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ARTICLE

An Assessment of Welfare Conditions in Wildlife Markets across Morocco

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ABSTRACT

The welfare of wild-caught animals in markets has generally been overlooked by both wildlife trade and welfare studies, despite the potential negative impacts on the animals. Morocco is a member of the World Organisation for Animal Health and has proposed draft legislation prohibiting mistreatment or abuse of animals in captivity. There is still, however, a bustling wild animal trade, and vendor compliance with industry-standard best practices is lacking. This study provides insight into the conditions of 2113 wild-caught animals in markets in six of the largest cities in Morocco by scoring their welfare based on four of the Farm Animal Welfare Committee Five Freedoms: freedom from hunger and thirst, freedom from discomfort, freedom to express normal behavior, and freedom from distress. Over 88% of animals were housed in situations that broke all four of the freedoms measured, and only 9 animals were in situations that broke none. Access to water, sun/heat exposure, and ability to hide from stressors were particularly poor. We urge the Moroccan government to fulfill its commitment to establish welfare laws and devote resources to their application.

KEYWORDS

Five Freedoms; Mediterranean; pet; wildlife trade; welfare assessment

Introduction

Humans, by virtue of removing nonhuman animals from the wild for use as companion animals (pets), for use in medical practices, or for entertainment, take control of the welfare of the animals involved. Mellor, Patterson-Kane, and Stafford (2009) argued that in any situation in which animals are used for human purposes, we are obliged to take into account, and where possible improve, the welfare of these animals using scientific criteria and rigorous observations to monitor them. Although animal welfare is potentially compromised at all stages of wildlife trade, Baker et al. (2013) observed that wildlife trade studies have not traditionally addressed the welfare of the animals involved, especially in the case of animals caught in the wild. Several studies have focused on the links among wildlife trade, welfare, and mortality (Ashley et al., 2014; Carder, Proctor, Schmidt-Burbach, & D'cruze, 2016; Fuller, Eggen, Wirdateti, & Nekaris, 2016; Iñigo-Elias & Ramos, 1991; Robinson, John, Griffiths, & Roberts, 2015), welfare aspects of animals confiscated from the illegal wildlife trade (Fuller et al., 2016; Moore, Cabana, & Nekaris, 2015; Schmidt-Burbach, Ronfot, & Srisangiam, 2015), and the legal implications of the link between wildlife trade and welfare (Das & Narayan, 2016; Sollund, 2011), but very few have focused on the welfare of the animals within wildlife markets. Baker et al. argued that although the issue of welfare and wildlife trade has been raised, more attention must be paid to the conditions in which live animals are traded, in particular those animals traded in large numbers for use as pets or entertainment.

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Animal welfare in markets has been overlooked partially because it is seen as a transit stage of their captivity and therefore is not significant. With around a 16% turnover of tortoises in Moroccan markets after one week, it is apparent that some animals will not spend a very long time in the conditions seen in these markets (Nijman & Bergin, 2017a). Some animals, however, will spend longer periods in captivity and will experience prolonged periods of negative welfare conditions. From 10 weeks to 12 weeks, turnover estimates only increased from 74% to 75%, indicating that a significant number of animals (~25%) spend several months in these markets (Nijman & Bergin, 2017a). Animals used as photo props or to entice customers to a shop can spend months or even years in these situations.

Using different grading indicators, it is possible to assess the likely impacts of external physical and mental stimuli on the well being of animals in captivity, while taking into account social and biological needs (Mellor et al., 2009). The Farm Animal Welfare Committee (FAWC) detailed the Five Freedoms designed to represent conditions essential for the basic physical and mental well being of animals in captivity. These freedoms are defined as: freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury, or disease; freedom to express normal behavior; and freedom from fear and distress (FAWC, 2009). Complete accordance with these freedoms is not always practically achievable, and in reality, animal welfare exists on a continuum with a complex relationship between suffering and welfare in which a reduction of one does not necessarily lead to an increase in the other (Mellor et al., 2009).

The Five Freedoms have been referenced directly or indirectly in the keeping and transportation guidelines outlined by entities such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the World Organisation for Animal Health (OIE). Although CITES only refers to the international transport of animals, the cage, food, and water requirements have been influenced by a desire to provide good welfare for animals and to reduce the risk for unnecessary fear, injury, damage to health, and suffering of animals in transit. The OIE provides welfare guidelines for animals in many forms of captivity. These welfare guidelines are used to design policy and legislation around the world.

Morocco has a range of habitat conditions, from mountainous regions to Mediterranean coastline to arid desert, and therefore, it contains a rich biodiversity. Both domesticated, captive-bred animals and wild-caught animals are kept and sold openly in pet shops, marketplaces, and squares (Bergin & Nijman, 2014; Nijman, Bergin, & Van Lavieren, 2016; Znari, Germano, & Mace, 2005). For some species, the number of individuals affected by this trade is high (Bergin & Nijman, 2014; Nijman & Bergin, 2017a, 2017b). The welfare of these animals does not appear to be prioritized, and the conditions in which they are kept are very poor (Bergin & Nijman, 2014; Martin & Perry-Martin, 2012; Shipp, 2002; Van Lavieren, 2008). Morocco is a member of the OIE, and in 2013, the government proposed draft legislation (Law 122–12, Article 14) prohibiting the mistreatment or abuse of animals in captivity, with fines of up to MAD 20,000 (US$2000 at 2016 exchange rates). Article 14 of this legislation states that animals must be kept in conditions compatible with the biological requirements of their species. However, the proposed legislation does not appear to apply to mistreatment due to negligence and does not incorporate all the OIE's guiding principles and standards for animal welfare (World Animal Protection, 2014). This legislation has finished its consultation period but has yet to be enacted. Law 29–05 on the Protection of Species of Flora and Fauna and the Control of Their Trade deals primarily with the sustainability of trade of wild animals. Article 11 (B) of Law 29–05 indicates that all animals in trade shall be prepared and transported in a manner that avoids the risk for injury, illness, or ill treatment but does not further elaborate. Articles 601, 602, and 603 of the Moroccan Criminal Code No. 1-59-413 1962 prohibit the unnecessary killing or maiming of pets.

We here report on the welfare conditions of mammals and reptiles taken from the wild and displayed in Moroccan markets, including those animals who are sold as pets, live animals sold for medicinal purposes, and animals kept as photo props. We aimed to quantify the welfare conditions of these animals while also contextualizing this information.

Methods

The first author visited the wildlife markets in Marrakesh, Fez, Casablanca, Meknes, Tangier, and Rabat in Morocco a total of 40 times from April 2013 to April 2017 to collect data on the wildlife on offer. Data specifically referring to the welfare of the animals in these markets were collected on 2 visits to each city, 1 in May 2016 and 1 in May 2017. Welfare was judged for all wild-caught animals present in the markets during these 12 visits. Wild animals in Morocco are traded in pet shops but more frequently in open markets. Towns and cities in Morocco often have multiple markets, and while wildlife tends to be concentrated in a single market, individual vendors in different locations are also present. Not every animal is necessarily visible at any given time, but there is no apparent attempt made to conceal animals from view; in fact, live animals are generally one of the most prominently displayed goods in shops. Animals are also displayed outside shops in an attempt to attract customers and are kept in squares for use as photo props. The Northwest region of Morocco in which the surveys were carried out has a typical Mediterranean climate with moderately hot summers and mild winters; in the summer months especially, the conditions in the markets can be extremely hot. For instance, in Marrakesh in April, the mean temperature is ~ 18°C but can be as high as 27°C, whereas in July and August, temperatures of 42°C have been recorded.

Due to the noninvasive nature of wildlife trade surveys and the need for a rapid scoring method, welfare was assessed based on husbandry factors that did not require physical contact with the animals and that were observable in a short period of time. Freedom from pain, injury, or disease could not be estimated because the animals could not be closely examined, although injuries and deceased animals were common. For the other four freedoms, six indicating factors were noted from which conclusions about the welfare conditions could be drawn (Figure 1). These indicators were: (a) access to appropriate food (scored as a yes or no), (b) access to water (yes/no), (c) ability to control heat or sun exposure (able/unable), (d) material of the floor of the enclosure (uncovered steel bars/plastic, wood, or otherwise comfortable floors), (e) proximity to conspecifics (sufficient space/overcrowded), and (f) ability to retreat from stressors (able to hide/unable to hide). Due to the inability to gather invasive data on the animals, we were unable to grade the welfare of animals according to the Five Domains model proposed by Mellor et al. (2009). A χ^2 test showed no significant differences in the welfare conditions of animals between years; thus, the data were grouped together. We tested for differences between the six welfare indicators using χ^2 tests by adjusting the sample sizes to the city with the smallest sample size (Meknes, 49 animals) and accepting significance when p was $< .05$ in a two-tailed test.

Contextualizing information was gathered on all 40 visits to the markets during informal conversations with vendors. This information was freely given, and no personal details were recorded about those who provided it. Excessive interest in animals for sale was avoided, no animals were purchased, and no money was given for photographs during the course of this survey to avoid stimulating the trade. Observer reliability was assessed on the conditions of 208 animals in Marrakesh in 2017. The first author and a visiting researcher separately evaluated the welfare of the observed animals and compared the results, and they found negligible difference in their assessments. Ethical approval was granted by Oxford Brookes University.

Results

Marrakesh had the most vendor or photo-prop stalls containing wild-caught live animals with 25 stalls, while Meknes and Rabat had as few as 2 stalls on some visits. Casablanca and Marrakesh had the greatest number of live wild animals in markets, with averages of 290 and 285 over the two years, respectively, followed by Tangier with an average of 223. The vendors were almost exclusively male, and all except three sold other goods such as herbs, spices, souvenirs, medicinal products, fabrics, or domesticated animals alongside the wild animals. Prices ranged from US$1 for a small spur-thighed tortoise (*Testudo graeca*) to US$500 for a Barbary macaque (*Macaca sylvanus*; though the macaques were primarily used as photo props). Welfare conditions were scored for 2113 animals in 61 enclosures in 48 shops, and 94%

of the animals were spur-thighed tortoises. Only 9 animals (all Bell's dabb lizards [*Uromastyx acanthinura*] in a single enclosure) were seen in conditions that were not assessed as breaking any of the four freedoms measured, with 88% of animals being kept in situations in which all four freedoms were broken (Figure 2). The ability to hide from stressors (present for 9% of the individuals), access to water (5%), and ability to control sun exposure (1%) were notably poor (Figure 1). Space restrictions were a common problem, especially for tortoises. In 22 enclosures, we observed so many tortoises that some could not touch the floor (Figure 3). Attempts to stimulate animals in a positive manner were rare as only 11 of the observed cages had any sort of enrichment attempts.

There was a statistically significant difference between cities in terms of the floor conditions (χ^2 = 19.289, df = 5, p = .0017); this difference was driven by Casablanca and Rabat, which had predominantly acceptable floor conditions while other cities did not. Likewise, for food (present or absent), there was a tendency for cities to differ (χ^2 = 8.578, df = 5, p = .127); this finding was mainly driven by Casablanca as very few individuals there had access to food. For the other conditions, we did not find any significant differences between cities (all χ^2 < 2.168, df = 5, p > .825).

In this survey, there was no way to accurately check for the presence of diseases. However, ticks on tortoises and North African hedgehogs (*Atelerix algirus*) were common, and recently deceased animals, especially Mediterranean chameleons (*Chamaeleo chamaeleon*) and spur-thighed tortoises, were regularly seen. Snakes were grouped together for this study but included 51% puff adders (*Bitis arietans*), 22% Egyptian cobras (*Naja haje*), and 27% unidentified species. Unidentified snakes were likely from the families Viperidae, Colubridae, and Lamprophiidae (Pleguezuelos, Feriche, Brito, & Fahd, 2016).

In conversations with vendors, they did not generally seem receptive to suggestions of improved welfare. In some instances, the researcher was informed that the animals did not require drinking water; in others, we observed on subsequent visits that the researcher's suggestions to add water to

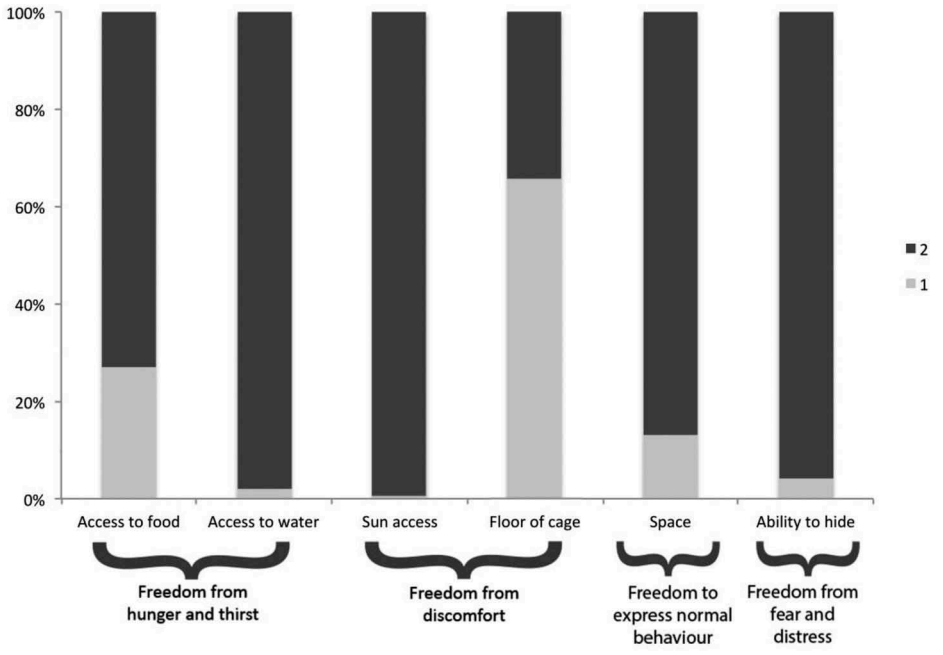

Figure 1. Welfare conditions of 2113 animals observed in the wildlife markets of six cities in Morocco in April 2016 and April 2017.
Note. Access to food: 1 = yes, 2 = no; access to water: 1 = yes, 2 = no; heat exposure: 1 = able to escape from or enter sunlight at will, 2 = unable to control sun access; floor of enclosure: 1 = acceptable floor, 2 = uncovered steel bars or covered only with rotting food; space: 1 = sufficient space, 2 = isolation or insufficient space; and ability to hide: 1 = able to hide, 2 = unable to hide. The brackets indicate the four Farm Animal Welfare Committee freedoms measured in this study.

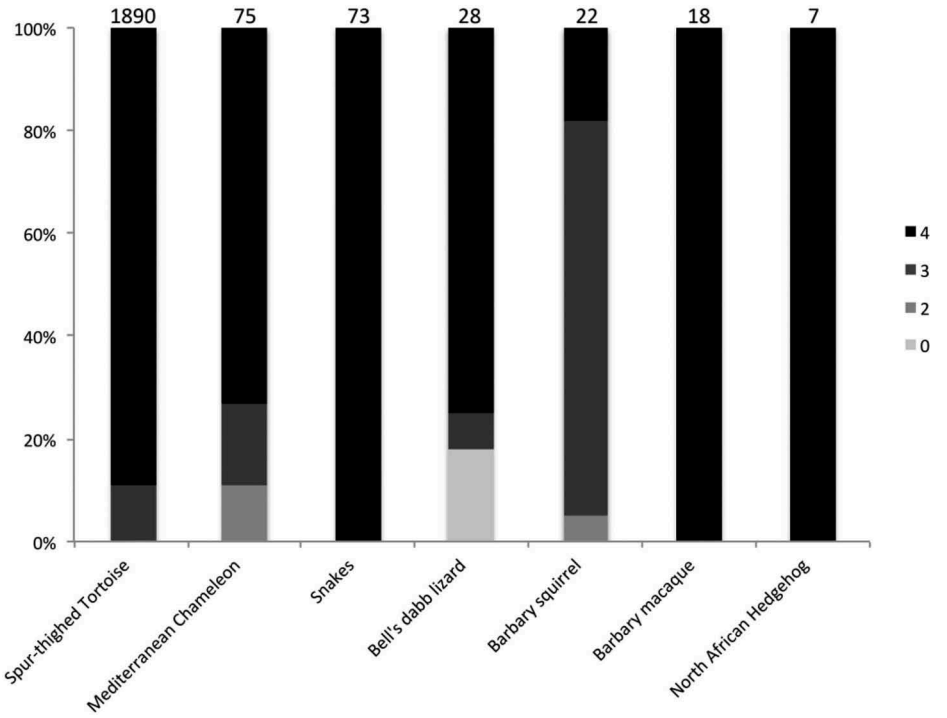

Figure 2. Species observed in wildlife markets in six Moroccan cities in April 2016 and April 2017 showing how many were kept in conditions that violated four of the Five Freedoms (freedom from hunger and thirst, freedom from discomfort, freedom to express normal behavior, and freedom from distress). The key represents the number of freedoms broken (no specimens were observed breaking only one freedom). Total number of each species observed is shown above each column.

animal enclosures had been ignored. Vendors informed the researcher that terrapins—who live in freshwater environments—could be released into the sea, and deceased animals rotting in cages with live animals were not always removed when noted by the researcher.

Discussion

The conditions of wild animals kept for sale or used for entertainment in Morocco were almost universally poor. In conversations with vendors, they possessed little knowledge of proper care and advised poor care and transportation practices, reflecting those observed in the markets. In many of the observed instances, increasing the animal's freedoms would not necessarily result in sufficiently appropriate welfare. Markets are busy, hot, stressful places for wild animals, and good welfare equates to more than the absence of negative influences; contemporary animal welfare thinking is that animal welfare should also include positive influences (Mellor & Beausoleil, 2015). Vendor apathy indicated they are unlikely to work toward eliciting positive welfare states in animals if the effort level is high and the incentives are low or absent.

Freedom from hunger and thirst

Although 37% of animals had access to food, much of it was rotting and only lettuce and mint leaves were seen given to the animals (Figure 3[d]). Animals require variation in their diets: Spur-thighed tortoises eat at least 34 species of plants in the wild (Cobo & Andreu, 1988); Barbary ground squirrels (*Atlantoxerus getulus*) eat manly fruit, seeds, and nuts (López-Darias & Nogales, 2008); and Mediterranean chameleons, despite commonly held beliefs in Morocco, cannot survive solely on

Figure 3. Welfare conditions of wildlife in markets in Morocco. (a) Chameleons were used to attract tourists to spice shops and were sold as pets. (b) A snake charmer in Marrakesh's Jemaa el Fna using cobras and pythons as photo props for tourists and locals. Cobras were regularly worked up into a state of distress for pictures. (c) Spur-thighed tortoises in Tangier crammed into a cage in which many could not touch the floor. (d) A Barbary ground squirrel (*Atlantoxerus getulus*) in Marrakesh in a cage with spur-thighed tortoises (*Testudo graeca*) and rotting lettuce. The bars on the floor of this cage were left uncovered.

mint leaves (Highfield & Bayley, 2007; Figure 3[a]). Although other food may, and in some cases, must have been given outside of observed market hours, vendors frequently mentioned in conversation their belief that a diet consisting of entirely lettuce was appropriate for many species, indicating that the variety of food offered to animals is often insufficient.

Readily available water was rarely seen in animal enclosures, even for those who were kept in direct sunshine for the majority of the day. Few enclosures even had a mechanism for storing water. Vendors informed the researcher that tortoises did not require drinking water. However, tortoises, especially smaller ones, require regular access to water, and lack of water may result in kidney disease and bladder stones (Highfield & Highfield, 2008). Mammals and other reptiles also require regular access to water to keep from becoming dehydrated.

Freedom from discomfort

Enclosures were poorly designed to provide comfort to animals and were frequently overcrowded, particularly for tortoises. Tortoises were often seen piled on top of one another, and some could not even reach the floor of the enclosure (Figure 3[c]). In more than 30% of the enclosures, the floors of cages were left uncovered and provided no relief for animals from the bars digging painfully into their feet (Figure 3[d]). Despite the extreme heat of some summer days in Morocco, we observed only five containers that allowed animals access to both sun and shade (Figure 3[b]). This situation would cause great discomfort as reptiles thermoregulate by entering and exiting sunlight and mammals easily overheat if exposed to direct sunlight for a prolonged period, especially without access to water.

Freedom from pain, injury, or disease

Although the presence of disease could not be accurately determined, the close proximity of animals and the poor cage-cleaning practices—with rotting lettuce and feces often left in the cages (Figure 3[d])—meant that any illness or disease present in one individual could easily spread to others. Checking for injuries would require a thorough examination of the animals, which was not possible, though obvious wounds and deceased animals indicated that injury and disease were present.

Freedom to express normal behavior

Almost 90% of animals observed were in cages in which their normal movement was restricted by a lack of space (Figure 3[c]). Overcrowding was judged on species-specific criteria based on the life history of the particular species. Snakes, for example, were assessed as requiring more space to retreat from conspecifics than Barbary ground squirrels, a more sociable species. Incidents in which an animal did not have space to avoid physical contact with a conspecific were always considered inappropriate and were regularly observed. This overcrowding of animals not only leads to discomfort, but also prevents them from retreating from their conspecifics if desired and severely hinders normal social interactions, especially for largely solitary animals such as tortoises or snakes. Other species such as the Barbary ground squirrel were seen mostly in isolation, despite their social nature. Close confinement and isolation of social animals in threatening and/or barren environments may lead to experiences that include various combinations of fear or panic (Mellor, 2017). The vast majority of animals received very little stimuli that would emulate a normal environment as any form of enrichment was rarely seen.

Freedom from fear and distress

In Morocco, animals are generally kept in front of a shop or stall to be most visible to potential customers, and only 9% of animals had the ability to hide if so desired. Animals therefore have to deal with the near-constant presence of people who are encouraged to handle them and interact with them. Egyptian cobras were kept in a state of agitation to evoke a defense posture with the hood on show because they were therefore seen as more photogenic. Barbary macaques were forced to regularly interact with people and often showed signs of distress and stereotypic behavior. Although the stress animals experienced in these conditions was not measurable, the fear caused by human presence coupled with their forced proximity to conspecifics undoubtedly caused fear and distress.

Moroccan welfare laws and their relevance to welfare in markets

The laws in Morocco do not currently reflect the commitment of the government to animal welfare. The vast majority of animals in Moroccan markets are experiencing poor welfare conditions, which would be in breach of the proposed Law 122–12 as the conditions are not suitable for the biological needs of

these animals. Simple improvements in housing and care such as access to water and shade would greatly improve the animals' quality of life and decrease their mortality rate and would therefore benefit both animals and traders. Enacting this law, which was produced in 2013 and has finished the legislative consultation period, would allow for authorities to intervene in the widespread abuse of animals in markets. New animal welfare laws must be used in conjunction with Law 29–05, which prohibits the sale of CITES-listed or nationally protected animals, to influence the selling or keeping of animals in markets and direct people away from unsustainable and cruel practices.

Despite vendors' unwillingness to increase animal welfare at the suggestion of the researcher, more long-term, focused efforts have achieved results in the past. The Society for the Protection of Animals Abroad has greatly increased the focus on the welfare of horses used to pull tourist carts in Marrakesh and has improved conditions for these animals (Jones, 2003).

In ideal circumstances, there are many changes that would allow for the wild animals in Moroccan markets to experience more positive welfare circumstances. These changes include a white list of allowable pets, a licensing system for vendors, and vendors keeping records of the animals in their care (de Volder, McLennon, & Schmit, 2013). However, given the current apathy of vendors and the government toward animal welfare, we propose more achievable goals that will impact the welfare of these animals. Many of these goals are in line with the recommendations suggested by CITES and the OIE .

- Enacting Law 122–12: The government has committed to introducing this law, but it has not progressed in several years. This law would at least provide recourse for government officials to enforce to discourage people from poor animal welfare practices. Enforcement efforts should focus on Casablanca, Marrakesh, Tangier, and Rabat as they contain the greatest number of live animals affected by trade. When this law is enacted, it is recommended that resources be devoted to the application of the new law and fines should be imposed on those who continue to show poor welfare practices and sell illegal animals.
- Providing access to water and a greater variety of food for animals: This change would be easy and would require low cost for vendors to implement.
- Providing the animals with shelter from the sun and the ability to retreat from stressors: Although the ability to remain completely hidden could impede sales and would therefore be unrealistic, pet shops and vendors globally have utilized structures that provide animals with a sense of security without allowing them to remain completely hidden from view. These structures would also provide shelter from the glaring sun.
- Providing simple enrichment for the animals: Complex enrichment is not necessarily a priority for animals while they are on sale, but for those who are kept over longer periods as photo props, enrichment would be beneficial. Even minor additions such as leafy branches would provide more stimulation for animals housed for sale.
- Improving the floor quality for animals: Ideal flooring for the animals seen in markets would differ between species, and the maintenance of such enclosures would likely be an unrealistic expectation in these markets. We therefore recommend plastic flooring with regular holes, as seen in many of the crates that were considered as having appropriate flooring in this study. This flooring maintains the animals' comfort but still provides the hygiene benefits and ease of cleaning provided by the bars. Even simply covering half the bars with plastic would provide animals with an area to rest.

Conclusion and animal welfare implications

It is clear from this study that the animals in markets in Morocco are not kept in conditions that meet any standards of basic welfare and that bad welfare practices are affecting a large number of animals. Although the welfare standards in markets need not reach the same levels

as those for animals housed in permanent situations, it is clear that basic improvements are necessary. There is no "one-size-fits-all" approach to improving people's commitment to animal welfare, and any training of vendors would need to be targeted and specifically designed (Butterworth, Whittington, & Hammond-Seaman, 2012). Although improvements in welfare conditions would benefit animals in wildlife markets, the majority are being sold illegally (Bergin & Nijman, 2014; Nijman & Bergin, 2017b; Van Lavieren, 2008) and using Law 29–05 to prevent animals from being taken from the wild may have the greatest impact on overall animal welfare. Enacting Law 122–12 prohibiting the mistreatment or abuse of animals in captivity would also allow officials to target vendors for specific welfare-related issues. Morocco has an obvious need to and will hopefully soon have the power to completely overhaul the wildlife markets by changing them from a place of suffering and illegal sale of protected animals to a regulated, legal practice.

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