

2021

## Advancing Applied Research in Conservation Criminology Through the Evaluation of Corruption Prevention, Enhancing Compliance, and Reducing Recidivism

Jessica S. Kahler

Joseph W. Rivera

Zachary T. Steele  
*Old Dominion University, zstee001@odu.edu*

Pilar Morales-Giner

Christian J. Rivera

*See next page for additional authors*

Follow this and additional works at: [https://digitalcommons.odu.edu/biology\\_fac\\_pubs](https://digitalcommons.odu.edu/biology_fac_pubs)



Part of the [Animal Sciences Commons](#), [Criminal Law Commons](#), [Criminology and Criminal Justice Commons](#), and the [Natural Resources and Conservation Commons](#)

---

### Original Publication Citation

Kahler, J. S., Rivera, J. W., Steele, Z. T., Morales-Giner, P., Rivera, C. J., Ahossin, C. F., Kaur, A., & Episcopio-Sturgeon, D. J. (2021) Advancing applied research in conservation criminology through the evaluation of corruption prevention, enhancing compliance, and reducing recidivism. *Frontiers in Conservation Science*, 2, 1-13, Article 698755. <https://doi.org/10.3389/fcosc.2021.698755>

This Article is brought to you for free and open access by the Biological Sciences at ODU Digital Commons. It has been accepted for inclusion in Biological Sciences Faculty Publications by an authorized administrator of ODU Digital Commons. For more information, please contact [digitalcommons@odu.edu](mailto:digitalcommons@odu.edu).

---

**Authors**

Jessica S. Kahler, Joseph W. Rivera, Zachary T. Steele, Pilar Morales-Giner, Christian J. Rivera, Carol F. Ahossin, Ashpreet Kaur, and Diane J. Episcopio-Sturgeon



# Advancing Applied Research in Conservation Criminology Through the Evaluation of Corruption Prevention, Enhancing Compliance, and Reducing Recidivism

Jessica S. Kahler<sup>1\*</sup>, Joseph W. Rivera<sup>1</sup>, Zachary T. Steele<sup>2</sup>, Pilar Morales-Giner<sup>1</sup>, Christian J. Rivera<sup>3</sup>, Carol F. Ahossin<sup>1</sup>, Ashpreet Kaur<sup>4</sup> and Diane J. Episcopio-Sturgeon<sup>4</sup>

<sup>1</sup> Department of Sociology and Criminology and Law, University of Florida, Gainesville, FL, United States, <sup>2</sup> Department of Biological Sciences, Old Dominion University, Norfolk, VA, United States, <sup>3</sup> Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL, United States, <sup>4</sup> School of Natural Resources and Environment, University of Florida, Gainesville, FL, United States

## OPEN ACCESS

### Edited by:

Odean Serrano,  
Saint Louis University, United States

### Reviewed by:

Tanya Wyatt,  
Northumbria University,  
United Kingdom  
Ana Filipa Filipe,  
University of Lisbon, Portugal

### \*Correspondence:

Jessica S. Kahler  
jkahler@ufl.edu

### Specialty section:

This article was submitted to  
Global Biodiversity Threats,  
a section of the journal  
Frontiers in Conservation Science

**Received:** 22 April 2021

**Accepted:** 02 August 2021

**Published:** 16 September 2021

### Citation:

Kahler JS, Rivera JW, Steele ZT,  
Morales-Giner P, Rivera CJ,  
Ahossin CF, Kaur A and  
Episcopio-Sturgeon DJ (2021)  
Advancing Applied Research in  
Conservation Criminology Through the  
Evaluation of Corruption Prevention,  
Enhancing Compliance, and Reducing  
Recidivism.  
Front. Conserv. Sci. 2:698755.  
doi: 10.3389/fcosc.2021.698755

Concomitant with an increase in the global illegal wildlife trade has been a substantial increase in research within traditional conservation-based sciences and conservation and green criminology. While the integration of criminological theories and methods into the wildlife conservation context has advanced our understanding of and practical responses to illegal wildlife trade, there remain discrepancies between the number of empirical vs. conceptual studies and a disproportionate focus on a few select theories, geographical contexts, and taxonomic groups. We present three understudied or novel applications of criminology and criminal justice research within the fields of fisheries, forestry, and wildlife conservation. First, we highlight criminological research on the application of corruption prevention in combating the illegal wildlife trade. Corruption has increasingly been getting attention from the non-governmental sector; however, there has been limited research aimed at understanding institutional opportunity structures, local conceptualizations of corruption, and the corresponding prevention strategies within conservation contexts. Second, we discuss the pre-emptive application of compliance theories when designing and monitoring Community-Based Conservation (CBC) programs such as community forestry, non-timber forest products, and community patrol programs. Applying opportunity theory and social development strategies are two suggestions to improve the effectiveness of CBCs in forestry and beyond. Finally, we present a discussion on recidivism (i.e., repeat offending) and non-instrumental or novel responses, utilizing illegal fishing as a case study. We present two alternative methods to traditional forms of punishment: restorative justice and community-based approaches. Lastly, we will present a diversity of priority research agendas within each of these topics.

**Keywords:** community-based conservation, compliance, corruption, recidivism, restorative justice, wildlife crime

## INTRODUCTION

The trade of flora and fauna, legal and illegal, local and distant, organized and opportunistic, spans diverse geographies, and time. However, there has been a recent increase in attention to the illegal wildlife trade (IWT) across the spectrums of scale, organization, and intensity due to impacts on biodiversity (Scheffers et al., 2019; Morton et al., 2021), ecosystem services (Beaune et al., 2013), human security, sustainable development, livelihoods (Brashares et al., 2014; Gore et al., 2019), and health (Aguirre et al., 2021). The threat of the IWT on human health is exemplified by the current uncertainty surrounding the origins of the COVID-19 pandemic and calls for more coordinated and robust management at the intersection of IWT and emergent zoonotic pathogens are materializing (Aguirre et al., 2021). IWT now accounts for an estimated value of \$1 trillion USD with governments from wildlife source countries likely foregoing between \$7 and \$12 billion USD in vital revenue (World Bank, 2019), which has disparate impact on the fragile economies of many biodiverse and developing countries (Gore et al., 2019). A diverse coalition of intergovernmental organizations, local and international non-governmental organizations (NGOs), academic institutions, and private organizations have coalesced to better understand, respond and reduce these myriad threats. These diverse groups are infusing human and financial capital and driving interdisciplinary innovations to respond to IWT. While spending estimates vary, a 2019 World Bank report suggests that, from 2010 to 2018, the international community invested a total of about \$2.4 billion USD in combatting IWT (World Bank, 2019). However, despite increased research, funding investments, and calls for interdisciplinary approaches, environmental crimes writ large are increasing 5–7% annually outstripping the rate of growth in the global economy by two or three times (Nellemann et al., 2016).

Concomitant with an increase in the funding and awareness of the myriad impacts of the IWT has been a substantial increase in research on wildlife crimes and their prevention within traditional conservation-based sciences (Kahler and Gore, 2017) and green or conservation criminology (McFann and Pires, 2020). Green criminology refers to the interdisciplinary study of environmental harm, including crime, victimization, law, regulation and justice (Lynch and Stretesky, 2011), which emerged over 30 years ago as a subfield of criminology in response to increasing environmental concerns and growth in green movements and politics (McFann and Pires, 2020). The framework of green criminology focuses on two aspects: (1) harms that cause natural environmental degradation; and (2) economic, political, and social contexts related to the aforementioned harms (for a review of green criminology see Brisman and South, 2017; Thomson et al., 2019). The majority of green criminology studies are conceptual in nature with a limited but rapidly expanding resume of empirical studies (McFann and Pires, 2020). The emergence of the conservation criminology branch, which has a heavy focus on applied, policy-relevant case studies, is a significant development within the evolution of green criminology (Thomson et al., 2019). Conservation criminology is an explicitly multi-disciplinary approach that utilizes and

explicitly draws on theoretical and methodological concepts from criminology, natural resources, and risk and decision sciences (Gibbs et al., 2010). The conservation criminology theoretical framework explores harm to natural systems as well as human health in terms of environmental crimes, non-compliance, and risks (Rivers and Gibbs, 2011) and provides a theory-based, systematic framework to measure assessed and perceived risks from IWT-related crimes and harm (McFann and Pires, 2020).

Conservation criminology literature has grown exponentially in the last two decades. However, empirical research thus far has been conducted by a handful of motivated criminologists and human dimensions of wildlife practitioners, has focused on the application of a select few theories (Thomson et al., 2019; McFann and Pires, 2020), and has been unevenly applied to geographic regions and taxa (e.g., Kahler and Gore, 2017; Margulies et al., 2019). There is a heavy focus on the poaching of charismatic megafauna, particularly within the African and Asian context, which until recently largely focused on the biological and ecological consequences of IWT, individual offender motivations, and larger socio-economic precursors of IWT (Kahler and Gore, 2017). For example, with the exception of illegal timber trafficking, the persistence of “plant blindness” in wildlife trade laws, regulations, and funding has translated into a research and policy gap through which many IWT-vulnerable plant species (e.g., Cactaceae family) are falling (Margulies et al., 2019). Nonetheless, IWT research continues to become more interdisciplinary, expanding geographical and taxonomic boundaries and various actors involved, with increasing applications from opportunity theories (e.g., routine activity theory, crime pattern theory) and crime prevention approaches (e.g., situational crime prevention; CRAVED) (Graycar and Felson, 2010; Moreto and Lemieux, 2015; Petrossian, 2015). A more nuanced understanding of IWT offenders and networks (e.g., Sánchez-Mercado et al., 2020), IWT related law enforcement (Moreto et al., 2015), policy responses (Wilson and Boratto, 2020), and the role of communities in IWT responses are also emerging (Anagnostou et al., 2020). In the following paper we outline critical research areas where theories, methods and applications from criminology are either lacking or absent and outline the theory, methods and applications of criminology to respond to conservation compliance challenges that plague the illegal harvest and trade of flora and fauna.

We proffer three understudied or novel applications of criminology and criminal justice research within the field of conservation. Each of these topics are broadly applicable to deal with compliance and crime issues within natural resource sectors such as fisheries, forestry, and wildlife. However, we pair each application with an illustrative example within fisheries, forestry, and wildlife sectors. First, we discuss the role of further theoretical and methodological integration of criminological research on corruption and corruption prevention in combating IWT. Currently, corruption is approached as a morality and criminal issue, with a focus on individual motivations rather than the corrupt structures that provide the opportunity for corruption among individuals. We focus on research aimed at understanding institutional opportunity structures and corresponding prevention strategies as well as better

understanding of the structure, function and conceptualization of corruption within conservation contexts. Second, the preemptive application of robust compliance theories when designing and monitoring Community-Based Conservation (CBC) programs such as community forestry, non-timber forest products (NTFP), and community patrol programs. Even though CBCs are used heavily within the forestry context, there is still a challenge of achieving compliance with natural resource regulations among communities that aim to manage their natural resources. Applying opportunity theory and social development strategies are two suggestions to improve the effectiveness of CBCs in forestry and beyond. Finally, a discussion on recidivism (i.e., repeat offending) and non-instrumental or novel responses, utilizing illegal fishing as a case study. Repeat environmental offenders are responsible for a significant amount of damage to natural resources and high recidivism can be illustrative of non-effective deterrence strategies, so there is a critical need to better understand recidivism in environmental crimes. Two methods are explored as alternatives to traditional forms of punishment, which includes restorative justice and community-based approaches. Lastly, there are a diversity of research agendas to be found within each of these topics. It should be noted that there are substantial literatures on each of these topics and that IWT is nuanced, diverse, and context specific. We have focused on a breadth of potential research agendas rather than an in-depth review of a singular topic.

## CONTEXTUALIZING AND PREVENTING CORRUPTION IN THE ILLEGAL WILDLIFE TRADE

Research illustrating the impacts of corruption within the fisheries, forestry, and wildlife sectors looms large with implications on species conservation, economic development, financial investments, and the legitimacy of governance structures among other dimensions (e.g., Laurance, 2004; Smith and Walpole, 2005; Garnett et al., 2011; Nunan et al., 2018; Tacconi and Williams, 2020). These studies give insight into the relationships between the legal and illegal markets and actors (Huisman and Vande Walle, 2010; van Uhm and Moreto, 2018). The effectiveness of conservation and anti-poaching efforts are impaired because corruption, such as bribery, fraud, laundering and smuggling, occurs at different stages of the IWT (Wyatt et al., 2018). Corruption may also have an adverse effect in motivating local populations to participate in wildlife conservation efforts. For example, perceived corruption from law enforcement officers such as rangers may reduce the legitimacy and trustworthiness of authority figures (Wyatt et al., 2018). Corrupt conservation officials and organizations can erode public trust and perceptions of legitimacy, which can reduce voluntary compliance with wildlife conservation laws (Moreto et al., 2015). The field of criminology defines corruption as the abuse or misuse of power bestowed on actors (public or private individuals) in specific roles, such as unlawful use of public office for private gain, in order to benefit personally, socially through network ties, or to benefit their community or

organization (Gore et al., 2013; Wyatt et al., 2018). Power is “an individual’s relative capacity to modify others’ states by providing or withholding resources or administering punishments” (page 265, Keltner et al., 2003).

Criminology can thus help bring much needed insight to corruption in conservation contexts by helping us to better understand the motivations for corrupt behavior and by facilitating the creation of effective corruption prevention and biodiversity conservation measures (e.g., Gore et al., 2013; Wang and Sun, 2016). Fortunately, there has already been an extensive amount of criminological research done in the area of wildlife crime and corruption. However, much more needs to be done, as a lot of the research done so far has been limited in its scope. For example, much like other types of crime associated with terrestrial wildlife, research on corruption in the wildlife sector has primarily been focused on specific countries or regions (e.g., Tanzania, Sub-Saharan Africa), taxa or commodity chains (e.g., elephants), and analytical focus on specific behaviors or actors (Williams et al., 2016). Most of this research focus has also been limited to low-level corruption, which involves corruption between the public and lower state officials (Moreto et al., 2015). Indeed, Williams et al. (2016) found that only 5% of the studies they reviewed examined a broad range of actors involved in corruption. In addition, a third of the reviewed studies did not even attempt to parse out the different types of “corruption,” but rather treated this diversified crime category as a monolith (Williams et al., 2016). As such, this research echoes other calls to further delineate the broad range of actors involved in corruption and avoid the tendency toward extremes of “smaller” or “grandier” scale actors.

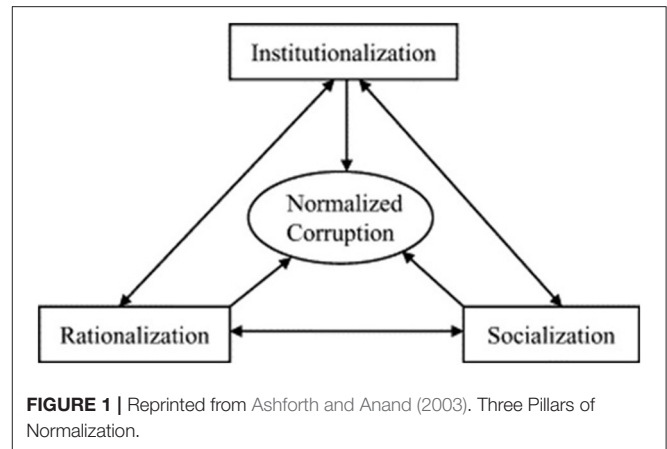
To counter some of these tendencies, as suggested by other researchers, more empirical research on the public policy mechanisms to reform corruption and on the effectiveness of anti-corruption and crime prevention strategies needs to be done (e.g., Gore et al., 2013; Williams et al., 2016; Tacconi and Williams, 2020). Accordingly, we focus on three dimensions where conservation criminology can advance the theoretical, methodological, and practical implications of research on corruption in wildlife crime, in order to: (1) explicitly draw on existing typologies of corruption-related crime and actors, (2) contextualize and understand the specific cultural, social and normative constructions of corruption in study sites, and (3) analyze organizational and structural opportunities for corruption in order to craft corruption prevention strategies aimed at changing the system itself instead of just the individuals involved.

First, it would be advantageous for empirical corruption focused IWT research to draw on taxonomies and typologies much like is the norm in other pursuits of conservation sciences. Corruption is not a monolithic behavioral category and while no singular definition of corruption exists, delineating corruption requires attention to power and the relationship between actors (e.g., Sundström and Wyatt, 2017; van Uhm and Moreto, 2018), the diversity of the actors themselves (e.g., Wyatt et al., 2018), and the distinct behaviors leveraged for gain by those actors (e.g., Wyatt et al., 2018; Musing et al., 2019). Research on the individual motives of corruption suggests the following causes for

corruption: lack of supervision, low salaries, enduring poverty, lack of appropriate training, lack of resources, which often lead to a low morale, and a limited ability to stop poachers (Moreto et al., 2015; Tunley et al., 2017).

At the broadest characterization, one should attend to the scale and relationship between actors for any given behavior (e.g., Sundström and Wyatt, 2017; Musing et al., 2019). The issue of scale can be thought of as the relative power and influence of the actors involved. For example, bribery among actors on a large-scale or grand corruption, such as politicians and industry leadership, can influence policymakers and result in lenient and biased legislation and regulations (Sundström and Wyatt, 2017; Musing et al., 2019). Bribery at a small-scale or petty corruption, among those charged with enforcing and obeying the laws (e.g., rangers, community leaders, resource extractors), can result in illegal resource extraction and compromised effectiveness of existing legislation (Sundström and Wyatt, 2017; Musing et al., 2019). Additionally, the actors themselves may broadly fall into the private and public sectors [see Wyatt et al. (2018) for a list of common actors in IWT]. Equally important is the characterization of the relationships between actors that facilitates corrupt behaviors. Passas' (2002) framework of symbiotic and antithetical relationships is advantageous when investigating IWT related corruption among actors (van Uhm and Moreto, 2018; Musing et al., 2019). Wyatt et al. (2018) advanced a typology of corruption associated with IWT in Asian contexts that broadly categorizes corrupt acts under bribes, patronage, diplomatic cover, and permit abuse.

Second, studying corruption should not be based on how institutions should ideally function, but on how they actually function in reality, focusing on conditions of administrations and institutions, especially in the “new states” that emerged in the post-colonial era, where the majority of species threatened by the IWT are located (Robbins, 2000; Khanna and Johnston, 2007). Instead of treating corruption as an anomaly, given its pervasiveness across case studies in natural resource management (Robbins, 2000), corruption should be thought of as the default state that all governing systems will settle on unless norms and institutions are put in place to prevent it and those norms and institutions are enforced and upheld. The socio-cultural context, therefore, weighs heavily on judgements on the acceptability of certain behaviors, such as clientelism or nepotism, among elected or traditional leaders (Sundström and Wyatt, 2017). For example, research in the Maroantsetra region of Madagascar found that residents' conceptualizations of corruption could not wholly be captured on the dichotomy of a moral deficiency vs. a normative behavior (Gore et al., 2013). Further, solutions based on moral deficiency often lead to the creation of additional layers of surveillance that increase opportunities for corruption. These state-level control mechanisms fail to draw on pre-existing traditional village leadership, which may increase accountability without infusing new actors and bureaucratic complexity (Gore et al., 2013). Some scholars even argue that corruption can be beneficial (e.g., Khanna and Johnston, 2007). Ideally then researchers should take into account the local conceptualizations of corrupt



**FIGURE 1** | Reprinted from Ashforth and Anand (2003). Three Pillars of Normalization.

behavior including any ways that local people benefit from existing systems.

We argue that conservation criminology should broaden the focus of research to reflect the diversity of approaches for corruption prevention within criminology. The understanding of corruption should not be limited to an analysis of individual motivations, because corrupt individuals and groups are the result of the corrupt structures in which they participate and thrive. Normalization of corruption is supported by three pathways corresponding to how individuals, institutions, and societies interact with this behavior (**Figure 1**) (Ashforth and Anand, 2003). Individuals may use rationalization, where people do not consider their acts to be corrupt and especially to be criminal, or they justify their corrupt acts by self-serving ideologies thereby facilitating otherwise illicit behavior (**Figure 1**). Corruption can become institutionalized within organizations when corrupt acts are tolerated giving rise to repetition of further corrupt acts, which becomes a routine (Ashforth and Anand, 2003). For example, an officer in power within an institution does not have to perform a corrupt act directly. Acts like ignoring, condoning, or facilitating the corrupt behavior intentionally or unintentionally motivates the actor in a low power position to pursue corrupt acts. Lastly, socialization occurs when the corrupt environment and peer pressure at the macro level of the institution influence the values, beliefs, and norms of the newcomers at the micro level (**Figure 1**). For example, a junior agent may feel the need to be corrupt in order to fulfill important personal duties, such as giving bribes or gifts to please someone at the workplace, and to make personal ties that may benefit them later (Ashforth and Anand, 2003). Organizational factors, such as ambiguous messaging on what is acceptable behavior and the limited availability of resources to motivate officials also facilitate corruption (Gorta, 1998; Wyatt et al., 2018).

Conservation criminology should apply practical solution-based approaches from traditional criminology, especially research applying normative perspectives (such as the clashing moral values theory) and research aiming to limit offending opportunities (relating to organizational culture theory). The

theoretical framework of future research on corruption would benefit from insights from political ecology and development studies (Graaf, 2007; Gore et al., 2013). Research should be extended to encompass an awareness of the normative conditions causing corruption. This requires an analysis of the organizational culture. The emotional and network ties linked to that phenomenon should be analyzed for a broader and deeper understanding of its intricacies.

Finally, opportunities also play a fundamental role in the various forms of corruption, and analysis and prevention efforts should be targeted at reducing these opportunities (Graycar and Sidebottom, 2012). Corruption opportunities are highly specific; for example, wildlife is killed for different purposes or different uses. Corruption opportunities are concentrated in time and space explaining how accessible various poaching location may be and how long illegal poaching can be carried out at these locations without being caught. One corrupt act can provide opportunity for another. An offender can indulge in similar or different corrupt activities over time, or other people in the organization can be corrupted by observing peers performing corrupt behavior and not getting caught. Social and technological changes can produce new corrupt opportunities if the organization is not evaluated periodically to catch new opportunities if they arise. Corruption can be prevented by reducing opportunities of committing crime or corruption. Situational crime prevention (SCP), which draws on opportunity theories, has been broadly applied to diverse crime types, such as theft, organized crime, and occupational corruption (Clarke, 1983; Graycar and Sidebottom, 2012; Tunley et al., 2017). These proactive techniques aimed at crime reduction have been increasingly used to address wildlife poaching and illegal wildlife trade (e.g., Pires and Clarke, 2011; Lemieux, 2014; Kurland et al., 2017; Kahler, 2018). Applied research into the use of SCP to analyze the organizational structure of agencies and organizations involved in conservation efforts can be used to reduce occupational corruption (Tunley et al., 2017).

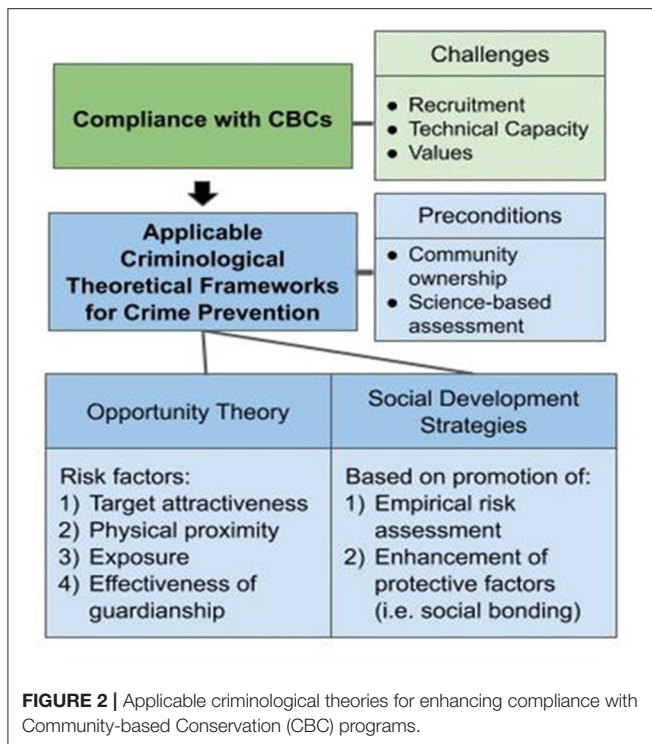
Theoretically robust research will facilitate more entry points to address specific corrupt behaviors and diverse actors. Additionally, utilizing existing typologies and frameworks, determining the specific socio-cultural and normative constructions of corruption in study sites, and analyzing the organizational and structural opportunities for corruption will facilitate the creation of context-specific corruption prevention strategies. Dynamic empirical research will facilitate cross-case comparisons and increase generalizability. Further, Williams et al. (2016) reviewed literature seeking to address corruption in wildlife crime and found that only 5% used mixed methods approaches. Mixed methods have been used to understand wildlife crime more broadly (e.g., Kahler and Gore, 2015), and would be advantageous in integrating quantitative and qualitative data relevant to the typology, and socio-cultural context associated with corruption in conservation. Lastly, projects like the Targeting Natural Resource Corruption (TNRC) provides resources, tools, and highlights research priorities (e.g., gender, political ecology) (Targeting Natural Resource Corruption [TNRC], 2021). To this effort, we proffered only a few theoretical perspectives, which we believe should be used

more to increase our understanding of IWT-related corruption. However, our discussion should not be thought of as an all-encompassing list, as more research needs to be done using various methods tailored to the topic being studied, instead of limiting the topics to the preferred form of methodology.

## COMPLIANCE BY DESIGN: ENHANCING COMPLIANCE IN COMMUNITY BASED NON-TIMBER FOREST PRODUCT PROGRAMS

Community-based Conservation programs (CBCs) strive toward the sustainable management of common-pool resources such as forests or fisheries to achieve both human and biodiversity conservation needs (Hutton and Leader-Williams, 2003; Cox et al., 2010). Previous literature has attempted to assess the factors that contribute to the success or failure of such programs (e.g., Cox et al., 2010; Nilsson et al., 2016). A review of the design principles for CBCs (initially posited by Elinor Ostrom in 1990) assessed the principles empirically, highlighted their theoretical issues, and provided a reformulation of the principles (Cox et al., 2010). The reformulated principles, which can be used to assess the strengths and weaknesses of CBCs, include: (1) user and resource boundaries; (2) congruence with local social and environmental conditions; (3) appropriation rules and related provisions; (4) collective-choice management; (5) monitoring of users and monitoring of the resource; (6) graduated sanctions; (7) conflict-resolution mechanisms; (8) recognition of rights to organize; and (9) nested enterprises (where activities such as monitoring, enforcement, and governance are organized in multiple layers of nested enterprises) (Cox et al., 2010). Theories of compliance, however, have been overlooked in the design and monitoring of CBCs for the explicit goal of reducing illegal use and overexploitation of natural resources managed by communities. Thus, opportunities exist to further draw from conservation criminology to better assess the design and monitoring of CBCs.

Within the forestry context, community-based initiatives (community-based forestry) have been established worldwide to achieve CBC goals, many with an emphasis on the management of non-timber forest products (NTFPs) (Michael Arnold and Ruiz Perez, 2001; Pandey et al., 2016). NTFPs sustain livelihoods through the provisioning of products for food, shelter, medicine, fibers, energy, and cultural artifacts, among others, and can promote conservation and development objectives through sustainable commercialization mechanisms (Michael Arnold and Ruiz Perez, 2001). Promoting the sustainable use of NTFPs, whether for subsistence or income generation purposes, is a conservation intervention established to minimize the overexploitation and degradation of timber resources. While such programs operate under the general design principles for CBCs, an ongoing problem arises with the issue of compliance within the forestry sector and related NTFP mechanisms (Foundjem-Tita et al., 2014). Although CBC principles highlight the role of monitoring resource users and the resource itself,



and the use of graduated sanctions, in practice, community-based forestry interventions have largely failed to account for the role of compliance, particularly within the design of the interventions. Studies have found that community-based monitoring (collaborative monitoring) in CBCs can lead to benefits such as shared ecological understanding; internal trust and external credibility of the program; social learning and community-building; and adaptive management (Fernandez-Jimenez et al., 2008). Challenges faced, however, include recruiting and sustaining community-participation in monitoring and building the technical capacity for monitoring (Fernandez-Jimenez et al., 2008). Moreover, local forest values, including use (e.g., economic, subsistence) and non-use (e.g., cultural, intrinsic) values, have been found to play critical roles in compliance with forestry legislation (Ramcilovic-Suominen et al., 2013). Below we describe theoretical frameworks from criminology that can elucidate opportunities for preventing issues of compliance within CBCs toward reducing illegal use and overexploitation of forest resources. We propose two approaches that focus on crime prevention: first, criminological theories to design NTFP programs for better compliance, and, second, social development strategies to create protective environments (Figure 2).

While the literature on community-based forestry has emphasized education and values to promote the success of CBC initiatives (Ramcilovic-Suominen et al., 2013), within criminological theory, opportunities theories are found to be more successful in crime prevention than education strategies. For example, in their systematic review on preventing repeat victimization, Grove et al. (2012) found that victim advice and education are not effective tools for crime prevention. By

contrast, the authors also found that situational crime prevention tools are the most effective in changing criminal behavior. Opportunity theory offers a framework to address situational crime prevention as it analyses “the time-space relationship in which victimization risk is greatest” (Cohen et al., 1981). This theory draws from two major theoretical backgrounds, life-style theory and routine activity theory, which maintain that there are four risk factors that contribute to victimization: (1) target attractiveness as the desirability of the target; (2) physical proximity between targets and offenders; (3) exposure (visibility and accessibility) of the target; and (4) effectiveness of guardianship in preventing the criminal activity (Cohen et al., 1981; Mears et al., 2007). Opportunity theory is particularly well-suited to analyze crimes that involve material benefits such as non-compliance with forestry non-regulation policies. Mears et al. (2007) carried out a statistical analysis that shows how opportunity theory can be applied to rural farms in California. In their study the authors found that proximity, target attractiveness, and lack of guardianship were the factors that more clearly correlated with agricultural victimization (in relation to crimes such as small equipment theft, serious theft, vandalism, burglary, etc.).

These findings are likely to be applicable to crimes that involve non-timber forest products. In fact, Mears et al. (2007, p. 177) found that “fruits and nuts, which are highly attractive because of the balance of portability and value, are more likely to be stolen than such less attractive targets as tractors and livestock, which are more difficult to steal.” Opportunity theory, which focuses on preventing crime at places (Eck, 2002) rather than motivations, also has potential for preventing crimes in rural and remote areas. The lack of community ownership of natural resources and wildlife entails that conservation crimes are not seen as stealing from the communities (Massé et al., 2017). Thus, several scholars claim that enabling ownership and use rights of wildlife and natural resources is a critical component for communities to play a strong role against conservation crimes (Biggs et al., 2017). By extension, community ownership should help provide a sense of victimization in the community. For example, in a communal conservancy in Namibia, with secure and regulated consumptive use rights over wildlife, residents conceptualized poaching as theft of community resources and therefore a threat to local livelihoods (Kahler et al., 2013). However, these feelings of victimization and by extension community-based regulatory responses may be mediated by local perceptions of the seriousness of the violation or use. For instance, residents living in and around a national park in Sumatra, Indonesia found illegal collection of fruits and nuts within the park as a non-serious offense and 77% preferred that witnesses ignore or take note of the activity without intervention (Kahler, 2018). These same respondents rated illegal logging as the most serious conservation crime in the park with approximately 63% of respondents preferring witnesses intervene directly or by calling authorities (Kahler, 2018). In this way, for opportunity theory analysis to work, community ownership must be established and an understanding of local perceptions of the seriousness of various offenses need to be scrutinized so that resulting



efforts drawing on opportunity theory (e.g., SCP) are supported by communities.

Social Development Strategies (SDS) also adopt a preventive approach by promoting capacity building of communities in which youth are in risk of developing problem behavior (Haggerty and McCowan, 2018). SDS focus on providing youth with opportunities to learn skills, while simultaneously recognizing their efforts and achievements. In this way, the combined effect of opportunities, skills, and recognition promotes strong social bonding (a sense of attachment to the persons and group that one is a member of) that acts as a motivator for following norms and accomplishing healthy standards. The Communities that Care program (CTC) has successfully adopted a place-based model grounded in a SDS (Haggerty and McCowan, 2018). One of the major strengths of the CTC is that it follows a science-based approach to reduce risks and prevent deviant behavior as it encourages community members to rely on survey and public data to conduct their risk assessments. In addition, multiple studies have found that CTC is an effective program. For example, Hawkins et al. (2008) found that CTC helped reduce initiation of delinquency, and Kuklinski et al. (2015) found that CTC is cost-beneficial for communities as it is “estimated to produce \$4,477 in benefits per youth.” While CTC has been designed to target youth problematic behavior, its success makes it an attractive tool that can be applied to CBC programs. Furthermore, similarly to CBC programs, CTC are grounded and developed through communities. In the process of establishing a CTC system, the first step of the program is to bring community leaders together and have them agree on the goals of the prevention program (Farrington, 2000). In the second step, a community board is established that assesses the risk and protective factors in the community. Finally, the community board chooses from a menu of strategies that have been proven to work effectively through empirical evidence. These steps align with the CBC principles described above (i.e., collective-choice management; monitoring of users and monitoring of the resource), however, CTC highlights the assessment of risks and protective factors, which are key factors for crime prevention. Lastly, there is evidence that injunctive norms (i.e., perceptions of what constitutes acceptable behavior in a social group) and perceived likelihood of community-level sanctions are more pertinent to compliance with IWT regulations than fear of arrests by rangers (Atuo et al., 2020). This research adds to a body of literature that concludes that normative compliance, consistent with CTC programs, may be as effective (if not more) than increased enforcement and detection, and the use of state-based sanctions (e.g., Kahler and Gore, 2012).

Opportunity theory and SDS are exemplary theoretical frameworks for achieving crime prevention and compliance with norms at the community level. First, moving attention from offender’s motivations (the who) to the time-space relationship in which crimes happen (the why) helps in identifying which conditions in a community (guardianship, exposure, proximity, or suitability) need to be monitored to achieve crime prevention. This is particularly relevant to community-based forestry interventions, where ample opportunities exist to ensure that the CBC principles of monitoring both users and forest

products (e.g., NTFPs) are efficiently and effectively implemented to strive toward reducing illegal product use and resource overexploitation. Secondly, promoting protective communities through SDS has the potential of reducing deviant behavior. The integration of SDS into community-based forestry programs can simultaneously strengthen activities, including monitoring, enforcement, and governance, reducing incidences of non-compliance and promoting the potential success of sustainable use of forest resources at the community level. There are, however, central conditions for such approaches to be effective. In order to achieve engagement with crime prevention strategies, community ownership of forest resources as well as capacity building needs to be enabled. In addition, risks assessments must be conducted with the support of empirical evidence.

## APPROACHES TO REDUCING RECIDIVISM IN ILLEGAL FISHING

In many places around the world, illegal fishing has become a major concern because it potentially risks depleting the ocean of available fishing stocks. Furthermore, overfishing can also decimate local fishing industries and may arguably lead to increasing other forms of organized crime (Nincic, 2013). As such, tackling repeat offenders of illegal fishing has become a pressing concern for many countries. However, one of the main contentions within criminology in general is the issue that traditional forms of criminal justice do not work to reduce repeat offending (Chiricos et al., 2007). In fact, as clearly stated by Cullen et al. (2011), “[p]risons do not reduce recidivism.” They also do not deter crime when compared to other non-custodial sentencing approaches (Cullen et al., 2011; Wilson and Boratto, 2020). Indeed, within the context of wildlife conservation, deterrence strategies may be entirely inappropriate, as according to Wilson and Boratto (2020), “Harsh sentencing laws appear to reproduce colonial inequality in places where modern governance favors wealthy Western access to land resources (e.g., trophy hunting, ecotourism) after colonial governance stripped indigenous communities of land tenure and rights.” Further, according to Huebner and Berg (2011), within the United States, the most likely offender to recidivate in general include those who are young, unemployed, unmarried, and who are members of the minority. This seems to reinforce the concept expressed by Braithwaite (2009), that the people most likely to be punished are usually the ones whose actions are more likely to be criminalized—the poor and underrepresented in society. As a result, according to Braithwaite (2009), “societies with both great extremes of poverty and great extremes of wealth have the deepest crime problems.” This trend may indicate that there is potentially an underlying conflict within that society which is going unaddressed, and which may be fueling this repeat criminal activity—to include some forms of environmental and wildlife crime. Therefore, given that these traditional methods do not seem to work to reduce recidivism (or worse, that they increase recidivism), this has led many criminologists to propose that other non-traditional methods should be considered.

According to McEvoy and Newburn (2003), there are several different alternative approaches that may better address these underlying conflicts and potentially reduce the rate of recidivism, including, for example, restorative justice conferences and truth and reconciliation commissions (TRCs). These approaches certainly have their positive and negative attributes; however, one potential positive is that they may serve as a type of non-judicial form of dispute resolution. According to Braithwaite (2009), restorative justice conferences are simply an informal process in which the offender, the victim, and members of the community can sit down together to discuss the crime and attempt to get the offender to accept responsibility for their actions and offer some meaningful form of apology. In order to ensure this process remains somewhat civil, it is supposed to also be overseen by a mediator who will help guide the discussion to keep the group focused on seeking reconciliation. As such, another approach, which is very similar to this process, include TRCs, like those used in South Africa and most recently in Canada. Essentially, the intent of these commissions was to bring the atrocities—many of which may have been committed in secret—to light. This was done under the theory that in order for the people to resolve the underlying conflicts plaguing their country, they must first acknowledge that these crimes or atrocities happened. In this way, both restorative justice conferences and TRCs are essentially a means to create a non-judicial forum for offenders to take responsibility for their crimes and for the victims and communities to obtain closure with the hope that this will ultimately lead to reconciliation and put an end to the seemingly endless cycle of violence or crime.

However, whether these approaches actually work or not is another matter entirely. In fact, while there is some evidence to support that restorative justice approaches work better than traditional forms of punishment to reduce recidivism, it is also difficult to prove that this is not simply a byproduct of a placebo effect, as according to Latimer et al. (2005), “[r]estorative justice, by its very nature, is a voluntary process.” So, only the most motivated and willing offenders and victims will take part. As such, there is clearly a potential for what is referred to as a self-selection bias, which theoretically cannot be resolved, as most restorative justice advocates argue that the process cannot be considered as “restorative” if individuals are forced to participate. However, regardless of whether these alternative approaches work, there is still an argument to make that, given the underlying inequality and conflict issues potentially generating crime within a society, something other than traditional methods should at least be considered, and this same argument applies whether we are discussing street crimes or environmental crimes. In fact, according to Madden and McQuinn (2014), this potential for deeply rooted social conflicts is often expressed as an issue that is overlooked by those in the conservation field. According to Madden and McQuinn (2014), “In many cases, this tendency is due to a lack of capacity for employing more comprehensive approaches, a lack of mandate or willingness to change existing methods, or a desire to avoid the messy complexity of conflict that, on the surface, may seem tangential or irrelevant to the conservation mandate.” However, as they warn, if this conflict is left unaddressed any proposed

solutions may be temporary at best, and, at worst, any further attempts at stakeholder engagement could potentially exacerbate the underlying conflicts. So, more comprehensive approaches that consider these underlying issues are necessary if we hope to address the problem with recidivism in environmental and wildlife crime.

In terms of wildlife crime, recidivism has been a tough issue to combat, mainly for two reasons: (1) a lack of severe repercussions for wildlife crimes (Minter, 2008; Billiet and Rousseau, 2014); and (2) the direct benefits from committing wildlife crimes (the value of illegal fishing is estimated to be between \$10–23.5 billion worldwide), which often benefit individuals who are in dire need of resources and income (Agnew et al., 2009). Deterring recidivism is particularly important when targeting illegal fishing because repeat offenders, especially those involved in organized illegal fishing, have been implicated as having the greatest negative impact on sustainability of species populations and on the livelihood of those who rely on the legal harvest of marine species (Environment Natural Resources Committee (ENRC) – Parliament of Victoria, 2002). According to the enforcement pyramid, punishments should begin with persuasion or a warning and only increase to the level of enforcing criminal penalties against offenders if these soft enforcement measures do not have the desired effect (Ayres and Braithwaite, 1992; Billiet and Rousseau, 2014). However, if harsher enforcement is never levied, anglers have little deterrence from repeating a crime knowing a light punishment is all that will be incurred (Billiet and Rousseau, 2014). In Victoria, Australia, where illegal fishing typically revolves around abalone, shellfish, and rock lobster, the ENRC recommends that repeat offenders should receive the highest penalties and remain top priorities of officials based upon their history of previous offenses (Environment Natural Resources Committee (ENRC) – Parliament of Victoria, 2002; Rivers and Gibbs, 2011). However, to this date, there has been minimal exploration into recidivism in illegal fishing and how effective larger penalties are for reducing repeat offenses.

If the penalty for an offense is perceived as being too low by the offender and does not outweigh the benefits gained from the infraction, a repeat offense is likely. In the state of Georgia, penalties levied on private firms for violation of Georgia’s Water Quality Control Act were significantly influenced by the firm’s previous history of violations, with an average increase of \$5,616 per violation (Oljaca et al., 1998). While this approach may deter smaller firms from repeat offending, it is likely that larger firms can easily withstand these fines. Similarly, organized groups of illegal anglers are likely to be able to withstand larger fines if they are generating significant profit, such as with high-value and high-demand species like abalone (Rivers and Gibbs, 2011). This illuminates an underlying flaw of the enforcement pyramid as a model for regulation of illegal fishing. With the small percentage of wildlife crimes that result in substantial punishment (Billiet and Rousseau, 2014), there is little fear from anglers that the “hammer” will truly ever be brought down. Even in circumstances where serious sentencing is enforced, it typically disproportionately impacts individuals and businesses that can least defend themselves (White, 2010). Additionally, traditional approaches tend to ignore the underlying social conflicts that

may be present (Madden and McQuinn, 2014), leaving future opportunities for retaliation from anglers or repeat offenses. In comparison to traditional approaches, alternative approaches like restorative justice and community-based programs offer more public involvement in determining proper punishment (White, 2010), which may be more suitable for lowering the amount of anglers who commit repeat offenses.

Restorative justice provides clear evidence to community members that offenders are contributing directly to remedying the problem for which they are being punished (White, 2010). For example, in the Waikato vs. Huntly case in New Zealand, in addition to simply paying a general fine for illegal stormwater drainage into the Waikato River, the Huntly Quarry donated \$7,500 to the Lower Waikato River Enhancement Society to undertake riparian enhancement (Waikato Regional Council, 2004). This exemplifies the potential of restorative justice to reducing recidivism in illegal fishing. Anglers who are caught repeatedly breaking regulations should be held accountable by their community by providing either funds or community services (i.e., participation in coastal cleanups or reef restoration projects) that directly contribute to remedying the problems their crimes intensified. While this approach seems ideal in theory, the implications of applying restorative justice to illegal fishing remain largely unexplored. However, a pilot project examining the potential of restorative justice in South Africa described by Hübschle et al. (2021) may provide critical insight into how restorative justice may reduce recidivism in illegal fishing, which has been particularly detrimental to the abalone fisheries in South Africa (Isaacs and Witbooi, 2019). Regardless, efforts focused on community involvement appear to be occurring more frequently with terrestrial wildlife and offer advantages such as heightened transparency and added pressure from community members to follow restrictions and guidelines which likely are applicable to illegal fishing. For example, in the Kafue National Park in Zambia, control of wildlife crimes is a two-part venture involving both enforcement by trained wildlife police officers and support by community-based natural resource management programs (CBNRM; Siamudaala et al., 2009). The arrests made by these wildlife police officers deter future wildlife crimes, while the CBNRM offers alternatives to poaching such as beekeeping, aquaculture, and farming (Siamudaala et al., 2009). These alternatives offer offenders a new way to earn money that both aids in the protection of wildlife and keeps the numbers of repeat offenders low (Siamudaala et al., 2009). This combined approach that emphasizes community involvement has been largely successful, especially in combatting recidivism. From 2000 to 2006, <3% of arrests made were repeat offenders in all five of the regions of the park that were analyzed (Siamudaala et al., 2009). However, reducing recidivism becomes increasingly difficult when targeting larger areas, especially crimes occurring in marine environments.

While community involvement efforts are often effective in attempts to reduce crime, there are certain situations where the complexity of community involvement makes it difficult for this approach to be enacted successfully. For instance, in Fiji, trained community members known as “fish wardens” are heavily involved in enforcing the regulations in place (Minter,

2008). However, these “fish wardens” lack the trainings, funding, and support from local police, who are often uneducated on the complicated fishing policies in Fiji under the Fisheries Act (Minter, 2008). Specifically, “fish wardens” and stakeholders discussed the difficulty in deterring recidivism because the current penalties levied against repeat offenders are minimal (Minter, 2008). A more stringent punishment was suggested like revoking offender’s fishing license because typically this license is required to maintain a source of income (Minter, 2008). This highlights the need for synergy between traditional and alternative (non-traditional) approaches to reducing recidivism. As White (2010) discusses, without the threat of the “big stick” that is essentially defined by the enforcement pyramid, there is little that compels offenders to not commit another crime. However, this threat alone is not sufficient, suggesting the need for pairing with alternative approaches like restorative justice and community involvement (White, 2010).

These findings indicate that one single approach to reducing recidivism in illegal fishing is not appropriate. Therefore, we recommend a synergistic, multi-faceted approach that combines traditional and non-traditional approaches toward attempting to reduce recidivism in illegal fishing. Since anglers who repeat offend are implicated as having the greatest negative impact on sustainability of aquatic populations (Environment Natural Resources Committee (ENRC) – Parliament of Victoria, 2002), the threat of severe sentencing needs to be clear and established; there cannot be hesitancy to enforce major punishment when deemed necessary. However, the typical smaller fine to slightly larger fine trajectory associated with the enforcement pyramid is not always sufficient, especially in situations like those with illegal fishing where the benefits outweigh the often low cost of fines (Environment Natural Resources Committee (ENRC) – Parliament of Victoria, 2002; Minter, 2008). In place of these fines, we advise implicating restorative justice and community involvement that better exemplify the repercussions of violating fishing regulations, while also better incorporating community members in the enforcement process.

## DISCUSSION

We presented three IWT relevant topics and highlighted the need for innovation and broadening the application of criminological theories into complex conservation-based crime scenarios. Crosscutting themes and conceptual connections emerged when reviewing these three areas for innovation. First, opportunity theories and frameworks, which have loomed large in wildlife poaching and trafficking crime prevention studies (Graycar and Felson, 2010; Moreto and Lemieux, 2015; Petrossian, 2015; Kahler, 2018), would be advantageous when applied to the facilitative crime of corruption and the design of livelihood alternatives in CBC programs. For example, using situational crime prevention to better understand the systematic ways that corruption is facilitated by socio-cultural, institutional, and regulatory environments allows anti-corruption policies and environments to be crafted that will transcend individuals in the system (Graycar and Felson, 2010; Tunley et al., 2017). Further,

opportunity theory offers a pathway to understand why issues of non-compliance occur within the forestry context, and a framework to analyze situational factors that contribute to illegal use of forest resources, including target attractiveness, physical proximity, exposure, and the effectiveness of guardianship (Mears et al., 2007; Graycar and Felson, 2010; Biggs et al., 2017; Kahler, 2018). Similarly, illegal fishing is a crime where opportunity is a dominant force and researchers have looked at issues of target attractiveness and suitability to understand illegal harvest (e.g., Petrossian, 2015). Using opportunity theory to delineate the environmental, economic, regulatory, and socio-cultural environments that facilitate recidivism would be fruitful to craft broad interventions to reduce these opportunities. Lastly, focusing on opportunity theories in relation to corruption, CBC design, and recidivism move the discussion away from individual predispositions and intrinsic motivations, which may lead to stigmatization of individuals as exceptionally deviant, toward identifying enabling and situational or extrinsic motivating factors that may prompt, provoke, or be permissive for unwanted behavior.

The impacts of corruption in fisheries, forestry, and wildlife management are well-documented and there is increased coordination particularly among practitioners, governmental agencies, and NGOs to craft anti-corruption policies (Williams et al., 2016; Musing et al., 2019; Targeting Natural Resource Corruption [TNRC], 2021). We advocate empirical research related to corruption start by explicitly delineating the taxonomy of the corruption-related behavior under scrutiny (Sundström, 2016; Wyatt et al., 2018), and developing an understanding of the normative nature and cultural context of this behavior (Gore et al., 2013; van Uhm and Moreto, 2018). Resulting corruption prevention measures should be tailored and designed for distinct behaviors within each unique cultural context. These measures should aim to reduce opportunities and motivations for corruption, while facilitating mechanisms for effective oversight, interventions, enforcement, and conflict resolution.

Finally, there is a need for more research on the role of power in motivating corruption. Power is relational to the actor and the context underpinning corruption at all scales and connecting all actors from collusive co-conspirators to disenfranchised victims (Keltner et al., 2003; Wang and Sun, 2016). Research on the psychosocial role of power in motivating corruption would give a much-needed insight on the individual motivations attached to corruption, while sociological studies of power should aim at understanding changing systems of environmental governance, conservation, and development. For example, the decentralization of power through CBC has the potential to reduce corruption through localized governance and oversight while expanding rights of ownership and use of wildlife and natural resources to previously disenfranchised communities (Biggs et al., 2017; Massé et al., 2017). However, the redistribution of power among user groups has the potential to have unanticipated consequences including, but not limited to, novel opportunities for and transformation of corrupt behaviors.

SDS can address issues of non-compliance in CBCs by taking a pre-emptive approach toward capacity building, risk reduction, and prevention of deviant behavior (Haggerty

and McCowan, 2018). Opportunity Theory and SDS are criminological theoretical frameworks that can be applied simultaneously to address issues of non-compliance in CBCs and strive toward reduction of illegal use and overexploitation of forest and other natural resources. Increasing integration of these theories can facilitate effective communication among stakeholders regarding compliance expectations during CBC program design and implementation. Disseminating clear compliance expectations and adopting transparent mechanisms for monitoring, enforcement, and sanctioning of violators has the potential to decrease incidental and deliberate non-compliance issues among resource users. Furthermore, when community-based forest interventions fail to account for the role of non-compliance, recidivism among violators may increase and undermine the biodiversity and livelihood development goals. Therefore, achieving compliance by design within CBC programs should involve communicating with local communities to determine an appropriate level of enforcement (Ayres and Braithwaite, 1992), to include restorative justice mechanisms, in order to reduce recidivism. This could also help provide clear evidence to other community members that offenders are at least trying to remedy and take ownership of their offenses, which may help them to better integrate back into that society.

More research needs to be done on the issue of recidivism and wildlife crime, because there is ample space for research to quantify the scope of the problem, discern the economic, regulatory, and socio-cultural drivers of repeat offenders, and move toward prevention and impact reduction. One issue with the research regarding illegal fishing and recidivism is that it ignores the fishing that is unregulated or goes unreported [Food and Agriculture Organization (FAO)]. As such, large-scale fisheries, which may arguably have a larger impact on fishing stock, are less likely to be penalized, because their behaviors are less likely to be criminalized (Song et al., 2020). So, much of our discussion on reducing the risk of recidivism, based on available research, is primarily focused on reducing the risk posed by those most likely to be caught, while ignoring others (Telesetsky, 2014; Glaser et al., 2019; Song et al., 2020). For example, research has shown that offenders most likely to recidivate are unemployed, unmarried, members of a minority group (Huebner and Berg, 2011). As such, this only highlights the underlying conflicts and power dynamics that may exist in these fishing communities we discussed. In addition to restorative justice and community-based approaches, investigating the efficacy of creating protective environments through social development strategies (SDS) that support healthy youth development and diversion tactics for recidivists is warranted.

It is difficult to determine what strategies for combatting recidivism in illegal fishing are effective if there are no recorded metrics. In areas like Fiji and South Africa, where illegal fishing is a serious problem (Minter, 2008; Rivers and Gibbs, 2011), if data is not recorded or reported on the frequency of arrests of repeat offenders or penalties that were levied against repeat offenders, it is nearly impossible to determine which approaches are more successful than others. While there will never be an ideal indication of the overall success of these approaches since many repeat offenders will avoid arrests and

penalties, having some data to evaluate an approach is crucial. The data provided on recidivism in Kafue National Park and on private farms in Georgia are valuable examples of future research applications to illegal fishing (Oljaca et al., 1998; Siamudaala et al., 2009). Research needs to explore areas that are particularly vulnerable to illegal fishing and document the approach undertaken to reduce recidivism and the resulting impact of this approach on illegal fishing in the area. Current restorative justice undertakings such as those described by Hübschle et al. (2021) in South Africa will hopefully encourage similar endeavors in the future.

We echo Gore and Bennett's (2021) call for an increased breadth in the number of crime theories being applied in conservation as well as an increased depth of synthesis between crime and conservation sciences in IWT research. However, research related to IWT and the resulting policy and enforcement responses are increasingly contentious with concerns related to the "militarization of conservation" (Duffy et al., 2019) and philosophical biases associated with the use of wildlife among the scientists conducting IWT research (Natusch et al., 2021) to name just a few. Further, despite an

increasingly prolific IWT research agenda by a select group of criminologists, relatively few, if any, of the IWT reducing policy and response recommendations have been implemented and evaluated (McFann and Pires, 2020). We recommend more intentionally interdisciplinary teams with a broader scope of theories, levels of analysis, and objectives to study diverse IWT relevant questions. Applying established methods in new contexts (e.g., situational prevention of corruption), applying robust criminological theories in established contexts (e.g., compliance theory in CBCs), and conducting empirical research on previously unstudied phenomenon (e.g., recidivism) can help conservation criminology further innovate and move toward measurable impacts on global risks such as IWT.

## AUTHOR CONTRIBUTIONS

JSK led concept, design, and writing. JWR, ZTS, PM-G, and CJR contributed to the writing, revisions, and figures. CFA, AK, and DJE-S contributed to writing and prepared figures. All authors contributed to the article and approved the submitted version.

## REFERENCES

- Agnew, D. J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J. R., et al. (2009). Estimating the worldwide extent of illegal fishing. *PLoS ONE* 4:e4570. doi: 10.1371/journal.pone.0004570
- Aguirre, A. A., Gore, M. L., Kammer-Kerwick, M., Curtin, K. M., Heyns, A., Preiser, W., et al. (2021). Opportunities for transdisciplinary science to mitigate biosecurity risks from the intersectionality of illegal wildlife trade with emerging zoonotic pathogens. *Front. Ecol. Evol.* 9:604929. doi: 10.3389/fevo.2021.604929
- Anagnostou, M., Mwedde, G., Roe, D., Smith, R. J., Travers, H., and Baker, J. (2020). Ranger perceptions of the role of local communities in providing actionable information on wildlife crime. *Conserv. Sci. Pract.* 2:e202. doi: 10.1111/csp2.202
- Ashforth, B. E., and Anand, V. (2003). The normalization of corruption in organizations. *Res. Organ. Behav.* 25, 1–52. doi: 10.1016/S0191-3085(03)25001-2
- Atuo, F. A., Fu, J., O'Connell, T. J., Agida, J. A., and Agaldo, J. A. (2020). Coupling law enforcement and community-based regulations in support of compliance with biodiversity conservation regulations. *Environ. Conserv.* 47, 104–112. doi: 10.1017/S0376892920000107
- Ayres, I., and Braithwaite, J. (1992). *Responsive Regulation: Transcending the Deregulation Debate*. New York, NY: Oxford University Press.
- Beaune, D., Fruth, B., Bollache, L., Hohmann, G., and Bretagnolle, F. (2013). Doom of the elephant-dependent trees in a Congo tropical forest. *For. Ecol. Manage.* 295, 109–117. doi: 10.1016/j.foreco.2012.12.041
- Biggs, D., Cooney, R., Roe, D., Dublin, H. T., Allan, J. R., Challender, D. W. S., et al. (2017). Developing a theory of change for a community-based response to illegal wildlife trade. *Conserv. Biol.* 31, 5–12. doi: 10.1111/cobi.12796
- Billiet, C. M., and Rousseau, S. (2014). How real is the threat of imprisonment for environmental crime?. *Eur. J. Law Econ.* 37, 183–198. doi: 10.1007/s10657-011-9267-2
- Braithwaite, J. (2009). Restorative justice for banks through negative licensing. *Br. J. Criminol.* 49, 439–450. doi: 10.1093/bjc/azp038
- Brashares, J. S., Abrahms, B., Fiorella, K. J., Golden, C. D., Hohnowski, C. E., Marsh, R. A., et al. (2014). Wildlife decline and social conflict. *Science* 345, 376–378. doi: 10.1126/science.1256734
- Brisman, A., and South, N. (2017). "Green Criminology" in *The Oxford Handbook of Criminology*, eds A. Liebling, S. Maruna, and L. McAra (Oxford: Oxford University Press), 14, 329–349. doi: 10.1093/oxfordhb/9780198719441.003.0015
- Chiricos, T., Barrick, K., Bales, W., and Bontrager, S. (2007). The labeling of convicted felons and its consequences for recidivism. *Criminology* 45, 547–581. doi: 10.1111/j.1745-9125.2007.0089.x
- Clarke, R. (1983). "Situational crime prevention: its theoretical basis and practical scope," in *Crime and Justice: An Annual Review of Research*, eds M. Tonry and N. Morris (Chicago: University of Chicago Press), 4, 225–256. doi: 10.1086/449090
- Cohen, L. E., Kluegel, J., and Land, K. (1981). Social inequality and predatory criminal victimization: an exposition and test of formal theory. *Am. Sociol. Rev.* 46, 505–524. doi: 10.2307/2094935
- Cox, M., Arnold, G., and Tomás, S. V. (2010). A review of design principles for community-based natural resource management. *Ecol. Soc.* 15:438. doi: 10.5751/ES-03704-150438
- Cullen, F., Jonson, C., and Nagin, D. (2011). Prisons do not reduce recidivism: the high cost of ignoring science. *Prison J.* 91, 485–655. doi: 10.1177/0032885511415224
- Duffy, R., Massé, F., Smidt, E., Marijnen, E., Büscher, B., Verweijen, J., et al. (2019). Why we must question the militarization of conservation. *Biol. Conserv.* 232, 66–73. doi: 10.1016/j.biocon.2019.01.013
- Eck, J. E. (2002). "Evidence-based crime prevention" in *Preventing Crime at Places*, eds B. C. Welsh and D. P. Farrington (Dordrecht: Springer), 1–17. doi: 10.4324/9780203166697\_chapter\_7
- Environment and Natural Resources Committee (ENRC) – Parliament of Victoria (2002). *Inquiry into Fisheries Management – Second Report Parliament of Victoria*. No.166 Session 1999–2002. Parliament of Victoria.
- Farrington, D. P. (2000). Explaining and preventing crime: the globalization of knowledge—the American Society of Criminology 1999 Presidential Address. *Criminology* 38, 1–24. doi: 10.1111/j.1745-9125.2000.tb00881.x
- Fernandez-Jimenez, M. E., Ballard, H. L., and Sturtevant, V. E. (2008). Adaptive management and social learning in collaborative and community-based monitoring: a study of five community-based forestry organizations in the western USA. *Ecol. Soc.* 13:4. doi: 10.5751/ES-02400-130204
- Foundjem-Tita, D., Speelman, S., de Haese, M., Degrande, A. M. I., van Huylenbroeck, G., Van Damme, P., et al. (2014). A tale of transaction costs and forest law compliance: trade permits for non-timber forest products in Cameroon. *Forest Pol. Econ.* 38, 132–142. doi: 10.1016/j.forpol.2013.08.007

- Garnett, S. T., Joseph, L. N., Watson, J. E. M., and Zander, K. K. (2011). Investing in threatened species conservation: does corruption outweigh purchasing power? *PLoS ONE* 6:e22749. doi: 10.1371/journal.pone.0022749
- Gibbs, C., Gore, M. L., McCarrell, E. F., and Rivers, I. I. I., L. (2010). Introducing conservation criminology: towards interdisciplinary scholarship on environmental crimes and risks. *Br. J. Criminol.* 50, 124–144. doi: 10.1093/bjc/azp045
- Glaser, S. M., Roberts, P. M., and Hurlburt, K. J. (2019). Foreign illegal, unreported, and unregulated fishing in Somali waters perpetuates conflict. *Front. Mar. Sci.* 6:704. doi: 10.3389/fmars.2019.00704
- Gore, M., Ratsimbazafy, J., and Lute, M. (2013). Rethinking corruption in conservation crime: insights from Madagascar. *Conserv. Lett.* 6, 430–438. doi: 10.1111/conl.12032
- Gore, M. L., and Bennett, A. (2021). Importance of deepening integration of crime and conservation sciences. *Conserv. Biol.* doi: 10.1111/cobi.13710. [Epub ahead of print].
- Gore, M. L., Braszak, P., Brown, J., Cassey, P., Duffy, R., Fisher, J., et al. (2019). Transnational environmental crime threatens sustainable development. *Nat. Sustain.* 2, 784–786. doi: 10.1038/s41893-019-0363-6
- Gorta, A. (1998). Minimizing corruption: applying lessons from the crime prevention literature. *Crime Law Soc. Change* 30, 67–87. doi: 10.1023/A:1008352924634
- Graaf, G. D. (2007). Causes of corruption: towards a contextual theory of corruption. *Pub. Administr. Q.* 31, 39–86. SPAEF Stable. Available online at: <http://www.jstor.org/stable/41288282> (accessed August 10, 2021).
- Graycar, A., and Felson, M. (2010). “Situational prevention of organised timber theft and related corruption,” in *Situational Prevention of Organised Crimes*, eds R. Clarke and N. Tilley (Devon: Willan Publishing), 1–12.
- Graycar, A., and Sidebottom, A. (2012). Corruption and control: a corruption reduction approach. *J. Finan. Crime* 19, 384–399. doi: 10.1108/13590791211266377
- Grove, L., Farrell, G., Farrington, D., and Johnson, S. (2012). *Preventing Repeat Victimization*. Stockholm: Swedish National Council for Crime Prevention.
- Haggerty, K. P., and McCowan, K. J. (2018). Using the social development strategy to unleash the power of prevention. *J. Soc. Social Work Res.* 9, 741–763. doi: 10.1086/700274
- Hawkins, J. D., Brown, E. C., Oesterle, S., Arthur, M. W., Abbott, R. D., and Catalano, R. F. (2008). Early effects of Communities That Care on targeted risks and initiation of delinquent behavior and substance use. *J. Adolesc. Health* 43, 15–22. doi: 10.1016/j.jadohealth.2008.01.022
- Hübschle, A., Dore, A., and Davies-Mostert, H. (2021). Focus on victims and the community: applying restorative justice principles to wildlife crime offences in South Africa. *Int. J. Restorat. Justice* 4, 141–150. doi: 10.5553/TIJRJ.000068
- Huebner, B. M., and Berg, M. T. (2011). Examining the sources of variation in risk for recidivism. *Justice Q.* 28, 146–173. doi: 10.1080/07418820903365213
- Huisman, W., and Vande Walle, G. (2010). “The criminology of corruption,” in *The Good Cause: Theoretical Perspectives on Corruption*, eds G. d. Graaf, P. v. Maravic, and P. Wagenaar (Opladen: B. Budrich), 115–145.
- Hutton, J. M., and Leader-Williams, N. (2003). Sustainable use and incentive-driven conservation: realigning human and conservation needs. *Oryx* 43, 215–226. doi: 10.1017/S003065303000395
- Isaacs, M., and Witbooi, E. (2019). Fisheries crime, human rights and small-scale fisheries in South Africa: a case of bigger fish to fry. *Marine Pol.* 105, 158–168. doi: 10.21608/asdj.2020.169175
- Kahler, J. (2018). *The situational prevention of wildlife poaching in Bukit Barisan Selatan National Park, Sumatra Indonesia*. Doctoral dissertation. Retrieved from ProQuest Dissertations and Theses database (UMI No.10815833).
- Kahler, J., and Gore, M. (2012). Beyond the cooking pot and pocket book: factors influencing noncompliance with wildlife poaching rules. *Int. J. Comp. Appl. Crim. Justice* 36, 103–120. doi: 10.1080/01924036.2012.669913
- Kahler, J., Roloff, G., and Gore, M. (2013). Poaching risks in a community-based natural resource management system. *Conserv. Biol.* 27, 177–186. doi: 10.1111/j.1523-1739.2012.01960.x
- Kahler, J. S., and Gore, M. L. (2015). Local perceptions of risk associated with poaching of wildlife implicated in human-wildlife conflicts in Namibia. *Biol. Conserv.* 189, 49–58. doi: 10.1016/j.biocon.2015.02.001
- Kahler, J. S., and Gore, M. L. (2017). “Conservation crime science,” in *Conservation Criminology*, ed M. Gore (John Wiley & Sons Ltd, Wiley Blackwell), 27–44.
- Keltner, D., Gruenfeld, D. H., and Anderson, C. (2003). Power, approach, and inhibition. *Psychol. Rev.* 110, 265–284. doi: 10.1037/0033-295X.110.2.265
- Khanna, J., and Johnston, M. (2007). India’s middlemen: connecting by corrupting? *Crime Law Soc. Change* 48, 151–168. doi: 10.1007/s10611-007-9086-0
- Kuklinski, M. R., Fagan, A. A., Hawkins, J. D., Briney, J. S., and Catalano, R. F. (2015). Benefit–cost analysis of a randomized evaluation of Communities That Care: monetizing intervention effects on the initiation of delinquency and substance use through grade 12. *J. Exp. Criminol.* 11, 165–192. doi: 10.1007/s11292-014-9226-3
- Kurland, J., Pires, S. F., McFann, S., and Moreto, W. D. (2017). Wildlife crime: a conceptual integration, literature review, and methodological critique. *Crime Sci.* 6:4. doi: 10.1186/s40163-017-0066-0
- Latimer, J., Dowden, C., and Muise, D. (2005). The effectiveness of restorative justice practices: a meta-analysis. *Prison J.* 85, 127–144. doi: 10.1177/0032885505276969
- Laurance, W. F. (2004). The perils of payoff: corruption as a threat to global biodiversity. *Trends Ecol. Evol.* 19, 399–401. doi: 10.1016/j.tree.2004.06.001
- Lemieux, A.M. (ed.). (2014). *Situational Prevention of Poaching*. New York, NY: Routledge. doi: 10.4324/9780203094525
- Lynch, M. J., and Stretesky, P. B. (2011). Similarities between green criminology and green science: toward a typology of green criminology. *Int. J. Comp. Appl. Crim. Justice* 35, 293–306. doi: 10.1080/01924036.2011.625233
- Madden, F., and McQuinn, B. (2014). Conservation’s blind spot: the case for conflict transformation in wildlife conservation. *Biol. Conserv.* 178, 97–106. doi: 10.1016/j.biocon.2014.07.015
- Margulies, J. D., Bullough, L. A., Hinsley, A., Ingram, D. J., Cowell, C., Goettsch, B., et al. (2019). Illegal wildlife trade and the persistence of ‘plant blindness.’ *Plants People Planet* 1, 173–182. doi: 10.1002/ppp3.10053
- Massé, F., Gardiner, A., Lubilo, R., and Themba, M. N. (2017). Inclusive anti-poaching? *Crime Q.* 60, 19–27. doi: 10.17159/2413-3108/2017/v0n60a1732
- McEvoy, K., and Newburn, T. (eds.). (2003). *Criminology, Conflict Resolution and Restorative Justice*. London: Palgrave Macmillan.
- McFann, S. C., and Pires, S. F. (2020). Taking stock in wildlife crime research: trends and implications for future research. *Deviant Behav.* 41, 118–135. doi: 10.1080/01639625.2018.1556851
- Mears, D. P., Scott, M. L., and Bhati, A. S. (2007). Opportunity theory and agricultural crime victimization. *Rural Sociol.* 72, 151–184. doi: 10.1526/003601107781170044
- Michael Arnold, J. E., and Ruiz Perez, M. (2001). Can non-timber forest products match tropical forest conservation and development objectives? *Ecol. Econ.* 39, 437–447. doi: 10.1016/S0921-8009(01)00236-1
- Minter, A. (2008). *Compliance and Enforcement for Coastal Fisheries Management in Fiji*. IUCN Regional Office for Oceania, Suva, Fiji.
- Moreto, W., Brunson, R., and Braga, A. (2015). Such misconducts don’t make a good ranger: examining law enforcement ranger wrongdoing in Uganda. *Br. J. Criminol.* 55, 359–380. doi: 10.1093/bjc/azu079
- Moreto, W., and Lemieux, A. (2015). From CRAVED to CAPTURED: introducing a product-based framework to examine illegal wildlife markets. *Eur. J. Crim. Pol. Res.* 21, 303–320. doi: 10.1007/s10610-014-9268-0
- Morton, O., Scheffers, B. R., Haugaasen, T., and Edwards, D. P. (2021). Impacts of wildlife trade on terrestrial biodiversity. *Nat. Ecol. Evol.* 5, 540–548. doi: 10.1038/s41559-021-01399-y
- Musing, L., Harris, L., Williams, A., Parry-Jones, R., van Uhm, D., and Wyatt, T. (2019). *Corruption and wildlife crime: a focus on caviar trade*. A TRAFFIC, WWF, U4 ACRC, Utrecht University, and Northumbria University report.
- Natusch, D., Aust, P., and Shine, R. (2021). The perils of flawed science in wildlife trade literature. *Conserv. Biol.* doi: 10.1111/cobi.13716. [Epub ahead of print].
- Nellemann, C., Henriksen, R., Kreilhuber, A., Stewart, D., Kotsovova, M., Raxter, P., et al. (2016). *The rise of environmental crime: a growing threat to natural resources, peace, development and security*. United Nations Environment Programme (UNEP).
- Nilsson, D., Baxter, G., Butler, J. R. A., and McAlpine, C. A. (2016). How do community-based conservation programs in developing countries change human behaviour? A realist synthesis. *Biol. Conserv.* 200, 93–103. doi: 10.1016/j.biocon.2016.05.020

- Nincic, D. J. (2013). Trends in modern piracy: cycles, geographical shifts, and predicting the next “Hot Spots.” *SAIS Rev. Int. Aff.* 33, 105–115. doi: 10.1353/sais.2013.0028
- Nunan, F., Cpíc, D., Yongo, E., Salehe, M., Mbilingi, B., Odongkara, K., et al. (2018). Compliance, corruption and co-management: how corruption fuels illegalities and undermines the legitimacy of fisheries co-management. *Int. J. Commons* 12, 58–79. doi: 10.18352/ijc.827
- Oljaca, N., Keeler, A. G., and Dorfman, J. (1998). Penalty functions for environmental violations: evidence from water quality enforcement. *J. Regul. Econ.* 14, 255–264. doi: 10.1023/A:1008031307103
- Pandey, A. K., Tripathy, Y. C., and Kumar, A. (2016). Non Timber Forest Products (NTFPs) for sustained livelihood: challenges and strategies. *Res. J. Forest.* 10, 1–7. doi: 10.3923/rjf.2016.1.7
- Passas, N. (2002). “Cross-border crime and the interface between legal and illegal actors,” in *Upperworld and Underworld in CrossBorder Crime*, eds P. C. van Duyne, K. von Lampe, and N. Passas (Wolf Legal Publishers).
- Petrossian, G. A. (2015). Preventing illegal, unreported and unregulated (IUU) fishing: a situational approach. *Biol. Conserv.* 189, 39–48. doi: 10.1016/j.biocon.2014.09.005
- Pires, S. F., and Clarke, R. V. (2011). Sequential foraging, itinerant fences and parrot poaching in Bolivia. *Br. J. Criminol.* 51, 314–335. doi: 10.1093/bjc/azq074
- Ramcilovic-Suominen, S., Matero, J., and Shannon, M. A. (2013). Do forest values influence compliance with forestry legislation? The case of farmers in the fringes of forest reserves in Ghana. *Small-Scale Forest.* 12, 235–256. doi: 10.1007/s11842-012-9209-z
- Rivers III, L., and Gibbs, C. (2011). Applying a conservation-criminology framework to common-pool natural-resource issues. *Int. J. Comp. Appl. Crim. Justice* 35, 327–346. doi: 10.1080/01924036.2011.625236
- Robbins, P. (2000). The rotten institution: corruption in natural resource management. *Polit. Geogr.* 19, 423–443. doi: 10.1016/S0962-6298(99)00087-6
- Sánchez-Mercado, A., Cardozo-Urdaneta, A., Moran, L., Ovalle, L., Arvelo, M., Morales-Campos, J., et al. (2020). Social network analysis reveals specialized trade in an Endangered songbird. *Anim. Conserv.* 23, 132–144. doi: 10.1111/acv.12514
- Scheffers, B. R., Oliveira, B. F., Lamb, I., and Edwards, D. P. (2019). Global wildlife trade across the tree of life. *Science* 366, 71–76. doi: 10.1126/science.aav5327
- Siamudaala, V. M., Nyirenda, V. R., and Saiwana, L. M. (2009). *Effectiveness of Law Enforcement on Wildlife Crimes in the Kafue Ecosystem in Zambia*. Zambia Wildlife Authority.
- Smith, R. J., and Walpole, M. J. (2005). Should conservationists pay more attention to corruption? *Oryx* 39, 251–256. doi: 10.1017/S0030605305000608
- Song, A. M., Scholtens, J., Barclay, K., Bush, S. R., Fabinyi, M., Adhuri, D. S., et al. (2020). Collateral damage? Small-scale fisheries in the global fight against IUU fishing. *Fish Fish.* 21, 831–843. doi: 10.1111/faf.12462
- Sundström, A. (2016). Corruption and violations of conservation rules: A survey experiment with resource users. *World Dev.* 85, 73–83. doi: 10.1016/j.worlddev.2016.04.011
- Sundström, A., and Wyatt, T. (2017). “Corruption and organized crime” in *Conservation Criminology*, ed M. Gore (Wiley Blackwell; John Wiley & Sons Ltd.), 97–114.
- Tacconi, L., and Williams, D. A. (2020). Corruption and anti-corruption in environmental and resource management. *Annu. Rev. Environ. Resour.* 45, 305–329. doi: 10.1146/annurev-environ-012320-083949
- Targeting Natural Resource Corruption [TNRC] (2021). Harnessing knowledge, generating evidence, and supporting innovative policy and practice for more effective anti-corruption programming. Available online at: <https://www.worldwildlife.org/pages/tnrc-targeting-natural-resource-corruption> (accessed March 22, 2021).
- Telesetsky, A. (2014). Laundering fish in the global undercurrents: Illegal, unreported, and unregulated fishing and transnational organized crime. *Ecol. Law Q.* 41, 939–998. doi: 10.15779/Z38656G
- Thomson, R., Samuels-Jones, T., and Downs, L. (2019). “The branches of green criminology: a bibliometric citation analysis 2000–2017” in *Quantitative Studies in Green and Conservation Criminology*, eds M. Lynch and S. Pires (New York, NY: Routledge), 1–27. doi: 10.4324/9780429453946-2
- Tunley, M., Button, M., Shepherd, D., and Blackburn, D. (2017). Preventing occupational corruption: utilizing situational crime prevention techniques and theory to enhance organizational resilience. *Secur. J.* 31, 21–52. doi: 10.1057/s41284-016-0087-5
- van Uhm, D. P., and Moreto, W. D. (2018). Corruption within the illegal wildlife trade: a symbiotic and antithetical enterprise. *Br. J. Criminol.* 58, 864–885. doi: 10.1093/bjc/azx032
- Waikato Regional Council (2004). *Huntly quarry fined for stormwater discharge*. Available online at: <https://www.waikatoregion.govt.nz/community/whats-happening/news/media-releases-archived/huntly-quarry-fined-for-stormwater-discharge/> (accessed June 01, 2004).
- Wang, F., and Sun, X. (2016). Absolute power leads to absolute corruption? Impacts of power on corruption depending on the concepts of power one holds. *Eur. J. Soc. Psychol.* 46, 77–89. doi: 10.1002/ej.sp.2134
- White, R. (2010). Prosecution and sentencing in relation to environmental crime: recent socio-legal developments. *Crime Law Soc. Change* 53, 365–381. doi: 10.1007/s10611-010-9233-x
- Williams, A., Parry-Jones, R., and Roe, D. (2016). The resource bites back: entry-points for addressing corruption in wildlife crime. U4 Anti-Corruption Resource Centre, U4 Issue.
- Wilson, L., and Boratto, R. (2020). Conservation, wildlife crime, and tough-on-crime policies: lessons from the criminological literature. *Biol. Conserv.* 251, 1–7. doi: 10.1016/j.biocon.2020.108810
- World Bank (2019). *Illegal logging, fishing, and wildlife trade: the costs and how to combat it*. The International Park for Reconstruction and Development. Available online at: <https://openknowledge.worldbank.org/handle/10986/32806> (accessed August 16, 2021).
- Wyatt, T., Johnson, K., Hunter, L., George, R., and Gunter, R. (2018). Corruption and wildlife trafficking: three case studies involving Asia. *Asian J. Criminol.* 13, 35–55. doi: 10.1007/s11417-017-9255-8

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**Publisher’s Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Kahler, Rivera, Steele, Morales-Giner, Rivera, Ahossin, Kaur and Episcopio-Sturgeon. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.