Positive Wild Animal Welfare

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Abstract

With increasing attention given to wild animal welfare and ethics, it has become common to depict animals outside of captivity as existing in a state of predominantly suffering. This assumption is now taken on board by many and frames much of the current discussion; but needs a more critical assessment, both theoretically and empirically. In this paper, we challenge the primary lines of evidence employed in support of wild animal suffering, to provide an alternative picture in which wild animals may often have much more positive lives than is commonly assumed. Nevertheless, while it is useful to have an alternative model to challenge unexamined assumptions, our real emphasis in this paper is the need for the development of effective methods for applying animal welfare science in the wild, including new means of data collection, the ability to determine the extent and scope of welfare challenges and opportunities, and their effects on welfare.

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1 Introduction

The welfare of wild animals has been the subject of a recent surge of attention. Historically, although a few authors noted the occurrence of suffering in nature, particularly regarding predation, the prevailing view was that we should not intervene in the lives of wild animals, either because they were considered to fall outside our sphere of ethical concern, or because we could not expect such interventions to be successful (e.g. Regan 1983; Singer 1973). More recently, this view has been challenged, with authors arguing both that suffering is far more prevalent than the traditional view assumes and that we have duties to intervene where we can (e.g. Ng 1995; Horta 2015; Johannsen 2020b). There are thus two big questions that shape the current discussion on wild animal welfare: Firstly, what is the welfare status of wild animals? And secondly, how should or ought we intervene to assist them?

The latter question has been engaged by ethicists and scientists alike. Animal ethicists have worked to determine what our moral duties toward wild animals may be, though as we will show, this work has often rested on problematic and speculative assumptions (Johannsen 2020b; Keulartz 2016; Kianpour and Paez 2021; Palmer 2013; Soryl et al. 2021). Whereas the fact that some moral theory implied a duty to intervene on behalf of wild animals had previously been used as a *reductio ad absurdum* to suggest a flaw in the theory itself, others are now taking more seriously that this could instead be a legitimate conclusion (McMahan 2015). The distinction between animals in the wild and in captivity is slowly disappearing when it comes to moral concern. Yet, while many now accept the moral call to protect the interests and welfare of wild animals, some deny that it is feasible in practice, and thus not something that requires attention. This, of course, is an empirical claim and has scarcely received scientific support, instead largely resting on intuition. Scientific work will help determine which actions are actually feasible, requiring an understanding of ecosystem processes - a point we will return to in Section 6. However, this subject is not the focus of our paper. Instead, we engage with the first question, of what the welfare of animals outside of captivity is actually like. This is the scientific question of wild animal welfare.

We need to know how good (or bad) the lives of wild animals are, and what conditions are having the greatest impact, before we can start to consider if or how we should intervene. To put it succinctly: we first have to answer what their welfare 'is' before we can make judgements about what it

'ought to be'. In particular, we challenge the now-prevailing view that the lives of wild animals contain more suffering than pleasure; that the balance of wild animal welfare is net-negative (Horta 2010; Johannsen 2020b; Ng 1995; Tomasik 2015). This view is now taken on board by many and frames most of the current discussion; but we think it needs a more critical assessment, both theoretically and empirically. In this paper we will examine this claim and the evidence offered in support of it to show that an account of net-positive wild animal welfare is at least plausible given the evidence. However, as we will emphasise throughout, this is not a question that can be settled by pure armchair philosophy (or ethics), but rather one that requires more empirical data regarding the lives and experiences of wild animals. There is a need for measurement of the welfare of wild animals of different species and life stages, to draw accurate conclusions. Otherwise all we have are our own unreliable intuitions about the possible features of animal experiences. And empirically uninformed philosophy has in many cases proven to be deeply impoverished and misleading.

Here, we follow the recent appeal for greater scientific attention to wild animal welfare, such as in the call for the establishment of the disciplines of welfare biology (Ng 1995; Soryl et al. 2021), and conservation welfare (Beausoleil et al. 2018), though the latter is primarily an attempt to base conservation on a foundation of animal welfare ethics with the individual, rather than the population at the centre of our concern (**?**Learmonth 2020). Welfare biology, on the other hand, is more directly intended as a naturalist approach to animal welfare that seeks to use the methods of a range of biological sciences, such as animal welfare science, behavioural ecology, and evolutionary biology, to assess the previously overlooked subject of the welfare of wild animals and extend our focus from animals in captivity to all animals. Work on animals outside of captivity, however, has hitherto primarily focused on their ecology, behaviour, nutrition, conservation, with scant attention paid to what their lives are like from their own point of view, i.e. their subjective experience (Griffin 1976). Though there are many ways of understanding animal welfare (Veit and Browning 2021), here we follow the dominant tradition in the wild animal welfare literature in taking animal welfare to consist in the subjective experiences of animals, a position we have also used and defended elsewhere (Browning 2019, 2018; Browning and Veit 2020b). Animals outside of captivity are individuals, like all animals, and beyond simply being ecosystem actors, also have lives in which they seek out pleasure and try to avoid pain. It is important for the study of wild animals

to look to find the best methods for discovering what this balance between positive and negative feeling, or 'affects', may be for different species, and how we might help in removing sources of suffering and promoting sources of pleasure.

The current literature is certainly right to challenge traditional assumptions that wild animals have high welfare resulting from their 'flourishing' in their evolved, species-typical manner. The dominant public conception of wild animals still appears to be one of a more 'idyllic' state of nature (Faria and Paez 2015; Waldhorn 2019). It is common for people to take wild animals to have good lives, a viewpoint which forms the basis for a lot of the resistance to housing captive animals (Browning and Veit 2021, 2020a). But these views are often based in intuition, rather than actual empirical evidence. As many have pointed out, and we will see in this paper, there are many sources of suffering that wild animals face. Unfortunately, this has in many cases led to them going too far the other way, exaggerating the prevalence of suffering. While this may be important to encourage interest in the subject, and to counter the previously received view, it is also dangerous to work on misinformation if we want to make a real difference in animal lives.

This article is organized in a linear fashion to tackle head on the four primary lines of evidence that are used to illustrate the dominance of suffering in nature and support the claim that most animals may actually have lives with net-positive welfare, or what would be considered 'lives worth living'. Section 2, 'Bad Deaths', challenges the assumption that deaths in nature contain extreme amounts of suffering. Section 3, 'Bad Lives', challenges the assumption that the daily lives of wild animals necessarily have a low quality of life. Section 4, 'Reproductive Strategies' challenges the assumption that the dominant life-history strategy of r-selected species must necessarily involve a lot of suffering. Finally, Section 5, 'Economic Models', challenges the economic model by Ng (1995) that attempted to show that life in the wild necessarily involves more suffering than pleasure. After having discussed the evidence base for wild animal welfare, Section 6, 'The Intervention Question', will discuss the issue of whether animal welfare interventions in the wild are feasible, suggesting numerous ways in which wild animal welfare could be improved. Section 7, 'Conclusion and Further Directions' summarizes the key points of this paper, emphasising that more data is urgently needed to settle the matter and allow us to move forwards with planning effective strategies for assistance where required and suggesting further directions for the study of wild animal welfare; both for the purposes of ethics and our

understanding of the lives of other sentient animals.

2 Bad Deaths

The first line of evidence that is often used in support of the predominance of suffering in the wild is the extreme pain and suffering surrounding animal deaths. In particular, predation is frequently taken as the paradigm case of the worst suffering that the wild has to offer – animals that are chased down by predators before being torn apart and eaten, often while still alive, creating states of fear and of excruciating pain. McMahan (2015) presses the point, giving a vivid description of the "continuous massacre" and "unceasing mass suffering" caused by predators "stalking, chasing, capturing, killing, and devouring their prey" through "dismemberment, asphyxiation, disembowelment, poison, and so on" (McMahan 2015 p. 268). Such intuitions are widespread and evocative from wildlife documentaries, but that of course does not mean that this picture is necessarily true. In this section we argue that bad deaths will not count as much toward the overall balance of lifetime welfare as is often assumed, both because the duration is short and the intensity of suffering is significantly lower than it may first seem.

Firstly, the experience of suffering during death may not be as intense as one may think. Take predation – the prey experiences the pain of capture, killing and consumption. While anecdotes of animals suffering for days after an attack before their subsequent death are easily stored in our memory, most animals in the wild are killed quickly once they are caught, precisely because they might otherwise escape. They are often dispatched with a bite to the skull or nape of the neck and thus would experience minimal pain. Of course, we do not wish to deny that some animals, such as African wild dogs or hyaenas, will catch and consume their prey while still alive, ripping out entrails and chewing on limbs as the animal dies more slowly from the injuries (Dawkins 1980 p. 52). This certainly sounds horrific and is not what any of us would envision as a humane death, but it may not be representative for most deaths taking place in the wild. Furthermore, it is also highly possible that these animals experience little pain at the time of death, due to a shock response. This experience has been reported in humans who have been severely injured in accidents. While they can recognise the extent of their injuries, it often takes time for the pain to begin. For example, Livingstone described his experience of being caught by a lion as 'dreamy', only aware

of his injuries after his escape (Bostock 2003, p.85). This may explain the observed response in many animals captured and consumed by hyaenas: "it is rare that the victim puts up any significant active defence" (Kruuk 1972, cited in Dawkins 1980, p. 52). McMahan (2015) notes this, and that human reports vary widely – some will indeed report shock or unconsciousness that prevents pain, while others report extreme pain and terror. As he concludes, there is thus likely to be variation in the intensity of pain experience for prey. He adds that the evolutionary function of pain likely tips the scales toward pain experience in these cases, however we contend that the opposite is more likely.

The primary function of pain appears to be to motivate avoidance and recovery, triggering behaviours that may actually interfere with defensive and escape responses. Suffering itself may be the interference with our cognitive abilities (Dennett 2017). If this is the case then is only after the fact that pain would be functionally useful. More so, it would be fitness-reducing if the animal could not use its cognitive capacities to escape in a life-or-death situation. While it is certainly true that "evolution has no reason to prevent death from feeling unbearably awful" (Tomasik 2015, p. 136), if it is beneficial to allow animals to experience shock to facilitate escape, this may then also benefit dying animals. This is a form of 'shock-induced analgesia' that uses adrenaline and endorphins to temporarily block pain (Amit and Galina 1986). Some experimental evidence may support this; that activation of the fear system inhibits the pain response through production of endogenous analgesics. Rats exposed to predators (cats) show opioid-mediated analgesia, demonstrating reduced sensitivity to noxious stimuli, that is reversed with the opioid antagonist naltrexone (Lester and Fanselow 1985). This mechanism will then reduce the intensity of suffering for prey animals during death. We are not here trying to make a strong claim regarding the intensity of experience of animals during death – this is something that can only be established empirically. We are only trying to show that there are reasons to believe it may not be as severe as some would claim based on introspection and intuition alone.

Furthermore, there is also the possibility of counting the behavioural and gustatory pleasures experienced by predators during the hunt and kill as a small offset to the suffering of the prey. In some cases - such as quick predation of hatchling fish – it has been claimed that the net enjoyment for the predator could even outweigh the negative experience for the prey (Mikkelson 2018). But even when it is the case that the end-of-life states

involve intense suffering, we should still not rank them too highly. The duration of such experiences is short, relative to the totality of an animal's life experience and thus it is likely to be the case that the quality of the 'average' day overall is the biggest determinant of overall welfare (we will address the case of short-lived animals in Section 3). Unless the overall life quality is very close to zero and the death is extremely painful and drawn out, it is unlikely to outweigh overall. Take predation again: where deaths by predators are described as being slow, they are still in the scale of minutes rather than hours. McMahan (2015) describes them as "a quarter of an hour or more" (McMahan 2015, p. 279), which is undeniably an unpleasant length of time, but not one that is likely to outweigh a length of life. The claim that "even if animals enjoy net happiness during most of their lives, this may be outweighed by the painful intensity of their deaths" (Tomasik 2015, p. 139) must therefore appear to be somewhat overblown. Emphasising short bursts of extreme pain can bias us to think of a life as worse than it is overall, influencing us to consider them as representative for a whole life experience.

Other types of deaths will be more prolonged and thus possibly a cause of more suffering overall – a lower intensity, but a longer duration. Typically, the longer the duration of the death stage, the lower intensity we would expect it to be – it is rare to find an excruciating prolonged experience. Deaths of starvation or illness may occur over days or even weeks, during which the animals will feel highly unwell, but even these are still short in terms of most animal lifetimes. This may be truer for larger animals with long lives than for small ones with shorter lives (as there are more opportunities for counterweighing positive experiences). These points should at least take much of the initial force out of the intuitively plausible arguments that death is major influence on lifetime welfare in most cases. Nevertheless, as we will emphasize throughout this article, actual research establishing the duration and intensity of suffering during death is needed to answer this question properly. Let us thus now turn to the question of whether the total life experience of an animal is itself bad.

3 Bad Lives

Even if we remove considerations of the pain and suffering around death, there are still many sources of suffering during life that may lead us to think that these lives are not net-positive, or at least not to a degree that outweighs

a painful death. There are a wide range of negative experiences that animals face every day: fear, disease, pain, itches, thirst, and starvation, among many others. However, what is often not considered are the range of positive experiences also available to wild animals. Whereas researchers and the public alike are happy to attribute negative experiences and emotions to other animals, the consideration of positive experiences has been far rarer. This may partially be due to implicit evolutionary reasoning: whereas pain is intuitively intelligible as an evolutionary response to avoid harms and dangers, pleasure - such as exhibited by play-behaviour on many mammals - has long puzzled researchers to provide a functional explanation (though this is now changing, e.g. Burghardt 1985). Whereas animal welfare science was originally almost exclusive concerned with reductions of suffering, there is now also a focus on creating positive experiences for other animals (Yeates and Main 2008).

It is therefore not enough to merely establish that there are many sources of suffering – we must also show that they are of a sufficient frequency and intensity to outweigh the positive experiences, and this requires us to include description of both (a point also raised by Mikkelson 2018). We cannot here establish this one way or the other, without much more data regarding the daily conditions of wild animals and their impact on welfare experience. However, we give some reasons to consider that the balance may be more often positive than negative. Our strategy here is threefold – to show that some of the negative experiences may be less prevalent than claimed, to show that most will be offset by countervailing positive affects, and finally to suggest that there may be a positive baseline experience.

Many negative experiences may not be as frequent or intense as some of the literature in this area would imply. A good example of this is fear. Fear is taken to be a huge source of suffering for prey animals. While it is almost certainly true that animals being pursued by predators experience an extreme fear (motivating the flight response), this will typically only last for a minute or two (Bostock 2003). However, it has also been claimed that prey animals live in a constant state of fear, watching and waiting for the next predator attack. The behaviour of prey animals is strongly determined by the presence of predators, effects known as 'fear ecology' (Ogden 2016; Zanette and Clinchy 2019) and the 'landscape of fear' (Laundre et al. 2010). Prey animals will reduce breeding efforts and change foraging patterns and habitat use in environments with predators (Laundre et al. 2010; Ogden 2016); effects which will disappear when predators are excluded, indicating they must have

a proximate mediation (Ogden 2016). Animals will suffer behavioural, physiological and neurobiological costs that may decrease their welfare (Zanette and Clinchy 2019). Studies on the effects of prolonged predator exposure on laboratory rats and mice have demonstrated that this can result in strong stress and anxiety responses (both behavioural and physiological), that shows slow habituation (Belzung et al. 2001; Blanchard et al. 1998) (however, it is worth keeping in mind that these last are studies of captive animals with very little control over their escape options - Belzung et al. 2001 even emphasise that it is exposure to "unavoidable" predators they have tested - and thus we must be cautious about the ecological validity).

There is no doubt that predator presence has strong effects on prey, but what is currently missing is the links to affect. It is not clear that these behavioural and physiological responses are associated with negative subjective experience. Behavioural changes could also be the result of caution – a risk-benefit tradeoff calculation. While prey animals may suffer decreased welfare in the presence of predators, in terms of reduced opportunities, it does not necessarily follow that there is a constant feeling of fear. In fact, it seems unlikely that many animals live in a state of chronic stress; it is certainly not adaptive. Stress responses are bad for organisms – they interfere with other body processes, suppress the immune system and potentially even alter the epigenome of offspring – and these are reasons animals are likely to minimise them (Ginsburg and Jablonka 2019; Sapolsky 2004). We need measures of subjective fear experience in order to determine whether or not this is actually a constant welfare challenge. Although this is just one example, it serves to illustrate a more general point: we must be careful not to conflate the presence of stressors or harms with the experience of negative affects – evidence of a stress or disease response for instance is not sufficient to assume negative experience without additional evidence linking this to welfare, such as behaviour. While of course most stressors and harms will have some negatively experienced component, the degree and intensity of this cannot just be taken for granted.

Our second argument is that most non-lethal sources of negative experience will be balanced by counteracting positive experiences. This makes sense if we consider the functional role of affects. Most accounts of the evolution of valenced experience – the ability to experience positive and negative mental state – take affects to play a motivational and decision-making role in guiding animal behaviour (e.g. Cabanac 1992; Dawkins 1998; Spruijt et al. 2001). Negative affects will motivate animals to move away from particular

stimuli or seek methods of reducing the experience, while positive affects will reward animals for behaviours that are in their interests (Fraser and Duncan 1998). Frequently, these will be paired. For example, an animal deprived of food will feel hunger, a negative affect that motivates it to seek out something to eat, which is important for building and maintaining their body. However, there are also positive affects that reward the experience of eating – satiation (the feeling of fullness after a meal), gustatory pleasure (the enjoyable taste of preferred food) and even behavioural pleasures in seeking and processing the food, such as the satisfaction of hunting behaviours.

So while animals experience negative affects when things are going wrong, they will also have positive experiences when they correct for these, and these positives will cancel out at least some of the overall negative experience. Being cold feels bad, but curling up in a cosy den feels good. We need more information to determine the intensity and duration of all these positive and negative experiences to determine if, and by how much, one set may outweigh the other. It is true that evolution does not 'care' about welfare and there is no evolutionary reason for welfare to be maximised beyond motivating fitness-enhancing behaviour, such that there will be cases where the two come apart and fitness 'wins' (Soryl et al. 2021). However, we would expect that most often the two will work in tandem, else the potentially costly affects would not be preserved. A 'Benthamite' model of pleasure maximization may work reasonably well.

Finally, there are additional positive experiences that animals can have over their lifetime. Social bonds, affiliative behaviour, courtship, mating and rearing offspring are all potential sources of positive experience. Young animals play a lot - and sometimes older animals join in - behaviours which are typically taken to be indicative of positive welfare (Held and Špinka 2011). A recent study suggests that presence of endogenous opioids signals that birds find singing intrinsically pleasurable (Stevenson et al. 2020). So even beyond simply the satisfaction of bodily needs that weigh against the negative experiences of dissatisfaction, there are additional positives an animal can experience, that help shift the balance back in a positive direction.

In particular, we may consider that the 'baseline' experience of an animal is mildly positive. If we strip away all the particular physical demands, the experience of just existing could be a positive one – a "joy of living" (Ginsburg and Jablonka 2019, p. 189). This makes sense from an evolutionary standpoint – that an animal for whom existence is positively valenced is one more likely to value its own life and to seek its continuation (Humphrey

2011). It could even have formed the earliest types of experiencing, an "inner feeling of living which if experienced as positive, would drive behaviors that sustain it and lead to the evolution of what we call more specific 'wanting'" (Ginsburg and Jablonka 2019, p. 189). This is not to imply that a sophisticated cognitive representation is needed, but merely that a positive feeling is one which an individual may fight to maintain. This is also likely to be true of the basic acts of exploration and engagement with their environment – the 'SEEKING' system is one of the proposed core affects such that moving about and investigating new spaces and objects will be a source of pleasure (Panksepp 2005). Exploration provides the benefits of new knowledge and learning, and it thus makes sense for it to be motivated by associated positive affect (Ginsburg and Jablonka 2019). If this is true, then this gives us even more reason to think that the negatives don't have to outweigh the positives.

One counter to this type of reasoning is to deny that we can compare positive and negative experiences in this way – either within a single animal or across different individuals. For example, Belshaw (2016) argues that positive experiences cannot compensate for negative experiences within the lifetime of an animal. This is not a claim that suffering is so bad that no amount of pleasure can outweigh it, but that for an animal, the lack of psychological continuity or integration over time means that moments of intense suffering make life not worth living for that animal, regardless of past or future pleasures. In reply, Višak (2017) shows that, on any plausible reading of this claim, it is not true. Pleasurable experiences should be able to compensate suffering for animals, just as they can for us – the value is not only a feature of the way our lives cohere. Harnad 2016 argues that we cannot aggregate experiences across different individuals – that "my orgasms cannot be traded off against others' agony". This is a stronger claim, that we cannot aggregate welfare across individuals at all. Of course, this is a claim against the very premise of a utilitarian calculus that motivates much work in animal welfare science and (human) happiness studies alike, and the defence of an entire ethical framework is not one we can attempt here. Within the debate we are engaging with, it is taken to be the case that such comparisons are allowable; though there may be additional difficulties in practice when attempting to compare welfare across individuals or species (Browning 2020). As is often the case, difficulty of comparison and measurement does not imply impossibility.

Again, we are not making any strong claims about the distribution of pleasures and suffering for wild animals. The intensity and duration of dif-

ferent experiences is likely to vary widely across species and can only be determined by careful investigation into the lives of different animals. What is crucial is that we examine not only the sources of suffering, but also the sources of positive experience, and how they are weighted by the animals. We have provided here some reasons for optimism that in many cases, this balance will be positive.

4 Reproductive strategies

Even if one accepts all that we have presented above, they can still hold that suffering dominates in nature, and most animals will have net-negative lives. This is because the majority of animals born are of so-called 'r-selected' species. This is a life-history strategy in which animals that pursue it produce a very large number of offspring, with low parental investment, where most will die quickly but a few will make it through to the next generation. This is particularly common in smaller species, such as invertebrates, and fish, amphibians and reptiles. In contrast are K-selected species, like humans, that produce a small number of offspring with high parental investment in each, to ensure a high rate of survival. While these strategies are part of a larger spectrum, most animals can be described as tending toward one end or the other. These strategies ensure that most animals born will be more r-selected, as a single parent can produced hundreds or in some cases even millions of offspring, with the expectation that only a few will survive. While a large proportion of these may not even survive to birth/hatching, it still leaves a large number that will be born and will die shortly after. This means that most animals that ever exist will have short lives with a lot of suffering – dying quickly from predation, or starvation when competing for resources against their siblings and conspecifics. Their lives are taken to be almost entirely suffering, and thus the number of animals with net-negative lives will outweigh those surviving members who have positive lives (Horta 2010). In this section we will challenge this conclusion on two grounds. Firstly, we deny that this strategy does necessarily result in a large amount of suffering, and secondly, that it is sufficient to outweigh the positive welfare in the lives of other animals.

There are two reasons to doubt that this strategy creates overwhelming suffering. The first is that the lives of those that die early may not be entirely filled with suffering. In the short period of their lives, they may also

experience small pleasures of exploring, finding food etc., and not only dizzying fear, pain and hunger. Pleasure and suffering are not directly correlated with survival and reproduction, but with the different experiences associated with these (e.g. finding food, avoiding predation, avoiding disease and injury, finding social companions). It therefore does not follow that an individual who does not survive or reproduce will not have many experiences of pleasure – for instance, a young animal may have many instances of satiety, comfort, social bonding etc. Individuals at very early life-stages taken by predators are likely to die quickly, without prolonged suffering. For animals with very short lives, this may not hold, but then neither will they have lives with very many experiences so even if they are all suffering, they will not amount to much in the overall total.

The second is that it is highly likely that these animals have reduced sentience. That is, that their conscious experience is likely to be dim, and the high of their highs and low of their lows correspondingly reduced. It is unclear exactly at which stage of development sentience emerges, and this is likely to be different for different species – ranging from pre-hatching to several months after birth (Mellor 2019). It will be a function of establishment of connections between relevant brain regions, and is likely to correlate with a stage at which the young first leave their protected spaces and start moving about autonomously in the external environment and feeding independently, a time where they will require behavioural flexibility (European Food Safety Authority 2005; Mellor 2019). However, this does not mean that at this time sentience is fully developed with the full capacity of an adult member of their species, particularly regarding the operation of positive and negative valence systems. There are two issues here – whether the young possess sufficient neurological complexity to support full sentience, and whether there would be an adaptive benefit to them to do so.

R-selected species are typically very small and not well-developed, having only rudimentary sensory organs and neural systems. It is precisely because of this lifestyle of R-selected species, that many deny that insects feel pain (Godfrey-Smith 2020). Though there are currently no measures that allow us to determine the relative sentience of an organism, some proxies have been suggested, such as number of neurons, or complexity of neural connections. Particularly, the number of neurons within the regions suggested to be associated with conscious experience – the pallium in vertebrates, mushroom bodies in arthropods (which are possible homologues arising from a common ancestral structure (Tomer et al. 2010)) and vertical lobes in cephalopods –

could be representative of degree and level of sentient experience. For cognitive ability, the number of neurons has been found to be more relevant than other measures such as brain size or brain to body ratio (Herculano-Houzel 2009), and the same could be hypothesised for sentience. There is obviously a lot more work needed here to understand the processes that produce sentience and determine the relevant proxies, but on any of these metrics currently proposed, most juvenile/larval animal forms will end up being less sentient than the adults. This would mean that their suffering will be correspondingly lower than that of another animal undergoing the same experiences. Here is another important research area, as greater understanding of the neurophysiology of sentience will help to determine the sentience capacity and range of affects young may undergo.

We can also consider whether there is an adaptive advantage for these young to develop full sentience. A complex brain is costly, and is only worthwhile if it provides sufficient benefit. If it is the case that large numbers of offspring will die early, and in cases where this will be through no fault of their own (i.e. there is mostly an amount of randomness as to which animals will perish and which will survive, rather than being a result of the decisions made and actions taken by the animals themselves) then there is no advantage for animals to develop the capacity to suffer at this stage. If we take seriously the idea that negative experiences serve to motivate learning and changes in behaviour to enhance survival, they would not be adaptive in this context. We already discussed the likely functional role of affect in motivating behaviour. In cases where an animal is in essence subject to random selection in terms of being taken by a predator or finding a food source before another, there is no selective benefit in having a valence system in place. Thus, we could expect these animals to not experience strong feelings and scale their suffering accordingly.

This is highly likely to differ between species. For example, Soryl et al. (2021) argue that most of these young are precocial and independent, and thus are likely to require the adaptive benefit of affect-driven motivation. Many negative affects are 'survival critical' affects, such as breathlessness, thirst, hunger, pain and sickness (Mellor 2019) and thus we would expect these to emerge quite early for individuals requiring them to motivate the relevant corrective behaviours in complex environments. Individuals surviving mostly on reflex behaviours are less likely to require them. We need then to establish facts about the life histories and behavioural strategies, to determine which species fall into which category.

We have given reasons to think that both the intensity and duration of suffering is low for r-selected species, and this may therefore mean that their suffering will not dominate calculations of wild animal welfare. But even if we grant that these animals do suffer a lot, this does not necessarily support the conclusion that suffering dominates. The argument given is that pure numbers cause the suffering to swamp the pleasure, even if we took the assumption that those who survive do go on to have good lives (which, as addressed in the previous sections, is not often granted). However, the problem with this argument is that it seems to conflate number of lives with amount of suffering. It is not the case that 'the majority of wild animals experience net suffering' is equivalent to 'suffering prevails in the wild'. Even if one were to grant that there were this overwhelmingly large number of individuals with negative lives, it does not have to entail that there is overall more suffering than pleasure, and this is because the length of lives differ so significantly.

Take the example used by Oscar Horta (2010), an Atlantic cod. These cod can produce up to two million eggs, but if the population remains stable then on average only two will survive to adulthood. He further stipulates a 10% chance of the eggs surviving to hatch, a 10% sentience of the offspring (he states it as a 10% chance of sentience, but we may also see it as having 10% of the sentience of the adult) and a life that nets 10 seconds of suffering before death (with perhaps the rest of life being neutral). This will still create 200,000 seconds of suffering, which is the equivalent of around 2.3 days. Thus we would need to offset 2 days of intense suffering to avoid a net-negative outcome. The two surviving individuals will have on average a lifespan of 16 years, or 5840 days. If these individuals live a life that is only just barely positive (say overall 0.1 out of 100), then even if we take the suffering to be extreme (100/100) then we still end up with the pleasure outweighing the suffering by over 8x, simply by virtue of length of life. Of course there may be cases where these numbers can be set such that the suffering will outweigh the pleasure, but it is at least not immediately obvious and many cases are instead likely to turn out the way we describe.

Many r-selected species will thus have sufficient positive welfare in their surviving members to outweigh the suffering of those that die. Additionally, the K-selected species will not be subject to this effect and so most individuals will not have lives dominated by suffering (dependent on how we take the considerations from the previous section). We need to make more direct comparisons based on the number of episodes of pleasure or suffering that the

different individuals have, and whether the much longer lives of the surviving individuals (and the K-selected species) will outweigh the shorter lives of the unsuccessful r-selected individuals. In this section we have provided reasons to think that they often will, and thus that pleasure rather than suffering will dominate in nature.

5 Economic Models

Finally, we have economic models of wild animal welfare that purport to demonstrate that suffering must dominate in nature. The original and perhaps most cited paper on this topic came from the Malaysian-Australian economist Yew-Kwang Ng. In a paper in 1995, Ng argued that we are in need of a welfare biology, which he defined as the "study of living things and their environment with respect to their welfare (defined as net happiness, or enjoyment minus suffering)" (p. 255). As opposed to traditional welfare science, this was a science focussed more on wild animals, and the effects of evolutionary and ecological factors on welfare experience; a proposal recently expanded by Soryl et al. (2021). Like us, Ng advocated a Benthamite subjective experience view of pleasure and pain, and he maintained that we could make progress on this difficult problem by combining the insights from economics, evolution, and animal welfare science. We agree with the theoretical underpinnings of such a research program - as stated by Marian Dawkins: "animal welfare studies generally lacked the evolutionary framework that characterizes so much else in biology" (Dawkins 1998 p. 305).

Unfortunately, his article contained no serious engagement with animal welfare science, making it thus unsurprising that there has been very little development by biologists with the proposed field of 'welfare biology', despite lots of attention by philosophers, animal advocates, and ethicists who saw it as an alternative to the perceived 'behaviourist' and 'objective' approach in animal welfare science. He proposes an "economics of evolution" that he takes to mean that animals that do not survive through to mating will most likely have negative welfare. In large part this is due to the excess production of offspring in so many species, as described in the previous section. He takes these individuals to have net-negative lives, not due to any specific evidence but simply because "it is difficult to imagine a positive welfare for such a life" (Ng 1995 p. 271). As we have already discussed, even if this is true for the individuals, this does not necessarily mean that their negative experiences

outweigh overall the positive experiences of their surviving relatives. Yet, many animal ethicists cited it as scientific 'proof' that animals in the wild will suffer and that we would require radical interventions. After all, Ng himself claimed that "if we can reduce the number of such miserable individuals, other things being equal; we can increase the level of over-all welfare" (p. 271). But as our previous sections demonstrated, such intuitions may well not be well-motivated.

Importantly, Ng's model relies on the 'Buddhist premise', that proposes that under a set of assumptions about the costs of enjoyment and suffering, there will be an excess of suffering over enjoyment. This he takes to imply that the pleasures associated with successful action will be less than the suffering associated with unsuccessful action. This premise was revised in a later paper (Groff and Ng 2019), showing the original model to contain mathematical errors undermining his Buddhist premise. The authors admitted that the balance between positive and negative experiences may instead go either way, depending on the living conditions of the animal. The original "model that, when fixed, negates the original conclusion. Instead, the model offers only ambiguity as to whether suffering or enjoyment predominates in nature" (Groff and Ng 2019, p. 39). In particular, we need to better understand the production function of pleasure and suffering. The original premise contained an assumption of a concave function, or diminishing marginal return - that every additional unit of pleasure (or suffering) will become increasingly costly as welfare increases (or decreases). Though this effect may be plausible, according with observations of habituation and diminishing marginal utility (Groff and Ng 2019), the revised premise requires the square of this function be concave, which is much harder to establish. As they point out, there is the possibility that as the number of doomed offspring increases, the suffering of each decreases, as the costs of producing suffering would be unlikely to benefit the organisms in these circumstances; a point we discussed in the previous section. Without further understanding of the costs and benefits of affective experiences within the contexts of each different organism, it is not possible to theoretically hypothesise which is likely to dominate. This is hardly a surprising claim. If affects evolved to deal with particular lifestyles in ecological niches, this diversity is just what would be expected. But the harm had been done and the original model cited hundreds of time in support of the more radical view of predominant suffering. Their revision calls for more empirical research to fill out this gap and learn more about the welfare of wild animals, a conclusion we likewise

endorse here. Economic models simply cannot prove a priori that animal suffering must outweigh pleasure in the wild. Like claims about bad deaths, bad lives, or reproductive strategies, we cannot determine in advance what the relative levels of suffering and enjoyment will be, without further empirical detail. And as we have shown, in many cases we may actually expect a net-positive.

6 The Intervention Question

One might nevertheless wonder why any of the above points matter at all. If we all agree that there is a lot of suffering in the wild, is it really all that important which way the overall balance sits? To some degree, this is true. There is widespread animal suffering, and if we can establish which processes are causing the most harm, and how to safely offset them, then we should be focussing on this. However, there are also some upshots from the claim of wild animal lives being, on average, net-negative. In particular, it will change how we calculate the costs and benefits of actions that result in the loss of many wild animals lives, i.e. when we engage in population ethics for non-human animals. For example, if nature is dominated by suffering, we may think that we should take drastic actions such as reduce the numbers of wild animals (Belshaw 2016) and even reconsider usually morally criticized actions such as land clearing to be instead a welfare-enhancing action (Tomasik 2017). If suffering is what we want to eliminate in a world where suffering outweighs different kinds of pleasures, our policy may be to prevent the birth of wild animals, rather than improve their lives.

Indeed, we might even think that conservation efforts are detrimental to animal welfare, insofar as they increase the number of suffering animals. The idea that the net-negative welfare of wild animals could entail that their removal would be an improvement has been called the 'logic of the logger' (John and Sebo forthcoming). As well as changing the expected value of actions like these, it will also influence how strong a priority we place on wild animal welfare in comparison to other areas of animal welfare concern – such as whether this is a more urgent matter than factory farming. This is not to say that an acceptance of net-negative wild animal welfare must necessarily lead to these conclusions – we may think, for example, that destruction of habitat would be undesirable because of environmental values or that our negative duties not to harm outweigh our positive duties to inter-

vene (Johannsen 2020a). It is not unreasonable to think that such policies would make our actual treatment of animals worse, for instance, by having negative effects on human attitudes toward animals (John and Sebo forthcoming) or if we disrupt habitats such that the species balances change, favouring r-selected over K-selected species (Johannsen 2020a). As noted by Višak (2017), recognition of suffering can be addressed either by reducing the sources of suffering or the bearers of suffering. Where we think that animals have lives of net suffering, we may be drawn toward the latter option, particularly if we think it would be difficult to address the former. We might then think the best options are to kill suffering animals (as we would in the cases of humane euthanasia), and/or to prevent them coming into existence in the first place. We have shown that there are reasons to doubt that wild animal lives are predominately suffering, and thus the latter would not be an ideal strategy. However, even if they were, it is still better where possible to prevent suffering than to remove its bearers – if we succeed in the former we would have created more value, rather than simply removing disvalue.

In cases other than these, the question of 'net' suffering may be somewhat of a red herring. Regardless of what we think about the net balance of welfare for any animal species, it will undoubtedly be true that there are many sources of suffering and their welfare could potentially be increased. We need to understand welfare, how affect operates in natural settings, and the range of experiences different individuals undergo in their lifetimes. If we identify those processes creating the highest amount of suffering, we can determine where we may be able to intervene to improve wild animal lives. The wild animal ethicists are also right to point out that we need to bring wild animals into our deliberations, even if we end up deciding not to intervene. Whether or not it dominates, there is a large amount of suffering in nature, and this is not something we should just ignore.

This leaves the issue of feasibility, perhaps the greatest challenge to wild animal welfare. Even if we identify sources of suffering, and decide that this should be of moral concern to us, we may simply lack the ability to intervene in a controlled or predictable way due to complex interactions and unintended effects. We may be unable to even predict whether our actions will lead to a net increase or decrease in wild animal welfare (Delon and Purves 2018). Indeed, our history of ecological interventions has been for the most part a worrying one. Ecological systems are highly complex and interconnected, and small changes in one area can lead to large unintended effects elsewhere. This is a reason for caution, though not for inaction, and definitely not a

reason to dismiss ethical concern. Instead, it can be seen as another reason to further ecological research, alongside conservation biology. The more we understand about our ecosystems, the better our chances of making welfare improvements. In the end, again, it comes back to a need for better understanding of wild animals. We could adopt something like 'fallibility-constrained interventionism' (Johannsen 2017) or the 'interventionist thesis' (Torres 2015); advocating that we should aim to intervene but only where we have sufficient understanding of the relevant ecosystems and will not create more suffering. Only if we think the problem is entirely intractable – that there is no way we could obtain enough information to reliably predict the outcomes of our interventions (or at least with a permissible degree of uncertainty) – would we think we should never intervene (Delon and Purves 2018). We may be particularly unable to predict the range of indirect effects. This will be more likely for large scale than for small scale interventions, but we think this level of pessimism is unwarranted.

There are a range of potential proposed interventions for wild animal welfare. Some we do already, such as vaccinations against disease outbreaks, rescuing animals from natural disasters, rearing orphans and supplementing food during times of shortage (Faria and Paez 2015; Horta 2017). Other proposals may appear more extreme, such as gene editing to reduce the breeding rate of r-selected species (Johannsen 2017), altering or removing predators to prevent predation (Bramble 2020; McMahan 2015; Pearce 2015b), eliminating parasite species (Johannsen 2020b), genetically modifying animals to adapt to the consequences of climate change (Palmer 2016), high-tech 'stewardship' of entire species (Pearce 2015b), through to a wholescale modification or redesign of natural systems – what has been termed 'paradise engineering' (Kianpour and Paez 2021) or utilising genetic engineering and nanotechnology as pathways to alter the neurological processes of all sentient life with the aim of abolishing all suffering, and enhancing positive experiences (Pearce 2015a). The feasibility and desirability will depend on the specific context, and understanding of the processes involved - restoration of habitat or reducing pesticide use probably far more feasible than preventing predation. Measures such as promoting concern for wild animals and changing the default assumptions regarding our lack of duties toward them, are some other methods that can encourage change without necessarily causing great harm (Horta 2017; Tomasik 2015).

7 Conclusion

In this paper, we have shown that the assumptions underlying the claim that suffering dominates in nature are not always justified, and thus that it at least as plausible that pleasure dominates. However, as we have emphasised, this is a matter that requires empirical data to determine the extent of wild animal suffering. Like Soryl et al. we consider it an "open question whether the life of a wild animal is worth living" (2021, p. 11); though we are more optimistic about the answer than they appear to be. There is no doubt that wild animals suffer a lot. However, what we really want to know is how much, and what are the primary influences.

There are biological reasons weighing both for and against a model of predominant suffering in nature, and without further data, we end up merely trading intuitions. While no-one denies that there are many sources of suffering for wild animals, there are also many sources of pleasure, and we cannot from the outside try to weigh these against one another. There are many reasons why our intuitions may be faulty – we may fail to empathise with the exact experiences of wild animals or we may only think about small sub-sets of existing animals (with a bias toward the more visible larger vertebrate animals) (Horta 2010; Tomasik 2015).

Which types of experience an animal has, their intensities, their durations, will all be important sources of information to consider, and ones for which we currently lack most of the important data. Most importantly, we need to know how the animal itself weights the different experiences – which negative experiences are worst, and to what degree different positive experiences may balance them out. There are a number of methods that we may use to assess the welfare of wild animals (e.g. Harvey et al. 2020), and in a future paper we will take a closer look at some specific methods that may be suitable for these ends. Which methods will work best will depend on the context of measurement, and the types of answers we are looking for. However, what is important is to establish how the different experiences of an animal's life interact and trade off to form a total welfare experience, and whether this will be overall positive or negative. Importantly, more data is urgently needed to settle the matter and allow us to move forwards with planning effective strategies for assistance where required. We should not assume too much before we know more. It is thus important that animal welfare science expand its scope to include all sentient animals - whether in captivity or in the wild.

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