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Special Issue on Long-term Research

Confronting ethical challenges in long-term research programs in the tropics

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Abstract

Ecologists and conservation biologists conducting long-term research programs in the tropics must confront serious ethical challenges that revolve around economic inequalities, cultural differences, supporting the local communities as much as possible, and sharing the knowledge produced by the research. In this collective article, researchers share their experiences and perspectives in dealing with the ethical issues that arise during research activities and cannot be ignored.

Introduction

Reinmar Seidler, Richard B. Primack

Normative attitudes toward field research in tropical regions have changed vastly over time, and continue to do so today. Field work is almost always time-limited and is generally marked by periodic crises, some anticipated and many others unexpected. Perhaps because such work often demands an intense and narrow focus, scientists may risk seeming oblivious to their impact on people and communities around them (Brittain et al. 2020). As researchers work to keep active research programs functional and productive over the years, conflicts and ethical dilemmas inevitably arise – many of which stem from acute global-scale inequities in funding, access and influence. These potential stumbling-blocks are rarely mentioned in conventional scientific accounts, but in practice, they are nearly unavoidable aspects of long-term research in the tropics. Having dealt with (and overcome) such challenges, experienced researchers can offer practical advice to students and colleagues just beginning tropical research (Riley & Bezanson 2018; Chin et al. 2019). However, such advice is generally only communicated privately.

We solicited short contributions from the authors in this Special Issue, along with several other scientists, to document the variety of observations they've made and solutions they've explored in the course of resolving ethical challenges. Collectively, the contributors have logged centuries of person-years' experience in managing and participating in long-term research programs. Some of the authors are based in countries in the global North and are visitors to the tropics; others are based in-country and have hosted visitors. We asked authors to maintain an informal style and an anecdotal focus.

The first and primary responsibility of anyone visiting and working in another country and culture is to understand cultural differences and adapt to them as much as possible. Our first three contributions present contrasting viewpoints on this fundamental expectation. Goswami's contribution demonstrates how in a large, complex country like India, field scientists—even from within the country—may depend on meaningful partnerships and local adaptation to navigate ethno-cultural heterogeneity in remote or culturally distinct regions. Khaling and Devy report back as experienced hosts of visiting researchers—not all of whom, regrettably, have met minimum ethical standards in adapting to Indian cultural contexts. Corlett's wise advice to scientists visiting China can easily be extrapolated to other parts of the world.

A second basic ethical obligation is to be sure the research project brings added value to the local community, beyond simply paying for accommodation and support as would any other visitor

(although that is important too!). As a pioneering Ugandan primatology student, Otali benefited from learning opportunities provided by the presence of a long-term research program, and is now enthusiastically extending those opportunities to another generation of students. The program described by Knott and her colleagues in Indonesia is a model of how integrating long-term research into the local and national cultural landscape can stabilize a program and strengthen its impact. Roth's experience in Thailand illustrates the unexpected ways in which sensitivity to cultural attitudes can yield dividends by facilitating the flow of important local information.

A third common responsibility among research programs is to share the resulting information and knowledge with local people, students, the scientific community, and government agencies. This, too, often requires extra time and effort, yet it is imperative from both ethical and utilitarian points of view. Connecting with hundreds of partners to integrate plot-scale observations into global-scale networks, Phillips and colleagues in ForestPlots.net have worked hard to unite data producers and users in a mutually beneficial research community, always with an eye to the long-term sustainability of forest monitoring itself. Primack and Wilson describe the patient and persistent development over years of what has become a veritable global network of knowledge production in the form of textbooks on conservation biology, each adapted to national contexts and translated into national languages.

Finally, Wrangham's contribution illustrates that for the people who live in the midst of it, "biodiversity" is not always an unalloyed good. Examples of this are not restricted to the tropics: wolves outside Yellowstone, elephants and tigers in South Asia, crop-raiding wild pigs all over the world… The local consequences of conservation efforts – including the successes – may involve increases in human-wildlife conflict, occasionally resulting in loss of livelihoods and sometimes even of life. This is not a reason to scale back conservation efforts, but it is surely a reason to be empathetic when there is push-back from local communities. It is also a reason to work very hard to help reduce and mitigate the risks. Many potential strategies to mitigate human-wildlife conflict, from effective fencing to electronic detection and warning technologies, are relatively expensive by local standards. Biodiversity conservation often involves ancillary financial costs that cannot, and should not, be borne by local communities.

We see welcome trends in diversity among tropical ecologists and conservationists today. In particular, there is increasing representation of women and of scientists hailing directly from all parts of the tropics, as well as a growing number of training options available to young ecologists in tropical regions. Nevertheless, the diversity of those leading research in tropical ecology and conservation remains far from representative. Several contributors here highlight the need and the opportunity to further involve local people in research programs and to ensure that students and young researchers have access to training and mentoring.

Our goal in organizing this paper on ethics for the Special Issue on Long-Term Ecological and Conservation Research in the Tropics is to consider the broader social issues of carrying out research in different countries and cultures. This is an issue frequently addressed by Prof. Kamal Bawa, who has worked hard and argued strongly for increased development of the scientific community in tropical countries. Our hope is that you enjoy the readings that follow, and that the insights provided might stimulate further discussion, appreciation and respect for different points of view.

1. Understanding cultural differences

1.1 Perspectives on working in community forests of tropical Northeast India

Varun R. Goswami

Megadiverse India is an exciting country to study basic and applied tropical ecology. Across much of India, if your research calls for fieldwork in forests, you will likely require access to protected areas (PAs) or other government-managed areas. State research permits need to precede such fieldwork, over and above the federal clearances that are a usual prerequisite for foreign researchers. Northeast India, a region that straddles two biodiversity hotspots, presents an interesting contrast to working in PAs. Here, a majority of forests in the hill states are community managed, with strong self-governance structures for decision-making. For fieldwork in these forests, you would need approvals from local administrative bodies.

What should you be mindful of if you want to work in these community forests? As these forests lie in a remote and relatively unexplored 'frontier region', logistical challenges can add to potential language and cultural barriers. You will need local support, be it to find accommodation, obtain research approvals or conduct fieldwork. All of these typically require fairly extensive consultation with community leaders and hinge on mutual trust, often built through sustained engagement. Therefore, a collaboration with a local organisation may be an ideal way to begin. If such collaborations are well aligned, they can build local scientific capacity, and improve and sustain conservation outcomes (Chin et al., 2019). Collaborator-facilitated community engagement can also help find synergy between your research and stakeholder interests, and thereby stimulate greater buy-in for your study. My PhD fieldwork on elephants in Garo Hills, Northeast India, was enabled by a fruitful on-ground collaboration—it allowed me to engage and train an existing team of local field personnel for ecological and social surveys, and yielded conservation-focused scientific outputs (Goswami et al., 2014; Goswami et al., 2015).

Fig. 1: Author Dr Varun Goswami and local field personnel collecting elephant dung samples in Garo Hills, Northeast India. Photo © Divya Vasudev

What are some pitfalls to avoid? The ethnocultural heritage of Northeast India is diverse, and exotic to many—Nagaland, a state I work in, is home to 16 major tribes for instance, each with their distinct language and culture. While it is important to be respectful of local norms and sensibilities, it is also easy to romanticise the socio-cultural, and by extension, conservation context. Community forests are important ecological systems, but researchers do on occasion overemphasize the value of community-based conservation, which, like PA-centric conservation, is no panacea (Berkes, 2007). Much as exotic tales from the 'frontier' make for a good story, your burden as a scientist is to report findings objectively, and strike a balance between ideology and reality. It is also critical that you avoid 'parachute research' (*sensu* Chin et al., 2019): researchers arriving abruptly and then leaving without sharing any of their findings. Disseminating results locally is pivotal to communities taking ownership of findings, building awareness and technical capacity, and ultimately, helping shape conservation decisions. If ecologists and communities partner effectively, community forests can be irreplaceable in supporting participatory research and conservation in the tropics.

1.2 North-South engagement in conservation research: From unequal collaborations to equal partnerships

Sarala Khaling and M. Soubadra Devy

Over two decades, researchers and professionals from the North have engaged with ATREE (Ashoka Trust for Research in Ecology and the Environment, see also Rai et al., this volume) on research in ecology and conservation in many parts of India. Only a few of these engagements have been equal partnerships that resulted in fruition of shared research/work interests. Others have not been at peer-to-peer levels. For example, qualified young researchers in ATREE have sometimes been confined to doing menial assignments (e.g., digging pits), while researchers from the North were involved in intellectual contributions (research design, analysis, and writing).

Another experience is the disregard for legal compliance, where many researchers from the North overlooked the requirement for research permits. Often they took the easy tourist-visa route, though deemed illegal for doing research in India. Obtaining permits—especially for foreigners—takes time. This is often misconstrued as obstruction, and the host institution's efforts to facilitate permits and follow up on them largely goes unappreciated.

As local hosts, we have been put in embarrassing situations by insensitivities to local culture of researchers from the North, especially when working or living among rural communities. These range from them not observing local dress codes, to culturally inappropriate personal interactions (specifically overt display of affection in the field sites with other Northern researchers), to not paying for rural hospitality and even trespassing onto personal property. Interdisciplinary research involves interactions with local people, and often these are fraught with insensitivities. For instance, interview questions often venture into personal queries like income sources and amount, type of food, expenditure of income and family and other personal details. Many times researchers have insisted on interview timings that disregarded interviewees' convenience. There was even an instance when an aged sick man was carried out of his bed to address questions of intergenerational experience of climate change! Often, interviewees are not apprised of the objectives of the research and dissemination plan, and no prior consent is sought. Despite our cautions, counterparts from the North have indulged in photography, particularly of young children, without prior consent of the communities.

Fig. 2: Research Associate Poonam Rai works with community members outside Singalila National Park, in the Darjeeling Himalaya (India), to produce village resource maps to help in mitigating chronic crop-raiding by wildlife. (Photo © Reinmar Seidler)

All researchers who come from the North rely on the local host organizations for field work. The time spent by field staff to facilitate this often goes uncompensated; this "chaperoning" is considered part of their work. There have been instances where authorship was denied even when intellectual inputs were contributed; at times ATREE researchers have not even been acknowledged. One of the most critical issues is the publication of sweeping perspectives in leading journals without researchers having spent adequate time in ATREE's field sites. These instances of extremely short field visits getting translated into compelling perspectives do not reflect ground realities, and in some cases, misrepresent critical issues around livelihoods, poverty, and biodiversity.

We feel North-South collaboration should move away from the current snapshot-like publication-centric approach, and towards long-term commitments and engagements. A good place to start would be developing and designing projects consultatively and a more thorough understanding of local issues and needs. Such engagements could contribute to capacity building and provide mentorship for young researchers in India. Lastly, an immersion period is critical for counterparts from the North to help them understand sensitivities of local culture, customs, and norms appropriate for undertaking field research and conservation in India.

1.3 Helping to build an 'ecological civilization' in China

Richard T. Corlett

There are tens of thousands of foreign scientists working in China, from graduate students to senior professors. It is popular because it combines an opportunity to work somewhere different with access to funding, world-class facilities, and stimulating colleagues. Although many foreigners working in China are near retirement, a stay there is particularly advantageous for early-career scientists, who often get more freedom to develop their own research interests than they would at home, and can leave with a CV that stands out from those of competitors. While China can be good for your career, however, there is a danger that you simply fill the foreigner quota at your host institution without contributing much else.

For conservation biologists, a key question will obviously be how your stay can contribute to biodiversity conservation in China and to mitigating the impacts of China's development on the rest of the world. China leads the world in some research areas but not (yet) in conservation biology, where there is no substitute for decades of practical conservation experience. China's conservation plans, including a new national park system and nationwide ecological red lines, where ecosystem services are protected, are hugely ambitious, and 'ecological civilization' is written into the constitution, but achieving these goals requires knowledge and skills that are still being acquired.

Fortunately, China is not a country where you must constantly worry about offending your hosts. There may be sensitive topics but let them set the limits. Helping colleagues publish in international journals can make a real practical contribution (and make you popular). China increasingly dominates English-language scientific publishing, at least in terms of numbers of papers, but most Chinese scientists need help for this. Training courses in new techniques can also be valuable but do find out first what is needed.

Things get more difficult when you move out of the English-speaking bubble which isolates many foreigners from the wider Chinese world. Even in your host institution, many good academics will not be able to converse in English, and outside the gates it is simplest to assume that nobody can, including people involved in practical conservation. You can communicate through colleagues, a translator, or phone apps, but this is no more satisfactory than it would be in the USA. Mandarin is not a particularly difficult language to speak—reading and writing is a different matter—but you will not pick it up casually and must make some effort. Particularly in rural areas, a willingness to eat anything and toast with whatever alcoholic poison the locals drink can make up for a lot of communication problems. Some things are difficult for foreigners, such as access to core areas of Nature Reserves, and some near impossible, such as permission to interview people. Be flexible and be prepared to work through local collaborators.

Finally, leave something behind. Your data and publications, obviously, but conservation biologists should also explore the opportunities for submitting policy papers—translated into Chinese—to appropriate branches and levels of the government. China is ambitious and self-confident, and there is no stigma attached to taking advice from knowledgeable foreigners.

2. Providing local value

2.1 Learning to do fieldwork in western Uganda

Emily Otali

In 2001, when Makerere University chose to invest in the training of more primatologists, I was one of three beneficiaries. I was urged to study blue monkeys, but a chance meeting introduced me to a community of chimpanzee researchers in Uganda and drew my attention to the benefits tapping into their experience. The attraction of having mentors to support me in the pursuit of chimpanzees was too good to resist.

I studied the dynamics of social organization by fission and fusion in chimpanzees of the Kanyawara community in Kibale National Park. When I graduated, I was not only one of the few primatologists in the country but also the first woman in Africa to attain a PhD in chimpanzee behaviour. I became both a resource on primate research for the East African region and a source of inspiration for many aspiring female biologists. Today, I know of five more female primatologists in training. This is all made possible by a long-term research facility that I am now managing, the Kibale Chimpanzee Project (KCP). In that role, I have had the opportunity to continue my research, supervise and mentor students, and serve as a cultural ambassador of sorts.

Over time, I have learned that the greatest challenge for students coming to work in a new country is not dealing with difficult field conditions but navigating the cultural differences. Even though the research station has a population of mixed nationalities, the local Tooro community is the predominant life force of support staff and research assistants. Like other Ugandan ethnic groups, they are unique in their culture which if lost in translation can lead to pretty uncomfortable conversations.

Fig. 3: Author Dr Emily Otali assists in veterinary treatment of a snared chimpanzee, Kibale National Park, Uganda. Photo © Andrew Bernard

Thankfully, they are keen to welcome foreigners into their midst. The biggest icebreaker is the *empaako*-giving ceremony. An *empaako* is any of the 12 endearing pet names used by the

Batooro to address each other. It is used more often than a person's given name. A newly arrived foreign student is expected to host his or her field assistants to a traditional Tooro meal during which they will be given their pet name. I come from eastern Uganda, so I am regarded as somewhat foreign in western Uganda. I was duly given the *empaako* "Amooti", which means a respectful person. Researchers are also often invited to attend local ceremonies like traditional marriages and the norm is to dress in traditional attire. This is locals' way of accepting researchers into their social fabric. In turn the researchers establish trust by respecting the local culture and having more meaningful conservation impacts through connections to the local community. Local conservation organisations like the Kibale Forest Schools' Program arrange for researchers to participate in primary school activities such as painting murals, taking pupils for nature walks and giving talks.

When I started my research in 2001, the local communities generally thought the chimpanzees belonged to foreigners and that we were herding the chimpanzees to raid their crops. Years of community education and trust between local people and researchers have changed this attitude. Now they refer to them as "our chimps".

2.2 Building Collaboration for Orangutan Conservation

Cheryl D Knott, Erin E Kane, Tri Wahyu Susanto

Many countries have laws or regulations requiring foreign scientists to work with and support local scientists. This investment in building in-country capacity should not be seen as an impediment to research, but as 'best practice' for all scientists. The COVID-19 pandemic has put this into sharp relief. In a 'globalized' world, our movements have paradoxically shrunk to our own backyards. This highlights the responsibility of those working outside of their communities of origin to support the development of local expertise. COVID-19 has restricted movement world-wide, with conservation and research projects relying on the expertise of permanent residents where these projects occur. We experienced this first-hand at our field site in Indonesia. At the outset of the pandemic, when foreign staff returned to their home countries, our well-trained and knowledgeable local staff continued their work and assumed new leadership positions in our conservation and research projects. With the relative ease of global travel, and increased human-wildlife contact, future pandemics are likely to recur (Rodríguez-Morales et al., 2020) and make travel to international field sites challenging or unethical (Reid, 2020). Consequently, international researchers must prioritize training and supporting host-country scientists even more than in the past.

Fig. 4: Field Research Assistant Muhammad Harissan (left), Researcher Dr Cheryl Knott (center), and Field Research Assistant Andi Abdul Sabta Pelari (right), observe and collect data on an orangutan constructing a night nest at Cabang Panti Research Station, Gunung Palung National Park, West Kalimantan, Indonesia. (Photo © Tim Laman)

Involvement of in-country students, scientists and government stakeholders has been key to the Gunung Palung Orangutan Project's long-term success and viability. Indonesian permit-granting bodies mandate that foreign researchers collaborate with Indonesian research counterparts, and our sponsorship agreements with research institutions and universities facilitate collaboration with Indonesian students conducting research at our Gunung Palung field site. These arrangements have produced a cadre of young Indonesian scientists committed to orangutan research and conservation, and trained to take on leadership roles when opportunities arise. We hire students who have trained with us as field laboratory assistants, research managers, project liaisons, and long-term conservation staff. Partnerships with research counterparts and students at sponsoring institutions are worth the investment: they improve equity of access to resources, provide opportunities for knowledge sharing between researchers of different backgrounds, and help fulfill responsibilities international researchers have to host countries (Lappan et al., 2020).

We work closely with the national park service, and research station management became a joint venture between our conservation NGO and the national park in 2014. This partnership led to new investment in the development of the field station, and the Indonesian government's commitment to turn our field site into a model research station. These collaborations improve research infrastructure for international field work while increasing opportunities and access for local scientists and conservationists. Our long-term commitment to the region, demonstrated through national and local partnerships, has built trust with local communities and pride in biodiversity. These connections with local communities, government agencies, scientists and

students have enabled continued research, engagement, and conservation of orangutan populations and habitat despite the pandemic. As we face an uncertain future, this is the clear path forward that scientists and conservationists must take to safeguard the future of wildlife.

2.3 Ethical Research in Conservation Social Science (Thai Highlands)

Robin J Roth

The primary purpose of institutional Research Ethics Boards (REB) is to ensure that conservation social science research does not compromise the safety and wellbeing of participants. Passing research plans through your institution's REB will help ensure adequate safeguards are in place (Ibbett and Brittain, 2020).

Ethical research in social sciences, however, goes well beyond obtaining REB clearance. It also requires being reflective about the ethical dilemmas inherent in conservation social science research (like being confronted with knowledge of illegal hunting activity), while creating the conditions for genuine collaboration, building trust and ensuring local benefits (Brittain et al. 2020). Genuine collaboration requires the researcher to practice humility and demonstrate a willingness to allow research participants to help shape the research from the beginning. Trust is built by spending time and learning the language and culture as much as possible. Local benefits should emerge from both the products of research (e.g., maps, species lists, recorded oral histories) and the process of doing research (e.g., hiring local research assistants, providing meals). The good news is that ethical social science research also results in better data as well as improved understanding and insight to inform enhanced conservation practice. A story from my PhD research helps illustrate this assertion.

Fig. 5: Author Dr Robin Roth, seen here with her one-year-old, conducts an interview with a local knowledge holder, in collaboration with Research Assistant Surasit Donjaipraiwan (left). (Photo © Robert Mckenna)

I was working in an Indigenous community in the Thai highlands who were resisting the establishment of a national park in a landscape they relied upon for their livelihood. I made careful efforts to hire local research coordinators, work in local dialects and respond to the request by local leadership to create a land-use map. But after 3 months there were many community members who believed I was mapping their land so that I could buy it from them, or so I could help the government establish a park. At this point, oblivious to the lack of trust, I thought I had developed a good understanding of local livelihood and interactions with the forest. It wasn't until forest rangers entered the village and I was able to provide maps that illustrated why their proposed sub-district station location would endanger the village's livelihood (by cutting off access to the sole source of an important bamboo species), that trust was established. Local community members then became much more eager to participate in creating the map and provided me with more detailed and seasonally sensitive information about the forest-farm matrix upon which their livelihoods depended.

The resulting map and survey helped the local leadership describe their livelihood needs in terms the park officials understood. The map informed park boundaries that did not cut off vital livelihood resources and identified areas that park officials and community members could collaboratively manage. Had I left after 3 months, thinking I had near-complete information about local livelihood needs, I might have met the minimum ethics protocol, but I would have missed significant details I was not yet trusted with. The result would have had little practical impact.

3. Sharing the knowledge

3.1 Closing the loop: How should large-scale data users engage with originators of tropical ecological data?

Oliver L. Phillips, Tim R. Baker, Corneille Ewango, Euridice Honorio Coronado, Aurora Levesley, Simon L. Lewis, Beatriz S. Marimon, Lan Qie, Bonaventure Sonké

Tropical forest plots are long-term science infrastructure for tracking the biodiversity and ecological functions of the most complex ecosystems on Earth. They become more and more valuable the longer they are monitored for – but each one needs a large amount of human effort and skill to deliver! These data are in demand by scientists, Earth Observation agencies, and natural resource managers.

ForestPlots.net enables investigators to manage and analyse their plot data - and to share if they want. *It is therefore a unique place where the originators and the users of tropical ecological data meet*. This puts ForestPlots.net at the heart of a major challenge in environmental and conservation research: How do we ensure equitable relationships among scientists from the global North, who have often been the users of data, and those in the South, who often play key roles in generating the data?

We think that ForestPlots.net can help to reverse centuries of inequity in global scientific endeavour, drive forward better research, support the management and conservation of tropical forest landscapes - and help forest monitoring grow.

So, *if you are interested in using tropical forest plot data and want to be part of addressing this challenge*, here's what we suggest.

First, know the context

It's tough to acquire these data, especially in remote locations where a single hectare holds more tree species than do whole countries in the temperate zone. Many prospective users now acknowledge the need to invest in the people and networks that underpin these data, but others do not.

Only with regular funding will fieldwork proceed, plants be identified, students trained, and plots maintained. And, unlike for remotely-sensed data acquired by space agencies or commercially, it is the researchers themselves who need to fund and implement data acquisition and pre-processing. .

Only with support for developing skills, leadership and analyses within tropical forest nations will we develop more equitable working relationships. Compared to many users of tropical data, data originators often have fewer opportunities and may be disadvantaged by nationality, ethnicity, and education. We therefore always ask prospective data users to support data originators and the wider public good, including by investing in data acquisition and management.

Fig. 6: The RAINFOR team prepares plot herbarium vouchers together at the end of the day, in Peru's Parque Nacional Yanachaga. Photo © Abel Monteagudo

Second, understand the process

We have a Code of Conduct: https://www.forestplots.net/en/join-forestplots/code-of-conduct. We encourage prospective users before requesting data to reflect on their contribution to developing this unique scientific resource and the human development on which it depends. Please ask yourself: *How can I help? How will I contribute to the costs? How will I support data collection?*

Third, commit

For your request to be approved by our steering group we require specific, measurable contributions and commitments. If approved, you will then need to get permission to work from the data owners themselves.

You will be expected to:

(a) Contribute. Show how you will invest in sustaining the science. Focus on involving field leaders and networks in seeking new funding for re-censuses, new permanent plots, data management, training, as well as involving them in analysis and writing manuscripts.

(b) Communicate. Discuss with contributors the research questions that you wish to address as early as possible. Offer to include them at the funding proposal stage, and in authorship of resulting work.

Overall, think of this as a long-term relationship with data providers that should grow and progress with time. Look for new projects together. Be prepared to change and develop your contributions in response to the needs of the data originators.

With thought and commitment this often works well

To give one example, in 2020 the Synergize project requested to access and analyse all biodiversity data from Brazilian Amazonia (ForestPlots.net Research Project #84). In less than a year, this large request from Brazilian and UK scientists has already led to database training in Leeds, one virtual workshop in plot data upload run by our trainer based in Brazil, and a second to support Synergize plot workers led by an Amazonian colleague who had been trained by our trainer. A manuscript in preparation is being led by a Brazilian early-career researcher and will include the new plots. Thus, by supporting hubs of knowledge and training data-owners, we can support users, support contributors, *and* grow a communal resource sustainably and equitably.

3.2 Producing locally-adapted conservation biology textbooks

Richard B. Primack, John W. Wilson

Textbooks are one of the most effective ways to learn about a new field. Conservation textbooks, however, are traditionally expensive, in English, and full of examples and approaches not always relevant to those regions richest in biodiversity, notably the tropics. As a result, students from such regions might not be able to relate to these textbooks, substantially limiting their exposure to modern concepts in conservation biology, ecology, and related disciplines.

For the past 25 years, Primack has demonstrated an effective approach to address this issue. This approach begins by inviting conservation biologists from an under-represented country to be co-authors of a new textbook: a locally-adapted version of Primack's widely-used *Primer of Conservation Biology*. The authors then seek a publisher willing to produce, publish, and distribute the book locally and at a reasonable price. In consultation with the publisher, the authors then replace study cases, references, photos, and illustrations in the *Primer* with local

examples, simultaneously translating the text if warranted. Seeking funding from foundations or government agencies to support the writing and production is sometimes part of this process. Using this approach, there are now more than 38 locally-adapted conservation textbooks available across the world, including such tropical and sub-tropical locations as Latin America (two editions in Spanish, one in Portuguese), Indonesia (two editions), China (five editions), and one each in Vietnam, Madagascar (in French), the Middle East (in Arabic), and South Asia (in English).

A locally adapted textbook for African audiences, published in September 2019, presented a novel challenge. Every print publisher we approached was either unable or unwilling to produce and distribute an affordable conservation textbook across dozens of African countries. Our struggle to find a suitable publisher was highly frustrating given the urgency of the work: Africa has some of the world's fastest growing human populations and fastest growing economies, placing an outsized burden on the continent's rich and unique biodiversity.

Fig. 7: This conservation biology textbook for Africa is filled with local examples and is available online without charge. Photo © Open Book Publishers (openbookpublishers.com/)

We eventually concluded that the African textbook should be produced under a Creative Commons (CC BY) license, and distributed online for free. Due to copyright concerns, we also felt a completely new textbook, completely independent of the *Primer*, had to be written. These realizations enabled us to produce a 694-page text (http://consbio.africa) with hundreds of color photos and over 50 "boxes" (case studies written by leading scientists working across the continent). The textbook has been a resounding success: several universities now use it in their conservation courses, and it has been accessed online over 13,000 times (not including copies distributed by teachers on memory sticks) in its first year.

There is no doubt that the success of this textbook is due to being an online resource available for free, being dedicated to African audiences, and having African scientists authoring their own case studies. This is also a model for how conservation biologists can work with their colleagues to achieve broader impacts by adapting review articles and other types of publications to be locally relevant.

4. Working to reduce risks

4.1 Conservation dangers in Uganda

Richard Wrangham

The biggest animals are especially appealing to the conservation-minded public. Unfortunately for their futures, however, they have low population densities, they need large living areas, and their meat, tusks, horns and infants make them attractive targets for poachers. To make matters worse, many large species are dangerous to humans. The risks they bring understandably undermine enthusiasm for conservation among local people.

We faced this problem in Uganda in the first decade of the Kibale Chimpanzee Project. Between 1994 and 1998 eight children were attacked by a chimpanzee. Attacks were made out of sight of adult humans, often as the child went to fetch water. Five of the children were killed. These sad events were consistent with the ordinary hunting behavior of chimpanzees preying on primates (Wrangham et al. 2000).

The attacks happened only a few kilometers away from where we had been habituating chimpanzees since 1987. As a result people often accused us of being responsible for making chimpanzees fearless of humans. Eventually we learned, however, that the attacks were due to a single adult male who did not belong to our study community. Apparently he was the last surviving male of a population that had had its forest territory cut down and converted into gardens of plantains and maize. Similar attacks have now been documented in many African countries. They probably occur wherever chimpanzees and humans are neighbors, made more frequent by forest loss (Hockings et al., 2010; McLennan and Hockings, 2016).

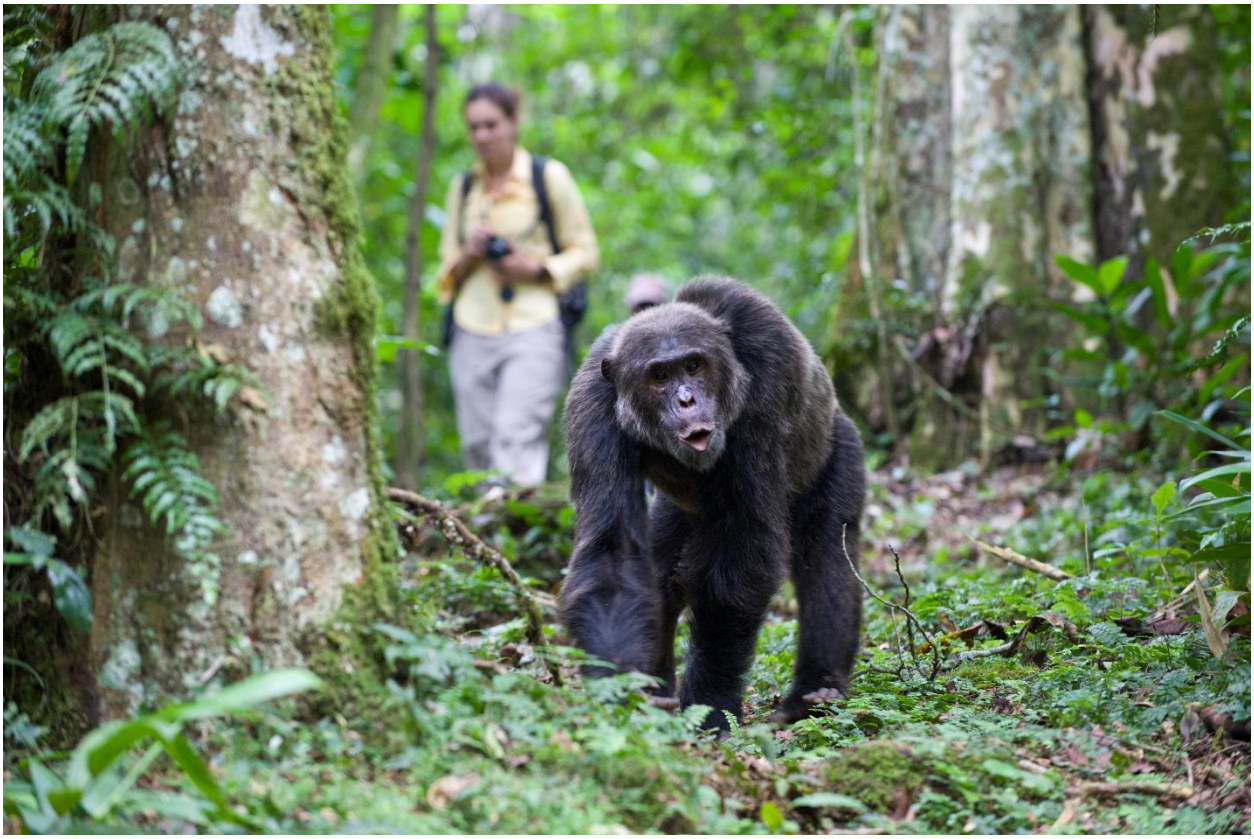

Fig. 8: Researcher Dr Jess Hartel takes data on 16-year-old adult male chimpanzee Lanjo in Kibale National Park, SW Uganda, 2011. Lanjo's facial expression shows that he is starting to give a long-distance 'pant-hoot' call. As of July 2020, the Uganda Wildlife Authority requires researchers studying chimpanzees to maintain a 10-meter distance and to wear a face-mask due to COVID-19. (Photo © Suzi Eszterhas)

As conservationists we were faced with an ethical dilemma. For several years we had been conducting afternoon seminars in villages to persuade our neighbors what a meaningful and valuable species chimpanzees are, and to ask for support in protecting them. So we were reluctant to compromise our message by trying to kill any chimpanzee seen in the area where children had been attacked. But we had to protect children. We appointed a member of our team to patrol the villages every day in an effort to help keep them safe, we searched for the elusive villain or villains, and with official permission we armed our conservation rangers. In the end, the killer chimpanzee solved the problem for us. One evening he took a baby off her 5-year-old sister's hip, climbed into one of the few tall trees in the area, and gave a loud call. Spear-carrying men were around the tree by the time he came down, and our rangers arrived in time to dispatch him. Unfortunately the baby did not survive.

Ideally the killer might have been removed to a location where he could do no harm. But given the hostility of male chimpanzees to strange males, not to mention the fact that all chimpanzee habitat in Uganda is already under pressure, the sad reality is that when an ape becomes a killer there are no good solutions. Balancing the decision to kill the offender with the message of care and respect for the species will always be a challenge.

Discussion

553 In this article, ecologists and conservation biologists carrying out long-term tropical research
554 have described ethical issues they have confronted. Direct conflict between humans and wildlife,
555 as documented by Richard Wrangham, can be one of the harshest of ethical challenges
556 associated with biodiversity conservation in densely populated regions of the tropics. However, it
557 is only the extreme case in a system that too often still saddles local people with high incidental
558 costs of protecting biodiversity. These costs are often layered on top of opportunity costs, which
559 are incurred through the absence of rural economic development and may themselves be very
560 high (Green et al. 2018). Hence, finding ways to *minimize local costs* while *maximizing local*
561 *benefits* is the fundamental challenge addressed in different ways by each of the contributors to
562 this collective article.

563 Many of the ethical issues arise from chronic underfunding of tropical scientific research (e.g.,
564 Barbier et al. 2018), leading to lack of training and employment for in-country scientists, lack of
565 opportunities for rural people, and lack of continuity for projects. Is it possible that many of the
566 ethical dilemmas cropping up in research programs in the tropics can be traced back to
567 fundamental discrepancies between what wealthy nations want (global biodiversity protection)
568 and what they have been collectively willing to pay for? And if so, can long-term tropical
569 research-action programs act effectively to reduce this structural imbalance, at least in specific
570 locations? These are some of the fundamental ethical questions that tropical ecologists and
571 conservation biologists must grapple with as they try to do the best science possible.

572

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