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ESSAY

Navigating ethical challenges in online wildlife trade research

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Article impact statement: Scientific and ethical rigors require that traditional ethical frameworks be adapted for online wildlife trade research.

Abstract

The surge in internet accessibility has transformed wildlife trade by facilitating the acquisition of wildlife through online platforms. This scenario presents unique ethical challenges for researchers, as traditional ethical frameworks for in-person research cannot be readily applied to the online realm. Currently, there is a lack of clearly defined guidelines for appropriate ethical procedures when conducting online wildlife trade (OWT) research. In response to this, we consulted the scientific literature on ethical considerations in online research and examined existing guidelines established by professional societies and ethical boards. Based on these documents, we present a set of recommendations that can inform the development of ethically responsible OWT research. Key ethical challenges in designing and executing OWT research include the violation of privacy rights, defining subjects and illegality, and the risk of misinterpretation or posing risks to participants when sharing data. Potential solutions include considering participants' expectations of privacy, defining when participants are authors versus subjects, understanding the legal and cultural context,

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minimizing data collection, ensuring anonymization, and removing metadata. Best practices also involve being culturally sensitive when analyzing and reporting findings. Adhering to these guidelines can help mitigate potential pitfalls and provides valuable insights to editors, researchers, and ethical review boards, enabling them to conduct scientifically rigorous and ethically responsible OWT research to advance this growing field.

KEYWORDS
e-commerce, ethics, informed consent, internet, IWT, privacy, social media, wildlife trafficking

INTRODUCTION

The global trade in wildlife is of critical concern for biodiversity conservation due to its detrimental effects on exploited species, introduction of non-native species, and facilitation of cross-species pathogen transmission (Bezerra-Santos et al., 2021; García-Díaz et al., 2017; Scheffers et al., 2019). To address these multifaced challenges, it is vital to acquire complex data through the identification and quantification of species traded, analyses of trade networks and potential connections to other illicit activities, and assessment of the economic and sociocultural values of species use among other tasks. Analysis of such data offers valuable insights that have the capacity to inform policy changes (e.g., Heinrich et al., 2022; McDavitt, 2004).

The advent of the internet sparked a rapid expansion of the global market for wildlife products, both legal and illegal (e.g., Borges et al., 2021; Siriwat & Nijman, 2020). While online wildlife trade (OWT) has been linked historically to dedicated e-commerce sites, the emergence of social media platforms has facilitated the formation of communities comprising wildlife owners and enthusiasts (Salas-Picazo et al., 2023). This has provided sellers with marketing tools that effectively target customers in addition to conventional websites (Feddema et al., 2020). Traders may also perceive reduced legal risks online because they can conceal their identities, establish virtual shops, and remove or conceal posts to evade detection (Hinsley et al., 2016; Yu & Jia, 2015).

Consequently, OWT research is generating a substantial body of critical work focused on determining the role of technology in shaping the dynamics of wildlife trade. It is imperative that ethical considerations evolve alongside technological advancements to uphold accountability and compliance with legislation (Di Minin et al., 2021; Ingram et al., 2024; Morcatty et al., 2022; Stringham et al., 2021). Ethical frameworks for researching OWT have not kept pace with the rapid development of social media (Townsend & Wallace, 2016), and principles traditionally applied for in-person surveys may be inappropriate. A reassessment of key issues around privacy, informed consent, ownership, and the delineation between public and private domains is therefore warranted (Buchanan & Hvizdak, 2009; Fiesler et al., 2020; Di Minin et al., 2021; Thompson et al., 2021).

Although universities typically have ethics boards and established procedures, the evolution of technology and online platforms complicates the process for those without in-depth expertise in the field to reach a consensus on key ethical principles, especially in the context of ever-changing social media environments. Hibbin et al. (2018) exemplified this lack of consensus among prominent universities in the United Kingdom, with less-experienced members holding rigid notions of consent and risk and more experienced members exhibiting greater flexibility and emphasizing the responsible use of social media data. Nongovernmental organizations, which also play a crucial role in gathering information on wildlife trade, formulating policy, and conducting investigations (Nurse, 2016), often lack formal ethics committees. There are few mechanisms for journal editors to ensure publishing decisions reflect ethical best practice in the context of OWT. These observations underscore two significant aspects: researchers may encounter ambiguities when applying current ethical standards, and continuous training and education for members of ethics committees is critical.

In response to this pressing need, we identified the main ethical challenges inherent in studying OWT and devised a comprehensive set of recommendations to assist researchers and academic ethical boards in navigating the complex ethical issues at every phase of a project, from initial design to final execution (Figure 1). The core purpose of this ethical framework is to assist in ensuring research integrity, such as preventing violations of privacy rights, reducing biases, guarding against the potential misuse of data and findings by third parties, and mitigating direct risks to involved researchers, participants, or content authors, irrespective of legality of their actions. This guide was the result of a collaborative effort through the Interdisciplinary Conservation Network that brought together a diverse group of 14 academics from 11 countries across all inhabited continents. The collaborative initiative was jointly organized by the University of Oxford's Interdisciplinary Centre for Conservation Science and Wildlife Conservation Research Unit and Oxford Brookes University's Oxford Wildlife Trade Research Group in 2021.

GUIDELINES AND LITERATURE CONSULTED

We drew on a comprehensive review of existing ethical guidelines and relevant literature on OWT research. These guidelines are based on widely recognized ethical principles outlined by professional societies and organizations, including the British Psychological Society (BPS) (2021), the British Sociological Association (BSA) (2017), the British Society of Criminology (2015), the British Economic and Social Research Council (ESRC) (2015), the American Sociological Association (ASA)

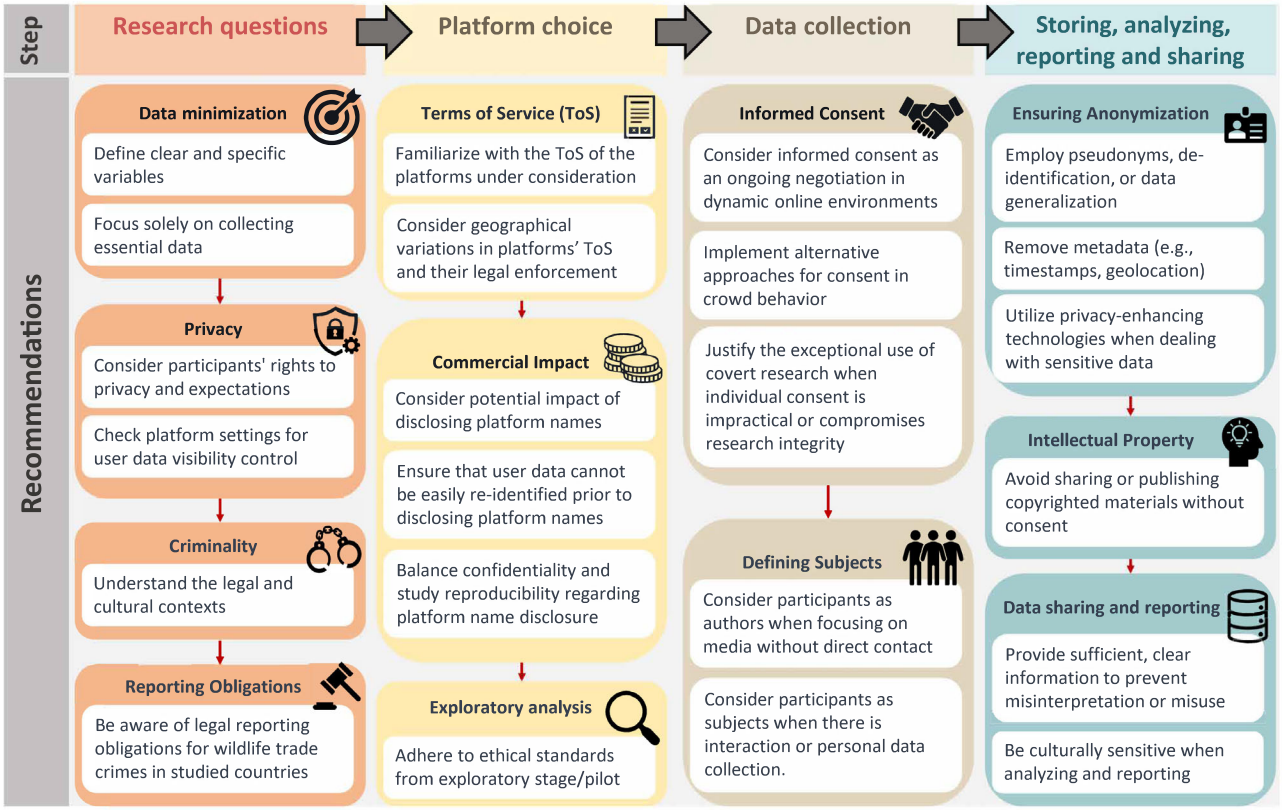


FIGURE 1 Recommended minimum standard practice for conducting ethical online wildlife trade research.

(2018), and the American Anthropological Association (AAA) (2012). We also consulted the Internet Research Ethical Guidelines by the Association of Internet Researchers (AoIR) 3.0 (Franzke et al., 2020), which incorporate comprehensive and diverse perspectives from countries beyond the United States, the United Kingdom, and Europe, including Israel, Australia, Singapore, Canada, Thailand, and Turkey. Additionally, we reviewed the General Data Protection Regulation (GDPR) from the European Union and the International Compilation of Human Research Standards by the U.S. Office for Human Research Protections, Office of the Assistant Secretary for Health, and Department of Health and Human Services (OHRP et al., 2021). To address the complexities of researching OWT, we also drew upon the scientific literature examining the application of ethical principles in relevant contexts, including works by Markham and Buchanan (2012), Pagoto and Nebeker (2019), Torous and Nebeker (2017), Eynon et al. (2009), and Thompson et al. (2021).

Certain guidelines are best suited to specific research scenarios because the policies are designed for the context and scope of these associations. For instance, the American Anthropological Association's Code of Ethics is designed for research on human subjects but may not provide adequate guidance for observing forums with a large number of participants. Guidelines established by the British Psychological Society and British Society of Criminology offer valuable insights and protocols for studies investigating illegal OWT, emphasizing the importance of maintaining anonymity of research subjects. The International Compilation of Human Research Standards provides an extensive list of over 1000 standards, including laws and regulations, on protection of human subjects in 131 countries, serving as a valuable resource for obtaining regional or country-specific advice on ethical issues to ensure researchers adhere to relevant local guidelines. It is important for researchers to remember that OWT is often multijurisdictional in nature and data may be collected from countries where the researcher does not reside. In these cases, it is important that the ethical guidelines of both the country of the researcher and the country or countries from which the data originate are consulted. Given this, we devised a checklist of ethical guidelines aligned to each specific research stage that can be tailored to a variety of OWT research contexts (Figure 1) and a summary flowchart of recommended best practice (Figure 1).

ETHICAL CONSIDERATIONS WHEN DEFINING RESEARCH QUESTIONS (STEP 1)

At this stage, it is crucial to consider the pros and cons of accessing and analyzing OWT data, including the potential of these data to contribute to collective knowledge on traded species, trends, and impacts on society. During research conceptualization, researchers should strategically define each research question to minimize potential ethical issues (outlined below).

Data minimization

Minimizing data collection to target only what is necessary is essential to reduce or avoid ethical problems related to data collection, analysis, or publication (Ess & Hård af Segerstad, 2019). This is of particular concern for automated passive data collection. Unless carefully implemented, such as through targeted extraction of specific character strings, this can result in large data sets with extraneous data (Stringham et al., 2021; Toivanen et al., 2019). Similarly, social media researchers are exposed to significant amounts of personal information through users' profiles and online behavior and must choose whether these data should be collected.

It is crucial to carefully target variables of interest to guide the data collection process and only collect data addressing the research question (Brittain et al., 2020; Di Minin et al., 2021; Thompson et al., 2021). This can be achieved by implementing strategies to limit the scope of data collection, such as focusing on specific species, products, languages, or platforms or data types or by controlling the amount of user data collected (McMillan et al., 2021; Roberts et al., 2022). However, there is a clear trade-off between ensuring sufficient data while simplifying ethical concerns. For instance, limiting the number of platforms can facilitate compliance with platform policies; however, this may also limit the representativeness and comprehensiveness of the study's findings and conclusions (Davies et al., 2022). Implementing these measures helps avoid causing harm to stakeholders involved and aids in obtaining ethics approval (Monkman et al., 2018; Zook et al., 2017). It is important to remember that whether the trade is legal, questionable, or illegal, researchers have an obligation to their participants, even when they are unknowing, to do no harm to individuals (see step 2).

Perceptions of privacy and dynamic privacy settings

When conceptualizing research, it is crucial to reflect on potential research targets' rights to privacy given the blurred boundaries between public and private domains. Researchers should consider people's expectations and beliefs regarding privacy and their perception of communication confidentiality (AoIR 3.0: 2020; Orton-Johnson, 2010). Differentiating between "publicly distributed" and "publicly accessible" information is crucial (Waskul, 1996). Publicly distributed information involves intentional dissemination to a wider audience, such as e-commerce sales adverts. In contrast, publicly accessible information is retrievable without restrictions, but not necessarily intentionally publicly distributed (e.g., a pet owner's selfie). In the latter, individuals may operate in public spaces while still maintaining expectations of privacy related to use of data (Markham & Buchanan, 2012). Conversely, for e-commerce sites, public message boards, or forums open to nonmembers that are intentionally public, individuals posting on these platforms may be aware that their messages are accessible to anyone (ESRC, 2015; Orton-Johnson, 2010; Rodham & Gavin, 2006).

Some ethical guidelines highlight that user expectations of privacy may change based on cultural norms, platforms, technological literacy, and individual preferences (AoIR 3.0: 2020; BPS, 2021). For example, Burkell et al. (2014) found in a study of students and staff at a Canadian university that despite using friend lists and privacy settings to limit their online presence, users organized their Facebook content assuming it was accessible to anyone. They perceived that once information was online, users lost control over viewership because others can save and share their content (Burkell et al., 2014).

Researchers can check profile, group, and platform settings to determine if users have control over the visibility of their data and how they have set it for their profiles because users who actively limit visibility often have higher expectations of privacy. Digital platforms often emphasize privacy features, leading users to expect protection for their personal information. For example, the social network MeWe positions itself as "the social network built on trust, control, and love" and assures users that their private life is not for sale and that the platform is devoid of ads, spyware, and deceptive practices. Similarly, Facebook provides users with security levels for their groups, ranging from public to private and secret. However, Nijman et al. (2021) point out that these levels are subject to change by group administrators, posing challenges for researchers gathering data from a public group that later switches to private or from groups utilizing multiple platforms with varying privacy settings. Consequently, researchers should regularly check and adhere to updated privacy settings before publishing their studies. Alternatively, researchers can directly inquire about users' expectations of privacy prior to data collection.

Criminality

Dealing with illegal trade involves unique risks in research compared to its legal equivalent. While the legal trade poses threats to wildlife through unsustainable exploitation (Andersson et al., 2021; Hughes et al., 2023), research often centers around illegal wildlife trade, commonly regarded as more problematic (Morton et al., 2021). Determining the legality or illegality of trade can be a challenging task because researchers often bear the responsibility of gathering evidence to differentiate between the two. It is often unclear at which stage of the supply chain a crime occurs or how the legality is defined and verified (Su et al., 2022).

The illegality of wildlife possession and trade can depend on domestic, regional, or international regulations, as well as cultural norms. It is necessary for researchers to be familiar with national and international legislation, including existing seasonal hunting bans (Adom & Boamah, 2020), cultural exemptions (e.g., the right of Indigenous peoples to maintain species for subsistence and cultural practice) (Antunes et al., 2019; Pain, 2015), and loopholes. The legality of harvesting a species from the wild may be legal up to a certain quota (Shepherd, 2008), or it may exist on the border of regions with different legal frameworks (Krishnasamy et al., 2018; Yi-Ming et al., 2000). Some species may be legal to sell if captive bred, but illegally traded if wild caught, and means to determine the difference are often

limited (Andersson et al., 2021). Additionally, it is important to consider that online trade can easily cross national or cultural boundaries, with individuals from one country able to advertise and sell to another (Razkallah et al., 2019). Laws regulating OWT may be clearly defined in some countries' legislation (e.g., Thailand Wildlife Conservation and Protection Act B.E. 2562 (WARPA) 2019) but not in others. From an ethical standpoint, it is crucial to exercise diligence and caution in determining the legality or illegality of OWT to ensure accurate conclusions, claims, and generalizations. Legally, an unfounded allegation of illicit activities can severely harm the individuals associated with the trade. Without concrete evidence, such claims can expose the researcher to defamation lawsuits under the legislation of many countries.

Reporting obligations

In the case of illegal wildlife trade, researchers must consider that the legal framework in the country where their survey is conducted may impose certain obligations on individuals who witness or have knowledge of wildlife trade crimes. These may include the legal obligation to report such incidents to the relevant enforcement authorities; failure to do so could expose the researcher to the risk of prosecution (see Bergin & Nijman [2020] for alternative approaches in such situations). If reported, the participant may face prosecution for their involvement in illegal activity. Traders and consumers should be warned that their transactions may need to be disclosed (BSA, 2017). Otherwise, obtaining a waiver from the authorities before commencing research might be necessary. Ethics boards must ensure researchers recognize these risks and mitigate it.

ETHICAL CHALLENGES RELATED TO PLATFORM CHOICE (STEP 2)

Deciding which platform to collect data from can be informed by an exploratory search, involving keyword searches on search engines and social media sites, as well as seeking input from experts to narrow down potential platforms. Stringham et al. (2021) propose a useful method for identifying websites containing wildlife trade data. Preliminary data access and collection must adhere to ethical standards comparable to the final workflow. For instance, engaging with community members during the exploratory search should align ethically with conducting definitive interviews, taking into account factors such as intrusiveness and participant risk (Brittain et al., 2020; John et al., 2016).

Terms of service

The terms of service (ToS) serve as a contractual agreement between a platform and its users. Meta, the parent company of Facebook and Instagram, explicitly states in their ToS that automated access or data collection from their products through automated methods is prohibited without prior permission (see "METHODOLOGICAL CONSIDERATIONS REGARDING ETHICAL DATA ACCESS AND COLLECTION (STEP 3)" for more information on application programming interfaces [APIs] and Web scraping tools) (Meta, 2023). Different platforms may have different policies and procedures based on geographical location. For instance, X (formerly known as Twitter) has separate ToS documents for individuals in the European Union, European Free Trade Association states, and the United Kingdom and for those residing outside these regions, including the United States (X, 2023). However, ToS are generally not universally recognized as legally binding contracts, except in specific cases where jurisdiction-specific laws dictate otherwise (e.g., the United States) (Zetter, 2016). Violation of ToS may be deemed acceptable by an ethics committee depending on the research justification, obtention of informed consent, or application of the minimal harm principle (e.g. Doughty et al., 2020). In the case of international collaboration and data collection, researchers should be well informed on applicable policies and procedures and consider the researcher's location and that of individuals in the sample if they differ.

Commercial impact

Data processing protections typically focus on individuals rather than commercial organizations. However, when considering potential harm, should researchers consider the potential commercial impact of their research on the platforms themselves? The BSC (2015) suggests that researchers are not obligated to minimize harm to corporate or institutional entities that may be affected by research activities. Therefore, researchers need not overly concern themselves with the effects on large commercial platforms. However, the online retail sale of wildlife products is often carried out by small operations or individuals in consumer-to-consumer (C2C) e-commerce or social media platforms. Therefore, naming these platforms in research outputs can have ethical and practical repercussions. Some authors caution against disclosing specific platform names in their studies (Hinsley et al., 2016; Sajeva et al., 2013), whereas others feature the platform names prominently in their titles and abstracts (Nijman et al., 2021; Xu et al., 2020). While identifying a platform reduces the effort required to re-identify user data (Di Minin et al., 2021), withholding such information can hinder the reproducibility of the study. In the latter case, outlining thoroughly how candidate e-commerce sites were identified might be needed to improve reproducibility. Disclosing platform names may be necessary when contributing to existing work or if conservationists aim to instigate corporate policy change or cooperation, but this risks unsustainable or illegal trade moving elsewhere with no change in volume.

METHODOLOGICAL CONSIDERATIONS REGARDING ETHICAL DATA ACCESS AND COLLECTION (STEP 3)

Technological advances provide various methods and tools for online data collection, offering unique opportunities to gather

information on a global scale, in a secure and cost-effective manner. Researchers choose between manual extraction and automated data collection (i.e., online surveys and interviews, social media analysis, data mining) depending on study length, intended scope, technical proficiency required, and the platform's ToS. Both manual and automated methods may require ethics approval before any data extraction can take place (Stringham et al., 2021). Each methodology has its own potential biases, limitations, and ethical considerations.

Nonintrusive data collection techniques aim to observe an online environment without interrupting the naturally occurring state of the site or online community, for example, observing e-commerce websites or social networks, accessing public blogs, or downloading YouTube videos (Lafferty & Manca, 2015). Participants are often unaware of their involvement in such research (Moreno et al., 2013). Even in situations where content is public (i.e., does not need passwords or permission), the researcher must still determine whether the use of content, such as quotations or images, may reveal the content creator's identity. If so, the researcher must minimize the use of such content, consider a certain level of disguise (Eastham, 2011), or seek informed consent (see "Informed consent and covert research").

In contrast, engaged data collection techniques involve active interaction with the site or community participants (Kitchin, 2007) through interviews, surveys, or interactive research approaches conducted online. This may involve getting access to private online content (such as private social interactions), interaction with individuals (e.g., through friending or following), or obtaining membership in a closed group. Researchers must respect participants' autonomy by providing them with the right to withdraw from the study at any point. Surveys and interviews are widely used and established methods in online research; however, some researchers highlight that as the level of involvement and interaction increases, potential risk of civic liability or reputational damage might also increase (Newing, 2010).

Defining subjects

Distinguishing whether individuals who upload OWT content should be considered research participants or authors can be a fundamental aspect for researchers (Samuel & Buchanan, 2020; Waskul, 1996; Wilkinson & Thelwall, 2011). This classification is significant because it influences the need for informed consent (Kharchenko et al., 2021; Markham, 2003). When focusing on media without direct author contact, such as text, graphics, photographs, or videos, participants are generally regarded as authors rather than research participants (see "Intellectual property and copyright") (Samuel & Buchanan, 2020). However, if there is any interaction with the subjects (e.g., following or membership acceptance, online survey responses) or personal data collection (e.g., gender, age, location, contacts, education, hobbies), they should be considered participants. In such cases, respondents must participate voluntarily, receive comprehensive information about the research, and be protected from misleading statements.

Informed consent and covert research

Informed consent should be regarded as an ongoing negotiation process rather than a singular event marked by a one-time signature at the beginning of a study. This is particularly important in online environments with fluctuating populations where identifying active participants or content authors and passive observers can be challenging.

The AoIR recognizes the importance of context when determining the appropriate timing and necessity of obtaining informed consent. In this regard, the ESRC acknowledges the impracticality or meaninglessness of obtaining informed consent from individuals involved in crowd behavior studies, including large forums, open social media groups, and e-commerce platforms (ESRC, 2015). In cases where acquiring informed consent from every individual participant is impractical or may compromise the integrity of the research, alternative approaches can be implemented to protect participants' rights and privacy while ensuring the validity and reliability of the study findings. Proposed solutions in the research literature include the use of gatekeepers or ethical statements in regular postings and signatures (e.g., Hinsley et al., 2016; Sugiura et al., 2017).

Certain content, including but not limited to gender, age, education, interactions, and behavior, may be publicly accessible, but obtaining informed consent remains crucial. Participants must be provided with clear information regarding the collected data, its purpose, and potential risks involved. In certain social media platforms, the ownership of publicly shared content (e.g., updates, chat logs, media) typically resides with the service provider. Likewise, the ownership of private communications between members facilitated by the web service also belongs to the platform. Given this, researchers could consider contacting the web service provider, although gaining their explicit permission may not be always feasible (BPS, 2021).

Requests for consent, however, have the potential to disrupt natural interactions or alter the study environment (Shiffman et al., 2017). The knowledge of being actively monitored could alter behavior during the monitored period and lead to biased conclusions, such as underrepresentation of overall trade or the absence of specific species in trade. This becomes particularly relevant in studies focusing on illegal wildlife trade or trade involving culturally sensitive, taboo, or ritualistic items. In addition, obtaining consent can be a risk to both researcher and participant when researching criminal activities (ASA, 2018).

In certain situations, conducting studies without participants' awareness might be considered. This is observed in studies on various forms of deviant or criminal behavior, such as digital piracy (Cooper & Harrison, 2001) or identity theft (Holt & Lampke, 2010). However, it is crucial to differentiate between passive observation, where publicly accessible online data are monitored without any form of deceit, and covert research methods. In the latter case, researchers actively adopt false identities or roles, as seen when posing as a potential buyer or using a fake profile to access exclusive data. They may also need to engage (through likes and comments) to avoid removal for inactivity. Such undercover tactics require intense ethical scrutiny because active deception about one's identity is not a

standard research approach in the study of crime. While fake profiles or accounts are sometimes employed for researcher safety, it obscures the investigator's true identity and complicates informed consent. Not only might this breach platform policies, such as Facebook's stance against fake accounts in their community standards, but it also could lead participants to inadvertently share sensitive details with whom they believe to be someone else. It is crucial to prioritize alternative, less intrusive methods. These undercover methods should only be considered when the potential public benefit of obtaining unique evidence significantly outweighs the ethical concerns of deception, as outlined by ESRC (2015) and BPS (2021). Finding the right approach involves carefully considering the potential impact of informed consent on the validity and reliability of the study's findings while ensuring protection of participants' rights and privacy.

Automated data collection tools

Automated data collection tools enable researchers to access a wide range of data quickly, facilitating large-scale analyses. Two primary methods have been used to obtain information on OWT: APIs and web scraping. An API provides a structured and controlled way of accessing and retrieving data from online platforms, but it relies on authorized access within the platform's ToS. For instance, Twitter's search API allows retrieval of posts from only the past 7 days. Regulations on data accessibility through APIs vary across platforms, and services may become restricted or discontinued over time, posing challenges to long-term monitoring projects (Toivonen et al., 2019; Xu et al., 2020). Nonetheless, it is crucial to acknowledge that certain data related to illegal trade may not be accessible through API searches (Di Minin et al., 2019).

Web scraping or crawling extracts data directly from web pages, which allows developers to collect structured or unstructured data from websites when APIs are unavailable. However, it can violate website ToS or local legislation and may collate data indiscriminately, including sensitive information requiring informed consent. To ensure compliance with ToS, developers can refer to a website's robots.txt file, which outlines whether and how the site can be scraped. The legality of web scraping remains ambiguous in most legislations, and there is a need for laws directly addressing it (Krotov et al., 2020). However, to address concerns such as data privacy and protection, copyright infringement, breach of contract, and so forth, researchers must thoroughly examine the relevant ethical and legal implications associated with web scraping. For instance, the GDPR, implemented by the European Union (EU), permits scraping only with explicit consent from EU residents (Mambelli et al., 2020).

Direct interaction and interviewing

Attempting, or pretending, to purchase items when conducting online research is not recommended because this can inadvertently contribute to the OWT by creating perceived demand (Kosinski et al., 2015). If any interaction with sellers or buyers of wildlife occurs, such as requesting information or prices, or interviews or questionnaire surveys are conducted, it is essential to adhere to consent standards equivalent to those employed in traditional in-person studies (see "Informed consent and covert research") (Thompson et al., 2021).

Emerging technological tools provide better opportunities to increase sample size and scope when conducting online interviews with actors throughout the OWT supply chain network (including individuals who promote or engage with posts offering wildlife for sale). Examples of such tools include SurveyMonkey, Google Forms, Qualtrics, and QuestionPro, which facilitate the creation, distribution, and analyses of surveys. However, when using these tools, in addition to addressing standard ethical concerns for in-person interviews, researchers must also consider that all collected data, including personal and sensitive information (such as data on illegal trade or ownership), will be shared with third-party software. Therefore, it is crucial to carefully choose a service that ensures data security and privacy and to inform participants about these considerations.

ETHICAL CHALLENGES WHEN STORING, ANALYZING, REPORTING, AND SHARING DATA AND RESULTS (STEP 4)

Careful data handling including storage, analysis, reporting, and sharing, especially when personal or sensitive information is involved, is often overlooked in OWT research. It is imperative to minimize the likelihood and impact of any risks that may arise for individuals whose personal data are being collected (Di Minin et al., 2021). The GDPR defines personal data as information related to identifiable natural persons (European Union, 2016). Determining whether data qualifies as personal data plays a key role in identifying the relevant national-level data protection laws that apply (Di Minin et al., 2021). It is crucial to consider compliance with legal requirements for data protection when processing such data for research purposes. In Europe, for example, users are subject to strict restrictions outlined in the GDPR policy (Hand, 2018). It also is essential to factor the jurisdiction of servers during data storage and sharing because it determines data protection laws and potential law enforcement access via court orders. In addition to policies, researchers should be respectful of diverse perspectives, avoid stereotypes, and ensure that the data analyses and results reported are culturally sensitive.

Ensuring anonymization

The protection of personal or sensitive information when storing, analyzing, reporting, and sharing data through anonymization prevents linking data to individual identities (Di Minin et al., 2019). It is advisable to utilize independent data sets for personally identifiable information that are not interconnected

with complementary data sets (Eynon et al., 2009). This involves removing personally identifiable information from the main data set, such as names, addresses, phone numbers, email addresses, and other details that can directly identify individuals.

Additional techniques, such as assigning pseudonyms or applying de-identification techniques, can also be effective in safeguarding identities. For textual data, employing data generalization by making content less specific (e.g., removing place references or jargon) and paraphrasing or summarizing responses, rather than reporting direct quotations, can prevent re-identification of individuals. For files, including photographs, removing metadata including time stamps and geolocation data is crucial. Aggregating data, where multiple responses or observations are combined to create group-level summaries or statistics, allows for reporting results without referring to a single individual. Another layer of data protection is the use of privacy-enhancing technologies, such as data encryption or Secure Socket Layer (SSL) protection. Researchers can store data in password-protected computer directories, use data labels that are only meaningful to them, and code data in a way that minimizes the possibility of tracing it back to specific individuals (Eid & Handal, 2018).

Intellectual property and copyright

Researchers of OWT will encounter content that constitutes intellectual property (e.g., text, images, videos, and structured data). Copyright, as a form of intellectual property, automatically provides creators with certain rights to creative expressions without registration or formalities. For detailed information on copyright and its implications, researchers can refer to Thompson et al. (2021).

It is important for researchers to be aware of copyright laws and obtain appropriate permissions when using copyrighted materials in their research, including screenshots of advertisements featuring wildlife for sale. E-commerce traders have developed social and parasocial relationships with consumers to gain their trust, and retailers may engage in personalized communications with potential buyers, blurring the distinction between personal communication and detached authorship (Ess & Jones, 2004). In instances where the research involves passive monitoring without obtaining informed consent, or if consent has not been granted, researchers should refrain from sharing, reporting, or publishing copyrighted materials in their studies. Researchers may consider alternative methods to convey their findings without infringing on copyright, such as providing detailed descriptions without directly reproducing copyrighted content.

Data sharing and secondary use

Data sharing and secondary use of research data sets are gaining momentum, with scientific journals and academic institutions increasingly encouraging or mandating researchers to make their data sets publicly available, often in open data formats. Attention must be given to ensure that no identifiable information is released (refer to "Ensuring anonymization"), and sufficient and clear information must be available in the data set to reduce the chance of misinterpretation or misuse when sharing. Once a data set is made available online, researchers relinquish partial control over how the data will be used, and the context of its interpretation may change. Therefore, if researchers plan to share data through data repositories, they must inform participants, especially when informed consent is obtained, that the information may be used for purposes beyond the original research. While open data are encouraged, crime research often deals with highly sensitive data that, even when anonymized, might harm participants. Ethics boards, journals, and funders must recognize that data pertaining to criminal activities, such as the illegal wildlife trade, may be exempt from standard open science protocols. In these instances, prioritizing participant safety often takes precedence over open data expectations.

CONCLUSION

To date, most published research on OWT has failed to comprehensively address ethical considerations. Researchers rarely discuss ethical elements, such as compliance with platform terms of use, data sensitivity, third-party involvement in data storage, and obtention of informed consent from participants. Given the rapid growth of OWT, tailored ethical guidelines are needed to navigate the complexities of internet-based research. We highlighted the multitude of ethical considerations across each research stage, emphasizing that even preliminary data access and collection must adhere to ethical standards (Figure 1). Thus, ethics should be perceived as a continuous decision-making process rather than a singular hurdle (Markham & Buchanan, 2012). Promoting the adoption of ethical reporting practices for all OWT research outputs would enhance transparency, stimulate broader ethical discussions, and provide reference material for future studies. By aggregating authorities' guidelines and addressing the points that uniquely pertain to OWT at all research stages, we devised a flowchart of recommendations (Figure 1) to further standardize procedures and evaluate standards and rigor of research into species trade, an increasingly important conservation discipline.

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