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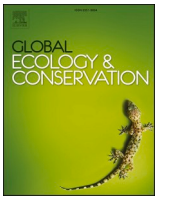

Short communication

Ethical considerations in natural history film production and the need for industry-wide best practice

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ABSTRACT

Natural history documentary films can be a powerful tool for wildlife conservation, providing an accessible means to increase public knowledge of the natural world. There has been an increasing focus in documentary films on the threats to biodiversity in recent years that has positively aided conservation efforts. However, potential ethical and welfare implications of natural history film making are often overlooked. Here, we consider the design and impact of the narratives used and the filming methods employed in natural history film making and their potential implications for conservation. Although these programmes are often lauded for their cinematography, filming techniques and practices should satisfy high ethical standards and should be evaluated to assess disturbance caused to wildlife and any associated negative behavioural and physiological impacts. This evaluation should include the direct impact of the filming, as well as considering the risk of viewers replicating human-wildlife encounters they see on film. Trends towards the use of highly dramatized storytelling, anthropomorphism and the inclusion of inaccurate information should also be addressed. Although some production companies have filming guidelines in place, this is not standard industry practice. Natural history films are an important means of educating and enthusing people about nature and its conservation; however, it is vital that films are made responsibly. To facilitate this discussion, we propose recommendations, including standardised industry-wide guidelines, codes of conduct and independent ethical reviews, for natural history film makers to mitigate and avoid negative impacts.

1. Introduction

Natural history film making is a popular staple of television broadcasting (Hofman and Hughes, 2018; Jepson et al., 2011) and provides an accessible way for the public to engage with nature and biodiversity. In recent years high profile series, such as *Blue Planet II*, *Dynasties*, *Serengeti* (all BBC) and *Our Planet* (Netflix) have tried to film wildlife and document the natural world in novel and engaging ways. These natural history films regularly attract audiences of millions of people and are sold to be shown around the world.

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However, natural history film productions have faced criticism for not addressing the substantial conservation threats faced by many of the species and ecosystems they feature (Jepson et al., 2011; Louson, 2018; Spector, 2012). In response to this criticism, and with growing awareness in audiences of the threats to many species and ecosystems worldwide, more recent natural history films, such as *Our Planet* and *Seven Worlds* [British Broadcasting Corporation (BBC)], have increasingly included conservation messaging at the forefront of their storytelling (Jones et al., 2019). The positive impacts that these programmes can have on conservation is exemplified by the BBC series *Blue Planet II*, which included footage of marine plastic pollution and is cited as an important factor in raising public awareness of the issue and prompting increased regulation of single use plastics (Schröder and Chillcott, 2019).

Although the positive effects of natural history film making have been covered in the literature (Hofman and Hughes, 2018), there are potential negative impacts to the conservation and welfare of wildlife that may be associated with natural history film productions. Some programmes that fall under the banner of natural history have been criticised for how they interact with wildlife and for taking a sensationalist approach to conservation biology, such as *The Crocodile Hunter* with Steve Irwin (Animal Planet). These products, and the resulting problems for animal conservation and welfare, have been previously discussed in the literature (Bradshaw et al., 2007; Northfield and McMahon, 2010). In this paper, using informal consultations with six mostly anonymous industry professionals, with over 75 years of industry experience, we discuss some of the techniques employed in select recent large-scale natural history films, that are made and broadcast by some of the most trusted sources for natural history production. These films purportedly focus on capturing the natural behaviour of wildlife and are generally considered to be the 'gold standard' for natural history film production. We focus on these productions as they reach particularly large audiences, typically have relatively large budgets and have the capacity to set best practice standards in the industry. We highlight the potential issues for conservation and suggest recommendations, such as independent ethical reviews, to mitigate potential negative impacts and optimise the potential positive effects of natural history films on wildlife and conservation.

2. Minimising disturbance

A major draw for viewers of large-scale natural history series is their visual splendour, with some film makers, such as the BBC Natural History Unit, becoming world-renowned for the cinematography of their productions. Achieving these visual sequences is often a result of film crews coming into close proximity with the wildlife they are filming, with the potential risk of disturbing the animals they are featuring. The presence of people within an animal's habitat has an impact and, due to the increasing reliance on filming technologies that require large crews to operate them, large camps may need to be established for the duration of filming (Amanda Barrett, Pers. Comm.). Human presence has been shown to be associated with increased predation (Leblond et al., 2013), lost feeding opportunities (Christiansen et al., 2013; West et al., 2002), temporal shifts in activity (Gaynor et al., 2018), changes in habitat use (Ngoprasert et al., 2007), increased energy expenditure (Regel and Pütz, 1997) and decreased reproductive output (Ellenberg et al., 2006; McHuron et al., 2018). Remote populations, that are unfamiliar or naïve to the presence of humans, are particularly likely to be at risk (Ellis et al., 1991; Forney et al., 2017; Shannon et al., 2017). However, people's behaviour in the vicinity of wildlife can make a substantial difference in how the wildlife are affected by their presence (Pagel et al., 2021; Ruhlen et al., 2003; Tablado and Jenni, 2017), and the careful behaviour of film crews can mitigate deleterious effects. In recognition of the importance of film crew conduct, some production companies have internal guidelines on acceptable behaviour and provide workshops that discuss improving work practices (Anonymous Industry Professional, Pers. Comm.), and some environmental management authorities have strict rules on, for example, proximity and shot limits to try and prevent wildlife being harassed (Anonymous Industry Professional, Pers. Comm.).

Table 1
Select examples of potential negative impacts resulting from the footage shown, and the narratives used, in some natural history films. Series/films are only included once, even where there were multiple examples of potential negative impacts within episodes/series.

Programme (episode)	Example	Potential negative impact
Shark Week	Sharks portrayed as violent killers	May create a false perception of the level of danger these species pose, which can lead to changes in management policy.
Bears (Maneaters)	Portrayal of bears as substantial threat to human life	May create a false perception of the level of danger these species pose, which can lead to changes in management policy.
Penguins - Spy in the Huddle	Male penguin described as having "cheated" on female penguin with the remote-controlled camera	Highly anthropomorphised interpretation of animal behaviour, which can lead to a false understanding of natural behaviour.
Blue Planet Live Revisited (1)	Programme contributors shown touching and feeding wild sharks	Unnecessary behaviour which is likely to disturb the sharks and affect their foraging behaviour. Viewers may see this behaviour and believe it is acceptable and safe to approach wild sharks, leading to harassment and/or injuries to both people and sharks.
Dynasties (4)	Film crew, presenters and contributors shown on foot next to a pack of African wild dogs	Wild dog packs may become further habituated to seeing humans on foot as non-threatening which may lead to conflict with local communities, particularly if it affects the ability of herders to scare dogs and prevent depredation of livestock. Viewers may see this behaviour and believe it is acceptable and safe to approach wild large carnivores leading to harassment and/or injuries.
Serengeti (1, 2)	Animals shown hissing and snarling at the camera (including in episode 1: lions at time points 05:06 & 16:33; episode 2: cheetahs at time points 04:54 & 51:49)	To get these images of the animals, which include both adults and young cubs, the camera must have been put extremely close them and, based on the reactions filmed, appears to have caused them distress.

However, not all management authorities have such rules, or the means to enforce them. Many natural history films now include 'life behind the lens' features, which show how the main film was made. In this extra footage film crews are sometimes shown interacting with and/or disturbing the wildlife they are there to film (Table 1). Showing crews in close proximity to the animals they are filming without explanation of guidelines and ethical considerations can give the impression that this is always acceptable behaviour and could lead to viewers and other filmmakers copying such behaviour.

Recent advancements in camera technologies for filming wild animal populations (Mulero-Pázmány et al., 2017) can play an important role in limiting human disturbance to wildlife during filming (Mills, 2010). Using extremely high-definition cameras with high standard long-lenses can enable film crews to keep their distance from an animal whilst still being able to get close up shots through post-production editing (Amanda Barrett, Pers. Comm.). In addition, the use of drones, unmanned aerial vehicles (UAVs) and remote-controlled cameras for filming has developed rapidly in the past ten years (Connolly, 2007; Ivošević et al., 2015; Mulero-Pázmány et al., 2017). These cameras also permit observation of wildlife behaviour that may not be possible using traditional hide-and-observe methods (Kross and Nelson, 2011), as well as being more cost effective, than direct observations (Cutler and Swann, 1999). Drones and UAVs have been used extensively to film the behaviour and ecology of multiple species across terrestrial and marine biomes (Christie et al., 2016). New techniques in film making can also have additional benefits and aid scientific research for example by filming behaviours for the first time, such as kea (*Nestor notabilis)* and orca (*Orcinus orca)* foraging behaviour (Nelson and Fijn, 2013).

Although drones and other technologies have the potential to cause lower levels of observable disturbance compared to traditional filming methods (Christie et al., 2016; Weissensteiner et al., 2015), disturbance to wildlife can be significant depending on how the technologies are used and which species is being filmed (Bevan et al., 2018; Weimerskirch et al., 2018). For example, a review by Rebolo-Ifrán et al. (2019) found that species that utilise terrestrial and aerial habitats are more likely to elicit behavioural responses to drones than marine species. Additionally, behavioural response to drones is also dependent on flight height, but the height at which a response takes place is also species dependent (Bevan et al., 2018; Brunton et al., 2019; Rümmler et al., 2016; Weimerskirch et al., 2018). The increasing use of stabilising camera gimbals to enable the filming of animals from moving vehicles, for example to capture dramatic footage during hunts, can disturb the animals involved and influence the outcomes of such events (Amanda Barrett, Pers. Comm.). Careful consideration of how such technology is used, and whether it is appropriate, is therefore vital. Companies may have guidance regarding the use of these technologies, particularly where regulated by permitting authorities (Anonymous Industry Professional, Pers. Comm.), however the use of guidelines is not standardised across companies or the countries where filming takes place.

Natural history film makers and production companies are recognised as trusted experts by the public; in the same way that the main documentary can help educate people about conservation, the "life behind the lens" mini-features also provide an opportunity to show viewers the best-practice ways of filming, and behaving around, wild animals. Drones, stabilising gimbals, and other filming technologies are increasingly available to the wider public, and their inclusion in 'life behind the lens' features have the potential to influence public use of these technologies around wildlife. Although film crews cannot control the behaviour of their viewers, if the use of these technologies are advertised, it is also important to make clear the guidelines for their use when filming wildlife as well as any ethical concerns they may raise if used insensitively (Table 1, Fig. 1). These mini-features could be used to educate viewers about the importance of minimising disturbance to wildlife while filming to promote responsible behaviour, rather than building a narrative around the need get a particular sequence.

3. Limiting human-wildlife interactions

Negative interactions between humans and wildlife are at the crux of many conservation issues, with human-wildlife conflict recognised as a leading threat to terrestrial large carnivores (Ripple et al., 2014). Careful consideration should be given before showing people in close proximity to, or interacting with, wildlife. For example, in the BBC *Dynasties* series, during the African wild dog (*Lycaon pictus*) episode (episode 4: Painted Wolves), the 'life behind the lens' feature (in this case called 'Dynasties: on location') showed

Fig. 1. A cheetah cub being disturbed at a kill by an amateur photographer's use of a remote camera in a National Park in Tanzania.

extensive footage of film crews, presenters and interviewees on foot next to wild dog packs (Table 1). When wildlife experience non-threatening human activities frequently enough, they become habituated to human presence and are less likely to exhibit avoidance behaviours, such as flight responses (Gunther et al., 2018). This is of significant conservation concern for species, such as African wild dogs, for which human-wildlife conflict is a major threat (Fraser-Celin et al., 2018; Gusset et al., 2009). If carnivores become habituated to seeing people on foot, it may make it more difficult for herders from local communities to protect their livestock from depredation; which can ultimately lead to decreased tolerance and retaliatory killings of predators (McManus et al., 2015). Habituation of wild species can also lead to increased wildlife presence in urban areas, and an increase in animal-vehicle collisions (Kloppers et al., 2005). For those species that also pose a direct threat to human life, the risks of habituation and decreasing animals' wariness of people is an even greater ethical issue.

Although it could be argued that the behaviour of one film crew may have limited impact on the wildlife featured, viewers seeing the behaviour of film crews and copying them could exacerbate these impacts for some species. Showing footage of how film makers behave around wildlife gives an implicit endorsement of their behaviour, which is likely to influence the behaviour of viewers (Pagel et al., 2021). Exposure to human-wildlife interactions in the media is also linked to an increased desire to visit captive-wildlife tourism attractions [defined by Moorhouse et al. (2015) as viewing animals in human made confinement, including zoos and aquaria, but also circuses and shows by mobile wildlife exhibitors] which offer the opportunity to interact with wild animals (Moorhouse et al., 2015; van der Meer et al., 2019). Although it can be argued that some captive-wildlife tourism may make a positive contribution conservation through awareness-raising, breeding programmes and education, some of these attractions can be detrimental to conservation and animal welfare (Moorhouse et al., 2015), and may blur people's perceptions of the dangers posed by wild animals (van der Meer et al., 2019). Increased human-wildlife interaction can also increase the risk of the transmission of zoonotic disease (Albers et al., 2020; Santana, 2020), which alters public risk perceptions of wildlife, which in turn can lower public tolerance in wildlife and impact conservation efforts (Decker et al., 2010, 2011), for example increased negative attitutes towards bat species following the recent COVID-19 outbreak (Lu et al., 2021; Sasse and Gramza, 2021). It has also been suggested that exposure to images of human interactions with wild animals can not only encourage these interactions in others, but increase risky behaviour, such as taking selfies with wild animals, or trying to stroke wild animals on safari (van der Meer et al., 2019). These risky behaviours are dangerous, not only to the people participating in them, but may also lead to animals being labelled as "problem" or "dangerous" individuals and culled from the wild population (Found et al., 2018; Gunther et al., 2018). In response to concerns that imagery of human and primate interactions could lead to adverse conservation impacts, the IUCN SSC Primate Specialist Group issued *Best Practice Guidelines for Responsible Images of Non-Human Primates* (Waters et al., 2021). These guidelines list several problems with disseminating images of people close to primates, including "Images of messengers with primates may make the general public want to obtain their own images very close to primates". Increased sharing of wildlife interactions on social media has been shown to exacerbate problems in illegal pet trade, particularly in endangered species (Nekaris et al., 2013). To avoid the trickle-down effect of poor behaviours to the public and amateur wildlife photographers/film makers, greater discussion during the 'life behind the lens' sections or disclaimers could be employed to make the public aware of the potential negative impacts such behaviours could have on wild animal conservation and welfare. Additionally, being clear when footage, such as extreme close-ups, were achieved through post-production editing, rather than by being in close proximity to an animal (Amanda Barrett, Pers. Comm.), may help reduce risky human behaviour and decrease disturbance to wildlife resulting from people attempting to emulate such footage without the appropriate equipment.

4. Eliminating misinformation

Studies have long shown the ability of the media to influence popular opinion, social attitudes and wildlife and conservation policy (Lassiter et al., 1997; Muter et al., 2013). Misinformation shared via respected broadcasters can influence public perception of science (Thaler and Shiffman, 2015). Bad science, pseudoscience and fake science [defined by Thaler and Schiffman (2015) as "unsound conclusions drawn from valid premises; sound conclusions drawn from invalid premises; and unsound conclusions drawn from invalid premises respectively"] can be pervasive and spread effectively, so that misinformation may remain as 'fact' within the public domain, despite being debunked by modern science (Flaherty, 2011; Godlee et al., 2011; Thaler and Shiffman, 2015). For example, the persistent myth of lemming suicide originated in a Disney natural history documentary film *White Wilderness* from 1958 (Bousé, 1998; Louson, 2018). Following the release of the Animal Planet 'documentary', *Mermaids: The Body Found*, the National Oceanic and Atmospheric Administration (NOAA) had to release a statement in 2012 reminding people that mermaids are not real, after they were inundated with calls asking for the truth about mermaids (National Oceanic and Atmospheric Administration, 2012; Spector, 2012; Thaler and Shiffman, 2015). During a particularly challenging time to do so, reducing dissemination of inaccurate information is important as public perception of wildlife can play a significant role in setting public policy (McCombs and Shaw, 1972; Muter et al., 2013; Otten, 1992).

The general public assume wildlife documentaries are a reliable source of information about the natural world (Pollo et al., 2009), especially when narrated by a trusted presenter or celebrity or shown by trusted broadcasters. Although storytelling and emotion can play important roles in audience engagement with wildlife documentaries (Chan, 2012; Tam et al., 2013), producers and film makers have a responsibility to ensure viewers are not misled by any information presented as part of the film (Dingwall and Aldridge, 2006; Pollo et al., 2009; Somerville et al., 2021). This is of particular relevance for television channels such as Public Broadcasting Service (PBS), National Geographic, Zweites Deutsches Fernsehen (ZDF), and the BBC Natural History Unit, who all have reputations for producing high quality, factual content; as such, material shown by those channels is particularly likely to be interpreted as factual and truthful information (Nichols, 2017). Some production companies, such as National Geographic and Smithsonian, provide fact checking teams to ensure scripts are scientifically accurate, but this is not common amongst most production companies (Anonymous

Industry Professional, Pers. Comm) and failing to robustly fact-check can result in the inclusion of incorrect information. Misinformation can also come in other forms, such as misnaming of featured species. For example, Fernández-Bellon and Kane (2020) found that two species of bird were referred to by their incorrect common names in *Planet Earth 2* (BBC), resulting in a diversion of online traffic (Twitter, Wikipedia) by the interested public towards species that were not featured in the programme. Including misinformation which drives internet traffic to the wrong species, can lead to audiences being confused and misled, reducing opportunities to raise awareness and educate about species and their conservation.

Innovation in natural history film making is important to keep engaging the public and ultimately ensure that production companies achieve a financial return on their products. Starting with *Big Cat Diary* in 1996, there has been an increase in the use of dramatised, fabricated story lines and constructed narratives in natural history film making (Richards, 2014; Somerville et al., 2021). This often includes using unrelated pieces of film to create sequences that did not happen but are built to serve the wider, highly dramatised narrative (Somerville et al., 2021). Such techniques were particularly prominent in the *Serengeti* series, shown on BBC One, where highly dramatised, inaccurate stories were shown, footage of animals from a different country was misleadingly included[1] and compositing techniques were used to modify footage[2] (Jones and Davies, 2019). In reply to criticisms, the BBC responded by saying *Serengeti* was a dramatisation, not a documentary (Jones and Davies, 2019). However, despite these assertions in the press, and the inclusion of a brief disclaimer at the beginning of the programmes, *Serengeti* and other similar natural history programmes are advertised as, and categorised under, "Factual" and "Documentaries" on the broadcasters' websites[3] and press releases (British Broadcasting Corperation, 2019a).

The use of story and narratives in natural history film making can increase audience engagement, in turn offering an opportunity to increase knowledge of the environment. However, such attempts to increase engagement should be transparent, and must not be at the expense of including inaccurate information, as this could decrease public knowledge and negatively impact conservation efforts (Hight, 2017; Somerville et al., 2021).

5. Reducing anthropomorphism

A narrative device that is incorporated in many natural history films is anthropomorphism, where human emotions, traits or behaviours are attributed to animals which can promote empathy towards featured animals (Chan, 2012; Hight, 2017; Tam et al., 2013). Increasing empathy through anthropomorphism has the potential to increase conservation efforts (Chan, 2012). When animals are humanised, people can find it easier to connect to these species and their environment, meaning they may be more likely to receive conservation support ahead of other species (Hausmann et al., 2017; Macdonald et al., 2015).

However, adverse anthropogenic portrayals of some species may distort public perception, creating misconceptions and negative sentiments towards the species (Bousé, 2003; Hight, 2017; van der Meer et al., 2019). Natural history films which use dramatised characters and storylines (Richards, 2014), in which certain species are portrayed as heroes and villains, present inaccurate information about species' behaviour and the reasons behind it (Somerville et al., 2021). For example, *March of the Penguins* was one of the first documentaries to use highly sentimentalised anthropomorphic techniques (Adcroft, 2011). Although it was successful at public engagement, by using themes of anthropomorphic heroism, family and love, the film was heavily criticised for not portraying penguin behaviour accurately. This gave audiences a misleading understanding of the motivations and behaviours of penguins that was based around human responses, rather than arguably more interesting insights into what it might mean to a penguin (Adcroft, 2011; Hight, 2017). In this way, anthropomorphism may actually reduce peoples understanding of the natural world, contrary to their intended purpose (Henderson and Anderson, 2005; Hight, 2017; Pollo et al., 2009).

Certain groups of species are at particular risk of negative portrayals, despite being threatened species themselves and in need of conservation support. For example, shark species on documentaries are often portrayed with ominous background music which has been shown to increase negative attitudes towards sharks by the public (Nosal et al., 2016). They are also regularly portrayed as violent killers, such as during The Discovery Channel's *Shark Week* programming (Evans, 2015). Although The Discovery Channel's Shark Week may help increase knowledge of sharks (O'Bryhim and Parsons, 2015) the emphasis on violence rather than conservation issues, can lead to a skewed perception of risks, and increased fear, of shark attacks (Myrick and Evans, 2014) which can drive public policy (McCagh et al., 2015).

6. Recommendations

Although the issues that we highlight may affect some species or systems more than others, ensuring recognition of potential issues and transparency across large scale productions is key to reducing the potential negative consequences. Here, we discuss some approaches, at the production level and industry level, which would enable natural history film makers to address the issues raised above (Fig. 2). The implementation of these actions would signal the commitment of film makers to ensuring high standards of behaviour and messaging around wildlife and conservation. Some of our recommendations may already be implemented by individual companies and film makers or by following regulations specified by local filming permits. However, even where guidelines are in place, production companies can come under pressure from commissioners to bend those guidelines to get the desired footage (Anonymous Industry

[1] https://twitter.com/HWConflict/status/1151778859005558785?s = 20
[2] https://www.youtube.com/watch?v=q_xY-aloS4k
[3] https://www.bbc.co.uk/programmes/m0006hmc

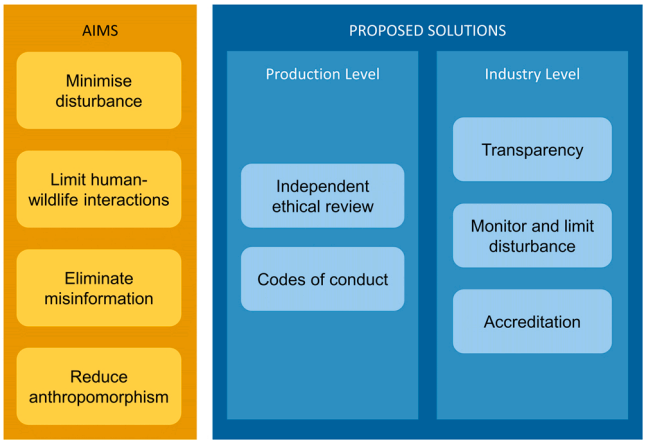

Fig. 2. A graphical representation of our suggested aims and proposed solutions for minimising negative impacts on wildlife and conservation resulting from natural history film making.

Professional, Pers. Comm.) and there are no standardised industry guidelines to establish standards. As permitting regulations and enforcement may differ between countries due to variability in governance (Amano et al., 2018; Santangeli et al., 2019), we suggest these recommendations should become industry wide standard practice. This should not only ensure general adherence to high ethical standards across production companies and filming localities, but also benefit those companies that already adhere to high ethical standards by ensuring they get the appropriate recognition.

6.1. Production level recommendations

6.1.1. Codes of conduct

Codes of conduct have been shown to be useful and effective as a method of establishing socially responsible behaviour within organisations (Erwin, 2011). They can outline the legal requirements, professional behaviour and conduct expected by the profession (Cowin et al., 2019), be set as a reference document to promote more ethical practices (Bennett et al., 2017) and reduce negative practices undertaken (Adam and Rachman-Moore, 2004; Erwin, 2011). Codes of conduct have previously been suggested for those working with wildlife such as in camera trapping (Sharma et al., 2020) and ecotourism (Gjerdalen and Williams, 2000; Öqvist et al., 2018) and have been shown to help minimise disturbance to wildlife (Quiros, 2007). Codes of conduct can be expansive in their remit and could cover both how series are filmed and how the narratives within them are portrayed.

Although some production companies, such as the BBC Natural History Unit, already have institutional guidelines for recording the natural world (British Broadcasting Corperation, 2019b), this is neither standardised nor mandatory industry practice (Anonymous Industry Professional, Pers. Comm.). Guidelines should apply to all productions, not only ones made entirely in-house [e.g., by using Computer Generated Imagery (CGI), and using imagery from other locations, that distorted the meaning of events and misled the audience (Jones and Davies, 2019), *Serengeti* appears to contravene aspects of the BBC guidelines, but was shown on BBC One and is hosted on BBC iPlayer]. As such, we recommend a code of conduct be established for all natural history film makers to ensure compliance to appropriate filming practices.

6.1.2. Independent ethical review

Codes of conduct are valuable tools providing guidelines about acceptable behaviour. However, they are often reliant on individuals making judgements about how acceptable their proposed actions are. Within most scientific research institutions, in order to avoid such subjective decision making, research involving procedures and interactions with animals in the wild must first gain the approval of an independent ethics review committee before the work can be undertaken (Dyson and Calver 2003). We argue that a similar process, which should include an independent panel of researchers, film makers and local stakeholders, exploring the filming techniques planned, would be beneficial for natural history film makers to incorporate into their pre-production planning. This would help to prevent potential negative impacts to target species. As with scientific journals, TV channels can then insist that ethical reviews are in place before commissioning or screening films.

6.2. Industry level recommendations

6.2.1. Limiting and monitoring disturbance

The level of disturbance experienced by wildlife in response to filming techniques is often species specific. We suggest that, where available, assessments of species behavioural and physiological reactions from the literature should be carried out prior to filming as part of the pre-production ethical review, in order to ensure that only techniques and technologies that limit or minimise disturbance are employed. In addition, any disturbance behaviours that may occur from film making should be recorded and reported, together

with any mitigation measures put in place, in an open access database, reviewed by the independent ethics committee, and used to inform future film making projects. This information would then become part of a rolling ethical review process, whereby the reporting against each ethical review leads to a continual process of improvement in standards as more evidence becomes available. Where the use of filming techniques and technologies that have the potential to cause disturbance are featured in 'life behind the lens' documentaries, they should be accompanied with information on how the techniques were used and the associated ethical considerations.

6.2.2. Transparency

Film makers have limited control of how a film is interpreted by the viewing audience. However, they are responsible for structuring programmes and developing their narratives. When producers decide that a more dramatised approach is required for a particular film, then these programmes should be advertised in a way that reflect this and enables viewers the best chances of assessing whether the information they are given is likely to be accurate. As such, we recommend that disclaimers before such shows are prominently included (as with current 'based on true events' or 'contains images of disturbing nature' disclaimers found across various television series) and not added in the credits section where many viewers may have switched off or may be easily missed. In addition, where relevant, further detail in the 'life behind the lens' sections could be included to increase transparency. These sections would also be a useful platform for filmmakers, should they decide to show filming techniques that could have impacts to wild animal populations, to discuss the ethical and conservation implications of those filmmaking techniques, and the mitigation actions they took to minimise impacts.

6.2.3. Accreditation

Accreditation establishes quality standards and verifies the status of service providers and their compliance with accepted standards at both national and international scales (Tabrizi et al., 2011; Ulker and Bakioglu, 2019). We propose that formal third-party accreditation, which could include information from the ethical reviews and codes of conduct, covering all aspects of natural history film making would be a valuable addition to natural history film production. Within other sections of the media, animal welfare accreditation is industry standard through the "No Animals Were Harmed" program of the American Humane Society. A similar third-party accreditation would signal to viewers that filming was conducted to high ethical standards which minimised disturbance and negative impacts to wildlife and conservation.

7. Conclusions

Natural history film making can play an important role in educating the public and in the conservation of wildlife. Natural history film making has substantial scope for influencing public opinion and behaviour which can be used to increase conservation awareness (Schröder and Chillcott, 2019). However, natural history film making also has the potential to negatively impact wildlife and conservation, through disturbance and poor practice during filming and by incorporating misleading information and excessive anthropomorphism in the final production. Although individual production companies may have ethical guidelines (Richards, 2014) (Anonymous Industry Professional, Pers. Comm.), these vary from company to company, and there is little information for specific filming practices to be assessed, or for documentaries to be accredited as following best practice.

Human-wildlife interactions, and increased disturbance from human presence or filming technologies, can have a negative impact on wild populations, and compound conservation issues. Anthropomorphism and misinformation may lead to dissemination of incorrect conservation information which has the potential to divert funding and conservation way from the species that most need it. However, through conscientious pre-production planning, and increasing transparency around dramatised storytelling, negative impacts from natural history film making can be limited, and natural history film making can continue to be an effective tool for increasing public understanding as well as aiding conservation efforts for a multitude of threatened species and ecosystems.

CRediT authorship contribution statement

MJW and HMKO conceived and formulated the perspective and led the writing of the manuscript. DJC, DMPJ and SMD aided formulating the perspective, and reviewed and edited the manuscript.

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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