Prevention of Poaching

Frank van Langevelde and Ignas Heitkönig

Herbert Prins, Henjo de Knecht, Mina Abosetta
• Why bother about wildlife crime?
• Ways to prevent poaching
• Development of Smart Park
1. Drugs
2. Counterfeiting
3. Humans
4. Oil
5. WILDLIFE

Illegal trade of wildlife is the world’s 5th most lucrative criminal industry.
WILDLIFE CRIME INCLUDES

BADGERS
Illegal disturbance and killing of and/or destruction of their setts

MARINE LIFE
Reckless/intentional disturbance of seals and basking sharks

NESTING BIRDS
Reckless/intentional disturbance.

FISH
Illegal taking (i.e. poaching), use of nets, or out of season

BATS
Illegal disturbance of roosts and killing

NON-NATIVE SPECIES
Release/allowing to escape into the wild

WILDFLOWERS
Illegal uprooting of wildflowers

INTERNATIONAL TRAFFICKING
Illegal trade in protected species or their constituent parts

DEER
Illegal taking/killing (i.e. poaching)

BIRDS OF PREY
Illegal killing

TRAPS
Illegal use
Why bother about wildlife crime?

![Graph showing the recorded number of rhinos poached in South Africa from 2007 to 2015.](image)

![Infographic showing African and Asian rhinos.](image)
Illegal killing for ivory drives global decline in African elephants

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\begin{itemize}
  \item Tanzania elephant population, 1979: 31,600 elephants
  \item Tanzania elephant population, 2019: 50,600
\end{itemize}
Species have an ecological function in ecosystems

- Large animals (elephant, tiger, rhino) often have more than proportional impact
- Their decrease changes the landscape

**Keystone species**

Keystone is essential support at top of arch
Example 1: Elephant as architects
Asner and Levick (2012)

Figure 1 (a) Map of the Kruger National Park (inset with South Africa) showing the location of four study landscapes against a backdrop of granite and basalt substrates. (b) An example LiDAR detection of a single tree crown in 2008 then toppled by 2010. A termite mound is visible to the left of the tree. (c) A small subset of the Nkuhlu landscape (Table 1) where the exclosure fence separates areas protected from elephant on the left from those accessible by elephant on the right. Trees lost between 2008 and 2010 are shown in red.
Figure 3 (a) Changes in the height of 58,429 trees between April 2008 and 2010. Green dots indicate the trees with full exclosure protection. Red dots are trees found in the landscape accessible to herbivores. (b) Percentage change in the number of trees on the landscape, partitioned by individual canopy height.
Impact elephant → increase forage availability
Elephant density (#/km²)
Example 2: Rhino as bulldozer

Grazing lawns: large grazers facilitate smaller grazers
Figure 3. The proportion of short grass (<7 cm DPM reading) around removed and control wallows in both Hluhluwe and iMfolozi. Bars represent the mean and whiskers the standard error.

Waldram et al. (2008)
Figure 4. The relative herbivore pressure, measured by the number of dung piles, around control (dark grey) and Rhino removal (light grey) wallows in a mesic (Hluhluwe) and a semi-arid (iMfolozi) savanna for (A) Impala, (B) Wildebeest, (C) Zebra and (D) Buffalo. Bars give the mean amount of dung and whiskers give standard error. Wilcoxon test result is indicated in the upper left corner, with significant results ($P < 0.05$) marked with an *, and non-significant results marked with an O.
Example 3: Seed dispersers
Poaching of keystone species: cascading effects on ecosystems
Why bother about wildlife crime?

Disruption of Rhino Demography by Poachers May Lead to Population Declines in Kruger National Park, South Africa

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Why bother about wildlife crime?

Recorded number of rhinos poached in South Africa

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Rhinos Poached</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>13</td>
</tr>
<tr>
<td>2008</td>
<td>83</td>
</tr>
<tr>
<td>2009</td>
<td>122</td>
</tr>
<tr>
<td>2010</td>
<td>333</td>
</tr>
<tr>
<td>2011</td>
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<tr>
<td>2012</td>
<td>668</td>
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<tr>
<td>2013</td>
<td>1,004</td>
</tr>
<tr>
<td>2014</td>
<td>1,215</td>
</tr>
<tr>
<td>2015</td>
<td>1,175</td>
</tr>
</tbody>
</table>
Reproduction rate (number of young per year):

6-8% of 20,000 = 1200-1600 young per year
Enormous efforts resulted in slower increase or even decrease?
Wildlife crime: high profit – low risk business
Dad, I'm considering a career in organised crime.

Government or private sector?
How to reduce wildlife crime:

• Stop poaching
• Stop trafficking
• Stop demand
Assumption: when people are poor and no job $\rightarrow$ easily attracted to crime

In developed counties is less crime than in poor countries?

- Wildlife crime is organized crime
- Top of crime chain in developed countries
- “Risky” part of crime is done by relatively poor people (that are found in all societies)

Proposition: we have to attack the top of crime chain (big bosses, middle men and corrupt officials)
Stop demand

- Ultimate solution
- But takes a lot of time
- We do not have this time!
Stop trafficking

• CITES is international treaty to protect wildlife against over-exploitation, and to prevent international trade from threatened species

• Because of CITES: illegal trade & illegal trade routes

• CITES is inadequate (because of loopholes in laws): requires coherent set of laws between countries

Can we stop smuggling of drugs?
Legalization of trade in wildlife

Together with
- Legal supply (breeding rhino horn)
- Trade regulation

Pros:
- Presumably reduces poaching
- Increases revenues that can be used for conservation
- Helps people out of poverty

Cons:
- Stimulates laundering (Russian caviar)
- Increases global trafficking
- Likely increases crime
- Trade regulation depends on capacity to monitor and enforce restrictions
Analogy legalizing prostitution

In 1997 survey (Weitzer 2000)
- 73% of Dutch citizens favoured legalization of brothels
- 74% said that prostitution was an “acceptable job”

Prostitution is legal and regulated

In last few years, lot of brothels and "windows" closed because of suspected criminal activity

Authorities fear that business is out of control:
"We've realized this is no longer about small-scale entrepreneurs, but that big crime organizations are involved here in trafficking women, drugs, killings and other criminal activities“ (Job Cohen, former mayor of Amsterdam)
Stop poaching: prevent that animals are shot or caught

- Impede poachers
- Involve local communities
- Reduce value wildlife
Stop poaching: prevent that animals are shot or caught

Dynamic “game” where poachers are continually responding to advances (e.g. in technologies)
“Now here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that”

from *Through the Looking-Glass, and What Alice Found There* (1871) by Lewis Carroll
Impede poachers

- Protect areas: fencing
- Detect poachers quickly: patrolling intensely

Translocation

Technological innovations: drones

Involve local communities

- Provide alternative income: alleviate poverty
- Make local community stakeholders
- Increase ‘eyes’ and ‘ears’ by informer network

Reduce value wildlife

- Flooding the market
- Decrease value of wildlife
Impede poachers

Protect areas: fencing

Detect poachers quickly: patrolling intensely

Translocation

Technological innovations: drones
• For large parks like Kruger National Park: many fences (> 1000 km)

• Limits animal movement
Militarization of wildlife protection

- Kruger since 7-8 years: increased presence of army
- Still poaching is going on
- From 2014: defended like a fortress
• Very stressful
• Too many animals to apply it effectively
UAVs bring hope for rhinos
Crashes are frequent, equipment breaks down

Limited by rain or high wind

Detecting poachers is difficult from the air (they can hide)

Trade-off between height of flight and precision

Battery problems

Not allowed in many places

At the moment: extended eyes of the rangers (few km, mainly during day)
**Bears Show a Physiological but Limited Behavioral Response to Unmanned Aerial Vehicles**

**Graphical Abstract**

- Bears outfitted with GPS-collars & cardiac biologgers
- Unmanned aerial vehicle flown over free roaming bears

![Graphical abstract](image)

- Bear heart rates indicated a stress responses during all flights
- In one instance, a 123 bpm increase from resting rate was observed
- Flights rarely (11.1%) induced a measurable change in movement behavior

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**In Brief**

Unmanned aerial vehicles (UAVs; i.e., “drones”) are increasingly popular tools for ecological research. Ditmer et al. used GPS collars and cardiac biologgers to assess effects of UAV flights on free-roaming bears. All bears exhibited a stress response to UAV flights as evidenced by elevated heart rates while rarely exhibiting a behavioral response.
Involve local communities

Provide alternative income: alleviate poverty

Make local communities stakeholders

Increase ‘eyes’ and ‘ears’ by informer network
How effective is making local communities stakeholders in wildlife protection?
Acornhoek 40,000 people
Bushbuckridge Local Municipality 550,000 people

How to make them stakeholders in wildlife protection?
Accelerated Human Population Growth at Protected Area Edges

George Wittemyer,*† Paul Elsen, William T. Bean, A. Coleman O. Burton, Justin S. Brashares*†

Protected areas (PAs) have long been criticized as creations of and for an elite few, where associated costs, but few benefits, are borne by marginalized rural communities. Contrary to predictions of this argument, we found that average human population growth rates on the borders of 306 PAs in 45 countries in Africa and Latin America were nearly double average rural growth, suggesting that PAs attract, rather than repel, rural populations, and these findings provide clues to understanding the relative effectiveness of PA protection worldwide.

The past three decades have witnessed a significant increase in land designation as protected areas (PAs) for nature conservation, with many of these PAs being created in fragmented landscapes, often adjacent to rural communities with populations that are increasingly dependent on natural resources for economic survival. This creates a “buffer” effect where human settlement expansion occurs on the edges of PAs, creating a high rate of rural population growth. While PA establishment aims to protect biodiversity, the edges of PAs have become hotspots for human population growth, suggesting that the relative effectiveness of PAs may be lower than expected, as rural communities often face significant pressures to access natural resources for economic survival.

Our comparison of population growth around the borders of PAs with average rural rates for the same country (11) may present a false picture of human settlement if parks are preferentially placed in areas of high ecological productivity. In such a scenario, humans may settle in the same general region as PAs simply because the land is better for agriculture or natural resource extraction rather than for reasons related to the conservation objectives of PAs. This highlights the need for more integrated approaches to land management and conservation strategies that consider the livelihood needs of rural communities.

Results from this study show that the rate of rural population growth is significantly faster on the edges of PAs compared to average rural growth, indicating that PAs may not be as effective as intended in limiting human population growth. Further research is needed to understand the underlying drivers of this phenomenon and to develop more effective strategies for conservation and sustainable development in these regions.
Reduce value wildlife

Flooding the market

Decrease value of wildlife
Higher price is not effective

When demand is high or inelastic (such as products without acceptable substitutes) = rhino horn & ivory

At low supply: consumers are willing to pay the price

Increase in price does not discourage consumption

Restricting supply (trade restrictions) will raise the price, but do little to lower demand
Lower price is effective?

Many wildlife products are luxury goods characterized by high income elasticity

Income-elastic products: demand increases as incomes rise

Rising consumer income is frequently cited as primary driver of increased demand for wildlife products in South-East Asia (TRAFFIC, 2008)

Now: supply is small, demand is high

Increases in supply will increase demand
Tagging and tracking horns

- Very stressful
- Many animals
Reduce poaching

• No single solution is the panacea
• Integration of methods
• Smart Park
**Smart Park**: early-warning system to detect intrusion of poachers

Through combining high-tech multi-sensor network with animal ecology
Ideal system to prevent poaching

- Early warning
- Non-invasive
- Covering large area
- Continuous monitoring (day and night)
- Not labour intensive
- Combination of approaches
- Easy to use
- Robust (heat, dust, baboons, elephants)
Animals as sentinels

Detection of environmental hazards using animals
When animals behave differently
Animal as sentinels: detection of anomalies in behaviour

Crowd motion analysis
Smart Park

- Design of sensors: low power
- Wireless networks
- Adaptive behaviour: no measuring in absence of activity
- Big data analytics
Reduce poaching

• Wildlife crime seem to decline in Kruger National Park (South Africa) due to anti-poaching efforts

• Replacing the problem
Total number of rhinos poached

- South Africa
- Zimbabwe
- Namibia
- Kenya*
- Others*

2011: 500
2013: 1,000
2015: 1,500

*Provisional numbers for 2015
Step forward

- Poaching is world-wide problem, regardless efforts of rangers, police, army, ...

- No single approach can prevent wildlife crime

- Reduce demand = takes time

- Reduce trafficking = limited success

- Something has to be done NOW
Thank you for your attention!

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