Some Animals Are More Equal than Others: Wild Animal Welfare in the Media

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The media can reflect social opinion and influence debate and policy. Wild vertebrate welfare issues are regularly reported in the media, but there has been no study of the type and frequency of their coverage. We compiled a list of potential wild vertebrate welfare issues in the United Kingdom, recording how often each issue was mentioned in the media during 2014. Lethal wildlife management issues were most frequently reported, whereas issues that received little coverage included marine debris, commercial fishing, and pollution. Overall, the media tended more frequently to report welfare issues that involved intent to harm an animal, were illegal, or occurred in the terrestrial environment. Insofar as media reporting may lead to improvements in the welfare of wild animals, greater effort may be required to provoke media interest in welfare issues that do not involve intent to harm, are legal, or occur in marine environments.

Keywords: wild animal welfare, media, wildlife management, marine, terrestrial

As yet, there is no single accepted definition of animal welfare (Mellor et al. 2009), but it is widely recognized as being multifactorial in nature (Stamp Dawkins 2012). Mellor and Reid (1994) identified five interacting welfare domains (nutritional, environmental, health, behavioral, and mental) and described "good welfare" as existing when an animal's needs in these five domains are fundamentally being met. The quality of an animal's welfare under these domains can be affected by human actions (Sainsbury et al. 1995, Paquet and Darimont 2010), and where human actions negatively affect animal welfare, it has been argued that we are morally obliged to mitigate these impacts where possible (Broom 1989, Littin et al. 2004).

Concern for the neglect and cruel treatment of domesticated (pet and farmed) animals and captive wild animals (used for work or entertainment) has been evident since the 1900s (e.g., Sainsbury et al. 1995, Fraser 2010, Wells 2010, Hadidian et al. 2014). During the last 30 years, there has been a proliferation of independent welfare bodies. For example, in Europe, animal welfare councils are overseen by the 2006 European Forum of Animal Welfare Councils (EuroFAWC); in New Zealand, the National Animal Welfare Advisory Committee (NAWAC) was established in 1999; and an Animal Welfare Committee has been created by the World Association of Zoos and Aquariums (WAZA 2016). The "Five Freedoms"—originally drafted by the Farm Animal Welfare Council (1979) to represent ideal states for a farmed animal's welfare—and their derivatives (including the welfare domains mentioned above) are now widely and internationally used in the assessment of animal welfare in other spheres, such as research (Mellor and Reid 1994) and wildlife management (Sharp and Saunders 2011). Although some legal protection exists for wild vertebrates (e.g., in New Zealand, the Animal Welfare Act 1999; in Australia, the Environment Protection and Biodiversity Conservation Act 1999; and in the United Kingdom, the Wild Mammals [Protection] Act 1996), generally, interest for the welfare of wild animals in their natural habitats has lagged behind that of domesticated animals and captive wild animals (Sainsbury et al. 1995, Fraser 2010). Despite the creation of various advisory bodies, wild, farmed, and pet animals continue to be treated in very different ways despite their similar capacities for suffering (Fraser 2008).

Historically, from a research perspective, wild animals have been the concern of conservation science (Dubois and Fraser 2013), and their welfare received little attention until the late twentieth century. This welfare attention focused primarily on wildlife management (Britt 1985, Warburton and Hall 1995, Pesticides Safety Directorate 1997, Baker and Macdonald 1999, Broom 1999), although some authors considered wider perspectives, including road traffic collisions, predation by domestic cats, poisoning of wildfowl by ingested lead shot, introduction of invasive species, habitat destruction, and release of disease (Kirkwood et al. 1994,

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Sainsbury et al. 1995). Today, although much of the literature on wild animal welfare continues to focus on wildlife management (e.g., Littin et al. 2004, Iossa et al. 2007, Warburton and Norton 2009, Sharp and Saunders 2011, Baker et al. 2012, Littin et al. 2014, Baker et al 2016), recent studies have also examined the welfare impacts of agricultural systems (Mathews 2010), wildlife trade (Baker et al. 2013), wildlife reintroductions (Harrington et al. 2013), and wildlife tourist attractions (Moorhouse et al. 2015).

In 2011, Fraser and MacRae (2011) identified four categories of human impacts on wild animals: (1) keeping wild animals in captivity; (2) causing deliberate harm (e.g., killing animals for food or pest management purposes); (3) causing direct but unintended harm (e.g., caused by agricultural practices such as harvest, vehicle collisions, oil spills or discharge at sea, windows, and artificial lighting); or (4) causing indirect harm (e.g., the introduction of exotic species and agricultural practices that degrade soil and water, such as chemical run-off, environmental pollution, and the spread of disease). So anthropogenic activities can affect wild animal welfare either directly or indirectly and through both intended and unintended actions (Fraser 2010, Fraser and MacRae 2011, Kirkwood 2013). The disruption of ecosystems, for example, through habitat fragmentation or climate change (Mathews 2010, Kirkwood 2013), may have widespread but less obvious welfare consequences for wild animals (e.g., via affecting their food supply or other habitat requirements). Individual actions, such as those resulting in lost or discarded fishing gear, also have unintended consequences for wildlife but may be higher-profile welfare issues. The impact on the welfare of wild animals from commercial enterprises, such as agriculture or commercial fishing, might be perceived as of less concern because these activities are deemed necessary for humans (Mathews 2010). A different welfare value may be attributed if, for example, shooting is for fun (seen as unnecessary) versus for food (seen as necessary) (Littin et al. 2004, Butterworth et al. 2012, Macdonald et al. 2016a). Similarly, a different welfare value may be attributed depending on how the species is perceived culturally. For example, in wildlife management, rodents may be treated differently to other so-called "pest" species (Mason and Littin 2003, Littin et al. 2004, Baker et al. 2012, Baker and Sharp 2015), and efforts to improve the welfare of laboratory rodents have exceeded those for wild rodent "pests" (Kirkwood 2013).

Mass media reporting is known to reflect public opinion, shape public debate, and affect implementation of policy (Scheufele 2000, Weaver 2007, Barua 2010, Bhatia et al. 2013, Muter et al. 2013, Sadath et al. 2013, Sakurai et al. 2013). Examining media articles is a useful way to explore which wild animal welfare issues have a high public profile and which aspects make them more or less newsworthy (e.g., Macdonald et al. 2016b). This information may help to facilitate more effective communication about anthropogenic threats to wild animal welfare. However, to our knowledge, there have been no studies on the frequency or type of wild animal welfare issues that are reported.

We used scientific literature, expert opinion, and a media database (containing a wide range of global media sources) to compile a list of issues potentially affecting the welfare of wild vertebrates, using the United Kingdom as a case study. We used the media database to quantify the frequency of the reporting of those welfare issues over the course of 1 year: 2014. We employed a consistent method, recording the number of articles in which each issue, together with the word *welfare*, was mentioned and ranking the different issues according to the number of articles relating to each issue. We then explored whether any patterns emerged from the data as to the type of issues that were reported. We discuss the implications of our results with regard to the type of threats posed to wild animal welfare from anthropogenic activities, how they are reported by the media, and how this knowledge may be used to lead to improvements in the protection of wild vertebrates.

Compiling a list of welfare threats

We compiled a preliminary list of potential anthropogenic threats to the welfare of native UK wild vertebrates, hereafter referred to as "issues," on the basis of scientific articles (e.g., Sainsbury et al. 1995, Broom 1999, Mathews 2010, Fraser and MacRae 2011) and expert opinion. This list was used as a starting point from which to search a media database (details below), and it was developed during this process through the refinement of issues and the addition of others. We used Nexis UK, a "media news" research service, for our search. Nexis is licensed by LexisNexis for the academic market, is fully customizable, and allows users to search global sources of news, including newspapers, newswires, blogs, reports, and trade journals. All results in Nexis are available as full text.

Searching the database

The wide variety of potential welfare issues precluded us from using a consistent number of search terms or connectors, as might have been possible if we were searching for similar issues or a single issue/species only (e.g., Barua 2010). Therefore, we set up seven basic rules to allow us to run searches as systematically as possible:

(1) Refining search terms: We performed an initial search using Nexis for each issue, using broad keywords. For example, on the use of scarers and deterrents, we began with a search of common words (e.g., "wildlife" + "scarer" or "repellent" or "deterrent"). We then examined the results to identify further useful keywords. We also ran searches on Google (*www.google.co.uk*) to further refine the final "search term sentence" and to identify new issues that might be on-trend (e.g. the use of deterrents to avoid seal shooting in British salmon farms). We set 15 as the maximum number of searches to perform in Nexis before deciding on a final "search term sentence" for each issue (see supplemental table S1 for final search terms). This allowed us to identify as

many issues and relevant articles as possible within the project time frame.

(2) We searched for articles that contained our keywords either within the "body" of the news text or "in the indexing" (used by Nexis as an equivalent to keywords related to the article).

(3) All searches were connected to the term "welfare" by the Boolean operator "AND," set up to appear "anywhere within the text." We found that if we restricted "welfare" to appear only "in the indexing," or used "animal welfare" to appear "anywhere within the text," relevant articles were missed because of inconsistencies in the classification within Nexis.

(4) We searched all publications that were dated between 1 January 2014 and 31 December 2014.

(5) When a search produced fewer than 3000 articles ("hits"), Nexis displayed all of them. For many of our issues, however, a search produced 3000 or more hits, in which case Nexis retrieved and displayed only the first 1000 (thus artificially truncating the results and making the final rankings incomparable between issues). When this occurred for a particular issue, we split the search into more than one search sentence and re-ran searches until each search produced fewer than 3000 hits.

(6) Language and UK News: Searches included "all English language news" within all online resources (e.g., UK, Irish, and international publications, global newswires, blogs and websites, business and trade publications, and company and industry reports). We also set the "duplicate options" to "off" so that all results relating to an issue were included, regardless of the same article being published in different media, to include exposure of an issue through different media sources.

(7) Downloading articles: UK and unclassified. Once results were retrieved, we used the "narrow by geography" category to record the number of both "UK results" (narrow by geography>Europe>Northern Europe>United Kingdom) and unclassified results (narrow by geography>unclassified). UK results included all publications relating to the United Kingdom (regardless of which country they were published in) rather than including only results from UK media or publications (as would have been the case if we had selected only "UK publications" before performing the search). "Unclassified" results in Nexis refer to those not assigned to a particular geographical area, and in all cases included relevant UK articles. The full text of each article was then added to a "my documents" folder and downloaded as a Word document for screening.

Details of the search terms used for each issue are given in table S1.

Screening results

All articles resulting from the searches were screened to confirm that they related to the particular wild animal welfare issue in question in an appropriate context. For example, an article whose main focus was not on animal welfare but that mentioned the wild animal welfare issue would be included in the results, whereas an article on the issue but related solely to nonnative species or domestic animals would be excluded. Some articles covered more than one issue, such as badger baiting and badger gassing, in which case the article was counted as one hit for each of the relevant issues. During the media search, some issues were redefined or split when this approach was more informative. For example, we searched for "fox hunting" separately from "wildlife hunting" (in which fox results were excluded), because we wished to explore the frequency with which foxhunting, a prominent issue, was reported in the media as opposed to other forms of wildlife hunting. Similarly, articles covering wildlife baiting were usually picked up using the term "dog-fighting," whereas results relating specifically to the baiting of badgers, another prominent issue, were generally picked up using the term "badger baiting." Therefore, we excluded from "wildlife baiting" any results regarding the baiting of badgers, and we searched for "badger baiting" separately. "hare coursing" was treated as an issue uniquely involving hares.

Categorizing issues

We categorized our final list of wild animal welfare issues to enable us to explore patterns in how they were reported by the media. We categorized the issues as follows: (a) *Legality*: Did the issue concern an activity that was legal, illegal, or potentially both (depending on the circumstances)? (b) *Intention to harm*: Did the issue concern an activity in which there was an intention to harm a particular species or group of species? "Intention to harm" equated to Fraser and MacRae's (2011) "deliberate harm," and "no intention to harm" equated to their categories "direct but unintended harm" and "indirect harm." Issues in which there may have been awareness that the activity could cause harm but causing harm was not the intention of the activity were categorized as involving no intention to harm. (c) *Environment*: Did the issue relate to an activity occurring in the terrestrial (including freshwater) environment, marine environment, or both? (d) *Seasonality*: Was there a seasonal element to the frequency of mentions of the issue? (e) *Species*: Did the issue affect a single species or multiple species? (f) *Purpose*: Was the issue concerned with wildlife management, entertainment, commercial purposes, or more than one purpose?

Wild animal welfare issues

We compiled an initial list of 42 potential wild vertebrate welfare issues in the United Kingdom identified from the literature and expert opinion. From Nexis and Google searches of the media, we increased the list to 61 issues (table 1). The welfare issues included those arising from activities with clear, direct, and more acute impacts on wildlife, such as culling, gassing, or poisoning, to those less obviously associated with wildlife welfare, such as the release of balloons and sky lanterns; bonfires or lawn mowing; and potentially

Table 1. Issues identified as potential threats to the welfare of wild UK vertebrates.

Rank	Issues	No. of hits	Generally legal/ illegal activity	Exceptions	Intent to harm	Marine/ terrestrial*/ both	Wildlife management/ commercial enterprise/ entertainment/ other	Seasonal	Species
1	Culling	715	L	Y	Y	B	WM	Y	M
2	Kill trapping	300	L	Y	Y	T	WM	Y	M
3	Shooting	277	L	Y	Y	B	WM	Y	M
4	Fox hunting with hounds	215	I	N	Y	T	WM/E	Y	S
5	Wildlife hunting (with animals)	213	L/I	n/a	Y	T	WM/E	Y	M
6	Badger baiting with dogs	125	I	N	Y	T	E/C	N	S
7	Air guns/air rifles/pot shots	106	L/I	n/a	Y	T	WM/E	N	M
8	Trapped in manmade structures/debris (terrestrial)	87	L	Y	N	T	O	N	M
9	Poaching	86	I	N	Y	T	C	N	M
10	Hare coursing	86	I	N	Y	T	E/C	Y	S
11	Relocation/translocations (excludes trapping)	81	L	Y	N	T	WM	Y	M
12	Gassing underground	80	L/I	n/a	Y	T	WM	N	M
13	Poisoning	71	L/I	n/a	Y	T	WM	N	M
14	Wildlife baiting with dogs (excludes badger baiting)	67	I	N	Y	T	E/C	N	M
15	Invasive species (impacts on wildlife)	67	n/a	n/a	N	T	n/a	N	M
16	Domestic species (impacts on wildlife)	65	L	N	N	T	E	N	M
17	Snaring	61	L/I	n/a	Y	T	WM/O	N	M
18	Antisocial behavior/ harassment	58	I	N	Y	T	E	N	M
19	Commercial fish farming	48	L	N	N	B	C	N	M
20	Habitat loss (not agriculture)	46	L	Y	N	T	C	N	M
21	Scarers/deterrents	42	L	Y	Y	B	WM	N	M
22	Collision: terrestrial	35	L	N	N	T	O	Y	M
23	Disturbance of birds/nests	35	L/I	n/a	Y	T	WM/E	Y	M
24	Crossbows	33	I	N	Y	T	E	N	M
25	Trapped in discarded angling gear	32	L	Y	N	B	O	N	M
26	Noise: terrestrial	31	L	N	N	T	E/O	N	M
27	Gamebird rearing and shooting	26	L	N	Y	T	E/C/WM	Y	M
28	Sky/Chinese lanterns and balloon releases	26	L	N	N	B	E	N	M
29	Seal shooting for fish farms	22	L	Y	Y	M	WM	Y	M
30	Trapped in discarded commercial sea fishing gear	18	L	Y	N	M	C	N	M
31	Marine debris (not from fishing)	13	L	Y	N	M	C/O	N	M
32	Pollution: terrestrial	13	L/I	n/a	N	T	C/O	N	M
33	Aero-engines: bird strikes	13	L	N	N	T	C/O	N	M
34	Collision: marine	12	L	N	N	M	C/O	N	M
35	Spread of disease from domestic animals to wildlife	12	L	N	N	B	C/O	N	M
36	Lawn mower or strimmers	12	L	N	N	T	O	Y	M
37	Native wildlife owned as pets	11	L/I	n/a	N	T	E	N	M
38	Film production	11	L	N	N	B	E	N	M

Table 1. (Continued).

Rank	Issues	No. of hits	Generally legal/ illegal activity	Exceptions	Intent to harm	Marine/ terrestrial*/ both	Wildlife management/ commercial enterprise/ entertainment/ other	Seasonal	Species
39	Agriculture: physical impacts	10	L	Y	N	T	C	Y	M
40	Pollution: marine (not debris)	9	I	N	N	M	C/E/O	N	M
41	Bonfires	9	L	Y	N	T	E/O	Y	M
42	Illegal trade of native wildlife	8	I	N	Y	T	C	N	M
43	Wind farms	8	L	N	N	B	C	N	M
44	Agriculture: chemical impacts	8	L	Y	N	B	C	N	M
45	Feeding of wildlife	8	L	N	N	T	E/O	Y	M
46	Noise: marine	7	L	N	N	M	C/O	N	M
47	Poisoning with antifreeze	6	L/I	n/a	Y	T	WM/O	N	M
48	Commercial sea fishing	6	L	Y	Y	M	C	N	M
49	Wildlife farming	4	L	N	N	T	C	N	M
50	Live trapping for release	4	L	Y	N	T	WM	N	M
51	Wildfires	3	I	Y	N	T	E/O	N	M
52	Drug administration	2	L	Y	N	T	WM/O	N	M
53	Lost loom bands	2	L	N	N	T	E	N	M
54	Wildlife research	1	L	Y	N	B	O	N	M
55	Light pollution	1	L	Y	N	B	C/O	N	M
56	Wildlife rescue center	0	L	N	N	B	O	N	M
57	Public entertainment involving wildlife	0	L	Y	N	B	E/C	N	M
58	Withdrawal of resources	0	L	N	Y	T	WM	N	M
59	Explosives	0	L	N	N	T	C	N	M
60	Agriculture: habitat loss	0	L	Y	N	T	C	N	M
61	Rodenator	0	L/I	n/a	Y	T	WM	N	M

Note: Issues are ranked by the number of articles ("hits") found in the media relating to that issue in 2014. Classifications of issues are as follows: Is the issue legal (L), illegal (I) or both (L/I)?; Are there exceptions? (Yes/No); Is there an intent to harm the animals? (Yes /No); Is the issue Terrestrial (T), Marine (M) or it can be Both (B)?; Does the issue relate to Wildlife management (WM), Commercial enterprise (C), Entertainment (E) or Other (O)?; Is the issue seasonal? (Yes/No); Does it affect a single species (S) or more than one (Multispecies, M)?. *Includes freshwater.

wide-ranging, chronic impacts such as habitat loss, light pollution, or invasive species (table 1). Issues affecting terrestrial vertebrates accounted for 40 of those on the list, 14 issues could potentially affect both marine and terrestrial vertebrates, and 7 issues were identified as potentially affecting marine vertebrates alone. The issues covered a range of legal and illegal activities. Most issues were classified as generally legal, such as shooting or commercial fish farming; 10 issues involved activities that were generally illegal, such as badger-baiting or poaching; and 10 issues could result from either legal or illegal activities (depending on the circumstances), such as wildlife hunting with animals or poisoning. Thirty-seven of the 61 welfare issues on the list did not involve a direct intent to harm wildlife (although there may have been awareness that the action could cause harm); these included discarded angling gear or the impact of domestic pets. The remaining 24 issues arose from activities that were intended to harm wildlife, including seal shooting, wildlife baiting, or gassing.

Frequency of reporting of welfare issues

Using Nexis, we retrieved a total of 23,811 media articles across all the welfare issues we had identified (UK: 5759; unclassified UK: 18,052), which, after screening, yielded a total of 3347 relevant articles (table 1). We ranked welfare issues according to their number of related articles (table 1), with the highest-ranking issues having the largest number of related articles. Of the 61 issues on our list, 55 were mentioned in the media in 2014 (table 1).

The wild animal welfare issues most frequently reported in the media, that is, with the greatest number of articles, related to wildlife management activities. Five issues, all of which related to wildlife management, accounted for over half of all articles (51% of 3347): These were culling

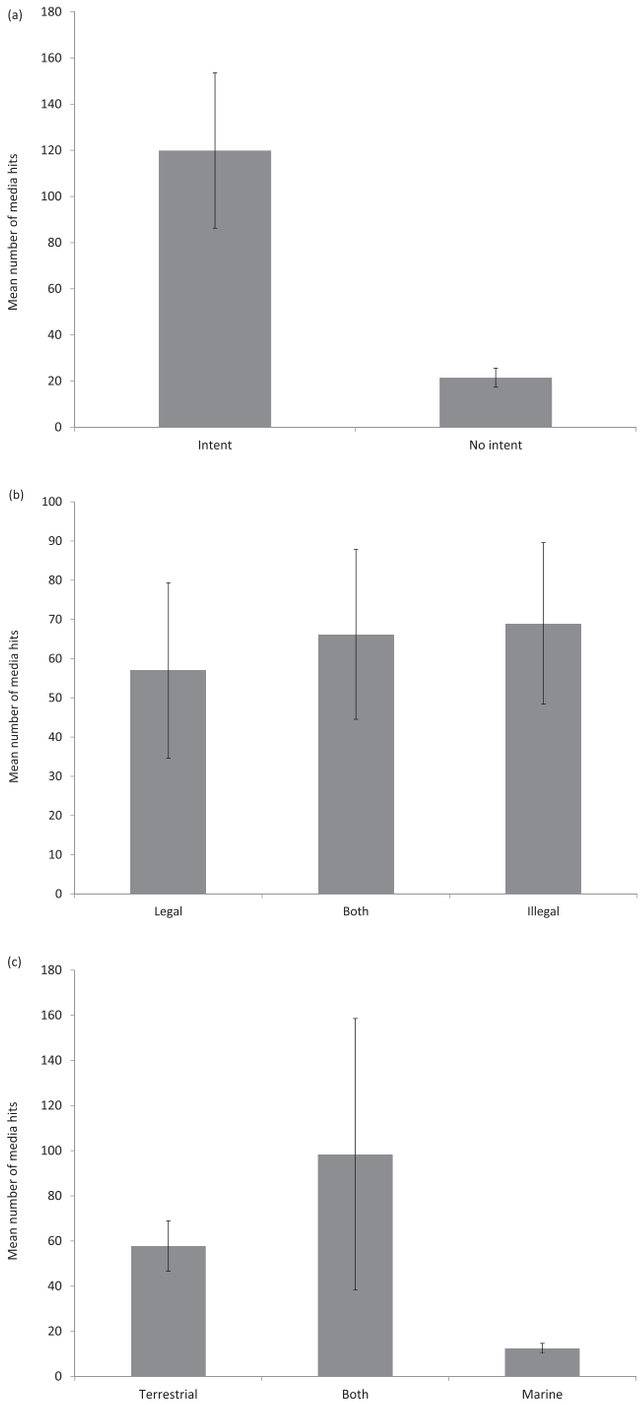

Figure 1. The mean number of media articles ("hits") for issues that (a) involved intent to harm (n = 2638) and those that did not (n = 709); (b) were legal (n = 1994), illegal (n = 690), or could be either legal or illegal (n = 596); (c) occurred in the terrestrial environment (n = 2079), the marine environment (n = 87), or both (n = 1181).

(715 hits), kill trapping (300), shooting (277), fox hunting with a pack of hounds (215), and wildlife hunting with animals (213, excluding foxhunting). Six potential welfare issues received no mention in the media: public entertainment involving wildlife, habitat loss due to agriculture, wildlife rescue centers, withdrawal of resources, use of explosives, and use of the Rodenator™ (an explosive device for destroying animal burrows).

Factors affecting frequency of reporting of welfare issues

The five highest-ranking issues all involved an intention to harm the target species, and, under most, but not all, circumstances, they could be conducted legally. However, issues that received more media coverage were those that involved intent to harm (figure 1a); were illegal or could be either legal or illegal, depending on the circumstances (figure 1b); and occurred in either the marine and terrestrial environment or only in the terrestrial environment (figure 1c). Although more issues occurred in the terrestrial environment than in the marine environment (table 1), there was also a tendency for issues occurring in the terrestrial environment to be reported more often: Where an issue was relevant to both terrestrial and marine environments (14 issues), the marine environment was mentioned in fewer articles (figure 2). The seven issues classified as occurring strictly in the marine environment were the subject of only 2.6% of articles (n = 87 of 3347).

There was a significant relationship between the legality or otherwise of an issue reported in the media and whether it involved intent to harm ($\chi^2(2) = 379.15$, $p < .0001$; figure 3a, table 2). Illegal activities, such as fox hunting and badger baiting, were more likely to be featured in the media than legal activities, such as gamebird rearing and shooting, if they involved intent to harm.

There was also a significant relationship between the environment in which an issue occurred and whether it involved intent to harm ($\chi^2(2) = 172.3$, $p < .0001$; figure 3b). Terrestrial activities (such as kill trapping and poaching), and those occurring in both terrestrial and marine environments (such as use of scarers and deterrents) were more likely to be featured in the media than marine-only activities (such as shooting seals and commercial sea fishing), if they involved intent to harm.

When there was no intention to harm the animals, activities were mostly conducted for commercial purposes, such as commercial fish farming, or had unintended impacts on wildlife, such as collisions with wildlife (table 1).

A total of 15 issues (2044 articles) related to seasonal welfare issues and 46 issues (1303 articles) to nonseasonal issues. Some seasonal issues showed clear seasonality in their reporting in the media. For example, out of 33 articles for the issue "disturbance of birds and nests," 85% were published between April and August (figure 4).

Some species featured much more prominently within an issue than others. For example, of 715 articles that concerned the culling of wildlife, 82.7% (n = 591) were related to badgers (*Meles meles*), whereas only 0.7% of articles (n = 5) related to the culling of foxes, 0.4% (n = 3) to that of moles, and 0.1% (n = 1) to that of rabbits (figure 5).

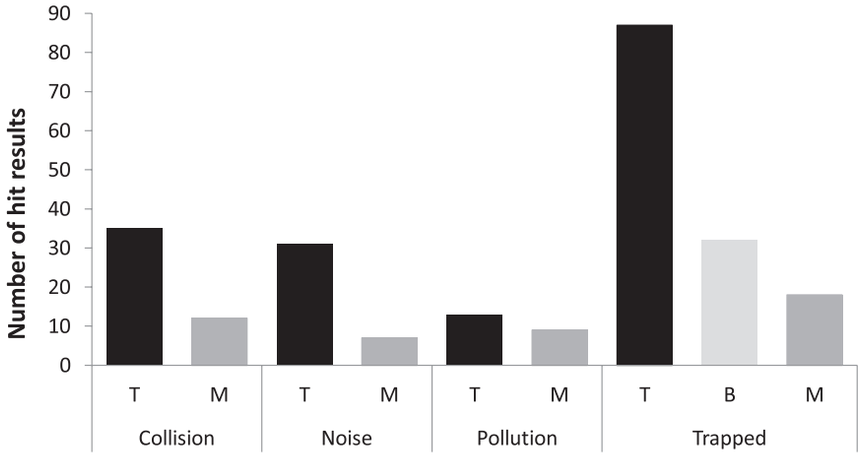

Figure 2. The number of media articles ("hits") for four issues that occurred in both marine (M) and terrestrial (T) environments. Where articles related to the issue "trapped," T is terrestrial and refers to animals becoming trapped in manmade structures and debris; B is both marine and terrestrial and refers to animals becoming trapped in angling gear; and M is marine and refers to animals trapped in discarded commercial sea fishing equipment.

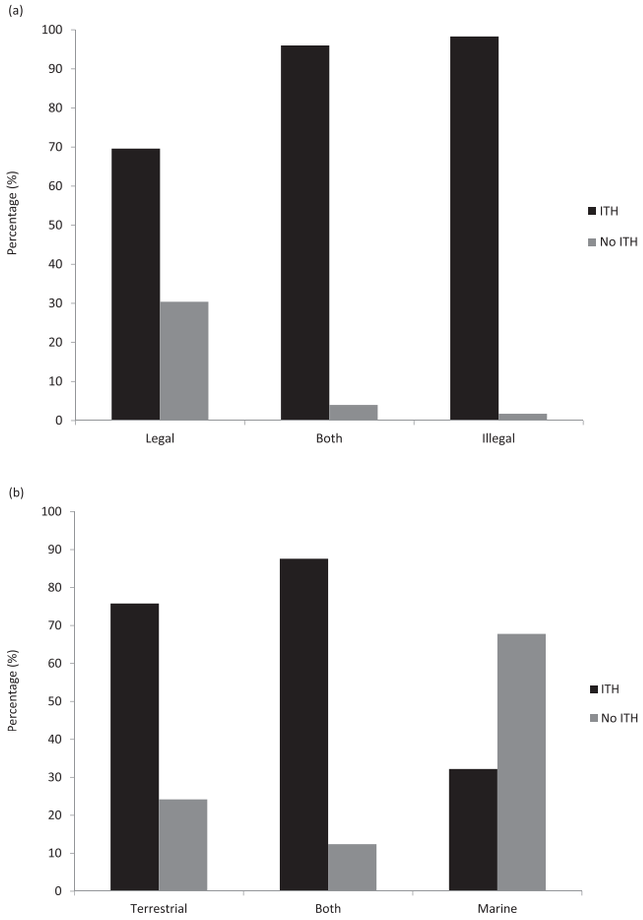

Figure 3. The relationship in terms of number of media articles ("hits") (a) between the legality of the issue—legal (n = 1994), illegal (n = 690), or both (n = 596)—and the intention to harm (ITH) and (b) between the type of environment—terrestrial (n = 2079), marine (n = 87), or both (n = 1181)—and the ITH.

Our results also highlighted the impact on media coverage of a high-profile figure becoming involved with an issue. On 4 April 2014, HRH Princess Anne (a senior member of the royal family in the United Kingdom) declared that gassing badgers was the most humane way to control them. From 76 articles related to the gassing of badgers throughout the year, 65.8% (n = 50) were published in April alone, and 98% (n = 49) of those April articles reported on the comment (figure 6).

Discussion

This study shows that a range of anthropogenic activities may threaten the welfare of wild vertebrates. Some of the activities have obvious impacts, directly intending to harm the target animal, such as culling, gassing, or poisoning, whereas other activities may have less obvious but potentially wide-ranging impacts on wild animal welfare, such as habitat loss or light pollution. Although our study did not formally assess the severity of different types of welfare impacts, our results suggest that the global media coverage of particular wild animal welfare issues does not necessarily reflect any measure of their severity or importance (e.g., the duration of suffering or the number of animals involved). For example, although kill trapping received several times as many hits as poisoning, a rodent killed by an effective break-back trap may suffer considerably less than one that is poisoned (Sharp and Saunders 2011). Similarly, collisions of any kind attracted many times fewer hits than various different wildlife management practices, whereas the number of birds killed through hunting (e.g., an estimated 1.2 million in the United States) can be dwarfed by those killed by unintended window collisions (e.g., an estimated billion in the United States) (Fraser and MacRae 2011).

Overall, we found that welfare issues were more likely to be mentioned in the media if there was direct intent to harm, if they were illegal, or if they took place in the terrestrial environment. Welfare impacts receiving less media attention related to activities that did not involve direct intent to harm, were legal, or occurred solely in marine environments. For example, although there is a large body of research into minimizing stress in capture–release animal studies (e.g., Fair et al. 2014) and on the welfare of wild animals marked or fitted with tracking devices (e.g., Gardner et al. 2015), none of these issues featured in media articles. Similarly, little media attention was given to light pollution although this issue is believed to be a significant threat to the welfare of a number of species (Fraser and MacRae 2011). Issues such as light pollution, which may have more chronic effects, are perhaps regarded as less newsworthy than prominent or controversial issues or those with conspicuously acute effects.

Table 2. The relationship between media articles ("hits"), intention to harm and the legality of activities.

	Legal	Illegal	Legal/ Illegal
INTENTION TO HARM	Commercial sea fishing	Antisocial behavior/harassment	Air guns/air rifles/potshots
	Culling	Badger baiting with dogs	Disturbance of birds/nests
	Gamebird rearing and shooting	Crossbows	Gassing underground
	Kill trapping	Fox hunting with pack of dogs	Poisoning
	Scarers/deterrents	Hare coursing	Poisoning with antifreeze
	Seal shooting for fish farms	Illegal trade of native wildlife	Rodenator
	Shooting	Poaching	Snaring
	Withdrawal of resources	Wildlife baiting with dogs	Wildlife hunting (with animals)
	(8 issues, 1388 hits)	**(8 issues, 678 hits)**	**(8 issues, 572 hits)**
NO INTENTION TO HARM	Aero-engines: bird strikes	Pollution: marine (not debris)	Native wildlife owned as pets
	Agriculture: chemical impacts	Wildfires	Pollution: terrestrial
	Agriculture: habitat loss	**(2 issues, 12 hits)**	**(2 issues, 24 hits)**
	Agriculture: physical impacts		
	Bonfires		
	Collision: marine		
	Collision: terrestrial		
	Commercial fish farming		
	Domestic species (impacts on wildlife)		
	Drug administration		
	Explosives		
	Feeding of wildlife		
	Film production		
	Habitat loss (not agriculture)		
	Lawn mower or strimmers		
	Light pollution		
	Live trapping for release		
	Lost loom bands		
	Marine debris (not from fishing)		
	Noise: marine		
	Noise: terrestrial		
	Public entertainment involving wildlife		
	Relocation/translocations (excluding trapping)		
	Sky/Chinese lanterns and balloon releases		
	Spread of disease from domestic animals to wildlife		
	Trapped in discarded angling gear		
	Trapped in discarded commercial sea fishing gear		
	Trapped in manmade structures and debris (terrestrial)		
	Wildlife farming		
	Wildlife rescue center		
	Wildlife research		
	Wind farms		
	(32 issues, 606 hits)		

Editorial preferences toward illegal issues may be because reporters feel that the public will be more concerned about an issue if it is judged by society to be wrong (Moorhouse et al. 2016). Conversely, if an activity is legal, this may increase the acceptability of a harmful activity in the eyes of the public and therefore make it less newsworthy. Although illegal issues were reported more frequently, it is important to note that this could also be exacerbated by the fact that the distinction between legal and illegal activities can be unclear, as has been illustrated by the UK Hunting Act 2004. For example, under this Act, it is illegal to hunt wild mammals with dogs, but exemptions to this include the hunting

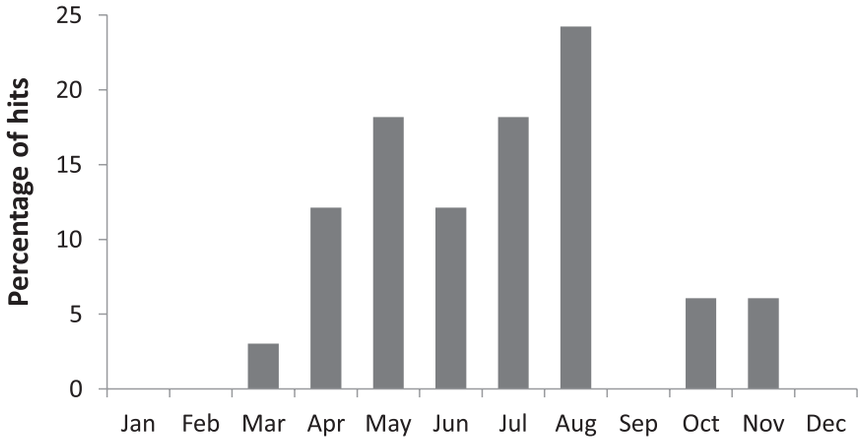

Figure 4. The seasonal variation in media articles ("hits") for the welfare issue "disturbance of birds and nests" (n = 33). The bars represent the percentage of total articles per month.

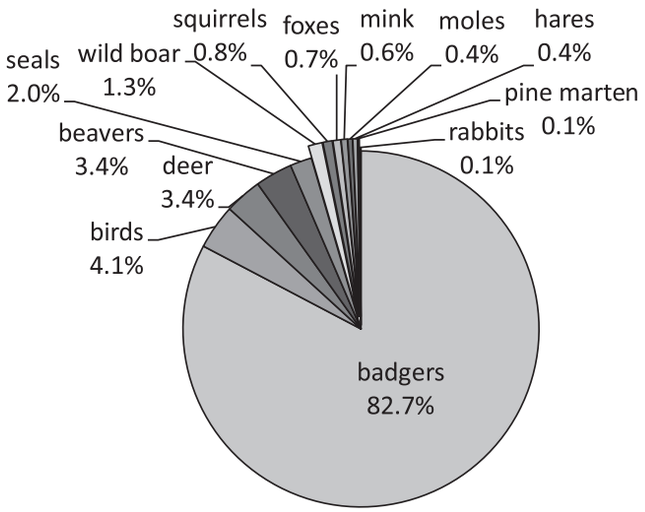

Figure 5. The percentage of "culling of wildlife" articles ("hits") in which a species (or group) was mentioned (n = 715). Only one mention per result was counted. For example, "deer culling" was mentioned in 3.4% of the total number of articles. It could be that more than one species appeared in the same article.

of rats (but not mice) and rabbits. Although it is illegal to use dogs to hunt hares (which are protected in the United Kingdom), they can legally be hunted if the hare has already been injured by a gunshot.

Editorial preferences toward terrestrial issues may reflect a possibility that people feel less connected to, and therefore less interested in, the marine environment. When articles did mention marine vertebrates, many related to marine mammals: For example, of the 87 articles on welfare threats to marine vertebrates, 25% concerned the shooting of seals at fish farms (n = 22 of 87). Williams and colleagues (2014) suggested that legislation for marine mammals has generally focused on lethal impacts, such as whaling or animals becoming victims of by-catch, as opposed to sublethal impacts, such as noise. However, our search for "by-catch" in relation to nonmammalian (birds) and mammalian (seals, dolphins) animals caught during commercial fishing for a target fish species yielded no hits at all in 2014.

Attitudes toward animal welfare can be influenced by context (Mathews 2010), also affecting editorial preferences. For example, people may feel less responsible for harming free-living animals when the threat to the animal's welfare is an indirect by-product of an activity that is deemed necessary (Sainsbury et al. 1995), such as food production. It is certainly true that, in these circumstances, wild vertebrates may be controlled using methods that would not be considered acceptable in scientific research. For example, glue boards are widely used for trapping rats and mice on food-production premises, and rodenticides are widely used in agriculture, but neither of these methods would be considered appropriate Schedule I methods for the humane killing of rodents in scientific research as required under the Animals (Scientific Procedures) Act 1986 (*www.legislation.gov.uk/ukpga/1986/14/contents*).

People's perception of what represents an animal welfare issue and the extent of the harm caused by a particular activity vary according to the species concerned (Fraser 2008, Dubois and Fraser 2013). Baker and colleagues (2013) found a bias toward mammals in their literature review of animal welfare impacts reported in the wildlife trade; they attributed this at least partly to the greater affinity that humans feel for mammals compared with other taxa. Hutchins (2006) found that the media reported on zoo mortality only of charismatic megafauna, disregarding smaller mammals as not being "newsworthy." In our study, 32% of the articles related to poisoning concerned high profile bird of prey species, whereas there were no articles relating to the poisoning of rodents (although this is also likely to be conflated with legality, because it is legal to poison rats and mice but not birds).

We detected seasonal trends in the reporting of some issues in the media. For example, 85% of 35 articles on the issue of "disturbance of birds and nests" were published between April 2014 and August 2014, coinciding with the peak breeding and nesting season of British birds. Other articles covered wildlife welfare issues around November, coinciding with Bonfire Night (5 November) celebrations. Issues can be reported not only when they are current, but they may also target the public at the appropriate time of year to raise awareness of potential welfare issues. Although only one-quarter of our welfare issues were classified as seasonal (15 out of 61), seasonally reported issues obtained almost double the number of articles (2044 versus 1303).

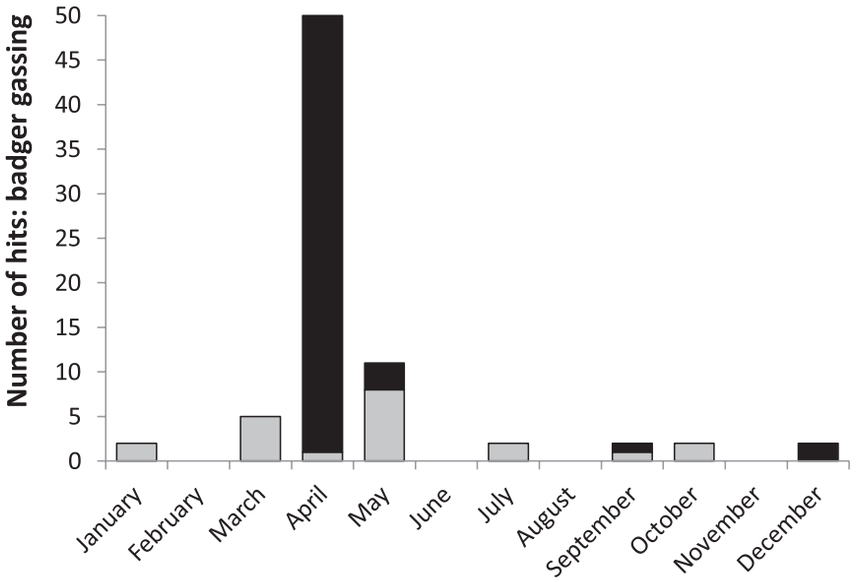

Figure 6. The number of monthly articles ("hits") relating to badger gassing (n = 76) during 2014. The black areas in the stacked bars are media articles related to or mentioning HRH Princess Anne's comment on badger gassing on 4 April 2014. The gray areas are the number of articles related to badger gassing but not mentioning HRH Princess Anne.

Our media search was limited to 1 year of news articles, which will have affected the extent of media coverage identified for some issues. For example, on one hand, our search for oil spills under the issue of "marine pollution" yielded no results, but no oil spill occurred in UK waters during 2014. On the other hand, in 2014, there was some media reporting of the danger to native wildlife of releasing invasive species, coinciding with the release of a Ninja Turtles movie: 22% of articles on invasive species concerned turtles or terrapins (*n* = 15 of 67 articles; e.g., Sayid 2014). Other topical welfare issues covered by the media in 2014 included the ingestion by wildlife of "loom bands," which appeared on the market for making bracelets, and the effects on wildlife of the release of sky lanterns.

Our results demonstrated the influence of a celebrity on media reporting. Princess Anne's suggestion that gassing was the most humane way to control badgers created a surge of media news reporting. Almost three-quarters of the articles relating to badger gassing either mentioned her comment or featured it directly. In the absence of her comment, this welfare issue may have received little media attention in 2014. Comments made by a celebrity can focus media attention on an issue, which may not otherwise have received any prominence (e.g., Corbett and Mori 1999, Barua 2010).

Conclusions

The welfare of wild vertebrates is threatened by a range of anthropogenic activities. Some of these may have clear impacts, directly intending to harm the target animal and with the potential for the animal's welfare to be compromised depending on how the activity is carried out. Other activities may have less obvious—but not necessarily less important—impacts on wild animal welfare. Our results suggest that media reporting may reflect a greater interest in wild animal welfare issues that involve direct intent to harm, are illegal, or occur in the terrestrial environment. Greater effort may be required to communicate to the wider public the potential impacts on wild vertebrates of issues that do not involve intent to harm, are legal, or occur in the marine environment. Further research into the extent and severity of different anthropogenic impacts on the welfare of wild animals is needed. This, together with effective communication of results, may facilitate wider media coverage, potentially aiding wild animal protection.

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Supplemental material

The supplemental material is available online at *http://bioscience.oxfordjournals.org/lookup/suppl/doi:10.1093/biosci/biw144/-/DC1*.

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