

The Importance of Wild-Animal Suffering

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ABSTRACT

Wild animals are vastly more numerous than animals on factory farms, in laboratories, or kept as pets. Most of these animals endure intense suffering during their lives, such as from disease, hunger, cold, injury, and chronic fear of predators. Many wild animals give birth to tens or hundreds of offspring at a time, most of which die young, often in painful ways. This suggests that suffering plausibly dominates happiness in nature. Humans are not helpless to reduce wild-animal suffering. Indeed, humans already influence ecosystems in substantial ways, so the question is often not whether to intervene but how to intervene. Because ecology is so complex, we should study carefully how to reduce wild-animal suffering, giving due consideration to unintended long-run consequences. We should also promote concern for wild animals and challenge environmentalist assumptions among activists, academics, and other sympathetic groups. Finally, we should ensure that our descendants think twice before spreading ecosystems to areas where they do not yet exist.

Keywords: wild animal suffering, natural harms, population dynamics, predation, death, intervention in nature, sentience, ecology, terraforming, unforeseen consequences.

In sober truth, nearly all the things which men are hanged or imprisoned for doing to one another, are nature's every day performances. [...] The phrases which ascribe perfection to the course of nature can only be considered as the exaggerations of poetic or devotional feeling, not intended to stand the test of a sober examination. No one, either religious or irreligious, believes that the hurtful agencies of nature, considered as a whole, promote good purposes, in any other way than by inciting human rational creatures to rise up and struggle against them.

John Stuart Mill (Mill [1874] 2005, 28-32)

1. INTRODUCTION

Animal activists typically focus their efforts on areas where humans directly interact with members of other species, such as on “factory farms”, in laboratory experiments, in circuses, and so on.

Less often discussed is the topic of animal suffering in the wild, even in the academic literature, though there have been notable exceptions (for instance Sapontzis 1984; Naess 1991; Ng 1995; Kirkwood and Sainsbury 1996; Cowen 2003; Fink 2005; Clarke and Ng 2006; Nussbaum 2006; McMahan 2010; Sözmen 2013). However, the numbers of wild animals on which humans have an impact is simply too large for animal advocates to ignore. Intense suffering is a regular feature of life in the wild that demands, perhaps not quick-fix intervention, but at least long-term research into the welfare of wild animals and technologies that might one day allow humans to improve it.

The argument developed in this paper will unfold as follows. Section 2 describes some of the ways in which animals suffer in nature. Section 3 explains that the majority of animals are small ones whose lives are very short and who reproduce by having huge numbers of offspring. Section 4 argues that due to this most animals probably have lives containing more suffering than happiness. Section 5 addresses the question of the extent to which young animals are sentient, and presents evidence that many of them are already conscious when they emerge from their eggs. Section 6 examines the question of whether we may intuitively misjudge the degree to which animals suffer in nature. Section 7 presents arguments against the view that the lives of wild animals must be on balance positive because otherwise animals in nature would kill themselves. Section 8 examines and rejects the view that humans cannot be successful in reducing the harms animals suffer in nature, and section 9 points out that humans already are intervening in nature, so our aim should be to do so in ways that are beneficial, instead of harmful, for other animals. Section 10 explains that in light of all this, wild-animal suffering is a serious issue, but given the complexities of the problem, we need more research on how to reduce wild-animal suffering. Section 11 argues that future technology will make successful intervention in nature easier, even though there are reasons why faster technological progress may not be desirable in general. Section 12 points out that we should focus on avoiding the spread of natural suffering to other places where it does not yet exist. Finally, section 13 concludes by arguing that animal advocates should focus their efforts to promote concern about wild-animal suffering among activists, academics, and others who would be sympathetic – both to encourage development of the research field and to

ensure that our descendants use their advanced technologies in ways that alleviate wild-animal suffering rather than inadvertently multiply it.

2. HOW WILD ANIMALS SUFFER

The scale of animal suffering at human hands is vast, and animal advocates are right to be appalled by its magnitude. However, the numbers of animals that live in the wild are staggeringly larger (Tomasik [2009] 2014). And, like their domestic counterparts, animals in the wild have rich emotional lives (Bekoff 2000; Balcombe 2006). Unfortunately, many of these emotions are intensely painful. And while “Nature, red in tooth and claw” is widely known as a platitude, its visceral meaning can often be overlooked. Below are some details of different ways in which wild-animal suffering occurs.

2.1. *Predation*

When people imagine suffering in nature, perhaps the first image that comes to mind is that of a lioness hunting her prey. Christopher McGowan (1997, 12-3), for instance, vividly describes the death of a zebra:

The lioness sinks her scimitar talons into the zebra’s rump. They rip through the tough hide and anchor deep into the muscle. The startled animal lets out a loud bellow as its body hits the ground. An instant later the lioness releases her claws from its buttocks and sinks her teeth into the zebra’s throat, choking off the sound of terror. Her canine teeth are long and sharp, but an animal as large as a zebra has a massive neck, with a thick layer of muscle beneath the skin, so although the teeth puncture the hide they are too short to reach any major blood vessels. She must therefore kill the zebra by asphyxiation, clamping her powerful jaws around its trachea (windpipe), cutting off the air to its lungs. It is a slow death. If this had been a small animal, say a Thomson’s gazelle (*Gazella thomsoni*) the size of a large dog, she would have bitten it through the nape of the neck; her canine teeth would then have probably crushed the vertebrae or the base of the skull, causing instant death. As it is, the zebra’s death throes will last five or six minutes.

Some predators kill rather quickly, such as constrictor snakes that cut off their victims’ air flow and induce unconsciousness within a minute or two, while others impose a more protracted death, such as hyenas that tear off chunks of ungulate flesh one bite at a time (Kruuk 1972). Wild dogs disembowel their prey, venomous snakes cause internal bleeding and paralysis over the course of several minutes, and crocodiles drown large animals in their jaws (McGowan 1997, 22, 43 and 49).

One snake owner's guide explains that when rodents are fed to snakes they spend some time biting, kicking, scratching, and doing anything they can to survive (Flank 1997). Snake prey may not die immediately after being swallowed, as is illustrated by the fact that some poisonous newts, after ingestion by a snake, excrete toxins to kill their captor so that they can crawl back out of its mouth (McGowan 1997, 59).

Prey suffer even in the claws of animals that are often considered cute and innocent. For instance, domesticated cats kill in painful ways hundreds of millions to billions of rabbits, mice, and birds (Woods et al. 2003; Loss 2013).

Fear of predators produces not only immediate distress, but it may also cause long-term psychological trauma. In one study of anxiolytics, researchers exposed mice to a cat for five minutes and observed subsequent reactions. They found "that this animal model of exposure of mice to unavoidable predatory stimuli produces early cognitive changes analogous to those seen in patients with acute stress disorder (ASD)" (El Hage et al. 2004, 123). A follow-up study found long-term impacts on the mice's brains: "[...] predatory exposure induced significant learning disabilities in the radial maze (16 to 22 days poststressor) and in the spatial configuration of objects recognition test (26 to 28 days poststressor). These findings indicate that memory impairments may persist for extended periods beyond a predatory stress" (El Hage et al. 2006, 45). Similarly, Phillip R. Zoladz (2008) exposed rats to unavoidable predators and other anxiety-causing conditions. The result was alterations in bodily and behavioral variables resembling human cases of post-traumatic stress disorder (PTSD).

Even for those prey that have not had a traumatic run-in with a predator, the "landscape of fear" (Laundré et al. 2001) that predators create can be distressing. When wolves enter an ecosystem, elk become increasingly vigilant against attack (Wirsing and Ripple 2010).

One can advance some argument that evolution should avoid making animal lives excessively horrifying for extended periods prior to death because doing so might, at least in more complex species, induce PTSD, depression, or other debilitating side-effects. Of course, we see empirically that evolution *does* induce such disorders when traumatic incidents happen, like exposure to a predator. But there is probably some kind of reasonable bound on how bad these can be most of the time if animals are to remain functional. Death itself is a different matter because, once it reaches the point of inevitability, evolutionary pressures do not constrain the emotional experience. Death can be as good as painless (for a few lucky animals) or as bad as torture (for many others). Evolution has no reason to prevent death from feeling unbearably awful (Dawkins 1995).

2.2. *Death by other means*

Of course, predation is not the only way in which organisms die painfully. Animals are also stricken by diseases and parasites, which may induce listlessness, shivering, ulcers, pneumonia, starvation, violent behavior, or other gruesome symptoms over the course of days or weeks leading up to death. Avian salmonellosis is just one example. Animals infected by this disease may develop depression over 1 to 3 days, along with

fluffed-up feathers, unsteadiness, shivering, loss of appetite, markedly increased or absence of thirst, rapid loss of weight, accelerated respiration and watery yellow, green or blood-tinged droppings. The vent feathers become matted with excreta, the eyes begin to close and, immediately before death, some birds show apparent blindness, incoordination, staggering, tremors, convulsions or other nervous signs. (Michigan Department of Natural Resources 2015)

Still other animals die of accidents, dehydration during a summer drought, or lack of food during the winter. Even weather events can be fatal for many animals. For example, if birds can't find shelter during an ice storm, their feet may become frozen to the branch on which they're perching. Some birds become buried in snow and suffocate (Heidorn [1998] 2001).

2.3. *A hard life*

While death may often constitute the peak of suffering during an animal's life, day-to-day existence is not necessarily pleasant either. Unlike most humans in the industrialized world, wild animals do not have immediate access to food whenever they become hungry. They must constantly seek out water and shelter while remaining on the lookout for predators. Unlike us, most animals cannot go inside when it rains or turn on the heat when winter temperatures drop far below their usual levels. UCLA (2015) explains:

It is often assumed that wild animals live in a kind of natural paradise and that it is only the appearance and intervention of human agencies that bring about suffering. This essentially Rousseauian view is at odds with the wealth of information derived from field studies of animal populations. Scarcity of food and water, predation, disease and intraspecific aggression are some of the factors that are normal parts of a wild environment which cause suffering in wild animals on a regular basis. While many animals appear to endure such conditions rather calmly, this doesn't necessarily mean they aren't suffering [Bourne et al. 2005]. Sick and injured members of a prey species are the easiest to catch, so predators deliberately target these individuals. As a

consequence, those prey that appear sick or injured will be the ones killed most often. Thus, evolutionary pressure pushes prey species to avoid drawing attention to their suffering. (Nuffield 2005, chap. 4.12, 66)

In line with this, based on studies of stress-hormone levels in domestic and wild animals, Christie Wilcox (2011) concluded the following:

[T]he real question becomes whether a domesticated or captive animal is more, less, or as happy in the moment as its wild counterpart. There are a few key conditions that are classically thought to lead to a “happy” animal by reducing undue stress. These are the basis for most animal cruelty regulations, including those in the US and UK. They include that animals have the “rights” to:

- Enough food and water
- Comfortable conditions (temperature, etc.)
- Expression of normal behavior

When it comes to wild animals, though, only the last is guaranteed. They have to struggle to survive on a daily basis, from finding food and water to another individual to mate with. They do not have the right to comfort, stability, or good health. [...] By the standards our governments have set, the life of a wild animal is cruelty.

In conclusion, even if we set aside the pain of their deaths, the lives of wild animals contain many other sources of suffering.

3. SHORT LIFESPANS

In nature, the most populous animals are probably the ones that are generally worst off. Small mammals and birds have adult lifespans of at most one or three years before they face a painful death. And many insects count their time on Earth in weeks rather than years – for instance, just 2-4 weeks for the horn fly (Cumming [1998] 2006). There are reasons to think that it would be better not to exist than to find oneself born as an insect, struggle to navigate the world for a few weeks, and then die of dehydration or be caught in a spider’s web. Worse still might be being entangled in an Amazonian-ant “torture rack” trap for 12 hours (BBC 2005) or being eaten alive over the course of weeks by an Ichneumon wasp (Gould 1994, 32-44). (That said, whether caterpillars eaten by Ichneumon wasps feel pain during the experience is unclear.)

The question remains unsettled as to whether insects experience conscious suffering (Smith 1991). However, the existence of serious debate on the issue suggests that we should not rule out the possibility. And seeing as insects number 10 to the 18 power (i.e., 18 goes in superindex) (Williams

1964), with the number of copepods in the ocean of a similar magnitude (Schubel and Butman 1998), the mathematical “expected value” (probability times amount) of their suffering is vast, even though the force of this point would be lessened if, as may be the case, an animal’s “intensity” or “degree” of emotional experience depends to some rough extent on the size of its brain.

4. WHY SUFFERING PROBABLY DOMINATES HAPPINESS

In light of what we have seen above, there are strong reasons in favor of the view that most animals (except maybe those that live a long time) probably have lives not worth living. Wild animals endure cold, hunger, disease, fear of predators, and other stresses on a regular basis. Moreover, even if animals enjoy net happiness during most of their lives, this may be outweighed by the painful intensity of their deaths. The claim of net expected suffering in nature appears to need only a weaker assertion: namely, that almost all of the expected happiness and suffering in nature come from animals that live very short lives. This is because most of the animals that live in nature are small (e.g., minnows and insects). The adults of these species live at most a few years, often just a few months or weeks, so it is hard in these cases for the happiness of life to outweigh the pain of death. Moreover, almost all the babies of these species die (possibly painfully) after just a few days or weeks of being born. This reproductive strategy of birthing many offspring with short lives has traditionally been called “*r*-selection”.

Humans are not *r*-selected, since they can only produce one child per reproductive season (excepting twins and other unusual cases). By contrast, in one reproductive season, dogs (*Canis familiaris*) may produce 1-22 offspring, the starling (*Sturnus vulgaris*) may lay 4-6 eggs, the bullfrog (*Rana catesbeiana*) may lay 6,000-20,000 eggs, and the scallop (*Argopecten irradians*) may lay 2 million eggs. Most small animals like minnows and insects are *r*-strategists. Granted, it is unclear whether all of these species are sentient – and even more regarding that fraction of the eggs that fails to hatch (see the next section) – but again, in expected-value terms, the amount of expected suffering is enormous.

Prevalent reproductive strategies thus mean that the number of animal deaths per parent is often high. Hapgood (1979, 34) explains how this happens:

All species reproduce in excess, way past the carrying capacity of their niche. In her lifetime a lioness might have 20 cubs; a pigeon, 150 chicks; a mouse,

1000 kits; a trout, 20,000 fry, a tuna or cod, a million fry or more; [...] and an oyster, perhaps a hundred million spat. If one assumes that the population of each of these species is, from generation to generation, roughly equal, then on average only one offspring will survive to replace each parent. All the other thousands and millions will die, one way or another.

If we consider this together with the claim made above that the lives of the animals who die shortly after starting to exist include more suffering than positive well-being, we can reach the conclusion that suffering prevails over happiness in nature.

The strategy of “making lots of copies and hoping a few come out” may be perfectly sensible from the standpoint of evolution, but the cost to the individual organisms is tremendous. Matthew Clarke and Yew-Kwang Ng (2006, section 4) conclude from an analysis of the welfare implications of population dynamics that “The number of offspring of a species that maximizes fitness may lead to suffering and is different from the number that maximizes welfare (average or total)”. And Ng (1995, 272) concludes from the excess of offspring over adult survivors: “Under the assumptions of concave and symmetrical functions relating costs to enjoyment and suffering, evolutionary economizing results in the excess of total suffering over total enjoyment”.

5. WHEN DO BABIES BECOME SENTIENT?

The previous section explained that in *r*-selected species, parents may have hundreds or even tens of thousands of offspring, and almost all of these die shortly after birth. It also argued that this causes net suffering to prevail in nature. But in order to reach that conclusion, some questions remain. What fraction of these offspring are sentient at the time of death, and what fraction merely die as unconscious eggs or larvae?

According to the European Food Safety Authority (EFSA 2005, 37-42) the age at which fetuses of various species begin to feel conscious pain varies depending on whether a species is precocial (well developed at birth, such as horses) or altricial (still developing at birth, such as marsupials). Precocial animals are more likely to feel pain at earlier ages. Also relevant is whether the species is viviparous (having live birth) or oviparous (giving birth through eggs). Viviparous animals have greater need to inhibit fetal consciousness during development in order to prevent injury to the mother and siblings. Oviparous animals that are constrained by shells have less need for inhibition of awareness before birth. In precocial birds, neural

development takes place when several days remain before hatching, and controlled movements as well as responses to stimuli occur then (Broom 1981). The European Food Safety (EFSA 2005, 38) also points out:

Most amphibians and fish have larval forms which are not well developed at hatching but develop rapidly with experience of independent life[.] Those fish and amphibians that are well developed at hatching or viviparous birth and all cephalopods, since these are small but well developed at hatching, will have had a functioning nervous system and the potential for awareness for some time before hatching.

Thus, it seems that many animals are able to suffer around the time of birth if not before.

Another consideration suggestive of pain before birth is the fact that many oviparous vertebrates can hatch early in response to environmental stimuli, including vibrations that feel like a predator. Early hatching has also been documented for amphibians, fish, and invertebrates (Doody and Paull 2013).

These points suggest that a nontrivial fraction of the large numbers of offspring born to *r*-selected species may very well be conscious during the pain of their deaths after a few short days, or even hours, of life. This means that the above conclusion regarding the prevalence of suffering stands.

6. MISJUDGING LEVELS OF WELL-BEING?

Another objection that can be considered here is that there is a danger in extrapolating the welfare of wild animals from our own imagination of how we would feel in the situation. We can imagine immense discomfort were we to sleep through a cold winter night's storm with only a sweatshirt to keep us warm, but many animals have better fur coats and can often find some sort of shelter. More generally, it seems unlikely that species would gain an adaptive advantage by feeling *constant* hardship, since stress does entail a metabolic cost (Ng 1995). Also, *r*-selected animals might suffer less from a given injury than long-lived animals would because *r*-selected creatures have less to lose by taking big short-term risks (Tomasik [2013] 2015).

On the other hand, we should also be wary of *underestimating* the extent and severity of wild-animal suffering due to our own biases. You, the reader, are probably in the comfort of a climate-controlled building or vehicle, with a relatively full stomach, and without fear of attack. Many of us go through life in a relatively euthymic state, and it is easy to assume that the general pleasantness with which life greets us is shared by most

other people and animals. When we think about nature, we may picture chirping songbirds or frolicking gazelles, rather than deer having their flesh chewed off while conscious or immobilized raccoons afflicted by roundworms. Moreover, even these examples, insofar as they involve large land animals, reflect a human tendency toward the “availability heuristic”. In fact, the most prevalent wild animals of all are small organisms, many ocean-dwelling. When we think “wild animals”, we should (if we adopt the expected-value approach to uncertainty about sentience) picture ants, copepods, and tiny fish, rather than lions or gazelles.

People may not accurately assess at a single instant how they’ll feel overall during a longer period of time (Kahneman and Sugden 2005). They often exhibit “rosy prospecting” toward future events and “rosy retrospection” about the past, in which they assume that their previous and future levels of well-being were and will be better than what’s reported at the time of the experiences (Mitchell and Thompson 1994). Moreover, even when organisms do correctly judge their hedonic levels, they often show a “will to live” quite apart from pleasure or pain. Animals that, in the face of lives genuinely not worth living, decide to end their existence tend not to reproduce very successfully.

Ultimately, though, regardless of exactly how good or bad we assess life in the wild to be on balance, it remains undeniable that many animals in nature endure some dreadful experiences.

7. IF LIFE IN NATURE IS SO BAD, WHY DON’T WILD ANIMALS KILL THEMSELVES?

One objection against the idea that most animals endure more suffering than positive well-being would point out that if that were so, then most animals would have reason to kill themselves – something they appear not to do. There are several responses against this objection.

Most animals do not understand suicide – It may be that most animals (except the smartest mammals and birds?), while conscious emotionally, do not understand death. As an analogy, when we have nightmares, we feel bad, but we do not fully realize we are dreaming and are not sufficiently in control of the situation that we can end the nightmares at will. It is reasonable to think that non-dreaming animals do have more control over their physical states than we do when asleep, but the broader point is that an animal can have emotions without understanding life and death.

Little to be gained when most suffering comes from death anyway – Animals do not generally have painless ways to kill themselves, and most of the total pain of their short lives may come from dying. For example, many of the 1000 offspring of a beetle mother will die within a few days or weeks of hatching. Their lives up to the point of death might hover around being neutral between pain and happiness, so there is not much to be gained by early suicide.

Temporal discounting – An animal often fails to act in its long-term hedonic interest due to short-sightedness. Even if suicide were optimal, the animal might not kill itself because doing so would be painful in the short run.

Non-hedonic “will to live” – Animals appear to have a “will to live” that is partly separate from their hedonic well-being. Animal behaviors are integrations of huge numbers of signals and brain systems, so it is not surprising that some of these systems act contrary to the hedonic-welfare-maximization systems. If animals did not have a “will to live”, presumably they would not survive as effectively.

Few suicides on factory farms – Perhaps animals such as battery-cage hens would be better off killing themselves. So, if animals do kill themselves when their lives are not worth living, why do not we see more suicides on factory farms?

Big animals may have decent lives – Finally, we must note that the animals that potentially could contemplate suicide (such as, maybe, chimpanzees?) likely do have lives worth living a good amount of the time. Those animals who do not, which are the majority, are those who cannot conceive the idea of taking their own lives to stop suffering.

8. ARE HUMANS HELPLESS TO AID?

Why, then, is the suffering of wild animals not a top priority for animal advocates? One reason is philosophical. Some feel that while humans have duties to treat well the animals that they use or live with, they have no responsibility to those outside their sphere of interaction (Palmer 2010). This response is, however, unsatisfying. If we really care about animals because we do not want fellow organisms to suffer brutally – not just because we want to “keep our moral house clean” – then it should not matter whether we have a personal connection with wild animals or not.

Other philosophers agree with this but do not oppose human inaction because they think that humans are ultimately helpless to change the situation. When asked whether we should stop lions from eating gazelles, Peter Singer (1973) replied:

[F]or practical purposes I am fairly sure, judging from man's past record of attempts to mold nature to his own aims, that we would be more likely to increase the net amount of animal suffering if we interfered with wildlife, than to decrease it. Lions play a role in the ecology of their habitat, and we cannot be sure what the long-term consequences would be if we were to prevent them from killing gazelles. [...] So, in practice, I would definitely say that wildlife should be left alone.

I would point out in response to Singer that most human interventions have not been designed to improve wild-animal welfare, and even so, many of them probably have decreased wild-animal suffering on balance by reducing habitats.

In a similar vein as Singer, Jennifer Everett (2001, 48) suggested that consequentialists may endorse evolutionary selection because it eliminates deleterious genetic traits:

[I]f propagation of the "fittest" genes contributes to the integrity of both predator and prey species, which is good for the predator/prey balance in the ecosystem, which in turn is good for the organisms living in it, and so on, then the very ecological relationships that holistic environmentalists regard as intrinsically valuable will be valued by animal welfarists because they conduce ultimately, albeit indirectly and via complex causal chains, to the well-being of individual animals.

These authors are right that consideration of long-range ecological side-effects is important. However, it does not follow that humans have no obligations regarding wild animals or that animal supporters should remain silent about nature's cruelty. The next few sections elaborate on ways in which humans can indeed do something about wild-animal suffering.

9. HUMANS ALREADY IMPACT NATURE

We should be cautious about quick-fix intervention. Ecology is extremely complicated, and humans have a long track record of underestimating the number of unanticipated consequences they will encounter in trying to engineer improvements to nature. On the other hand, there are many instances in which we are *already* interfering with wildlife in some manner. As Tyler Cowen (2003, 10) has observed:

In other cases we are interfering with nature, whether we like it or not. It is not a question of uncertainty holding us back from policing, but rather how to compare one form of policing to another. Humans change water levels, fertilize particular soils, influence climatic conditions, and do many other things that affect the balance of power in nature. These human activities will not go away any time soon, but in the meantime we need to evaluate their effects on carnivores and their victims.

One such evaluation was actually carried out regarding an Australian government decision to cull overpopulated and starving kangaroos at an Australian Defense Force army base (Clarke and Ng 2006). While admittedly crude and theoretical, the analysis proves that the tools of welfare economics *can* be combined with the principles of population ecology to reach nontrivial conclusions about how human interference with wildlife affects aggregate animal well-being.

Consider another example. Humans spray 3 billion tons of pesticides per year (Pimentel 2009), and whether or not we think this causes more wild-animal suffering than it prevents, large-scale insecticide use is, to some extent, a *fait accompli* of modern society. If, hypothetically, scientists could develop ways to make these chemicals act more quickly or less painfully, enormous numbers of insects and larger organisms could be given slightly less agonizing deaths¹.

Human changes to the environment – through agriculture, urbanization, deforestation, pollution, climate change, and so on – have huge consequences, both negative and positive, for wild animals. For instance, “paving paradise [or, rather, hell?] to put up a parking lot” prevents the existence of animals that would otherwise have lived there. Even where habitats are not destroyed, humans may change the composition of species living in them. If, say, an invasive species has a shorter lifespan and more non-surviving offspring than the native counterpart, the result would be more total suffering. Of course, the opposite could just as easily be the case.

Caring about wild-animal suffering should not be mistaken as general support for environmental preservation; indeed, in some or even many cases, preventing existence may be the most humane option. Consequentialist vegetarians ought not find this line of reasoning unusual:

The utilitarian argument against factory farming is precisely that, e.g., a broiler hen would be better off not existing than suffering in cramped con-

¹ Note that pesticides could actually prevent net insect suffering if they reduce insect populations enough, so encouraging humane insecticides is not equivalent to encouraging *less* pesticide use.

ditions for 45 days before slaughter. Of course, even in the calculation of whether to adopt a vegetarian diet, the impacts on animals in the wild can be important and sometimes dominant over the direct effects on farmed animals themselves. (Matheny and Chan 2005)

That said, before we become too enthusiastic about eliminating natural ecosystems, we should also remember that many other humans value wilderness, and it is good to avoid making enemies or tarnishing the suffering-reduction cause by pitting it in direct opposition to other things people care about. In addition, many forms of environmental preservation, especially reducing climate change, may be important to the far future, by improving prospects for compromise among the major world powers that develop artificial general intelligence.

10. A RESEARCH AGENDA

In light of what we have seen above, wild-animal suffering deserves a serious research program, devoted to questions like the following:

- (i) What animals are sentient? What reasonable subjective probabilities should we use for the sentience of reptiles, amphibians, fish, and various invertebrates?
- (ii) What sorts of affective states do animals experience during the course of everyday life in the wild? How often do they feel hunger, cold, fear, happiness, satisfaction, boredom, and intense agony, and to what degrees? In the future, perhaps it will become possible to answer this question with high precision through wearable continuous measurement devices recording neural correlates of hedonic experience. But until then, we can also benefit greatly by applying standard tools for assessing animal welfare (Broom 1991).
- (iii) What is the overall balance of happiness versus suffering for various species? How does this depend on the animal's lifespan and whether it dies before maturity?
- (iv) Are certain species happier than others? Do certain types of ecosystems contain less total suffering than others? Which environmental-preservation efforts increase and which decrease aggregate animal welfare? Are there long-term technologies that could eventually enable humans successfully to reduce wild-animal suffering in a serious way?

11. ADVANCED TECHNOLOGIES?

Humans presently lack the knowledge and technical ability to seriously “solve” the problem of wild-animal suffering without potentially disastrous consequences. However, this may not be the case in the future, as people develop a deeper understanding of ecology and welfare assessment.

If sentience is not rare in the universe, then the problem of wild-animal suffering extends beyond our planet. If it is improbable that life will evolve the type of intelligence that humans have, we might expect that *most* of the extraterrestrials in existence are at the level of the smallest, shortest-lived creatures on Earth. Thus, if humans ever do send robotic probes into space, there might be great benefit in using them to help wild animals on other planets. (One hopes that objections by deep ecologists to intervening in extraterrestrial ecosystems would be overcome.)

However, I should note that faster technological progress *in general* is not necessarily desirable. Especially in fields like artificial intelligence and neuroscience, faster progress may accelerate risks of suffering of other kinds. As a general heuristic, it may be better to wait on developing technologies that unleash vast amounts of new power before humans have the social institutions and wisdom to constrain misuse of this power.

12. INADVERTENTLY MULTIPLYING SUFFERING

While advanced future technologies could offer promise for helping wild animals, they also carry risks of multiplying the cruelty of the natural world. For instance, it is conceivable that humans could one day spread Earth-like environmental conditions to Mars in the process of “terraforming” (Burton 2004). More speculatively, others have proposed “directed panspermia”: dispatching probes into the galaxy to seed other planets with biological material (Meot-Ner and Matloff 1979). Post-human computer simulations may become sufficiently accurate that the wild-animal life they contain would consciously suffer. Already we see many simulation models of natural selection, and it is just a matter of time before these are augmented with AI capabilities such that the organisms involved become sentient and literally feel the pain of being injured and killed. Any of these possibilities would have prodigious ethical implications, and I do hope that before undertaking them, future humans consider seriously the consequences of such actions for the creatures involved.

13. ACTIVISTS SHOULD FOCUS ON OUTREACH

What does all of this imply for the animal-advocacy movement? There are reasons to think the best first step toward reducing wild-animal suffering that we can take now is to promote general concern for the issue. Causing more people to think and care about wild-animal suffering will hasten developments in research on wild-animal welfare and associated humane technologies, while at the same time helping to ensure that our advanced descendants think cautiously about actions that would create vastly more suffering organisms.

Perhaps finding supporters within the animal-advocacy community would be a good starting point. While some activists oppose all human intervention with the affairs of animals, occasionally even preferring that humans did not exist, many people who feel humane sympathy for the suffering of members of other species should welcome efforts to prevent cruelty in the wild. It's important to ensure that the animal-rights movement doesn't end up increasing support for wilderness preservation and human non-interference of all kinds. Another potential source of supporters could be people interested in evolution, who recognize what Richard Dawkins (1995, 133) has called the "blind, pitiless indifference" of natural selection.

Individuals can do much to raise the issue on their own, such as by (i) posting on animal-rights forums and writing blog comments, (ii) participating in animal-rights meetups/events and asking attendees what they think, and (iii) writing conference papers, journal articles, or books on the topic (perhaps co-authored with ecologists, ethologists, or other scientists, to ensure that the work is not entirely armchair philosophy).

There may be a danger here of raising the wild-animal issue before the general public is ready. Indeed, the cruelty of nature is often used as a *reductio* by meat-eaters against consequentialist vegetarianism. Suggesting that ethical consideration for animals could require us to expend resources toward long-term research aimed at helping wildlife might turn off entirely people who would otherwise have given some consideration to at least those animals that they affect through dietary choices (Greger 2005). So wild-animal outreach should begin within communities that are most receptive, such as philosophers, animal activists, transhumanists, and scientists. We can plant the seeds of the idea so that it can grow into a component of the animal-rights movement. A "do not spread wild-animal suffering to space" message could even appear even in venues like TED or *Slate* precisely because it is a controversial idea that people have not heard before. For those audiences, the message wouldn't interfere with audience members' daily lives and therefore could be entertained with less resistance.

It is crucial that at some point the animal-rights movement moves beyond farm, laboratory, and companion animals. The scale of brutality in nature is too vast to ignore, and humans have an obligation to exercise their cosmically rare position as both intelligent and empathetic creatures to reduce suffering in the wild as much as they can.

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