










CONTRIBUTED PAPERS

Facilitating biodiversity conservation through partnerships to achieve transformative outcomes

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Abstract

Conservation biology is a mission-driven discipline that must navigate a new relationship between conservation and science. Because conservation is a social and political as well as an ecological project, conservation biologists must practice interdisciplinarity and collaboration. In a comparative study of 7 cases (Jaguars in the Chaco, Grevy's zebra in Kenya, Beekeeping in Tanzania, Andean cats in Argentina, Jaguars in Mexico, Lobster fishing, and Black bears in Mexico), we examined motivations for collaboration in conservation, who can collaborate in conservation, and how conservation professionals can work well together. In 5 case studies, successful conservation outcomes were prioritized over livelihood benefits. In the other 2 cases, livelihoods were prioritized. All case studies employed participatory approaches. There were multiple external actors, including local and Indigenous communities, nongovernmental organizations, agencies, regional and national governments, and international organizations, which enhanced conservation and wider sustainability outcomes. Key collaboration aspects considered across the case studies were time (mismatch between relationship building and project schedules), trust required for meaningful partnerships, tools employed, and transformative potential for people, nature, and the discipline of conservation biology. We developed guidelines for successful collaboration, including long-term commitment, knowledge integration, multiscalar and plural approaches, cultivation of trust, appropriate engagement, evaluation, supporting students, and efforts for transformation.

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KEYWORDS

biodiversity conflict, conflict transformation, interdisciplinarity, just conservation, participation, partnership, role of academics, stakeholder engagement

Facilitación de la conservación de la biodiversidad a través de colaboraciones para lograr resultados transformadores

Resumen: La biología de la conservación es una disciplina impulsada por sus objetivos que debe navegar una nueva relación entre la conservación y la ciencia. Dado que la conservación es un proyecto social y político así como ecológico, los biólogos de la conservación deben practicar la interdisciplinaria y la colaboración. En un estudio comparativo de siete casos (jaguars en el Chaco, cebras de Grevy en Kenia, apicultura en Tanzania, gatos andinos en Argentina, jaguars en México, pesca de langosta, osos negros en México), analizamos las motivaciones para colaborar en la conservación, quién puede colaborar en la conservación y cómo los profesionales de la conservación pueden trabajar bien juntos. En cinco estudios de caso, se priorizaron los resultados satisfactorios de la conservación sobre los beneficios para los medios de subsistencia. En los otros 2 casos, se dio prioridad a los medios de sustento. Todos los estudios de caso emplearon enfoques participativos. Hubo múltiples actores externos, como comunidades locales e indígenas, organizaciones no gubernamentales, agencias, gobiernos regionales y nacionales y organizaciones internacionales, que mejoraron los resultados de conservación y sostenibilidad en general. Los aspectos clave de la colaboración considerados en los estudios de caso fueron el tiempo (desajuste entre el establecimiento de relaciones y los calendarios de los proyectos), la confianza necesaria para establecer colaboraciones significativas, las herramientas empleadas y el potencial transformador para las personas, la naturaleza y la disciplina de la biología de la conservación. Se elaboraron directrices para el éxito de la colaboración, como el compromiso a largo plazo, la integración de conocimientos, los enfoques multiescalares y plurales, el fomento de la confianza, la participación adecuada, la evaluación, el apoyo a los estudiantes y los esfuerzos de transformación.

Facilitación de la conservación de la biodiversidad a través de colaboraciones para lograr resultados transformadores

PALABRAS CLAVE

colaboración, conflicto de biodiversidad, conservación justa, interdisciplina, papel de la academia, participación, participación de los accionistas, transformación del conflicto

【摘要】

保护生物学是一门任务驱动的学科,它需要在保护和科学之间建立一种新的关系。由于保护计划是社会、政治和生态的综合性计划,保护生物学家必须进行跨学科工作和合作。我们通过对7个案例(查科的美洲虎保护、肯尼亚的细纹斑马保护、坦桑尼亚的养蜂业、阿根廷的安第斯虎猫保护、墨西哥的美洲虎保护、龙虾捕捞,以及墨西哥的黑熊保护)的比较研究,分析了保护中合作的动机、保护中参与合作的人员,以及保护专家开展良好合作的方式。在五个案例研究中,成功的保护结果被认为比生计利益更重要。而在另外两个案例中,生计被放在了优先位置。所有的案例研究都采用了参与式方法。参与者中包括多个外部行为者,如当地社区及原住民社区、非政府组织、机构、区域及国家政府,以及国际组织,他们的参与有利于保护和更广泛的可持续性成果。所有案例研究都纳入考虑的重要合作因素是时间(建立关系和项目安排之间的时间不匹配)、建立有意义的伙伴关系所需的信任、采用的工具,以及对人、自然和保护生物学学科的变革性潜力。最后,我们还制定了成功合作的指导方针,包括长期承诺、知识整合、多领域和多方法、培养信任、适当的参与、评估、支持学生,以及努力转型。【翻译:胡怡思;审校:聂永刚】

关键词: 伙伴关系,利益相关者参与,参与,生物多样性冲突,跨学科,学术界的作用,公正的保护,冲突转化

INTRODUCTION

Conservation biologists seek understanding of ecological processes, but are also interested in the normative goal of biodiversity conservation (Soulé & Orians, 2001). Conservation biology is thus a “mission-driven discipline” that has to navigate between science and conservation (Baumgaertner & Holthuijzen, 2017; Meine et al., 2006; Soulé & Wilcox, 2014). Biodiversity conservation is also a social and political process (Lele et al., 2010). Although the ideas of contemporary conservation are Western in origin (Adams, 2004; Meine et al., 2006), diverse cultural and geographic perspectives of conservation are required (Whyte et al., 2016). Conservation biology “rests on the assumption that biological diversity (species, communities, and ecosystems) or aspects of it are good and have intrinsic value or values” (Baumgaertner & Holthuijzen, 2017), but increasingly it embraces a plurality of biodiversity values (Pascual et al., 2021). Conservation is especially challenging in the Global South (Reed et al., 2016), and biodiversity hotspots there are often associated with cultural and linguistic diversity (Gorenflo et al., 2012). Cultural and temporal variation occurs in biodiversity values, and there has been a shift in conservation biology from “nature for people,” “nature despite people,” and “nature for itself” to “nature and people” (Mace, 2014).

Biodiversity loss is one of the most significant global sustainability issues (Rockström et al., 2009; UN, 2015). It is exacerbated by accelerated land-use change, deforestation, persistent poverty, rapid cultural change (Gardner et al., 2009), and globalization (Davis et al., 2020), including large-scale land acquisition and deforestation (Davis et al., 2020) and wildlife trafficking (Kurland & Pires, 2017). Global drivers interact with local threats to conservation, although local practices can enhance biodiversity (Adams, 2004). These external and local pressures create differences in goals and expectations among groups and individuals. Such divergences can emerge as biodiversity conflicts, when one actor or group acts against the needs and interests of another and at their expense in relation to biodiversity conservation (Marshall et al., 2007). Partnership-based, pluralistic, and dynamic approaches to conservation are needed to understand and address conflict and produce socially just conservation solutions (Gavin et al., 2018).

We drew on case studies to explore how such partnerships can be developed in practice, through interdisciplinary, participatory, collaborative, and transformative approaches. We sought shared experiences and lessons learned from academics and professionals who have been working with others to facilitate a range of conservation and development projects and to reflect on alternative ways of framing and tackling conservation challenges. Specifically, we asked what motivates conservation biologists to work with others, with whom can they work, and how can they work well together with other actors? We drew on lessons learned to suggest guidelines for such partnerships. We sought much needed empirical insights into how nonexclusionary, dialogical conservation approaches that consider socioeconomic and cultural as well as biological outcomes can function (Lele et al., 2010). This article is a collaborative

synthesis that emerged from a symposium at an annual meeting of the Association for Tropical Biology and Conservation. We use the term *conservation biologists* to indicate the roles and experiences of conservation scientists and professionals focusing on biodiversity conservation. We are all academics who fill multiple roles; hence, our perspective is also grounded in practice and informed by action research (White, 2013).

First, we addressed the imperative for interdisciplinary research. The integration of conservation into a broader framing of sustainable development (UN, 2015; White, 2013) recognizes that conservation is a social and biological project. Social sciences are required to support conservation biology (Mascia et al., 2003), although there is a difference between social science for conservation, which shares the normative goal of biodiversity conservation, and research on conservation, which explores the theories and practices of conservation (Sandbrook et al., 2013). Social scientists can tell the stories of communities and illustrate different perspectives on conservation (e.g., Drury et al., 2011). Interdisciplinary and transdisciplinary research frames interrogate and analyze a problem synergistically via multiple disciplines (Briester, 2016) and can meet real-world challenges (White, 2013) and support democratization of science (Carolan, 2006). The boundary between conservation biology and other disciplines has become more porous (Meine et al., 2006). However, interdisciplinary and transdisciplinary research is difficult, time consuming, and risky (Ledford, 2008) and presents multiple practical (Campbell, 2005) and epistemological (Briester, 2016) challenges.

Second, we considered nonacademics with whom we could work to enact a pluralistic view of conservation. The term *stakeholder* emphasizes stakes and interests, and we prefer *actors* to acknowledge their legitimate roles and to reduce the initial emphasis on competition and potential conflict (Lecuyer, White, Schmook, & Calmé, 2018). Actors may include civil society (including local communities and nongovernmental organizations [NGOs]), local and national governments, the private sector, and hybrid roles (White et al., 2018). Actors have needs, values, and different forms of representation, and why and how they should be engaged needs consideration. For instance, Indigenous peoples have moral legitimacy and make practical contributions to biodiversity conservation and should be given a greater role (IPBES, 2019; Sobrevila, 2008; Whyte et al., 2016). Local communities should be engaged to achieve ethical and practicable solutions to conservation (Mishra et al., 2017; Vermeulen & Sheil, 2007).

Third, we explored how different actors can be engaged. Participation is a concept and practice that incorporates different forms of engagement and can be both a means and an end (Parfitt, 2004). There is a ladder of formats ranging from tokenism, to communication, to empowerment (Arnstein, 1969; Pimbert & Pretty, 1995; White et al., 2018). More empowering forms of participation include collaboration (Davies & White, 2012), codesign (White & van Koten, 2016), and partnership (Leach, 2002). The greater potential benefits of empowering forms of participation are offset by human, institutional, financial, and time resources required

to achieve them (Kapur, 2001), and a pragmatic strategy for participatory activities may be required (White et al., 2018). Participatory approaches can identify more effective solutions, enhance buy-in of strategies, and deepen mutual trust and relationships (Blackstock et al., 2007; White et al., 2018). If undertaken carelessly, however, they can have negative consequences, including exacerbating power inequalities (Cooke & Kothari, 2001). Participatory action research involves a nonhierarchical collaboration between researchers and participants to address a problem through novel thinking and action (Kindon et al., 2007). This approach is particularly relevant for conservation because its normative impetus blurs the boundary between knowledge production and implementation (White, 2013).

METHODS

We conducted a comparative case study analysis. Case studies focus on bounded systems; are time and work intensive; offer rich and detailed data on holistic systems; can have an element of development, revealing a longitudinal narrative over time; and are important within their wider context (Baxter, 2016; Bryman, 2012; Creswell, 2013; Flyvbjerg, 2011). We selected critical cases (Bryman, 2012; Flyvbjerg, 2011) in which we identified engagement with nonconservation biologists to explore the broad phenomenon of democratic and applied science and the more defined problem of enhancing biodiversity conservation. Comparative case study analyses employ multiple case studies (usually not more than 8) to provide a more structured research approach, but, in doing so, one needs to balance contextual insight (Bryman, 2012).

Comparative case study analysis requires selection of appropriate case studies and interpretation that enables theoretical reflection (Bryman, 2012). We used purposeful maximal sampling (nonprobability judgmental or expert sampling) (Creswell, 2013) for our case studies. Authors self-identified after presentation in our symposium, and each author contributed to 1 of the case studies. Case studies focused on Jaguars in the Chaco, Grevy's zebra in Kenya, Beekeeping in Tanzania, Andean cats in Argentina, Calakmul Jaguars, Lobster fishing, and Black bears in Mexico (Figure 1). Narratives were originally developed for each case study through a guided approach between the first and coauthors, which supported critical reflection and allowed the context and development aspects of the cases to be illustrated (Flyvbjerg, 2011) (Appendix S1). Such processes tend to expose and overcome inherent bias (Flyvbjerg, 2011). Each case study was structured in response to the following questions: why did you work with others, with whom did you work, how and to what extent did you work with others, what were the consequences of working with others, and what were the benefits and challenges of working with others?

We undertook embedded scrutiny of specific case study aspects to develop a thematic cross-case analysis (Creswell, 2013). This analysis was largely inductive. It emerged from the case studies themselves and allowed us to generate new insights; deductive elements were derived from existing theories of conservation (Baxter, 2016). We undertook 2-phase coding

(categorization of themes and unit codes) with double blind coding synthesis. A suite of codes was developed from research questions and modified to address narrative content (including project aims, motivation, time frame, who was engaged, and outcomes). Coding was undertaken by R.M.W. and B.S. from the full narratives. A second round of questioning sought additional insights to strengthen the comparative analysis. Coding was then verified and adapted. Themes were developed from coded categories for interpretation and discussion. Results are presented as vignettes of individual case studies from the perspective of the conservation biologist who was involved in the case study (abbreviated in text and longer in Appendix S1) and as summary coded outcomes (Table 1).

RESULTS

Jaguars and landscape management in the Chaco

An initiative started in 2008 to address conservation needs of the jaguar in the Gran Chaco. The initial focus was on Paraguay, but transboundary goals are now being pursued (Bolivia, Argentina, Brazil). Very rapid deforestation and a lack of connectivity were exacerbating negative interactions between jaguars and landowners. This shifted the initiative's emphasis, and the jaguar was used as a tool and metric for wider landscape conservation and connectivity across the Chaco. Collaborative engagement with senior government officials, multiple NGO actors (mostly national and local), and associations of cattle producers led to some power devolution with mutual benefits for jaguar populations, ecosystems, and local actors.

Reducing conflict around Grevy's zebra in Kenya

Grevy's zebra (*Equus grevyi*), with fewer than 3000 individuals, is one of Africa's most endangered mammals (Williams, 2002). An initiative, starting in 2014, focused on building field capacity in conservation conflict transformation. A prominent local NGO (Grevy's Zebra Trust) facilitated more sustainable conservation outcomes for the zebra. They sought power devolution to local actors who could transform conservation conflicts and stimulate peacebuilding between communities. Both social and conservation gains accrued.

Beekeeping as a livelihood option in Tanzania

The socioecologically important miombo woodland ecoregion covers approximately 3.6 million km² across central and southern Africa. Currently threatened by deforestation for charcoal, agriculture, and pastoralism, it is a conservation priority (Jew et al., 2019). An initiative began in 2001 as a response to a conflict situation in which local communities were deprived of their right to use natural resources in a large protected area in

TABLE 1 Summary data, derived from the reconciled coding process, from long-term case studies of collaborative conservation efforts

Case study name and number							
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Location of lead and type of lead	USA, NGO and research institution	USA, university and NGO	Switzerland, research institution and NGO	Canada, university; Mexico, research institution; Scotland, university	Argentina, research institution and NGO	Mexico, research institute	Mexico, university
Date and mode initiative started work in the area (others or self)	2008, ongoing	2014, project completed but wider initiative ongoing	2001, started as an idea then project and evolved into a program, ongoing	2014, PhD project from but wider engagement for 20 years, ongoing	1999, Andean cat alliance; 2014 community engagement, ongoing with a different approach	1968, first fishers' cooperative, academics involved over last 30 years, ongoing	2009, masters project then PhD until 2015, ongoing as action research project
Initiative focus	Using jaguars as a tool for landscape conservation and sustainable practices in the Gran Chaco	Supporting conservation through capacity building in conflict transformation and peace building around endangered Grevy's zebra	Beekeeping to support conservation and livelihood outcomes	Understanding biodiversity conflicts and develop practical strategies to manage them	Engaging local communities to improve wildlife conservation and using Andean cats to improve local livelihoods	Understanding and enhancing sustainability of a community fishing cooperative in Mexico	Exploring ways of engaging local communities in participatory conservation of black bear and other large carnivores
Motivation for initiation of case study	Personal passion, professional investment in the area, intellectual opportunity to pursue perceived gap in ecological knowledge, pragmatic opportunity for conservation	NGO needed Grevy's zebra conservation, focus on peacebuilding because social conflict was a conservation and security threat, personal passion for African wildlife and people, desire to make a difference	Conflict where local communities deprived of access to protected area, request of people for livelihood options	Personal experience and passion; desire to answer theoretical questions about conflict and contribute to conflict management practice	Recognize and address need to engage local communities for conservation, pragmatic opportunity for improved access to conservation funding	Diffuse engagement by academics over a long period to provide scientific evidence to underpin sustainable fishing strategies and empower the cooperative	To understand the visions and coexistence of local people for community originating conservation strategies to address carnivore conflicts
Main species	Jaguar (<i>Panthera onca</i>)	Grevy's zebra (<i>Equus grevyi</i>)	Miombo woodland	Jaguar	Andean cat (<i>Leopardus jacobita</i>)	Spiny lobster (<i>Panulirus argus</i>)	Black bear (<i>Ursus americanus</i>)
Main habitat	Forest and savanna	Savanna	Tropical dry forest	Tropical dry forest	Montane grassland and shrubland	Ocean, coral reef	Pine and oak forests
Location	Gran Chaco, Paraguay, Bolivia, Argentina	Northern Kenya	Tanzania	In and around the Calakmul Biosphere Reserve, Mexico	Started NW Argentina but expanding to Bolivia, Peru, and Chile	Quintana Roo, Mexican Caribbean	Northeastern Mexico

(Continues)

TABLE 1 (Continued)

	Case study name and number						
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Case study name and number	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Aim	Conserve Gran Chaco landscape and species through the implementation of sustainable practices and economic incentives	Reduce social conflict affecting conservation of Grevy's zebra through conflict transformation and peace building within a conservation strategy	Provide alternative livelihoods for communities influenced by conservation actions in Tanzanian Miombo woodland	Understand and address biodiversity conflicts to enhance conservation outcomes in southern Mexico	Engage local Andean communities in wildlife conserving livelihoods through sustainable natural resource use and management	Support local fishing cooperative to develop sustainable fishing strategies in southern Mexico	Explore how participatory approaches with local communities could strengthen black bear conservation in northeast Mexico
Longitudinal development	Shift from ecological science to action, from species to habitat scale, from conflict mitigation only to holistic and integrative strategies	Shift from conservation conflict focus to systemic social conflict focus, from NGO-only conservation capacity building to more actors for conservation and peace building	Shift from assessment of livelihood options (research) to supporting beekeeping, community comanagement, and land-use planning	Shift from ecological focus to exploration of social dimensions of biodiversity conflicts management and land-use analysis	Shift from conservation research focus to realization that community engagement is essential	Shift from community cooperative to partnership with academics enabling better resource management and political negotiation	Shift from ecology to including groups with less representation in conservation issues from 60 community groups
Why work with others?	Personal passion for carnivore conservation, pragmatic strategies to enhance conservation requires integrative, practical, socioeconomic, and livelihood-based solutions	Personal passion, desire to make a difference using an interdisciplinary approach to conservation conflict, relationship development across actors, understand systemic conflict, evaluate conservation outcomes and peace building impacts as a result of capacity building	Support livelihoods and enhance conservation, personal conviction, passion for Africa	Desire for academic understanding, to explore whether collaboration could lead to better conservation outcomes and less conflict	Personal motivation and interest in interdisciplinary approach, interest in learning from others, donor pressure, strategic need to develop cross-border partnerships, increase efficacy and widen funding options	Motivation for community fishers was to improve fishing success and management and to lobby government for support, motivation for academics was to support sustainable resource use with evidence base	Desire for successful conservation processes and belief that all social actors need to be involved: local people (children, youth, and adults), universities, NGOs, and government

(Continues)

TABLE 1 (Continued)

Case study name and number							
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Funding or resource support	NGO (S.P.E.C.I.E.S.), including international donors, foundations, and governments	NGO (Grevy's Zebra Trust) with international donors	Small NGO then Swiss donor (Geneva Federation for Cooperation, University of Applied Sciences and Arts of Western Switzerland)	University research institute	International NGOs, individual donors, local authorities	Mixed over time, combination of ecological and practical support	Small grants foundation, international trust
Case study name and number	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Working with whom?	Government (Ministry of Environment, Paraguay), local NGOs, associations of cattle producers, universities, tourism sector	NGO staff, local communities and conservation council, other NGOs, police, local government agencies	Local communities, conservation agencies, farmers, trophy hunting businesses, honey buyer, NGOs	Local communities, farmers, ranchers, decision makers, reserve managers, NGO	NGOs, universities, local communities, (including children, youth, adults and the elderly), local and provincial government, protected areas agency	Community fishing cooperative, academics, local and national government, private sector, UNDP	Local communities (including children, youth, adults, and the elderly), NGOs (COVIDEC AC), local governments, national government, secretariats, (CONANP, SAGARPA, CONAFE, SEMARNAT), universities
Local communities	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local government	Yes	Yes (county agencies or village chiefs or police)	Yes (district councils and village councils)	Yes	Yes	Yes	Yes

(Continues)

TABLE 1 (Continued)

	Case study name and number						
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
National government	Yes (Ministry of Environment, Paraguay)	Yes (Kenya Wildlife Service)	Yes (Ministry of Natural Resource and Tourism)	Yes (through CONACYT link)	Yes (national park agency)	Yes	Yes (federal ministries: Environment and Natural Resources, SEMARNAT, through its body for natural protected areas, CONANP, Agriculture, Livestock, Rural Development, Fisheries and Food, SAGARPA)
International NGOs	Yes	Yes	Yes	Yes	Yes	Yes (UNDP)	Yes (Rufford Trust)
Local NGOs	Yes (some)	Yes	Yes	Yes	Yes	Yes	Yes (Conservación de Vida Silvestre y Desarrollo Comunitario, COVIDEC.AG)
Academic researchers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Private sector	Yes (cattle rancher associations, tourism, beef distribution, marketing)	No	Yes (trophy hunting businesses, farmers, honey exporters)	Yes (farmers, ranchers)	No	Yes (fly fishing business, lobster buyers)	No
Government agencies	Yes (Ministry of Environment, Ministry of Agriculture)	Yes	Yes (Tanzania Forest Services and Tanzania Wildlife Authority)	Yes (Calakmul Biosphere Reserve managers)	Yes	Yes	Yes (see national governments above)
Others	Public, students	Development NGOs	Police and judiciary authorities	Collaborative committee for reserve management	Provincial government	Local community fishing cooperative	Local livestock union
Working with others how?							
Case study name and number	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)

(Continues)

TABLE 1 (Continued)

Case study name and number							
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Interdisciplinary	Yes (started as pure ecology but moved into social science as well; 1 project included social anthropology; more through adoption of more skills than through collaboration with more people)	Yes (started as conservation biology focus then more in the nature of the interdisciplinary field of enquiry in conflict transformation and peace building)	Yes (started with social scientists working to identify stakes and interests and develop collaboration; biologists assisted through methods design, training local scouts, and wildlife surveys)	Yes (explicitly interdisciplinary, drawing on PhD committee including ecology; social science, sustainability studies, geography and doing an interdisciplinary PhD in a biology department; drew on literatures across social anthropology, psychology, etc.)	Yes (activities included postgraduate student in tourism, tried to develop partnerships with social science for community-based tourism and conservation with little success)	Yes (over time interdisciplinary included number of PhD and other students and longer term relationships with a range of academics, including geography, GIS, ecology)	Yes (3 strands of research: ecology and biology of black bear populations, interactions with communities involving anthropology, sociology, and socioecology, and environmental awareness and dissemination, including environmental education and communication sciences)
Participatory	Started as information provision but moved into partnership over time, attitude, and process of outreach and willingness to solve problems raised; adapts depending on actor and issue involved; ultimate goal devolution of power	Uses conflict transformation framework to enable participation theory, practical participation (conflict analysis and capacity building, intention for partnership from beginning); aim devolution of power to conservation council and to NGO staff	Aim to empower communities to manage natural resources themselves; clear intention to empower and devolve management authority; building collaborative institutions	Participatory through research and engagement with the collaborative board	Feasibility study, capacity building workshops, course on sustainable tourism in villages, participatory workshops to collectively identify tourism resources and strategies (fewer participants than expected)	Driven by empowered community that choose to accept or reject partnerships	Participatory processes through engaging local trackers, women, and children in expressing perceptions toward and taking actions toward black bears and their conservation

(Continues)

TABLE 1 (Continued)

Intention	Case study name and number						
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Solve problems and mitigate conflicts around natural resource management and incentivize conservation of jaguars and ecosystems		Capacity building of NGO staff and council to build and strengthen relationships that foster intercommunity peace and conservation	Support livelihood options for communities to reduce the costs of conservation and empower them to support and manage conservation themselves	Understand and address biodiversity conflicts to enhance conservation and improve human–human relationships	Enhance conservation by providing sustainable tourism options to improve livelihood	Ensure sustainable fishing strategy and understand successful community fishing cooperative	Ensure long-term conservation of black bear (and some other species) and help empower local people
Case study name and number	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Trust and relationships	actors distrustful of international and local conservation NGOs; social capital as a tool for trust building rather than a result	Emotionally engaging, intense process	Project started with distrust between actors; value belief in giving communities affected by conservation something in return; needed to build trust to enable constructive dialogue	Academic focus on common ground, trust, collaboration, and concepts of fairness	Communities seemed to trust the community workers and researchers at first; trust declined after political change and possibly prejudices regarding gender and origin; frustration for researchers	Trust with individual students limited (partly because it was felt results are not returned to the community); longer term researchers have better relationships	Took time to establish trust with local communities; people feared to talk or respond to initial survey because of retaliation against black bear; trust gradually established; research team now collects data and actively incorporates community

(Continues)

TABLE 1 (Continued)

Case study name and number							
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Practical engagement	Addresses problems brought by local actors, supports alternative livelihoods	Specific problem focus from the start (Grevy's zebra conservation)	Problem raised by local communities; feasibility study then workshops and long-term collaborative project and further elucidation of interests and community heterogeneity	Embedded in real-world situation due to wider context; genuine attempt to engage with local communities; worked with ongoing activities of collaborative board	Always underpinned by desire for conservation; practical attempt to support sustainable ecotourism in the region as alternative source of incomes	Based in a practical initiative already ongoing but with intention to support this and understand it conceptually	Research team cooperates with hunters and vice versa (hunters install cameras and research team pays hunters for bear photos, young people involved, research team got a laptop for the community)
Action research	Began as nearly pure research, now science, innovation, and evidence-based action	Began as nearly pure action, now sits more toward research but still action research	Started as action through community request and became research to inform action followed by action and research; overall good example of action research over time	A PhD project, focused mostly on research with an action aspect	Initial research ecological; then some surveys to understand feasibility and local interest and enable action; to date little research on the process and action element; tends to provide an ecological research plus development action model	Focus on action research providing information as required and studying the process	Began as research, became more active

(Continues)

TABLE 1 (Continued)

Case study name and number						
Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Ecological knowledge and applied science tools as important as social capital; partnerships with several universities as full partners; supports graduate students	Theoretical and ecological framework needed for university; NGO needed practical application; developed experiential training based on long-term background in corporate learning and development; government and communities more interested in action; personal learning led to evaluation and more research	Based on theoretical understanding of CBNRM but used workshops to integrate different knowledges in the local region; surveys and analyses led to research papers; engaged undergraduate students and master's student; capacity building of village scouts	Used PhD to deepen research; strong conceptual base to work; engaged with local collaborative institution, aiming to provide practical recommendations	Used academic knowledge to deepen ecological understanding; tried to engage social science academics for tourism development; engaged local people in surveys	Ecological knowledge and local fishers' knowledge combined; work with UNDP biosphere actors, who offer global framing, and business interests through fly fishing	Academic knowledge of black bear ecology and local knowledge of local places, habitat use, and tracking skills
Shift from information provision to mutual identification and resolution of problems, challenges, and needs to improve outcomes	Capacity building critical component; personal learning led to project evaluation and monitoring of capacity building project and more research in systemic conflict transformation applied to conservation	Comanagement and codesign of long-term strategy; specific skills training, e.g., wildlife scouts; managing different actors' expectations	Academic focus on common ground, trust, collaboration, and concepts of fairness	Specific training in tourism for sustainable development workshops; learning of academic regarding challenges of such projects	Learning by students and academics; community members learn specific skills (e.g., GPS use); wider resilience learnings; ecological understanding, and social and communication skills	Participation of local actors in the research processes made it possible to generate reliable information related to bears, which otherwise would not have been achieved or would have taken several years to achieve

(Continues)

TABLE 1 (Continued)

Case study name and number							
	Jaguars in the Chaco (1)	Grevy's zebra in Kenya (2)	Bee keeping in Tanzania (3)	Jaguars in Mexico (4)	Andean cats in Argentina (5)	Lobster fishing in Mexico (6)	Black bear in Mexico (7)
Benefits of working together approach	Enhanced mutual understanding of needs and goals; openness to innovation and new perspectives; transparency and clarity help to establish trust, patience, and respect all around; receive referrals as a trusted authority working to help landowners and communities	Less human–human and intercommunity conflict, reduced biodiversity conflict, more collaborative community conservation; opportunities for innovative conservation interventions	Communities have livelihood options, conservation improved, private sector and governmental gains (trophy hunting)	Better understanding of conflicts and perceptions of fairness; collaborative board has more specific information on how to act	Better understanding of scale of challenges, established partnerships, widened funding pool scope, enriched local school education; basis for further community engagement and development actions	Sustainable fishings, local livelihoods supported, integrated with private sector businesses, possibility for academics to study and support the cooperative and its practices	Better understanding of bear ecology and agricultural damage, better relationships between bears and landowners, robust data culminating in research papers, recommendations to minimize livestock depredation, local employment and enrichment of local school education
Challenges of working together approach	Takes a lot of time to build trust and social capital; numerous logistical challenges of working across areas large enough to be relevant to jaguar conservation; limited funding and capacity preclude rapid program expansion; effective solutions take time, money, and understanding	Emotionally draining; people killed in conflict; difficult to devolve and let go (still feel responsible: "The stakes are high for the endangered Grevy's zebra and resources to protect them are limited in a violent conflict zone."); top and start timeline due to unpredictability of conflict area	Different aims and expectations across actors; heterogeneity, e.g., of local communities; integrating knowledge	Interdisciplinary, not well received by biology peers; difficult to get funding because most still for ecological monitoring rather than conflict management	Personal frustration at slow progress; partnerships take a lot of time; compartmentalization is common and expressions of interest not always genuine; communities may not be interested in someone else's project; differences in goals and expectations across actors should be clarified; community mistrustful of women in charge of developing project; limited funds for interdisciplinary work, in spite of claims of interest	Community mistrustful of some academics, especially students; differences in opinion between biosphere reserve and local fishers; challenges with private sector; challenges when reserve was first designated across land and sea of local fishers	Uniting visions and expectations. At the beginning, local communities expected problem bears would be relocated and they would be paid for damage; now they must seek coexistence; researchers had to learn how to achieve participation

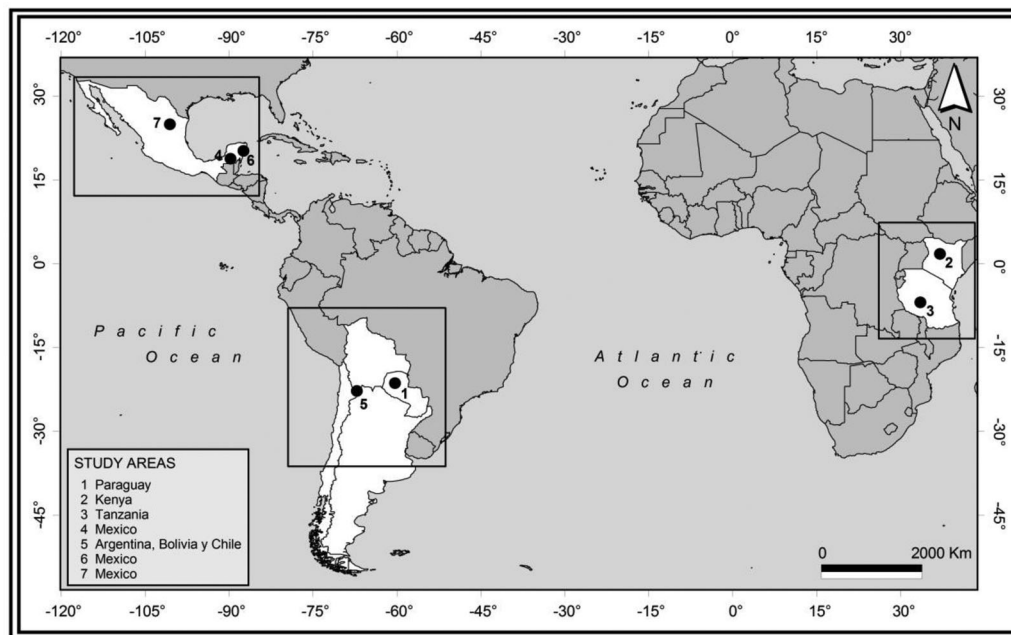


FIGURE 1 Location of collaborative conservation case studies.

Tanzania (Hausser & Mpuya, 2004; Hausser et al., 2009). The aim of the project was to offer livelihood options other than forest resources, particularly beekeeping, a traditional practice. Long-term conservation and livelihood gains have occurred.

Jaguars and social justice in Mexico

The Calakmul Biosphere Reserve in southern Mexico hosts the largest jaguar (*Panthera onca*) population in Mexico (Zarco-González et al., 2013), and 25,000 people live in the surrounding area (INEGI, 2015). A doctoral project continued a 20-year body of research in the region. Biodiversity conflicts around jaguar provided an empirical context for fieldwork, and practical recommendations for conflict management were presented to the local reserve collaborative management board.

Community conservation of Andean cats

The endangered Andean cat (*Leopardus jacobita*) is one of the world's rarest felids. The Andean Cat Alliance (AGA) was established in 1999 for its conservation. The conservation of the carnivore guild and other endemic species of the high Andes is part of AGA's ongoing conservation actions. Conservation biologists aimed to improve local community participation in wildlife conservation by developing livelihood benefits through community-based ecotourism. Although long-term engagement generated joint interest and collaboration on some projects, the ecotourism initiative was only partially successful because of funding and facilitation challenges and a lack of codesign with the community in early project stages.

Fishing cooperative for lobsters in Mexico

The Vigía Chico fishing cooperative (established 1968) is in the community of Punta Allen in the Biosphere Reserve of Sian Ka'an, Mexico. Although it has been the top producer of spiny lobster (*Panulirus argus*) in the region for over 30 years, it is a good example of a successful small-scale artisanal fishery (Méndez-Medina et al., 2015). The collaborative relationship between the cooperative, academia, and NGOs has enabled the fishers to acquire ecological knowledge about resources, but has also assisted them in negotiations with a succession of state actors and the market.

Black bear in Northeast Mexico

Black bears (*Ursus americanus*) face a range of threats in Mexico (Ripple et al., 2014). In the past, research on bears in Mexico focused on their ecology, with less emphasis on relationships with local communities (Juárez-Casillas & Varas, 2013). Participatory approaches with local communities were explored to strengthen black bear conservation in northeast Mexico. A wide range of novel engagement approaches with schools and other local community members raised awareness and released local knowledge. There is a sense of ownership by local people, which has reduced conflict and supported conservation efforts.

Types of case studies

The case studies comprised a range of initiatives in tropical or subtropical regions (Table 1). Some initiatives were based in well-defined places and focused on particular species,

populations, human communities, and institutions (e.g., lobsters in Mexico, Grevy's zebra in Kenya, jaguars and black bear in Mexico). Others had a wider species focus (e.g., Andean cat) or habitat or ecosystem focus (e.g., jaguars in Gran Chaco, beekeeping in Miombo) that led to complex initiatives spanning international borders. In all cases, initiatives comprised multiple overlapping projects situated within a recognized program, in most cases, forming a string of studies varying in aim, disciplinary and practical focus, and intention. Four of the 7 case studies were based around particular carnivore species, although in each case the carnivore was a leverage point for additional species (e.g., Andean cat) or a charismatic species to facilitate conservation of a large regional landscape (e.g., jaguars in Gran Chaco).

Because all cases self-identified as concerned with managing biodiversity conflicts, there was an initial recognition of different interests held by different parties with at least one party acting against the interests of another (Marshall et al., 2007). In all case studies, which took place over many years (approximately 13–35 years), the relationship between conservation biologists and other actors was longstanding. Such interactions involved multiple conservation biologists, including students at times, although maintaining long-term personal relationships and trust with key conservation biologists was seen as important. All case study narrators were passionate and emotionally involved in their projects.

Why conservation biologists work with others

The motivations for working with nonconservation biologists varied. In 5 of the 7 cases, conservation biologists primarily wanted successful conservation outcomes, and livelihood benefits were seen as being desirable and necessary coproducts. These cases initially focused on a charismatic species (jaguar, Andean cat, Grevy's zebra, black bear). In the other 2 case studies, the focus was on direct use of species for livelihoods (bees, lobsters). The bees case in Tanzania highlighted that “conservation was an unintended byproduct of an approach that focused first and foremost on local development and needs.” Likewise, the successful fishing cooperative in Mexico began with the determination of local fishers to develop viable livelihood options; natural resource management strategies emerged later. Working with local communities altered community perspectives on carnivores, supporting longer term conservation goals (e.g., black bear in Mexico).

In all cases, conservation biologists perceived their research as value based and as supporting a public good. Motivations always had a practical intention, although most case studies also sought conceptual understanding. Motivation varied from a specific project (Grevy's zebra conservation through addressing intertribal conflict) to investigation of an ecoregion under threat (ranching in the Gran Chaco) from which a suite of issues and projects emerged over time. Donor pressure stimulated some work with nonacademics (e.g., Andean cat), and we all recognized that transdisciplinary action research widened funding opportunities. Initiatives drew on multiple funding sources,

from local government support (e.g., lobsters in Mexico), to national state funding (e.g., jaguar and black bear in Mexico), and to international government and NGO support (e.g., Andean cat, jaguar in Gran Chaco, Grevy's zebra). The focus of projects was determined by “a combination of strategy, prior experience and serendipity” (jaguar in Gran Chaco).

Who conservation biologists work with

In all case studies, conservation biologists worked with multiple nonacademic actors. All initiatives involved local communities, and most also engaged with local governments, government agencies, or local or international NGOs. Four cases engaged extensively with the private sector, including farmers, ranchers, and fishers. In some cases, actor definitions were blurred or hybrid. For example, research on beekeeping in Tanzania was led by an academic who was also a cofounder of the NGO involved in practical action. Local communities were recognized as heterogeneous, with individuals having different views and enthusiasms (e.g., Andean cat, black bear in Mexico), and were defined by place (e.g., villages—Andean cat; formal regional designations—jaguar in Mexico) or were engaged through existing institutions (e.g., fishing cooperative—lobsters). Actors were sometimes engaged as collectives or existing collaborations, such as the fishing cooperative (lobsters), Collaborative Reserve Management Board (jaguar in Mexico), or tourism association (Andean cat). In only 1 case was the initiative begun by nonacademics and then academic input sought (lobsters). All of the cases sought collaboration or partnership with academics from other disciplines, recognizing that both social science and ecology were required. Some interdisciplinarity was achieved through a willingness of individuals to learn new academic skills (especially jaguar in Gran Chaco and in Mexico). All case studies were intellectually agile, demonstrating how academics are not restrained by specific academic disciplines and can develop new competencies. Finally, north–south partnerships were evident in most of the case studies (less so for Andean cat and Mexican lobster), enabling initiatives to draw on Global North resources to work with local knowledge and culture. Key individuals often traversed north–south categories, for example, through membership in multiple institutions (e.g., beekeeping in Tanzania, jaguar in Mexico, jaguar in Gran Chaco).

How conservation biologists work with others

Interdisciplinarity was critical to all case studies, perhaps because of the focus on real-world problems (White, 2013). Embedded social science facilitated feasibility surveys, communication, workshops, economic assessments, understanding of community processes, and specific skills delivery, such as sustainable tourism, and was never merely add-on for communication. In 2 cases, research was driven by social scientists in collaboration with natural scientists (beekeeping in Tanzania, jaguars in Gran Chaco). In some cases, researchers did not frame their research within a discipline, rather they cited approaches (e.g., ethnography) or methods (e.g., surveys, inter-

views, transects). The approach was pragmatic, open-minded, and opportunistic; no researcher was dogmatic in their defense of a particular discipline. All cases involved integration of multiple knowledges, including academic, local, and Indigenous, but they were also defined as ecological, political, and economic or as intellectual, human, and social knowledges.

All case studies cycled temporally between research and practical action, with research starting some initiatives (Andean cat, black bear, and jaguar in Chaco and Mexico) and action beginning others (Grevy's zebra, lobster, and beekeeping initiatives). In the case of jaguar in Gran Chaco, there is now an explicit cyclical strategy in which science underpins action recommendations, actions are implemented, outcomes are rigorously evaluated, and additional targeted recommendations are proposed, if necessary, depending on action outcomes and research findings, and the cycle repeats.

The emphasis on action or research also varied; some cases leaned more toward research (e.g., jaguar in Mexico) and others toward action (e.g., jaguar in Gran Chaco) at the time of writing. It was difficult to entirely separate research from action because, for example, good initiatives used evidence derived from surveys to inform action. However, in 2 case studies (Andean cat, lobster) it was recognized that good research took time to complete and could delay required action to mitigate loss of biodiversity. One researcher commented, "The rhythm of science is slower than the rhythm of management; we need to act before all possible data are collected." Another noted, "The problem is that the science is being driven by universities. Conservation science on the ground should be driven by science-based NGOs engaged in action and problem solving."

All cases included multiple and changing forms of learning by different actors. Shifts in learning focus represented transitions from research to action, engagement with different actors, and the need for different specific skills. In the beekeeping case, traditional ecological knowledge on beekeeping was included, and in the black bear case study, local perspectives on indigenous species were incorporated.

The degree of participation varied across cases from offering conceptual and pragmatic insights (jaguar in Mexico) to empowerment coproduction of knowledge to enable participants to negotiate successfully for continued access to resources and develop sustainable management strategies (lobster in Mexico). In all cases, the ultimate aim was empowerment of communities and other actors. Actors were involved in research interviews, focus groups, surveys, feasibility surveys, skills training, strategic development, and being mentored.

DISCUSSION

Our comparative case study analysis provides lessons regarding motivation, forms, and outcomes of collaboration in partnerships between conservation biologists and other actors. The aspects highlighted below represent key lessons from these case studies for successful collaboration, but we also broadly concur with wider proposals for suites of principles in approaches to conservation partnership (e.g., Gavin et al., 2018; Mishra et al., 2017; Vermeulen & Sheil, 2007).

Time

All cases demonstrated that collaboration takes significant time, which is consistent with previous work (Mishra et al., 2017; Vermeulen & Sheil, 2007). Relationships, specific projects and goals, and long-term objectives all evolve slowly, sometimes over decades (Mishra et al., 2017; Sterling et al., 2017). The expectations of conservation biologists or of community members (e.g., Grevy's zebra, Andean cat) may not be met within a project life cycle. There is thus a need to consider conservation biology initiatives as a chain of projects that allow access to diverse funding options, offer adaptability to changing political and biophysical contexts (e.g., Grevy's zebra, lobsters), and permit key conservation biologists to remain connected with local actors while students enter and depart. Hence, time can be seen as immediate and defined (e.g., by a 3-year project funding cycle or PhD project), but it is also infinite and unbounded (as a dynamic process; an evolving partnership striving for stronger relationships and adapting to new conditions). Longer term initiatives may have strategic direction, but can also be responsive and resilient, changing over time with serendipity or necessity. For example, the lobster fishers have to adapt to more frequent and intense hurricanes with climate change. We saw progression and maturation over time in some initiatives (e.g., shift to empowerment for beekeeping in Tanzania; shift from training to systemic transformation for Grevy's zebra in Kenya). Time was not linear in these case studies in that most had simultaneous as well as sequential aims over time; they were opportunistic in response to funding, community pressure, and biophysical changes.

In contrast to this long-term view for commitment and deep relationships is the need to address conservation crises. One researcher said, in frustration, "The stakes are high for endangered species and yet there are limited resources to manage these animals." This is a major paradox for conservation: avoiding ecological tipping points, but needing long-term efforts to overcome relational tipping points and establish reciprocal collaborative action (Whyte, 2020).

There was also a focus on place and a similar nested context for spatial as for temporal scales. Hence, a project may focus on 1 test village, but the region may align with a species distribution or habitat range that provides an imperative for transnational emphasis (as for Andean cat and jaguars in Gran Chaco). Long-term presence in 1 place can help generate trust for decision-making and project success (Mishra et al., 2017), but wider kinship relationships are required to support consent, trust, accountability, and reciprocity toward environmental justice and deeper coordinated action (Whyte, 2020).

Trust

We found that trust is critical to collaborative achievement in conservation biology and beyond, both in individual and institutional relationships. For example, ECOSUR in Mexico developed trust with the fishing cooperative that enabled tough discussions around use of fishing devices and resource allocation. Trust is both an outcome and an attribute to facilitate

outcomes. One researcher commented that they nurtured “trust as a tool, not a result.” Trust is a key element in the PARTNERS principles for engaging local communities described by Mishra et al. (2017). Trust is essential for building relationships with landowners and managers for effective biodiversity management (Young, et al., 2016). Trust is synergistic with other successful aspects of partnership, including effective communication, transparency, joint knowledge production, and shared responsibilities (Sterling et al., 2017). However, deep trust can be difficult to gain in the Global South as relationships between actors are redefined in the context of the decolonization of conservation (Whyte, 2020).

The case studies revealed challenges for students working on biodiversity conflicts. For instance, a doctoral project can contribute through generation of a new theoretical framework, and it permits focused collection of systematic data, but fieldwork must be completed within a certain period. The case studies showed that students sometimes step into precarious situations and have little opportunity to develop trust and invest in long-term relationships if not supported by a wider collective or program.

Tools, tasks, and topics

The programs in our case studies all sought to overcome longstanding, violent, or entrenched conflict to deliver better conservation outcomes and livelihood options, but each focused on different tools, tasks, and topics.

Wildlife can be used as a tool to achieve multiple outcomes. Charismatic species have long been used to attract attention, resources, and effort in particular areas (Albert et al., 2018). The jaguar was an entry point to conservation in the tropical forests of southern Mexico and the savannas of the Gran Chaco, and the Andean cat was used as a flagship species for the conservation of the high Andes unique wildlife. Perhaps this was seen most clearly in the Grevy's zebra project; this species offered a leverage point for peacebuilding and overall attempt to systematically reduce violent interethnic conflict.

Although funded project-level topics and tasks determined potential collaborations, actors who engaged with researchers also determined tasks on which to focus in the next project, evidencing a participatory action research cycle of learning and action (e.g., Andean cats) (Kendon et al., 2007). Innovation, creativity, and empathy facilitated engagement (e.g., Grevy's zebra). Successful engagement requires empathy and open mindedness, but also needs early engagement to lead to genuine involvement in later decision-making (Mishra et al., 2017; Sterling et al., 2017).

Interdisciplinarity is often framed as a combination of particular disciplines (Brister, 2016), but our case studies demonstrated a more diffuse and organic deployment of approaches and tools from different disciplines as appropriate. Although 1 conservation biologist expressed frustration at different priorities held by other academics, none explicitly articulated the epistemological incompatibilities that can arise (Brister, 2016; White, 2013). Either such philosophical aspects are of less importance or less obvious in practice or in our case stud-

ies conservation biologists were sufficiently open-minded to accommodate them.

Transformation

Our case studies show the possibility of more effective implementation of biodiversity conservation through partnership approaches. However, they also lend legitimacy to a new paradigm for biodiversity conservation (Gavin et al., 2018). If conservation biology is normative in its pursuit of conservation (Soulé & Orians, 2001), different perspectives on conservation must be negotiated and accommodated theoretically and practically in local contexts. Hence, conservation professionals must genuinely engage local partners in pluralistic debates around goals and how to achieve them (Lele et al., 2010; Mishra et al., 2017; Vermeulen & Sheil, 2007; Whyte, 2020). These debates may incorporate justice as well as biological outcomes of conservation, in line with notions of sustainable development (Lecuyer, White, Schmoor, Lemay, et al., 2018) and the social and political nature of conservation (Lele et al., 2010). The case studies showed how to engage diverse partners across sectors and at different scales. However, when paradigmatic transformation is required, it can be difficult to determine where and with whom to draw project boundaries. We, the case-study authors, experienced frustration or other emotions and expended significant effort in engaging additional actors (e.g., jaguars in Gran Chaco, Grevy's zebra, lobster fishing).

More dialogical, pluralistic forms of conservation can also generate personal transformation. All of us were passionate about our cases and willing to learn new approaches. Several of us had deep, personal shifts in views—an epistemological transformation. Working in partnership can require transformation in the way one perceives actors, for example, perceiving local communities as being part of the solution rather than the problem (Vermeulen & Sheil, 2007). Epistemological incompatibility can arise (White, 2013) because scientists are expected to be objective and produce excellent, rigorous research to support evidence-based policy, yet human interactions demand recognition of subjectivities, emotions, and values (Mishra et al., 2017). Transformative learning may occur, supporting development of competencies for critical, strategic, and future thinking, but also for collaboration, self-awareness, and normative and cultural awareness (Giangrande et al., 2019). Personal transformative learning can derive from diverse experiences. All of us adopted hybrid identities. Hence, many of us were both academic (e.g., scientist) and nonacademic (e.g., NGO leader); long-term resident (e.g., resident of the Global South for 30 years) and foreign (e.g., born and raised in another country); and expert (e.g., well published) and learning (e.g., gaining new knowledge from local people). Partners in biodiversity conservation can draw on multiple cultural experiences and identities (Cocks, 2006).

From participation to partnership

Participation and partnerships described in our case studies functioned differently across diverse scales: spatial (local to international); human (one champion to large teams); organi-

zational (small NGO to large research institution); and unit of action or research (a few dollars to support a feasibility survey to multimillion dollar investment in habitat conservation). There were mismatches in time scales, such as the difference in rhythm of research and conservation management. In all cases, there were recognized benefits of participation (Table 1) in line with those of Blackstock et al. (2007) and strong motivations for empowerment of local actors, but this intention was not always easy to implement in practice. Partnerships in the case studies were dynamic relationships developing through social learning and collaborative action. Learning that occurs in individuals, groups, and organizations is critical for successful participation and adaptation (Sterling et al., 2017). Sharing research results with local communities is an important aspect of action research to minimize knowledge imperialism (Jones & Luhe, 2021).

Although there has been a welcome trend toward more collaborative, empowering forms of participation in conservation (Davies & White, 2012), there is concern regarding possible power asymmetry, poor representation, and lack of capacity (White et al., 2018), and increasing neoliberalism of conservation (Corson, 2010). However, in our cases, partnerships were mainly at the local or regional level, with some national engagement. In these cases, the advantages of local NGOs included specificity, local expertise, and embeddedness in place, and international NGOs offered access to financial resources, possibilities for awareness campaigns, and (sometimes) wider legitimacy or leverage. In developing countries, nascent local NGO voices can be overcome by international, more politically astute, and well-resourced organizations (Mercer, 2003). There are also situations when less intense forms of participation (White et al., 2018) are appropriate for practical or ethical reasons.

Although all our case studies were based in the global South, in 4 of the 7 the lead researchers were based in institutions in the global North. The politics of knowledge influences knowledge integration for biocultural conservation approaches (Gavin et al., 2018). This is a significant challenge. de Sousa Santos (2015) calls for researchers from the global North to recover and recognize the epistemologies of the global South through “cognitive justice,” which appreciates ecologies of knowledge and intercultural translation. The capacity of academics and nonacademics in the global South must be released for collaborative conservation efforts, and their different ways of knowing will be essential to coproduce solutions to global crises (Whyte, 2020; de Sousa Santos, 2015). Global North–South collaborations can leverage additional resources and forms of expertise, but resource asymmetry can lead to agenda setting by global North actors (N’Da & Fokou, 2021) or extractive relationships in which researchers from the global North publish research based on data mined in the global South (Jones & Luhe, 2021). Exchanges among global South researchers can support postcolonial conservation approaches (de Sousa Santos, 2015). However, defining individual academics as being of the global North or global South is oversimplistic. We are individuals from the global North who were resident and working in the global South and vice versa. Fluidity across these categories can support epistemological exchange, but epistemological respect and equality will only be achieved through active processes and

relationships of consent and accountability (de Sousa Santos, 2015; Whyte, 2020).

Implications for conservation

There was no binary success or failure, but rather a long-term narrative for each case study that included highlights and setbacks. Our analysis enabled us to offer recommendations to conservation professionals seeking to work with others to enhance the outcomes of their conservation initiatives. Because each context is specific, we developed a series of guiding principles in association with development of competencies that support each principle (Table 2).

We shared our lived and critically analyzed experiences of working with others in conservation biology. The results raise several questions for the discipline. First, where are the boundaries of the discipline? As the boundaries of conservation become more porous (Meine et al., 2006), this influences how students are trained, how journals and conferences are structured, and how aspirations and methods are developed. Because conservation is a normative field of study, students may find employment in practice or in hybrid roles (as have several of us) but, currently, student training largely centers on research and rarely prepares graduates for the emotional investment in such work that comes from supporting intrapersonal competencies (see Giangrande et al., 2019) or from the time and effort collaborative research requires (White, 2013). Some programs develop graduate student interdisciplinary skills and support teams working on real-world issues with local stakeholders (e.g., Duchelle et al., 2009), but more such innovation is required.

Second, how can a rigorous academic discipline that includes effective interdisciplinary, participatory action research be supported? Academic incentives do not always reward interdisciplinarity (Campbell, 2005) or the time taken to establish trust and relationships. There are now some national (e.g., UKRI) and international (e.g., ORA) interdisciplinary funding calls and an increased emphasis on the outcomes of publicly funded research (e.g., UK research impact agenda) and on public engagement (White, 2013), but recruitment and promotion procedures also need to consider such achievements, and more integrated forms of teaching and learning need to be encouraged.

Third, should all conservation professionals and all conservation projects engage with nonprofessionals? Perhaps not all academics can conduct excellent ecological research while liaising with local communities and facilitating workshops, undertaking public engagement, and working with policy makers. A proposed “ecosystem of expertise” (Brand & Karvonen, 2007) acknowledges and celebrates different roles in sustainable development. However, if all such roles are not taken on individually, collaborative work with those who can will be needed.

Fourth, there is a need to continue to monitor and evaluate the theory of conservation approaches (e.g., Mace, 2014) and the practical impacts of conservation initiatives, not merely in species or habitat terms, but also in terms of livelihood outcomes, development measures, and social learning and capacity (e.g., Ferraro & Pressey, 2015). Although it can be difficult to assess impacts that are cumulative and serendipitous

TABLE 2 Guiding principles to encourage and facilitate conservation engagement and partnerships by conservation scientists and the associated sustainability learning competencies (Giangrande et al., 2019; UNESCO, 2017) for each principle

Principle	Detail of how to enact principle	Associated learning competency
Commit for the long term while addressing crisis	See project as part of a longer chain of projects in a program or initiative; can take decades to develop trust and relationships and shift behaviors or adapt cultural norms; may need to address the nature crisis and strive for quick solutions while longer term, evidence-based collaborative strategies are developed and agreed on	Future thinking—use anticipatory skills (forecasting and backcasting) and consider intergenerational equity
Integrate different knowledges	Use sound science to develop an evidence base for conservation; develop interdisciplinarity with social scientists while respecting and integrating local, traditional, and practitioner knowledges; recognize epistemological differences and technical contributions	Transdisciplinary competencies—use relevant academic disciplines, apply interdisciplinary work, integrate knowledges
Local to global scales	Situate conservation research and practice win a real-world setting, recognize local socioecological and stakeholder context and previous local conservation efforts; scale up from species to habitat to landscape when ready and not before; scale up collaborations from local to national government or international NGOs or agencies; scale up project or program to match resources to goals	Systems thinking—consider nested scales, socioecological systems, resilience, and tipping points
Plurality of perspectives	Engage different stakeholders, appreciate different perspectives, and promote dialogical processes toward consensus; realize conservation in practice is not separate from development, equality, and livelihood needs; be open to new ideas, different perspectives, other belief systems, cultural contexts, creative approaches and innovative methods; listen	Normative competencies—understand ethics and epistemological maturity; have knowledge of justice issues (environmental, restorative, intergenerational, etc.); be fair, equitable, and open minded
Appropriate engagement form and extent	Develop appropriate engagement and participation approaches for the stage and aspect of your project and the stakeholders; in some cases, information, consultation, and involvement may be sufficient; empowering forms of participation, such as partnership, necessary in the long term	Interpersonal competencies—collaborative skills, mediation skills, empathy, capacity for teamwork, knowledge of cooperation models
Cultivate trust and relationships	Understand biodiversity conflicts are human—human manifestations, relationships take investment, and trust takes time and commitment to develop; be aware of one's emotional investment and passion for conservation and acknowledge emotions and passions of others; nurture self-awareness	Interpersonal and intrapersonal competencies
Learn and adapt	Learn new approaches and how to use new tools as required; adapt and respond to changes in context, knowledge, or serendipitous opportunities; learn from failure	Critical thinking—capacities for critical reflection, analysis and skills for learning and adaptation
Jointly monitor and evaluate	Work with a joint reflexive action-learning cycle and thus plan with others; implement a collaborative workplan; celebrate and reflect together and then codesign the next project to support adaptation, maximize impact, and offer collaborative input in strategic and meaningful ways	Strategic planning, decision-making strategies, awareness of success factors, obstacles to change, knowledge of behavioral change, organizational development skills
Support future conservation biologists	Create opportunities for student projects in a real-world framework; give students meaningful yet discrete questions to address and support them in learning collaborative practices and respect for others; share lessons learned, including failures	Interpersonal, anticipatory, critical, futures, and strategic thinking competencies
Strive for transformation	Conservation biology seeks a sustainable future with diverse species, habitats, and ecosystems and associated functional processes; achieving this requires radical changes through biocultural approaches in human—nature relationships and in human—human relationships; transformative peace building, transformative programs, and transformative placemaking may be required; interaction with others may change one's worldview, possibly creating temporary dissonance and prompting personal transformation	Intrapersonal competencies (cultivating self-awareness, capacities for connection, meaning making, and future thinking and normative competencies)

(White, 2013), such approaches can support cyclical reflexive processes.

Finally, our results suggest that the real-world, crisis-driven, and normative nature of conservation (Meine et al., 2006; Soulé & Wilcox, 2014) can generate insights regarding the nature of science and knowledge production, sharing, and implementation. As science becomes more participatory and democratic (Carolan, 2006), conservation biology can pioneer such adaptations. However, to do so properly, complex challenges, such as decolonization of conservation, epistemological plurality (de Sousa Santos, 2015), and restorative justice, will need to be addressed.

We concur with the framing of “nature and people” (Mace, 2014) in which many potential partners have emotional, rights-based, or livelihood connections to the land (with accompanying species, habitats, and ecosystems). We propose that conservation biologists work with others, but who these others are and how one works with them depends on a range of factors. Such collaborations can advance not only biodiversity conservation, but also wider sustainability goals.

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REFERENCES

- Adams, W. M. (2004). *Against extinction: The story of conservation*. Routledge.
- Albert, C., Luque, G. M., & Courchamp, F. (2018). The twenty most charismatic species. *PLoS ONE*, *13*(7), e0199149.
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, *35*(4), 216–224.
- Baumgaertner, B., & Holthuijzen, W. (2017). On nonepistemic values in conservation biology. *Conservation Biology*, *31*(1), 48–55.
- Baxter, J. (2016). Case studies in qualitative research. In I. Hay (Ed.), *Qualitative research methods in human geography* (4th ed., pp. 130–146). Oxford University Press.
- Blackstock, K. L., Kelly, G. J., & Horsey, B. L. (2007). Developing and applying a framework to evaluate participatory research for sustainability. *Ecological Economics*, *60*(4), 726–742.
- Brand, R., & Karvonen, A. (2007). The ecosystem of expertise: Complementary knowledges for sustainable development. *Sustainability: Science, Practice and Policy*, *3*(1), 21–31.
- Brister, E. (2016). Disciplinary capture and epistemological obstacles to interdisciplinary research: Lessons from central African conservation disputes. *Studies in History and Philosophy of Biological and Biomedical Sciences*, *56*, 82–91.
- Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.
- Campbell, L. M. (2005). Overcoming obstacles to interdisciplinary research. *Conservation Biology*, *19*(2), 574–577.
- Carolan, M. S. (2006). Science, expertise, and the democratization of the decision-making process. *Society and Natural Resources*, *19*(7), 661–666.
- Cocks, M. (2006). Biocultural diversity: moving beyond the realm of ‘indigenous’ and ‘local’ people. *Human Ecology*, *34*(2), 185–200.
- Cooke, B., & Kothari, U. (Eds.). (2001). *Participation: The new tyranny?* Zed Books.
- Corson, C. (2010). Shifting environmental governance in a neoliberal world: US AID for conservation. *Antipode*, *42*(3), 576–602.
- Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches* (3rd ed.). SAGE Publications.
- Davies, A. L., & White, R. M. (2012). Collaboration in natural resource governance: Reconciling stakeholder expectations in deer management in Scotland. *Journal of Environmental Management*, *112*, 160–169.
- Davis, K. F., Koo, H. I., Dell’Angelo, J., D’Odorico, P., Estes, L., Kehoe, L. J., Kharratzadeh, M., Kuemmerle, T., Machava, D., Pais, A. D. J. R., Ribeiro, N., Rulli, M. C., & Tathego, M. (2020). Tropical forest loss enhanced by large-scale land acquisitions. *Nature Geoscience*, *13*, 482–488.
- de Sousa Santos, B. (2015). *Epistemologies of the South: Justice against epistemicide*. Routledge.
- Drury, R., Homewood, K., & Randall, S. (2011). Less is more: The potential of qualitative approaches in conservation research. *Animal Conservation*, *14*(1), 18–24.
- Duchelle, A. E., Biedenweg, K., Lucas, C., Virapongse, A., Radachowsky, J., Wojcik, D. J., Londres, M., Bartels, W.-L., Alvira, D., & Kainer, K. A. (2009). Graduate students and knowledge exchange with local stakeholders: Possibilities and preparation. *Biotropica*, *41*(5), 578–585.
- Ferraro, P. J., & Pressey, R. L. (2015). Measuring the difference made by conservation initiatives: Protected areas and their environmental and social impacts. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1681), 20140270.
- Flyvbjerg, B. (2011). Case study. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (4th ed., pp. 301–316). SAGE Publications. https://www.researchgate.net/profile/Bent-Flyvbjerg/publication/235953309_Case_Study/links/00463514b20a55cf69000000/Case-Study.pdf
- Gardner, T. A., Barlow, J., Chazdon, R., Ewers, R. M., Harvey, C. A., Peres, C. A., & Sodhi, N. S. (2009). Prospects for tropical forest biodiversity in a human-modified world. *Ecology Letters*, *12*(6), 561–582.
- Gavin, M. C., McCarter, J., Berkes, F., Mead, A. T. P., Sterling, E. J., Tang, R., & Turner, N. J. (2018). Effective biodiversity conservation requires dynamic, pluralistic, partnership-based approaches. *Sustainability*, *10*(6), 1846. <https://doi.org/10.3390/su10061846>
- Gavin, M. C., McCarter, J., Mead, A., Berkes, F., Stepp, J. R., Peterson, D., & Tang, R. (2015). Defining biocultural approaches to conservation. *Trends in Ecology and Evolution*, *30*, 140–145.
- Giangrande, N., White, R. M., East, M., Jackson, R., Clarke, T., Coste, M. S., & Penha-Lopes, G. (2019). A competency framework to assess and activate education for sustainable development: Addressing the UN sustainable development goals 4.7 challenge. *Sustainability*, *11*(10), 2832.
- Gorenflo, L. J., Romaine, S., Mittermeier, R. A., & Walker-Painemilla, K. (2012). Co-occurrence of linguistic and biological diversity in biodiversity hotspots and high biodiversity wilderness areas. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(21), 8032–8037.
- Hausser, Y., & Mpuya, P. (2004). Beekeeping in Tanzania: When the bees get out of the woods... An innovative cross-sectoral approach to community-based natural resource management. *Game and Wildlife Science*, *21*(3), 291–312.
- Hausser, Y., Weber, H., & Meyer, B. (2009). Bees, farmers, tourists and hunters: Conflict dynamics around Western Tanzania protected areas. *Biodiversity and Conservation*, *18*(10), 2679–2703.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). The global assessment report on biodiversity and ecosystem services. *Summary for policymakers*. Author. <http://unesdoc.unesco.org/images/0024/002474/247444e.pdf>
- Jew, E. K. K., Burdekin, O. J., Dougill, A. J., & Sallu, S. M. (2019). Rapid land use change threatens provisioning ecosystem services in miombo woodlands. *Natural Resources Forum*, *43*(1), 56–70.
- Jones, B., & Lühe, U. (2021). Knowledge for peace: Transitional justice and the politics of knowledge in theory and practice. In *Knowledge for Peace* (pp. 1–19). Edward Elgar Publishing.
- Juárez-Casillas, L. A., & Varas, C. (2013). Revisión bibliográfica actualizada del oso negro en México. *Therya*, *4*(3), 447–465.
- Kapur, D. (2001). Expansive agendas and weak instruments: Governance related conditionalities of international financial institutions. *The Journal of Policy Reform*, *4*(3), 207–241. <https://doi.org/10.1080/13841280108523420>

- Kindon, S., Pain, R., & Kesby, M. (Eds.). (2007). *Participatory action research approaches and methods: Connecting people, participation and place*. Routledge.
- Kurland, J., & Pires, S. F. (2017). Assessing U.S. wildlife trafficking patterns: How criminology and conservation science can guide strategies to reduce the illegal wildlife trade. *Deviant Behavior, 38*(4), 375–391.
- Leach, W. D. (2002). Surveying diverse stakeholder groups. *Society and Natural Resources, 15*(7), 641–649. <https://doi.org/10.1080/08941920290069245>
- Lecuyer, L., White, R. M., Schmook, B., & Calmé, S. (2018). Building on common ground to address biodiversity conflicts and foster collaboration in environmental management. *Journal of Environmental Management, 220*, 217–226.
- Lecuyer, L., White, R. M., Schmook, B., Lemay, V., & Calmé, S. (2018). The construction of feelings of justice in environmental management: An empirical study of multiple biodiversity conflicts in Calakmul, Mexico. *Journal of Environmental Management, 213*, 363–373.
- Ledford, H. (2008). Collaborations: With all good intentions. *Nature, 452*, 682–684.
- Lele, S., Wilshusen, P., Brockington, D., Seidler, R., & Bawa, K. (2010). Beyond exclusion: Alternative approaches to biodiversity conservation in the developing tropics. *Current Opinion in Environmental Sustainability, 2*(1–2), 94–100.
- Mace, G. M. (2014). Whose conservation? *Science, 345*(6204), 1558–1560.
- Marshall, K., White, R., & Fischer, A. (2007). Conflicts between humans over wildlife management: On the diversity of stakeholder attitudes and implications for conflict management. *Biodiversity and Conservation, 16*(11), 3129–3146.
- Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation Biology, 17*(3), 649–650.
- Meine, C., Soulé, M., & Noss, R. F. (2006). 'A mission-driven discipline': The growth of conservation biology. *Conservation Biology, 20*, 631–651. <https://doi.org/10.1111/j.1523-1739.2006.00449.x>
- Méndez-Medina, C., Schmook, B., & McCandless, S. R. (2015). The Punta Allen cooperative as an emblematic example of a sustainable small-scale fishery in the Mexican Caribbean. *Maritime Studies, 14*(12), 1–19.
- Mercer, C. (2003). Performing partnership: Civil society and the illusions of good governance in Tanzania. *Political Geography, 22*(7), 741–763.
- Mishra, C., Young, J. C., Fiechter, M., Rutherford, B., & Redpath, S. M. (2017). Building partnerships with communities for biodiversity conservation: Lessons from Asian mountains. *Journal of Applied Ecology, 54*(6), 1583–1591.
- N'Da, S. A. Y., & Fokou, G. (2021). Knowledge asymmetry and transitional justice in Cote d'Ivoire. In B. Jones & U. Lühe (Eds.), *Knowledge for peace* (pp. 75–98). Edward Elgar Publishing.
- National Institute of Statistics and Geography (INEGI). (2015). Encuesta Intercensal 2015. <http://www.beta.inegi.org.mx/proyectos/enchogares/especiales/intercensal/>
- Parfitt, T. (2004). The ambiguity of participation: A qualified defence of participatory development. *Third World Quarterly, 25*(3), 537–555.
- Pascual, U., Adams, W. M., Díaz, S., Lele, S., Mace, G. M., & Turnhout, E. (2021). Biodiversity and the challenge of pluralism. *Nature Sustainability, 4*(7), 567–572.
- Pimbert, M. P., & Pretty, J. N. (1995). *Parks, people and professionals: Putting 'participation' into protected area management* (Discussion Paper No. 57). UNRISD. <https://www.iied.org/sites/default/files/pdfs/migrate/X181IIED.pdf>
- Reed, J., Van Vianen, J., Deakin, E. L., Barlow, J., & Sunderland, T. (2016). Integrated landscape approaches to managing social and environmental issues in the tropics: Learning from the past to guide the future. *Global Change Biology, 22*, 2540–2554.
- Ripple, W. J., Estes, J. A., Beschta, R. L., Wilmers, C. C., Ritchie, E. G., Hebblewhite, M., Berger, J., Elmhagen, B., Letnic, M., Nelson, M. P., Schmitz, O. J., Smith, D. W., Wallach, A. D., & Wirsing, A. J. (2014). Status and ecological effects of the world's largest carnivores. *Science, 343*(6167), 1241484.
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., III, Lambin, E., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., de Wit, C. A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., ... Foley, J. (2009). Planetary boundaries: Exploring the safe operating space for humanity. *Ecology, 14*(2), 32.
- Sandbrook, C., Adams, W. M., Büscher, B., & Vira, B. (2013). Social research and biodiversity conservation. *Conservation Biology, 27*(6), 1487–1490. <https://doi.org/10.1111/cobi.12141>
- Sobrevilla, C. (2008). *The role of indigenous peoples in biodiversity conservation. The natural but often forgotten partners*. The World Bank. <https://www.iccaconsortium.org/wp-content/uploads/2017/06/RoleofIndigenousPeoplesinBiodiversityConservation-2008.pdf>
- Soulé, M. E., & Orians, G. H. (Eds.). (2001). *Conservation biology: Research priorities for the next decade*. Island Press. <https://searchworks.stanford.edu/view/4675236>
- Soulé, M. E., & Wilcox, B. A. (2014). Conservation biology: Its scope and its challenge. In M. E. Soulé & R. L. Peters (Eds.), *Collected papers of Michael E. Soulé. Early years in modern conservation biology* (pp. 19–30). Island Press.
- Sterling, E. J., Betley, E., Sigouin, A., Gomez, A., Toomey, A., Cullman, G., Malone, C., Pekor, A., Arengo, F., Blair, M., Filardi, C., Landrigan, K., & Porzecanski, A. L. (2017). Assessing the evidence for stakeholder engagement in biodiversity conservation. *Biological Conservation, 209*, 159–171.
- UNESCO (2017). Education for sustainable development goals. Learning objectives, UNESCO, Paris. <http://unesdoc.unesco.org/images/0024/002474/247444e.pdf>
- United Nations (UN). (2015). Transforming our world: The 2030 agenda for sustainable development. <https://sustainabledevelopment.un.org/content/documents/21252030AgendaforSustainableDevelopmentweb.pdf>
- Vermeulen, S., & Sheil, D. (2007). Partnerships for tropical conservation. *Oryx, 41*(4), 434–440.
- White, R. M. (2013). Sustainability research: A novel mode of knowledge generation to explore alternative ways for people and planet. In S. Sterling, L. Masey, & H. Luna (Eds.), *The sustainable university* (pp. 168–191). Routledge.
- White, R. M., & van Koten, H. (2016). Co-designing for sustainability: Strategizing community carbon emission reduction through socio-ecological innovation. *The Design Journal, 19*(1), 25–46.
- White, R. M., Young, J., Marzano, M., & Leahy, S. (2018). Prioritising stakeholder engagement for forest health, across spatial, temporal and governance scales, in an era of austerity. *Forest Ecology and Management, 417*, 313–322.
- Whyte, K. (2020). Too late for indigenous climate justice: Ecological and relational tipping points. *Wiley Interdisciplinary Reviews: Climate Change, 11*(1), e603.
- Whyte, K. P., Brewer, J. P., & Johnson, J. T. (2016). Weaving Indigenous science, protocols and sustainability science. *Sustainability Science, 11*, 25–32.
- Williams, S. D. (2002). Status and action plan for Grévy's Zebra (*Equus grevyi*). In P. D. Moehlman (Ed.), *Equids: Zebras, asses and horses. Status survey and conservation action plan* (pp. 11–27). International Union for Conservation of Nature. http://www.equids.org/docs/Moehlman_02_Low.pdf
- Young, J. C., Searle, K., Butler, A., Simmons, P., Watt, A. D., & Jordan, A. (2016). The role of trust in the resolution of conservation conflicts. *Biological Conservation, 195*, 196–202.
- Zarco-González, M. M., Monroy-Vilchis, O., & Alaniz, J. (2013). Spatial model of livestock predation by jaguar and puma in Mexico: Conservation planning. *Biological Conservation, 159*, 80–87.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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