Eur J Crim Policy Res (2011) 17:101–123
DOI 10.1007/s10610-011-9141-3

Preventing Wildlife Crimes: Solutions That Can Overcome the 'Tragedy of the Commons'

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Published online: 9 February 2011

Abstract The 'tragedy of the commons' dilemma occurs when individuals working independently of one another, will overuse a common-property resource for short-term benefits while decimating the resource for long-term use (Hardin 1968). This is often found in the field of *wildlife crimes* where species become overexploited to increase short-term profits while endangering and eliminating a natural resource for future users. Wildlife crimes suffering from the 'tragedy' need to be prevented in order for species to avoid extinction while also conserving a natural resource that monetarily benefits numerous people and their respective communities. Current approaches to the illegal wildlife trade include implementing trade bans or regulatory schemes at the national and international level, yet their effectiveness of reducing the trade is unknown. Perhaps, a better approach in reducing the illegal wildlife trade is a combination of making it more difficult to poach (i.e. situational crime prevention) and incentivizing locals to abstain from poaching. This paper will first review the literature on wildlife crimes and then use a case study approach that will examine the literature on the illegal parrot trade, the market for wildlife skins, and over-fishing. Through these case studies, a comprehensive review of the problem will be detailed as well as innovative conservation solutions that show promise in reducing the poaching and exploitation of species. Amongst these solutions will be the use of situational crime prevention that has shown immediate reductions in crime when tailored towards highly-targeted areas and crimes.

Keywords Conservation criminology · Situational crime prevention · Tragedy of the commons · Wildlife crimes · Wildlife trade

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Introduction

The 'tragedy of the commons' dilemma occurs when individuals working independently of one another, will overuse a common-property resource for short-term benefits while decimating the resource for long-term use (Hardin 1968). For instance, in open oceans, fishermen will try to catch as much as possible while thinking if they do not, someone else will. After years of overfishing by multiple parties, certain species of fish will have been overexploited to the point where no members of the fishing community will benefit. Over the past few decades though, considerable evidence has accumulated showing a 'tragedy' will not always occur when individuals use a common property-resource. A variety of settings have shown that sustainable use of common property-resources can occur without resulting in overexploitation[1] (Feeny et al. 1996; Ostrom 1999; Van Vugt 2009). Yet, many of these successful case studies are not related to wildlife resources that are commonly exploited for the illegal wildlife trade.

Many of the wildlife crimes occurring globally fall into a category of de facto 'open access'. An open access regime is devoid of property rights, communal rights or state regulation (see Feeny et al. 1996; Ostrom 1999). This type of property-rights regime allows there to be a certain free-for-all mentality to poach despite existing laws or treaties in some cases, and without any long-term concerns for sustainability. This is the most dangerous type of wildlife management system because the (unprotected) wildlife becomes over-exploited and the local community will quickly lose a profitable natural resource. Wildlife crimes like overfishing need to be prevented in order for certain species to avoid extinction,[2] while also conserving a natural resource that monetarily benefits numerous people and their respective communities. It appears from the literature that much of the *wildlife poaching* committed globally is not the product of organised crime and professional poachers, but of opportunistic locals who subsist on very little income. Poor locals take advantage of flora and fauna species that are in close proximity to their homes and where they can easily sell to a middleman or market. The legal and illegal wildlife trade is a secondary and sometimes primary income source for many impoverished communities around the world. Any solutions in tackling the illegal trade problem must acknowledge that livelihoods depend on exploiting species for the wildlife trade and without viable alternatives, success in reducing the trade is unlikely.

A common response to reducing the illegal wildlife trade has been the creation of laws and international trade agreements forbidding species from being poached in the wild. National legislation and international trade agreements like the Convention on International Trade in Endangered Species (CITES) have implemented trade bans and regulatory schemes[3] in the wildlife trade, but evidence of either approach working to conserve species in the long term has yet to be evaluated (Smith and Walpole 2005; The Economist 2008). CITES has had some success in reducing the international trade in endangered species, but is unable to regulate the domestic trade. The internal trade of wildlife products in range countries[4] is a much larger problem than many in the conservation field have ever

[1] For instance, "maintenance of common agricultural land, irrigation systems, and lake and shore fisheries" have all been shown to not result in a tragedy of the commons (Ostrom 1999, cited in Van Vugt 2009: 170).
[2] Namely, the Atlantic Cod, Atlantic Salmon, Patagonian Toothfish, Bluefin Tuna, Yellowfin Tuna, Chilean Sea Bass, Orange Roughy and several Sturgeon species are all examples of overfished species in need of more protection.
[3] Regulatory schemes implement catch-quotas for species, often banning trade in threatened species and allowing trade for more abundant species.
[4] Range states refer to regions or countries where species are commonly found.

acknowledged. Recent evidence, for example, shows most of the illegal parrot trade is fuelled by internal markets within neo-tropical countries and not international markets as popular opinion suggests (Cantu et al. 2007; Herrera and Hennessey 2007; Gastanaga et al. 2010; Pires and Clarke In Press a, b). Given this evidence, traditional anti-poaching legislation must be seen as part of the solution, but not the panacea for eliminating the illegal wildlife trade.

Alternative conservation solutions and wildlife management systems have been receiving more attention and have become more utilized as a small-scale approach in reducing wildlife poaching. These alternative approaches can provide incentives for locals to abstain from poaching by establishing a vested economic interest in the conservation of the wildlife around them. This perspective is based on three premises; (1) locals, not outside poachers, make up the majority of the wildlife poaching problem; (2) these individuals are motivated by generating income; and (3) anti-poaching laws and tougher sentencing alone have had a negligible effect on reducing the illegal wildlife trade. Utilizing the carrot-and-stick approach in targeting locals may result in the reduction of poaching in the long run. This perspective emphasizes community-based enforcement over formal social control by the government. It recognizes law enforcement can do very little to deter potential poachers given a host of factors that include inadequate resources, the amount of land to patrol, and law enforcement's general indifference to wildlife crimes, especially in underdeveloped countries where environmental police may not even exist.

This paper will elucidate how alternative methods in reducing poaching can be applied to other wildlife crimes in the world. A case study approach will be taken that will examine the literature on the illegal parrot trade, the market for wildlife skins and, illegal, unregulated, and unreported (IUU) fishing. A brief summary on the literature regarding wildlife crimes will be examined, specifically focusing on the nature of the trade, including some of its causes and impact on species. Additionally, situational crime prevention (SCP) techniques that have been used in the wildlife field will also be covered to highlight the common characteristics SCP has with alternative conservation solutions. Before summarizing the literature on wildlife crimes, an appropriate definition of 'wildlife crimes' must be considered.

Review of the Literature

Defining Wildlife Crimes

According to Interpol, "Wildlife crime is the taking, trading, exploiting or possessing of the world's wild flora and fauna in contravention of national and international laws." (Interpol 2010 n.p.) The poaching of an African elephant for bush meat and/or for its ivory tusks is an example of a wildlife crime. All African nations have laws against poaching elephants and the CITES ban on the ivory trade restricts any international trade in elephant tusks. However, not all harms to animals are classified as criminal acts. For example, converting rainforests into farmland has exacerbated the decline in species by diminishing their primary habitat. In fact, habitat loss is the primary threat to the conservation of species according to the World Wildlife Fund (WWF 2008). Despite being harmful to flora and fauna, deforestation is generally not a crime in many countries where it is a common phenomenon.

Other harms to species that are not defined as criminal in nature also include human-animal conflict. Such conflict can be attributed to increasing human populations diffusing into continually declining natural animal habitats resulting in the overlap of physical living space and conflict over resources (Woodroffe 2000; Treves and Karanth 2003; WWF 2006). This is quite common in underdeveloped countries where killing animals is often in response to the destruction of crops (e.g. elephants), eating livestock (e.g. leopards), or killing humans (e.g. elephants, tigers) (Omondi et al. 2004). Incidentally, as a result of such human-animal conflict, conservation initiatives may be hindered if responses to such conflicts are not effective (WWF 2006).

As can be seen, the very concept of what constitutes a wildlife crime is multi-faceted in nature and in scope. Therefore, if criminologists entering this field of research want to protect biodiversity from all preventable threats, a broader definition of wildlife crimes should consider 'wildlife harms' that can also threaten the loss of biodiversity such as de-forestation, but may not be considered a crime in the local context (White 2008). For the purposes of this paper though, wildlife crime will be defined in a more legalistic method that is aligned with the aforementioned, Interpol definition. Thus, *wildlife crime* will be defined as: (1) poaching for trade or personal possession; (2) illegally killing for bush meat; and (3) killing animals due to human-animal conflict.

The Nature of the Legal and Illegal Wildlife Trade

The wildlife trade can be seen as a multi-level chain that typically involves poachers, middlemen, processing centres, and markets. It appears that much of *wildlife poaching* - the initial step in the wildlife trade - is committed opportunistically by poor locals rather than professional poachers or members of organised crime. Opportunistic poaching can be seen in the: neo-tropics with parrots (Pires and Clarke In Press a, b, Under Review); in East Asia with turtles, tortoises, sea horses, and reptiles (TRAFFIC 2008); in Africa with bush meat (Roe 2008); in North America with cacti (Robbins and Barcenas 2003); and in some cases, overfishing (EJF 2007; Putt and Nelson 2008). After the initial act of poaching, one begins to see more organization in subsequent stages such as local, regional and international middlemen, processing centres, and markets. Depending on the species and region of the world, 'organised' can simply mean anything from three individuals who are loosely organised together to a vast criminal enterprise that comprises all stages of the wildlife trade (i.e. vertically integrated organizations). Legal enterprises that are involved in illegal activities, as is often found with logging companies and fishing vessels, should also be treated differently from traditional 'organised crime' syndicates. These entities have much more at stake to lose (i.e. licences, contracts, etc.) and therefore are much more rational in responding to penalisation. Therefore, conservation criminologists[5] should differentiate between wildlife crimes that are a product of 'organised crime', from loosely organised wildlife crimes in order to understand how the illegal wildlife trade can be reduced at each stage of the chain.

On the other hand, some wildlife poaching is not facilitated by locals taking advantage of easy opportunities. Some of the notable exceptions include turtle poaching in Asia and tiger poaching in India (TRAFFIC 2008). These examples illustrate the penetration of organised crime groups and professional poachers into a highly-profitable industry.

[5] This term seems appropriate for this field of study (Gibbs et al. 2010).

However, this is not the dominant picture as some journalists and researchers would like to believe. In the aggregate, most wildlife crimes are not highly profitable and are generally committed by poor locals as a secondary and sometimes primary income source (TRAFFIC 2008; Pires and Clarke In Press a). Interestingly, there is evidence of some wildlife crimes, namely sturgeon poaching and the illegal caviar market, that involve *both* the participation of locals and professional poachers linked with more organised crime groups in the different stages. For example, it has been documented that local fishermen along the Caspian sea poach along the coastline and within the rivers that drain into the sea, while professional poachers with links to organised crime are able to poach in further distances within the sea itself due to increased capabilities (i.e. larger, faster boats; GPS technology, etc.) (Vaisman 1997; Tayler 2001; Saffron 2002; Carey 2005). A similar picture can be seen in South Africa and Australia with abalone poaching where there is a mix of opportunists and some elements of organised crime such as Chinese syndicates (Hauck and Sweijd 1999; Hauck and Kroese 2006; Putt and Nelson 2008; White 2008).

Trade Bans and Regulating the Trade

The two dominant approaches in curbing the wildlife trade have been regulating the trade (i.e. catch-quotas) or enacting trade bans. With both approaches, the goal is to minimise poaching and to conserve species - especially endangered ones. Surprisingly though, many of these policies that have been implemented at the international and national level have not been scientifically evaluated (Smith and Walpole 2005). International trade agreements such as CITES have banned the trade in over 800 species of flora and fauna and yet the effectiveness of trade bans is quite unknown (The Economist 2008; Roe 2008). For some species, international bans appear to have reduced the poaching of parrots, big cats, whales, African elephants and vicunas. For other species, total bans have not worked and possibly made poaching worse for the conservation of rhinos, tigers, and pangolins (The Economist 2008; Lemieux and Clarke 2009; Pantel and Yun 2009). For instance, rhinos went from a population of about 75,000 to 11,000 in just a few decades (The Economist 2008) while wild tiger populations have been stagnant since the 1970s (Project Tiger 2005; Marsh 2010). The ineffectiveness of some trade bans can be explained by the rising price for an animal product on the black market when demand continues unabated. This gives more incentive to hunt threatened species as well as more power to corrupt officials who will seize this opportunity in countries with little transparency or oversight (Smith and Walpole 2005).

The regulatory approach, on the other hand, is severely limited as well. Evidence and common sense will show that individuals will exceed quota limits because it is highly unlikely that they will get caught. In the developing world where regulatory schemes are enacted, one will often find that accountability is lacking on the part of the government to enforce quota limits in addition to corruption (Smith and Walpole 2005). Sometimes, even catch-quotas themselves are not based on scientific assessment of what sustainable catch should be for species. This was a particular problem with the parrot regulatory scheme in Mexico in implementing catch-quotas for non-threatened parrot species. As a result of this system and sheer negligence on the behalf of authorities, up to 78,500 parrots were being poached over quota limits on an annual basis in Mexico (Cantu et al. 2007). It was not only the permitted parrot species that were being poached, but threatened species were involved in the illegal parrot trade as well. Another prime example of the limitations of the regulatory approach is overfishing. Overfishing is extremely difficult to curtail because it is committed

in open oceans where there is an absence of *capable guardians*[6] to prevent this crime. There is little to stop an ordinary fisherman from overfishing except for the depletion of fish stocks. Of course by then, the tragedy of the commons has already occurred.

Without more research into these policies, it is difficult to say which policies work, with what species, and in what regions. A general rule that should guide policy decisions is that the people of the range states must support trade bans on certain species or else the ban will not work (The Economist 2008). This appears to be a main obstacle in reducing the poaching of tigers in East Asia, elephant poaching in Africa and Asia, as well as parrots in the neo-tropics. Many of the people in these regions like the products that come from these species (e.g. tiger skins, elephant ivory) or in the case of parrots, enjoy their company as household pets (Smith et al. 2003; Project Tiger 2005; Cantu et al. 2007; Herrera and Hennessey 2007; Lemieux and Clarke 2009; The Economist 2008).

The Limitations of Formal Social Control in Reducing the Illegal Wildlife Trade

Throughout the conservation biology literature, tougher anti-poaching laws and increasing law enforcement resources are typically prescribed as solutions to the illicit wildlife trade. However, most criminologists would argue that deterrence has had negligible effects on crime reduction (Pratt and Cullen 2005; Kennedy 2009).[7] Deterrent-driven policies, like police crackdowns, will be ineffective in reducing the illegal wildlife trade in the long run given the temporary nature and focus of such a crackdown. Once police have reduced their presence and go back to their normal routines, individuals in the trade will resume their activity in poaching, transporting and selling species. Crackdowns would also be ineffective because many of these wildlife crimes are relatively minor from the perspective of locals and others partaking in these illegal activities. As stated by Pires and Clarke (In Press a, b), "if the authorities tried to punish more poachers, they would therefore risk losing the support of the local population" (15). The support of locals is integral to the success of any conservation solution because they are most involved in the poaching stage of the illegal wildlife trade.

Increasing law enforcement resources in underdeveloped countries will also do very little to disrupt the illicit trade in wildlife products even if it were feasible. The wildlife crime literature reveals law enforcement resources in developing countries are especially lacking (Hauck and Sweijd 1999; Smith and Anderson 2004; Lee et al. 2005; Project Tiger 2005; TRAFFIC 2008; Nijman 2009; Moyle 2009; Nellemann and Refisch 2010; Wellsmith 2010), and corrupt practices, including the bribing of authorities, is not an uncommon practice (Tayler 2001; Robbins and Barcenas 2003; Cantu et al. 2007). Even if some countries had more resources to combat the wildlife trade, omnipresence in the wild is unattainable given the amount of land that would need to be patrolled. The problem with combating the illegal wildlife trade is more than a resource issue; law enforcement[8] can do very little to deter wildlife crime because law enforcement also lacks will power, general knowledge on endangered species, and follows a reactive-policing model that does not prevent wildlife crimes. In many of these underdeveloped countries, environmental police do not even exist, so the responsibilities of enforcing wildlife policies falls upon traditional

[6] Cohen and Felson (1979) describe three main elements that interact in time and space in order for a criminal offense to occur: the presence of a likely offender and a suitable target and the absence of a capable guardian. It should be noted that the role of guardianship – in the context of those who 'discourage crime' – has been extended to include handlers and managers (see Felson 1995).

[7] Although, see Kennedy (2009) for an interesting discussion on the re-examination of deterrence.

[8] Includes ordinary police officers, environmental police, custom agents and coast guard.

law enforcement. Furthermore, the mobile nature of species further exacerbates the limitations of law enforcement due to the interplay between man-made socio-political boundaries and borders resulting in confusion as to *who* is responsible for monitoring and enforcement. While humans are restricted by legal and administrative restrictions; animals are able to move freely, typically without such socio-political impediments.[9] This has been evidenced in the movement of African elephants and sturgeon species in the Caspian Sea.[10]

The Prospects of Using Situational Crime Prevention in Reducing the Illegal Wildlife Trade

Since opportunities to poach in the forest and in the ocean are ubiquitous, and the limitations of formal social control are numerous, applying situational crime prevention (SCP) to this area of research can be very helpful in reducing the wildlife trade in the immediate future. SCP can be identified as a pragmatic approach to addressing specific types of crimes and settings with an explicit focus on establishing or implementing changes to the contextual environment and/or management of such an environment in order to block opportunities for offending (Clarke 1999, 2008, 2009). SCP focuses on the immediate *proximate* environment and recognizes the possibility that *any* individual is capable of committing an offense at any time given the presence of an opportunity.[11] In addition, SCP acknowledges that crime occurs as a result of the person-situation nexus that occurs in specific settings and posits that the surrounding, contextual environment is a *dynamic* factor in any criminal act and should not be merely considered as a backdrop for an offense to occur since such an environment may actually stimulate an offender to offend (Clarke 2008, 2009). SCP provides 25 techniques based on these theoretical principles that seek to *increase the effort, increase the risks, reduce the rewards, reduce provocations* and *remove excuses* in any presented opportunity to an offender (Table 1) (Clarke 2008, 2009).

SCP presents a unique and viable approach to limit or halt wildlife-related crimes. By implementing solutions that are locally-targeted, SCP creates the opportunity for preventative approaches to be specifically-tailored to the issues and concerns at a community-level. This is in direct contrast with many of the current wildlife policies that tend to be focused at the international or national-level. Blanket bans on trade are not always good policy. For example, making parrot poaching illegal in Mexico may not reduce

[9] However, like humans, animals may be restricted by physical barriers.

[10] For example, prior to the dissolution of the Soviet Union, the Caspian Sea was governed by two states: Iran and the Soviet Union. The subsequent collapse of the Soviet Union resulted in the Caspian Sea being governed by five independent states (Azerbaijan, Kazaakhstan, Turkmenistan, Russian Federation and Iran) rather than two. Each state, with their own boundaries within the Caspian Sea, differs in administrative and legal definitions as well as resource capacity in the monitoring and surveillance of the sturgeon species that inhabit the Caspian. Moreover, conservation initiatives (i.e. fish hatcheries), regulatory policies (i.e. catch quotas) and measurements in relation to sturgeon species within the Caspian Sea vary from state to state (De Meulenaer and Raymakers 1996; Vaisman 1997; Speer et al. 2000; Graham and Murphy 2007). Despite the socio-political environment, the sturgeon species within the Caspian Sea were *directly* not affected insomuch that their typical activities did not change (i.e. reproductive breeding grounds and feeding groups; movement and passage through the Caspian Sea, etc); however, the sturgeon species were *indirectly* affected by such changes due to the direct effects on the states surrounding the Caspian Sea. Limited resources and lax and corrupt formal enforcement has facilitated an environment where rampant poaching has festered (De Meulenaer and Raymakers 1996; Vaisman 1997; Speer et al. 2000; Shadrina 2007).

[11] This is not to say that *all* individuals are capable of committing all the same types of offenses since individuals may be restricted or limited in their abilities or drives to commit a specific offense (i.e. a graffiti writer may or may not have the necessary tools or abilities to steal a vehicle nor will they necessarily *want* to). Rather, SCP recognizes that if an opportunity to offend is present, *someone*, at any given time, will have the abilities and the inclination to take advantage of such opportunities unless such situations are remedied or alleviated.

Table 1 Techniques of situational crime prevention can be obtained from www.popcenter.org

Twenty five techniques of situational prevention				
Increase the effort	Increase the risks	Reduce the Rewards	Reduce Provocations	Remove Excuses
1. Target harden	6. Extend guardianship	11. Conceal targets	16. Reduce frustrations and stress	21. Set rules
■ Steering column locks and immobilisers	■ Take routine precautions: go out in group at night, leave signs of occupancy, carry phone	■ Off-street parking	■ Efficient queues and polite service	■ Rental agreements
■ Anti-robbery screens	■ "Cocoon" neighborhood watch	■ Gender-neutral phone directories	■ Expanded seating	■ Harassment codes
■ Tamper-proof packaging		■ Unmarked bullion trucks	■ Soothing music/muted lights	■ Hotel registration
2. Control access to facilities	7. Assist natural surveillance	12. Remove targets	17. Avoid disputes	22. Post instructions
■ Entry phones	■ Improved street lighting	■ Removable car radio	■ Separate enclosures for rival soccer fans	■ "No Parking"
■ Electronic card access	■ Defensible space design	■ Women's refuges	■ Reduce crowding in pubs	■ "Private Property"
■ Baggage screening	■ Support whistleblowers	■ Pre-paid cards for pay phones	■ Fixed cab fares	■ "Extinguish camp fires"
3. Screen exits	8. Reduce anonymity	13. Identify property	18. Reduce emotional arousal	23. Alert conscience
■ Ticket needed for exit	■ Taxi driver IDs	■ Property marking	■ Controls on violent pornography	■ Roadside speed display boards
■ Export documents	■ "How's my driving?" decals	■ Vehicle licensing and parts marking	■ Enforce good behavior on soccer field	■ Signatures for customs declarations
■ Electronic merchandise tags	■ School uniforms	■ Cattle branding	■ Prohibit racial slurs	■ "Shoplifting is stealing"
4. Deflect offenders	9. Utilize place managers	14. Disrupt markets	19. Neutralize peer pressure	24. Assist compliance
■ Street closures	■ CCTV for double-deck buses	■ Monitor pawn shops	■ "Idiots drink and drive"	■ Easy library checkout
■ Separate bathrooms for women	■ Two clerks for convenience stores	■ Controls on classified ads.	■ "It's OK to say No"	■ Public lavatories
■ Disperse pubs	■ Reward vigilance	■ License street vendors	■ Disperse troublemakers at school	■ Litter bins
5. Control tools/ weapons	10. Strengthen formal surveillance	15. Deny benefits	20. Discourage imitation	25. Control drugs and alcohol
■ "Smart" guns	■ Red light cameras	■ Ink merchandise tags	■ Rapid repair of vandalism	■ Breathalyzers in pubs
■ Disabling stolen cell phones	■ Burglar alarms	■ Graffiti cleaning	■ V-chips in TVs	■ Server intervention
■ Restrict spray paint sales to juveniles	■ Security guards	■ Speed humps	■ Censor details of modus operandi	■ Alcohol-free events

the illegal trade by itself and banning the ivory trade did not stop Asian and a few African countries from continuing elephant poaching (Smith et al. 2003; Lemieux and Clarke 2009). From this perspective, wildlife crimes are no different than ordinary crimes from the perspective of situational crime prevention. Opportunistic factors that are facilitating parrot poaching in Oaxaca, Mexico may not be the same in Santa Cruz, Bolivia. Parrot poaching may be contingent on the people, the habitat, itinerant fences,[12] the type of species in the area or the availability of markets nearby (Pires and Clarke In Press b).

To reduce the illicit wildlife trade, it would be necessary to understand the opportunities that arise within each stage of the chain in the context of the local environment. For instance, Lemieux and Clarke (2009) found most countries in Africa gained elephants after CITES banned the trade in ivory in 1989. However, four countries experienced declines in elephant populations after 1989 which was mostly due to the "presence of unregulated domestic ivory markets in and near countries with declines in elephant populations" (Lemieux and Clarke 2009: 451). The accessibility to numerous markets appears to be a vital incentive to continue elephant poaching and to easily dispose of ivory. Therefore, eliminating unregulated markets may have the biggest impact on saving the African elephant in conjunction with an international ivory trade ban.

Case Studies

This next section will explore three different wildlife crime issues in which the illegal trade is diminishing the populations of species dramatically. The first case study will focus on the illegal parrot trade that is largely found in the neo-tropics. The second study will examine the procurement and trade of wildlife skins and how communities in Central Asia and South America have been able to successfully reduce the poaching of animal species for their skins. Finally, the last case study will examine illegal, unreported, and unregulated (IUU) fishing, specifically focusing on small-scale/artisanal fishing. Each of these cases studies will detail the problems at hand, and outline innovative small-scale conservation solutions that show promise in reducing the poaching and exploitation of species through the lens of SCP.

The Illegal Parrot Trade

The global illegal parrot trade has contributed to endangering a significant proportion of parrot species, making parrots the most threatened bird species in the world (Juniper and Parr 1998; Wright et al. 2001). The risk of extinction for many of the 330 parrot species found around the world is fuelled by the demand for parrots as household pets (Howell and Webb 1995; Juniper and Parr 1998; Cantu et al. 2007). In response to this vast demand, an array of laws and international conventions forbids parrots from being killed or being taken from the wild. One of these laws was the Wild Bird Conservation Act (WBCA) which was passed by the U.S. Congress in 1992. This act made it illegal to import wild parrots from the neo-tropics and immediately reduced the illegal parrot trade coming into the United States (Armstrong et al. 2001; Pain et al. 2006). International conventions like CITES have also been able to reduce the international trade in wild parrot species, but cannot regulate the domestic trade. Recent evidence shows most of the illegal parrot trade is fuelled by

[12] Itinerant fences are middlemen who go from town to town to acquire poached species in order to fence it off to an illegal market or higher middleman (Pires and Clarke In Press b).

internal markets within neo-tropical countries and not international markets as popular opinion suggests. For example, illicit pet market research in Peru and Bolivia as well as interviews with parrot trappers in Mexico reveals tens of thousands of parrots are annually poached in each country for local and regional demand (Cantu et al. 2007; Herrera and Hennessey 2007; Gastanaga et al. 2010).

Poaching for the illegal parrot trade continues in range states because: (1) parrots are abundant in the wild and it is fairly easy for peasants to poach and dispose of them for money; (2) local demand is high; (3) and it is highly unlikely poachers and traders would get caught by authorities (Pires and Clarke In Press a, b). Wild parrots are commonly sold in open-air markets in cities throughout the neo-tropics without interference from law enforcement. Police tend to cast a blind eye towards illegal pet markets given their perception that it is a relatively minor offense (Herrera and Hennessey 2007). Even when law enforcement has taken the illegal parrot trade more seriously, very little of the trade has been reduced. For example, in Mexico, law enforcement has only stopped what represents one to two percent of all illegal parrot poaching on an annual basis (Cantu et al. 2007). This comes as no surprise; the reactive-policing model of catching offenders in the act will not be enough to significantly reduce the illegal trade.

Recent criminological analyses of the illegal parrot trade in the neo-tropics have shown wildlife crimes such as poaching, are influenced by environmental factors much like traditional property crimes. In the first criminological study of the illegal parrot trade, Pires and Clarke (In Press a) applied the CRAVED Model (Clarke 1999) to better understand poaching variation of Mexican parrot species. The acronym CRAVED - concealable, removable, available, valuable, enjoyable, disposable - helps explain why some products are stolen in much higher quantities than others. Exploratory research so far suggests environmental factors like *availability* plays a large part in parrot poaching variation in two different neo-tropical countries. In both Mexico and Bolivia, parrot species that were more accessible[13] and abundant in the wild were more likely to be poached. In Mexico, it was also found that parrot species that nested closer to the ground (i.e. removable) were also significantly more likely to be poached in greater numbers (Pires and Clarke In Press a, b).

The illegal parrot trade presents itself as a conservation problem that needs alternative solutions in order to reduce the illegal trade within range states. Trade bans and regulatory schemes have already been implemented and the illegal parrot trade continues in an unsustainable fashion. Many of the possible solutions to this problem can be summarized as incentivizing locals not to poach as well making it more difficult to poach parrots in the wild. In regards to the latter approach, in areas where parrot poaching is concentrated, possible solutions to reducing poaching include: removing ladders from trees; keeping a watch out by citizens/police during breeding periods[14]; shutting down illegal pet markets; and CCTV for the most poached species (Pires and Clarke In Press a, b). The 80-20 concentration, i.e. a small set of species accounts for most of the parrots poached (Clarke and Eck 2005), of parrot species was a particularly interesting finding in both Bolivia and Mexico. In Mexico, it was found that 27 percent of Mexican species made up 88 percent of all poached parrots while in Bolivia, 13 percent of Bolivian parrots made up 83 percent of all Bolivian parrots found on an illegal pet market (Pires and Clarke In Press b). Concentrating preventive resources to target the most poached species may garner the most gainful reductions in poaching.

[13] Accessibility was measured as the proportion of parrot species ranges that inhabited non-rainforest areas as well the average human population within each species' range.
[14] Breeding periods for parrot species generally last 2-3 months the same time every year.

Another solution to the tragedy of the commons problem would be increasing eco-tourist lodges. An eco-tourist lodge has an explicit interest in conserving wildlife around it in order for it to stay in business and attract tourists. If poaching is mostly done by locals, then the solution to prevent poaching is to incentivize locals to not only abstain from poaching, but to become capable guardians as well. Eco-tourism has the potential to do both by hiring locals (i.e. economic incentive) and to police the wilderness to deter poachers (i.e. capable guardianship).

For the past few decades, eco-tourist lodges have sprung up in developing nations where biodiversity is rich with exotic species. Some eco-tourist lodges have specialised in focusing exclusively on parrots, such as the Macaw licks in Peru. These particular clay-licks in Peru attract Macaws on a daily basis in order for these parrots to obtain sodium that they lack in their vegetarian diet (Powell et al. 2009). Such eco-tourist establishments have built a business around a species' daily activity in order to guarantee tourists an up-close view of a species that is notoriously difficult to spot in the wild (Pires and Clarke In Press a). Additionally, another factor influencing where eco-tourist businesses should be developed would be whether such areas are rich in diverse species of a particular animal. For instance, in Mexico, there is some evidence that areas richest in parrot diversity are also areas where parrot poaching is more prominent. This makes sense because poachers would have more incentive in these areas to exploit parrots given the wide range of species they can capture and sell to middlemen. Thus, to avoid the tragedy of the commons, it may be highly beneficial to introduce an eco-tourist lodge in these specific areas to incentivize locals to protect parrots and increase capable guardianship. Figure 1 shows three areas of Mexico that have the highest concentration of different parrot species (reprinted from Pires and Clarke In Press a). Establishing an eco-tourist lodge in any of these three areas may be able to reduce poaching in the immediate area while employing locals.

Wildlife Skins

While the global market for wildlife skins has traditionally been driven by the international fashion industry and for ornamental purposes (EIA 2004, 2006; Roe 2008), evidence indicates that other factors, including local human-animal conflict, have also contributed to global wildlife skins market. Big cats, such as snow leopards, have been targeted by local herders in response to the animals hunting their livestock (Jackson and Wangchuk 2001a, b; Hussain 2003; Mishra et al. 2003; Theile 2003; Bagchi and Mishra 2006). Variability in the drivers for the wildlife skin market demonstrates the necessity of assessing whether the poaching of a species is market-driven (both legal and illegal) or due to other local-level dynamics.

The snow leopard[15] can be found in several regions in Central Asia and is listed in Appendix I within CITES[16] (Hussain 2003; Theile 2003). The largest threat to the existence of the snow leopard is the retaliatory killing by herders and farmers in response to the snow leopard killing their livestock (Jackson and Wangchuk 2001a, b; Hussain 2003; Mishra et al. 2003; Theile 2003; Bagchi and Mishra 2006). In addition to this threat, snow leopards are also directly targeted for their skins.[17] As a result of the

[15] Specifically the *Uncia uncia* and the *Panthera uncia.*

[16] Species that are in Appendix I of the CITES agreement cannot be legally poached or traded, unless they are permitted to be bred in captivity.

[17] Hussain (2003) found that poachers used leg snares during the winter (when the snow leopards would come near the villages) to trap the animal and kill it in a way that did not damage the pelt. The primary goal of these individuals was to secure the pelt rather than protect their livestock.

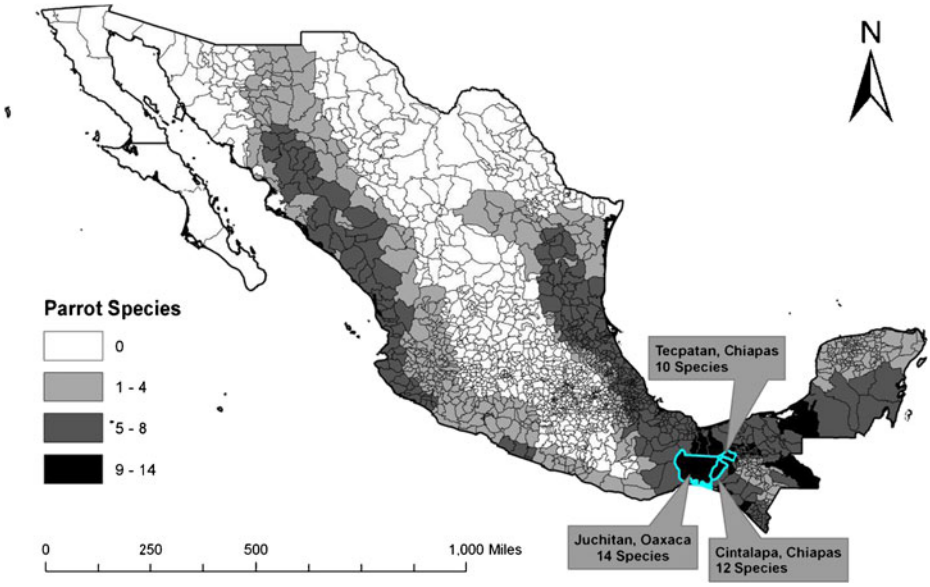

Fig. 1 Numbers of parrot species within Mexican municipalities. Three areas with the highest concentration

antagonism towards snow leopards, retributive killing and poaching are both considered to be beneficial, as the elimination of snow leopards helps sustain the livelihoods of rural communities by protecting livestock and also generating secondary sources of income (Hussain 2003; Theile 2003; Bagchi and Mishra 2006). The plight of the snow leopard highlights the difficulties of sustainable management programmes that attempt to ensure the survival of a *predator* species that explicitly cause strain upon rural communities.

Despite the difficulties in implementing community-level management programmes in such hostile environments, promising attempts have been made. In Mongolia, for example, as a response to the recognition of local communities receiving low-returns in their selling of raw animal products (i.e. camel wool), a community-based conservation programme known as *Snow Leopard Enterprises* was created to facilitate opportunities for rural community members to increase their income by teaching them how to produce hand-made woollen goods. What is unique about the programme is that the community as a whole was required to agree and follow specific rules of conduct regarding the protection of the snow leopard and their prey in order to receive the training and equipment needed in order to participate in the programme (Mishra et al. 2003; Theile 2003; Snow Leopard Trust 2010[18]). In return, the majority of the sales from goods sold were returned to the community with an additional 10% of the profits allocated to a conservation fund (Mishra et al. 2003; Theile 2003; Snow Leopard Trust 2010).

[18] For current information, visit: http://www.snowleopard.org/

In India, the *Traditional Village Homestay* pilot programme was established in 2001 in Hemis National Park as a means for local communities to gain direct benefits through ecotourism (LEDeG Centre 2001; Theile 2003; Snow Leopard Conservancy 2010). Surrounding local communities were provided training and support to house foreign tourists who were visiting Hemis National Park in homestays; thus, creating an economic incentive for the protection of snow leopards that inhabit the park. In addition, local herders were trained in effective livestock protection (Theile 2003; Jackson and Wangchuk 2004). Acknowledging the concerns of rural herders within Hemis National Park,[19] the programme also focused on protecting livestock from predators like the snow leopard. The programme utilized community members and other institutions in the creation of predator-proof corrals in 2000 alleviating the need for herder retribution (Jackson et al. 2002; Theile 2003; Jackson and Wanchuk 2004).

Other types of community-based sustainable management programmes in Latin America have been utilized in addressing peccaries and crocodilian species. An approach that has been utilized in Peru in order to control the hunting of peccaries[20] in the region is to *certify* the skins that are obtained from communities who participate in sustainable management practices (Bodmer et al. 2004a, b; Roe 2008; The Peccary Pelt Certification Project 2010). In other words, the skins are labelled and documented as being obtained in a permitted manner increasing their value on the international market. While skin trading is not the driving reason for the harvesting of peccaries,[21] the certification programme enables communities participating in sustainable harvesting to benefit from the profitable international sales of the skins. Furthermore, the project not only provides an increased economic incentive for the rural communities involved to practice sustainable hunting (as opposed to unsustainable and unregulated bush meat hunting), but it also incorporates community members as valuable stakeholders in the management of the peccary populations (Bodmer et al. 2004a, b; Roe 2008; The Peccary Pelt Certification Project 2010). Recognizing community members as important stakeholders' results in individuals establishing a sense of ownership, which is a necessary component in the investment in the sustainability of peccary populations.

Local community members are not the only ones who benefit as the certification project directly affects all those involved in the manufacturing and distribution of the skins as well. For example, hunters believe that such a programme will result in higher quality preparation resulting in greater returns (Roe 2008). Additionally, the certification of the peccary skins results in the continued (and possibly increased) business interests for the middlemen (who supply the skins to the national tanneries[22] from indigenous and non-indigenous communities) and national tanneries (who tan/manufacture the skins and export to international tanneries in Europe) (Bodmer et al. 2004a, b; Roe 2008; The Peccary Pelt Certification Project 2010).

[19] Hemis National Park is home to 16 small human settlements (Theile 2003).
[20] Specifically, the White-lipped Peccary (*Tayassu pecari*) and the Collared Peccary (*Pecari tajacu*) (Roe 2008; Bodmer et al. 2004a, b).
[21] The main reason is the consumption and sale of peccary meat in local domestic markets (Bodmer et al. 2004a, b).
[22] Tanneries are responsible for "rehumidifying, degreasing, and chrome tanning" the skins (Bodmer et al. 2004a, b: 203).

Illegal, Unreported and Unregulated (IUU) Fishing

Simply due to its reach and the extent of the market, illegal, unreported and unregulated (IUU) fishing is one of the most damaging examples of wildlife crime.[23] IUU fishing is a global problem and thought to make up a considerable amount of the total annual global catch (Bray 2000; EJF 2007; Le Gallic 2008; EJF 2007, 2009). Doulman cautions (2000) that, "to a greater or lesser extent, illegal, unreported and unregulated (IUU) fishing is found in all capture fisheries, irrespective of their location, species targeted, fishing gear employed or intensity of exploitation" (n.p.). IUU not only destabilizes sustainable management of global marine fisheries (Doulman 2000; Baird 2006), but it directly affects the lives of fishermen who live in impoverished rural coastal villages who rely on marine wildlife for sustenance, employment and income and whose waters are purposely targeted due to lax surveillance, monitoring, and limited resources (MRAG 2005; HSTF 2006; EJF 2009). Additionally, the ecological impacts of IUU fishing (i.e. unintended by-catch of other marine species[24]) are also difficult to determine but are believed to be considerable (EJF 2005; Kelleher 2005; Davies et al. 2009).

Formal enforcement and surveillance is extremely difficult to conduct as a result of the area in which IUU fishing can occur (two-thirds of the Earth's surface is covered by water). Differences in resource capabilities between states (i.e. developed compared to underdeveloped) in their ability to monitor their Exclusive Economic Zones[25] (EEZ); jurisdictional and administrative barriers; disparities between legal definitions regarding IUU fishing and; the lack of uniformity related to issues on 'high-seas' IUU fishing all impede effective monitoring and enforcement of the sea (HSTF 2006; OECD 2006). As such, alternatives based on sustainable management of fisheries may prove to be more effective, especially those that include the rural communities. In fact, since 95% of the 30 million fishers in the world live in developing countries, such an approach is required (Mathew 2000).

Before outlining some examples of sustainable management of fisheries, it is important to differentiate between small-scale/artisanal and industrial fisheries. Small-scale/artisanal fisheries are characterized by local-level fishing established by and/or conducted through coastal village fishermen. Such fisheries use simple technology and equipment and the catch is typically used for consumption or domestic trade.[26] Industrial fisheries, on the other hand, are larger fishing entities that use superior equipment and vessels to catch a significant amount of fish for domestic and international trade (Mathews 2003; FAO 2010). For the purposes of this article, only small-scale/artisanal fisheries will be discussed.

[23] As described by Baird (2006: 9), IUU fishing encompasses the some or all of the following: (1) fishing within the exclusive economic zone (EEZ) of a state without the authorization of the coastal state; (2) fishing within a Regional Fisheries Management Organizations (RFMOs) area of application by a fishing vessel associated with a contracting party; (3) fishing in direct breach of national or international requirements or laws; (4) fishing within a RFMO area of application by a fishing vessel that is not associated with a state or associated to a non-contracting party which is in direct conflict with conservation and management measures of the relevant RFMO; (5) fishing on the high seas without flag state authorization and; (6) over-exploitation due to unreported or misreported catches.

[24] Although see Davies et al. 2009 for an attempt to estimate such figures.

[25] Defined as the 200 nautical miles extended from a state's coastline considered to be within its jurisdiction.

[26] See Mathews (2003) for a discussion on possible conceptual differences between small-scale, artisanal and traditional forms of fishing.

Recently, the Food and Agriculture Organization of the United Nations (FAO) has utilized a sustainable livelihoods[27] approach in its Sustainable Fisheries Livelihoods Programme by implementing several projects in rural communities in West Africa. One such example is the project implemented in Aido Beach, Benin. With the involvement of local fishermen in the creation and implementation of the project, the Aido Beach project is attempting to show that seines with larger, two-inch mesh (current seines measure at one-inch mesh) results in the capture of more mature fish (FAO 2003). Such an approach not only results in limiting unintended by-catch of smaller, juvenile fish and smaller fish species, but it also provides a financial incentive by generating higher-value fish yields for the rural fishermen.

In an attempt to stop the overexploitation of species and improve market-value on the coastal village of Kayar, Senegal, local fishermen decided to establish an agreement based on the need to stop "the race to fish" and initiate a more useful means to regulate production through sustainable management measures (Alioune and Catanzano 2005: 152). Such a ground-level approach is interesting for a few reasons. First, and foremost, the agreement was instigated by the locals themselves and was not as a result of external forces. Second, the management approach reduced stress and conflict amongst the fishermen by creating a sales commission to mediate trading and the resources by establishing catch limits. Third, the attention of the fishermen was diverted away from overfishing resulting in increased participation within on-shore communal activities that benefited the community as a whole. In general, the sustainable management measures implemented by the village of Kayar resulted in improved economic gain, increased resource longevity and enhanced communal relations (Alioune and Catanzano 2005).

The last example illustrates an innovative programme that has been created in the *developed* nation of Australia, where overfishing had become common practice. By the 1970s, marine biologists concluded that local fishermen in Port Lincoln, Australia were poaching lobsters. Without any changes to the industry, there would soon be no more lobsters in the area and fishermen would be out of a job. Therefore, the local government privatised the lobster industry so that only a select number of fishermen could purchase 'shares' in order to capture adult lobsters.[28] Since there were only a certain number of shares to go around, the only way to join this industry in Port Lincoln were to buy shares off retiring fishermen. The fishermen had a direct incentive to stay under catch-quotas because the less they fish, the more lobsters that spawn. This meant that when licenced fishermen retired, their 'shares' had increased in value due to an abundance of lobsters in the ocean. Thus, share owners in this lobster fishery had a direct incentive to 'underfish' so that lobster populations could grow. Moreover, such licencing resulted in a local culture that promoted responsible fishing practices. Their collective conservationist behaviour over four decades has brought unprecedented wealth to share owners while keeping lobster populations growing (Tierney 2000). A recent study of 11,135 fisheries around the world substantiates these types of fisheries, otherwise known 'rights-based catch shares', are less likely to fail as compared to non-privatized fisheries (Costello et al. 2008).

[27] The concept of Sustainable Livelihoods attempts to go beyond traditional definitions of poverty and the means to address the issue. It focuses on three main aspects: (1) explicit focus on the abilities of the impoverished to take advantage of economic opportunities; (2) recognize that poverty is not just financial but also includes other factors (i.e. illiteracy, lack of social services, etc) and; (3) acknowledge the inclusion of the impoverished communities in the development of policies and programmes (FAO 2010; Krantz 2001).

[28] These shares are officially called Individual Transferable Quotas (ITQ).

Summary

Community-based sustainable management programmes provide an alternative to formal enforcement and surveillance in addition to international and domestic regulatory schemes. Operating within the context of local communities, such programmes directly involve community members as key stakeholders in the management of resources. The successful studies discussed in this article highlight the importance of including local communities and community members in the creation, implementation and subsequent evaluation of sustainable management policies and programmes. Indeed, it is argued that without the insight and inclusion of locals, the implementation of most programmes and policies that attempt to sustain and manage resources will be undermined and ineffective. Problems arise especially when conflicting perspectives clash as in the case of snow leopards and herders discussed earlier. The recognition of locals as stakeholders results in a greater understanding of the issues related to sustainable management at a ground-level, acknowledgment of the varying definitions of 'success' and the establishment of ownership for those directly involved.

Related to this, the surrounding socio-cultural environment must also be assessed and a programme or policy be created specifically-tailored to that location or region. SCP highlights the importance of focusing on specific problems at specific areas for other issues in criminal justice, such as drug markets, burglaries and robberies to name a few. Such recommendations can also apply to conservation criminology and wildlife crimes. While the actual programmes discussed in this article may be utilized in other regions and species, it is cautioned that policy-makers take heed of the underlying factors that have led to the success of such programmes and not the components themselves. In other words, policy-strategists must assess similarities and differences between contexts and species and create programmes based on the driving aspects that have led to the successful implementation of the aforementioned programmes.

For example, the programmes implemented in Mongolia and India is an example of *reducing the provocation* and *removing the excuses* related to retaliatory killing of snow leopards (Table 2). Further, by creating an environment where locals can profit from the sustainable management of the snow leopards, poachers who seek the skins of the snow leopards may have *increased risks* as a result of more informal supervision and sanctions from within the community. In regards to the peccary skin trade in Peru, the certification of peccary skins results in *increasing the effort* for poachers to move the product while simultaneously *reducing the rewards* since their product will be considered of less quality. The inappropriate use of seines in Aido Beach are addressed and the *excuses* and misconceptions related to erroneous beliefs that smaller mesh results in greater total catches is refuted and the benefits of alternatives are provided. Lastly, the communal consensus to stop 'the race to fish' in Kayar implicitly *reduces the provocation* and *the excuse* for fishermen to overexploit resources in response to other locals.

In the Port Lincoln experiment, a lobster industry in a developed country shows that preserving species and making a good living as a fisherman are not mutually exclusive. By privatising the lobster industry, Port Lincoln's experiment *increased the risk* and *effort*, while *removing excuses* (i.e. freeloader problem) for fishermen that were poaching lobsters and ultimately turned the tide against poaching. For sedentary marine species like lobsters, privatising fisheries may be able to counter the issue of overfishing with the informal social control a 'rights-based catch shares' programme instils. At the same time, this approach may not be viable in more underdeveloped countries where access to fishing will be severely limited to a select number of fishers, excluding many who may not have other means to obtain steady income.

Table 2 Summary table

Summary of case studies

Programme	Location	Response	SCP technique
CASE STUDY 1			
Eco-Tourist Lodge	Peru	Clay-licks in Peru are a favorite destination for Macaws throughout the year. Eco-tourism in such areas can economically exploit the visibility of parrots up-close, while incentivizing locals to abstain from poaching parrots given the ability to create jobs locally.	*Increase risks* (extend guardianship, strengthen formal surveillance) *Reduce rewards* (disrupt markets)
CASE STUDY 2			
Snow Leopard Enterprises	Mongolia	Community-based programme that focused on teaching rural community members how to make hand-made woollen goods to increase income. Training and equipment provided only if community agreed and followed protection of snow leopard and prey.	*Increase risks* (extend guardianship, assist natural surveillance) *Reduce provocation* (reduce frustrations and stress) *Reduce excuses* (set rules, assist in compliance)
Traditional Village Homestay	India (Hemis National Park)	Training and support provided to surrounding communities around Hemis National Park to house foreign tourists. Created incentive for protection of snow leopards that inhabit the park by having a vested interest in eco-tourism. Also, erected predator-proof corrals to alleviate herder retribution for livestock killings.	*Increase risks* (extend guardianship, assist natural surveillance, utilize place managers) *Reduce provocation* (reduce frustrations and stress) *Reduce excuses* (set rules, assist compliance)
The Peccary Pelt Certification Project	Peru	Skin certification programmed created to certify skins from communities that practice sustainable management. Certification helped increase market value. Enabled local communities to benefit from profitable international sales thus providing economic incentive to locals.	*Increase the effort* (screen exits) *Reduce rewards* (identify property, deny benefits)
CASE STUDY 3			
Aido Beach Project	Benin	Incorporated local fishermen in the creation and implementation of a sustainable management programme that promoted the benefits of using two-inch mesh seines rather than one-inch mesh. Reduced unwanted by-catch and generated be higher-value fish yields.	*Remove excuses* (set rules, alert conscience)
Local-level regulatory programme	Senegal	Locally-initiated sustainable management programme based on catch-quotas and centralized sales.	*Reduce provocations* (reduce frustrations and stress, neutralize peer pressure, discourage imitation) *Remove excuses* (set rules, alert conscience)
Rights-based catch shares	Port Lincoln, Australia	By privatizing the local lobster industry, lobster fishers were incentivized to catch less lobsters, resulting in a growing lobster population and more profits for licensed fishers.	*Increase risks* (assist natural surveillance) *Increase effort* (control access) *Remove excuses* (set rules)

Research on the illegal parrot trade reveals that policy-makers can tackle the issue in two distinct ways: (1) make it harder to poach and trade parrot species by use of situational crime prevention techniques that *increase the risk* and *efforts*; and (2) provide financing for local entrepreneurs to create eco-tourism that can *reduce the rewards* of poaching local species. Despite a lack of empirical studies testing such small-scale solutions in their effectiveness to reduce parrot poaching, they conceivably should be able to reduce poaching in highly targeted areas.

By no means are these case studies an exhaustive list of alternative conservation solutions. These case studies are just snapshots of innovative ways that can overcome the tragedy of the commons and profit off natural resources in a sustainable way.

Conclusions

The illegal wildlife trade is a large industry that has been estimated in costing between $9 - 20 billion annually, excluding fisheries and timber (Brack 2004; Barber-Meyer 2010; Wilson-Wilde 2010). While it has fed and clothed many of the poorest people in the world, it has also brought many species to the brink of extinction. Biological conservationists and animal activists have, up to this point, been at the forefront in the push to curb poaching and the global illegal wildlife trade. While their participation has contributed greatly for the struggle to draw attention to and provide responses that address wildlife-related crimes, direct involvement of criminologists is needed. Arguably, criminologists may be able to provide a perspective to address wildlife-related crimes that is disconnected from the ideological rhetoric which may be present amongst such circles, hindering objective policy implementation and analysis. For example, the belief that trade bans implemented by CITES or nations will automatically reduce the poaching of a species and the subsequent trade, has yet to be confirmed systematically by empirical research.

This is not to say that criminologists are not driven by ideology or that criminological research is not value-laden; rather, that the input of criminologists is enough removed from conservation-related agendas to provide insight that might otherwise be neglected. As a discipline, criminology is shifting from an era of ideologically-driven policies to those based on theory and empirical evidence. The promotion of evidence-based policies and research is at the centre of criminological inquiry and criminologists are especially aware of the detrimental effects of policies premised on beliefs *rather* than on evidence. With the involvement of criminologists in researching wildlife crimes, more viable solutions can be developed and implemented that help facilitate persons to sustainably trade species as well as prevent poaching and the subsequent illegal trade. As described in this paper, SCP is one possibility in which criminologists can be directly involved.

Additionally, specific nuances that have been identified in crime prevention can also be addressed as they relate to the illegal wildlife trade. Issues related to crime displacement (i.e. the notion that if crime is prevented in one setting with a particular species, crime may re-appear elsewhere, or with other species) (Cornish and Clarke 1987; Eck 1993) and potential *diffusion of benefits* (i.e. crime reductions spread beyond the immediate target, which is the largest benefit of introducing preventive measures) (Clarke and Weisburd 1994; Ratcliffe and Makkai 2004; Guerette and Bowers 2009) must be assessed in order to determine whether responses have deleterious (or beneficial) results. Indeed, it is argued that successful and effective responses in one context may result in the formation of new techniques, modes of transportation and/or transportation routes, targets and settings that can be manipulated and exploited by poachers, manufacturers, transporters, buyers and sellers.

This reality calls attention to the importance of critically assessing how wildlife issues are defined, prioritised and investigated, as well as how such issues are dealt with. Indeed, current top-down approaches that emphasize state-level concerns (i.e. expanding foreign exports and imports; increasing state security against smuggled contraband) may ignore how policies affect impoverished rural communities, as well as the natural resources that such policies are attempting to protect and/or manage sustainably (Salagrama 2005). Policy-strategists are ethically responsible in the implementation of responses; therefore, it is imperative that responses are specifically-tailored to particular species and/or to the contraband sought, the locations and settings where wildlife is illegally captured, manufactured and transported, the individuals' committing such offenses and the surrounding socio-culture context. For example, the reactions of individuals in rural communities regarding the involvement of outside authorities needs to be considered since such individuals may be weary of outside interference (Cebulak 2004; Franzen 2010). By failing to consider such factors, preventative measures and sustainable forms of management may be undermined resulting in less effective or ineffective remedial solutions. Even worse, the inability to acknowledge cultural customs may inadvertently result in the criminalisation of common practices which are not deemed to be detrimental to the protection of specific species (i.e. the hunting of small game in newly created national parks) (Duffy 2010).

Related to this is the importance of recognising the various conceptualizations of what a 'successful' policy to address wildlife crimes would be. Bostock (2005) describes at least three dimensions related to sustainable fisheries management, which could also translate to other wildlife issues: (1) biological (i.e. achieving conservation objectives; increasing species populations); (2) economic (i.e. achieving fiscal goals) and; (3) social (i.e. achieving equality in distribution and access). 'Success' will be envisioned by different stakeholders in a multitude of ways and it is imperative that such outputs of success are identified at the onset of policy or programme development. By classifying what a policy or programme intends to do, how it intends to do it and how to determine if it has been done, policy-strategists and researchers will be able to provide more comprehensive, theoretically-grounded evaluations producing more meaningful insight.

In addition, the practice of defining 'success' will also require the defining of the 'costs' related to a particular policy or programme. By conducting a cost-benefits analysis of a policy or programme, policy-strategists and researchers will be able to determine whether the costs (i.e. financial, time invested by locals) of a specific policy or programme is acceptable compared to the returned benefits. Such assessments may be especially needed in regions that require low-costs approaches to wildlife management due to a lack of resources.

Lastly, one of the goals of this article is to provide criminologists some insight on how to tackle wildlife crimes within multiple contexts. In the case studies covered, research indicates incentivising locals to preserve wildlife is one of the best solutions in tackling the tragedy of the commons dilemma. With photogenic species like parrots, elephants and snow leopards, eco-tourism can be a viable solution in reducing poaching in the immediate area of an eco-tourist lodge. Eco-tourism also hires locals which can lead to community passion to protect and appreciate biodiversity as seen in countries such as Costa Rica. Another approach in incentivising locals to preserve wildlife can be seen with privatising fisheries. Despite convincing evidence that rights-based catch shares can reduce poaching and allow species to re-populate, political will is still needed in these contexts to implement such policies. Therefore, in some situations, conservation criminologists must be able to think of multiple ways of reducing poaching given that local stakeholders may not be accepting of some approaches.

Acknowledgements The authors would like to extend their gratitude to Dr. Ronald Clarke of Rutgers University – Newark for his guidance and critical feedback. Also, they are indebted to Phyllis Schultze of the Don M. Gottfredson library for her tireless efforts in finding resources, many of which were beyond criminological sources. The authors are responsible for any errors.

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