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Research article

Wanted dead or alive: ethics and animal welfare in food choice

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Abstract

The use of live food in zoological collections is a constant source of debate, with multiple approaches to discussions of implementation. The debate can be divided between those 'internal' (professionals within captive care) and 'external' (public) to the zoo world. Generally, there is a certain objection by a part of the public to the use of live prey, especially regarding the use of animals that commonly generate empathy such as mammals. The public is more likely to accept this practice if it is performed behind the scenes. The focus is often on the visual impact of such a practice, especially on families visiting with children. Additionally, each country has its own national regulations and therefore public perception may be different. Internally in the community of zoo professionals, the debate should be centred primarily on animal welfare—of both predator and prey. Some of the factors that should be considered are positive stimulation of predatory instincts with environmental enrichment, pain and stress for the prey and in turn injury to the predators, sanitary risks and conditions of the facilities. The European Zoo Nutrition Conference 2023 was considered an appropriate event at which to highlight the situation, presenting the latest research on this issue, combined with data provided by conference participants. The authors hope to generate a purposeful discussion to address this 'elephant in the room'.

Introduction

Animal welfare is one of the priorities of modern zoos, which are interested in increasing the quality of life of their animals and in giving the best image of the zoo to visitors (Warsaw and Sayers 2020). Wickins-Dražilová (2006) considered that despite conservation, education and research programmes, the existence of zoos in the 21st century can only be ethically justified if zoos guarantee the welfare of their animals. At the legal level, Directive 2010/63/EU establishes measures for the protection of animals used for scientific or educational purposes and requests to "avoid inflicting undue distress, pain and suffering on an animal". These directives are referred to in the national legislation of most European countries when implementing animal welfare measures. Multiple factors influence animal welfare, such as diet and housing, the presence of environmental enrichment and disturbance of the correct behavioural development of the animals. In the last 20 years there have been great advances in animal training, focused on improving animal care, and environmental enrichment programmes (Fernandez and Martin 2021). Research conducted in zoos has focused primarily on environmental enrichment, enclosure structure and other aspects of the interaction between animals and their environment that may affect their welfare.

Analysing the research carried out in zoos in the last few decades, it can be observed that studies on animal behaviour have always been a priority. Studies on the effects of environmental enrichment, which have been scarce until 2008, have increased considerably in the last decade. At the

taxon level, studies over time show a bias towards mammals, although the number of mammal species in zoos are on average less than that of fishes and birds (Anderson et al. 2008; Binding et al. 2020; Miranda et al. 2023; Wemmer et al. 1997). One of the stimuli applied in environmental enrichment programmes is food. Thanks to modern technology, it is possible to monitor animals in detail, discriminating their reactions based on the stimulus, and to estimate how variations in diet and food presentation influence animal behaviour (Boissy et al. 2007; Riley and Rose 2020; Whitham and Miller 2016). Despite a greater understanding of, and improvement in, animal welfare in zoos, there is still much debate over the use of live prey for animal feed. The collection and critical analysis of expert opinion, and exploration of the arguments for and against the use of live food, could provide the basis for a more consensual view on this issue. For this reason, a survey was conducted among the participants of the European Zoo Nutrition Conference 2023 (hereinafter Nutrition Conference) organised by the European Zoo Nutrition Group of the European Association of Zoos and Aquaria (EAZA), with a presentation and discussion during the conference itself. Some of the results are presented here.

Table 1. Main arguments for and against the use of live food in zoos from the participants of the European Zoo Nutrition Conference 2023

Reasons for use of live food	Reasons against use of live food
Shows the cycle of life	Causes pain to the prey
Stimulates appetite of predators	Unfair, because prey has no chance of escape
Provides physical activity for predators	If vertebrates are not used, then insects should not be either
Live food is preferred by the animal	Necessary to develop better environmental enrichment techniques instead of continuing to use live prey

Materials and methods

Conference participants received an anonymous form with the following questions: 1) What country are you from?; 2) Approximately how many carnivore (mammal) species are in your zoo?; 3) Approximately how many carnivore (reptile/amphibian) species are in your zoo?; 4) Does your country's national legislation restrict the use of live food in any way (e.g., allows feeding of live mammals only in registered collections)?; 5) If the answer to the previous question is yes, please explain the restrictions; 6) Does your institution approve of the use of live food?; 7) If the answer to the previous question is yes, do you have any internal guidelines on the matter?; 8) Have you ever had public discussions on live feeding of animals?; and 9) Is use of the following considered acceptable as live food: a) invertebrates, b) fish, c) amphibians, d) reptiles, e) birds and f) mammals.

The results were presented at the Nutrition Conference in a presentation/discussion mode and participants were able to comment on the results. The comments were not evaluated quantitatively but have been integrated into discussion of the responses below.

Results

Representatives of 38 institutions from 17 countries participated in the survey (Figure 1). Most zoos had between 10 and 50 species (n=24) of carnivorous mammals in their collections, followed by zoos with less than ten species (n=12). For reptiles and amphibians, the same number of institutions held less than ten species and between 10 and 50 species (n=17 each) (Figure 2).

In the survey, 32 respondents (32/38, 84.2%) reported that their country's legislation restricts the use of live food. For

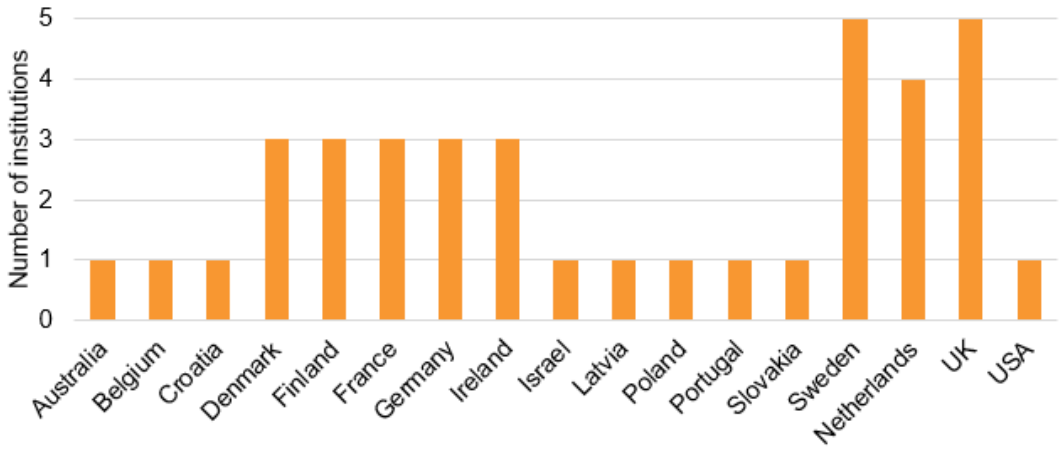

Figure 1. Location of institutions participating in the survey

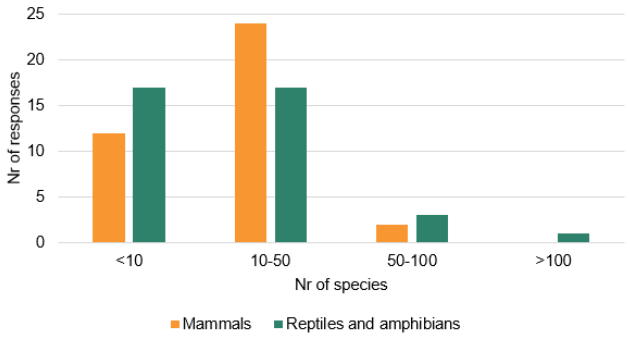

Figure 2. Number of predator species (mammals and reptiles/amphibians) present in participants' collections

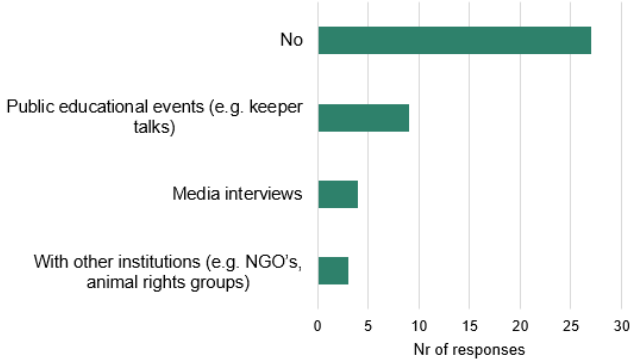

Figure 3. Answers to the question: "Have you ever had public discussions on live feeding of animals?"

vertebrates, the main reasons for restrictions were animal welfare and veterinary sanitation. In the survey, 23 respondents (23/38, 60.5%) reported that their institutions use live food, mainly invertebrates, although there were cases that reported the use of live fish, reptiles and amphibians. There were also some cases of wildlife rescue centres that reported the use of rodents as live prey for wild animals prior to their release. Many respondents stated that there were no internal or external guidelines, and when asked for elaboration they referred to restrictions on the supply of live mammals and birds. In the survey, 27 respondents (27/38, 71.1%) reported that no activities had ever been carried out to talk to the public about the use of live food (Figure 3). The use of invertebrates as live food was considered acceptable by most survey participants (n=32). Birds (n=30), mammals (n=29), reptiles (n=25) and amphibians (n=23) were not considered as live food options in the majority of the submitted answers. Use of fish as live food shows the greatest variety in opinion (Figure 4).

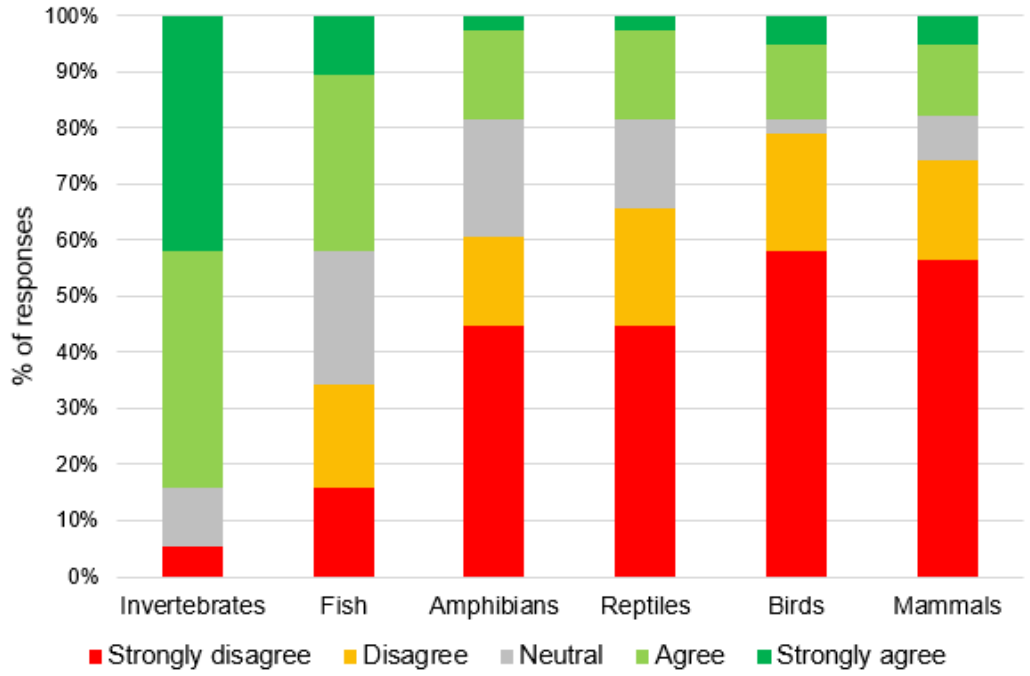

Figure 4. Answers to the question: "Is use of the following species as live food considered acceptable?"

Discussion

The use of live food and even more so the choice of the species used for this feeding technique remains a subject of debate. The advantages and disadvantages of using live food are discussed below, supporting both positions using data extracted from scientific publications. The aim is to encourage the reader to think, by giving examples of how to approach the argument. A more in-depth study of the subject exceeds the scope of this work. To facilitate analysis, aspects that can influence decisions about the type of feeding used were approached individually. Participation in the survey, with 38 participants from 4 continents, allows the argument to be evaluated on an international level.

The results of the survey seem to indicate a very wide acceptance of the use of invertebrates as live prey, with only two submitted answers expressing a negative response regarding their use. There is also broad rejection of the use of mammals and birds as live food (Figure 4). This could be interpreted, at least partially, as respecting national animal welfare legislation prohibiting the use of vertebrates as live food. Respondents that reported a lack of national legislation on the use of live food were more in favour of the use of live vertebrates as food. One case of interest relates to two respondents from the same country, one who stated that their country has no legislation on animal welfare and was in favour of using vertebrates as live food and the other who stated that there is legislation. This could be due either to confusion, a mistake or misinformation on the part of one of the participants. To obtain a more complete picture of how the use of insects and vertebrates as live food is perceived, a sociological study might be of interest, especially considering that recent studies, although debated, seem to indicate that invertebrates also feel pain (Keller 2017). The survey conducted during the conference allowed many of the participants to present their arguments for and against the use of live food (Table 1).

As reported by Warsaw and Sayers (2020), improvement in the living conditions of zoo animals is—among other reasons—due to the better image that these institutions want to give to the public. However, during debate at the Nutrition Conference, participants in favour of using live food argued that it is a valid tool to show the cycle of life to the public. Another argument was that the development of natural behaviours helps to improve welfare of predators. However, many predators are also opportunistic carrion feeders and showing a group of carnivores feeding on a dead carcass—carrion—would give sufficient basis to talk about the life cycle or develop natural behaviours of the animals. The data show that 71% of respondents (27/38) have had no public discussions about the use of live food. This lack of communication with the public about the use of live food seems to contrast with the idea of using this feeding system to transmit information to the public. In addition, live feeding tends to take place mainly outside of visiting hours, further invalidating the concept that its use is related to educational purposes. In any case, public acceptance of animal feeding techniques should always be secondary to animal welfare—for both predator and prey. Educators should take care to inform visitors of the ethical and animal welfare reasons behind feeding decisions.

Learmonth (2019) suggests that offering zoo animals a 'wild' experience, trying to replicate natural behaviours in an anthropogenic environment such as a zoo, is less relevant than offering animals the conditions necessary for 'a life worth living'. Using a hypothetical example raised during the Nutrition Conference, will a Siberian tiger housed in a zoo in central-southern Europe see the introduction of a live rabbit in its enclosure as a suitable representation of its natural environment and thus be able to satisfy its behavioural needs? Or should it be assumed that this animal is not living in its natural environment, and due to advancement in knowledge and husbandry skills it is instead possible to offer anthropogenic stimuli, which—although not present in nature—allow the animal to develop appropriate behaviours? Bashaw et al. (2003) found that by stimulating large felids with the presentation of leg bones or live fish "both techniques appear to have sustained effects on behaviour lasting at least two days after presentation, which may indicate their ability to alter the animals' underlying activity patterns". The study showed that both stimuli helped to reduce stereotypies in a zoo setting. Live fish, introduced into shallow ponds within the facilities just prior to the introduction of the predators, generated natural prey-catching behaviours in Sumatran tigers and were attractive to them for ten minutes. It might be appropriate to consider whether the stimulation produced by the fish for ten minutes could be obtained by offering food stimuli (not live prey) within a well-developed environmental enrichment programme. A similar example is found in Fernandez et al. (2021), which showed increased activity in Humboldt's penguins when fed with live prey. From an ethical point of view, it should be assessed in this case whether the use of live prey is truly the only way to stimulate penguin swimming. From the description and pictures of the facilities described in that study, their environment appears to be a pool without any stimulation, and an environmental enrichment programme could have likely obtained similar results. However, the implementation of structured and long-lasting environmental enrichment plans requires time and dedication on the part of keepers or animal welfare staff, which can be a limiting factor.

The use of live prey often stimulates appetite, and this aspect is used in wildlife rescue centres or in the breeding of species that are very selective with food (e.g., baby seahorses). Both points are reflected in the comments of participants at the Nutrition Conference. It is important to point out, however, that these are exceptions where other feeding systems do not guarantee the same results. In general, zoo animals suffer more from obesity complications than from starvation (Liesegang et al. 2008; Videan et al. 2007).

Considering the argument with respect to prey species, obtaining food for a predator in a zoological collection causes the death of another animal. Although pain cannot be totally eliminated, reducing it as much as possible should be the aim of all nutritionists or those in charge of feeding protocols at zoological collections. Even standardised slaughterhouse methods aimed at reducing the pain of the animal about to be slaughtered cannot remove it completely (Mota-Rojas et al. 2021). To kill prey, a predator usually relies on its instinctive behaviours enhanced by practice and learning from conspecifics. The hunting ability of captive reptiles and amphibians can be considered similar to that of wild conspecifics. However, reptiles and amphibians have been widely bred in captivity and have shown a high acceptance of dead prey. In many cases, a discriminating factor towards the use of live prey for these taxa is based on the time that keepers have available to train the animals to accept dead prey. It is important to remember that accidents can be caused by live prey (mainly rodents) fed to reptiles and amphibians without supervision. In the case of live prey supplied to mammals, the example of the Siberian tiger and the white rabbit is informative. If the rabbit were introduced into a completely foreign environment, it would most likely 'freeze' as a defence. The tiger would begin to play with the rabbit, likely in a long process that would generate unnecessary suffering for the prey. However, an escape attempt by the prey and subsequent chasing by the tiger cannot be excluded; in this case, there would be a physical risk for the predator, which could accidentally collide with solid structures of the facility.

In conclusion, the use of live prey should be contextualised and can be a tool in extraordinary situations. Live prey should not, however, be considered as the first option in ordinary situations

and its implementation should reduce the unnecessary 'waste' of animals used as food. Implementation should be evaluated from different points of view (e.g., economic, social, ethical), considering animal welfare of both predator and prey as the main reference.

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