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The overwhelming prevalence of suffering in Nature

La abrumadora prevalencia del sufrimiento en la naturaleza

L'acaparant prevalença del patiment a la naturalesa

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Abstract

There are several reasons to believe that there is a predominance of suffering over wellbeing in nature. The difference grows exponentially when the suffering of invertebrates is taken into consideration. Given the relevance of the experience of pain when it comes to attributing moral considerability to an individual, the seriousness and implications of the above statements are significant due to the need to reconcile the interests of an enormous number of individuals who experience pain to some degree. Depending on the species and the ecosystem, there are variations that must be kept in mind with the aim of reducing the existing amount of suffering.

Keywords: invertebrates; invertebrate suffering; prevalence of suffering in nature; population dynamics; r/K selection theory.

Resumen

Tenemos fuertes razones para creer que hay una prevalencia del sufrimiento sobre el bienestar en la naturaleza. Esta diferencia crece exponencialmente si tenemos en cuenta el sufrimiento de los invertebrados. Dada la relevancia de la experiencia del dolor para la atribución de consideración moral a un individuo, la gravedad e implicaciones de lo dicho son enormes en la medida en que tenemos que conciliar los intereses de una gran cantidad de individuos que experimentan dolor en algún grado. Dependiendo de la especie y el ecosistema, existen variaciones que tenemos que tener en cuenta en aras de reducir la cantidad de sufrimiento existente.

Palabras clave: invertebrados; sufrimiento de los invertebrados; prevalencia del sufrimiento en la naturaleza; dinámica de poblaciones; teoría de la selección r/K.

Resum

Tenim fortes raons per creure que hi ha una prevalença del patiments sobre el benestar en la naturalesa. Aquesta diferència creix exponencialment si tenim en compte el patiment dels invertebrats. Donada la rellevància de l'experiència del dolor per a l'atribució de consideració moral a un individu, la gravetat i implicacions del que s'ha dit són enormes en la mesura en què hem de conciliar els interessos d'una enorme quantitat d'individus que experimenten dolor en algun grau. Depenent de l'espècie i l'ecosistema, existeixen variacions que hem de tenir en compte per reduir la quantitat de patiment existent.

Paraules clau: invertebrats; sofriment dels invertebrats; prevalença del sofriment en la naturalesa; dinàmica de poblacions; teoria de la selecció r/K.

Introduction

There are several reasons to think that suffering prevails over positive wellbeing in nature even if we just consider vertebrates. However, if we also take invertebrates into account, the case for the prevalence of suffering in nature gets stronger. To defend these claims, Section 1 will examine the evidence that at least a large number of invertebrates do experience pain. In this section, it will be argued that, if the existence of subjective experiences is accepted in vertebrates, it would be logical to do so in the case of a number of invertebrates. Section 2 will explain the case that suffering prevails over positive wellbeing in nature. It will claim that this conclusion can be drawn when the lessons learnt from population dynamics are considered. This section will also examine the possible sources of suffering which can be experienced by animals in nature, such as weather conditions, predation, or parasitism. In addition, it will attempt to briefly deal with the ecosystems where the prevalence of suffering is more evident. Section 3 will elaborate on the ethical consequences which must be considered once the moral relevance of suffering is accepted. Finally, the paper will present some measures that can be taken in order to reduce the total amount of suffering on the planet.

1. Do invertebrates suffer?

The presence of subjective experiences in general, and the experience of pain in particular, are rarely disputed in vertebrates. Humans behave in their daily lives as if other vertebrate animals, human and non-human, had subjective experiences. That is, as if they were aware of what happens to them. For example, a person would refrain from kicking a child or a pigeon because they assume that they would hurt them. Both the child and the pigeon would experience pain. However, it seems that people are not so sure with respect to invertebrates, which are usually viewed from a different perspective. As Koch (2008) ironically put it: “[s]urely they can’t be conscious—they look too different from us, too alien”.

Even taking all of that into consideration, since the last decades of the 20th century, a significant amount of literature has been published supporting the view that invertebrates can suffer. First of all, it has been shown that many invertebrates have nociception. This is the case of such animals as snails (Wigglesworth, 1980), some mollusks (Crook & Walters, 2011), nematodes (Wittenburg & Baumeister, 1999), or fruit flies (Tracey, *et al.*, 2003). Given that nociception is “the capacity to detect and respond to noxious or aversive stimuli” (Smith, 1991, p. 26), it seems to be a necessary condition to experience pain. Nevertheless, nociception is not a sufficient condition

(Mather, 2001) to infer the ability to experience suffering. Perhaps in beings with a nervous system nociception is a necessary, but not a sufficient condition, for the kind of experiences whose function is linked to the avoidance of immediate damage (Bateson, 1991). In whatever way, it seems to be an indicator of the presence of the suffering experience, which is, in fact, the case in many invertebrates.

In addition to nociception, there are other neurophysiological indicators that can lead to the attribution of the experience of pain to invertebrates. For example, Barrow and Klein (2016a, 2016b) state that the most basic kind of consciousness¹ is caused by the basal ganglia and midbrain in human brains, and that it can be hosted by the nervous system of insects. In contrast to those who argue that the neurophysiological differences between vertebrates and invertebrates should result in the rejection of the idea that the latter can be conscious, some researchers (e.g. Lockwood, 1988) maintain that the same function can be caused in different animals with divergent morphologies. Moreover, the existence of natural opioids and analgesics in the nervous system of invertebrates has been verified (Knutsson, 2016a). Even when the analgesics are artificially injected, the effects on both vertebrates and invertebrates are very similar. In summary, if we assume that the role of these substances is the regulation of pain, we must wonder what their usefulness would be if invertebrates did not experience pain.

Furthermore, some cognitive capacities have been reported in invertebrates, which we can consider another sign of the experience of pain. These include memory and the capacity to avoid the source of pain. The main function of the awareness of pain seems to be the protection from possible future damage. When a negative experience is lived by an individual, they develop an aversive attitude against it, which means they will tend to avoid the source of that negative experience in the future. By virtue of this, the two mentioned features are necessary in some degree for that goal to be satisfied. As it happened with the previous requirements, invertebrates fulfill these features. Memory has been shown to be present in invertebrates like bees (Menzel, *et al.*, 2005; Sømme, 2005), and cephalopods (Mather, 2001). The ability to avoid sources of pain has also been noticed in crustaceans (Elwood, *et al.*, 2009), fruit flies (Yarali, *et al.*, 2008), and ants (Broom, 2013).

At this point it is important to note that a human being should not presuppose, on the basis of their own subjective experience, the presence of such subjective experience in vertebrates; particularly, in other human beings. Since human beings are sure about their consciousness, it is

¹ Following Block (1991) we would be talking about "phenomenal consciousness". The experience of pain would be included in that type of basic consciousness.

normally inferred that an organism with the same neurophysiological structure and a suitable behavior must be conscious as well. However, as we have seen, these two conditions are satisfied to some degree in the case of invertebrate individuals. In order to attribute subjective experiences to invertebrates, it is not necessary that they have a central nervous system identical to the human (Elwood, 2011). As the same function can be caused by different organic structures, there is no reason to assign the experience of pain to vertebrates and not to invertebrates. This conclusion is reinforced by the observed behavior of invertebrates. For instance, it would be very difficult to explain the fact, noted by Elwood, *et al.* (2009), that crabs avoid entering compartments where they received electric shocks if we deny they are conscious. In the light of all this evidence, we can conclude that the same reasons that lead to the attribution of subjective experiences to vertebrates are also applicable in the case of many invertebrates, even if in many cases the degree of certainty we may have concerning their satisfaction may be lower.

2. Does suffering prevail in nature?

By virtue of what has been concluded in the previous section, the uncomfortable question whether there is a predominance of suffering over welfare in our planet is raised. There are many works (see e.g.: Rolston III, 1992; Ng, 1995; Horta, 2010a, 2010c, 2015; Tomasik, 2016a [2009]; Faria, 2016) that deny the fictitious but common idea that nature is an idyllic place. It might not even be necessary to include invertebrates in our calculus of the proportion of suffering against positive wellbeing in the wild to reach this conclusion. However, if the conclusion reached in Section 1 is accepted, it could be claimed that the asymmetry between suffering and wellbeing in the wild is actually increased. There are several factors causing sentient animals (vertebrates and invertebrates) to suffer in the wild, including physical injuries, hunger and thirst, extreme weather conditions, psychological stress, predation, parasitism, and diseases (Faria, 2016; "Animal Ethics", 2017).

As it can be imagined, physical injuries are common in the lives of wild animals. Far from being a minor issue, wounds caused by fighting between individuals of the same, or different, species are an enormous source of suffering that in many cases can lead to death. Rape has also been observed in many species, including dolphins, chimpanzees (Connor & Vollmer, 2009), and ducks (Bailey, *et al.*, 1978), all of whom are known to engage in collective "rape flights". Moreover, since there is not necessarily a proportional correspondence between the resources present in a given ecosystem and the number of animals born in it, it happens that hunger and thirst are in some cases an important factor in the suffering that can accompany animals throughout all their lives, if not lead to death.

Besides, animals have to endure adverse weather (Sládek, 1881), and mass deaths of animals can actually be caused by weather changes and climatic conditions, including harsh cold and heat waves (Salzman, 1982). Likewise, hot weather favors the transmission of diseases (Henning, *et al.*, 2005). Animal life in nature is also characterized by the stress caused, for example, by the need to develop a balance between exhibition to predators and the obtainment of food (Clinchy, *et al.*, 2004), or competition among gregarious animals of the same species (Sapolsky, 2005). Predation is a cause of extreme suffering, as it can be clearly seen in some cases involving invertebrates. As Faria says, “[i]t is difficult to estimate the suffering that results from being preyed upon” (2016, p. 77). For instance, spiders may use scant venom to paralyze the prey when it lacks important defensive mechanisms (Wigger, *et al.*, 2002). Some beetles eat their prey alive, a process that sometimes takes hours or even days (Wizen & Gasith, 2011). In nature, there are also numerous cases of parasitism and diseases affecting invertebrates. Ichneumon wasps introduce their eggs into the body of other insects, such as caterpillars, so that when they hatch, the larvae can feed by eating them from within (Horta, 2015). Another example is illustrated by *Ophiocordyceps unilateralis*, a fungus that parasites ants, penetrating their cuticle and modifying their behavior in order to achieve a greater distribution of their spores (Evans, *et al.*, 2011).

2.1. Reproductive strategies and life tables

The different causes of suffering we have just seen only partially explain why suffering is so prevalent in nature. However, the key factor in the predominance of suffering is related to the reproductive strategies animals follow in nature because of the scarcity of the resources they need to survive. Most animals (especially, but not only, fish and invertebrates) seek to maximize the number of their offspring, and typically invest little parental care in them (Colyvan, 2008). The sunfish is a paradigmatic example of this, as they lay around 300 million eggs (Horta, 2015; Faria, 2016). Only a few animals follow a different strategy and seek to maximize the survival of their offspring. Under this strategy animals try to have a low progeny to ensure their survival by investing great care in them (Colyvan, 2008). Animals sometimes combine both reproductive strategies (Faria, 2016), but the one that maximizes the number of offspring is widely prevalent in the wild.

Due to this, a huge number of individuals die shortly after having started to live, often in painful ways. They cease to exist, therefore, without having had any positive experience, but having endured great pain (Horta, 2015). Given the small number of survivors among species who follow the strategy of maximizing the number of their offspring, and the wide predominance this

strategy has, we can conclude that in nature there is an astronomic amount of suffering, which vastly prevails over happiness (Horta, 2010b).

This idea was backed initially by using the *r/K* selection theory, introduced and popularized by the biologists MacArthur and Wilson (1967), and later applied to the field of evolution of life histories by Pianka (1970). According to this theory, there are in nature two types of reproductive strategies, *r*-selection and *K*-selection, which are followed, respectively, by those who maximize either their offspring or the survival of their offspring, and which are typically accompanied by other life history traits concerning lifespan, age at reproduction, size of offspring and others. Over the years, however, this theory has been replaced by new paradigms in biodemography focused, for example, in the examination of different trade-offs between life history traits by considering the life tables of different organisms (Stearns, 1992; Reznick, *et al.*, 2002). Nevertheless, regardless of the theory used to examine this question, the same conclusion applies; the lives of most animals appear to contain more suffering than positive wellbeing. This is especially so in the case of invertebrates, as they typically have very short lives. In the case of fruit flies, for instance, a research carried out with approximately 1,200,000 flies showed that only half of them reached 20 days of life (Carey, 2001). In the same way, the life-span of monarch butterflies is around 2-3 months during the summer reproductive period, and around 6-10 months during the winter migration period (Carey, 2001). Either way, if we consider life expectancy or life-span, and without even taking into consideration early mortality rate, the temporal parameter of life differs greatly between mammals (extending for years) and most invertebrates (extending for days) (Horiuchi, 2003). This is very worrying, provided that the vast majority of the animals on the planet are invertebrates.

2.2. The distribution of suffering across different ecosystems

A last interesting issue to be considered, even briefly, is how suffering is distributed in different ecosystems. It cannot be invariably inferred that the same amount of suffering is present everywhere. Now, given the numerous difficulties this question raises, we can only make some speculations based mainly on the amount of biomass per ecosystem. In the case of marine ecosystems, for example, there exists a significant difference between estuaries or coral reefs, on the one hand, which together with rainforests are some of the ecosystems with the largest amount of biomass at global level (Ricklefs & Miller, 2000), and open ocean, whose biomass production is only over that of deserts (Ricklefs & Miller, 2000). Although biomass includes the net weight of

non-sentient living beings, such as plants and bacteria, the existence of these is an indicator of the number of sentient individuals that can be expected to be found (Ellwood & Foster, 2004).

That said, let us suppose that the “line of neutrality” (Ng, 1995), where well-being and suffering equal 0, is found in an area where the number of both vertebrate and invertebrate animals equals 0. If the arguments presented in Section 1 and in Subsection 2.1 are right, that is, if there exists a prevalence of suffering over wellbeing in nature caused by the search of efficacy in genetic transmission, then it can be maintained that that situation with a welfare and suffering equal to 0 is made worse in the ecosystems with lower biomass, i.e. deserts (Ricklefs & Miller, 2000). We can infer from what has been said that there is a prevalence of suffering over well-being in deserts. Likewise, we can assume that suffering is increased, as in the previous case, in ecosystems with a slightly higher amount of biomass, such as tundra. This rule can be applied successively until we reach the level of extreme suffering that prevails in places with a greater amount of invertebrate biomass, namely, estuaries and tropical forests. In the absence of further analysis of the conditions that lead to this disparity in invertebrate biomass, such as temperature, the conclusion we can draw is that the higher the biomass, the larger the amount of suffering and the proportion to which it prevails over positive happiness.²

3. Ethical implications of the prevalence of suffering in nature

3.1. The moral relevance of suffering

The two previous sections were limited to the defense of factual conclusions. In these sections, it has been maintained that a large proportion of invertebrates have the capacity to suffer, and that this suffering prevails over welfare. In this section, we will discuss the consequences that these conclusions have in axiological and normative dimensions.

Ethics is a discipline that revolves around the positive and negative effects of the actions of individuals on one another. Accordingly, only those individuals who fulfill the condition of being capable of having positive and negative subjective experiences should be considered morally. Pleasure and pain are the morally relevant properties. According to Bernstein:

² The variability of suffering among different ecosystems is also due to other indicators not taken into consideration in this article. Some examples are the length of trophic chains, or the distribution of biomass between primary producers and consumers.

A property P is a morally relevant property if and only if insofar as an individual possesses P, that individual warrants its welfare be given preferential consideration (treatment) vis-à-vis an individual who lacks P or has it to a lesser extent to degree (2002, p. 531).

Insofar as they are morally relevant properties, we should promote pleasure and reduce pain with our acts. However, the question arises whether both pleasure and pain can be symmetrically considered (see Tomasik, 2016b [2015]). If this were so, then we would have to admit that the fact of increasing the quantity of pleasure in 6 points on a scale out of 10 in someone has the same moral relevance as reducing suffering also in 6 points. Nevertheless, it does not seem intuitive to believe that making someone happy has the same moral weight as not making them unhappy (Griffin, 1979). Rather, it seems to be the case that the prevention of suffering has moral priority over the increase of wellbeing, as negative consequentialism holds.

Even if we were to defend the symmetry between pleasure and pain we would find a huge prevalence of the last one. There is such a predominance of suffering in the world that almost the same conclusions would follow if we maintained a consequential negative theory, especially bearing in mind that the vast majority of sentient individuals in nature are invertebrate animals which follow the *r*-selection. Therefore, the conclusion that can be drawn here is that, in order to prioritize the maximization of happiness, existing amount of suffering should be minimized.

3.2. Measures to be implemented

When it comes to discussing the measures that could be implemented to reduce the harm suffered by animals in the wild, it is important to keep in mind the impact that human action has already had on the number of invertebrate animals. It has been claimed that during the anthropocene the population of invertebrates decreased dramatically (Dirzo, *et al.*, 2014). However, it has been also argued that the population of the already most numerous type of invertebrate, insects, is likely to increase due to global warming (Stange & Ayres, 2010; Tomasik, 2016c [2008]). In the light of this, in order to reduce the harm that animals suffer, it is necessary to find a balance between the need to control the number of invertebrates being born—for example, through urbanization and the eradication of the biggest focus of suffering (rainforests)— and global warming (Tomasik, 2016d [2015]). The conclusion that Tomasik (2016d [2015]) draws in this respect is that it is

necessary to promote research to determine the ways in which we can reduce the suffering of insects without this having significant direct or indirect effects on the rest of sentient beings.³

Section 2 pointed out that suffering prevails in nature mainly due to the early death of sentient beings that have not had many positive experiences. Thus, it is not even necessary to accept an anti-frustrationist or a suffering-focused approach. Such an approach concludes that any negative experience means that life is not worthwhile (Benatar, 2006; Longueira, 2011), and maintains that it would have been more positive for most invertebrates (especially arthropods) to not have been born. This conclusion would remain the same from an axiology not giving priority to avoiding negative things over promoting positive things. For this reason, the best way to minimize the amount of suffering on the planet may be preventing sentient beings from reproducing, particularly those which have enormous numbers of offspring.

Regarding invertebrate suffering, the important effect of human action in a direct sense should not be underestimated. If the successive conclusions we have reached are right, we have a duty to modify some of our current practices. For example, we should refrain from feeding on invertebrates such as snails (Tomasik, 2016e), wearing animal materials such as silk (Tomasik, 2016f), or using *prima facie* insecticides (Tomasik, 2016g [2007]), as all these practices harm invertebrates. The duty to use anesthetics in research with invertebrates ensues from our conclusions (Lockwood, 1987, 1988), which rather suggest the eradication of this practice in favor of alternatives that do not use beings which are sentient to some degree.

4. Conclusion

This paper has defended mainly the following two claims:

1. If we accept that vertebrates can have positive and negative experiences, there are strong reasons to maintain that this is also so in the case of invertebrates.

³ The assumption of an “extinctionist ethic in strong sense” (Longueira, 2011) must be considered in relation to this kind of reflection. Given the enormous suffering at stake, the desirability of an empty world against a populated one (Knutsson, 2016b) should not be overlooked. Other authors, such as Ng (Carpendale, 2015), stand against the hypothetical destruction of the planet arguing that technological advances will be able to reverse the current situation of prevalence of suffering over welfare.

2. There are strong reasons to hold that suffering prevails over positive welfare in the wild, and that it does so, to a large extent, in proportion to the amount of the biomass present in each ecosystem.

In view of this, we should also accept that:

3. We should try to minimize the harm sentient beings suffer.

The next conclusion follows:

4. We ought to take measures to reduce the suffering of invertebrates.

In addition to the suggestions presented above, raising awareness about our arguments and conclusions is imperative, as it is a necessary condition for their implementation. None of the measures of greatest impact that have been stressed here will be effectively carried out if it is not through the collective assumption that it is necessary to expand the circle of moral consideration beyond the beings belonging to human species.

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