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Ethics of Primate Fieldwork: Toward an Ethically Engaged Primatology

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Abstract

Field primatologists have ethical responsibilities that extend beyond study subjects to the local human communities living near primate populations and their surrounding ecosystems. In this review, we explore the history of ethical discussions within anthropological primatology and examine the best practices for an ethically engaged primatology that should be followed and role-modeled by primatologists. An increasing number of primates are showing reduced population sizes and are in imminent danger of extinction; thus, we need to carefully consider the ethics of intervening to ensure the survival of remaining populations, the impact of anthropogenic factors (e.g., climate change), and whether long-term field research results in conservation outcomes that consider local human communities. Because best practices change over time as theoretical frameworks and methodological tools advance and scientific goals change, field primatologists must continually reflect on what constitutes ethical practice and consider how research influences the overlapping dimensions of fieldwork: primates, people, and ecosystems.

INTRODUCTION

Field research on nonhuman primates (hereafter, primates) is distinct from research conducted in captive and/or biomedical contexts because the subjects are not confined and the methods tend to be minimally invasive. As such, the set of principles outlined in resolutions and policy statements on the ethical treatment of primates often do not apply in field situations (see Fedigan 2010). Primates in field settings may, nonetheless, be affected by our presence and field-based procedures (e.g., habituation, field experiments, disease transmission). Moreover, it has become increasingly clear that field primatologists work in a broader ethical realm than do primatologists working with captive primates (see Phillips et al. 2014), meaning that our ethical responsibilities extend far beyond the animals we study (Nash 2005; Wolfe 2005; MacKinnon & Riley 2010, 2013). For example, we often live within a local human community for ease of access to the fieldsite; we hire local community members to assist in the research; and increasingly, we use our research results to inform conservation management plans that may affect those human communities (Hill 2002). We also have a direct impact on the ecology of habitats in which we work and must pay attention to disposing of waste, modifying habitats (e.g., constructing and marking trails), and packing out equipment and other items we bring to our fieldsites (Fedigan 2010, Strier 2010, Bezanson et al. 2013). The ethical landscape of the primate fieldworker is therefore more morally complex, encompassing the intersection of human, nonhuman primate, and ecosystem needs and interests.

Given this complexity, it is not surprising that attention to the ethics of field primatology has increased tremendously in the last few decades. This upsurge in interest and discussion recently culminated in the development of the Code of Best Practices for Field Primatology jointly adopted by the American Society of Primatologists (ASP) and the International Primatological Society (IPS) (Riley et al. 2014). In this review, we (*a*) provide a general overview of the recent history of ethical conversations that led to the development of the 2014 Code of Best Practices; (*b*) identify the key principles of ethical practice that inform how we design and do field primatology; (*c*) explore recent trends in ethically informed primatological practice; and (*d*) consider what the future holds for ethically engaged field primatology.

THE DEVELOPMENT OF FIELD PRIMATOLOGY AND ETHICAL GUIDELINES FOR ITS PRACTICE

Compared with other fields, primatology, particularly field primatology, is young (**Figure 1**). In 1929, after psychologist Robert Yerkes and his wife Ada Yerkes produced a monograph that compiled all existing information on the great apes, they discovered that little was known about the majority of wild primate populations (Yerkes & Yerkes 1929). Recognizing the need to fill this gap, Yerkes initiated a series of field expeditions aimed at documenting the behavior of our closest living relatives, giving rise to the naturalistic study of the primates. As a research fellow under Yerkes, Clarence Ray Carpenter conducted the first study of wild howler monkeys on Barro Colorado Island, Panama (Carpenter 1934). His contributions to field primatology, however, extended beyond this one field expedition. Carpenter is widely recognized as advancing the methodological rigor of primate field studies, thereby positioning field primatology as valid scientific research (Montgomery 2005). He developed systematic data collection methods, advanced the use of technology in the field, established the process of habituating primates to human observers as a critical first step in primate fieldwork, and was the first to engage in long-term and multidisciplinary field research of primates (Carpenter 1964).

The first primatologist to situate primatology within the intellectual domain of anthropology was Kinji Imanishi. Switching from wild horses to the primates native to Japan, the Japanese macaque (*Macaca fuscata*), Imanishi was interested in the anthropological insights that could be

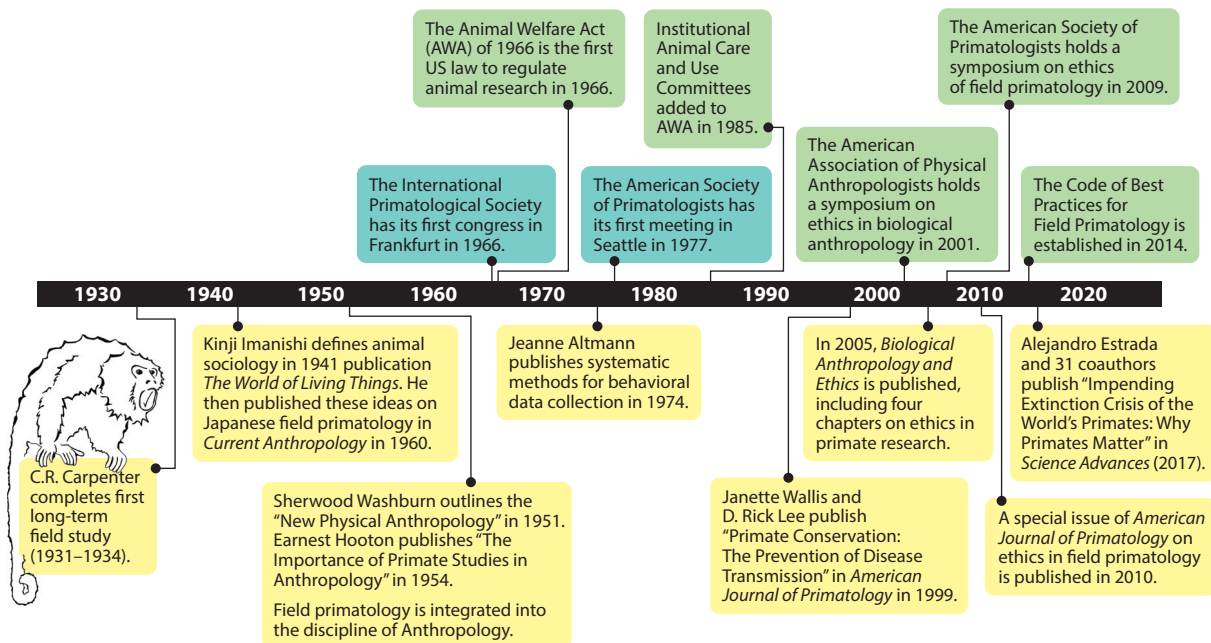


Figure 1

Ethics in field primatology timeline. This timeline includes major events in the development of primatology that relate to ethics. It is not meant to be exhaustive. Yellow, key scholarly publications for field primatology; blue, professional organizations; green, important events for field primatology ethics.

gained by studying the social behavior of other primates, specifically the evolutionary origin of human society and culture (Imanishi 1960, Matsuzawa & McGrew 2008). In the United States, it was not until almost a decade later that anthropologists created a home for primatology within the discipline of anthropology. Biological anthropologist Earnest Hooton (1954) laid out his vision for what he saw as the specific contributions of primatology for the field of anthropology: that the comparative study of the anatomy, physiology, and behavior of the primates could expand our understanding of taxonomy and systematics, human evolution, and the origins of social organization. Hooton’s student, Sherwood Washburn, established the tradition of field primatology in American physical (biological) anthropology, building on his vision for a dynamic field that focused on form, function, and process, i.e., “The New Physical Anthropology” (Washburn 1951). Washburn recognized the need to examine primate form–function relationships by measuring morphology and observing primates’ behavior, preferably in their native habitats. Since the 1950s, anthropological primatology has experienced considerable growth in terms of the scope of taxa studied, the methodologies used, and the theoretical frameworks invoked (Jay 1968; Smuts et al. 1987; Strier 1994, 2003, 2011; Strum & Fedigan 1999, 2000; Sussman 2011; Fuentes et al. 2017).

It was not until the turn of the twenty-first century, however, that primatologists began to explicitly address the ethical ramifications of their field research. As noted by Wolfe (2005, p. 15), early field primatology was “relatively uncomplicated”: All one needed were funds and (sometimes) permits. Moreover, in addition to observational work, many of the early field expeditions involved the killing and removal of wild primates to expand museum collections. By the 1970s and 1980s, however, more attention was being paid to the issue of animal welfare, with a call for expanding our moral horizons to include other sentient, nonhuman beings that cannot speak for

themselves (Singer 1975, Regan 1983). Coinciding with these views, an amendment was made to the US Animal Welfare Act (AWA) (1966), which resulted in major changes to the regulation of animal research. Namely, the 1985 Improved Standards for Laboratory Animals Act required the implementation of Institutional Animal Care and Use Committees (IACUC) (Cardon et al. 2012; see the sidebar titled Terms and Definitions). This amendment also required greater attention to the psychological well-being of primates. The US Public Health Service also stipulated that research with animals be conducted in a manner consistent with the *Guide for the Care and Use of Laboratory Animals*, a document that went through seven revisions from its inception in 1963,

TERMS AND DEFINITIONS

Animal Welfare Act (AWA): This Act was originally titled the Laboratory Animal Welfare Act of 1966 and was the first US federal law to regulate research and exhibition of animals (7 USC §§ 2131–2159; 18 USC § 49). In 1970, it was renamed the Animal Welfare Act, and the definition of animal was broadened to include all “warm-blooded” animals (Cardon et al. 2012). The AWA requires the humane treatment of animals and that all animal dealers must be licensed; the 1985 amendment required all institutions and animal facilities to have a committee devoted to animal care and use (IACUC).

Code of Best Practices for Field Primatology: This set of ethical obligations was developed in 2014 by an international committee of field primatologists representing major primatological societies and organizations from Africa, Asia, and Europe, as well as North, Central, and South America (Riley et al. 2014). The Code was adopted by the American Society of Primatologists (ASP) and the International Primatological Society (IPS) to provide a set of ethical considerations and best practices for conducting primatological field research. The 2014 ethical code was unique because it involved an international committee and provided specific standards that focused on primatological fieldwork.

Field experiments: Primatological field experiments have involved placing specific objects in the environment to elicit behaviors of interest (e.g., for stone handling, see Leca et al. 2010; for tools to solve foraging tasks, see Garber et al. 2012), provisioned platforms to test spatial memory (Bicca-Marques & Garber 2004), the use of playback experiments to understand vocal repertoires (Cheney & Seyfarth 1982) and to examine intragroup (Kitchen 2006) and intergroup behavior (Schel et al. 2013, Scarry 2017), and the removal of specific individuals from their social group (Sommer 1993).

Habituation: This includes repeated and continued observation over time to eventually reduce nonhuman primate response, increase comfort, and reduce abnormal behavior during observer presence (Williamson & Feistner 2003, Goldsmith 2005). Although habituation is widely defined by some researchers as the point when wild animals accept human observers as a neutral element in their environment (Tutin & Fernandez 1991, van Krunkelsven et al. 1999), other scholars acknowledge that human presence and insistence on following study subjects for multiple hours throughout the day are rarely neutral or passive (McDougall 2012), and they instead emphasize the mutual attunement that occurs between study subjects and human observers during habituation (Alcayna-Stevens 2016, Hanson & Riley 2018). In this sense, habituation is not a state to be achieved, but a dynamic, bidirectional, intersubjective process (Hanson & Riley 2018).

Institutional Animal Care and Use Committee (IACUC): The IACUC is the committee charged with reviewing research protocols, reviewing facilities’ animal care and use programs, and inspecting animal facilities semiannually at research institutions in the United States. The IACUC is required to have at least five members and must include an attending veterinarian and a person not affiliated with the research institution to serve the community’s interests (Cardon et al. 2012, Sikes et al. 2012).

Institutional Review Board (IRB): The committee that reviews and approves all research involving human subjects. A human subject is defined as “a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information” (45 CFR § 46.102f). Guidelines are based on the Belmont Report and the US National Research Act of 1974 (Stinson 2005). Primatologists who conduct human observation/questionnaires/interviews must have their research approved by an IRB.

The Three Rs: The 3Rs were developed by Russell & Burch (1959) with a specific focus on minimizing the effects of animal research on individual subjects: replacement (replace animals with nonanimal research subjects if and when possible), reduction (reduce or use the minimum number of samples possible for the research design), and refinement (refine the research design to minimize research impacts on subjects).

notably without input from wildlife biologists conducting field research (Sikes et al. 2012). The lack of concern regarding the ethics of fieldwork is also apparent in the Federal Register of the AWA (9 CFR § 2.31d), which defines field studies as “any study conducted on free-living wild animals in their natural habitat, which does not involve an invasive procedure, and which does not harm or materially alter the behavior of the animals under study” (9 CFR § 3.31d) and exempts such studies from review by IACUCs. These features of the regulation governing animal research in the United States may help explain Nash’s (2005) findings from a survey of the primate literature she conducted for evidence of ethical oversight. Of 49 papers that involved studies with varying degrees of intervention (i.e., habituation, capture, collaring, and anesthesia), none expressed concern for ethical issues.

In 1993, a working group on Ethics in Primatology was held in conjunction with the American Society of Primatologists annual meeting. The focus of this working group was more philosophical than practical: Discussion centered on the status of animals in research, and participants reflected on the human–nonhuman relationship (Petto & Russell 1993). Less than a decade later, the ASP (2000, 2001) and IPS developed specific policy statements that addressed some aspects of field-based research (e.g., the protection of primate health in the wild and the conservation of wild populations, particularly regarding the importation of wild primates). Additionally, the 2001 American Association of Physical Anthropologists (AAPA) meeting served as the venue for a symposium on ethics as it pertains to all areas of biological anthropology, including primatology. Building on only a handful of studies that considered the long-term consequences of primate fieldwork (e.g., Wallis & Lee 1999, Fuentes & Wolfe 2002) and related enterprises, such as ecotourism (e.g., Butynski & Kalina 1998), some of the papers that emerged from this symposium were among the first to explicitly address the ethics of conducting field primatology (Goldsmith 2005, Nash 2005, Wolfe 2005).

In 2006, a special issue of the *American Journal of Primatology* focused on disease risk analysis as a tool to assess and predict disease transmission between people and primates (Travis et al. 2006), with specific papers on the great apes (e.g., Leendertz et al. 2006) and macaques (e.g., Engel et al. 2006, Fuentes 2006). In addition, following the publication of direct evidence of human respiratory disease transmission from humans to wild apes (Köndgen et al. 2008), the *American Journal of Primatology* published a set of research papers and commentaries devoted to great ape health in research, tourism, and conservation contexts (Garber 2008; see papers therein). A year later, in 2009, the first symposium dedicated to ethics of field primatology was held at the American Society of Primatologists annual meeting and resulted in a Special Section on Ethical Issues in Field Primatology in the *American Journal of Primatology* (see MacKinnon & Riley 2010 and papers

therein). In the years that followed these efforts, field primatologists began to critically examine the practice of fieldwork (MacClancy & Fuentes 2011) and confront the impacts of primate field research, including field schools, on relevant ecosystems (Bezanson et al. 2013).

These collective efforts to explicitly address the impacts that our field research has on the primates we study and the human communities that surround them laid the groundwork for the development of the Code of Best Practices for Field Primatology (Riley et al. 2014). Generated by an international committee of field primatologists representing major primatological societies and organizations from Africa, Asia, Europe, and North, Central, and South America, this code provides a set of ethical guidelines and best practices to follow before, during, and after primatological fieldwork. The Code notes how it is especially critical that primatologists engage in research that benefits conservation goals and continues to reflect, assess, and define ethical best practices within cultural contexts (Riley et al. 2014). The guidelines also serve as a call to primatologists, institutions, organizations, and funding/donor agencies to participate in broader discussions and initiatives on how to be better role models. We should be held accountable for our actions as educators and scientists, strive to engage in rigorous research that entails well-considered conservation outcomes, and engage in practices that benefit primate populations, local human communities, and their ecosystems. In the next section, we summarize the key principles of and recent trends in ethical practice that inform how we design and conduct field primatology.

PRIMATE FIELDWORK AS A PRIVILEGE: KEY PRINCIPLES OF ETHICAL PRACTICE

Primatologist Leanne Nash (2005, p. 29) wrote, “I have always viewed doing primate research as a privilege. However, it is even more important from the ethical perspective to view it as a privilege, not a right.” This perspective is invaluable. By viewing primate fieldwork as a privilege, primatologists are better situated to consider and address the key principles of ethical practice in primate fieldwork: “responsibility” and “do no harm.” These principles are at play across the overlapping dimensions of primate fieldwork: the responsibilities primatologists have as scientists, in general, and the responsibilities to the animals we study, to the people who are involved in and impacted by the research we do, and to the ecosystems in which these groups live (**Figure 2**). Here we consider these principles in turn and examine recent trends in applying them.

Primatologists as Scientists: Ethical Obligations

First and foremost, as practitioners of science, field primatologists must abide by a broad set of ethical principles that apply to scientists in general (Wolfe 2005, Riley et al. 2014). These include the following.

- Ensure that research is reviewed and approved by relevant ethical oversight committees [e.g., in the United States, the Institutional Review Board (IRB) if the research involves human subjects and the Institutional Animal Care and Use Committee (IACUC) for animal subjects].
- Obey the laws regarding research in the countries where primatologists work and ensure that all required research permits are secured. Doing so ensures that future researchers’ opportunities are not jeopardized (Wolfe 2005).
- Ensure that data collection and analysis are conducted with rigor.
- Avoid fabricating or falsifying data.
- Disseminate research in a timely fashion and via media that are accessible to diverse parties. For example, in addition to publishing research in scholarly venues, primatologists should share research results with relevant groups (e.g., local communities, park officials) via oral

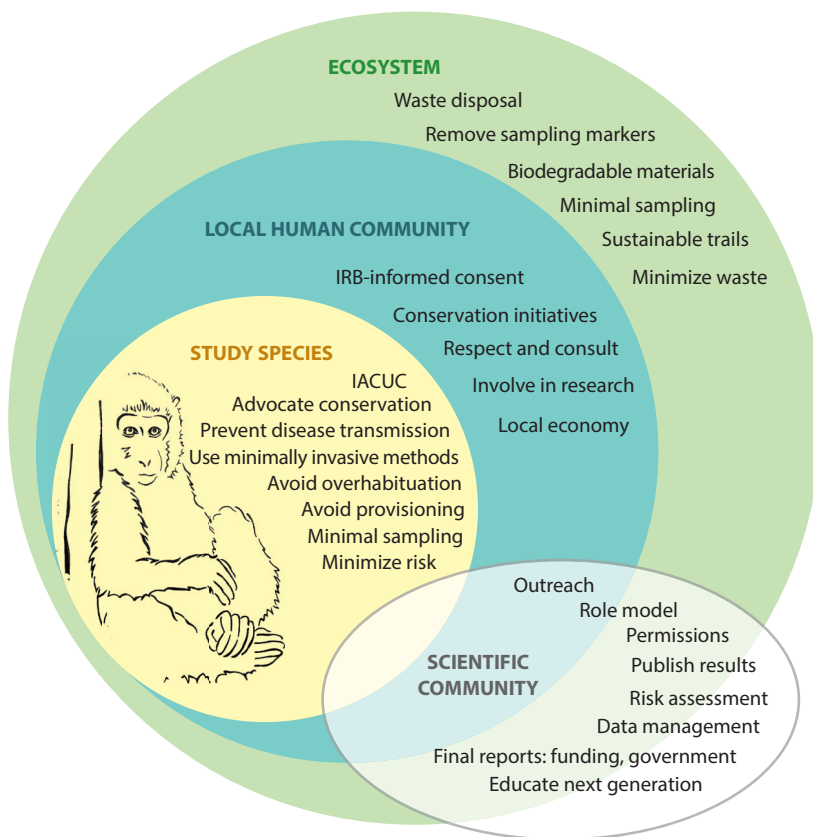


Figure 2

The ethical responsibilities of primatologists across the overlapping dimensions of primate fieldwork. Abbreviations: IACUC, Institutional Animal Care and Use Committee; IRB, Institutional Review Board.

presentations as well as written communication in the primary language used by habitat country nationals.

- Fulfill academic and conservation obligation to train the next generation on best practices in field primatology.
- Be a role model for and educate students, in both the classroom and the field, on culturally appropriate behaviors; appropriate professional behavior (Nelson et al. 2017); sustainable behavior in fragile ecosystems that lack services (Bezanson et al. 2013); sex and gender misconduct (Clancy et al. 2014, Nelson et al. 2017); relevant local, national, or international legal requirements; and scientific rigor.

Ethical Obligations to the Animals We Study

In the United States, the IACUC is charged with ensuring that the research institution is in compliance with the AWA and with reviewing and approving all research activities involving animals. Underlying the review and approval of research proposals are the 3 Rs—replacement, reduction, and refinement—which, as proposed by Russell & Burch (1959), constitute the basic practices aimed at minimizing pain and distress experienced by research animals (see the sidebar titled

Terms and Definitions). Although, as noted above, noninvasive field studies are currently exempt from IACUC review, many institutions interpret the AWA more broadly and require IACUC review of all research with vertebrate animals, from laboratories and classrooms to field settings (Sikes et al. 2011). That said, application of the Three Rs to wildlife research, in general, and field primatology, in particular, has been challenging. Replacement—i.e., replacing the use of animals when possible—is undoubtedly the most difficult R to abide by, given that research by primatologists of anthropological training is done precisely because the primates' phylogenetic similarity means considerable insight for anthropology's objective to understand the human condition (Nash 2005). Reduction—i.e., reducing the number of animals used—is more doable. However, depending on the research objective, a larger sample size may be necessary (e.g., documenting patterns that are generalizable across populations; Sikes & Paul 2013). The key in these cases would be to clearly justify why the number is needed to meet the research goals. Refinement—i.e., determining ways to minimize pain and suffering—is definitely a principle that can be implemented in primate field research (e.g., replacing invasive sampling procedures with less invasive ones). Despite some of these difficulties in translating principles that were developed for laboratory animals to field settings, these principles remain valid for field primatology (see Sikes & Bryan 2016). Accordingly, the following ethical considerations have emerged from primatologists' reflexive examination of their research practices in concert with guidance from other wildlife research guidelines.

- Carefully weigh the costs and benefits of habituation. While a number of studies conducted in the 1990s, for example, examined the behavioral responses of primates to habituation (Johns 1996), it was not until the early 2000s that primatologists recognized the possible negative effects that accompanied a process considered so fundamental to primate field studies. For example, Mourthé et al. (2007) attribute increased levels of terrestriality exhibited by one group of muriquis to long-term habituation. This behavioral shift could in turn put the muriquis at greater exposure to pathogens and risk of injury or death from terrestrial predators (Strier 2013). Field primatologists should therefore use methods that minimize stress during the habituation process; habituate only until presence is tolerated so as to avoid overhabituation; ensure that appropriate distance-to-study subjects protocols are followed to minimize the probability of disease transmission; employ the principle of reduction when considering the number of animals to habituate; avoid habituating new groups of primates, particularly if the species is Endangered and/or if the subjects are great apes (e.g., see habituation decision tree; Gruen et al. 2013); avoid habituation in areas where human–primate conflict and/or heavy hunting pressure exist; and consider how the habituation of one primate group may negatively impact neighboring groups (Goldsmith 2005, Fedigan 2010, Malone et al. 2010, Strier 2010, Gruen et al. 2013).
- Minimize the potential for disease transmission. It is our responsibility, as field primatologists, to be aware of the opportunities for disease transmission at our specific fieldsites (Wallis & Lee 1999, Rwego et al. 2008) and to consult with veterinarians and medical experts to develop site- and taxa-specific health and sanitation standards (ASP 2000). These standards could include protocols for hygienically disposing of human waste while in the field (e.g., burying it in deep soil or packing it out) and actively maintaining distances between researchers and nonhuman primate individuals to minimize the potential for airborne transmission (Jones-Engel et al. 2001, Gilardi et al. 2015). Additionally, it may be advisable to require all research personnel to be tested for potentially dangerous diseases (e.g., tuberculosis; Collins 2003), update vaccinations against diseases for which vaccines exist (e.g., measles, mumps, and rubella, hepatitis, yellow fever, influenza; Collins 2003, Köndgen et al. 2008), and refrain from entering primate habitats if research personnel show signs of illness (Muehlenbein et al. 2010, Gilardi et al. 2015).

- Design field experiments so as to minimize risk. Cuthill (1991, p. 1007) provides some important considerations on the ethics of experiments in field studies. He argues that the benefits to humanity that derive from behavioral research are more diffuse; if the justification of experiments depends in part of this valuation system, then the threshold for allowing or rejecting a behavioral experiment should be lower than, say, for cancer research. Thus, we should be stricter in our ethical oversight of field experimentation. Field experiments often involve foreign stimuli or manipulation that may cause stress for the primates and/or disrupt their environment. Hence, the scientific value of the experiment should be considered. For example, if food provisioning results in escalated aggression that leads to injury and mortality, then field primatologists must consider whether provoking aggression is justifiable.
- Use capture, mark/measure, and release techniques that minimize risk. The capture and handling of free-ranging primates enable primatologists to collect data that can substantially enhance our understanding of primate behavior, physiology, and health status and that can be used to inform conservation and management efforts (Karesh et al. 1998, Glander 2013). However, heightened levels of stress in the primates and risk of injury and death are critical concerns. First, compassion should underlie all methods used for capture (Bekoff 2002, Glander 2013). In a recent review on darting, Cunningham et al. (2015) recommended that primatologists always consider noninvasive methods first, particularly for arboreal primates for which the risk of falling is greater, and during the procedure only veterinarians should administer anesthesia (regardless of what the country-specific requirements are). Primatologists should also collaborate with one another to reduce the number of animals darted and share their procedures, successes, and failures to better refine darting protocols (see Hopkins & Milton 2016, Fernandez-Duque et al. 2017) and share both positive and negative outcomes of our techniques [e.g., radio collar use; Crofoot et al. (2010), Juarez et al. (2011)]. This last point includes collecting data on behavioral and physiological responses to the capture methods used and publishing those data (e.g., Wasserman et al. 2013).
- Prioritize the use of minimally invasive methods. Remote sensor cameras (known as camera traps) provide a viable alternative method for data collection in settings where habituation is not possible or is ethically problematic (e.g., cases in which habituation might exacerbate human–primate conflict, such as crop foraging; Zak & Riley 2017). Cameras are also beneficial where direct observation is not absolutely necessary (e.g., documenting presence/absence or geographical range; Gerber et al. 2014) and cases in which animal follows are difficult (e.g., some arboreal primates; Gregory et al. 2014) or might heavily alter primate behavior (Pebsworth & LaFleur 2014). Data on the distribution and density of primate populations can also be collected remotely with the use of drones (Wich et al. 2015). Genetic, hormonal, stable isotope and other biological data can be collected using feces (Arandjelovic et al. 2011), urine (Vogel et al. 2012), hair (Loudon et al. 2016), and saliva (Higham et al. 2010, Smiley et al. 2010). Physical traits, such as body size dimensions, can also be measured remotely, thereby obviating the need for capture (e.g., parallel lasers; Rothman et al. 2008, Barrickman et al. 2015).

Ethical Obligations to the People Impacted by Primate Fieldwork

Primate field research is ethically complex because it can affect humans who are part of the broader ecological communities in which primates live. Increasing recognition of this dimension of the ethical landscape of primate fieldwork has emerged largely as a result of recent scholarship in ethnoprimateology—the study of the diverse ways that humans and other primates interface and the implications of those interfaces for conservation and sustainable coexistence (Fuentes 2012,

Riley 2013, Hockings et al. 2015). Ethnoprimateology's explicit focus on the ecological, social, and cultural interconnections between people and primates has meant that the primate methodological toolkit has expanded beyond traditional primatological tools; studying people requires different methods and additional ethical considerations (Malone et al. 2010, Dore et al. 2017). Even primatologists who pursue traditional topics (e.g., social behavior, life history, reproduction) need to recognize that they are never "just primatologists"; they are social actors who must interact and forge relationships with diverse and heterogeneous groups of people (e.g., local community members, governmental officials, park managers, members of nongovernmental organizations) (McLennan & Hill 2013). For example, McLennan & Hill (2013) describe how their arrival, research purpose (to study chimpanzee ecology and their interactions with people), and ongoing presence at their fieldsite in Hoima District, Uganda, exacerbated social and political issues already at play in the area (e.g., concerns over land insecurity, shifting resource use patterns, and existing tensions regarding chimpanzees' status and behavior).

Field primatologists are also more likely to encounter multiple levels of ethics that they must navigate across and negotiate among during their fieldwork. Kutsukake (2013) identifies at least three levels: personal ethics (the decisions one makes as an individual and the factors that underlie one's decision making, i.e., culture, religion, nationality, etc.), professional ethics (the professional codes and guidelines one is expected to follow), and community ethics (the ethical structure in place within the community in which one lives and works). What might be considered ethical at the personal or professional level (e.g., decision to not intervene in crop feeding behavior), for example, may not necessarily be deemed ethical at the community level (e.g., allowing observed crop feeding to occur negatively impacts villagers' livelihoods). It is also worth noting that further structural complexity and heterogeneity may be nested within each of these levels, which will require consideration. For example, an ethnoprimateologist who is interested in finding ways to balance human and primate needs amid human–primate conflict may struggle with determining which personal ethics or professional ethics to follow (e.g., a more general code governing anthropological research or a more specific one concerning primate welfare). As such, field primatologists face issues similar to those that other anthropologists encounter in their own fieldwork; hence, primatologists have much to learn from a broader discussion on the ethics of fieldwork (Wilson 1993; MacClancy & Fuentes 2011, 2013; Plemmons & Barker 2016), including consideration of the complexity and power dynamics at play when primatologists from the Global North conduct research in the Global South [see Fuentes (2011) and Montgomery's (2015) discussion of what she calls the "Africanization of the Amboseli Baboon Project" in Kenya]. Below we summarize some of the key ethical considerations that may arise in the context of primate fieldwork.

- Be mindful that the process of gaining consent for research often flows from top to bottom: What governmental officials hundreds of kilometers away in the capital city deem appropriate may not be viewed in the same fashion at local levels, but such concerns may not be communicated overtly (see McLennan & Hill 2013). Accordingly, be transparent about research objectives and outcomes, encourage discussions about the research, and do so frequently throughout the duration of the project.
- Be prepared to encounter issues or observe behaviors that challenge one's moral compass: for example, illegal activity, such as forest product collection and the keeping of pet primates; research conducted without appropriate permits; and invasive behavior toward the primates under study (e.g., feeding, harassment). Consider developing educational activities in the communities that may instead stimulate appreciation for the primates (Fedigan 2010).
- Determine how the research activities are perceived and understood by the community, and seek guidance from trusted local informants on the best ways to address any

misunderstandings (Gearheard & Shirley 2007). For example, McLennan & Hill (2013) report that despite holding public meetings during which the research approach was clarified, some people were still suspicious of vegetation surveys, interpreting the transects as ways to divide the land, and tree flagging as staking claims of ownership. Be open and transparent about the research, be persistent in addressing unfounded suspicions, and be committed to building the community's trust.

- Recognize how the research will impact the local economy and intracommunity dynamics. Primatologists often live in or nearby local communities, meaning they will purchase food, supplies, and other items locally, rent housing facilities, hire local community members as cooks, etc. Primatologists also typically hire local community members as guides and/or field assistants. While these outcomes are generally recognized as positive impacts (e.g., capacity building), short-term projects provide only short-lived economic opportunities—opportunities that may have kept community members from exploring alternative income-generating activities. For longer-term projects upon which local people may depend financially, any disruptions to the project can lead to serious economic insecurities (Strier 2010). Moreover, the hiring of local people can be a difficult and/or awkward process that presents a number of ethical dilemmas: deciding how much to pay, who should be hired, whether to follow local norms for selecting assistants or making selections on one's own, and how to handle jealousy and resentment that may arise within the community if only a few individuals benefit (Fedigan 2010). The hiring of local field assistants may also shift the relationship the assistants have with other community members, in both positive and negative ways (McLennan & Hill 2013).
- Carefully consider the impacts that the research methods and results, and any conservation outcomes generated, may have on the community. Primatologists should ask, Who benefits from fieldwork (Lee 2011, p. 70)? For example, habituating primates is often seen as a necessary first step in primate field research, but doing so in human-dominated environments may pose risks for local human communities. If primates lose their fear of humans, it may result in aggression directed toward the people they encounter in crop lands or in the forest (Hockings et al. 2010, McLennan & Hill 2010). Such attacks can produce negative attitudes toward primates that can, in turn, result in retaliatory measures and reduce support for conservation initiatives (Madden 2008, McLennan & Hill 2012). Additionally, conservation policies that result in restricted or complete loss of access to natural resources (e.g., timber, fuelwood, foods) may threaten the livelihood security of rural households (Eudey 2002, Hill 2002).

Ethical Obligations to the Ecosystems in Which the Primates Live

Primatological field research has the potential to negatively impact primate ecosystems (Fedigan 2010, Strier 2010, Bezanson et al. 2013). Some longer-term and/or more established fieldsites experience high researcher traffic, frequent field courses, and, in some cases, tourism (Nakamura & Nishida 2009, Tydecks et al. 2016, Bezanson & McNamara 2018). Therefore, fieldsites may have large researcher and student groups that move through during academic breaks, or students may be engaged in longer-term study-abroad programs that visit fieldsites for entire semesters (Garber et al. 2010, MacKinnon 2010). Our presence causes an increase in trash, sewage, trail damage, scientific monitoring markers (flagging, tree tags, sensors, etc.), and the number of humans observing individual primates at one time. Project principal investigators, field course instructors, and station managers should consider and assess both the negative consequences and the benefits of researcher presence at fieldsites.

The following guidelines for reducing our ecological footprint at biological research stations should be considered (Spear 2004, Simon & Alagona 2009, Bezanson et al. 2013, Leave No Trace Cent. Outdoor Ethics 2017):

- Educate ourselves, our assistants, our students, and any other visitors: Before arriving at a field station, know how trash removal, recycling, and composting work at the field station. Have every researcher, instructor, assistant, student, and other visitors sign a sustainability contract (Bezanson et al. 2013). As researchers at a field site, we have a commitment to contribute to its future by serving as an educator and a role model when others visit the site. We should not, nor should our research, exist in a private scientific bubble.
- Maintain trails/minimize construction of new trails. Field researchers should construct trails on durable surfaces (e.g., areas that can handle foot traffic and are unlikely to erode), invest in trail maintenance, prevent widening of trails, and curtail the creation of new trails. New trails should be constructed only by principal investigators and field station personnel and only when necessary. Trail widening can contribute to habitat loss and increase opportunities for poaching and invasion by exotic organisms (Fedigan 2010). Educate assistants and students to avoid trail widening by walking in the center of the trail and going off trail only when absolutely necessary for research. Deconstruct trails that become no longer necessary for research. Minimize the number of individuals using trails at the same time.
- Dispose of waste and remove research markers. If the research design requires exclusion in particular plots/areas, then install markers (surveyor's measuring tape, flags, cords) that clearly define the plant/area involved. Describe in the research design how and when markers will be removed. On all markers, the name and final date of the project should be noted. When the research ends, retrieve all materials (Fedigan 2010). Avoid the use of nonbiodegradable plastic.
- Take only the smallest samples necessary. Collect the smallest number of samples possible, work around plants/animals, and do not disturb organisms that are not defined in the IACUC research protocol (Strier 2010). Plants and animals should be observed in their natural habitat only and not removed for "show and tell."
- Bring less and burn less. Many field stations lack trash services. Waste may be burned owing to the costs of collection or transport. Recycling facilities may not be able to deal with aerosol cans, batteries, and plastic bottles. Therefore, reduce the use and purchase of these items and pack out your recyclables to the appropriate facility.
- Your purchases should reflect the recycling systems available in the community near your field station. Recycling systems in rural areas may support only glass and aluminum. Return bottles to the place of purchase if they redeem bottle costs. Be aware that your purchase behaviors can influence local economies.
- Field researchers are role models, and our behavior can influence students, other researchers, and the local community: Consider how our consumption and behavior influence others. For example, field researcher activities such as adopting feral dogs at field stations can have devastating and far-reaching consequences (e.g., disrupt/harm wildlife and negatively impact the community).

ADVANCING ETHICALLY ENGAGED FIELD PRIMATOLOGY

Best practices for primate field research are not static. They change over time as theoretical frameworks and methodological tools are improved. Field primatologists therefore need to continually reflect on what constitutes ethical practice. In this final section, we identify key elements that should be considered moving forward.

Ethically engaged field primatology will increasingly use minimally invasive methods, including remote data collection strategies. For studies that do involve invasive procedures, we need to ensure that our protocols involve coordination and cooperation between field primatologists and wildlife veterinarians (Cattet 2013). Given the threatened status of many primates, we need to carefully consider the ethics of intervening to ensure the survival of remaining populations (Gruen et al. 2013; see intervention decision tree). Primatologists also need to become more involved in the structures that provide ethical oversight of our research. Indeed, scholars have lamented how there is a widespread lack of representation by wildlife researchers on IACUC committees (Fedigan 2010, Sikes & Paul 2013, Wallace & Curzer 2013). Rather than complaining that the IACUC forms do not align with field research design and objectives or being worried that committees will not be able to evaluate our responses on such forms, primatologists should be proactive and agree to serve on these committees at their respective institutions. Because field primatology research increasingly involves both humans and primates, some scholars have even argued for the creation of a new structure of ethical oversight for primate field research—one that includes primate experts as well as scholars who are familiar with the cultural context in which the research will occur, health professionals, and ethicists (Gruen et al. 2013).

Because primates are facing an uncertain future, given anthropogenic impacts on primate habitats (Estrada et al. 2017), we have an obligation, now more than ever, to engage the public with our science and integrate conservation outcomes in our work (even if conservation is not central to the research design). In fact, one could argue that primate field research that does not pay attention to the conservation of primates and habitats where we work is ethically questionable (Nekaris & Nijman 2013). Recent trends include, but are not limited to, examining the impact of broader-scale anthropogenic factors (e.g., climate change; Lehmann et al. 2010, Graham et al. 2016), partnering with multinational corporations to monitor primate response to industrial activities (Gregory et al. 2017), and working with indigenous local human communities to promote sustainable forest use and hunting (Shaffer et al. 2017).

Primatologists also need to continue to think critically about how research presence influences primate populations, human communities, local ecosystems, and whether long-term studies contribute to conservation (**Table 1**). In some cases, research (and field station) presence can afford

Table 1 Benefits and negative consequences of researcher presence at fieldsites (table modeled after Brussard 1982, Wrangham 2008, Lurance 2013)

Benefits	Negative consequences
Scientific discovery can lead to protection	Disturbs wildlife and the ecosystem with infrastructure, trails, etc.
Increases public awareness	Has the potential for attracting tourists/other exploitative users
Increases local human community participation/support	May exclude/alienate/negatively impact the local community
Builds local capacity and supports local economy	Short-term field visits may cause unequal or unpredictable economic support
Influences policy/management, attracts government support	Has the potential for disease transmission
Enhances the ability to identify and report poachers	May increase poaching and hunting with increased visibility and popularity
Brings tourism (increased jobs, funding)	May induce problematic behavior by tourists
Provides opportunities for educational programs (e.g., field courses and conservation education initiatives)	May induce problematic behavior by students
Enables habituation of primate groups	Alters the behavior of study subjects and other wildlife

new conservation initiatives and support local human communities (Wrangham 2008, Marshall et al. 2016, Campera et al. 2017). For example, long-term data collection at some great ape sites (e.g., Gombe Stream, Tanzania; Kibale Forest, Uganda; Virunga Mountains, Rwanda; and Bwindi Impenetrable Forest, Uganda) have resulted in increased governmental protection, the formation of national parks, increased local involvement, and increases in primate numbers (Wrangham 2008). In other cases, however, research presence can have negative effects on primate populations, including disease transmission (Kaur et al. 2008), adverse behaviors enhanced by overhabituation (Strier 2013, Hanson & Riley 2018, Westin 2017), and failed programs that were designed to help local human communities (Webber et al. 2007). Moreover, we argue that ethically engaged primatology means investing in the training of local people as integral field team members, empowering them to make important intellectual contributions to the research and advancing their career trajectories as in-country primatologists and/or conservationists.

Finally, field primatologists must consider how ethical statements move between ideology and compliancy checklists to become practice. For example, university departments (e.g., Pennsylvania State University, Department of Anthropology), fieldsite managers, and field course instructors are providing resources and/or requiring ethical contracts for researchers or students who work at remote fieldsites (Bezanson et al. 2013; <http://www.anthgenomicslab.com/psu-anth-safe/>). Doing so places us in a better position to role-model ethical behavior (Carr 2012) and take responsibility for how our behavior can affect primate populations, local human communities, and the environments on which they rely. Role-modeling ethical behavior in our classrooms, field settings, and publications is critical for primate conservation.

CONCLUSION

Field primatologists have a responsibility to do no harm to the animals we study, to the humans with whom we work and/or impact through our research, and to the ecosystems in which we work. We should define the parameters of our research and assess how our methods may harm the environment. We must assess how our behavior fits within particular local cultural contexts and economies, be aware of how waste may influence local primate and human environments, and contribute to conservation initiatives at our sites. We also have a responsibility to be role models, behaving ethically and contributing to the training of the next generation of primatologists as well as fulfilling our broader professional obligations (e.g., working on host-country guidelines, reporting successes and failure).

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