Discover Animals

RESEARCH Open Access

Viewer perceptions (and misperceptions) of animal-visitor interactions with big cats and crocodilians on YouTube

Lauren A. Harrington[1,2*], Angie Elwin[3] and Neil D'Cruze[2,3]

*Correspondence:
Lauren A. Harrington
lauren.harrington@biology.ox.ac.uk
[1]Oxford, UK
[2]Wildlife Conservation Research Unit, Department of Biology, University of Oxford, Life and Mind Building, South Parks Road, Oxford OX1 3LE, UK
[3]World Animal Protection UK, 5Th Floor, 222 Grays Inn Road, London WC1X 8HB, UK

Abstract

Animal-visitor interactions (AVIs) that involve "touching" captive wild animals are hugely popular, increasingly in-demand, and widely shared on social media. Social media may help raise awareness of conservation, and educate viewers, but the quality of information provided via AVIs varies, as does the treatment of the animals involved. Global standards for AVIs are lacking but various recent national-level codes and regulations call for increasing consideration of animal welfare (particularly for large, potentially dangerous animals). For accredited facilities, World Association of Zoos and Aquariums guidelines demand "respect" for the animals involved, and that AVIs are accompanied by animal welfare and conservation messaging. We described, and analysed the response to, 78 YouTube videos showing AVIs with captive "big cats" or crocodilians. Videos comprised predominantly promotional material, coupled with messaging that touched on conservation and animal welfare issues but lacked detail, and, in some cases, was potentially misleading. Both the videos themselves and viewer response to videos (assessed on the basis of video comments) revealed superficial "respect" for the animals, but there was little apparent appreciation of the "wildness" of the animals or of their place in the natural world. The sentiment of viewer comments was variable, but positive on average. We conclude that social media has considerable potential to perpetuate a potentially damaging perception of wild animals being "safe" and "protected" in captivity, where people seem to desire an unnatural relationship with wild animals and appear to be largely unaware of the welfare implications for the animals involved.

Keywords Crocodilians, Felids, Animal-visitor interactions, Wildlife tourist attractions, Social media

1 Introduction

A huge diversity of wild animals are kept in captivity in zoos, aquariums, sanctuaries, wildlife parks, private collections and commercial wildlife farms, where they interact indirectly and directly with both trained keepers, facility staff, and the general public. A growing number of public access facilities also make animals available for direct animal-visitor interactions (AVIs; sometimes termed Human-Animal Interactions, HAIs),

where visitors are able to feed, touch, ride, bath, walk and swim with the animals [12] and references therein). AVIs are provided by facilities for a variety of reasons—including income generation, advocacy and community engagement, and provision of visitor education or animal enrichment [12, 25]. The variety and availability of AVIs has grown rapidly in recent years [33, 68] and there appears to be increasing demand for, and availability of, opportunities to physically touch wild animals [14, 59, 60].

From an animal welfare perspective, some researchers suggest that AVIs may provide stimulation and enrichment for the individual animals involved [9, 10, 16, 17, 41]. However, understanding the relationship between people and wild captive animals is complex [26] and research on the short- and long-term impacts on the welfare of the animals involved in direct and indirect AVIs is generally lacking [10, 12, 33, 49, 60]. Animals may suffer poor welfare associated with keeping, training, or breeding methods, physical restraint during interactions or when off-show, or stress induced by the presence, proximity, or noise of visitors (e.g. [16]) and responses will likely vary among facilities (associated with variation in management and standards of care), species, and even individuals [12, 16, 26, 28, 54, 68]. Moreover, variation among existing studies in terms of the specific research questions posed and the methods used [12, 16, 26, 28, 68] mean that generalisable conclusions regarding the animal welfare impacts of AVIs are currently difficult (if not impossible) to draw [54].

From a visitor perspective, there are also potential benefits and disbenefits. For example, whilst there is evidence that close interactions with animals can have positive impacts on the mental health of human participants (e.g. [55]), there are also potential human health risks (due to injury or contracting zoonotic disease; [68]). Similarly, although visitors may benefit from learning opportunities [18, 54], education goals can be undermined by portraying animals in unnatural or demeaning situations [12] and references therein). It has been posited that AVIs can also benefit free-ranging wild animal populations as a result of actions associated with increased conservation awareness and/or conservation fund-raising [10, 60], although the effectiveness of animal encounters in delivering conservation-education is not always clear, [63]. At the other extreme, captive animal facilities may be involved in illegal and/or unsustainable sourcing of animals from the wild (e.g. [7, 42] and other practices of concern, from an animal welfare perspective, such as "speed breeding" [64, 67] and (in South Africa) providing animals for "canned hunting" (where wild animals—primarily lions—are hunted within a fenced area [11, 15, 65]).

Currently, global standards and laws for AVIs are lacking; however, recent national-level legislation in various countries is relevant. Notably, the UK's Animals (Low-Welfare Activities Abroad) Act 2023, which extends to England and Northern Ireland, prohibits the domestic sale and advertisement of low-welfare animal activities abroad (www.legislation.gov.uk; [38]). Others, such as the Big Cat Public Safety Act 2022 in the US (www.fws.gov,[31]) and decisions by the South African government to end lion farming [13, 37], relate to restrictions on keeping certain *s*pecies and carrying out certain activities (including, in the US, interactions with various large felid species at facilities that exhibit them). In Australia, the 2023 review of the Code of Practice on the Humane Treatment of Wild and Farmed Australian Crocodiles (Callida [6]) extends consideration of animal welfare to large reptile species, with implications for crocodilians in visitor attractions provided by farms. A number of companies in the tourism industry have made

public commitments to animal welfare [24], and references therein) and the Association of British Travel Agents (ABTA Animal Welfare Guidelines, www.abta.com) considers tourist contact with wild cats and crocodilians, specifically, as unacceptable. The Southern Africa Tourism Services Association (SATSA Captive Wildlife Toolkit, www.satsa.com), similarly, classes tactile interactions with all predators as unacceptable. For zoos, guidelines by the World Association of Zoos and Aquariums [68] recommend avoiding experiences that compromise the animals' welfare, reducing potential discomfort and stress in the animal, and regularly monitoring potential impacts on the animals' physical and behavioural welfare (although they do not explicitly advise against interactions with potentially dangerous animals). Additionally, WAZA [68] recommends that the messaging accompanying interactive experiences should raise conservation awareness and encourage respect towards the animals, that animals should not be presented as 'pets' or as 'performers' (or in a manner whereby visitors could perceive them as pets), and, specifically, that photo opportunities with animals should be accompanied by appropriate animal welfare and conservation messaging.

Like many other contemporary leisure or entertainment activities, AVIs are promoted on social media by visitors, special guests, and the venue owners and staff themselves [20]. Social media thus functions as advertisement for facilities, potentially drives demand (for this and other similar activities) and contributes to social norms and visitor expectations. Videos and posts on social media can also, potentially, significantly extend the reach of any "messaging" provided during the interaction.

Here we focus on YouTube videos showing AVIs involving large apex predators—specifically 'big cats' (felid species) and crocodilians. AVIs with these species are increasingly seen in eco-tourism settings but are also often associated with negative impacts on animal welfare [19, 46], in part because the training and handling techniques required to ensure the safety of visitors may be harmful for the animals (cf. SATSA Toolkit). Preliminary scoping revealed both (big cats and crocodilians) to be prevalent among online videos showing people interacting with wild animals, in a tourist or visitor setting. We used YouTube videos because YouTube is commonly used for both professional (e.g. advertising) and personal (e.g. experience sharing) purposes and is currently the biggest online video platform worldwide (www. statista.com). The aims of the study were to gain insight into the types of AVIs available involving big cats and crocodilians, the context or style in which they are portrayed, and how videos showing these activities are perceived by online viewers. Ultimately, we were interested in the extent to which AVIs involving large apex predators are promoted online, and the extent to which online exposure might stimulate interest, and potentially drive demand for these, and other similar, activities.

2 Methods

2.1 Video selection

To select videos for analysis we used a combination of search terms related to "travel vloggers/YouTubers/adventurers" or "attractions/experiences" (e.g. "top travel vloggers", "animal visitor interactions") and snowball sampling (c.f. Babbie 2020; whereby we included videos linked to those identified in the initial search, and progressively identified additional, more specific, search terms, e.g. "cuddling baby tigers"), and followed a semi-systematic, adaptive search strategy (described in full in Appendix 1). Our inclusion criteria were: English language videos, posted within the previous five years

(2017—2022), showing people interacting with wild felids or crocodilians, in captivity, in a public venue, with a minimum of 100 viewer comments (to provide sufficient comments for analysis, see 2.3.1 and 2.3.2), where the activity shown was offered to paying visitors (or the animals shown were available for similar interactions with paying visitors). We included videos of AVIs involving felid cubs because although these animals are not large or potentially dangerous themselves (in terms of physical injury to visitors), they are relevant to the welfare of the animals in the facility through the breeding system used to produce them, and their own fate when they have grown too large to interact with safely (cf. [65]). At all search stages (see Table A1, Appendix 1), videos were screened for relevance; where necessary, we checked venue websites to clarify that they were open to the general public and that the particular activity shown was offered to paying visitors. Searches were carried out between April and June 2022.

2.2 Data collation

2.2.1 Video content

To describe and categorise video content, we watched all videos in full and read any additional text provided. For all videos we recorded: date posted, video length (in minutes), venue (and country), poster (i.e. venue owner/s, animal keepers/trainers, or visitors), and the species and activity shown. We did not attempt to assess the welfare of the animals included in the videos, or the suitability of the conditions that they were kept in, because the videos provided only a short (edited) snapshot of the interactions. To provide a measure of the potential influence of videos, we recorded the number of subscribers to each of the YouTube channels on which the videos were posted. As descriptors of the type of messaging used in the video narration, we recorded any mention of conservation (including the species' status or threats in the wild, and/or protection efforts ex situ), welfare (or "well-being") of the animal in captivity, or the 'natural' biology and/or behaviour of the animal. (Note that descriptions of video messaging were intended to represent only the narration included by the video presenters, and are not necessarily factually correct). We also recorded whether video presenters stated clearly that the animal shown was not a pet. Finally, we noted whether a website link for the venue was provided either in the video or the text, and whether video presenters actively promoted the venue and/or the activity shown.

2.2.2 Video metrics

To quantify video exposure and popularity, we recorded the number of views (exposure) and the number of likes (popularity) that videos had received at the time of viewing. For video likes, we used like:view ratios to account for differences in exposure among videos, and (as in [21, 22]) compared like:view against a 'benchmark' value of 0.04 (or 4 likes per 100 views, which is considered to represent a marketing "metric of success" for YouTubers, [47]). We did not correct the number of views for the length of time since the video had been posted because we were primarily interested in quantifying total exposure of the videos included in the study and evidence suggests that the number of views for many videos peaks within the first few days or weeks of posting (e.g. [2]). This means that, in our analysis, video *likes* were independent of time since posting but *views* were not (although all videos included in the study were limited to a maximum of five years since posting).

2.3 Comment analysis

2.3.1 Sentiment analysis

We used sentiment analysis to quantify the polarity of viewer comments on videos (see [21] and references therein). Comment text was extracted from videos using the "tuber" package [52] in R and exported to a plain text file (one file per video), where lines of text corresponded to individual comments. Here, we used a sentence-level lexicon-based approach, which assigns a sentiment score to each sentence based on the scores of all 'meaningful' (scorable) words within the sentence (i.e. all words that exist in the chosen lexicon and have an associated score). We used the "sentimentr" package [45] in R to assign sentiment scores, which is able to account for valence shifters and modifiers in the text. The sentimentr package provides a sentiment score between − 1 and + 1 for each scorable word, and the function 'sentiment_by' assigns a sentiment score to each sentence (in this case, comment) based on the sum of all scorable words (taking account of the word count used). For each video, we derived an overall sentiment score based on the mean of all comment scores, and a measure of the variation in sentiment within the comment text based on the inter-quartile range (IQR) of per comment scores.

2.3.2 Frequently occurring words

To provide context for sentiment scores, and further insight into what aspects of the video or activity shown that the viewers were commenting on, we quantified the most frequently occurring words in the comment text following the extraction and text cleaning approach described in Harrington et al. [21]. For this analysis, we collated comments from videos grouped by species-activities (defined below). For each species-activity group we recorded all words that occurred in the comment text at least ten times, removing any nonsensical "words" (i.e. incomplete words and strings of punctuation marks) that were missed during the text cleaning process. To compare amongst groups, we then created a combined dataset containing the ten most-frequently cited words in each of the groups and the frequency with which they had been used in all groups.

2.4 Statistical analysis

Statistical analysis was carried out to describe patterns in our dataset. For comparative purposes, species-activities were grouped (post hoc) as: 1. 'small' felid cubs (estimated < 3 months in age), 2. 'large' felid cubs (ca. 3 months—1 year in age), 3. sub-adult/adult felids in venues in the USA, 4. sub-adult/adult felids in venues in Thailand, 5. crocodilians, 6. various species (shown in the same video). For felids, we used age as reported in the video.

We used a Kruskal–Wallis rank sum test to test for differences in the number of video views, and ANOVA and Tukeys post hoc HSD test to test for differences in like:view ratios, mean sentiment scores, and within video inter-quartile range (IQR) in sentiment score, among species-activity groups (hereafter 'groups'). We tested whether average like:view ratios exceeded benchmark values, and mean sentiment scores were significantly greater than 0 (i.e. positive), using Wilcoxon signed rank tests. Note that differences in the number of video views refer only to differences in total exposure among species-activity groups and are not a measure of 'popularity' because they do not account for time since posting. We tested for similarity in the words used most frequently in the comments using Kendall's tau rank order correlation. Additional statistical tests used are

stated in the text. Exact p values were computed for Wilcoxon tests (where possible, i.e. in the absence of ties), and, for multiple tests, p values were adjusted using the Bonferroni correction. Medians were used as a measure of central tendency for skewed variables, otherwise we used means. All statistical analyses were carried out in R (version 4.1.2; [44]).

2.5 Research ethics

All data used in this study (videos, video metrics, and comments) were publicly available on the YouTube platform and posted on public accounts. Given that comments were posted as public feedback to the video creators, we assume that commenters intended to contribute to the commentary associated with the video, and thus expected and wanted their comments to be read by others. Accordingly, and as in Townsend and Wallace [56], use of these data was considered to not require informed consent. Commenters were not identified individually, no identifying information was collated, and data deriving directly from comments are presented here only in aggregate form (single words and sentiment scores). We did not engage in deceptive practice and did not engage directly or otherwise with YouTube users (either those posting videos or commenting on videos). To protect the identity of the individuals posting the videos and those commenting on videos, web addresses and channel names are not reported here (see, e.g. [70]).

3 Results

3.1 Dataset

We analyzed 78 YouTube videos (2.6–34.3 [mean 12.2] minutes long), posted on 22 different YouTube channels between March 2017 and June 2022, showing big cat or crocodilian AVIs at nine venues based in the USA (n = 4), Thailand (n = 2), Central America, Australia, and South Africa (all n = 1). Animals involved included cubs (ca. 6 weeks—1 year old) of four felid species (tiger *Panthera tigris*, lion *P. leo*, jaguar *P. onca*, and leopard *P. pardus*, n = 29 videos), sub-adult and adult tigers and jaguars (n = 7), adult ligers (hybrid offspring of a male lion and female tiger, n = 4), and three crocodilian species (saltwater *Crocodylus porosus* and Nile *C. niloticus* crocodiles, n = 3, and American alligators *Alligator mississippiensis,* n = 20) (all crocodilians appeared to be adults, Fig. 1). Thirteen videos showed interactions with various animals (including gibbons *Hylobates lar*, lemurs *Lemur catta, Varecia* spp., chimpanzees *Pan troglodytes*, sloths *Coloepus* spp., wolves *Canis lupus*, and an African elephant *Loxodonta africana*), all of which featured either felid cubs or primate infants amongst the other species shown. Activities shown across all videos included swimming with felid cubs (n = 14 videos), swimming with alligators (n = 14), touching and photo opportunities with tigers (n = 5) and alligators (n = 1), and cage diving with crocodiles (n = 3) as well as touching and holding felid cubs, primates and sloths, riding and swimming with the elephant, feeding the wolf, and photo opportunities with the liger (n = 13, Fig. 1). 'Behind the scenes' videos showed special guests playing and interacting with felid cubs (n = 8), or owners/keepers feeding and caring for felid cubs (n = 7), walking with adult felids (n = 9), or training alligators (n = 4).

Videos were presented by the venue owner, or animal trainers/keepers that worked at the facility (hereafter "owners/keepers", n = 47), or by YouTubers recording their own visit to the facility, either as special guests on private behind-the-scenes visits, as visitors undertaking the same experience available to the general public, or as reporters

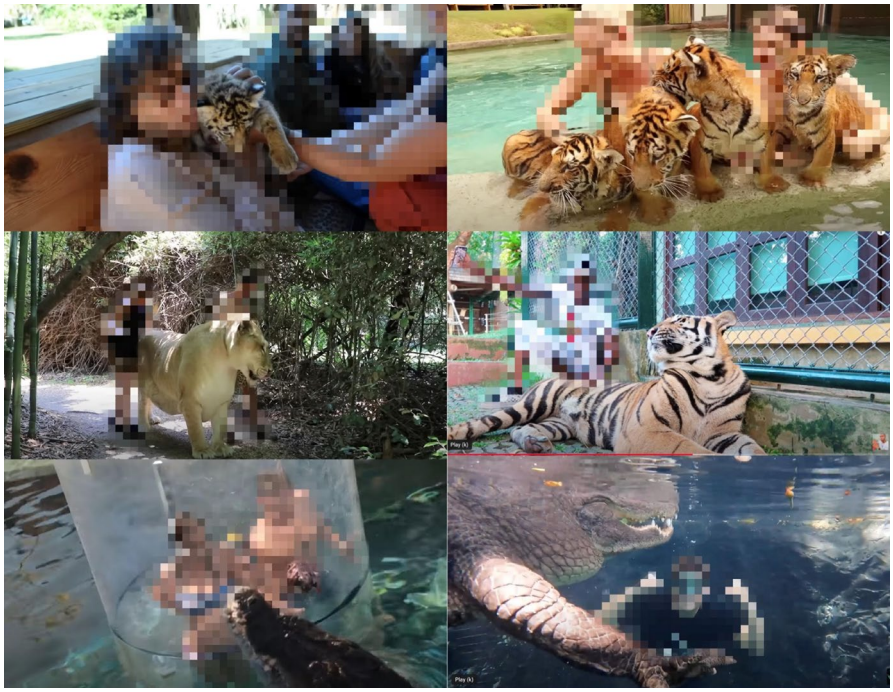

Fig. 1 Screenshots from YouTube videos showing (from top left to bottom right): small felid cub petting, swimming with tiger cubs, walking with a liger, photo opportunities with a tiger, cage diving with crocodiles, swimming with an alligator

describing the facility/attraction (n = 25). Owner/keepers were sometimes accompanied by a visitor (sometimes but not always a high-profile celebrity, n = 7) and were sometimes visitors themselves to another facility (n = 6). Variation in the number of channel subscribers was large (0—20.2 million, median = 942,500) but there was no statistically significant difference between the number of subscribers for YouTubers visiting the facility (median = 1 million, n = 15) versus those that were presenting as owners/keepers (median = 782,000, n = 7; Wilcoxon rank sum test: W = 57, p = 0.783). These were therefore combined for further analysis.

3.2 Video content

3.2.1 Messaging

Thirty-seven percent (n = 29) of videos mentioned the species' status, or threats to the species, either in the wild or in captivity (including ex situ protection efforts, i.e. "saving" or "rescuing" the animal). Forty-one percent (n = 32) of videos mentioned animal welfare; an additional 8% (n = 6) stated that the animals were there because either they "had nowhere else to go" or would otherwise have been killed. Seventy-eight percent (n = 61) described the natural biology and behaviour of the species (e.g., vocalisations, colour variants, physical capabilities such as bite force, running or swimming speed, and the size and weight of the animal). In three of 44 videos showing people interacting with young felids and infant primates the presenter explicitly stated that the animal was not a pet; in five of these videos the presenters say that "they want one" or ask if they can "take them home". Twenty of the 23 videos showing interactions with crocodilians included commentary on conflict and coexistence with these species in the wild and warned viewers never to get in the water with an alligator.

3.2.2 Promotion

Videos promoted venues via website links shown on the screen or in the accompanying text (76.9% [n = 60] videos), directly in the video narration (65.4% (n = 51]), or both (53.8% [n = 42]). In total, 88.5% (n = 69) videos included some form of promotion.

3.3 Video metrics

Videos received 1,324—12,436,594 views (median = 359,046); the number of views was highly left skewed but almost a third of the videos (29.5%, n = 23) had been viewed > 1 million times. There was no evidence that the number of views was linearly related to, or limited by, the number of channel subscribers (linear model: number of video views ~ number of channel subscribers, excluding three outliers: $F_{1, 73} = 0.04$, p = 0.8461; and for 26 [33.3%] videos, views > subscribers). Video views were lowest for group 4 (Thailand sub-adult/adult felids, Fig. 2a) and differed statistically significantly among groups (Kruskal–Wallis chi-squared = 11.844, df = 5, p = 0.037).

Like:view ratios were 0.005—0.075 (mean = 0.027, excluding one outlier with no 'likes'). For at least one video in four of the six groups (17.9% [n = 14] overall), likes:views > 0.04;

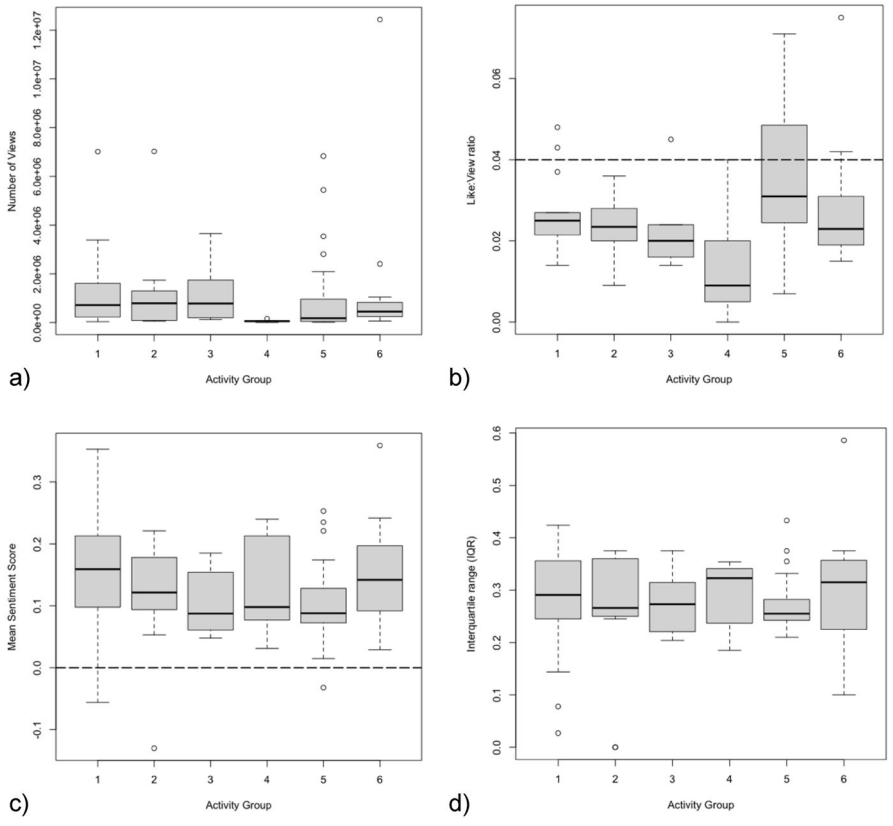

Fig. 2 Video metrics (number of views [**a**] and like:view ratio [**b**]) and sentiment of viewer response (mean comment sentiment score [**c**] and IQR of comment sentiment score [**d**]) plotted by activity group, where groups are as follows: 1 = small felid cubs (n = 15), 2 = large felid cubs (n = 14), 3 = sub-adult/adult felids in venues in the USA (n = 8), 4 = sub-adult/adult felids in venues in Thailand (n = 5), 5 = crocodilians (n = 23), 6 = various species (shown in the same video) (n = 13). The dotted line in b = 0.04 and indicates the benchmark for popularity; the dotted line in c = 0 (i.e. scores above the line are positive). There was no evidence that the variation in like:view variations in group 5 was due to differences between videos showing cage diving with crocodiles and those for videos showing direct interactions with alligators (Wilcoxon rank sum test: W = 15, p = 0.1845). Post hoc pairwise comparisons revealed statistically significant differences in the number of views between group 4 and groups 2, 3, and 6, and marginally statistically significant differences in like:view ratios between group 5 and group 4

although, on average, likes:views did not exceed the benchmark value (one-sided Wilcoxon signed rank test, V = 357, p = 1). Likes:views were highest for group 5 (crocodilians) and lowest for group 4 (Fig. 2b), and differed statistically significantly among groups (ANOVA: $F_{5, 72} = 2.61$, p = 0.032).

3.4 Comment text

3.4.1 Sentiment scores

Across all videos, we scored the sentiment polarity of a total of 190,146 comments (104-84,101 comments per video; median = 536). On average, 71% of comments per video carried overall positive or negative sentiment polarity (range 23–90%). Combining all videos, the most frequent comment sentiment polarity class was positive (52% comments), followed by neutral (29%) and negative (19%), with similar combined rankings per group (% positive comments for all 6 groups = 46.4–56.3, % neutral comments = 20.8–37.7, % negative comments = 14.3–23.1). Mean sentiment scores across all videos were – 0.130–0.36 and were, on average, statistically significantly greater than 0 (i.e. positive, Wilcoxon signed rank test: V = 3020, p < 0.001), with an overall mean positive value of 0.13. Within video IQR in comment sentiment score was 0–0.586 (mean = 0.280) but there was no statistically significant difference in either mean sentiment scores (ANOVA: $F_{5, 72} = 1.12$, p = 0.36, Fig. 2c) or IQR among activity groups (ANOVA: $F_{5, 72}$ 0.32, p = 0.899, Fig. 2d). Mean sentiment score was significantly positively correlated with like:view ratios, albeit relatively weakly (Pearson's product-moment correlation = 0.263, p = 0.020) but not with the number of comments per post (Pearson's product-moment correlation = – 0.071, p = 0.538, excluding one outlier).

3.4.2 Frequently occurring words

Frequently occurring words in the comment text were similar across video groups (rank order for all groups, with the exception of group 4, were moderately positively correlated, r = 0.54–0.57, p = 0.03–0.05), and appeared to suggest broad appreciation of the videos. For example, the words "love", "like", and "good" were among the 17 most frequently occurring words in all seven groups (Fig. 3; for example, "I love these tiger so so much!!!", "Omg so Good"). The only frequently occurring word with clearly negative connotations was the word "drugged" which appeared in the most frequently occurring words to videos in group 4 (Fig. 3; for example, "The animals are drugged. Shame on you … for supporting this cruelty."). Other videos in group 4 received positive responses (for example, "It was awesome, the tigers are definitely well taken care of.").

4 Discussion

Our analysis revealed videos showing a range of AVIs involving large, potentially dangerous felids and crocodilians on YouTube, as well as "cuddling" and "petting" young felid cubs. Both (although different in terms of their risks for visitors) raise a number of concerns for the animals involved, and more broadly regarding the portrayal of interactions between people and wild animals.

Because we specifically selected videos with > 100 comments our dataset does not represent a random sample of YouTube videos showing AVIs involving wild felids and crocodilians, rather it represents the particular videos that were *most engaged* with. Videos and social media posts for sentiment analysis will almost never be a random

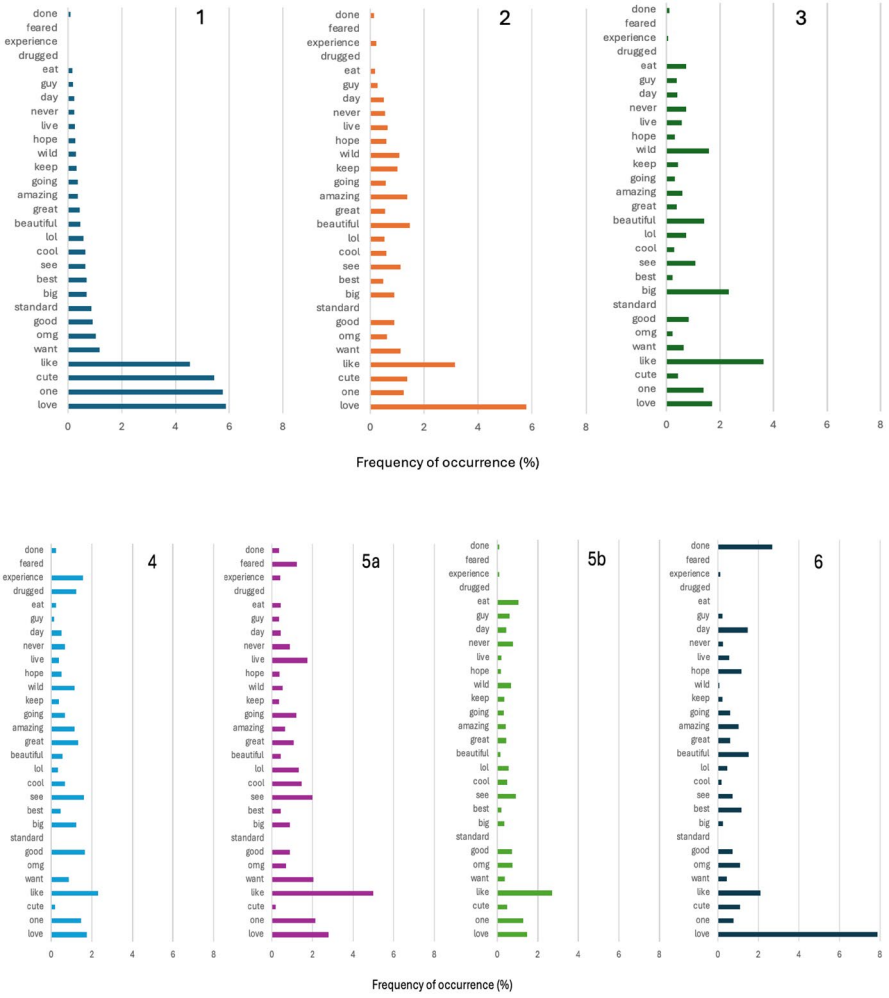

Fig. 3 Frequency of occurrence (as % of total word occurrences) of the most frequently occurring words in the comment text for each video group; data shown include the ten most frequently occurring words in the comment text for each video group, but, for comparative purposes, also include the most frequently occurring words in all other video groups. Group 1: small felid cubs; 2. large felid cubs; 3. sub-adult/adult felids in US venues; 4: sub-adult/adult felids in venues in Thailand; 5. crocodilians (a. 'cage diving', b. swimming); 6. various species. Total number of words occurring at least 10 times, and total word occurrences = Group 1: 748, 46,033; Group 2: 959, 47,040; Group 3: 815, 29,974; Group 4: 334, 2,122; Group 5a: 241, 5,403; Group 5b: 1,915, 114,156; Group 6: 860, 72,330, respectively. Note that the words "baby" and "happy" were retrospectively removed from this analysis because "baby" was used as a keyword (a word that viewers were requested to put in the comments by presenters to get a mention online) in several of the videos in Group 1 and "happy" was used predominantly in the context of a birthday greeting in one of the videos in Group 6; prior to removal, these two words were the most frequently occurring words in Group 1 (n = 8,984) and Group 6 (n = 13,454), respectively, but neither occurred within the ten most frequently occurring words in any other group

sample because a certain number of comments are required for analysis; since videos with greater exposure are more likely to receive more comments, the sample of videos used will almost always be the most viewed and often also the most liked (or disliked). Our dataset, therefore, does not allow us to draw broad conclusions based on average video metrics and sample summaries, but it does provide insight on maximum reach and popularity of these types of videos and how they are perceived by viewers.

In common with other similar social media studies (e.g. [2, 21, 22]), most videos received relatively little attention (Fig. 2a) compared against published social media benchmarks (e.g. [47]), and were not considered "popular" (Fig. 2b). This is particularly

striking when considering that our sample might be expected to be biased towards videos that are more popular and with higher levels of exposure. Indeed, almost 30% (n = 23) of videos did attract considerable numbers (> one million) of viewers (one video had been viewed more than 12 million times), and some (c. 20%) had relatively high like:view ratios (up to 7.5 likes per 100 views). Across groups, felid venues in Thailand received less exposure than videos showing other species-activities and were, on average, least 'popular', whilst venues offering interactions with crocodilians were, on average, most popular. Nevertheless, despite differences in content, exposure (Fig. 2a), and popularity (Fig. 2b), viewer comments for all groups were predominantly positive (in terms of sentiment scores and most frequently occuring words). Further, whilst all videos, across all groups, received a mix of positive, neutral, and negative reactions in the video comments, the proportion of positive comments consistently (in 73 of 78 videos) exceeded that of negative comments. This was the case even for videos of tiger interactions in Thailand where severe animal welfare concerns (i.e. questions regarding the use of drugs) were raised by the viewers.

4.1 'Unnatural' and high- risk interactions with apex predators

In contrast with Learmonth's [27] suggestion that human-animal interactions in zoo environments could be considered 'natural' in a modern human-dominated world, AVIs involving large apex predators could, arguably, be considered highly 'unnatural' interactions between animal and human (given that, in the wild, humans do not come into close contact with large predatory species, except when through intentional hunting or when they are being preyed upon). Certainly, these interactions carry a number of risks, to the humans participating (including risk of zoonotic disease transmission, e.g. Green [19]), the animals involved, and to societal expectations and understanding regarding wild animals. Even when hand-raised and habituated to humans, the size and power of these predatory species means that they can inflict serious and/or lethal injuries suddenly and without warning [48]. Animal keepers and visitors have been injured and killed by captive lions and tigers in zoos and privately-owned entertainment facilities [30, 40], and there are numerous reports in the national and international press of animal handlers being harmed (most recently losing a limb) by crocodiles and alligators in facilities that are open to the public and offer close contact interactions to visitors (e.g. [1, 51, 53, 62]). We do not know what safety protocols were adopted by the particular venues shown in the videos but recent surveys suggest that techniques (such as aversive conditioning and physical restraint) that can have severe, long-term, negative impacts on animal welfare, and are advised against by WAZA [68], persist at many unaccredited animal facilities in many regions [66]. Our analysis (based on the response of video viewers to videos showing direct contact interactions with these species) suggests that indirect risks may extend to the wider community of online viewers, who may perceive that all wild cats can be touched [57] or that all crocodiles and alligators can be safely approached. Safety messages included in many of the crocodilian videos in this study contrasted with the image of the video presenter in the water with an alligator. We did not explicitly include mention of disease in our assessment of messaging used in the video narration but note that none of the videos showed people (either hosts or visitors) using gloves or masks when handling animals. Discussion of the influence of social media on human behaviour (beyond visiting similar AVIs to those viewed in the videos), the uptake of risky

behaviours with respect to wild animals in particular, is beyond the scope of this paper but is not without precedence in other fields (e.g. [43], see [4] for further discussion on the influence of social media on conservation-relevant human behaviours).

4.2 Cuddling 'cute' lion and tiger cubs

Videos showing people holding, stroking, and playing with felid cubs comprised the largest group in this study. These videos are superficially similar to other "cute" online content (cf. [32]), and many of the videos (i.e. those posted by visitors who are unaware of the potential negative welfare impacts on the animals involved, cf. [35]) are presumably well-intentioned. However, there is a risk of erroneously portraying wild animals in contact with humans as suitable pets (e.g. [34, 39]), particularly when they are young, easily handled, and resemble a domestic kitten. Evidence of a causal link between social media content and increased demand for wildlife as pets is currently lacking [58], see also [57], but very few of the videos analysed in this study stated clearly that the animal was not a pet.

We do not know where or how multiple cubs were sourced, but there is some concern regarding the apparently constant supply of young animals, the circumstances under which they were taken from their mothers, the unnatural conditions that they are kept in, and the impact of their extensive exposure to humans (e.g. [3]). Separation of felid cubs from their mothers at a young age is associated with negative impacts on their subsequent health, developmental and social behaviour, and potentially causes psychological stress to both the mother and cub [8, 65] and references therein). What happens to the animals in these videos when they are too large to safely handle is unknown.

4.3 Video messaging

Video commentary was often sensational in tone and focused on, for example, the "size", "power", and "speed" of the animals. We did not attempt to fact-check all of the commentary, but some information presented was incorrect (as has been found for online videos of alligator wrestling; [46]): for example, white Bengal tigers are a colour variant [69], they are not white because they "live in the snow" as claimed in many of the videos. Reference to conservation used terms like "saving" or "protecting" the animals but provided little or no detail on what they were saving or protecting animals from, or how. Several of the felid videos referred to the importance of keeping the species in captivity "in case they go extinct in the wild" or suggested that they were "safeguarding genetics" through captive breeding, but there was no mention of releasing animals back into the wild in the future. Colour morphs (rather than species) were referred to as "endangered" but there was no mention of the risk of inbreeding. It is well documented, for example, that many white tigers in captivity are inbred to maintain this autosomal recessive trait [69] and consequently suffer a number of health problems [61]. Animal welfare was used to justify the actions shown in the videos (i.e. providing enrichment), to rebut suggestions that the animals were declawed or subject to aversive conditioning, or to explain that the animals had been rescued (from, for example, "canned" hunting or conflict situations), rather than explaining how to properly meet the needs of these species in captivity.

4.4 The role of social media in the (ir)responsible use of captive wild animals

Several owner/keepers (and YouTubers) had more than a million subscribers, and all owner/keepers had at least 200,000 followers (qualifying them as "mega- " and "macro-influencers" respectively; [23]). This, and the promotional venue material that was included in most of the videos, highlights the considerable advertising role of YouTube videos that is largely unmoderated in terms of compliance even with its own policies (cf. [21]) and potentially in conflict, in the UK, with the Animals (Low-Welfare Activities Abroad) Act, in the US, (for felid interactions) with the Big Cat Public Safety Act, and more generally with recommendations within the tourism industry (e.g. ABTA, SATSA). There is no particular requirement for social media content to educate people about conservation, but entertainment presented as education can lead to significant misinformation (cf. [50]) with potentially damaging implications for the welfare of captive animals and the conservation of wild populations.

As for "exotic" pets, whether or not online promotion and attention actually drives demand for these types of tourist interactions is not known, but there is a risk that exposure to such content changes attitudes, particularly among young social media users, which could normalise harmful practices for a new generation of tourists [36]. Most tourists are unaware of the potential negative impacts of WTAs [35] and similar misperceptions are likely associated with viewing videos of AVIs. For example, animal behaviours and facial expressions that reflect distress are commonly misinterpreted (e.g. [29]), even in domesticated species [5]. And, whilst video viewers questioned the apparent docility of full-grown tigers and crocodiles in the video, there was little or no discussion in the video comments regarding the constant supply of felid cubs or their long-term fate, which may equally involve welfare harms to the animals involved.

5 Conclusion

For large apex predators specifically, there is a raft of national-level legislation and corporate policies that prohibit, or recommend against, keeping these animals in captivity for entertainment purposes and against offering direct contact interactions to the public. In contrast with these trends, videos portraying interactions with large potentially dangerous animals are widespread on social media and appear to attract a predominantly positive response from viewers. Both presenters and viewers appear to care about, and admire, the animals involved in the activities, but within these videos, and other similar online content (e.g. Harrington et al. unpub. data.), there seems to be an evolving concept of people "protecting" wild animals and of keeping them "safe" in captive environments, in a way that bears little or no relation to the natural behaviour of wild animals in wild, natural spaces, and may fail to foster any real appreciation of the natural world and the place of people within it. Given the reach, and potential influence, of social media on people's attitudes and social norms, this type of mis-information could be hugely damaging to nature much more broadly than the wild animals currently in captivity. We suggest that the role of AVIs in zoos and other animal-keeping facilities, and of social media content portraying these experiences, in shaping the perceptions and attitudes of people, warrants further study, and compliance within and across regulatory policies requires greater oversight.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s44338-025-00118-2.

Supplementary file 1.

Supplementary file 2.

Author contributions

NDC, LH and AE conceived the study, LH collated data with input from NDC and AE, LH designed the analysis and wrote the first draft of the paper; all authors contributed to data interpretation, and final editing of the manuscript.

Data availability

For protection of users' privacy and compliance with General Data Protection Regulation (GDPR 2016/679), raw data used in the study cannot be made publicly available.

Declarations

Ethics approval and consent to participate

Institutional ethical approval was not available to the authors at the time of data collection for this study; ethical research practices as outlined by the British Sociological Association and current academic thinking on the use of publically-available social media data were followed. Further details, including the steps taken to protect individual social media users, are provided in the Methods section. Consent to participate was not required. Individual social media users (either posting, or commenting on, videos) were not engaged with directly or identified in the data collated. Further information on our processes is provided in the Methods section.

Consent for publication

Consent to publish was not required. Individual social media users (either posting, or commenting on, videos) were not engaged with directly or identified in the data collated. Further information on our processes is provided in the Methods section.

Competing interests

This study was funded by an animal welfare organisation; two of the authors are employed by the same organisation (NDC holds the position of Head of Research). Our intent in carrying out this study was to provide insight into how videos showing AVIs involving large and potentially dangerous animals are perceived by viewers, which is relevant to research questions regarding the role that social media might play in driving such AVIs. We do not attempt to assess the welfare conditions of the animals involved in the particular videos included in the study, nor do we make any assumptions that animal welfare conditions in these particular videos are poor. We do hold the view that animals used in these types of visitor attractions are at risk of suffering poor welfare at some point in the process. However, our results pertaining to viewer response were in no way influenced by our own personal views on the appropriateness of these type of AVIs, on animal welfare, or the funding source. Authors declare no other COI.

Received: 31 July 2025 / Accepted: 19 August 2025
Published online: 06 September 2025

References

1. Atkin C. Crocodile attacks handler in dramatic video as tourists 'think its part of the show'. 9 March 2016. The Independent. 2016. https://www.independent.co.uk/news/world/australasia/crocodile-attack-handler-dramatic-video-tourist-show-a6921081.html
2. Bärtl M. YouTube channels, uploads and views: a statistical analysis of the past 10 years. Convergence. 2018;24(1):16–32. https://doi.org/10.1177/1354856517736979.
3. Bending Z. The Conversation. 2020. https://theconversation.com/before-you-hit-share-on-that-cute-animal-photo-consider-the-harm-it-can-cause-126182.
4. Bergman JN, Buxton RT, Lin H-Y, Lenda M, Attinello K, et al. Evaluating the benefits and risks of social media for wildlife conservation. FACETS. 2022;7(1):360–97. https://doi.org/10.1139/facets-2021-0112.
5. Burn CC. A vicious cycle: a cross-sectional study of canine tail-chasing and human responses to it, using a free video-sharing website. PLoS ONE. 2011;6(11): e26553. https://doi.org/10.1371/journal.pone.0026553.
6. Callida Consulting. Research and Consultation Report. Review of the Code of Practice for the Humane Treatment of Wild and Farmed Australian Crocodiles. April 2024. Department of Climate Change, Energy, the Environment and Water. 2024. https://www.dcceew.gov.au/sites/default/files/documents/research-consultation-report-review-code-practice-crocodiles.pdf
7. Carder G, Plese T, Machado FC, Paterson S, Matthews N, et al. The impact of "selfie" tourism on the behaviour and welfare of brown-throated three-toed sloths. Animals. 2018;8(11):216. https://doi.org/10.3390/ani8110216.
8. Chorney S, DeFalco A, Jacquet J, LaFrance C, Lary M, et al. Poor welfare indicators and husbandry practices at Lion (*Panthera Leo*) "Cub-Petting" facilities: evidence from Public YouTube Videos. Animals. 2022;12(20):2767. https://doi.org/10.3390/ani12202767.
9. Claxton AM. The potential of the human–animal relationship as an environmental enrichment for the welfare of zoo-housed animals. Appl Anim Behav Sci. 2011;133(1–2):1–10. https://doi.org/10.1016/j.applanim.2011.03.002.
10. Collins CK, McKeown S, O'Riordan R. Does an animal-visitor interactive experience drive conservation action? J Zool Bot Gard. 2021;2(3):473–86. https://doi.org/10.3390/jzbg2030034.

11. D'Cruze N, Elwin A, Green J. South Africa is to shut down captive lion farms. Experts warn the plan needs a deadline. 8 April 2024, The Conversation. 2024. https://theconversation.com/south-africa-is-to-shut-down-captive-lion-farms-experts-warn-the-plan-needs-a-deadline-227258
12. D'Cruze N, Khan S, Carder G, Megson D, Coulthard E, et al. A global review of animal-visitor interactions in modern zoos and aquariums and their implications for wild animal welfare. Animals. 2019;9:332. https://doi.org/10.3390/ani9060332.
13. DFFE (Department of Forestry, Fisheries and the Environment). Policy position on the conservation and sustainable use of elephant, lion, leopard and rhinoceros. DFFE, Republic of South Africa. 2024. https://www.dffe.gov.za/sites/default/files/legislations/Revised%20Policy%20Position%20on%20the%20%20Conservation%20and%20Sustainable%20use%20of%20ELLR.pdf
14. Dwyer J. Do not feed the animals: do not touch: desire for wild animal companionship in the twenty-first century. Interdiscip Stud Lit Environ. 2012;19:623–44.
15. Elwin A, Asfaw E, D'Cruze N. Under the lion's paw: lion farming in South Africa and the illegal international bone trade. Nat Conserv. 2024;56:1–17. https://doi.org/10.3897/natureconservation.56.124555.
16. Escobar-Ibarra I, Mota-Rojas D, Gual-Sill F, Sanchez C, Baschetto F, Alonso-Spilsbury M. Conservation, animal behaviour, and human-animal relationship in zoos. Why is animal welfare so important? J Anim Behav Biometeorol. 2021;9(2):2111. https://doi.org/10.31893/jabb.21011.
17. Fernandez EJ, Upchurch B, Hawkes NC. Public feeding interactions as enrichment for three zoo-housed elephants. Animals. 2021;11:1689. https://doi.org/10.3390/ani11061689.
18. Godinez AM, Fernandez EJ. What is the Zoo experience? How zoos impact a visitor's behaviors, perceptions, and conservation efforts. Front Psychol. 2019;10:1746. https://doi.org/10.3389/fpsyg.2019.01746.
19. Green J, Jakins C, Asfaw E, Parker A, de Waal L, D'Cruze N. Welfare concerns associated with captive lions (*Panthera leo*) and the implications for commercial lion farms in South Africa. Anim Welf. 2022;31(2):209–18. https://doi.org/10.7120/09627286.31.2.005.
20. Harrington LA, Elwin A, Patterson S, D'Cruze N. The role of social media in promoting inappropriate wildlife tourism: a case study of direct contact animal-visitor interactions portrayed on YouTube.
21. Harrington LA, Elwin A, Paterson S, D'Cruze N. The viewer doesn't always seem to care – response to fake animal rescues on YouTube and implications for social media self-policing policies. People Nat. 2023;5(1):103–18. https://doi.org/10.1002/pan3.10416.
22. Harrington LA, Macdonald DW, D'Cruze N. Popularity of pet otters on YouTube: evidence of an emerging trade threat. Nat Conserv. 2019;36:17–45. https://doi.org/10.3897/natureconservation.36.33842.
23. Ismail K. Types of social media influencers: mega, macro, micro or nano. *CMS Wire,* 2023. https://www.cmswire.com/digital-marketing/social-media-influencers-mega-macro-micro-or-nano/
24. Jones P, Comfort D. Tourism companies and animal welfare. Athens J Tour. 2021;8(2):75–88.
25. Kreger MD, Mench JA. Visitor-animal interactions at the zoo. Anthrozoos. 1995;8(3):143–58. https://doi.org/10.2752/089279395787156301.
26. Learmonth MJ. Human-animal interactions in zoos: what can compassionate conservation, conservation welfare and duty of care tell us about the ethics of interacting, and avoiding unintended consequences? Animals. 2020;10(11):2037. https://doi.org/10.3390/ani10112037.
27. Learmonth MJ. Dilemmas for natural living concepts of zoo animal welfare. Animals. 2019;9:318. https://doi.org/10.3390/ani9060318.
28. Learmonth MJ, Sherwen S, Hemsworth PH. Assessing preferences of two zoo-housed Aldabran giant tortoises (*Aldabrachelys gigantea*) for three stimuli using a novel preference test. Zoo Biol. 2021;40:98–106. https://doi.org/10.1002/zoo.21585.
29. Maréchal L, Levy X, Meints K, Majolo B. Experience-based human perception of facial expressions in Barbary macaques (*Macaca sylvanus*). PeerJ. 2017;5: e3413. https://doi.org/10.7717/peerj.3413.
30. Marnewick K, de Waal L. Biting the hand that feeds you: attacks by captive carnivores cause deaths and injuries in South Africa. Afr J Wildlife Res. 2023. https://doi.org/10.3957/056.053.0021.
31. Maron DF. National Geographic. 2022. https://www.tiger-king-cub-petting-illegal/
32. Meese J. "It belongs to the internet": animal images, attribution norms and the politics of amateur media production. M/C Journal. 2014. https://doi.org/10.5204/mcj.782.
33. Mellor DJ, Hunt S, Gusset M. Caring for Wildlife: The World Zoo and Aquarium Animal Welfare Strategy. WAZA Executive Office, Gland. 2015; 87 pp.
34. Moloney GK, Tuke J, Dal Grande E, Nielsen T, Chaber AL. Is YouTube promoting the exotic pet trade? Analysis of the global public perception of popular YouTube videos featuring threatened exotic animals. PLoS ONE. 2021;16(4): e0235451. https://doi.org/10.1371/journal.pone.0235451.
35. Moorhouse TP, Dahlsjö CAL, Baker SE, D'Cruze NC, Macdonald DW. The customer isn't always right—conservation and animal welfare implications of the increasing demand for wildlife tourism. PLoS ONE. 2015;10(10): e0138939. https://doi.org/10.1371/journal.pone.0138939.
36. Moorhouse TP, Elwin A, D'Cruze NC. Emotional and attitudinal responses to social media depictions of human–wildlife interactions at wildlife tourist attractions. Conser Biol. 2025;e70130. https://doi.org/10.1111/cobi.70130.
37. MTT (Ministerial Task Team). Ministerial Task Team Report. To identify and recommend voluntary exit options and pathways for the captive lion industry. 15 February 2024, for submission to the Minister of Forestry, Fisheries and the Environment. 2024. https://www.dffe.gov.za/sites/default/files/reports/ministerialtaskteamMTTreport_captivelionindustry.pdf
38. Mulligan C, Crawford C. New animal welfare act set to change UK tourist habits. 21 September 2023, Kennedy's Law LLP. 2023. https://www.gov.uk/guidance/animal-welfare
39. Nekaris KAI, Campbell N, Coggins TG, Rode EJ, Nijman V. Tickled to death: analysing public perceptions of 'cute' videos of threatened species (Slow Lorises—*Nycticebus* spp.) on Web 2.0 Sites. PLoS ONE. 2013;8(7): e69215. https://doi.org/10.1371/journal.pone.0069215.
40. Nyhus PJ, Tilson RL, Tomlinson JL. Dangerous animals in captivity: Ex situ tiger conflict and implications for private ownership of exotic animals. Zoo Biol. 2003;22:573–86. https://doi.org/10.1002/zoo.10117.
41. Orban DA, Siegford JM, Snider RJ. Effects of guest feeding programs on captive giraffe behavior. Zoo Biol. 2016;35:157–66. https://doi.org/10.1002/zoo.21275.

42. Osterberg P, Nekaris KAI. The use of animals as photo props to attract tourists in Thailand: a case study of the slow loris *Nycticebus* spp. TRAFFIC Bull. 2015;27(1):13–8.
43. Purba AK, Thomson RM, Henery PM, Pearce A, Henderson M, et al. Social media use and health risk behaviours in young people: systematic review and meta-analysis. BMJ. 2023;383: e073552. https://doi.org/10.1136/bmj-2022-073552.
44. R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing. 2021. https://www.R-project.org/.
45. Rinker TW. sentimentr: Calculate Text Polarity Sentiment, version 2.9.0. 2021. https://github.com/trinker/sentimentr
46. Riordan C, Jacquet J, Franks B. Investigating the welfare and conservation implications of alligator wrestling for American Alligators (*Alligator mississippiensis*). PLoS ONE. 2020;15(11): e0242106. https://doi.org/10.1371/journal.pone.0242106.
47. Robertson MR. 3 metric ratios to measure channel success. tubularinsights.com, 2014. https://tubularlabs.com/blog/3-metrics-youtube-success/
48. Shepherd SM, Mills A, Shoff WH. Human attacks by large felid carnivores in captivity and in the wild. Wilderness Environ Med. 2014;25(2):220–30. https://doi.org/10.1016/j.wem.2014.01.005.
49. Sherwen SL, Hemsworth PH. The visitor effect on zoo animals: implications and opportunities for zoo animal welfare. Animals. 2019;9:366. https://doi.org/10.3390/ani9060366.
50. Somerville K, Dickman A, Johnson PJ, Hart AG. Soap operas will not wash for wildlife. People Nature. 2021;3:1160–5. https://doi.org/10.1002/pan3.10202.
51. Sommerlad J. Zoo keeper "still loves" alligator who nearly tore off her hand. 20 August 2021, The Independent. 2021. https://www.independent.co.uk/news/world/americas/alligator-attack-darth-gator-utah-b1905852.html
52. Sood G. Tuber: Access YouTube from R. R package version 0.9.9. 2020. https://cran.r-project.org/web/packages/tuber/tuber.pdf
53. Sottile Z. An occupational hazard: Florida wildlife director loses hand after alligator bite. CNN. 2022. https://forum.freecodecamp.org/t/making-a-index-html-file/609303
54. Spooner SL, Farnworth MJ, Ward SJ, Whitehouse-Tedd KM. Conservation education: are zoo animals effective ambassadors and is there any cost to their welfare? J Zool Botanical Gardens. 2021;2(1):41–65. https://doi.org/10.3390/jzbg2010004.
55. Sumner RC, Goodenough AE. A walk on the wild side: how interactions with non-companion animals might help reduce human stress. People Nature. 2020;2:395–405. https://doi.org/10.1002/pan3.10074.
56. Townsend L, Wallace C. Social media research: a guide to ethics. The University of Aberdeen, 2016. https://www.gla.ac.uk/media/Media_487729_smxx.pdf
57. van der Meer E, Botman S, Eckhardt S. I thought I saw a pussy cat: portrayal of wild cats in friendly interactions with humans distorts perceptions and encourages interactions with wild cat species. PLoS ONE. 2019;14(5): e0215211. https://doi.org/10.1371/journal.pone.0215211.
58. Veríssimo D, Anderson S, Tlusty M. Did the movie Finding Dory increase demand for blue tang fish? Ambio. 2020;49:903–11. https://doi.org/10.1007/s13280-019-01233-7.
59. von Essen E, Lindsjö J, Berg C. Instagranimal: animal welfare and animal ethics challenges of animal-based tourism. Animals. 2020;10(10):1830. https://doi.org/10.3390/ani10101830.
60. Ward S, Sherwen S. Zoo animals. In: Hosey G, Melfi V, editors. Anthrozoology: human-animal interactions in domesticated and wild animals. Oxford: Oxford Academic; 2018. https://doi.org/10.1093/oso/9780198753629.003.0005.
61. Warrick DM. Inbreeding depression in captive white tigers: methods for purifying tiger lineages. ZOOS. 2010;25(10):7.
62. Watling T. Female zookeeper mauled by 16ft monster crocodile in horror reptile park attack. 13 May 2023, Express. 2023. https://www.reddit.com/r/watchpeoplesurvive/comments/xskada/crocodile_attacks_zoo_keeper_a_visitor_jumps_in/
63. Whitehouse-Tedd KM, Lozano-Martinez J, Reeves J, Page M, Martin JH, Prozesky H. Assessing the visitor and animal outcomes of a zoo encounter and guided tour program with ambassador cheetahs. Anthrozoos. 2021;35(2):307–22. https://doi.org/10.1080/08927936.2021.1986263.
64. Whitney M. Tigers rescued from cub petting, part 1. 19 January 2017, IFAW website. 2017. https://www.ifaw.org/eu/journal/tigers-rescued-cub-petting-operation-part
65. Wilson A, Phillips CJC. Identification and evaluation of African lion (*Panthera leo*) cub welfare in wildlife-interaction tourism. Animals. 2021;11:2748. https://doi.org/10.3390/ani11092748.
66. WAP (World Animal Protection). The show can't go on. End the suffering of wild animals at cruel visitor attractions in zoos and aquariums. 2019. https://www.worldanimalprotection.org/globalassets/pdfs/reports/english/the-show-cant-go-on.pdf
67. WAP (World Animal Protection). Tiger selfies exposed: A portrait of Thailand's tiger entertainment industry. 2016. https://www.worldanimalprotection.org/sites/default/files/media/int_files/tiger_selfies_exposed_a%20tiger-selfies-exposed-report-2016.pdf
68. WAZA (World Association of Zoos and Aquariums). WAZA Guidelines for Animal - Visitor Interactions. 2020. https://www.waza.org/wp-content/uploads/2020/05/ENG_WAZA-Guidelines-for-AVI_FINAL_-April-2020.pdf. Accessed 23 Nov 2022
69. Xu X, Dong G-X, Hu X-S, Miao L, Zhang X-L, et al. The genetic basis of white tigers. Curr Biol. 2013;23(11):1031–5. https://doi.org/10.1016/j.cub.2013.04.054.
70. Zook M, Barocas S, Boyd D, Crawford K, Keller E, et al. Ten simple rules for responsible big data research. PLoS Comput Biol. 2017;13(3): e1005399. https://doi.org/10.1371/journal.pcbi.1005399.

Publisher's Note