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The intrinsic moral value of individuals: A bioethical approach to domestic cats and damaged species

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ABSTRACT

The domestic cat (*Felis silvestris catus*) is present on all continents, but only in some regions of the earth it can be considered native. All domestic cats originated from SWA and Egypt and, in theory, can be considered alien species in the rest of the world. However, the expansion of the cat in the Old World has begun during the Neolithic and ended, hypothetically, a thousand years ago. This time is probably sufficient to allow predator-prey relationships to develop, unlike in countries such as Australia, New Zealand and the New World, where the domestic cat was introduced between the early 1600 s and 1800 s. In these countries, the domestic cats do much more damage, contributing to the declines and, in some cases, to the extinction of vulnerable wild species, in particular on islands. But how can we define 'damage'? In biological terms, it is not possible to give a definition because 'damage' is a human moral category. Consequently, decisions on the management of 'harmful' animal populations are entirely the prerogative of human beings and at the service of resolving the interests of the human species, which vary in different parts of the earth. Based on the most basic dictates of bioethics, the domestic cats deserve 'humane' methods of control because they are sentient animals capable of experiencing suffering and, as such, have intrinsic moral value. But prey are sentient animals, too. And, therefore, have intrinsic moral value as well and are bearers of interests. The problem of safeguarding domestic cats and wildlife survival and welfare of both is, at present, unsolved. There are several positions on this issue, and some of them are mentioned. Probably, there is no solution to this problem except to humanize the methods of controlling feral and owned domestic cats, and other species of super-predators and meso-predators, as much as possible, in order to safeguard the damaged prey species. To this aim, it is urgent to increase scientific research to make usable those methods, like genetic biocontrols and/or contraceptive baits to reduce cat fertility, that are already under study but not yet available.

But it is time to give up with further hypocrisy: this is a problem created by human beings through their unwise behaviour and choices. Humans represent the most invasive vertebrate species and, in a way, their management of other species, including the domestic cat, is one of the many factors by which he has manifested his invasiveness.

1. The beginning

The domestic cat (*Felis silvestris catus*) is now present on all continents, with the exception of the Antarctica; however, only in some regions of the earth it can be considered native. Actually, Vigne et al. (2004) suggested that in the Fertile Crescent, during the Neolithic period, cats developed a commensal relationship with early human communities engaged in agricultural activities. Based on genetic evidence, Ottoni et al. (2017) suggested that both Near Eastern and Egyptian populations of *Felis silvestris lybica* contributed to the domestic cat gene pool at different historical times, although an introduction of cats from the southwest Asia (SWA) to Egypt, and not vice versa, cannot yet be ruled out. Thus, all domestic cats originated from SWA and Egypt through the domestication process, and in theory can be considered alien species in the rest of the world.

However, the expansion of the cat in the Old World began soon after domestication, many millennia ago, during the Classical period (Baca et al., 2018) and ended at an unspecified time, hypothetically a thousand years ago (Faure and Kitchener, 2009; Ottoni et al., 2017). Thus, exclusively in the Old World, the time span leading up to the present day is sufficient to suggest that today the domestic cat in natural environments occupies an ecological niche because, although it is a domestic

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species, in many habitats its presence has resulted in predator-prey relationships similar to those of a native wild species. For example, many rodent species, habitually preyed upon by the domestic cat in the wild, respond as precisely to the scent of the domestic cat as they do to that of the fox or various species of mustelids (Apfelbach et al., 2005).

This was facilitated by the fact that the domestic cat, especially in the first centuries after domestication, lived in natural environments around human settlements. Worldwide, a large proportion of the populations of this species lived, and live again today, in a situation of independence from humans by procuring food by hunting. Such populations are referred to as 'feral' (Table 1).

The diffusion of the domestic cat in the Old World occurred mainly along ancient land and sea trade routes, following the spread of the black rat (*Rattus rattus*) (Yu et al., 2022) and house mouse (*Mus musculus*), in order to control such pest populations (Ottoni et al., 2017).

In contrast, the domestic cat arrived in the New World in the early 1600 s, in New Zealand in the late 1700 s-early 1800 (Brockie, 2007) and in Australia (from Europe) in the early 1800 s (Shultz, 2015).

In the Old World, in the centuries following the 'completion' of the colonization of the domestic cat, human attitudes towards domestic cats began to change, in a process that lasted from around the year 1000 until around the 19th century. The tendency to appreciate it also as a companion animals and/or for its aesthetic qualities, originally probably the prerogative of a privileged few aristocrats who indulged in the pleasure of having it buried with them (Vigne et al.), began to spread to the less wealthy social classes as well (Todd, 1977).

Until that time, the domestic cat had served to control pest rodent and snake populations, and to be effective humans had not even had to apply strict artificial selection methods as occurred with the dog (*Canis familiaris*) in order to obtain specialised breeds for different tasks (hunting, guarding properties, herding and so on). The size, morphology, colour and behaviour of the domestic cat were effective for the purpose for which cats had been accepted in human communities without the need to modify them, i.e. to control (prey, kill and eat) populations of small and medium-sized rodents (i.e. *Mus musculus*, *Arvicola* sp., *Rattus rattus*). But from the 18th century onwards, probably also due to the increased level of generalised welfare, humans began the 'game of the thousand colour' of the domestic cat, appreciating it more and more as a pet for its aesthetic qualities (Kaelin et al., 2012). The intensive artificial selection of the domestic cat to create different coloured shapes with different lengths of fur began in the 19th century (Driscoll et al., 2009). Such forms would have had low chances of survival in the natural environment, as supported by recent papers (see for example Dubiner et al., 2023). The first feline exhibition was held at the Chrystal Palace in London in 1871 and a limited number of cat breeds were present. Since then, artificial selection on cat breeds by humans has increased exponentially, purely for aesthetic purposes (Robinson, 1977).

The increase of the general level of welfare of the human population, due also to economic reasons, has not only led to the increase of feline breeds through artificial selection, but also to the widespread adoption of the domestic cat as a pet; in turn, the spread of cats as companion animals has gone hand in hand with bringing them along during travels. Therefore, transporting cats for the purpose of controlling rodent infestations on ships has been matched by the transportation of cats as a source of pleasure. The result is that today the domestic cat is one of the most popular companion animals (Crowley et al., 2022). The Ecology Global Network (2023) reports the number of 370 million pet cats around the globe.

2. The original function of the domesticated cat

But in rural environments and beyond, the original cause for which the cat began its relationship with human beings, i.e. the control of pest rodents, has not ended. Surprisingly, the cat's predatory activity and its impact on pest rodent populations have not been documented as thoroughly as in the case of other aspects of domestic cat behaviour like:

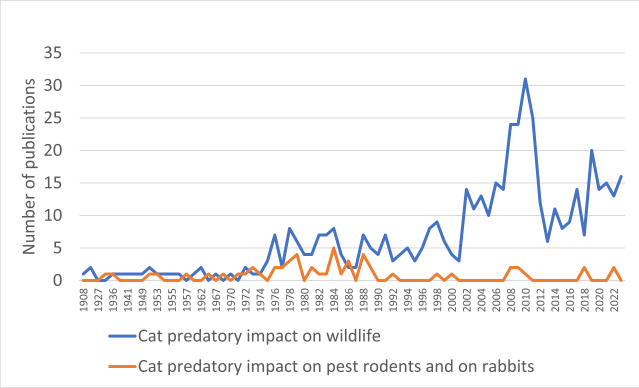

Fig. 1. Number of scientific publications on cat predatory impact on wildlife and on pest rodents and rabbits.

solitary vs social and territorial behaviour, mating and reproductive behaviour (reviewed in Natoli et al., 2022).

Remarkably, a good level of attention has been devoted to the effects of predator odours in rodent prey species (see for example Mahlaba et al., 2017) leading to the conclusion that rodent behaviour is greatly affected by indirect cues of predation risk (McGregor et al., 2002). In any case, the habit of keeping cats in the vicinity of barns, in every rural setting on earth, is still widespread (see for example Yonas et al., 2010), although farmers, yesterday as today, rely not only on cats but also on traditional means of pest rodent control, such as rodenticides (poisoned bait) (Elton, 1953; Wodzicki, 1973; Fitzgerald, 1988; Yonas et al., 2010).

Currently, the production of scientific articles on the actual hunting behaviour and on its predatory impact on pest rodents, which cause economic damage to humans in the rural environment (e.g. the house mouse, *Mus musculus*, the rat, *Rattus* spp., voles, *Microtus* spp.) is very scarce, as it was underlined more than twenty years ago by Fitzgerald and Turner (2000). The situation today has not changed much, especially when compared to the scientific production on the cat as a harmful species for wildlife (Fig. 1).

There is also a scientific production on the predatory impact of the domestic cat in urban environments: the presence of cats affects the abundance of rodent species except that of rats (*Rattus norvegicus*), for which it is concluded that cat presence has little impact on prey population size (Glass et al., 2009; Herrera et al., 2022; Parsons et al., 2018). For example, in some urban habitat, the distribution of the wood mouse (*Apodemus sylvaticus*) is negatively correlated with that of cats (Baker et al., 2003). Notably, in a forested and largely inhabited valley in New Zealand, the population of black rats (*Rattus rattus,* smaller and less aggressive than Norway rats (*Rattus norvegicus*) was found to be well controlled by the hunting behaviour of feral domestic cats (Fitzgerald and Karl, 1979, 1986).

However, the shortage of scientific papers on domestic cat predatory success on invasive rodent species is surprising, considering that the cat was domesticated specifically for this task (Turner and Meister, 1988).

3. Predatory impact of domestic cats on wildlife

It is not surprising that publications on the predatory impact of domestic cats (owned free-ranging or feral) on wildlife have increased considerably in the last period. It is no coincidence that, although the subject has been addressed since the beginning of the last century (Reed, 1908; Editorial, 1916), there has been a peak in scientific publications on the issue from 2009 until today (Fig. 1). Actually, the damaging effects of predatory impact of domestic cats have become particularly evident when added to the damage caused to wildlife by other factors that have been on an exponential trend in recent decades: from deforestation to the fragmentation of habitats, from pollution to climate

change (Spatz et al., 2017). Thus, the globally distributed domestic cats contribute to the declines and, in some cases, to the extinction of vulnerable wild species, in particular on islands (Medina et al., 2014).

There are studies that quantify the costs of biological invasions (not only those of domestic cats) worldwide, in terms of biodiversity decline and the high economic losses associated with managing these invasions for human society: for example, an average annual cost of $26.8 billion has been calculated over the past decades (1970–2017) (Diagne et al., 2021). But it is practically impossible to calculate the average annual cost to human societies of the damage caused by deforestation, habitat fragmentation, pollution and climate change in recent decades, because it is beyond any measure.

The phenomenon of predatory impact of domestic cats on wildlife is now well studied: there are reports on the predatory behaviour of feral as well as free-ranging pet cats (Trouwborst et al., 2020; Fischer, 2020). In terms of motivation, the two categories differ in one fundamental characteristic: feral cats prey to survive, while pet cats no longer depend on hunted prey. But both categories of cats respond to identical proximate (triggering stimulus: the sight of prey) (Adamec, 1976, 1980; Turner and Meister, 1988) and ultimate (cats have been selected to prey in order to survive) causes. This poses completely different management and ethical problems.

Unfortunately, in practical terms more than in theoretical ones, unowned feral cats are indistinguishable from owned free-ranging cats (Crowley et al., 2020), and this was true especially until the mid-twentieth century when most cats, even if they were associated with particular households, had the possibility to wander freely (Crowley et al., 2020). Today, with a great variability among countries and cultures, cats are more likely to be 'owned' by people, although they may maintain some access to the outdoors (Crowley et al., 2022). There is currently a very intense debate on whether or not to allow owned cats to wander free outside the home (see for example Hadidian, 2021), which I will afford later. Let us first look at the factors that shape bioethical issues.

It has been well documented that owned cats, even neutered, bring to their owner hunted preys, most of the time without eating them. Sometimes this habit has been exploited as a method of conducting studies on the predatory impact of owned cats on wildlife (see for example George, 1974, 1978; Borkenhagen, 1978; Churcher and Lawton, 1987; Carss, 1995; Mori et al., 2019). One might be inclined to think that the trend not to eat the killed prey happens more with pet cats attached to a household, but it seems that it is not always true.

Towns et al. (2011) reported that in a study on Little Barrier Island, feral cats killed the birds but consume little of them (brain or liver) or, in another study on Juan de Nova Island, a certain percentage (22%) of birds were killed without being consumed (Peck et al., 2008, in Towns et al., 2011). As Leyhausen (1979) pointed out, this is because hunting, killing and consumption of prey are rather independent actions in the domestic cat, and killing and consumption of prey are independent of hunger. Confirming this hypothesis, there are many studies reporting that domestic cats go hunting immediately after eating a meal (Turner and Meister, 1988). Fitzgerald and Turner (2000) hypothesised that the cat has been selected to hunt frequently for relatively small meals (its prey size is never larger than itself) on an opportunistic basis. I think that cats are simply responding to the ecological pressure common to many carnivores, i.e. it is better to have as much prey available as possible because you don't know when the next meal will arrive. Cats do not eat all killed preys because animals that live 'naturally' (so let's exclude neutered animals that live exclusively indoors and are often fat/obese) have been selected not to overfeed (see also Natoli et al., 1999), due to a feedback mechanism that prevents them from eating after satiation, as it has been reported for other wild carnivores (Kruuk, 1972). In conclusion, it seems clear that the domestic cat's impulse to initiate hunting is not exclusively due to hunger, and for other wild carnivores it has been suggested that satiety has little or no influence on catching or killing, at least sometimes and maybe always (Kruuk, 1972).

Cats are considered efficient predators (Fitzgerald and Turner, 2000) even in the Old World, where the relationship between predator and hunted species have had time to co-evolve. Hunted species respond either with innate or learned behaviours to avoid predation, and there is a thriving scientific literature that reports on the behaviour and physiology of prey species in response to odours from urine, faeces, fur, skin and anal glands of domestic cats: it goes under various names, among which 'smell of danger', 'smell of fear', 'landscape of fear' (reviewed in Mahlaba et al., 2017). For obvious reasons (pest control), the strategies evolved by pest rodent species to counteract the hunting actions of domestic cats have been studied more than those of avian species. This causes a major gap in the literature, which should be filled as soon as possible in view of the focus on the cat's predatory impact on avian species.

Where native wildlife has evolved without predators like cats, and consequently has limited defence mechanisms, cats do much more damage (Kruuk, 1982; Tan et al., 2020). For example, McEvoy et al. (2008) found that the scent of a native predator, the spotted quoll (*Dasyurus maculatus*), works as a deterrent for the native Tasmanian swamp rat (*Rattus lutreolus velutinus*), whereas the same has no reaction to the scent of cats and foxes.

The other side of the coin is represented by the fact that some species are evolving anti-predator mechanisms previously absent. For example, it appears that some island birds are able to respond adaptively to the increased risk of predation by the new predators. Massaro et al. (2008) found that the new predation risk imposed by introduced mammalian predators altered the parental behaviour of the endemic New Zealand bellbird (*Anthornis melanura*). Similarly, Li et al. (2014) highlighted the behavioural plasticity of the Aegean wall lizards (*Podarcis erhardii*, Lacertidae). These lizards are able to adapt to varying levels of predation, ranging from minimal or non-existent level in small islands without predators, to a substantial level on island where the domestic cat has been introduced.

Many factors influence the relationship between domestic cats and predated species: ecological, such as the relationship with other superpredator and mesopredator species (Fan et al., 2005; Le Corre, 2008), meteorological (George, 1974), environmental (arid vs forested Burbidge and Manly, 2002, but also urban vs non-urban Tsurim et al., 2008), human (Bellard et al., 2016) and, of course, the density and population dynamic of the prey species (Pontier et al., 2008).

But in any case, the overall picture that emerges from a careful review of the literature that comprehensively examines countless aspects of the problem is that, worldwide, the situation is not under control. The domestic cat is on the IUCN list of the 100 most invasive species in the world and there is a flourishing literature on the devastating effects on biodiversity due to the introduction of the domestic cat as a predator in Australia, New Zealand, the United States and many smaller islands around the globe (see for example Legge et al., 2023 and Fig. 1). There are studies that quantify the damage in terms of the number of individuals killed, whether mammals, birds, reptiles, amphibians or invertebrates (reviewed, for example, in Loss et al., 2022).

4. Methods of controlling cat populations

Numerous instruments have been suggested and utilised to counter cat action of wildlife predation: from the most lethal like poisoned baits (Johnston et al., 2011), shotguns (Legge et al., 2020), spreading infectious viral diseases (Oliveira and Hilker, 2010) to the most compassionate like putting a collar with a bell on cats (Ruxton et al., 2002) and confining them indoors at night or 24 hours a day (Tan et al., 2020). There are also different, interesting, suggestions on both side: Cecchetti et al. (2021) suggested to feed pet cats with grain-free food with meat-derived proteins and to engage in object play because both reduced predation of wild animals; Birand et al. (2022) propose that control of long-lived species like the feral cat is potentially possible over very large areas using genetic biocontrols.

It is clear that in terms of suggestions to suppress the predatory behaviour of domestic cats, suddenly the 'ferals' and the 'pets' have different 'legal/moral status': those cats that can be poisoned, shot, infected, destroyed in short, and those that have the right to live even if with limitations. And it is on these limitations that the bioethical debate has raged (Yeates, 2017), as some of them are criticised as being detrimental to the welfare of cats. As already said above, the distinction does not exist outside the houses, since unowned feral cats are indistinguishable from owned free-ranging cats and, for sure, some of the latter are killed by mistake.

The heated debate is about whether or not to let pet cats out (see for example McDonald et al., 2015). I would say that first of all it should be whether it is right to shoot feral cats or poison them. Actually, unlike the other debated questions, is the most relevant from a bioethical point of view as it is inherent to the human right to decide the life or death of a sentient organism (see for example Allen et al., 2023). There are recent and less recent studies reporting large-scale cat poisoning campaigns (Moseby et al., 2009; Johnston et al., 2011; Algar et al., 2018) without any bioethical questions being raised.

Today, there is perhaps more reticence in describing studies in which cats are eliminated by shooting them, but this was the most common method of capture until a few decades ago, not for the purpose of preserving wildlife species but merely to analyse the stomach contents of cats and determine their diet (reviewed in Fitzgerald, 1988; Fitzgerald and Turner, 2000).

There are organisations that incite 'humane' control of animal species, though considered harmful for the environment or agricultural production. Among those, the Royal Society for the Prevention of Cruelty to Animals, Australia (RSPCA), recognises that in some circumstances it is necessary to control populations of these animals to reduce or eliminate their negative impact, provided the measures are properly justified, effective and humane. Thus, the RSPCA promotes humane vertebrate pest control (HVPC), i.e. the development and selection of feasible control programmes and techniques that avoid or minimise the pain, suffering and distress of target and non-target animals. A totally humane pest control method is one in which the animal experiences no pain, suffering or distress. There is a rich literature that supports the HVPC, as well (see for example Sharp and Saunders, 2011; Crowley et al., 2020).

5. The bioethical debate

Based on the most basic dictates of bioethics, although domestic cats cause 'harm', they deserve 'humane' methods of control (Wallach et al., 2015) because they are sentient animals capable of experiencing suffering and, as such, have intrinsic moral value. But how can we define 'damage'? In biological terms it is not possible to give a definition, otherwise all carnivores that live in the wild by hunting prey, would also fall into the category of 'harmful animals' (for example: lions, *Panthera leo*; tigers, *Panthera tigris;* hyenas, *fam. Hyaenidae*; bears, *Ursus spp;,* leopards, *Panthera pardus,* and so on). 'Harm' is a human moral category. However hard one may try to give a biological definition to the word 'harm', the fact remains that it is a human value. Consequently, decisions on the management of 'harmful' animal populations are entirely the prerogative of human beings and at the service of resolving the interests of the human species, which vary in different parts of the earth.

Although there is now a widespread view (since the last quarter of the 20th century) (see for example De Vries, 2008) that animals have an intrinsic value as sentient beings and that they therefore are bearer of interests, humans still feel that they have to choose which interest has to prevails when two (or more) species are in conflict.

There are different positions on this issue. I will mention some of them.

The position that human beings choose which interest has to prevails when two (or more) species are in conflict is somewhat in contradiction with bioethical statements such as <<animals have a 'value of their own' (or a *telos*, of Aristotelian memory), which is independent of their utility-value for humans>> (Verhoog, 1992). But Verhoog, 1992 also argues that the characteristics which make it justified to consider the animal as having a 'value of their own', and that constitute the 'nature' of the animal, have neither to be made nor changed by humans. In other words, the less the animals are adjusted by humans, the more their good is their own (Verhoog, 1992). This position seems to me quite weak because, according to it, the feral domestic cat, i.e. an animal that after having gone through the domestication process has returned to a "wild" life independent from humans, has a lower intrinsic value than wild species hunted by it, paradoxically whatever they may be, from the sewer rat (*Rattus norvegicus*, certainly not endangered) to the yealkouan shearwater (*Puffinus yelkouan*, endangered). But from a conservationist perspective, the rat (it does not matter if alien or native) and the cat are 'worth less' than the yealkouan shearwater.

However, in the biological perspective it is relatively undisputed that animals 'strive' to realise their species-specific nature or *telos*: they try to survive, develop, reproduce and display species-specific behaviour (where humans do not prevent it). Continuing the bioethical debate, Musschenga (2002) asserted that humans' direct duties toward animals involve ensuring an acceptable level of well-being, satisfactory health, and a natural life. This refers to a life in which animals can develop their natural capacities and adapt. Thus, in the management of feral cat populations, as much as of pet cats, humans are in clear conflict with themselves because they are incapable of ensuring a natural life for animals, except at the expense of other populations of sentient beings (the preys) with the same intrinsic moral value as cats. The latter are obligate carnivores and, as already said, are efficient hunters; they were domesticated because of their predatory efficiency and human beings have been responsible for their spread worldwide and their introduction to environments where they were not native.

In this article, my analysis is focused mainly on vertebrate organisms (invertebrate species represent only a little part of cat diet), thus it is possible to affirm that they all, predators and preys, have moral value and, consequently, are bearers of interests, as Peter Singer claims in his classical Practical Ethics (1979). According to Singer's position, it should be followed the principle of 'equality of interests', i.e. equal interests must be valued equally, regardless of the species to which they belong (i.e.: a prey's interest in not being killed counts more than a cat's interest in killing it for fun) and, then, differences between different moral subjects may result in conflict being resolved in favour of one party (i.e.: all things being equal, the life of a domestic cat is worth less than the life of a native Australian bird). Again, I do not believe that the problem described in this article can be resolved by the principle of 'equality of interests' because in this case there are great difficulties in putting it into practice (which then includes who actually decides). How can one even imagine considering the interests of so many species with so many individuals, thus in very complex environments? And, then, who makes the final decisions? In short, even if one adopts this criterion of impartiality of interests, the practical problems remain. Because, again, is the human species that decides on the base of human moral values (right or wrong).

6. Conclusions

I do not think there is any solution to this problem, at least not in short time. But the available scientific literature could help with some suggestions. For example:

- in places on earth where cats live in colonies and receive supplemental food from humans, give preference to grain-free food with meat-derived proteins, since it has been shown that this food reduces cat predation of wild animals (see Cecchetti et al., 2021);
- to undertake further studies on the evolved avian (or other preyed taxa) anti-predator strategies against cat hunting; the potential application of the researches could lead to the development of non-

Table 1
Definition of feral cats.

Since the definition of feral cats is still a debated issue, I need here to clarify it. In the available literature there are several definitions, responding to different criteria ranging from origin of the domestic cat (abandoned by humans, offspring of a feral female cat, lost by an owner) to dependence on/independence from food supplied by human beings, to socialization status to human beings (reviewed in Natoli et al. 2019). In an attempt to be as unambiguous as possible, I have decided to distinguish between owned and unowned domestic cats in my articles. This is because, regardless of the origin, freedom to roam and socialisation level of the cats (in many situations and environments domestic cats are a mixture of these categories), the distinction between having or not having an owner is clear. And it represents an indispensable basis for the bioethical debate on management approach of both. Feral cats are always unowned, and so it is in most literature on the subject. In contrast, some free ranging cats can be owned. All the cats mentioned (unowned feral cats and all owned cats), are domestic cats, thus gone through the domestication process and belonging to the *Felis s. catus* taxonomic group.

lethal deterrents or new applications of avian anti-predator strategies;
- increase scientific research to make methods of controlling feral cat populations more humane, yet effective, by using genetic biocontrols and/or contraceptive baits to reduce cat fertility.

There is an urgent need to humanize the methods of controlling populations of feral domestic cat, and other invasive alien species of super-predators (like the fox, *Vulpes vulpes*) and meso-predators (like the rats, *Rattus* spp.) and, at the same time, there is an equally urgent need to safeguard the damaged prey species.

But it has to be clear, without further hypocrisy, that this is a problem created by human beings through their unwise behaviour and choices. Humans represent the most invasive vertebrate species and, in a way, their management of other species, including the domestic cat, is one of the many factors by which he has manifested his invasiveness.

CRediT authorship contribution statement

Natoli Eugenia: Writing – review & editing, Writing – original draft, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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