MODERN INTELLIGENCE MEASURES TO COMBAT ANIMAL POACHING: A CONSERVATION & COUNTERTERRORISM STRATEGY

ANGELA J. ANDERSON

A Thesis

Submitted to the Faculty of Mercyhurst University

In Partial Fulfillment of the Requirements for

The Degree of

MASTER OF SCIENCE
IN
APPLIED INTELLIGENCE

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DEDICATION

I would like to dedicate this thesis to my amazing mother and my darling puppy. Not only have they been there throughout this thesis process, they have supported me in everything I have done. For that, I cannot love or thank them enough.

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ABSTRACT OF THE THESIS

Modern Intelligence Measures to Combat Animal Poaching:

A Conservation & Counterterrorism Strategy

A Critical Examination

By

Angela J. Anderson

Master of Science in Applied Intelligence

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Professor Dawn M. Wozneak, Chair

This thesis explores nuanced intelligence techniques and technologies currently implemented by analysts, rangers, anti-poaching units, and governments to combat the growing problem of animal poaching. It explores how these new intelligence methods can be incorporated into anti-poaching operations and in what environments they are most effective. The study finds that terrain, cultural factors, and specific, customizable, anti-poaching intelligence techniques play a large role in terms of devising the best possible intelligence strategy to combat animal poaching. The study views these possible solutions through the lens of the INT's including HUMINT, SIGINT, MASINT, IMINT, GEOINT, and OSINT. It further highlights terrorist groups' increasing use of poaching to fund their operations. This thesis takes a case study methodological approach in order to describe a wide variety of cases in various national parks, reserves, conservatories, anti-poaching organizations, and countries across the African continent. Due to a lack of data and only recent implementation of these methods, this approach provided the best

possible means to display and analyze the current available data applicable to intelligence in anti-poaching operations.

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LIST OF ABBREVIATIONS

CITIES	Convention on International Trade in Endangered Species
DNA	Deoxyribonucleic Acid
EO	Electro-Optical Imagery
ETIS	Elephant Trade Inventory System
GEOINT	Geospatial Intelligence
GPE	Geospatial Preparation of the Environment
GPS	Global Positioning System
HUMINT	Human Intelligence
IC	Intelligence Community
IMINT	Imagery Intelligence
IPB	Intelligence Preparation of the Battlefield
IPOE	Intelligence Preparation of the Operating Environment
IR	Infrared Imagery
LRA	Lord's Resistance Army
MASINT	Measurement and Signature Intelligence
MIKE	Monitoring Illegal Killing of Elephants
OSINT	Open Source Intelligence
RPG	Rock-Propelled Grenade
SIGINT	Signals Intelligence
UAV	Unmanned Aerial Vehicle
VHF	Very High Frequency

INTRODUCTION

Introduction to the Problem

Illegal animal poaching is a growing crisis across the globe and an increasing interest to the intelligence community. In 2012, poaching levels in Africa were at their highest since detailed record keeping began in 2002 and 2011 broke the record for the most illegal ivory seized worldwide totaling 38.8 tons (Gettleman, 2012a). In November of 2012, former Secretary of State Hillary Clinton addressed the intelligence community stating:

> Trafficking relies on porous borders, corrupt officials, and strong networks of organized crime, all of which undermine our mutual security. I'm asking the intelligence community to produce an assessment of the impact of large-scale wildlife trafficking on our security interests so we can fully understand what we're up against (Secretary Clinton Declares War on Wildlife Traffickers, 2012, para. 20).

The awareness Secretary Clinton generated on November 9, 2012 at the high-level meeting "Wildlife Trafficking and Conservation: A Call to Action" at the State Department was unquestionably necessary. She went on to state:

> It is one thing to be worried about the traditional poachers who come in and kill and take a few animals, a few tusks, a few horns, or other animal parts. It's something else when you've got helicopters, night vision goggles, automatic weapons, which pose a threat to human life as well as wildlife. (Secretary Clinton Declares War on Wildlife Traffickers, 2012, para. 4).

Often a forgotten cause, with the exception of animal rights groups, animal poaching is becoming an increasingly pertinent issue within the intelligence community due to the increase in sophistication and the powerful individuals involved.

President Obama has also ramped up awareness for animal poaching, as shown during his first trip to Africa in July 2013. Among other key initiatives, the trip included

a $10 million USD commitment to tackle the growing poaching problem threatening to completely wipeout elephants, rhinos, and other endangered animals (Reinl, 2013). While there, President Obama signed an executive order in Tanzania that created a Presidential Task Force on Wildlife Trafficking where officials from US agencies, including the Interior, State, and Justice Departments met at the White House to map out the presidential initiative. The program will provide training and technical assistance to sub-Saharan African countries that are increasingly aware their anti-poaching efforts cannot compete with the well-funded and heavily armed traffickers. Overall, the Obama administration has taken a progressively tough stance on illegal poaching.

Ivory, specifically, continues to be a coveted item rising in value. As a result of this poaching epidemic, described by Richard G. Ruggiero, an official with the United States Fish and Wildlife service, "We're experiencing what is likely to be the greatest percentage loss of elephants in history" (Gettleman, 2012a, para. 21). This has led conservationists to make claims that the mass killings in Africa are as bad or worse than the 1980's, when poachers eliminated over half of Africa's elephants before the international ban on the commercial ivory trade was implemented (Gettleman, 2012a). As noted by Karimi (2013) drastic measures have been taken to create awareness, such as the destruction of 6 million tons of seized ivory compiled over the past 25 years. According to Robert G. Dreher, acting Assistant Attorney General for the Environment and Natural Resources, "by destroying our domestic stocks of ivory, we send a very clear signal that these illegally traded products should not be perceived as items of value" (Huetteman, 2013, para. 3). Furthermore, the White House hopes that the Task Force mentioned above will signal Obama's commitment to stop illegal trafficking and to

elevate wildlife trafficking from a narrow conservation interest to an urgent national security concern (Goldenberg, 2013).

Recent statistics suggest poachers killed 35,000 African elephants in 2012, amounting to 96 killed each day (Goldenberg, 2013). At this rate, elephants will be extinct within the next ten years. Former Secretary of State Clinton further stated that the profits from the illegal ivory trade are fuelling extremist groups, namely affiliates of al-Qaida in Somalia (Goldenberg, 2013). She indicated a zero-tolerance strategy is the only way to stop it. David Hayes, Deputy Secretary of the Interior, describes the phenomenon declaring, "the numbers we are seeing are truly staggering" in terms of the animals killed and animal parts being trafficked (LaFranchi, 2013, para. 4).

As noted by LaFranchi (2013) the expanding global market for illegally poached animals is beginning to rival the global narcotics, arms, and human trafficking markets at $7 billion dollars a year in illegal trade. In South Africa alone, rhino poaching has increased 5,000% between 2007 and 2012 with 514 Rhino's killed in 2013 (World Wildlife Fund, 2013). According to Carter Roberts, President and CEO of the World Wildlife Fund (WWF) (2013):

> We are faced with a global market, and we have to deal with it in the places where the animals are, in the places of transshipment, and where the people are who are the buyers of the animal part, whether they're in Vietnam, China, or even the US. We're not going to win unless we operate in all three areas of whit is a vast global trade (LaFpara, 2013, para. 12).

This indicates the ever-increasing complexity, global span, and need for new measures to counter animal poaching.

Illegally poached ivory and rhino horn often travels to Asia to make figurines or is crushed and used for medicinal purposes that hold no credibility. While this market

continues to increase due to the demands of an expanding middle class in Asia, many do not know that poaching also funds organized crime syndicates, terrorism, and rebel groups. According to the International Union for Conservation of Nature (2013), the global illegal ivory trade has more than doubled since 2007. Joyce (2013) notes black-market prices for elephant ivory and rhinoceros horn have reached record highs, which have in turn pushed wildlife poaching to record highs. Levin (2013) specifically finds that ivory currently sells for approximately $1,300 per pound. These prices are highly attributable to a high consumer demand in Asia, particularly in China and Thailand. The boom is further spurred by the growing Asian presence across Africa in terms of Asian business investments and development projects (Aljazeera, 2013).

While elephants and rhinos are most widely known to suffer from poaching activities, elephants for their ivory and rhinos for their horns, there are many other animal populations in decline due to poaching. Other poached species include leopards for their coats, blue fin tuna for their meat, tigers for their skins, bones and skulls, lions for their skeletons, leatherback turtles for their meat and eggs, Pangolin, the only mammal with scales, for their scales sand meat, and the giant salamander for their meat. According to Zerkel (2013) the majority of these animals find their way into Asian markets as well.

The animals mentioned above all possess a particular trait that makes them coveted by poachers looking to make a profit. Many of these animals are nearing extinction without drastic intervention by protection authorities. O'Donnell (2012) claims that poachers, while interested in elephants and rhino for their tusks and horns, also sell the elephant and rhino eyes. Additionally, much like the rhino horn, tiger bones are crushed and used as ingredients in traditional medicines (Zerkel, 2013). Only about

3,000 rhino remain today. Lion skeletons, selling for up to $9,000, are now extinct in twenty-five African nations. The Pangolin scales are made of keratin; again, the same material found in human fingernails. An extreme case as noted by Zerkel (2013) found an instance in which a Bluefin Tuna weighing close to 500 pounds sold at a fish auction in Tokyo for about $1.76 million or $3,600 a pound; the Bluefin population is down a 96.4 percent since fishermen began mining the fish.

Non-governmental organizations have initiated new efforts to counter illegal poaching as well. In 2012, Google announced a $5 million USD grant to the World Wildlife Foundation to pay for a fleet of drone aircraft to be used in tracking poachers in Africa who are hunting endangered rhinoceros, elephants, and tigers (World Wildlife Fund, 2012). A spokesman for the WWF is quoted in saying "The poacher and the crime syndicates that fund them are getting more and more sophisticated, and it's time for us to step up our game too, and level the playing field" (O'Donnell, 2012, para. 3). Matt Lewis (2013), a WWF wildlife biologist also describes the increased sophistications of poachers. He asserts:

> When poachers are starting to use night vision technology, and when poachers are starting to use tranquilizer drugs to silently dart an animal and cut off its horns at night and get out at night…. It's incumbent upon us to find a better solution to address that (Joyce, 2013).

Wildlife crimes typically occur in remote rural regions characterized by low population density and diverse geographical features (Eliason, 2013), which makes it difficult for intelligence agencies and law enforcement agents alike to solve poaching crimes and bring perpetrators to justice. Due to the varying conditions, it is necessary to determine which techniques work in different environments, as what works in one geographical location may not be effective in another. O'Donnell (2012) clarifies that these drones

designed to combat poaching are not built to carry out kinetic strikes, but are equipped with cameras so park rangers can locate and identify poachers before they are able to kill.

Furthermore, other national security techniques are applicable to this problem with a little "out of the box thinking." Tom Snitch, an economist, and his team at the University of Maryland created a program to help the Pentagon predict where bombers would place improvised explosive devices (IEDs) in Afghanistan and Iraq. He now uses similar techniques to counter poaching. While the end goal is different, the missions are analogous: to predict the behavior of people exhibiting the potential to be applied to poaching activities (Joyce, 2013). This case will be further analyzed in Chapter 4.

While these technologies can provide the necessary intelligence to locate poachers, politics will then come into play; governments must step up and prosecute poachers. According to a report to the UN Security Council, Secretary General, Ban Ki-moon said that poaching and its potential links to other criminal and terrorist activities "constitute a grave menace to sustainable peace and security in central Africa" (Moses, 2013, para. 9). To put it into perspective, Moses (2013) notes, in the 1970's there were about 20,000 elephants in Garamba National Park in the Democratic Republic of Congo (DRC) where today there are only 1,800. According to Peter Fearnhead, Chief Executive of African parks which has jurisdiction and manages the park on behalf of the Congolese wildlife authority, "The Lord's Resistance Army is now part of a larger poaching crisis that is decimating elephants throughout central Africa" (Moses, 2013, para. 7). With a new interest and the apparent financial benefits of poaching, terrorist groups such as the Lord's Resistance Army (LRA) have taken to this illegal activity; these species, already

in danger, cannot withstand the threat of more enemies. John E. Scanlon, the Secretary General of Convention on International Trade in Endangered Species (CITES), said:

> This disturbing report further reinforces concerns over the increasing involvement of organized crime groups, rebel militia and in some cases rogue elements of the military in the poaching and smuggling of elephants. The illegal killings that are occurring on a mass scale in central Africa, often with the use of sophisticated weapons and other equipment, is decimating local elephant population and has serious impacts on people and on national and regional security. (Moses, 2013, para. 7)

The lack of government control and vast forest and jungle terrain makes it imperative that the intelligence community increase the use of new and available technologies. Bas Huijbregts, head of policy for the WWF's illegal trade campaign in Central Africa states, "the increase in activity of rebel groups in the Central African region is very worrying, and their use of ivory has a devastating impact on the remaining elephant populations in the northern parts of this region" (Moses, 2013, para 12). Huijbregts is cautious to note that while international terrorist groups such as the LRA are a new threat to security and the elephant population, the majority of elephants killed are by local hunters linked to international organized crime in pursuit of quick money.

Finally, as will be discussed briefly, education is a necessary component when it comes to cutting off poaching at its source. Without the demand, poachers will not be inclined and motivated to supply. According to Joyce (2013) in Vietnam, rhino horns are sold as a medicine that will cure a wide range of diseases yet, as stated above, there is no evidence that rhino horn does anything at all and is mainly comprised of keratin. Creating awareness throughout the world, particularly in Asian markets, will aid in decreasing demand for these highly coveted items. Overall, the increasing need for

intelligence agencies to combat illegal poaching not only comes in terms of illegal trafficking, but its new role in militant and terrorist funding.

Statement of the Problem

Animal poaching can be traced back thousands of years, but the severity only continues to increase and poachers' methods are becoming more sophisticated. Money generated from poaching is now supplying terrorist and extremist groups. Currently, scholarly research does not exist placing anti-poaching operations in the context of intelligence. This research is necessary not only for conservation purposes but to counter the efforts of these extremist groups. Some of the new technologies discussed may be more effective in certain terrains and geographical locations, but lack the necessary testing. It is essential to evaluate whether these intelligence techniques are successful in countering the elevating poaching crisis so valuable resources are effectively incorporated into these anti-poaching strategies.

Purpose of the Study

The purpose of this research is to evaluate the use of new techniques and technologies used to combat poaching activities. It assesses which technologies are more effective in certain areas of the world over others, thus assisting the intelligence community in determining which technologies and techniques are worth investing in and where. This will be evaluated by looking at the different intelligence INTs including Human Intelligence (HUMIT), Signals Intelligence (SIGINT), Imagery Intelligence (IMINT), Geospatial Intelligence (GEOINT), Measurement and Signature Intelligence (MASINT), and Open Source Intelligence (OSINT). Overall, due to the absence of scholarly research on the topic and the new nature of many of these initiatives, this

research serves as a foundation for further study. It is also intended to increase awareness among the national security community of the current poaching crisis.

Research Questions

This study attempts to answer the following questions:

- What new intelligence technologies are national security and law enforcement agencies using to catch poachers and combat poaching activities?
- What new techniques are poachers using to carry out their illegal activities?
- In what environments do certain techniques work, and are they more effective in different geographical settings?
- What intelligence techniques besides technological advances assist in locating and catching illegal poachers?
- What is the best possible anti-poaching intelligence strategy for Africa, or is there a best possible anti-poaching intelligence strategy for Africa; does each strategy need to be specially tailored towards a specific location?

Definitions of Terms

Poaching. The illegal killing of animals or fish, a great concern with respect to endangered or threatened species (The World Factbook, 2014).

Unmanned Aerial Vehicle (UAV). A powered aerial vehicle sustained in flight by aerodynamic lift over most of their flight path and guided without an onboard crew. They may be expendable or recoverable and can fly autonomously or piloted remotely (UAV Evolution, n.d).

Nature of the Study

This study analyzes the various technologies and techniques utilized in anti-poaching operations. It focuses on any measure relatable to intelligence and intelligence's increasing role in anti-poaching operations in national parks, reserves, conservancies, anti-poaching organizations, and countries across Africa. The problem is assessed through the intelligence INTs including HUMINT, SIGINT, IMINT, GEOINT,

MASINT, and OSINT. Due to a current lack of scholarly literature, data has been gathered through open source methods such as newspapers, documentaries, and oftentimes websites of an array of anti-poaching organizations throughout Africa.

Relevance and Significance of the Study

Illegal animal poaching has become more relevant to the intelligence community in recent years. By evaluating new technologies and techniques to catch poachers, animal lives will not only be saved and extinction prevented, but the intelligence community will decrease and likely abolish many of the problems tied to these illegal activities. John E. Scanlon, Secretary General of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), describes poaching as a national security concern stating:

> This disturbing report further reinforces concerns over the increasing involvement of organized crime groups, rebel militia and in some cases rogue elements of the military in the poaching and smuggling of elephants. The illegal killings that are occurring on a mass scale in central Africa, often with the use of sophisticated weapons and other equipment, is decimating local elephant population and has serious impacts on people an on national and regional security. (Moses, 2013, para. 11)

Militia and terrorist groups such as the LRA, al-Shabab, and Darfur's Janajaweed, groups on the radar of intelligence officials, are now cited as using ivory and hunting elephants to buy weapons and sustain their operations (Gettleman, 2012a). This instantly elevates the national security interest in poaching activities. Gettleman (2012a) notes they are making increasingly complicated connections with organized crime syndicates to move the ivory and exploiting turbulent states, porous borders, and corrupt officials in sub Saharan Africa and China in this growing crime ring. Terrorism's ties to poaching

are likely in their infancy and an increased awareness is necessary before it becomes a greater threat to global and national security.

There are various ways to alleviate this problem, one involving the use of Unmanned Aerial Vehicles (UAV)s. According to Matt Lewis, a WWF wildlife biologist, "As the war in Afghanistan winds down, drone manufacturers are coming out of the woodwork, looking for new customers for downsized and cheaper versions for their unmanned military aircraft" (Joyce, 2013, para. 3). Putting a halt to this rapidly growing problem through the use of drones is a win-win situation for drone manufactures, animal rights groups, animals, and the intelligence community.

Assumptions and Limitations

A major limitation of this study is the lack of current research on intelligence's role in preventing poaching, particularly in terms of new technologies very recently incorporated into the reduction and prevention of poaching. Scholarly research on areas such as GPS and aerial surveillance do exist, but very new technologies such as drones have not been examined from an academic standpoint. Furthermore, while there is a plethora of research on poaching overall, there is a lack of research viewing anti-poaching operations through an intelligence lens. Various articles have been cited to compensate for the lack of research, but only in terms of informing the reader of new technologies emerging in recent years that have not yet been used in any form of academic research, and providing an intelligence perspective or context. Again, this is an attempt by the author to provide a foundation and generate encouragement for further scholarly work on the subject. Another limitation is the broad nature of the case study

methodology because while the case study may appear broad, the newness of the topic necessitates a basic starting point to lay a foundation for further research.

A significant assumption is based on the grounds that the chosen methodology, the case study, is the best possible means to begin to provide scholarly research on this understudied topic. With no previous examples to learn from, the author made a judgment call. Another assumption is made in terms of figures and statements used in the research. Many of these figures and statements come from witness accounts and not scholarly literature due to the newness of the topic and the unavailability of scholarly research. Readers must assume that the accounts described and figures given are reliable.

A further assumption is that drones are only intended for military use. Contrary to this assumption, drones are customizable to suit other needs, which mean they are oftentimes unarmed and used only for surveillance purposes. In this case, drones will constitute these commercial, unarmed drones. Finally, another common assumption is poaching only takes place in the context of small groups selling small amounts of an illegal substance. This thesis focuses on the increasing issue that government and large crime syndicates are poaching, moving, and selling large amounts of these illegal substances.

Organization of the Study

Chapter 1 of this thesis provided an overview of the current poaching crisis and intelligence's increasing role in countering this crisis. Chapter 2 of this thesis will provide a literature review. It will begin with a review of the literature on the theoretical framework in which this thesis is viewed, the crime triangle. The literature review will focus on the three areas of scholarly research available that are most applicable to

intelligence including Law Enforcement, GPS and Radio Tracking, and DNA Forensics. It will conclude with a review of the literature on the chosen methodological framework, the case study. Chapter 3 of this thesis will introduce the methodology used to conduct the research. This chapter will detail the case study methodology and provide an overview of the cases this thesis will analyze. Chapter 4 of this thesis contains the case studies and research. Each case is analyzed from the perspective of one or more intelligence INTs as applicable. Finally, Chapter 5 provides a conclusion, the overall findings of the study, as well as intelligence recommendations for the future.

LITERATURE REVIEW

Introduction

The following is designed to provide an overview of current literature relating to intelligence's role in animal poaching. While the studies do not directly address intelligence, the methods used constitute various intelligence collection methods. This chapter first provides insight into the crime triangle, the theoretical framework in which this thesis views poaching, followed by a brief overview of law enforcement and its relation to poaching activities, followed by carefully selected works on GPS and DNA extraction for anti-poaching measures. Next, it reviews literature on the case study methodology, and ends with a summary of findings.

While a large body of literature exists, detailing the many risks of animal poaching, this selection of literature places a particular focus on research describing technology and intelligence techniques used to counter animal poaching. It is important to note this selection of literature does not specifically address intelligence, but it is the best possible literature available utilizing techniques that are considered methods of intelligence collection and analysis. Of these topics, the current research body is heavily weighted toward GPS and DNA technology, which are the main intelligence or intelligence related measures historically used to combat animal poaching. An important distinction to make between GPS and DNA is GPS is an intelligence collection technique that falls under the SIGINT form of collection often transferred onto platforms such as Google Earth and ArcGIS, in turn producing actionable GEOINT. Alternatively, DNA extraction provides necessary location data for analysts to determine what type of intelligence collection best suits the poaching environment. Other technologies such as

drones, microchips, paramilitary armies, and K9 unit's recent implementation into anti-poaching measures display a large gap in the current available literature. This is largely due to its recent implementation and a lack of data available on these techniques. Later chapters will focus on these new collection methods.

Theoretical Framework

The crime triangle, also called the problem analysis triangle, consists of three elements necessary for a crime to occur including the offender, the victim, and the crime scene or location (Clark & Eck, 2014). Baker & Wolfer (2003) note that the framework allows for an analysis of the, who, what, when, where, how, why, and why not, which pertain to each component of the triangle, and how these components interact with one another other. The crime triangle, as a whole, is an effective means to visualize and understand a criminal problem. All three factors listed above, the offender, a victim, and a location must be present for the crime to occur.

The crime triangle comes from the Routine Activity Theory, coined as one of the most useful theories for understanding criminal victimization and offending patters in the late 20th and early 21st century, originally constructed by Lawrence E. Cohen and Marcus K. Felson (2010). The crime triangle is a fairly simplistic yet effective way to view the crime of poaching. Oftentimes crimes are thought of as taking place between people, therefore it is necessary to look at it in a non-traditional sense. In this case, the offender is the poacher, the victim is the animal, and the crime scene is a location somewhere on the African Continent. With a better understanding of the crime, law enforcement agencies can more effectively assign individuals and equipment based on the crime

analysis and crime-specific programming thereby using proactive measures aimed at protecting citizens, property, or in this case endangered species (Baker & Wolfer, 2003).

According to Eck (2003), a crime is highly likely to occur when an offender and a target come together at the same place, at the same time, and there is no one nearby to control the offender, protect the target, or regulate conduct at that location. Given the vast areas constituting the case studies in Chapter 4, it is not feasible to expect countries to have the resources to place officers and troops throughout these locations. Furthermore, due to the harsh terrain and climate in remote African locations it is not practical to utilize people as a resource for providing protection to endangered species. This is where alternative intelligence collection techniques become invaluable. When, for example, a drone flies overhead to protect the target at that location, an offender is more likely to be deterred simply by its presence.

The crime triangle displays an inner triangle, which contains the elements necessary for a crime and outer triangles that contain the controllers sufficient for prevention (Eck, 2003). The crime triangle provides a means to view poaching by first a location with many offenders present or with many targets present, but ultimately these two factors must be viewed together at the same time and the same place (Eck, 2003). Second, the absence of controllers or people who can intervene with the offender, target or place and keep the crime from occurring must be explained (Eck, 2003). Ultimately, this is where the analyst, intelligence collection techniques, and rangers come into play. Eck (2003) notes empirical research suggests that offenders, targets, and places show highly skewed crime distributions and therefore a few targets, places, or offenders are involved in a large proportion of the crimes. Furthermore, all problems involve repeat

offenses, repeat victimization, repeat places, or a mixture of these elements (Eck, 2003). This evidence provides insight into pinpointing hotspots in which these poaching crimes are most likely to continue to occur.

Review of the Critical Literature

Law Enforcement

There are three factors related to the prevention of a crime. According to Milner-Gulland and Leader-Williams (1992), the prevention of crime should occur if there is an increase in the perceived probability or severity of punishment, a decrease in profit from the crime, or an increase in the opportunity cost of the crime through improved wages elsewhere. As will be seen and proven later in the case study of Amboseli National Park in Chyulu Hills, Kenya, incentives such as a competitive salary, or as described by Milner-Gulland and Leader-Williams, improved wages elsewhere, and community prestige (oftentimes on the same level of importance as financial gains in this society/culture) are analogues to becoming a park ranger. This explains the motivation of many former poachers to essentially "switch sides" becoming rangers, as is the case in many of the preceding cases.

This study explores the penalty type that best deters poachers from partaking in the crime. It finds that a penalty which varies with the output of a poacher is a more effective tool against poaching than a fixed penalty and the probability of capture is a highly significant factor in the poacher's decision to hunt. It goes on to look at organized and local gangs versus local poachers, showing they have different reactions to law enforcement. Findings suggest that local poachers will respond to local investment

schemes, but the deterrence of organized gangs can only be achieved with improved law enforcement operations (Milner-Gulland & Leader-Williams, 1992).

Lessons learned from studies on illegal activities that do not relate to the crime of poaching in the traditional sense can provide insights into the regulation of trophy hunting. By looking at poaching in different contexts, such as reviewing lessons learned from studies on other illegal activities, law enforcement is able to infer multiple perspectives as to the reasons poachers carry out these activities as well as how to better counter them. This study specifically looks at theft and burglary in the United States. While this technique may work in certain areas of the world, poaching is a global problem often taking place in remote tribal areas in, particularly, Africa. The dynamics of life and financial needs in these areas vary vastly from the reasons an individual may carry out a crime in the US making many factors unclear. While the Milner-Gulland and Leader-Williams (1992) study considers external economic factors, including the economic health of the country, they do not cover other possible internal factors. Elements such as tribal ties and the variation of tribal wealth are oftentimes highly influential in these societies and must be accounted for as well. Therefore, comparing poaching to other crimes has benefits in that it provides a valuable, general insight. However, deeper analysis of other internal factors is also necessary.

GPS, Radio Tracking, and Radio Tracking

Much of the research on technology in elephant tracking and anti-poaching activities is heavily weighted toward GPS technology. In the 1960's Iain Douglas-Hamilton (n.d.) conducted the first scientific study of elephants, paving the way for elephant research and conservation. From there, Douglas-Hamilton founded Save the

Elephants and soon after pioneered GPS tracking of this species in Africa. Douglas-Hamilton has devoted his career to studying and protecting elephants. Much of the research done on this subject is authored or co-authored by this individual. It is also important to note that while a large amount of the research has been done specifically on elephants, it is oftentimes applicable to other endangered species.

Various forms of SIGINT are the most widely used collection techniques in the war against poaching. According to Blake, Douglas-Hamilton, and Karesh (2001), it was not until the 1990's that GPS technology became widely available to wildlife biologists, although as stated by Douglas-Hamilton (1998), the use of conventional radio beacons date back to the late sixties. Researchers have found that SIGINT collection has provided many breakthroughs in protecting endangered species. They also note that this type of SIGINT collection has limitations. Whyte (1996) states radio tracking's main limitation is that only one record can be made per elephant per tracking session. An additional limitation when using this method, as described by Douglas-Hamilton (1971), is that fixes, or location data, are acquired at weekly, monthly, or even longer intervals. This provides limited data and an extended time commitment to gather the amount of data needed to make a credible assessment, at a high cost. Finally, the infrequent data gathering permits large gaps when determining elephant location. While oftentimes limiting, radio tracking allows for the improvement in the range of maps, at least a basic understanding of elephant location, and for the overall understanding of elephant behavior.

Fixes can also be acquired using satellite radio tracking with the ARGOS System. Alternatively, according to Douglas-Hamilton (1998), this more recent method allows for

a higher degree of data acquisition, but at the cost of more inaccurate fixes. When using this method, the collar transmits a signal to a satellite within the ARGOS system. This measures the Doppler Effect between the transmitter and the receiver, which then calculates a position. The findings are then transmitted to an earth station. This method has the ability to give four to six fixes a day. Unfortunately, it, too, is costly and the ARGOS readings are less accurate.

While the two previous methods have historically given researchers valuable anti-poaching data, GPS is revolutionary for this field. It is the most effective data collection platform and allows for improved radio tracking with frequent and accurate fixes. The accuracy is due to 3D triangulation, in which four satellites are needed for 3D triangulation, though most receivers monitor more than four, providing even greater accuracy (Douglas-Hamilton, 1998). This technique is relatively new to animal conservation. The first GPS units used date back to 1991 in Kenya (Douglas-Hamilton, 1998). Today, GPS units can withstand the many issues that arise when tracking such a large, active animal such as the ability to weather several tons of pressure, exposure to the elements, total immersion in water, as well as a long battery life capacity system (Douglas-Hamilton, 1998). While this GPS tracking project placed a special focus on elephants, its many positive qualities makes it transferable to other endangered species such as the rhinoceros.

Oftentimes, studies incorporating GPS technology are conducted for purposes other than anti-poaching operations. These studies can still offer valuable information into the use of GPS and assist in improving the method overall. Raizman, Rasmussen, King, Ihwagi, and Douglas-Hamilton (2013) conducted a recent study to determine the

spread of disease in cattle based on animal movement. While the study's focus was geared toward the dynamics of disease transmission between livestock and wildlife using cattle, the techniques utilized can easily be applied to elephant movement as well as the movement of other endangered species. The study further provides important, detailed insight into present GPS capabilities utilized when tagging and tracking animals. Due to the wide use of GPS tracking, additional technical details will be provided. This will offer the reader a better understanding of today's capabilities by elaborating on GPS-GSM Collars and GPS-Satellite Collars.

The first type of collar used in the study was a GPS-GSM tracking collar. These collars were provided by Savannah Tracking Ltd. Data transmission took place by mobile phone (GSM) network, satellite, or radio frequency beacon (RF). The GPS embedded in the collar recorded the position of the animal in five to ten minute intervals, displaying the more frequent capability to provide real time data. Custom software downloaded the data transmitted through short message service (SMS) via the internet. A memory card stored the GPS data for backup in the RF collars. A VHF is included in this collar in case the GPS fails. Positions were provided in user-defined intervals.

The second collar type used is a GPS-Satellite Collar. In this case, position acquisition again was done by GPS, where data was then transmitted onto the internet to Blutrax software. These collars included a VHF Beacon as well. The data was sent via the Immarsat D+ satellite system. In this study, while the understanding of disease transfer is the main objective, the way the information was gathered is the key take away. It shows the GSM collars were programmed to collect positions every hour while the satellite collars, due to higher battery requirements, were set to transmit positions every

three hours. It is observations such as these that provide insight into what resources are more efficient and cost effective. This is especially important for countries and organizations without the necessary funds to combat poaching, a common setback throughout Africa.

Douglass-Hamilton (1971) notes the movements and ranges of elephants vary greatly not only from one location to another, but from one individual to another. This is mainly due to the nutritional requirements and the wildness or tameness of the individuals, or simply the elephant's personality. This is proven through three different cases in which Douglas–Hamilton (1971) tracked three elephants, one in Manyara Naitonal Park, one in the Tarangire National Park, and one in the Serengeti National Park. The study found that the Manyara elephant moved the least. Its environment included an area with an abundant food supply and an irrigated forest by a series of springs all close-by. The Tarangiare elephant moved more than the Manyara elephant but less than the Serengeti. This elephant's habitat included a more arid climate with vegetation that was more wide spread. The Serengeti movements were taken from a time when the elephants were disturbed and nervous, likely the reason for their abnormally fast movement. Taking into consideration the Serengeti elephant moved the most, it is demonstrated that their state of mind plays a role in movement patterns.

An additional finding of the study displayed that human development also plays a role in elephant movement. The Manyara population experienced high levels of growth of the surrounding human populations. This displaced the elephants as well as restricted their movement patters. This is likely to be a growing problem in the near future as infrastructure and human settlement increases across Africa.

This study showed that "getting to know" the elephants with detailed records of each individual elephant and herd will assist in revealing their likely behavior. Furthermore, the ability to take this information and produce actionable GEOINT by providing detailed maps of each park or reserve will display where each particular elephant is likely to move for food or in times of distress. This information allows rangers to collect intelligence on these patterns, which in turn tells them where to concentrate their resources and the likely location of poachers based on the location of the elephants.

Analysts can learn a great deal by tracking the behavior of an animal in different situations. Blake, Douglas-Hamilton, and Karesh (2001) focus on the behavior and tracking of forest elephants using GPS telemetry as a tool to study ranging, seasonal movements, and distribution. This study was conducted at Dzanga-Sangha and Nouable-Ndoki National Parks Complex of Central African Republic and Congo. The data recorded, while only obtained from one elephant, demonstrated daily activity patterns of the forest elephant. This study is significant in that it implemented fix acquisition. This technique consisted of a collar programmed to take fixes every hour that was strapped to the backpack of a researcher, attached to a tree, or attached to a camera tripod stand. At night, the collar was placed on a tree with an antenna. For each fix acquisition attempt, details on weather conditions, vegetation type, canopy type, suitability of antenna position, and whether the collar was stationary or moving was required. The collar, attached to all commonly encountered vegetation types in the region, concluded that the hand held unit would provide the same data as the GPS collar attached to the elephant; therefore displaying the best conditions for GPS tracking. The study found that

vegetation types with open or sparse upper canopy cover proved the best conditions for fix acquisition, with clearings, light gaps, plantations, and villages having the highest success rates. Intermediate fix acquisition success was displayed in forest vegetation with an open upper canopy, which includes mixed open forest, vine forest, and Marantanceae forest. Finally, mixed closed forest demonstrated the lowest fix acquisition rate. This provides further insight into the use of GPS data in difficult terrain and environment such as the dense jungles and forests of Africa where this intelligence collection method is often implemented.

When conducting anti-poaching operations, knowing the general location and likely migration patterns of an animal can help rangers in terms of more efficient resource allocation. Galanti, Tosi, Rossi, and Folli (2000) used GPS telemetry to track five female elephants in Tarangire National Park in Tanzania. In this case, they hoped to gather useful information on migration routes and the use of space by elephants, then applying the result to long-term conservation strategies for large herbivores in the Tarangire area. Their noted approach to apply their findings only to the Tarangire area is key because elephant movement varies significantly based on terrain and environmental conditions. The study found that the elephants whose ranges extended outside the park displayed their highest movement from 4:00 PM to 12:00 PM while the animals within the park had the highest movement rates during daylight hours from 8:00 AM to 4:00 PM. This is useful information for positioning anti-poaching units, resource allocation, in accordance with the time of day in this particular area.

DNA Forensics

While governments, national parks, reserves, conservancies, anti-poaching organizations, and countries all around Africa are ramping up their efforts to combat illegal animal poaching, resources, funds, and human capital continue to be insufficient. This is mainly due to the vast areas of land these "poaching armies" must cover. DNA analysis is a means to assuage the issues associated with the factors listed above. While DNA may not directly fall under one of the intelligence gathering disciplines, it serves as a lead for analysts. Studies suggest DNA forensics may provide vital information as to the origination points of ivory. The information generated from DNA analyses is then able to articulate target locations, significantly narrowing the amount of land they must patrol. This is essential for better resource allocation for anti-poaching teams worldwide.

Certain research suggests that there are ways to drastically zero in on poaching hotspots. Wasser, Clark, Drori, Kisamo, Mailand, Mutayoba, and Stephens (2008) argue the most effective way to contain the illegal trade is to determine where wildlife is being removed from. The researchers argue that by focusing law enforcement on areas where poaching is most concentrated, authorities can direct law enforcement to hot spots, thereby stopping the trade before the animal is killed. Furthermore, this prevents countries from denying their poaching problems, and potentially thwarts the trade before it enters into the complex web of international criminal activity that is often expensive and difficult to track.

DNA analysis is a method conducted on poached wildlife to determine the point of shipment. While this is a key element of anti-poaching measures, it fails to take the place of origination into account, in a sense missing the vital first step of the problem.

By applying new DNA assignment methods, researchers were able to determine the geographic origins of the ivory in addition to the point of shipment.

In this case, DNA analysis took place on two strings of ivory seizures. The first string, seized in Singapore, was shipped from Malawi via Mozambique and South Africa. Researchers concluded that the ivory originated in Zambia. In addition to the 6.5 tons of ivory seized, the shipment also included 42,000 cylindrical signature seal termed *hankos*, or chops. While the DNA on the *hankos* could not be amplified, they play a significant role regardless. Four months prior to the ivory seizure, a raid on an ivory factory took place in Lilongwe, Malawi where authorities confiscated approximately 100 scraps of ivory called *hanko shells*. The boarded holes in the scraps matched the size of the *hankos.* By using DNA analysis to identify the geographic origins of the *hankos* seized in Singapore and the *hanko shells* in Malawi, they were able to determine whether the tusks, *hankos*, and *hanko shells* came from elephants poached in the same location. Their final analysis showed that the tusks originated in Zambia. The origins of the *hankos, hanko shells,* and tusks closely overlapped with the *hankos,* and *hanko shells* coming from a location slightly further northeast. The study further found that all tusks came from savannah elephants.

The second seizure contained 3.9 tons of ivory. Authorities in Hong Kong x-rayed a container deceptively loaded with forest timber and found ivory stashed in a compartment in the back of the container, behind a fabricated internal wall. Knowing the characteristics of the container and the company, Cameroon authorities searched two similar containers that returned from Hong Kong. These contained the same compartments and leftover ivory chips. Researchers concluded through DNA analysis

that the tusks seized in Hong Kong and the ivory chips seized in Cameroon had common origins. The researchers were able to determine the elephant type, forest or savannah, as well as and the general location where the elephants were poached. The results of their analysis found that the tusks came from a tightly clustered area centered in southern Gabon. The ivory chips were also found to have originated in the same area.

Multiple takeaways can be extracted from this analysis. First, the common origin of the seized ivory suggests that both crime syndicates were targeting specific populations for intense exploitation. This disproves the previous hypothesis that dealers used a decentralized plan of opportunistically procuring ivory as it became available. Second, smuggling took place in multiple shipments first going through an intermediate country before its journey to the Far East. This suggests a risk reduction strategy to minimize the time ivory is in possession of the dealer. While the ivory is not in the hands of the dealer long, they do return to the same location repeatedly. This illustrations that resources focused on the country of export are better utilized on the country of origin.

Forensic evidence from the Hong Kong and Cameroon seizures indicates evidence of a highly organized trafficking operation. The serial numbers on the container seized in Hong Kong and the containers seized on their return to Cameroon showed they had been changed two or more times, suggesting that each container had been shipped with contraband at least three times. Port agents and anti-poaching units stationed at ports can use this forensic evidence to inspect containers with suspicious serial numbers for ivory, rhino horn, and other poached items. After obtaining this evidence, researchers were able to look at a partial customs registry, which showed that 12 shipments from the same company in similar containers with the same volume, type codes, and shipping and

receiving destinations, took place. This gives clues to depict which companies are linked to the trade as well as to the general characteristics that a container may possess, thereby sending a red flag to agents. Overall, this study clearly displays that it is now possible to stop poaching at its source, which is likely the most effective means to end the ivory trade. It eliminates the many channels law enforcement encounters when they begin in the middle of the complex web, the area of shipment.

DNA can assist in more effective resource allocation. Comstock, Ostrander, and Wasser (2003) argue that the ability to extract DNA from ivory allows for the genetic tracking of the origin of poached ivory, and therefore contains important implications for conservation and management. They developed a genetic method that can identify areas where stronger anti- poaching efforts are needed, the basis for monitoring the extent of the trade, as well as consequences of future international trade decisions. While the science behind this method is not necessary to detail, the final assessment of where these poaching activities are taking place is highly valuable to intelligence analysts. It not only allows for better resource allocation, but also reveals the terrain in which the elephants are being poached. Their findings assist in providing the necessary information to determine which collection method is best suited to a given environment.

The ivory trade is very complex. Wasser, Mailand, Booth, Mutayoba, Kisamo, Clark, and Stephens (2007) argue that tracking ivory is difficult because it is often smuggled across multiple international borders and along numerous trade routes. By providing DNA evidence, they find it is possible to determine hot spots and trade routes more accurately. By using a Voronoi tessellation method, these researchers determined the geographic origin of the largest ivory seizure since the 1989 ivory trade ban. They

were able to conclude that while wildlife authorities suspected the ivory came from multiple locations, and included both forest and savannah elephants (DNA evidence allows for nearly 100 percent accuracy when determining forest or savannah). The analysis showed that the ivory was solely from savannah elephants, most likely originating from a narrow East to West band of Southern Africa centered on Zambia. By simply knowing whether the tusk came from a savannah or forest elephant, an analyst can rule out any location that is not home to a forest elephant, greatly narrowing down their area of interest (AOI).

While this study focused on a particular ivory seizure, it can be applied to almost any seizure. This allows anti-poaching teams to make the most of sparse resources by concentrating them in a much smaller, more narrowed down areas. Finally, the Voronoi tessellation method used proved to be more effective than the more widely used sample-by-sample methods often applied when assigning sample cluster of known origin. It provides a more accurate assessment of the origin of the ivory on a finer scale. For the sake of this review, the complexities of the Voronoi tessellation method is not pertinent to the analyst, as they do not carry out the process. Here, it is important know which method is more effective and how its results can be used by the analyst.

Determining the location ivory was poached is another useful method to distribute resources better. Wasser, Shedlock, Comstock, Ostrander, Mutayoba, Stephens, and Harpending (2004) posit that regulation of the trade could be vastly improved by the ability to verify the geographic origin of tusks. They developed a combined genetic and statistical method to determine the origin of poached ivory. Their results show that the absolute accuracy of this method is high, alleviating many previous problems associated

with standard assignment methods. The approach further allows for assignment of samples to locations where no reference samples are available; this is especially important because ivory seizures may have originated in these locations.

Findings suggest that continent-wide, 50 percent of samples were located within 500 km and 80 percent were within 932 km of their place of origin. Also important is that accuracy varied by region. Median accuracies show that West Africa displayed a 135 km accuracy rate, Central Savannah 286 km accuracy rate, Central Forest accuracy rate 411 km accuracy rate, South 535 km accuracy rate and East 697 accuracy rate. This shows which African regions are best suited for this type of DNA collection. Particular small geographic regions showed accuracy variation as well.

While heavily statistical, the results display an ability to discern individual forests in which poaching is most heavily concentrated. This data may also assist in tracking the bush meat trade, which tends to go hand-in-hand with illegal poaching. Furthermore, this method allows for an estimate of the proportion of African versus Asian elephant ivory being sold throughout the world. Again, in the interest of the analyst, it is not the process in how this information is obtained, but how the final data can be utilized by analysts in the estimates they produce.

A key take away from this research is that while CITES maintains the Monitoring Illegal Killing of Elephants (MIKE) and the Elephant Trade Inventory System (ETIS), two expensive programs (the MIKE costs approximately $13.8 million over a six-year interval) DNA analyses cost approximately $100 per tusk plus labor. This suggests that by increasing the use of DNA analyses, therefore reducing cost, not only can more

resources be allocated to anti-poaching measures, but, due to the accuracy provided by this method, resources can be better directed to areas most in need.

Review of the Methodological Literature

A case study methodology was chosen for this thesis due its ability to provide a large degree of flexibility throughout the methodology process. The following section reviews the literature on the case study and the elements of this methodology that make it best suited for this analysis.

According to Yin (1994), the case study methodology is defined as an empirical inquiry about a contemporary phenomenon (e.g., a "case"), set within its real-world context when the boundaries between phenomenon and context are not clearly evident. Yin describes case studies as pertinent when the research addresses either a descriptive or an explanatory question. This thesis attempts to answer the descriptive question as to what measures are currently taking place within the discipline of intelligence to counter animal poaching.

When the question is formed, Yin effectively lays out the three steps in designing case studies including defining a case, selection one of the four types of case study designs, and using theory in design work. Yin provides a step-by-step approach that was used as a guide throughout the process of writing the case studies. Additionally, this research points out the importance of incorporating multiple sources of evidence. The wide range of sources incorporated in this thesis provides the reader with a strong overview of current available information on the topic. Finally, Yin also expresses a need to triangulate evidence from multiple sources. He states the researcher should constantly check and recheck the consistency of the findings from different as well as the

same sources. Due to the varying degrees of credibility of sources, triangulation was especially important.

The case study methodology makes for a high degree of flexibility. According to Rowely (2002), a case study provides a method where specific procedures can be determined while the study progresses, new data is constantly analyzed, a large variety of factors and relationships are included, and no basic laws exist to determine which factors and relationships are important. Given the recent emphasis on new anti-poaching techniques, flexibility, as stated above, is a key component to organizing and analyzing the information available on the subject. Rowley also notes that the case study methodology is applicable to studies on contemporary events. Many of the components in terms of intelligence's role in poaching are new; therefore, this study fits these criteria well.

A continual analysis of the data in a case study is essential. Fidel (1984) systematically develops a pattern model of online searching behavior. While the actual case study conducted in this research is not pertinent, Fidel highlights various aspects of the case study methodology that are important to this thesis. She explains that the analysis of the data is performed throughout the duration of the study. The open-ended nature to analyze data continuously increased the rigor of the case studies analyzed and allowed for in-depth analyses throughout the writing process.

Finally, Baxter and Jack (2008) provide an invaluable analysis of the case study methodology for individuals new to the method. They concentrate on highlighting the degree of flexibility and rigor for a properly written case study. They go on to describe the case study as a way to expand a researcher's opportunities to explore or describe a

phenomenon in context using a variety of data sources. Given the new nature of the topic, a large compilation of sources was necessary. This methodology allowed these sources to be integrated in an organized fashion. They further state that the issue is not explored through one lens, but rather a variety of them, which allows for multiple facets of the phenomenon to be revealed and understood.

Overall, these scholars provide a compilation of research essential to understanding the case study methodology. Furthermore, this research provided the best insight into the case study methodology as applicable to this thesis. Through their guidance, the cases in Chapter 4 display rigor and organization thus rendering them as comprehensive as possible.

Chapter 2 Summary

This chapter provided an overview of the current academic literature available on intelligence and its role in combating poaching activities. Most significantly, GPS technology has been at the forefront and shows the longest history in terms of intelligence's role in reducing poaching and provides a fairly inexpensive way to track and locate animals. With this information, rangers are able to closely monitor and understand a particular species. DNA is another method used; while not specifically considered an intelligence discipline, its findings supply analysts with key data. When using DNA extraction, the overarching goal in each of the above literature was to aid in pinpointing the geographic locations of poached elephants in order to determine the origin of the ivory as well as its transit points. While the science behind DNA extraction is not pertinent to the intelligence analyst, its findings help the analyst narrow down hotspots where elephants experience a high degree of poaching. This technique can be

used alongside GPS technology. By having an idea of where the poaching is taking place due to DNA analysis, analysts can concentrate GPS technology in these affected areas. If deemed unsuitable, the analyst may decide to implement an alternative intelligence technique new to the fight against poaching, which will be described in Chapter 4. Finally, with improved knowledge on law enforcement measures, countries can begin to implement procedures to combat the problem. Essentially, a system must be devised in terms of intelligence collection, analysis, resource allocation, and lastly, effective law enforcement measures. In Chapter 4, these anti-poaching techniques including more novice techniques are discussed by reviewing case studies from various national parks, reserves, conservatories, anti-poaching organizations, and countries.

METHODOLOGY

Introduction

The following methodology assesses and analyses the role of intelligence techniques to combat the growing problem of animal poaching in Africa. It takes a multiple case study approach reviewing a number of cases from various African countries. Case studies will come from national parks, reserves, conservatories, anti-poaching organizations, and countries.

Research Design

The research design of this thesis is purely qualitative. It uses a case study methodology incorporating multiple cases. Rather than taking on the case study in the more traditional sense, the study will look at fifteen cases where intelligence was utilized to address poaching. In terms of detail, a number of cases may be thorough while others sparse. The shorter cases denote a current lack of information due to the very recent implementation of the intelligence technique. They are still included to promote awareness and provide the reader with nuanced intelligence collection techniques currently utilized to counter poaching. It is necessary to include an array of cases to best depict the different ways in which these anti-poaching methods are applied across the African continent.

This case study methodology was chosen for multiple reasons. First, it allows for a high degree of versatility, particularly in this preliminary and exploratory stage of the research. This is especially important when conducting research on cases varying in detail. Second, the case study methodology is particularly well suited to new research areas (Rowley, 2002). Given that many of the poaching techniques were recently

implemented, case studies allow for an approach to clearly explore and display any available open source information in these early stages of research.

The procedure for evaluating these cases includes looking at any intelligence techniques or technologies used to prevent animal poaching in the context of the intelligence disciplines including HUMINT, SIGINT, IMINT, GEOINT, MASINT, and OSINT. HUMINT includes information obtained strictly from human informants. SIGINT refers to anything that gives off electronic emissions, with the best example in this research being GPS collars. A caveat must be made when discussing IMINT and GOINT. While IMINT oftentimes falls under the GEOINT category, the researcher found that at this stage, it was best to separate the two. Therefore, IMINT constitutes imagery and full motion video (FMV) while GEOINT constitutes the use of mapping. MASINT constituted the most creative approach. Given MASINT's broad definition a focus was placed on emissions or the ability to be "sensed." Finally, OSINT is anything gathered from open source collection such as newspapers or websites. The researcher found this as the best way to convey data from various locations and to distinguish between new intelligence strategies for a clear understating of this emerging research topic. Data analysis takes place by looking at key factors such as terrain, the overall environment, and surrounding countries in relation to the effectiveness of the intelligence technique.

Selection of Participants or Cases

This thesis relies on representative sampling for its case selection. It attempts to display a wide array of perspectives on these techniques from different organizations and to a lesser extent African countries. Criterion sampling was used to select cases that meet

the condition that the country was in Africa and contained a national park, national reserve, conservancy, or anti-poaching organization that utilized intelligence techniques. The anti-poaching organization must be incorporating at least one of the intelligence disciplines or INTs to counter poaching in their area of operation. There are three exceptions: first, Somalia is a special case due to lawlessness and a lack of governance, therefore viewed as a whole country. The second is Tanzania due to the recent undercover operation carried out by the Public Broadcasting Network (PBS). Third, and finally is Namibia due to Google's presence in the country and the companies at work in anti-poaching operations. The diversity of organizations and countries is intentional to display why certain methods are used in different environments and terrains.

The sample for this thesis includes national parks, national reserves, conservancies, anti-poaching organizations, and three countries viewed as a whole state. The specific cases include the Ol Peject Conservancy, Tsavo National Park, and Maasai Mara National Reserve, and Amboseli National Park in Kenya, Somalia will be analyzed as a country, the Hwange National Park in Zimbabwe, the Limpopo National Park in Mozambique, the Zakouma National Park in Chad, Garamba National Park, and Salonga National Park in the DRC, SAN Parks, Kruger National Park, and Peace Parks Foundations of South Africa, Tanzania, and Namibia, which will both also be analyzed as a country.

While focusing on intelligence technology and techniques, when relevant, terrorist organizations such as the LRA, al-Shabab, and the Janaweed will appear due to their use of poaching, the role of these new collection techniques in the detection of these groups, and the US intelligence community's interest in counterterrorism. It is also

important to note that the cases listed below do not constitute all areas and countries partaking in anti-poaching measures; they are a selection of cases the writer deemed as the best possible overview in the use of intelligence in anti-poaching operations. Finally, this thesis focuses mainly on the supply side of the equation. The demand side most predominately, Asian Markets is also pertinent to this issue but the author deemed this aspect of the problem as deserving of an entire thesis in itself; finding it best suited to mention but later recommend for future research. By focusing on supply, more detail was permitted to address one, albeit essential, side of the issue.

Country	Park
Kenya	Ol Peject Conservancy Tsavo National Park Maasai Mara National Reserve Amboseli National Park
Somalia	Whole Country
Zimbabwe	Hwange National Park
Mozambique	Limpopo National Park
Chad	Zakouma National Park
Democratic Republic of Congo	Garamba National Park Salonga National Park
South Africa	SAN Parks Kruger National Park Peace Parks Foundation
Tanzania	Whole Country
Namibia	Whole Country

Data Collection

Data collection will take place using a wide variety of open sources. Due to the lack of current academic research, and these techniques' recent implementation, newspaper articles and excerpts from various anti-poaching websites were also used. At times, data from several African sources appear, as it is the only available information on the current anti-poaching campaign. Credibility is a potential issue, a result of possible

exaggeration of figures or information. When appropriate and available, triangulation was implemented to verify these sources. The *New York Times*, PBS, and CNN all have extensive written articles and media on the poaching crisis, affording invaluable first-hand reporting from numerous countries. While news articles provided a wealth of information, private organizations working in Africa such as Save the Elephants and Big Life Foundation conduct their own research and appear in the many of the cases. These organizations are important in that they are much less likely to incorporate media or government bias that may plague other sources.

Data Analysis Procedures

Exploring the details and factors in each case study will allow for a better understanding of which intelligence INTs displayed the most success in anti-poaching intelligence collection. For example, IMINT and GEOINT, specifically thermal, is likely the best use of intelligence collection in areas with thick canopy, which is typical for African Jungles. The study hopes that by laying out the "how" and the "where" these intelligence techniques are implemented, anti-poaching teams will have a better idea of more efficient resource allocation in financially strapped countries and organizations.

To draw conclusions across the case studies in the preceding chapter, various methods will be used. First, replication logic plays an insurmountable role in marshalling a large number of cases to establish that intelligence significantly assists in reducing animal poaching. Replication logic increases the robustness of the research considerably. Essentially, according to Rowley (2002), if two or more cases are shown to support the same theory, the theory that intelligence helps reduce animal poaching, replication can be claimed, this also displays a higher degree of rigor within the study overall. While each

case is considerably different in the intelligence disciple incorporated and how it is used, the results are similar, which as stated above produces a degree of literal replication (Rowley, 2002). Second, the use of pattern matching attempts to match the observed pattern, the increase in animal poaching, to the expected pattern or hypothesis that intelligence techniques will decrease this illegal activity (Hak & Dul, 2009). When available, figures show that the implementation of anti-poaching measures decreased the amount of poaching taking place in an area. This numerical data indicates the number of a certain animal poached compared to the number poached after the anti-poaching operation was implemented. When direct figures are not available, other statistics may be available such as the amount of arrests made or number of weapons confiscated. This numerical data also helps discern how intelligence is assisting in decreasing activities related to animal poaching.

Each case analyzed is significantly different. Therefore, the overall structure of each case will be presented in a manner that best depicts the intelligence techniques used and the particular circumstances of that country. Outside factors mentioned above, such as terrorist involvement in poaching is highlighted in relevant cases due to its importance in the intelligence community and its effects on poaching in that particular area.

Limitations of the Research Design

A case study methodology displays various limitations. First, case studies are traditionally viewed as lacking rigor and objectivity (Rowley, 2002). While this perspective exists, the researcher made a conscious attempt to view each case objectively. To mitigate this potential drawback, the researcher takes a multiple case study approach, attempting to provide as much detail into each case as possible. It is important to

understand that some cases are very recent so while the case may seem as though it lacks rigor, the information provided in the case comprises the current available literature on the topic. Furthermore, to maintain objectivity, the researcher consciously endeavored to eliminate any bias that arose while analyzing the cases, thereby increasing the credibility of the researcher's procedures (Yin, 2012). Due to the lack of numerical data and the limited data currently available, the case studies provide as much information as possible to draw the best possible conclusion. While case study research is often only seen as exploratory or serving as only a prelude, it is useful when a gap in the literature exists (Yin 2012). Even though this is often seen as a fault of case studies, it can also be viewed as a necessary starting point.

Credibility

Source credibility varies. In certain situations, data was available from only African websites or released by various anti-poaching organizations throughout Africa. Due to oftentimes, corrupt politics and political influence on press, certain data only obtainable from African sources is questionable. As mentioned above, triangulation was incorporated when possible to increase the external validity of the study. Reputable newspapers are cited due to the increasing news coverage on the topic. The analyst works to maximize internal validity through cognitive input, thereby working to reduce any possible bias.

Transferability

By selecting national parks, reserves, conservatories, anti-poaching organizations, and countries with various terrains, environments, and economic statuses, the intention is to make these cases transferable to other organizations with similar terrain, environments,

and financial statuses. The transferability of these cases is not limited to African states. For example, Asian countries also suffer from poaching issues. Therefore, any other country with similar variables can be looked at in a similar context. Overall, this allows for an understanding of these intelligence techniques and their role in anti-poaching operations in a broader context. While the writer selected cases most representative of those in the broader context, they are not representative of all regions or anti-poaching techniques.

Ethical Issues

Ethical issues are overall minimal. All case material comes from open sources and protected sources were not utilized for data collection. HUMINT collection did not take place which includes any interviews. While all information included in the cases came from open sources, the only issue that may arise is in terms of placing these anti-poaching techniques into one organized document is the potential of giving the poacher an upper hand. It is hoped that analysts and anti-poaching units can implement the techniques before poachers find a way to counteract these strategies.

Chapter 3 Summary

The multiple case study methodological approach was chosen as a way to provide readers with a foundation on current day anti-poaching techniques. While the following cases take on a non-traditional approach in that they include an above average number of cases varying in length, it provides the best possible avenue to showcase available data on the subject. Sample cases were selected very carefully. These cases, while not representative of all aspects of every organization conducting anti-poaching measures, are as comprehensive as possible in terms of areas susceptible to animal poaching on a

global scale. The following chapter includes the case studies listed above, specifically looking at them through the lens of the various intelligence INTs.

RESULTS

Introduction

The following chapter comprises various cases in which intelligence was implemented into anti-poaching operations. There are fifteen cases in total spanning across the African Continent. The section will review and analyze each case through the intelligence INTs as applicable including, HUMINT, SIGINT, IMINT, GEOINT, MASINT, and OSINT.

Data and Analysis

Before divulging into specific cases, a brief overview of poaching in Africa is needed to deliver useful contextual details. Poaching in Africa is currently at a peak high when looking at figures over the past twenty years. As poachers' tactics evolve, counter measures must also change. Complex crime rings are being formed between these groups on the ground and organized crime syndicates to move the illegal substances around the world. According to Gettleman (2012a) those involved are exploiting turbulent states, porous borders, and corrupt officials around the world to their advantage in moving ivory as well as other poached animal parts.

Some of Africa's most notorious armed groups and terrorist organizations are increasingly using poaching to fund their operations and achieve their objectives. As mentioned above, the three biggest threats include the LRA, al-Shabab, and the Janjaweed. The LRA is said to deliver poached ivory to their leader Joseph Kony to fund the purchase of guns, ammunition, and radios (Gettleman, 2012a). Al-Shabab, a militant Islamist group with close ties to al-Qaeda, is well organized. While little was known about how the group funded operations, new evidence suggests that about 40 percent of

funding comes from trafficking ivory through Kenya (Kalron & Crosta, n.d.). Additionally, reports now connect the attack at the Nairobi shopping mall to poaching stating that ivory or the "white gold of jihad," almost certainly funded a portion of the attacks (Bergenas & Medina, 2014). Finally, horsemen from Sudan, or the Janjaweed, are said to have traveled to Bouba N'Djida in Northern Cameroon, killing half their elephant population in only a few days (Orenstein, 2013).

Gettleman (2012a) finds that while these groups play a large role in the slaughter, members of African armies are also involved. Members of the Ugandan military as well as the Congolese Army have been arrested for smuggling ivory, and South Sudan's military has been involved in battles with wildlife rangers. For these individuals, the temptation is high. Economic woes may drive their decisions. Gettleman (2012a) further notes the demand for ivory alone is so high that the ivory from one elephant is potentially worth 10 times the average annual income of many African countries, for example, in Gabon, subsistence hunters kill elephants and trade the tusks for, at times, a single sack of salt.

Poached ivory filters though complex crime webs where their most likely endpoint is in Asia. Figures suggest that approximately 70 percent of illegal ivory goes to Chinese markets (Walker, 2013). China's increased presence in Africa is another likely factor in the upsurge of poaching. According to Taylor (2011), with the growing Chinese presence in Africa, evidence suggests that poaching increases in areas with a combination of high elephant populations and Chinese construction workers. According to Tom Milliken, director of the Elephant Trade Information System, an international ivory monitoring project, the smugglers are "Africa-based, Asian-run crime syndicates

highly adaptive to law enforcement interventions, constantly changing trade routes, and modus operandi" (Gettleman, 2012a, para. 19). This ivory is often smuggled in customs shipping containers encasing secret compartments easily transported due to a global network of corrupt officials. The idea that poachers are merely villagers looking for extra money to support their families is no longer true. With the addition of highly capable individuals with resources at their disposal, poachers are able to evade the legal system.

Every three years, international governments, Non-governmental Organizations (NGO)s, and intergovernmental organizations meet for the Convention International Trade in the Endangered Species (CITES). CITES makes up the highest power in deciding the fate of elephants. In 2013, CITIES announced any measures taken are applied to all cases as well as to the international community as a whole (Annual report 2013). The most recent mandate states, according to CITIES 2013 annual report, that DNA samples will be taken in seizures over 500 kg and all parties must now report on their ivory stockpiles each year. The CITES Secretary General is required to cooperate with the UN Office of Drugs & Crime regarding the illegal killing of elephants, the illegal trade in ivory, and the national security implications (Annual report 2013). This proves that while saving species from extinction is a top priority, poaching is becoming, now more than ever, a law enforcement and national security concern.

To sum up, ivory is now in the same category as blood diamonds from Sierra Leone, or plundered minerals from Congo (UPDF, Kony killing, 2012). The Elephant Action League recently stated the "deadly path of conflict ivory starts with the slaughter of innocent animals and ends in the slaughter of innocent people" (Medina, 2013, para. 10). It is now more important than ever to counter this growing issue by halting the ivory

trade as well as the trade of all illegally traded animal parts. Improved intelligence collection is a key first step in turning this problem around.

Kenya

Ol Pejeta Conservancy. Of all the African countries undertaking anti-poaching operations, Kenya is seen as having one of the best anti-poaching strategies and fairly sufficient resources. One example of their exemplary efforts occurs at Ol Pejeta Conservancy. Ol Pejeta Conservancy is a non-profit wildlife conservancy that supports endangered species, tourism, and community outreach. It is the largest Black Rhino sanctuary in east Africa, home to 11 Southern White Rhinos, and has four of the world's seven remaining Northern White Rhinos (Northern white rhinos, 2014). It employs 160-armed guards across 90,000 acres to protect the Northern White Rhinos (Ol pejeta's dog, 2013). According to the Kenya Wildlife Service, Kenya lost 384 elephants and 29 rhinos in 2012, and, at the time of this research, 190 elephant deaths and 34 rhino deaths have taken place (Muraya, 2013). According to Otineno (2013), six Kenya wildlife service rangers have also been killed since December 2011 in an attempt to save these animals.

Ol Pejeta is the number one anti-poaching dog-training center in Africa. The canine unit is made up of three bloodhounds, an assault dog, and 10 Dutch-Malinois Shepherd puppies that work with the rangers (Ol Pejeta's dog unit, 2013). In mid-August of 2013, an ex-military trainer, Daryll Pleasants, carried out a six week volunteer program to train the canine unit. He trained the attack dog and the 10 new puppies, all in different specialties including two arms, two explosives and ivory detection dogs, two tracker and attack dogs, two special ops dogs that run completely silent for ambush attacks, two assault dogs, and two patrol dogs for perimeter rounds ("Ol pejeta's dog

Unit," 2013). While the dogs mainly assist park rangers in terms of operations, they also play an important role in intelligence collection. The two puppies that are trained to detect arms, explosives, and ivory are involved in a very unconventional form of MASINT through their ability to detect various explosives and substances found in weapons. MASINT in the traditional sense deals with detecting weapons emissions. For example, MASINT, may be used for nonproliferation purposes or, alternatively, as in this case, rather than stopping the spread or proliferation of WMDs, the intent is to stop the "proliferation" of ivory. Ex-military trainer Daryll Pleasants states, "dogs will play a huge role in saving wildlife as they not only act as deterrents to poachers getting in but also follow and stop anyone who manages to get into the Conservancy" (Ol Pejeta's dog unit," 2013, para. 5). In addition, according to Kulish (2013) the implementation of dog units is also taking place at airports around Kenya such as those in Nairobi and Mombasa to heighten surveillance.

Ol Pejeta is taking further measures to combat poaching in the conservancy as one of the many wildlife sanctuaries in Africa implementing drone surveillance, in this case, a form of IMINT combined with SIGINT with radio frequency tags. This particular drone, made by Unmanned Innovation Inc., flies 90-minute missions and covers 130 miles at a time (Otineno, 2013). These capabilities signify an obvious benefit of drones over human capabilities in terms of the ability to monitor vast areas of land. According to Otineno (2013), the drone tracks the animals by reading Radio Frequency Identification (RFID) tags using radio frequency and scanning the landscape with thermal imaging cameras. Thermal imaging is a form of IMINT, specifically infrared (IR) imagery. This is especially useful in situations such as detecting a possible poachers cooking fire at

night, or any type of heat signature such as the body heat given off by a human or animal. Kermeloitis (2013) further finds that the drones transmit a live stream to a laptop on the ground to provide information to rangers to reach hotspots quickly. This delivers a live fed, similar to a 24-hour watch center found in many intelligence agencies with drones monitoring and flying over hotspots. It is currently unknown how effective the $70,000 drone will be in the conservatory due to its very recent implementation (Kermeloitis, 2013).

In Kenya, along with other parts of Africa, reformed poachers are becoming a common trend in anti-poaching units. Julius Lokinyi, one of the most notorious poachers in Kenya, said to have killed over 100 elephants, now works as a ranger in a conservation militia (Gettleman, 2012b). He marches with village people, banding together to fight poaching gangs. These units are essentially a militarized neighborhood watch, displaying a form of law enforcement. In the United States, this is comparable to a neighborhood crime watch unit.

Many of these squads consist of those who are warriors in their communities, experts in bushcraft from years of grazing cattle and goats on the savannah, and defending them against armed raiders (Gettleman, 2012a). Those with this skill can instantly perceive when someone has trespassed on their land, which gives them almost a sixth sense to detect unwanted intruders. Another example is a man named John Pameri, selected because he was able to run an 11-mile race very quickly. His ability to respond rapidly to a poaching crisis or track a poacher swiftly is a finite skill. Furthermore, as stated by Gettleman (2012b), they can play the role of HUMINT collectors as well as field agents able to travel long distances as well as encompassing the ability to follow

faint footprints. These are not qualities an individual learns through training, but qualities individuals native to Africa learn through experience; they are invaluable skills only obtained through recruitment of those who live this lifestyle.

Tsavo National Park. Tsavo National Park is located in South East Kenya coined "Theatre of the Wild," comprising Tsavo West and Tsavo East National parks, together it makes up one of the largest national parks in the world, covering four percent of Kenya's total land. (Tsavo East National Park, 2014). Its close proximity to the Somali border has led to high levels of poaching.

This park is significant in that it is home to many very large elephants which means large tusks (Tsavo East National Park 2014). Moreover, the sheer number of elephants, currently at 12,000, is an attraction to poachers (The Tsavo poaching wars, 2014). Tsavo is in dire need for more sophisticated anti-poaching technology. With their large elephant population, technology is needed to patrol this vast terrain. Surprisingly, this key land, possibly detrimental to the survival of these species, significantly lacks the needed anti-poaching equipment and technology. The best possible example of anti-poaching takes place in Tsavo East. Here the David Sheldrick Wildlife Trust (DSWT), deploys eight full-time anti-poaching units with vehicles, camping equipment, radios, GPSs, cameras, and an Aerial Surveillance Unit to prevent snaring and other poaching related crimes ("The antipoaching project," 2012). These measures, while essential to the sustainment of the park, are simply not enough to cover these large areas of land. This is a unique case where a large population still exists but lacks the necessary intelligence capabilities to sustain it. The implementation of drones would highly likely benefit the park, the rangers, and the animals living there.

Maasai Mara National Reserve. The Maasai Mara National Reserve is located at the northern section of the Serengeti National Park. At the Maasai Mara National Reserve in Kenya, AR Drones, available for purchase on Amazon, now encompass an essential role in elephant protection. James Hardy, of the Mara North Conservancy stated, "Drones are basically the future of conservation; a drone can do what 50 rangers can do" (Spillane, 2013, para.12). According to Spillane (2013), the drones used in this case cost roughly $300 each, are two feet long, and are launched by touching "take off" on an iPad 3. They then collect IMINT by recording aerial footage of the landscape to aid in tracking poachers. Drones have also been found to display unexpected benefits. Some drones are silent, but those that are not produce a "buzzing" sound. Those that run while letting off a sound are known to frighten the animals because they relate it to their fear of bees, which may then keep them out of harm's way (Spillane, 2013). Many would assume a silent drone is preferred, showing that in poaching and in the unconventional use of drones, sound does have benefits. Another possible benefit of this "buzzing" is the ability for poachers to hear it, likely making them aware of an external presence and deterring them from carrying out this illegal activity.

Spillane (2013) finds that 15 elephants are now collared in the reserve with a particular GPS system that allows them to be tracked on a computer which overlays their paths on Google Earth; knowing where the elephants are located allows rangers to deter them from entering dangerous zones. The combination of SIGINT and IMINT/GEOINT has thus far proven an effective and powerful anti-poaching strategy. Additionally, the use of Google Earth, a free tool, is a very cost effective yet sophisticated way of producing GEOINT. Future drones in this area will encompass simple yet nontraditional

capabilities such as the capacity to release capsaicin, the active component in chili pepper, this technique is similar to the paint balls loaded with chili pepper that are used in Zambia's lower Zambezi region (Spillane, 2013). This method deters the elephant from risky areas. The ability to tailor drones to the needs of conservationists at reasonable prices is one of the most beneficial qualities of commercial drones, largely helping in anti-poaching efforts.

Up until recently, rangers struggled to find an intelligence collection method suitable for darkness. Spillane (2013) further asserts that rangers now use night vision googles to collect HUMINT and execute nighttime operations due to poacher's tendency to work at night. Other capabilities rangers hope to include on future drones at this specific location include infrared imagery, which, as mentioned above, allows for the detection of heat signatures.

Kenya is now implementing a strategy to microchip every rhino in the country after, for the first time in six years, a rhino was poached in Narobi Naitonal Park, coined one of Kenya's most secure parks. The small chips will be implanted into the horn of the rhino. These chips will not only allow for the tracking of the animals, but if they are poached, the horn will be trackable ("Kenya to microchip every rhino in anti-poaching drive," 2013). This form of SIGINT is the most common in monitoring wildlife and a particularly necessary measure for the nearly extinct rhino population.

On the law enforcement side, rangers enjoy prestige in Kenyan society while poachers are shunned. Kenya implemented a website to name and shame poachers at the address, PoachersExposed.com, launched by wildlife campaigners ("Kenya poachers to be named and shamed online," 2013). This, while a completely different situation, will

list offenders in a way comparable to the public listing of sex offenders, a law enforcement technique utilized in the United States. While the degree of humiliation will likely deter Kenyans, due to the importance of prestige in society, the websites also aims to collect data that will reveal trends to fight poaching. This is also a platform for OSINT collection and record keeping. Another site is RafikiyaWanyamaKenya, which reports attacks on wildlife ("Kenya poachers to be named and shamed online," 2013).

Amboseli National Park. Amboseli National Park is a large swath of land that runs through Tanzania and Kenya. Amboseli constitutes a remarkable case of success in the growing field of anti-poaching operations. First, considering the many differences between Tanzania, a very poor country, and Kenya, a more well off African country, a joint, trans border anti-poaching operation needed to be initiated. Richard Bonham, founder of the Big Life Foundation, takes a unique approach to combat poaching activities by implementing the only cross border initiative in East Africa.

The founder of this initiative's background gives him a variety of advantages in this area. First, Richard Bonham has lived in the Amboseli area for decades giving him a valuable understanding of the key players in the area ("Anti-poaching," 2012). Damian Bell manages Big Life Operation in Tanzania, and, like Bonham, has a long lasting relationship with the locals and connections to wildlife departments ("Anti-poaching," 2012). These two men display an invaluable asset, especially among tribes in Africa: trust. Within two years of the organization's founding, a variety of milestones have been achieved and are as follows according to the Big Life Foundation (2013): First, approximately 315 rangers have been placed across the two countries with open communications lines. This allows rangers to reach one another on either side of the

border quickly. Second, 31 ranger outposts now exist. These are strategically located in the most vulnerable areas. Third, 15 anti-poaching vehicles including Land Cruisers and Land Rovers move freely on the land, with aerial support and monitoring coordinated between the two countries. Additionally, rangers have the latest technology including night-vision and GPS equipment, four anti-poaching dogs, and, possibly, most importantly, the individuals have gained trust in the community providing them with a large network of informers at all levels delivering valuable HUMINT. These factors and the fact that Big Life has impunity to coordinate the pursuit and arrest of poachers attempting to escape across the Tanzanian border, has led to 1,030 arrests and 3,012 confiscated weapons ("Anti-poaching," 2012).

The dog unit in Tanzania, according to the Big Life Foundation (2012), goes as far as strategically placing kennels so they have quick access to particular conservation areas. Just knowing the dogs are there is often a deterrent to keep poachers from committing these illegal acts. Dogs also play a key role in unconventional interrogation. Rangers have seen success in lining up potential poachers and allowing the dogs to sniff the poachers ("Dogs save elephants," 2012).

In a growing trend throughout Africa, Bonham employs local community members, offering them competitive wages ("Elephant conservation with," n.d). Some of the best rangers are ex-poachers so they know the tricks and tactics better than others. Bonham explains his undertaking as an attempt to gain the hearts and minds of the community who are living with the animals. This again sounds similar to a counterinsurgency approach in the nontraditional sense.

This approach demonstrates that starting from the first node or the root issue in a complex large web of links and nodes is effective. By providing these men with prestige in the community and a respectable salary to care for their families, not only do their livelihoods improve, but so do those of the animals. Furthermore, extracting rangers from the community strengthens HUMINT links between Big Life and the community as well as the important bush network in the area. Big Life also employs GEOINT successfully in that their website displays various maps plotting out, for example, outposts. Some maps are even interactive. This allows them to keep track of where they as well as strategically place new outposts.

In addition to measures taken at wildlife sanctuaries, Kenya is also a prime spot for transferring ivory. At Mombasa, Kenya's largest port, regular ivory seizures are common. Poachers often disguise the ivory as they attempt to sneak it out of the country; for example, Kulish (2013) finds that recent seizures were in the form of a haul of sun-dried fish and another as a consignment of 240 bags of groundnuts. When ivory makes it this far, to prevent it from reaching Asia, a boots-on-the-ground approach is necessary. No longer will drone surveillance suffice; labor is needed to detect these substances. While ivory is smuggled in a plethora of goods, poachers tend to favor wrapping it in chili pepper. Gettleman (2012) notes this constitutes a way to get past sniffer dogs. This is why oftentimes more advanced MASINT techniques are necessary to detect illegal ivory or shipments need to be thoroughly inspected before they are loaded onto ships. Moreover, it shows the extremes and creative methods poachers are willing to employ to move these illegal substances.

Overall, Kenya's success when it comes to anti-poaching is largely due to the perspective they take, treating poaching as a war, employing paramilitary forces and intelligence tactics such as drones. Not only do they realize the implication of poaching on animal populations, but they also know the value of their tourism industry in which elephants play a large role. Organizations such as Ol Pejeta know poachers also promote crime, corruption, instability, and intercommunal fighting. According to Paul Elkan of the Wildlife Conservation Society, "This isn't just about animals. It's about security, conflict reconciliation, even nation building" (Gettleman, 2012, para. 12).

Somalia

Somalia is characterized as one of the most lawless countries in the world. It lacks a functioning government. It is the home to Islamist militants and human traffickers, as well as pirates. In addition to these factors, according to Stewart (2013), allegations' have been made that poaching is now contributing to Somalia's instability. Evidence suggests, as compared to LRA and Janjaweed ivory operations, al-Shabab's are far more sophisticated and, according to a former Shabab associate, they hope to "facilitate the marketing" of ivory and are encouraging villagers on the Kenyan border to "bring tusks" (Gettleman, 2012, para. 47).

Somalia may not display effective anti-poaching efforts, or any for that matter, but it is essential to report that the right use of HUMINT in this country has the potential to provide valuable intelligence on this al-Qaeda affiliate. Recently acquired HUMINT accounts by Somali elders stated that al-Shabab began training a number of its fighters to infiltrate Kenya to poach elephants in order to sell ivory and help fund their operations (Gettleman, 2012a). Andrea Crosta, the executive director of the Elephant Action

League (EAL), who maintains a network of undercover spies and informants inside al-Shabab, claims up to three tons of ivory was bought and sold every month through a coordinated supply chain (Doshi, 2014). This case displays an excellent example of HUMINT on the operational level. According to Doshi (2014), gathered intelligence points to one man, likely in charge of all ivory dealings.

Additionally, US interest is peaking in Somalia and, for the first time since 1993, a small team of uniformed military advisers have been sent to the country to provide logistics, planning, and communications assistance to Somali and other African forces fighting al-Shabab (Schmitt, 2014). The presence and interest in the country is likely to expand, particularly after al-Shabab's role in the Nairobi mall attack of September 2013. As US presence expands in Somalia, various intelligence collection methods providing intel on al-Shabab's use of ivory and how they are getting it may afford US and Somali officials with valuable insight into al-Shabab's operations as well as point them to top al-Shabab leaders.

Zimbabwe

Hwange National Park. Hwange National Park is Zimbabwe's largest game reserve and the third largest in Africa. This case is an anomaly and displays the tactic of poisoning, which is common throughout the park, rather than more traditional poaching techniques. Zimbabwean authorities report that at least 81 elephants were killed for their ivory using cyanide poison in water holes ("Ivory," 2013). Furthermore, poachers are now spreading deadly poisons on elephant carcasses to kill vultures, which serve as an early warning system that an animal has been killed (Gettleman, 2012c). This deters the

attention of park rangers. Poachers at Hwange also use snares cutting into the animals only to wound them (Elephant conservation with, n.d.).

Until recently due to economic woes, Hwange National Park did not have a vehicle dedicated to anti-poaching operations (Elephant conservation, n.d.). According to Guvamombe (2013), rangers in this park do not receive regular salaries or food rations. These factors contribute to the park's great need for the integration of intelligence in its anti-poaching operations and a means to increase the motivation of rangers.

If effective measures are not taken, particularly MASINT to detect the poisoning and a form of IMINT to survey the park for poachers, the cyanide will not only kill animals, but will also have long lasting effects on the land and its water supply. No measures are currently being taken to stop this form of poisoning. Rather than a display of current intelligence techniques, this case serves as increasing awareness of this new technique implemented by poachers and possible ways to mitigate it.

Mozambique

Limpopo National Park. Mozambique is a poor country with very limited anti-poaching efforts. However, Limpopo National Park is home to one of the world's most endangered species; approximately 60% of the world's remaining rhino population ("Establishment of a special anti-poaching unit in Limpopo National Park," 2013). Cross border joint operations is a primary focus between Mozambique and South Africa in the prevention of illegal poaching. New measures are being taken to give South African's intelligence and ranger units the ability to cross the border in a "hot pursuit" strategy ("Mozambique taking steps to tackle rhino poaching," n.d). This is a deterrent against Mozambique poachers that cross the border into South Africa, kill a rhino and cross back

into Mozambique because once the poacher crosses the border, they are no longer at risk of arrest ("Mozambique taking steps to tackle rhino poaching," n.d). The implementation of an open-fence agreement, according Albi Modise, a spokesman for South Africa's event minister, "has become an open season for poachers" (Laing, 2013, para. 10). Laing (2013) notes that rangers in the Kruger National Park are engaged in daily battles with Mozambican poachers. This, in turn, is of the catalyst of more fences along the border.

Mozambique has only recently begun training a small force of rangers to protect wildlife. However, far behind South Africa in their efforts, their willingness to work together and share intelligence is essential to counter poaching in both countries. While this is a step forward, a major setback as noted by Laing (2013) comes in terms of wildlife rangers coordinating with poachers to kill the animals. It is necessary to increase incentives for these rangers as in the case of Amboseli National Park, detailed above, where rangers enjoy prestige and a monetary incentive to save the wildlife.

In addition, Mozambican authorities claim that poachers very recently began using land mines (Gettleman, 2012c). This is another case of a new technique being implemented by the poachers themselves rather than a technique to mitigate the problem. Poacher's use of landmines in Mozambique suggests that anti-poaching units may have to consider land mine detection tools. Knowing that many of these parks may not be able to afford sophisticated tools, other options are available. For example, after Mozambique's 16- year civil war, landmines still cover much of the country. The use of Mine Detection Rats (MDRs) to sniff out the mines has proven an effective strategy. According to Lindow (2008), rats are easy to train, transport, cheap to feed, and resistant to many tropical diseases; they are also quick and methodical and therefore a viable option if this

technique spreads into other countries. It is essentially, an elementary, very low technology form of MASINT.

Democratic Republic of Congo (DRC)

Garamba National Park (African Parks). African Parks is a non-profit that currently operates seven of Africa's national parks. African Parks is a governing body, law enforcement agency, and intelligence agency in its own right. Russo (2013) lists African Park's specific responsibilities which include: park finances, security, infrastructure, tourism components, roads, and law enforcement. The organization hopes to own and operate 15 parks by 2020 ("African parks annual report," 2012). It is likely they will provide the same services at all parks and implement intelligence into their strategy.

Garamba National Park is located in the Northeastern DRC, founded in 1938 it spans over approximately 1,900 Square miles ("Garamba National Park," 2012). Garamba was named a UNESCO World Heritage Site in1980 and a World Heritage Site in Danger in 1996 ("Garamba National Park," 2012). Traditionally known as a picturesque, untouched reserve mixed with trees, woodland, dry forest, riverine, swamp forest grassland, savannah, and wildlife, it is now coined a battlefield ("Life Returns," 2011). Furthermore, the poaching case in Garamba is particularly of interest to the intelligence community due to the LRA presence in the area. This park is a major area of operation for the LRA.

Gettleman (2012a) states that Garamba has a force of 140 wildlife rangers armed with assault rifles, machine guns, and rocket-propelled grenades (RPG) to protect animals from poachers often hidden in the thick bush. This is an example of the rough terrain

many African countries face. Better intelligence techniques are needed to alleviate the burden that comes with these environments.

Garamba is significant in that it was the last home of the White Rhino before it became extinct in the wild. Luis Arranz, Garmaba's Park Manager states:

> Garamba was the final wild refuge of the critically endangered northern white rhino, during the 1950s the park was home to between 40,000 and 60,000 elephants and 1000 rhinos . Today the rhinos are gone, the last one disappeared in 2007 and the elephants have been reduced to fewer than 4000 rhinos. But Garamba's nutritious grassland could support ten times the current elephant population. (Life returns, 2011, p. 60)

Northern Garamba, characterized as the land north of the Garamba River was abandoned for approximately 15 years until 2010 when patrols began crossing the river to regain control of the lawless land likewise; Garamba's western boundary was deemed a no-go zone for rangers since 2008 due to LRA presence (Cunlife, 2011).

Interpol, is now involved in poaching investigations in Garamba. A station in the park where biologist Pablo Schapira Perez works collects DNA samples from elephant sculls then sends his results to Interpol (Gettleman, 2012a). Then, according to Gettleman (2012a), researchers use this evidence to determine if ivory seized in other parts of the world originated from elephants killed in Garamba by sending ivory to Interpol and comparing ivories they have found in illegal markets. This is an example which displays the power of DNA and intelligence used in conjunction with one another. Neme (2013) notes DNA can now link suspects to specific crimes, allowing for stronger evidence in court to identify individual elephants killed in a particular incident.

Gettleman (2012a) notes many poachers traveling on foot have been killed by rangers in Garamba, but the alleged tactic of helicopter poaching is a new development

and proven by a recent incident where 22 elephants were found in a circle trying to protect their young by surrounding them. The bullet location, the top of the head, indicates they were likely shot from above. They suspect this incident may match a large ivory siege found in a box labeled, "household goods," which was seized at the Ugandan airport Gettleman (2012a). Various observations, as described by Gettleman (2012a) show that the Ugandan military is possibly responsible for the massacre and soon after the incident, a Ugandan military helicopter was seen flying at a low altitude over the park on an unauthorized flight, which turned around after being seen. Park rangers almost instantly linked the killings with the helicopter, noting it as suspicious activity. Gettleman (2012a) finds that in this case, after the area was surveyed, there were no tracks leading away and no sign the poacher stalked the elephants from the ground while further evidence shows that the tusks were hacked away, none of the meat was missing; subsistence poachers almost always take a portion of meat for their return to camp.

Anti-poaching capabilities at Garamba are improving, though nowhere near the level of sophistication necessary. While recent initiatives have helped, park manager Arranz hopes to soon add improved operations and intelligence collection tools (with a focus on IMINT and GEOINT) such as surveillance drones, night-vision goggles, flak jackets, and pickup trucks with mounted machine guns to its arsenal of tools to defeat the poachers (Gettleman, 2012a). A recent battle against LRA members that took place in June 2012 displays the need for these weapons. According to Onyango, "They opened up on us with PKMs, AKs, G-3s, and FNs. Most poachers are conservative with their ammo, but these guys were shooting like they were in Iraq. All of a sudden, we were outgunned and outnumbered" (Gettleman, 2012, para. 29). Doshi (2013) states ivory has

been described as Kony's new lifeline, according to LRA escapees and defectors, Kony instructs his fighters to kill as many elephants as possible and send him the tusks.

The best information on Kony comes from HUMINT and OSINT published online and in newspapers in the form of accounts given by LRA defectors and escapees. As noted by Gettleman (2013b) these escapees are able to provide exact counts, for example, one woman said she saw rebel kill 10 elephants and wrap tusks in cloth sacks, then sending them to Kony, while another escapee claimed the group killed at least 29 elephants. Finally, an ivory retailer in Omdurman, Sudan claims the LRA is one source of the ivory he sees and it is how the group buys their weapons ("UPDF, Kony killing elephants for ivory," 2012).

To stop these incidents, people like Paul Onyango are being placed in anti-poaching units, Onyango trains and leads a force of rangers employed by the *Institut Congolais pour la Conservation de la Nature* (ICCN), an organization that exists to re-establish control of Garamba National park (Cunlife, 2009). He received paramilitary training and went on to work for the Kenyan Wildlife Conservation and Management Department he then spent six years at an anti-banditry unit operating on the Somali border (Cunlife, 2011). According to Nuria Ortega, Garamba's tourism, marketing, and public relations coordinator, "the ongoing recruitment and training of rangers has been a focal point, and this has helped to secure the park and get a handle on poaching" (Cunlife, 2011, para. 23).

Garamba is a location encompassing many advantageous factors for the poacher. According to Arranz, "Garamba is located in one of the most remote places on the continent; combine this with a derelict road network, and logistics become extremely

complicated and hellishly expensive" (Cunlife, 2011, para 21). This is likely a significant reason groups such as the LRA choose to poach in Garamba as well as other areas containing the same variables.

Salonga National Park. Salonga National Park is located in central DRC. The park is the home to the endangered Bonobo, a type of chimpanzee, and rare forest elephants ("Anti-poaching operation makes DRC park safe for elephants and people," n.d). As a result of evidence provided by USAID and help from the WWF and the Zoological Society of Milwaukee (ZSM), the Congolese government allocated 300 military personnel to carry out "Operation Bonobo" ("Anti-poaching operation makes DRC park safe for elephants and people," n.d). The idea of implementing military personnel into anti-poaching operations is a growing trend. In 2011, rangers began a sweep of the park and surrounding communities to seize illegal weapons and arrest suspected poachers ("Anti-poaching operation makes DRC park safe for elephants and people," n.d). The intensity and rigor of this "sweep" likely contributed too many accomplishments of the park. After thorough inspection of these areas, Operation Bonobo successfully resulted in the arrest of 30 poachers, 7 prison sentences, the confiscation of approximately 120 firearms, and the destruction of one ton of bushmeat, overall elephant circulation tripled and surveys and patrols resumed ("Anti-poaching operation makes DRC park safe for elephants and people," n.d). This operation displays that with proper funding, the ability to clear an area is a useful first step in undertaking an anti-poaching operation. After a sweep of the park is complete, implementing intelligence collection technologies is likely to help maintain the degree of security

already achieved. SIGINT and IMINT collection through GPS and drones would play a vital role in maintaining the security of the area.

Chad

Zakouma National Park. According to African Parks, Chad once provided a home to roughly 50,000 elephants while numbers today suggest there are 1,200 left (Russo, 2013). Ninety percent of elephants in Zakouma National Park have been killed by poaching in the past 10 years, one of the most drastic declines of an elephant population anywhere in Africa (Gettleman, 2012). Russo (2013) finds in Zakouma alone, a count done in 2005 exhibited roughly 400 elephants, whereas the most recent count shows about 450. This gradual increase is likely due to recent intelligence measures. African Parks implemented what they call a multifaceted strategy. First, Russo (2013) notes they tagged 15 sub-herd elephants with satellite collars that automatically provide location information every four to eight hours allowing for frequent SIGINT collection, the collected intelligence is fed into a central control center that can then send out anti-poaching patrols to monitor the herds. Russo (2013) further states that the park operates two aircraft, which conduct aerial surveys on a daily basis. A combination of HUMINT and OSINT is gathered through a telephone network, almost like an anti-poaching anonymous tip hotline that was installed in surrounding villages; here, villagers can call toll free in regards to hostility towards animals or people (Russo, 2013). Measures are also being taken on the law enforcement side. A rapid response team is in place to rush to any threat that may arise (Russo, 2013). Furthermore, the manager of Zakouma, Rian Labuschagne wants to build a highly trained, younger army of rangers, as many poaching units are men in their 40’s and 50’s (Gettleman, 2012c).

Understanding how to utilize the strengths of locals is key in Labuschange's strategy. He knows the strengths of his men and what works in the areas they protect in terms of operations and intelligence measures. He states:

> Although some protected areas are using modern technology such as drones as an anti-poaching tool, we believe that a combination of an easy flow of information from the communities to the park, the use of radios and toll-free telephone numbers, together with effective, para-military-trained game scouts on the ground, and in Zakouma's case also on horseback, are our best ways to effectively protecting Zakouma's elephant herds. (Walley, 2013, para. 7).

For example, in Zakouma, along with foot, motorbike, and bicycle anti-poaching patrols, horse patrols play a large role as part of their anti-poaching strategy due to the lengthy rainy season where horses are able to weather these conditions, providing effective patrolling from May to October (Walley, 2013). Chadians are skilled horseback riders. Furthermore, according to Walley (2013), Public Relations Manager at African Parks Network, they are now being trained to use pistols as well as implement a comprehensive para-military training program to train rangers in the use of sniper rifles. In Africa, particularly, it is essential for each area to tailor their anti-poaching units to the distinct environment they protect and utilize the strengths of those living there.

Intelligence is also providing ways to identify the "who" aspect of the poaching problem. According to Getleman (2012c), an attack in 2013 in Zakouma left five rangers dead and one missing, likely revenge for a raid on a poacher's camp; furthermore, after evidence was recovered, this incident, normally assumed to have been carried out by the Janjaweed, is more likely the work of the Sudanese government. A camp likely tied to the incident was raided nearby the site of the killings and various evidence was recovered including: one uniform for Abu Tira (Central Reserve Forces), several elephant tusks, a

stamped leave slip from the Sudanese Army that granted four soldiers permission to go to the Chadian border, and digital photos from a phone that showed stacks of elephant carcasses that looked very similar to a recent killing in Cameroon, one of the biggest single elephant slaughters in decades (Gellteman, 2012). This type of investigation is essential for connecting individuals to these poaching activates. If the raid had not occurred, the dangerous assumption that the Janjaweed was responsible would still exist.

South Africa

South African Wildlife Reserve. South Africa is one of the more developed countries in Africa and has the capital to implement many intelligence techniques other African countries cannot afford. It is difficult to narrow down the cases on South Africa as they have undertaken numerous initiatives although the best example of South Africa's use of intelligence is seen though their implementation of drones in high-risk areas. Recently tested drones made by Falcon were taken to a South African wildlife reserve. The drones are equipped with sophisticated IMINT collection technology and equipped with multiple video cameras including infrared, which allows the operator to see the real time feed on laptops (Joyce, 2013). These capabilities, while in their infancy, are likely some of the best possible combinations in terms of anti-poaching strategies. Infrared, as mentioned above, is necessary to detect heat signatures beneath triple canopy jungle and a necessary feature when detecting poachers at night. The ability to monitor these feeds in real time allows for heightened awareness, and specific location information, therefore resulting in quicker deployment of forces when needed. Other technologies are also being implemented in the South Africa Wildlife Reserve, as noted by Joyce (2013), through the use of historical records of wildlife movements and poaching, a computer

program was devised to position the drones in "hotspots." Joyce (2013) further finds that this approach will allow operators to determine where to position the drones at night to intercept poachers before they reach animals as well as ideal locations to position rangers. The designers of the program plug in the location of water or trails rhinos commonly use. They then program poachers' behavior into the drone's software and flight plan (Joyce, 2013). This type of software is applicable to any situation and rather than water or trails, any other feature can be imputed, thereby tailoring the program to the specific needs of an area. This nuanced tactic will allow officials to make the most of their resources zeroing in on hotspots as the drone program is slowly implemented. Tom Snitch, an economist that heads the team from the University of Maryland, compares the war on poaching to the wars in Afghanistan and Iraq. Joyce (2013) describes this comparison, stating the team created a program that helped the Pentagon predict where bombers would place IEDs, while in Africa the result is different. Here they are trying to predict where the poachers will likely poach. The drones used in this test run showed a great deal of potential in terms of tracking animals and people.

SANParks. Oftentimes various institutions will work closely with national parks on anti-poaching techniques and strategies. South Africa's national parks authority (SANParks) is teaming up with the Council for Scientific and Industrial Research (CSIR) for a five-year strategic partnership looking at existing methods for tracking rhino and improving them overall ("Sanparks and tech," 2013). While information on the partnership is still in its infancy, CSIR is working on sensors and surveillance at poaching hotspots that can locate shooters within seconds and track human movement across borders. According to Charl Petzer, the program manager at CSIR, "We will be assisting

SANParks from strategic and planning levels through to tactical issues" ("Sanparks and tech," 2013, para 6) This shows a degree of understanding and an acknowledgment in terms of the importance of the each of these three levels. These terms, "strategic," "tactical," and "operational" further show the overlap into intelligence.

Operationally, they help manage resources and optimize capabilities by establishing operations rooms for real-time surveillance, allowing for collaboration at national command centers where law enforcement agencies and departments can work towards environmental protection together ("Sanparks and tech," 2013). To do this, they will have to focus on amalgamating individuals with expertise in defense science and engineering with South African military, security and intelligence organizations (Csir/sanparks in partnership, 2013). Maj Get (Ret.) Johan Jooste, Commanding Officer of Special Projects at SANParks, states:

> We are facing a battle at the moment and need to respond deftly, and with the best means we have. But, we cannot forget the bigger war. We are therefore taking a long-term strategic view on increasing the effectiveness of environmental asset protection interventions at our parks throughout the country. At the highest level we need to bring together the many departments and agencies that have mandate to act in this filed and get cohesion and consistency in how we best work together. There are policy issues involved. (CSIR/Sanparks in Partnership to Safeguard AS's Natural Assets, 2013, para 3)

The statements made by this individual, a former General point to the importance of intelligence in combatting animal poaching. Furthermore, a military helicopter, discussed below, has been donated to SANParks that will be used at Kruger National Park in addition to the Seeker MKII surveillance airplane recently implemented in 2012 ("Sanparks gets military chopper," 2013). This military helicopter will provide surveillance as well as IMINT to rangers in the park.

In addition to the recent partnership, SANParks has many other available technologies. They will use Skate, a low cost, off-the-shelf, UAV that has been deployed by troops in Afghanistan ("Nova labs hosts," 2013). The fact that technologies used to gather intelligence in a war as large as the counterinsurgency in Afghanistan provides insight into the "war" connotation now associated with anti-poaching operations. According to Johnson (2010), SANParks has high quality air-to-land equipment from Denel that can take pictures of the offenders, with the ability to detect the color of the shirt the poacher is wearing, with hopes to eventually gather enough intelligence to directly target the poachers.

Kruger National Park. Kruger National Park is home to the world's largest rhino population ("Establishment of a," 2013). Kruger is a well-known park with a fairly sophisticated anti-poaching team. On the law enforcement side, South Africa has a partnership with South Africa's Crime Line which allows the public to make anonymous SMS tip-offs 24/7 ("Establishment of a," 2013). This park takes a mixed approach to counter poaching. They implement both a military aspect and law enforcement tactics to counter poaching. Some of these measures include appointing a highly rated and decorated retired army Major General to oversee the anti-poaching operations, deploying of the South African National Defense Forces, providing cash rewards for successful conviction of poaching syndicates, aerial patrols to assist ground efforts, as well as sniffer dogs at the park's entrance gates ("Establishment of a," 2013).

Furthermore, Kruger recently received The Gazelle, a military helicopter, for anti-poaching operations. According to Ivor Ichikowitz, Chairman of the Ichikowitz Family Foundation, the donor of the aircraft, "During war time, the strategic advantage always

belongs to the force that has superior airpower. Essentially, although this is a unique "warzone", the Gazelle will strengthen SANParks' existing forces and bring this element to Kruger National Park" (Theunissen, 2013, para. 7). His words continue to reinforce the "war" connotation now associated with anti-poaching efforts.

Peace Parks Foundation. Peace Parks Foundation, an anomaly in that it does not control a particular swath of land, has provided invaluable contributions to anti-poaching operations. Their most unique contribution is the offering of classes on basic Geographic Information Systems (GIS) and GPS training at the Southern Africa Wildlife College ("Training conservation staff," 2013). The value of GIS in conservation is recognized by the foundation and being increasingly implemented to provide actionable GEOINT. Courses also teach students about GPS, remote sensing, as well as monitoring and evaluation tools where they are often taught to use GPS to collect SIGINT and feed it into a central monitoring system ("Training conservation staff," 2013). Education and increased knowledge of the value of GEOINT in anti-poaching has the potential to be revolutionary in the field if classes are offered at protected areas throughout Africa.

Tanzania

In 2013, PBS released a documentary titled *Battle for the Elephants*. It looks at the ivory trade from two different perspectives: the Chinese market's demand and the point of origination, Africa. This case will focus on the African aspect of the investigation. Aidan Hartely, an investigative journalist, goes undercover as a westerner looking to purchase ivory. Tanzania, a very poor country, has the largest stockpile of ivory as opposed to any other country. It is worth an estimated $50 million ("Battle for the elephants," 2013). While the ivory entering Dar al Salam originates all over Africa,

recent successful DNA matches show that 60 percent comes from The Selous, the largest game reserve in Africa, now coined Africa's killing fields ("Battle for the elephants," 2013). In this case, HUMINT is the main focus. Haretly goes undercover as a Westerner looking to purchase ivory in Dar al Salam while filming covertly. After a very short time, he comes into contact with a seller that claims he can get 1,000 kilos. Hartely states he needs to see the ivory himself. The seller insists he travels to his stash location with him. During the hour drive, the seller begins opening up to Hartely about the ivory trade. He states that many powerful people in Tanzania sell ivory. He further claimed to know of an airplane coming in that day, one that belonged to what he called a VIP. This "VIP" was the government of China sending diplomats to partake in the trade ("Battle for the elephants," 2013). This short study displays the invaluable power HUMINT can provide in gathering anti-poaching information. During the hour ride, the poacher, likely due to Hartely's easy going nature, provided him with information on key players in the poaching business in Tanzania as well as the location the ivory is kept.

Namibia

Companies are also becoming involved in anti-poaching operations. Since 2012, Google has funded the Wildlife Crime Technology Project carried out by the World Wildlife Fund. Namibia was chosen as the location to carry out their pilot project. At national parks in Namibia, Falcon UAVs equipped with a variety of cameras and sensors conducted daytime and nighttime reconnaissance flights, rhinoceroses were tagged with radio frequency identification (RFID) chips, ground based sensors connected to real time communication was integrated in key areas, and local officials tested a spatial reporting and monitoring platform that can track the movements of poachers, rangers, and animals

(Ungerleider, 2014). This is a case that shows a nuanced integration of intelligence disciplines, in the anti-poaching sense. It is also important to note that while these are innovative technologies, they must be low maintenance technology able to withstand African terrain and be simplistic enough for rangers to learn quickly. By combining the use of UAVs (IMINT) and RFID tags (SIGINT) with mobile command centers, a holistic, Multi-INT collection approach begins to emerge.

Chapter 4 Summary

Overall, intelligence will increasingly become an asset in combating animal poaching. According to Johan Bergenas, deputy director of the managing Across Boundaries Initiative at the Stimson Center, a nonprofit, nonpartisan think tank in Washington:

> These poachers are no longer using non-sophisticated weapons. They are really going after the use of helicopters, machine guns, vision goggles that can see at night. And we have to respond with the technology that – 'the good guys' have in managing these issues (DeCapua, 2013, para. 8).

To effectively counter this growing problem, actionable intelligence is needed now more than ever as poachers become more sophisticated. The next and final chapter will explore what the previous case studies have concluded thus far and how, going forward, intelligence techniques can be an asset in the war against animal poaching.

CONCLUSION

Introduction

The purpose of this study was to highlight intelligence's increasing role in the poaching crisis currently taking place throughout Africa and worldwide. By evaluating various cases and intelligence's role in each, it is evident that intelligence is a means to deter this problem. The following chapter concludes this research with an overall summary of the study, a final discussion of significant findings categorized by the INTs, the implications for practice, and recommendations for further research.

Summary of the Study

This thesis analyzed various intelligence techniques used to counter poaching activities in national parks, national reserves, conservatories, and countries throughout Africa. Each case is viewed through the most applicable INT, which include HUMINT, SIGINT, IMINT, GEOINT, MASINT, and OSINT collection. The overall purpose of the study was to provide an early assessment of intelligence's role in countering poaching activities thereby beginning to close the current gap in the literature. After the preliminary assessment, it can be concluded that factors such as terrain and cultural influence determine the best possible anti-poaching strategy for each area. Furthermore, while broad aspects of an anti-poaching strategy can be applied to all cases, an essential takeaway is that no one case is alike. Attention and the need for customization towards a particular area is crucial to comprising a successful anti-poaching strategy.

Discussion of the Findings

After reviewing the case studies in Chapter 4, various intelligence actions can be concluded for possible implementation including three key takeaways. First, the

importance of terrain and overall environment plays a key role in intelligence collection techniques. GPS collars' durability may prove more suitable than drones in particular climates; for example, from an intelligence standpoint, governments, parks, reserves, and conservancies must fully understand the terrain under their control. This allows these organizations to make the best possible assessment as to the most effective collection methods suitable for their area of control.

Cultural factors also encompass a large role in anti-poaching operations particularly in Africa. The case study of Zakouma shows that Chadians are skilled in horseback riding and patrols on horseback have proven very effective (Walley, 2013). Rather than allocating resources towards vehicles, which are not as efficient throughout their long rainy season money can go toward other resources that may prove more effective in this area (Walley, 2013). This finding shows the key role locals play in intelligence collection as well as their ability to provide insights into resource allocation due to their extensive understanding of the culture.

Finally, the need to tailor each intelligence strategy towards a specific area is a key takeaway from this research. While larger picture factors may be applicable to all situations, each park, reserve, conservancy, and country must have a very specific, one-of-a-kind intelligence plan to suit its particular needs. Ultimately, the details tailored to each area will play the largest role and make the difference in a successful or unsuccessful anti-poaching intelligence strategy. It is important to note that while these intelligence actions are critical to countering illegal animal poaching, a combination of techniques including education and effective law enforcement constitute vital roles, as a holistic approach is also the most comprehensive.

Based on the nature of this research, the author deemed it best suited to discuss the findings and provide any recommendations in the context of the findings. These recommendations will focus on the possible intelligence solutions to the problem. The following findings and recommendations will be broken down by the various INTs.

HUMINT

There is no substitute for on-the-ground HUMINT. It is universally beneficial in almost all situations. Anti-poaching strategies do not place enough weight on HUMINT collection techniques. Which, under these conditions, due to its ability to be collected through open source methods, for example, by talking the locals, displayed in many of the above cases. HUMINT was also obtained by LRA escapees and an ivory trader in Somalia. Anti-poaching units going undercover can also gather invaluable intelligence particularly in terms of the key players in the ivory trade in a specific country. In the case of Tanzania, journalist Aidan Hartely went undercover in a clandestine operation and in only a few hours was able to gather intelligence on key players, foreign involvement, poaching locations, ivory stockpile locations, and government involvement from a local ivory dealer. The documentary states that Hartely would not have been able to penetrate the illegal market without the help of operatives and specialized undercover gear ("Battle for the Elephants," 2013), thus emphasizing locals' importance in the equation. This can lead to better resource allocation, even the elimination of other more costly INTs.

While Hartely was lucky to collect the intelligence he did, it is more likely to find individuals that have grown up in an area and have connections that can only be forged over time to gain the trust of these dealers. While natives of the country are ideal

candidates to preform HUMINT, the case of Amboseli National Park suggests otherwise; that's where Richard Bonham and Damian Bell are located. Both have lived in the Amboseli area for extended periods of time ("Anti-poaching," 2012) fostering trust throughout the community and allowing locals to feel at ease when providing HUMINT on poaching operations. By fostering these long-term relationships with the locals, thereby founding an element of trust is a means to allow HUMINT to essentially come to you. Finally, in the case of Somalia, an alleged network of undercover spies and informants are planted inside al-Shabab who report information on ivory deals and provide valuable HUMINT, including the notion that one individual is likely in charge of all ivory dealings.

HUMINT, while a likely asset in all anti-poaching intelligence operations, may deem highly necessary as the US presence increases in Somalia, an extreme case. US officials may want to discuss anti-poaching measures and information on al-Shabab from Kenyans who share a border with Somalia. Sharing a border with this country has afforded wildlife employees insight into operations going in Somalia and with Kenya seen as a leader in anti-poaching efforts in Africa, they may soon have best practices to offer for implementation in Somalia.

SIGINT

SIGINT has played the largest role in anti-poaching efforts over the past few decades with technologies such as radio tracking and GPS. It is important to note that while various scholarly work is available on GPS and radio tracking, it is not specifically viewed in the context of intelligence, but is certainly a form of SIGINT. Due to the cost effectiveness of GPS, SIGINT should continue to play a vital role in the tracking and

overall ability to understand elephant movement and behavior. It is also a means to keep close tabs on any animal, not just elephants. Today, collars can be purchased in different sizes, weights, and with a variety of capabilities and features making them highly customizable to different animals and environments. This plays a key role in the high level of awareness necessary in monitoring endangered populations. However, its role may decrease as drones become widely used in animal conservation efforts. That said, drones may currently lack the ability to withstand some of the harsh conditions GPS units can endure. Therefore, while traditional GPS may decline, more sophisticated methods such as the use of RFID tagging in conjunction with other INTs such as IMINT and GEOINT are likely to increase.

With the proper technology, SIGINT, particularly GPS, is accessible in nearly any environment. Studies have proven it is slightly more effective in some environments over others. Yet, as noted, with technological advancements, GPS collars are able to withstand conditions in even the harshest climates in Africa.

IMINT

Very recently, as discussed, besides aerial surveillance simply done by the human eye, IMINT is being incorporated into anti-poaching operations with the use of unarmed drones. This is a significant finding in the context of IMINT as drone integration will likely increase in anti-poaching measures throughout the next few years. Africa is made of harsh, oftentimes unnavigable terrain by human standards. Drones' greatest strength is their ability to navigate this terrain and their versatility to be tailored to suit a particular environment. Traditional Electro-Optical (EO) imagery, for instance, may not prove useful due to the often forested, jungle- ridden, or triple canopy jungle seen throughout

African terrain; therefore, many of these drones must encompass the capability to capture IR imagery. This not only provides IR of animal locations, but potential unwarranted human presence, or even a poacher's cooking fire, for example. In the case of Ol Pejeta Conservancy in Kenya, and the South African Wildlife Reserve in South Africa, which provide the capability to scan the land with thermal imaging cameras provide IR, an oftentimes necessary feature as discussed above. It is also highly useful for these drones to stream a live feed, allowing park rangers to monitor areas unnavigable by humans and quickly deploy rangers to an exact location if suspicious activity is taking place. The ability of these African organizations to set up a 24-hour watch center or NOC similar to those found in the intelligence community, only on a smaller scale, with embedded analysts, would deem highly useful to anti-poaching strategies universally.

Additionally, drones can be further tailored to suit various situations highlighting the need for versatility in anti-poaching operations and drones' ability to provide it. An example from Chapter 4 can be extracted from the Maasai Mara National Reserve in Kenya. There, drones have the capability to release capsaicin to deter elephants from entering dangerous regions.

After flying drones for an extended period of time, rangers will also have an idea of where particular animals are most likely to congregate, which will then assist in better resource allocation. The drones can then be concentrated on a particular area of the park. Vegetation characteristics, the distribution and availability of important resources, the time in which elephants are most active or inactive, and the distance they travel allows park officials to comprise an artificial border to patrol, which is important in order to "get to know" the animals of a specific location. This is necessary, as found in Chapter 2,

because each elephant herd has a particular personality and preference, disallowing any strategy to be overall generalizable. This will likely provide park rangers and anti-poaching teams with the intelligence they need to allocate resources appropriately and efficiently. Currently, with limited data available, a combination of multiple video cameras, IR technology, and a live feed likely encompass the best possible combination of IMINT collection.

GEOINT

It is important to state again that while GEOINT is often viewed as a combination of INTs, in this case the author found it most suited to break up the various INTs and place GEOINT into its own category. After imagery is collected, actionable GEOINT can be produced. With the aid of ArcGIS and Google Earth, a free tool and especially useful for many anti-poaching units with limited funds, GEOINT becomes highly effective. After proper collection, utilizing the new technologies described above, the analyst can also produce an Intelligence Preparation of the Battlefield (IPB), Intelligence Preparation of the Operating Environment (IPOE), or Geospatial Preparation of the Environment (GPE) of the area of interest. These methods are extremely useful in that they allow layering of key elements attributable to that particular area. These methods also factor into the finding that it is necessary to tailor each poaching strategy by location accordingly. For example, in a park comprised of forest elephants, a layer displaying dense forest would be essential while this layer would not be overly useful in an area comprised of the savannah elephant, due to their preference of less dense terrain ("African forest elephant," n.d). By using a combination of IMINT, GEOINT, and other

intelligence methods, rangers can almost certainly concentrate resources more efficiently and produce a more effective anti-poaching strategy.

MASINT

While unconventional, the use of dogs in anti-poaching operations is currently the best possible comparison to MASINT. For example, the puppies trained at Ol Pejeta Conservancy in Kenya are taught to detect arms, explosives, and ivory. This is an asset all national parks should incorporate. As a preventative measure, the ability to detect arms and explosives is an advantage in terms of tracking poachers before they can kill, essentially a strategy of using "animals to save animals." Dog's ability to smell ivory at ports is useful although it is not a preventative measure. While it may stop the ivory from being shipped, it does not stop the killing of the animal. Setbacks to this non-technical form of MASINT are widely prevalent such as the use of chili pepper to deter the dog's sense of smell (Spillane, 2013). For this reason, more sophisticated detection tools need to be implemented in accordance with sniffer dogs to alleviate these setbacks.

Poacher's use of landmines in Mozambique suggests anti-poaching units may consider land mine detection tools. Knowing that many of these parks may not be able to afford sophisticated MASINT equipment, other options are available. For example, after Mozambique's 16-year civil war, landmines still cover much of the country. The use of Mine Detection Rats (MDRs) to sniff out the mines has proven an effective strategy. According to Lindow (2008), rats are easy to train, transport, cheap to feed, resistant to many tropical diseases, and are also quick and methodical. Therefore, if the use of landmines by poachers spreads into other countries, sniffer rats may be a viable option.

Sniffer rats can be considered an elementary, very low technology form of MASINT as well.

OSINT

Open source information is becoming more useful throughout the intelligence community. It is likely local newspapers and news agencies mentioning poaching and smaller scale incidences each day throughout Africa can provide valuable OSINT. Accounts given from LRA defectors and escapees published in newspapers as discussed in Chapter 4 can provide exact counts in terms of the number of elephants killed. Those working in the particular area would have access to these forms of media and can use it to their advantage.

DNA and Law Enforcement's Role in Intelligence

As discussed in Chapter 3, DNA is not on its own an intelligence technique to prevent animal poaching, but it does provide a wealth of information of use to rangers and analysts to produce actionable intelligence. For example, by using the DNA analysis of ivory seizures, scientists were able to determine the species of a large swath of poached ivory determining that it came from savannah rather than forest elephants. This instantly eliminates an area that does not contain the species identified. From an intelligence standpoint, a universal layer displaying where savannah and forest elephants are located should be implemented into a shared IPB. This layer, of course unclassified, should be available not only to parks, reserves, and conservancies, but port patrol, local law enforcement, CITIES, EUROPOL and any other body. Hybrid elephants exist, too, and these elephants must also be accounted for when making this layer. The mere distinction between these animals' behaviors and locations will make an insurmountable

difference an anti-poaching intelligence operation. As seen in Wasser, Clark, Drori, Kisamo, Mailand, Mutayoba, and Stephant (2008), the ability to determine whether tusks came from a forest or savannah elephant significantly narrow down a search area, or an area of interest. This is very valuable in terms of allocating intelligence resources.

On the law enforcement intelligence side, when using DNA analysis to track the complicated webs of organized crime, a link analysis may prove beneficial. Using software such as I2 Notebook to connect individuals and places involved in the trade, a better, more simplified picture is displayed. This is where the business of crime model is most useful particularly when tracing the activities of terrorists. By cutting off their funding at its source, it is likely to prevent their ability to train, purchase arms, and carry out attacks. Here, again, the informants planted inside al-Shabab by the EAL's ability to relay HUMINT claiming one person is responsible for ivory dealings may be a good place to start. After an analysis is done, law enforcement has the ability to determine factors such as the area in which the animal was poached, possible individuals in the area, the shipping company, or even the container used at the port, also seen in Wasser, Clark, Drori, Kisamo, Mailand, Mutayoba, and Stephan (2008), and the likely destination. Law enforcement can then begin to determine the key links and nodes such as the most used trade routes, the points the illegal substance travels, and the individuals most likely involved in the trade.

Implications for Practice

While many may see poaching as a problem only in terms of animal conservation, the national security community has a growing interest in this issue. This is due to the terrorist and militia groups mentioned in previous chapters including the LRA, al-Shabab,

and the Janaweed's tendency to use poaching to fund operations. Furthermore, the case of the Kenyan mall incident is a recent example of a larger scale terrorist attack likely largely funded through animal poaching. The intelligence community should be aware that this is a growing problem and resources must be allocated to stop it.

As the need for military funding subsides in Afghanistan, the US government may consider allocating, even a small portion of this money to national parks, reserves, conservatories, and anti-poaching organizations to counter this issue before it becomes any larger. A significant area for growth comes in terms of drones and drone manufacturers. As drones become less needed for military operations the market will still exist. Allocating drones toward this cause is a way to alleviate the potential issue drone manufactures will face providing them with a new market. Additionally, producing drones with specific capabilities to counter and reduce poaching will likely have an effect on reducing the ability of these terrorist groups from acquiring funding. This study reveals that drones, encompassing capabilities such as multiple cameras, IR technology, a real time feed, and the ability to be customizable are needed to be most effective in anti-poaching operations. Therefore, these drones may need varying functions when compared to what many understand or perceive as a drone today.

It is important to note that this does not come without risk. Park rangers have been known to take bribes and work with poachers hoping for a cut of the profits. Based on the findings of this thesis, community prestige and a wage high enough for these rangers to care for their families deters them from taking part in this illegal activity; therefore, US involvement must take a holistic approach not only providing supplies and

training, but assuring that those using the technologies are not disgruntled and willing to use them to assist poachers and terrorists alike.

Recommendations for Further Research

Currently, academic research on poaching does not place it in the context of intelligence. As intelligence becomes more widely used and necessary in this area, research viewing poaching through intelligence will be necessary. Current research is heavily weighted towards GPS and DNA extraction. While GPS is a form of SIGINT, it is not placed in the specific context of intelligence. Beginning to see this problem through an "intelligence lens" is necessary to bridge the current gap in the literature.

Those in the field may consider beginning data collection early on in terms of new techniques and their implementation into anti-poaching operations. This will allow for future quantitative assessments of their usefulness, which, through past research on SIGINT, through GPS technology have proven useful. For example, the large emphasis on drone's implementation into anti-poaching measures is increasing, therefore early data collection will allow for a future assessment of their effectiveness.

Another area for further research comes in terms of breaking down the INT's onto a more micro scale, thereby focusing an entire study on one INT. This research will be more effective in a couple years based on the previous statement that a larger amount of data is needed to conduct a single case study on one INT's effectiveness.

While this thesis explored Milner-Gulland and Leader-Williams (1992) hypothesis that supplementing wages elsewhere decreases animal poaching, they propose two other hypotheses that are likely to lessen criminal actions. First, they state that the prevention of a crime should occur if there is an increase in the perceived probability or

severity of punishment. Literature on nation states changing policies on the persecution and punishment of indicted poachers is essential to determine whether these policies are deterring and thus decreasing animal poaching. Milner-Gulland and Leader-Williams (1992) also note that a decrease in profit from the crime will result in the prevention of a crime, another under researched hypothesis in the context of anti-poaching.

While this thesis focuses on the supplier side of the issue, there is a large problem in terms of the demand for these illegal substances. Research into education to suppress the Asian demand for ivory is necessary to curb the trade. This, in turn, will cut it off at its source. Today 80 percent of Chinese middle class own one or more pieces of ivory and 84 percent say they will buy in the future ("Battle for the elephants," 2013). This is the other side to the equation and more research is necessary at this end of the problem as well.

Finally, a more technical approach is necessary. Research comparing various types of GPS collars and tracking systems overall would be extremely useful. This could be done in terms of a specific study on SIGINT as mentioned above or as research on technology and poaching overall. In this situation, it could also potentially review other technologies such as currently available UAVs.

Conclusions

Overall, intelligence has insurmountable potential to counter the current poaching crisis in Africa and throughout the world. While each intelligence discipline including HUMINT, SIGINT, IMINT, GEOINT, MASINT, and OSINT play a key role in this process, the best possible solution comes in terms of a Multi-INT approach. Given the wide-ranging differences of people and terrain throughout Africa, it is also necessary to

tailor each intelligence strategy based on these factors. Finally, intelligence is a crucial counterpart of any war and as the fight against poaching becomes a war in itself, intelligence will become an increasingly essential element of this battle.

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