overlapping meanings. When we talk of palliative care, we refer to a personal and family-centred treatment, care and support for the animals living with a life-limiting illness. The common definition would be that "Palliative care is an interdisciplinary medical caregiving approach aimed at optimizing quality of life and mitigating suffering among people with serious, complex, and often terminal illnesses."[7]. To be very clear, there are no time constraints when talking of palliative care. It is simply the care, treatment and support offered to someone living with a debilitating, permanent, incurable condition. Hospice care instead is referring to maintaining the quality of life when a cure is no longer possible, or the burdens of treatment outweigh the benefits. It is specialized care that focuses on improving the comfort and quality of life for individuals with serious illnesses who are approaching the end of life. It provides physical, emotional and social support to both patients and their families, aiming to manage symptoms and reduce distress. Hospice care is a specialized form of palliative care.

End-of-life care also includes physical, emotional, social, and spiritual support for patients and their families. The goal of end-of-life care is to control pain and other symptoms so the animal patient can be as comfortable as possible. End-of-life care may include palliative care, supportive care, hospice care, and assisted/palliated death.

These types of special care for sensitive and challenging situations, developed initially in human medicine, are now beginning to be available for our animal companions as well. As animals are now,

[6] Especially in Romania, where palliative care for companion animals is in its infancy.

[7] See https://www.nicenet.ca/kb/palliative-care (accessed 24.06.2025)

for most of us at least, parts of our families, their diseases, disabilities, and ageing are more and more considered in terms similar to fellow human patients. And it is also important to stress from the beginning the importance of the human family and its crucial role in caring for incurable ill animal patients.

For a very long time, when a cure was impossible for our animal companions, living with illness or/and disability was considered not a good life. But the more we know them, understand their complex lives and see their emotions, we begin to realize that our assumptions were not accurate. It is altogether possible that an animal living with an incurable and life-threatening disease may be happier and live better than a human in the same situation. This may be partly because they are blissfully unaware of the diagnosis and partly because they live in the present moment far better than we do. Even faced with debilitating conditions, animals tend to manage quite well. For instance, being blind or deaf or missing limbs or being paralyzed or having other disabilities is affecting animals far less than previously considered. Given the chance to live in comfort, safety, and without pain, even if with disabilities, animals manage perfectly[8]. In general, when they fail to thrive, we should better question our own estimations, our pain treatment protocol and the other conditions. Adjusting to the animals' needs will generally lead to coping with difficulties and disease. Of course, there are no general solutions as there are no general patients and each individual has, beyond the medical condition, her/his whole life history that may affect the way they adapt and cope with a given situation. But my main point is that, given the treatments and

[8] We should also be aware that generalizing is dangerous for leaping into false conclusions. Animals, just like us, are individuals and different individuals fare differently. I just try to make a point about the contrast with our previous assumptions.

conditions they need, animals can adapt very well to living with a disability or incurable disease. Their comfort and the management of their pain should be of utmost importance, as well as living in a stress-free[9], loving and safe environment. All lives are precious.

Quality of Life vs. Animal Welfare

When we think of animal welfare, the first thing that comes to mind is the welfarist theories and the welfare calculations and measurements done for exploited animals. But in fact, these things made even the term "welfare" lose its true meaning. We cannot talk of welfare in general, in groups of animals; welfare is something concerning the individual. And of course, it has a significant subjective part. Talking about welfare in farming or other types of animal exploitation is misleading. In this case, simply the term may be misused. We cannot really talk of welfare in confinement or without basic medical assistance.

For this reason, I prefer using the term well-being in place. In fact, to truly assess the well-being of an animal, we need very strong knowledge of species-specific behaviour and also a leap of faith. I simply say this because it is really hard in my view to imagine what constitutes a good life[10] for a different species. Of course, we can more easily see what the impediments to a good life are. Pain, disease, emotional suffering of any kind, all these are clear indicators of a poor quality of life. But, on the other hand, it is truly important to consider

[9] It is very important to make vet visits as stress-free as possible. And even more so when a critically ill animal needs repeated vet visits. Stress and anxiety should always enter this equation of QoL.

[10] It is also extremely problematic to assess what constitutes a good life for humans in general; in fact, I simply believe that there is no such thing, and this is very much dependent on the individual.

the individual animal when making the effort to assess her/his well-being. An aspect which, for a resilient individual, may pass as something unimportant or easy to deal with, for a more sensitive one can be a life-altering experience. The individual is of utmost importance, and so is the context.

There are so many questions to consider when pondering the well-being of someone else. And even more so when that someone is also from a different species. How can we truly measure the actual quality of life of a being from a different species? It is always important to remember that well-being is highly linked to subjective experiences. Thus, well-being may look different for different individual animals. It is relative, not absolute. It is truly important to make the effort to consider the animals' perspective. This is what Lori Gruen called "entangled empathy", and this "requires an awareness of the differences between empathizer and the other animal as well as an understanding of the animal's species-typical behaviours and individual personality" (in Abrell 2021, 79).

What matters for the animal? How is the disease making them feel? These are just a few of the many questions that need our answers when assessing the well-being of an animal in need of palliative care. And there are always multiple variables to consider in order to get to a complete image as much as possible. We need to keep questioning and keep monitoring throughout our treatment and interventions. The knowledge is never final, the context may change, the disease may progress, the animal's resilience (that is always contextual) may surprise us.

There are some very important things to manage to be sure that we first and foremost monitor the level of comfort, stress, anxiety and pain in the patients and second, that we address these and other basic needs properly. The patients' physical comfort has to be a priority (not the only one, of course). The animal needs to have the pain under

control with appropriate medication, (s)he needs to be clean and comfortable, well fed[11] and hydrated and as mobile as possible. But we always need to keep in mind the animals' emotional and mental health and comfort as well. And to do our best to monitor animals' overall happiness; we need to be sure that the good days are more than the bad days and the slow and progressive decline is not leading to unbearable suffering[12].

Imagining that we can truly know what is best for another individual is probably paternalistic. And so is to consider that we can know how (s)he feels. But being put in the position of carers, we need to embrace this role with all that it implies. In fact, what would be truly paternalistic in my view, and much worse, would be to imagine that a non-human life is less valuable, less important, less worth living than a human life.

Anticipating Disease Trajectories

For us, humans, not having certain knowledge and being unable to understand what to expect next can be very unsettling. If we add to this the common belief that we need to do whatever needs to be done to cure, we arrive at a point where we crave as precise and as certain a diagnosis as possible. And in many cases, not all of course, the progress made in veterinary medicine will be able to answer this desire.

But if we step back a little and put ourselves in our animals' paws, the picture might look completely different. We need to make an effort to understand the animals' perspective when making choices regarding them. For instance, we as humans are able to see and weigh

[11] As good as possible, of course.

[12] See scales for assessing pain and discomfort in veterinary patients like the Grimace Scale (Evangelista et al. 2019) or other guides to acute or chronic pain like ISFM guides https://icatcare.org/cat-advice/cat-carer-guides (accessed 24.06.2025)

the long-term benefits over immediate suffering. Animals live in the moment; they may "become" their pain. For them, the quality of life in the present is what matters, as they cannot understand our calculations and expectations, and they do not have the same ability to anticipate the future. This is why it is of utmost importance to keep their interest central in the decision-making. And this includes accepting not performing invasive diagnosis procedures and not needing to completely understand the underlying problem (for our need of certainty). Sometimes we just need to understand that choosing the animals' comfort over a potential cure might be the best way to go[13].

I wish to make clear that what I stated before does not equate to "giving up" on our animals. On the contrary, it's just letting go of our anthropocentric perspective to make room for theirs. And now, of course, it is not always the case of intricate and complicated diagnosis procedures and treatments. So, even if we feel their pain and anxiety, our animals will still need to go through the regular check-ups and diagnosis procedures at the vet. Even more so as they grow older, just like us. For this reason, we need to make all efforts to have the veterinary visits as stress-free as possible. Time and patience are of utmost importance, and also our animals' previous experiences at the vet's office. If we know that our animals' protective emotions (fear, stress, anxiety, etc.) make the experience of pain feel more intense,[14] we should make every effort possible to minimize these emotions[15]. We have to acknowledge that the vet visit begins at home, when we put the animal in the carrier and for this reason, it is we who need to understand and handle this whole process as well as possible, so that

[13] Of course, there is an intricate calculation and all factors should be considered.

[14] And, of course, also more pain raises the intensity of protective emotions thus entering in a loop that is very hard to escape.

[15] For more see Sarah E. Heath, the sink model (2023).

when we arrive at the veterinarian our animals are relaxed and not stressed. The pre-visit preparation is as important as the visit itself, determining the stress and the anxiety animals feel. A good veterinary visit will be conducted by staff handling the animal in a friendly and careful manner, giving cuddles and treats in the time of the medical procedures. Sedation procedures will be used in case of need.

It is very important to stress the crucial effect of correct diagnosis. For this, we need to facilitate access to medical care, specialized veterinary care and investigations for every animal. The fact that, until now, access to advanced medical care is scarce leaves us with very difficult decisions to make. And if it is acceptable and even advised that sometimes we do not continue investigations for the best interest of the animal, other times this process is cut short for other reasons, like inaccessibility or financial burden. And this is, for most of us, inacceptable/hard to accept. This is why it is so important to acknowledge the high level of moral distress involved in this process, both on the guardians' side and also on that of the veterinarian professionals.

With a correct diagnosis, we can begin the correct treatment, whether this treatment is meant to cure or just to increase the comfort and quality of life for the patient. If we correctly envision the paths that the disease will take, we can better mitigate the effects. We should always prepare in advance our medication and investigations. Knowing what to do in an emergency or life-threatening case may be life-saving. Understanding the disease and what, how, and how long (or short) the expected decline would be can also be very helpful for anticipatory grief.

But no good theory can truly solve for us the heavy burden of choosing the right path ahead. The more love and responsibility we have toward our animal companion, the harder the decisions will seem. How can we truly make a correct choice for somebody else's life?

Human–Animal Bond

When veterinary care professionals approach this delicate stage in animals' lives, the time when they need palliative or hospice care[16], they should never leave out of the question the problem of the human–animal bond. This may inform the diagnosis process, the way to approach the cure trajectory, and the palliative or hospice care we choose, as well as all end-of-life decisions.

When caring for patients in these stages of their life,[17] it is important to protect the human-animal bond. A family-centred approach is truly important for implementing a realistic, sensitive and effective care plan for every patient. We need to consider the whole picture and understand caregivers' needs, emotions, beliefs, finances, physical abilities, past experiences, and so on, because all these factors are important in the decision-making process and in the type of plan that might be implemented. People need to be listened to and their needs, goals, and challenges must be considered. The whole veterinary team has to be empathetic to the clients and their entire family situations without judgment. Sometimes the inability to meet the desired standards of care does not come from ill will or lack of love, but it's just a lack of skills, time, or finances. This is why it is very important to take all aspects into consideration and tailor specific care plans suited for each patient and their family. But we should never let the human part of this take over; always, the veterinary team must prioritize the patient and her/his interests. And this perspective should also be made very clear to the family.

[16] And also, as a general rule, co-produced care, where all those involved cooperate, is more effective.

[17] This is always important, of course, but in this stage is particularly hard to maintain: frequent veterinary visits, medication to administer, different procedures, etc., put a strain on the human-animal bond.

It is also very important to educate people so that they become able to care for their animals. Lack of knowledge or incomplete knowledge, or lack of skills should not impair the care process. The clients should be able to find the information they seek with the veterinary team[18]. The family should also be provided with quality-of-life and pain scales in order to be better able to monitor their animals' disease. Sometimes it may be truly useful to consider telemedicine appointments in situations when patients cannot be moved due to size, pain, or other conditions. It is very important to consider what is the best way to achieve the best outcome.

The administration of medication might be another issue that might affect both clients and the human-animal bond. Thus, it is advised that the clients are shown how to do this properly, and also the medication may be flavoured or administered in alternative, less stressful ways, whenever possible (transdermal, for instance). The clients should learn how to monitor their animals' progress and be able to easily contact the veterinary team when it's time to make adjustments to the treatment.

Considering the true significance and strength of the human-animal bond, it is possible that the clients get overwhelmed. In this case, it would be truly great if emotional support for caregivers were possible. Managing stress and other negative emotions is extremely important not only for the caregiver (to be able to carry on) but also for the animal. We now know that there is emotional contagion between caregivers and their animals[19]. Thus, caregiver stress, fear, worry and

[18] And in case this is not possible, they should be able to get referrals to where their questions might get answered.

[19] For more on how we influence our non-human friends and how stress is making them feel see Parr-Cortes et al. (2024), Bombail (2018), Vitale Shreve (2026) or Amat et al. (2015).

anxiety may have a more significant impact on how the animals perceive their own pain than previously thought. Stress is easily transmitted, and living in a stressful environment (with a stressed and overloaded caregiver) may negatively impact the health and well-being of the animal.

Co-produced and Cooperative Care

The importance of adopting a spectrum-of-care philosophy and including companion animals' guardians/caretakers and (when possible) companion animals themselves in the decision-making process during palliative care must be underlined. This can significantly improve the quality of life of the animals and strengthen the human-animal bond.

We have to admit that animals in need of long-term care and assistance are very much dependent on their human guardians. Even if sometimes for the veterinarians themselves it may seem that the animals' caretakers are not providing care to the desired standard, it is always important to acknowledge the human-animal bond, to work together with the guardians in order to achieve the desired results. For this reason, it is truly important to correctly inform the guardians and support them throughout the process. The veterinary team has a duty to empower caregivers to observe and understand their animals, to read their communication and body language in order to be able to assess pain and discomfort. The more empathetic and non-judgmental the veterinary team is, the more compliant the guardians are and the better the results for the animal patients. All is down to good communication, and we'll delve more into that in the last part of this article.

As the veterinary team (veterinarians, vet nurses, vet technicians, behaviour specialists, trainers, physiotherapists, etc.) and animal guardian collaboration is essential, we must also not overlook the fact

that animal patients in need of permanent care can be very demanding for a single guardian. For this reason, it may be advised to extend the unit of care so as to be able to offer support and assistance to the guardian as well. In this case, we may be sure that the guardian will be able to do her/his best to support the animal patient. Thus, it may be better to extend the care unit to include, besides the veterinary team and animal caregivers, also pet-sitters, groomers, and, when needed, even social workers, and/or mental health providers.

Also, treatment must be tailored to fit the individual patient and her/his particular situation and care unit. We must understand and acknowledge that there are often different pathways to take. And sometimes different pathways can lead to similar results, depending on the individual case. It is of utmost importance to always keep in mind that we are not treating a disease, we are treating a patient, and that patient is much more than the disease we are addressing. Contextualized care acknowledges that different treatment pathways are able to offer equally acceptable patient journeys in different contexts, all with the aim of a good outcome.

Caregivers should be assisted in building a supportive environment for their animals in order to boost their resilience in when dealing with the challenges of disease and pain. And we know that resilience, contrary to what may be commonly believed,[20] is not a trait of the individual but it's developed in context. Thus, social support, agency, good environment, safety and security, mental, emotional and physical well-being, predictability and control, all these and others are essential factors in building resilience[21]. Looking at the larger picture is

[20] For more on resilience, see Clark (2021 and 2023).

[21] And improving resilience will change the perception of pain; overall well-being will improve.

incredibly important when we have as our primary goal increasing the quality of life of the animal patients.

The main point is that we need a collaborative approach[22], we need co-produced care. The skills of the veterinary team are of the greatest importance. But these skills should also include, besides exquisite professional expertise, the ability to assess the caregiver situation and design a nursing plan considering all these details.

Ethical Dilemmas and Moral Distress

Palliative care and end-of-life care for companion animals present a unique set of ethical dilemmas that challenge veterinarians, caregivers, and society as a whole. As companion animals increasingly became integral members of families, decisions about their care, especially when facing terminal illness and/or chronic suffering, always evoke profound emotional, moral, but also practical considerations. Palliative care in veterinary medicine aims to improve the quality of life for animals facing serious, chronic, or terminal illnesses primarily by managing pain and other distressing and debilitating symptoms. End-of-life care involves decisions about when and how to alleviate suffering, often culminating in euthanasia to prevent prolonged distress. Unlike the cases in human medicine, where patients can explicitly express their wishes, animals are harder to understand. Almost always, the decision is made by proxy as they rely entirely on their caregivers and veterinarians to advocate for their well-being. But, as we know, the animals' point of view should always be considered, and the difficulty of understanding it and truly reading what the animals need or want complicates ethical decision-making.

[22] See Zero pain philosophy https://www.zeropainphilosophy.com/ (accessed 24.06.2025).

One of the central ethical dilemmas in palliative and end-of-life care for animals revolves around assessing and prioritizing quality of life. Unlike most humans, animals cannot verbally communicate their pain or preferences, so caregivers, behaviourists and veterinarians must interpret behavioural cues and clinical signs to understand their suffering. This subjective assessment can lead to differing opinions about whether an animal's life is worth prolonging. And when opinions differ, it is all the more difficult to assess whose point of view is better: the caretaker who knows the animal best or the veterinarian because of his professional knowledge? There are also cases when caregivers may prioritize extending life at all costs due to emotional attachment, while veterinarians may emphasize minimizing pain and distress. But finally, we sometimes may try to minimize the importance of emotional attachment and maybe even read it in a selfish note (like in the sentence above). But what if exactly this emotional attachment is allowing the caregivers to communicate better with their animals and read better what they want? Of course, generalizing in cases like this is the worst idea.

Many times, veterinarians and caregivers may struggle with balancing hope for recovery or stabilization against the reality of ongoing suffering. Ethical tension and moral distress arise when prolonging life may lead to diminished quality of life or when there are serious questions about the moral justification of continued treatment on the side of the veterinarian that the caregiver overlooks.

Euthanasia is a legally accepted practice and a pretty common one in veterinary medicine. It is generally understood as a compassionate means to end suffering. However, it presents profound ethical dilemmas. Deciding when euthanasia is appropriate involves predicting the animal's future quality of life and weighing the benefits and burdens of continued treatment. Also, veterinarians must navigate the very delicate balance between advocating for the animal's well-

being when also respecting the caregiver's wishes and emotional disponibility. Some guardians may request euthanasia prematurely due to emotional distress or financial constraints, while others may resist euthanasia despite clear signs of suffering due to emotional attachment. Ethical practice requires veterinarians to provide honest, empathetic guidance while avoiding judgment and coercion.

We also need to keep in mind that euthanasia raises questions about the sanctity of life and the moral permissibility of actively ending an animal's life. While most agree that preventing unnecessary suffering justifies euthanasia, cultural, religious, and personal beliefs can influence perspectives, complicate consensus and make certain guardians more resistant to this practice than others.

Alongside the veterinarian team, caregivers also face significant ethical responsibilities in managing palliative and end-of-life care. They must make informed decisions about treatment options, balancing hope, the animals' well-being and their (often limited) financial and other[23] resources. Emotional attachment can sometimes cloud judgment, leading to either overtreatment that prolongs suffering or premature euthanasia driven by personal distress. Caregivers will also experience guilt, grief, and uncertainty, and all these will turn the decision-making process profoundly challenging. Sometimes heavily relying on veterinarians for guidance, caregivers remind us of the importance of clear communication and compassionate support.

Veterinarians and the veterinary team occupy a central role in assessing the animal's condition, managing pain and other distressing symptoms, and advising caregivers on prognosis and treatment choices. Ethical practice demands balancing beneficence (acting in the animals' best interest), non-maleficence (avoiding harm), respect for

[23] Time, abilities, emotional capacity, etc.

caregiver and animal autonomy[24], and justice (fair allocation of resources)[25]. And we should never minimize the fact that the veterinarian team must also manage their own emotional responses and professional boundaries. Witnessing animal suffering and caregiver grief can lead to moral distress and compassion fatigue, which may impact decision-making and care quality. Ethical veterinary practice includes self-care and seeking peer support to maintain objectivity and empathy.

Ethical dilemmas extend beyond individual cases to societal issues such as resource allocation and access to care. Advanced palliative treatments can be costly, raising questions about equity and the prioritization of veterinary services[26]. Furthermore, cultural attitudes towards animals influence ethical norms and expectations. In some societies, companion animals are cherished family members, warranting extensive care, while in others, animals may be viewed primarily as property or working animals, affecting decisions about palliative and end-of-life care.

All decisions regarding palliative and end-of-life care are emotionally charged and morally nuanced, demanding empathy, clear communication, and a balanced approach that prioritizes the well-being of the animal while respecting the perspectives of the caregivers. As veterinary medicine advances and societal views on animals evolve,

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[24] This is harder to fulfil the more we emphasize animal agency and autonomy. The true question is where autonomy should be placed to maintain animal well-being. If in human medicine the situation is clear, in veterinary medicine it is more challenging. Most scholars have emphasised the recognition of decision-making by proxy (see Donaldson and Kymlicka 2011).

[25] For the deontological rules of practical veterinary ethics, see Yeates (2021) or Wathes et al. eds. (2013).

[26] Decisions about investing in expensive treatments for animals must be weighed against broader societal needs and the potential for animal suffering. For more on this, see Humanimal trust https://humanimaltrust.org.uk/ (accessed 24.06.2025).

ongoing ethical reflection and dialogue are essential to guide compassionate and just care for animals in general and also animals facing terminal, debilitating illnesses and the end of life.

End-of-Life Ethical Dilemmas

Euthanasia is a defining aspect of end-of-life care in veterinary medicine, often regarded as a compassionate option to relieve animals from unmanageable pain and suffering. However, the decision to euthanize an animal is charged with ethical complexities that involve the animal's well-being, the caregiver's emotions and values, and the veterinarian's professional responsibilities.

One of the most challenging ethical questions is deciding the right time for euthanasia. Unlike most human patients who can express their wishes or participate in advance care planning, animals face considerable difficulties when trying to communicate their preferences to humans. Veterinarians and caregivers must make considerable efforts to understand what animals want, interpret behavioural signs, read clinical indicators, and assess the quality of life. It may be very challenging at times to determine if the animals are enduring irreversible suffering and/or a significantly diminished quality of life. This assessment is inherently subjective. For example, some animals may show signs of pain or discomfort that are manageable with medication, while others may experience persistent distress despite treatment. Also, caregivers may have differing thresholds for what constitutes acceptable quality of life, influenced by emotional attachment, cultural beliefs, or personal values. The veterinarian team must navigate these differences sensitively, ensuring that decisions prioritize the animal's wellbeing while respecting the caregiver's perspective.

Euthanasia embodies a tension between compassion—ending suffering—and respect for autonomy – respecting the patients' wishes.

When the patient cannot communicate clearly her/his wishes, the situation becomes even more complicated, and most times in the case of animal patients, what is considered is the caregiver's right to make decisions for their companion. Veterinarians must always act as advocates for the animal's best interest but also must make efforts to honour the caregiver's wishes[27]. Conversely, some guardians may resist euthanasia despite clear signs of suffering, driven by hope, denial, or emotional difficulty in letting go. Veterinarians face the ethical challenge of providing honest, compassionate guidance without imposing their own values or abandoning the client. This requires excellent communication skills, empathy, and sometimes, difficult conversations about prognosis and quality of life.

The practice of euthanasia also raises broader ethical questions about the moral status of animals. While most agree that preventing unnecessary suffering justifies euthanasia, the act of intentionally ending an animal's life is morally significant. Different cultural, religious, and philosophical perspectives influence how euthanasia is viewed—ranging from acceptance as a humane necessity to opposition based on beliefs about the sanctity of life.

Veterinarians and caregivers may grapple with feelings of guilt or moral distress associated with euthanasia, even when it is the kindest option[28]. This emotional burden can complicate decision-

[27] This effort is harder but must be made even when they may conflict with professional judgment. For instance, a guardian may request euthanasia for an animal with a treatable condition due to financial constraints or personal circumstances, raising ethical questions about the justification of ending a life prematurely – and this might be one of those morally complicated cases that raise questions for veterinarians and create moral distress.

[28] Not to mention the cases when it is not and this decision is made on other considerations, like financial constraints or other issues not directly connected to the animal. But unfortunately, economic considerations are also frequently impacting euthanasia decisions. Veterinary care can be expensive, and some

making and requires acknowledgment and support within veterinary practice. Also, other social factors, such as the availability of support networks, cultural attitudes toward animals, and legal regulations, shape end-of-life attitudes and decisions. For example, some communities may stigmatize euthanasia, making caregivers more reluctant to consider it, while others may have strong norms supporting it as an act of kindness, empowering guardians in this difficult time.

Although the ultimate decision lies with the caregiver, veterinarians also carry a truly significant ethical responsibility in euthanasia decisions. They must assess the animal's condition, provide clear information about prognosis and treatment options, and support owners emotionally. It is ultimately very challenging deciding what is a life worth living and when living becomes truly painful and suffering is dominant, making life a torment; and even more so when this must be done for an individual of a different species. Choosing the right moment and keeping the balance between not ending a life too early and protecting an animal from extreme pain is incredibly hard[29]. It demands time, patience, empathy and knowledge of the other animal species' language and communication.

The veterinarian's personal beliefs and experiences can influence their approach, necessitating self-awareness and professional

caregivers may feel compelled to choose euthanasia due to financial limitations rather than purely medical or welfare reasons. This raises ethical concerns about equity and access to care, as well as the potential for "economic euthanasia"—ending an animal's life primarily because treatment is unaffordable.

[29] An important ethical consideration is the availability and use of palliative care as an alternative or complement to euthanasia. Effective symptom management and supportive care can improve quality of life, potentially delaying the need for euthanasia. However, palliative care requires resources, time, and commitment from caregivers, which may not always be feasible. But, considering this option for what it truly means, this may be helpful both for veterinarians and caregivers.

boundaries. Sometimes, it may be helpful both for the veterinary staff and the caregivers if euthanasia is viewed as a treatment option against extreme pain. It is also important to keep in mind that performing euthanasia can be emotionally taxing for veterinarians, contributing to compassion fatigue and moral distress. Ethical veterinary practice includes recognizing these challenges and seeking support to maintain well-being and provide compassionate care. This is just one of the reasons that self-care and peer support are of utmost importance in this profession.

Euthanasia and end-of-life care for animals involve complex ethical dilemmas that encompass the need for accurate assessments of suffering, respect for caregiver and animal autonomy, moral considerations about life and death, and also balancing practical factors such as finances, accessibility and social context. But the importance of having the balance right cannot ever be overstated. Ultimately, euthanasia (following exactly the literal meaning of the Greek term, a good death) is about improving the quality of death, about assisting the animal in having a peaceful and pain-free transition[30].

Navigating these challenges requires empathy, clear communication, and a commitment to the well-being of the animal that must always remain centre focus. Supporting both animals and their caregivers through this difficult process is one of the fundamental ethical responsibilities of veterinary medicine.

[30] It is important to consider hospice-assisted death or palliated death, in order to improve the quality of death. For more on alternatives to active euthanasia, see https://www.lapoflove.com/ (accessed 20.06.2025).

Communication and Caregiver Distress

Decisions about integrating palliative care or proceeding to euthanasia involve weighing the animal's comfort, prognosis, caregiver capacity, values, and available resources. Ethical practice encourages exploring all options transparently and collaboratively. Thus, for correctly managing a very difficult situation, it is truly important to have effective communication strategies available.

Caregiver burden must be considered and never minimized. Caring for a disabled and sick animal in the final stages of their life may be as demanding as taking care of a sick human. But it may also be more difficult to understand what an animal truly needs and wants when reading their body language and behaviour may get complicated by the challenge of living with an ill animal for a long time.

Empowering caregivers to recognize pain is of utmost importance. The veterinary team, together with the caregivers, must also develop an integrative pain care plan (individualized, having both traditional and complementary medicine, including even environmental modification and behavioural enrichment). The well-being of the animal patient must accompany every decision. The pain management of a patient needs a whole team working together for the better life of that animal. To have appropriate veterinary care, all contexts need to be taken into account.

And it is also crucial to underline the importance of discussing and seriously taking into consideration the problem of mental health in animals. Coping with difficult, challenging, painful and stressful conditions is affecting the other animals just as it's affecting us humans. Living with a debilitating disease should also be considered at this level. To be able to talk about well-being, we need to consider all aspects: physical state, cognitive or mental state, and emotional well-being.

Guardians with a high level of emotional attachment to their companion animals are more likely to believe that they should have the same treatment options as human patients. This is what makes both advanced veterinary care and an animal-guardian centric approach very important. But, from a societal perspective is also raising questions of equity and social justice. We need contextualized care, empathy, co-produced care, professional integrity, confident relationships and last, but not least, we need accessibility to care.

Learning to cooperate, to listen (to the veterinarian, to the caregiver, to the animal) is of utmost importance. Clinical communication skills are an essential asset for the veterinary team. Sometimes it may seem that veterinarians also need training in human behavioural change in order to convince their clients to do the right thing. This is truly important in developing a non-judgmental and empathetic attitude toward clients, even when they have diverging opinions. It is also very important to work in a multidisciplinary team, where collaboration and dialogue can bring out the best solutions.

It is also very important to understand and stress the idea that, even if the work on the curing side is no longer possible, it is both possible and advised to work on the changing side, the changing for the better of the quality of life and the quality of death. Sometimes, when a cure is no longer possible, both veterinarians and caregivers feel disappointed and powerless. This is why it is so important to understand that even when it is no longer possible to cure a patient, the way forward, living with the disease, is what makes the difference. We are all mortal beings after all, but the way we live and the way we die matter to us all as sentient beings.

We cannot close without some considerations on anticipatory grief[31]. This is the grief experienced before the anticipated loss, and it is most common when anticipating the death of a loved one due to illness. It involves emotions of grief, guilt, disappointment, anxiety, even before the actual loss occurs. This may be even exacerbated in the case of the terminal illness of a beloved animal due to the moral complexity involved in end-of-life decision-making. And also, due to the societal burden given by the lack of recognition and support. Unfortunately, our societies still don't recognize and respect the meaning of a broken human-animal bond. The emptiness and grief left by the passing of a beloved animal remain disenfranchised grief. Thus, this anticipatory grief can manifest in various ways, as numbness, disbelief, guilt, sadness, anger, anxiety, or stress, depending on the individual. Recognizing it for what it is may be a way to mitigate its effects.

A Few Closing Lines

This paper is an attempt to describe the mindset needed to embrace palliative care. First and foremost, we need to acknowledge and understand the fact that a diagnosis of a terminal illness does not equate to the end of the road. Life continues until the last breath and the way it continues is of utmost importance for the person, no matter the species, that is going through this experience. Thus, reclaiming control in a situation when we are apparently without any can sometimes bring some peace of mind. Well-being matters to all sentient beings. And when we can no longer work on the curing side, we can always work on the changing side: changing the quality of life and the

[31] For more see https://www.healthdirect.gov.au/understanding-anticipatory-grief (accessed 24.05.2025).

quality of death. Understanding euthanasia for what it truly is, a good death, may also ease the burden of very difficult decisions.

Navigating these very complicated decisions, balancing the quality and continuity of life and mitigating the painful and stressful effects of the disease is never easy. It is also bringing us face to face with our own finitude, vulnerability and suffering. But maybe, discovering that, we may start to build bridges. Different species indeed lead their lives differently, navigate health and illness differently, and suffer in different ways. But in the end of the day, we are all mortal beings trying to make the best of our earthly lives.

If we work with animals as our friends, partners, co-workers and co-researchers, we will transform not only the way we understand them but also the way we understand ourselves. And transforming the way we think about ourselves is of paramount importance today, when we start to get to know the harms of anthropocentrism. For a paradigm change, where "interspecies solidarity" (Coulter 2016) will truly matter, we need to acknowledge our true place in nature, and also acknowledge and respect the existence of all our friends, companions and comrades from different species.

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