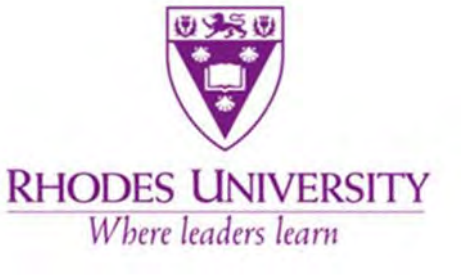
UNDERSTANDING HUMAN-WILDLIFE CONFLICT:

A GEOGRAPHIC STUDY OF THE

PRINGLE BAY CHACMA BABOON TROOP

A thesis submitted in fulfilment of the requirements for the degree of

MASTER OF SCIENCE



September 2021

by

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Pringle Bay troop last seen in the natural fynbos above our home, 24 November 2020

"It's surely our responsibility to do everything within our power to create a planet that provides a home not just for us, but for all life on Earth."

Sir David Attenborough, 2016

DECLARATION

I declare that I have read and understood Rhodes University's plagiarism policy and that I have not plagiarized the work of others. All work herein is my own, except where I acknowledge otherwise.

Wendy Jennifer Parsons
22 September 2021

ABSTRACT

A better appreciation of the physical geography and environmental factors that play a role in the movement of the Chacma baboon troop in and around Pringle Bay (Overberg Municipality) and part of the Kogelberg Biosphere could lead to a better understanding of their movement. In turn, this insight may contribute to reducing the human-wildlife conflict that has arisen in the town. Human-wildlife conflict escalated after the rapid urban development that followed the introduction of electricity in 1993. The baboon-human conflict in Pringle Bay is, in part, due to habitat loss caused by urban development and the easy availability of food in the urban area. The wild animal's natural behaviour (seeking food and fresh water) and the human way of living (food and waste management) has led to baboon habituation and increased raiding in the village. The objective of this geographic study was to understand the baboon troops spatial and temporal movements.

Two methods are being used to track the baboon troop. The first method entails collection of data from GPS tracking collars which record the location of the baboons at 30 minute intervals. This is considered a reliable, but invasive and expensive method where the alpha male and female baboon had to be captured and fitted with tracking collars. The second method entails using volunteered geographic data, in this case, information from a WhatsApp baboon alert group. While this provided data at no real cost, the mining of the information was challenging and building a geodatabase was time consuming. However, this citizen science approach added valuable data and was able to identify human-wildlife conflict sites in the urban area.

The baboon location data was mapped using GIS. Primary and secondary spatial data was sourced and added to the geodatabase created in ArcMap 10.7. Various ArcMap tools were used in analysing the environmental factors (climate, vegetation, water sources and topography) together with the location data. Analysis of this data allowed the range of the baboons to be mapped, showing the maximum extent of the territory the baboons move in. The was refined by mapping their home range (defined as the area in which they spend 95% of the time) and their core area (in which they spend 50% of the time). High activity areas - or hotspots - were identified, as were the baboon sleep sites. The data allowed for habitat use and seasonal patterns of movement to be explored.

A key finding of the research was that the baboons were observed outside of the urban area for 82% of the time. The baboons spent the majority of their time in mountain fynbos vegetation. Hotspot areas showing significant baboon activity were identified within the town and close correlation with

their sleep sites and wetland areas was evident. No definitive seasonal or weather patterns were found that influence the baboon distribution.

Baboon management is complex and difficult. The sustainability of the baboon troop is important for the biodiversity of the Kogelberg Biosphere Reserve. While the baboons should not be encouraged to enter the urban area, the residents should play a role in reducing the availability of food and baboon-proofing their properties. The Overstrand Municipality also needs to address waste management and waste collection in the town. Understanding the biogeography of the baboons and implementing the above-mentioned mitigating management measures would encourage human-wildlife coexistence and inform future baboon management plans.

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^{o}C	degrees centigrade
CBA	Critical Biodiversity Area
CBD	Central Business District
CITES	Convention on International Trade in Protected Species
DMP	Dissolved Monthly Polygon
DPL	day path length
ESAs	Ecological Support Areas
ESRI	Environmental System Research Institute
FAO	Food and Agriculture Organisation
GCM	Grid-cell Method
GIS	Geographical Information System
GPS	Global Position System
GSM	Global System for Mobile Communications
HWC	human-wildlife conflict
ICUN	International Union for Conservation of Nature
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
KD	Kernel Density
KDE	Kernel Density Estimation
km/hr	kilometre per hour
LoCoH	Local Hull nonparametric kernel density
MCP	Minimum Convex Polygon
min.	minute
mm	millimetres
NGI	National Geo-Spatial Information
ODK	Open Data Kit
pa	per annum
PBBAG	Pringle Bay Baboon Action Group
PBRPA	Pringle Bay Rate Payers Association
PGIS	Participatory GIS

POI	Points of Interest
POPIA	Protection of Personal Information Act
PPGIS	Public Participation GIS
SANBI	South African National Biodiversity Institute
TM	Transverse Mercator
TMG	Table Mountain Group
UD	Utilization Distribution
UN	United Nations
UTM	Universal Transverse Mercator
UNESCO	United Nations Educational, Scientific and Cultural Organization
VGI	volunteered geographic information
WAG	WhatsApp Alert Group
WCBSP	Western Cape Biodiversity Spatial Plan
WGS84	Worlds Geodetic System 1984
WWW	World Wide Web

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Thank you to the Pringle Bay Ratepayers Association (and in particular David Muirhead) who permitted me to use the GPS tracking collar data and to Human Wildlife Solutions for the provision of the downloaded data. The hard work of Pringle Bay Baboon Action Group who, with the aid of the Pringle Bay baboon monitors, worked tirelessly to educate and reduce human-wildlife conflict in and around our town. This motivated me to better understand the movement of the baboons in Pringle Bay.

Special mention of friends, Dr Peter and Sue Folb and Professor Stefan and Shellie Kienzle, who inspired me to follow the data and learn new skills! Numerous people also encouraged me on my journey of learning. While too many to name individually, you know who you are – thank you.

On a more personal note, thank you to my family who have given me much strength and encouragement over the last three years. My husband Roger encouraged me every step of the way - his love for science and belief in making informed decisions was the foundation upon which I built this research. Michelle and Samantha constantly inspire and motivate me with their ‘can do’ attitudes to life. The three of you helped get me over the finish line! Thank you.

CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter provides an introduction to the research undertaken on the movement of the Pringle Bay troop of Chacma baboons (*Papio ursinus*) between October 2017 and July 2019. The relevance and importance of the research explores human-wildlife conflict that has arisen in the last twenty years and the complex and difficult management thereof. Characterising the environment in which they move and understanding the temporal and spatial patterns of that movement could inform the management of the baboons going forward. The aim and objectives of the research are set out and an overview of the structure of this thesis is presented.

1.2 Problem Statement

Pringle Bay is a coastal town in the Overstrand Municipality in the Overberg region of the Western Cape Province, South Africa. It is a popular holiday resort town and retirement destination that is part of a small and critical southern coastal transition zone of the Kogelberg Biosphere Reserve. UNESCO (2016) defined a transition zone as the interface between the bio-geographical region and human settlement. Attwell (2015) highlights that urban development in this coastal transition zone is taking place in extremely sensitive vegetation types and poses a significant threat to biodiversity. To date, no large-scale agriculture or industry occurs in Pringle Bay so the natural fynbos surrounding the town is considered pristine. However, the Western Cape Biodiversity Plan Handbook highlighted that Pringle Bay is surrounded by ecosystems whose status are considered both Critical and or Endangered (Pool-Stanvliet et al., 2017). Within Pringle Bay extensive areas of natural vegetation occur on commonage and many homeowners retain natural vegetation on their erven and control alien vegetation (Gumbi, 2011).

The fynbos vegetation, which is nutrient poor, does not support large mammals. The Chacma baboon (hereafter referred to as baboon when in the context of the Pringle Bay research), is considered a medium size mammal and a generalist feeder with a varied diet – which includes insects and a wide range of plants (*Protea* species for nectar and geophytes for the bulbs). The fynbos provides low-quality forage for general herbivores (Davidge, 1977). At certain times of the year there is a shortage of food in the fynbos and some troops have adapted to foraging in the intertidal zone (Cowling and

Richardson, 1998) while others move towards the urban fringe where opportunistic feeding has created human-wildlife conflict (Fehlmann et al., 2017).

Anecdotal evidence by residents of Pringle Bay maintain that there has always been a baboon presence and that the town formed part of their natural foraging area. While initially a town of small fishing cottages and non-permanent residents, it has grown and developed rapidly since electricity was introduced in 1993. The current perception is that the human-baboon conflict has escalated proportionally to this growth, requiring intervention by the residents of Pringle Bay, the Overstrand Municipality and Cape Nature. In 2012 the community, under the auspices of the Pringle Bay Rate Payers Association (PBRPA) and Cape Nature, introduced a voluntary monitoring of the baboons by concerned citizens to discourage them from entering the town. This proved to be unsustainable. After consultation with the local authorities, Cape Nature and Professor J. O'Riain (a behavioural ecologist at the University of Cape Town's Institute for Communities and Wildlife in Africa), the PBRPA decided to introduce an official baboon monitoring programme as a management tool (Appendix A). This programme was funded by donations from the residents. As an aid to help the monitors locate the baboons, Global Positioning System (GPS) tracking collars were fitted on the Pringle Bay alpha male and female baboons in 2017 (see Cape Nature license CN43-29-6748 in Appendix B). A social media voluntary WhatsApp alert group (WAG) was formed by M. Meyer (personal communication, 21 April 2016) to alert residents of baboon movements as a further tool of the PBRPA to decrease human-baboon conflict.

The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) key message stated the "biodiversity – diversity within species, between species and of ecosystems – is declining faster than at any time in human history" (IPBES, 2019). A global phenomenon, well documented in the literature, records that animal habitats are continuously shrinking as urban expansion occurs and climate change is felt (Bean and Johns, 2005; Ellis et al., 2010; Hill and Winder, 2019; Stillman et al., 2015). Many animal species come into increasing competition with humans over space and other resources where land has been transformed by man (Mormile and Hill, 2017).

Fryer (2010) observed that problems arise between humans and wildlife, when the wild animal's natural behaviour (seeking food and fresh water) and the human way of living leads to a rise in tensions - best described as human-wildlife conflict. This is a global issue and occurs in both developed and undeveloped countries. Seoraj-Pllai and Pillay (2017) highlighted gaps in the understanding of this phenomenon, especially in local communities bordering on protected areas. The loss of natural habitat from human activities is considered the key driver of biodiversity loss in terrestrial ecosystems

and Skowno et al. (2019a) reported that since the mid-1600s, 22% of the natural habitat of South Africa has been lost. From 1990 to 2018 the rate of natural habitat loss in the South Africa was 0.12% pa. However, the loss of fynbos in the five year period 2014 - 2018 was higher at 0.56% pa (Skowno et al., 2021).

Several studies involving baboons in a variety of South Africa habitats have been undertaken - in the Cape Peninsula (Hoffman and O'Riain, 2012; Kansky, 2015; Beamish, 2010), Knysna (Mormile and Hill, 2017), KwaZulu Natal (Stone et al., 2012) and the Drakensberg Mountains (Gaynor,1994), amongst others. These studies highlighted the human-baboon conflict where humans are one of the main threats to baboons. Human-wildlife conflict is closely related to the increase in human population and resultant urban expansion has a dramatic effect on the distribution and ranging patterns of the baboons (Hoffman and O'Riain, 2012a). Other environmental factors such as climate (van Doorn et al., 2010), habitat (Dunbar,2018), home range (Dostie et al., 2016), intolerance towards animals (Kansky, 2015) and habituation to human food and waste (Guth, 2005) play a role. Climate change and the impact on biodiversity is considered another threat, especially to the Cape Floral Kingdom. Wild (2019) described how the Western Cape's changing climate is resulting in more frequent droughts and lower winter rainfall is putting pressure on the fynbos biome and its fauna. This has been shown in avifauna research on the fynbos endemic birds by Lee and Barnard (2015).

1.3 Motivation for the Research

The escalation of baboon-wildlife conflict in Pringle Bay over the last twenty years saw the following headlines in local (Pringle Post, Hermanus Times), national (Cape Times and Daily Maverick) and international newspapers (Los Angeles Times) (Appendix C):

- Baboons terrorise resort (Cape Times, 14 June 2004);
- Humans declare war on baboons (Los Angeles Times, 10 July 2005);
- Boy stable after unprovoked baboon attack (Cape Times, 6 February 2006);
- National Geo sparks baboon furore in Pringle Bay (Hermanus Times, 9 July 2012);
- National Geographic in Pringle Bay baboon brouhaha (Mail & Guardian, 3 July 2012); and
- Injured baboon sparks talks in the Overberg (Hermanus Times, 20 May 2019).

Baboon management in Pringle Bay is complex and difficult covering a range of scenarios. Damage has been reported to include structural damage to houses (gutters, thatch-roofing and breaking of

windows etc.), foraging of vegetable gardens and opportunistic raiding of shops (loss of income) and homes (where the baboons leave a trail of chaos).

The current human-baboon scenarios impact the sustainability of the troop, leading to injury or death of the animals and/or damage to property. This problem is widespread in South Africa and has been extensively researched on the Cape Peninsula (Beamish, 2009; Fehlmann et al., 2016; Hoffman and O'Riain, 2012b). The use of tracking collars, while introduced to help locate the troop for daily monitoring, presented a unique opportunity to get a better geographic understanding of why, when and where the Pringle Bay troop moved. Permission to use the collar data was requested from the Chairman of the PBRPA (D. Muirhead, personal communication, 8 May 2018). Understanding the environmental factors that play a role and finding spatial and temporal patterns related to the geography of the study area contributed to knowledge on the Pringle Bay baboons and the biodiversity of the study area. This could also be relevant to the neighbouring towns of Rooiels, Betty's Bay and Kleinmond where human-baboon conflict also occurs.

The findings of this research would give historical context to the history of the human-baboon conflict in Pringle Bay showing a change from an ethos of coexistence to one where the emphasis is to keep the baboons outside the urban area. The use of citizen science and community involvement in monitoring the baboons via the WAG was novel, this was not the stated intention of this social media 'warning' group. The subsequent conversion of this "chat" to track the baboon locations in town could prove valuable and provide a cheap method for tracking the animals for baboon management in the future. The use of Geographical information Systems (GIS) to map and analyse the locations of the baboons would provide a dynamic baseline understanding the Pringle Bay troops range.

1.4 Aims and Objectives

The aim of this research project was to investigate the Pringle Bay baboon troop's spatial and temporal movements in relation to environmental factors. The four main objectives were:

- *Objective 1:* To conduct a desktop study to develop an understanding of the human-wildlife conflict in the global and local context, with a focus on understanding the history of the human-baboon conflict and approaches used to manage it in Pringle Bay;
- *Objective 2:* Source and compile a database of primary and secondary spatial and other data relevant to investigating the baboons and humans in the Pringle Bay area;

- *Objective 3:* Map the locality data of the baboon troop and identify the environmental factors that influence the baboon's movements; and
- *Objective 4:* Develop a conceptual model to understand the relationship between the baboons and their environment.

1.5 Research Questions

To provide a structure to the research and ensure the objectives presented in Section 1.4 could be met, several key research questions were developed. These were based on the literature review, previous investigations and perceptions of the residents:

- *Question 1:* The range of the baboons includes the urban area, but do the baboons spend most of their time outside of the town?
- *Question 2:* Is the Volunteered Geographic Information (VGI) (reported on the social media WhatsApp platform) credible to identify the locations the baboons while in the town?
- *Question 3*: Is the movement of the baboons seasonal and habitat based?

1.6 Research Design and Methods

The scientific method, succinctly described by Matthews (1981), was adopted for this research and is depicted in a flowchart in Figure 1.1. A literature review laid the foundation for the aims, objectives and methodology of this research. A mixed-method approach was followed, where both qualitative (WhatsApp observations) and quantitative (tracking collars) data were used. Environmental data were obtained from secondary sources and archived historical data was sourced from media, anecdotal information, Overstrand Municipality and PBRPA reports. GIS and Microsoft Excel were the tools used to perform spatial and statistical analyses on the data. The results are presented, discussed and appraised in light of the literature reviewed for this research. This applied geographic approach allowed for the hypotheses to be tested and discussed with recommendations on the baboon movement informing future management of baboons and human-baboon conflict in Pringle Bay.

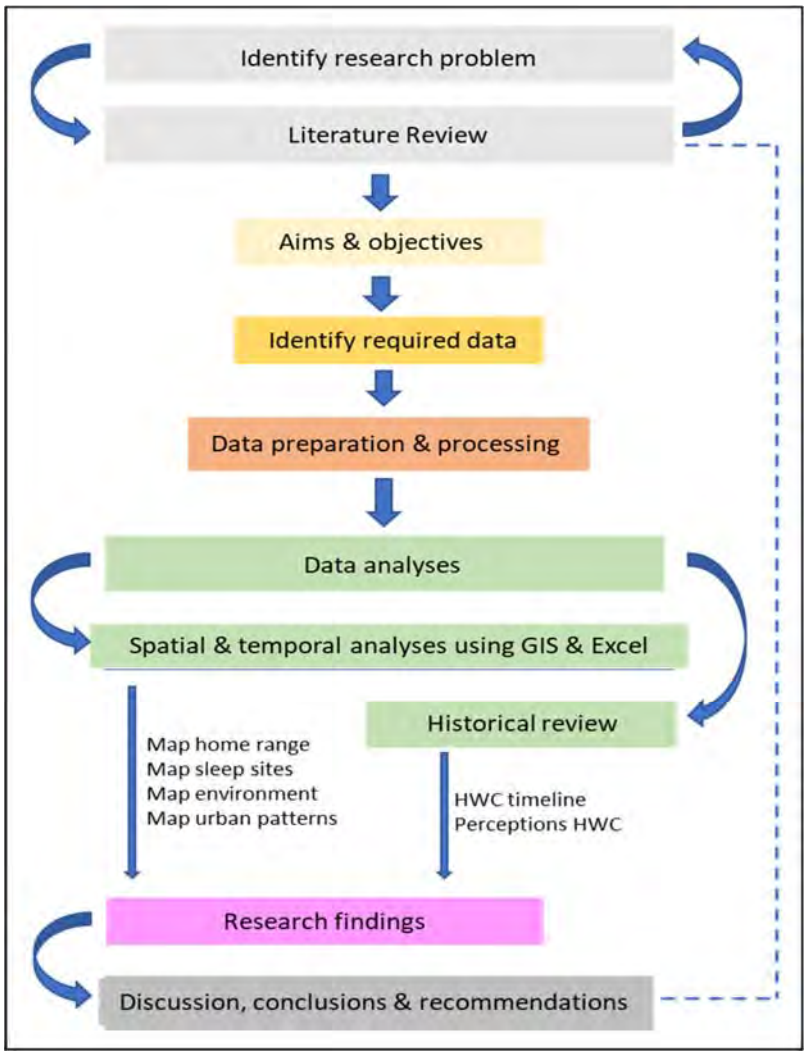

Figure 1.1: Conceptual research framework.

1.7 Thesis Outline

Chapter 1 provides a preliminary overview of the human-wildlife conflict in Pringle Bay. The study area and biodiversity therein, together with the history of baboon management, is introduced. The relevance and motivation for this research, together with the aims and objectives, are set out and the hypotheses defined. The chapter concludes with an illustration of the research design.

Chapter 2 provides a review of literature which informed the framework of this research and gave it context with reference to similar studies. The state of global biodiversity, a South African context with a fynbos emphasis, together with the role that baboons play in order to have a healthy ecosystem. This included an overview of the Chacma baboon, human-wildlife conflict and the management

thereof. GIS, spatial tools and applications together with the tracking of animals were also explored. The use of VGI as a data source and the role of physical geography were reviewed.

Chapter 3 introduces the study area, the history of Pringle Bay and it's urban development. The geography of the landscape is described and includes the topography, rivers, geology and soils together with the vegetation. The richness of the biodiversity, land use, climate and effects of fire are also documented.

Chapter 4 addresses the philosophical approach, collection of data and methodology used to achieve the objectives of this research. The data collection, processing and analyses using GIS as a tool for spatial and statistical analyses are also discussed.

The results of the spatial and temporal patterns of the baboon movement in the study area are presented in Chapter 5, highlighting the relationships to the local geography of Pringle Bay. The outcomes of this are discussed against pertinent studies found in the literature.

A review of the objectives of the research, what outcomes were achieved, and the key research questions answered are addressed in Chapter 6. The limitations of the study are expounded, while the conclusions, recommendations for future research and the future management of the human-baboon conflict in Pringle Bay conclude the thesis.

CHAPTER 2 LITERATURE REVIEW

2.1. Introduction

Geography is defined as the study of places and relationships between people and their environments (Oxford Dictionary, 2004) and the National Geographic (2021) depicts "What is geography?" in an illustrated booklet (Appendix B) which shows how geography is central to the human, physical and biological systems of the world and how Geographers analyse patterns at locations to solve problems and inform decision-makers. The geographic perspective adapted from the National Research Council (1997) led to the formulation of the following questions in this research:

- Why are the baboons located where they have been tracked?
- What does the spatial distribution tell us about the environment?
- How has man impacted the distribution?
- At what scale does loss of habitat impact the animal?
- What is the importance of the human-wildlife conflict on the social, economic and environment of Pringle Bay?

Biogeography is fundamental to understanding the geographic distribution of an animal species where quantifying, monitoring and explaining the distribution patterns provides understanding to the ecology of the area (Melly, 2011). Maps are the traditional tool of geographers used to display spatial data in two dimensions. However, advances in data collection, storage, analysis and display have resulted in a "modern map" which is dynamic and multidimensional which has led to new areas of research and application such as geographic information systems (GIS) (National Research Council, 1997).

To provide context for this research a review of biodiversity literature was undertaken. The IPBES (2019) recently warned that humans are exploiting nature unsustainably, which is driving extinctions and suggests that up to a million species could disappear by 2050. Hallmann et al. (2017) found a 76% decline in insect diversity and numbers over a 27 year period in protected areas in Germany and the impact thereof on ecosystems worrying, since insects play an important role in pollination and are an important food source for birds, mammals and amphibians. Globally, half the world's population lives in urban areas, highlighting a growing gap between humans and the natural world (Dallimer et al., 2012). Seventy-five percent of the land surface has been altered, 66% of the ocean has been impacted and over 85% of wetland areas have been lost (Diaz et al., 2015). Globally nature has been changed

by multiple human activities, with most indicators of ecosystems and biodiversity showing decline on global, regional and local scales (Figure 2.1).

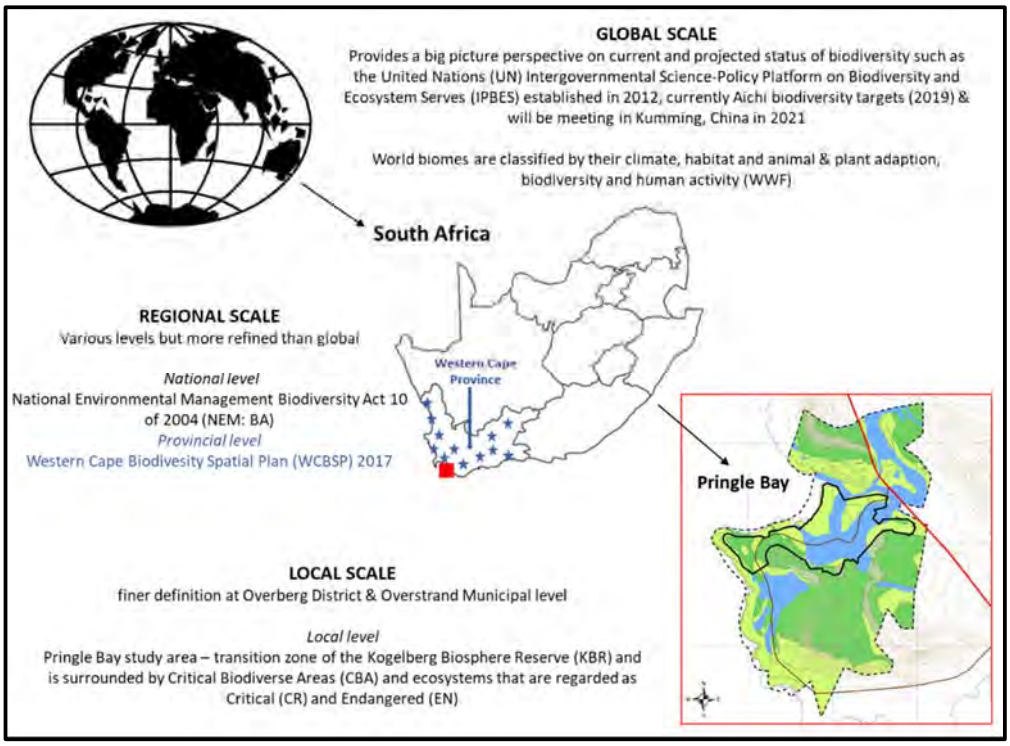

Figure 2.1: Biodiversity scales from global to local (adapted from Ferrier et al., 2004).

In South Africa, the National Biodiversity Strategy and Action Plan (2015) is aligned with the Aichi Targets for the United Nations Convention on Biological Diversity (2011 – 2020) whose vision was one of living in harmony with nature, where biodiversity is valued, conserved and wisely used and where ecosystem services are maintained sustainably. An ecosystem approach (Walker, 1995) where all the species are conserved, is one way to ensure that vision. The Western Cape Biodiversity Spatial Plan (WCBSP) (2017) acknowledged that the regional habitats are under significant threat and balancing the need to protect biodiversity versus infrastructure and economic development is an ongoing challenge. The use of geospatial data and a GIS based approach is one way to look at the impact of man in areas of rich biodiversity (Haines et al., 2012). The WCBSP embraces this, with the key objectives presented in Figure 2.2. Using the ecosystem approach (where the relationship of all biodiversity is linked to an environment) has resulted in the identification of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) which act as a buffer to prevent further habitat loss and degradation.

Figure 2.2: WCBSP key objectives (Cape Nature, 2017).

The ICUN Red List of Threatened Species (2017) estimated that almost 50% of the world's primate species are at risk of extinction. The Chacma baboon has a status of Least Concern (LC) on the Red List of Mammals of South Africa (Hoffman et al., 2016), but subpopulations are considered to be threatened. The most severe threat to this species is human-wildlife conflict. Strum (1987) highlighted this thirty-five years ago and suggested that while baboons were not yet endangered, neither their adaptability nor intelligence will save them from becoming part of a biodiversity crisis.

The role of Chacma baboons in the biodiversity of the fynbos is not well understood or researched. Consultation with a number of specialists, including Dr A. Rebelo (personal communication, 3 March 2021) and Professor J. O'Riain (personal communication, 3 March 2021), regarding this resulted in unanimous agreement that baboons play an important role in biodiversity (seed dispersal, turning over stones, eating insects and scorpions etc.), but that there is currently a gap in the knowledge about this. Consensus was that there are too many variables, requiring expensive and long-term research. As a local example, the effect on biodiversity because of relocating the Pringle Bay troop in November 2020 is not known and is of concern.

However, this research was driven by the human-baboon conflict that emerged in and around Pringle Bay and focused on investigating the movement of the Pringle Bay baboon troop and the animal ecology of the troop to their environment. No physical interaction with the animals took place during the study. The literature review structure has been divided into the following sections:

- Chacma baboon (*Papio ursinus);*
- Human-wildlife conflict and management thereof;
- GIS, spatial tools and applications;
- Tracking animal movement;

- Volunteered Geographic Information (VGI); and
- Physical environmental factors.

2.2 Chacma Baboons

The Chacma baboon (*Papio ursinus*) is one of six baboon species distributed across sub-Saharan Africa and in a small southwestern area of the Arabian Peninsula. The geographical distribution and animal classification is shown in Figure 2.3, highlighting the fact that baboon genus (*Papio*) is the most widespread of the African primates (Johnson et al., 2015). The Chacma baboon is listed as "Least Concern" by the ICUN Red List of Threatened Species (2019), but the population is declining (Sithaldeen, 2019). They are listed under the Convention on International Trade in Protected Species of Wild Fauna and Flora (CITES II, 2007) and are protected wild animals in the Western Cape, as per the Nature Conservation Ordinance 19 of 1974 (Nature Conservation, 1974).

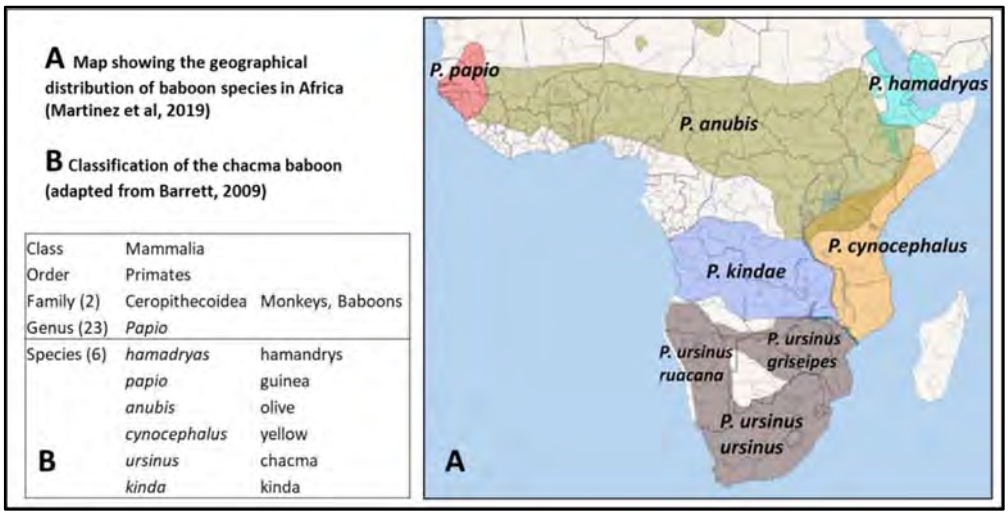

Figure 2.3: The geographical distribution and classification of the Chacma baboon.

Mormile (2014) described baboons (genus *Papio*) as being highly intelligent, opportunistic, large bodied, omnivorous primates that maintain a complex social organization. The genus was described by Stuart and Stuart (1993) as having "dog-like muzzles, shoulder held-higher than rump with a broken tail." The Chacma baboon occupies a wide range of habitats including woodland, savanna, sub-desert, montane regions, Cape Fynbos and Succulent Karoo.

Diurnal animals that sleep on cliffs, hills and in large trees, baboons need to drink water daily. Water availability is considered a limitation in their home range (Stuart and Stuart, 1993). Although they are highly adaptable and are known to go without water for approximately 11 days in the Namib desert

(Sithaldeen, 2019). Considered opportunistic omnivores, their natural diet includes seasonal bulbs, shoots, fruit and seed, small mammals, invertebrates and crops. The Cape baboons also forage in the marine intertidal zone (Lewis, 2014).

Baboons are gregarious and social, living in troops of varying size (15 - 100). Troops have a hierarchy dominated by an alpha male and female, with sub-adults, juveniles and babies. Dispersing males are often considered to be loners, but they are sexually mature males who leave the troop when dominance issues occur. They look for a new troop to take over to elevate their status to being the alpha male. Cape Nature (2019) state "they play an integral part in the ecology of the Cape Floristic Kingdom, foraging from the coastline to the tops of the highest mountain ranges, dispersing seeds and bulbs as they go. The plight of the urban baboon is complex. Lone dispersing males are seen as rogues, but actually migrate to stop incestuous in-breeding and to strengthen the gene pool across troops." Cape Nature (2019) also note that killing males within troops has wider implications, as it opens a door for new males to immigrate into the troop, often resulting in infanticide where the new male kills all the offspring of the previous alpha male. Baboon characteristics and behaviour are shown in Figure 2.4. It must be noted that this research did not consider the biotic influences on baboon behaviour or troop dynamics, only the abiotic environment where geography and environmental factors of their range were investigated.

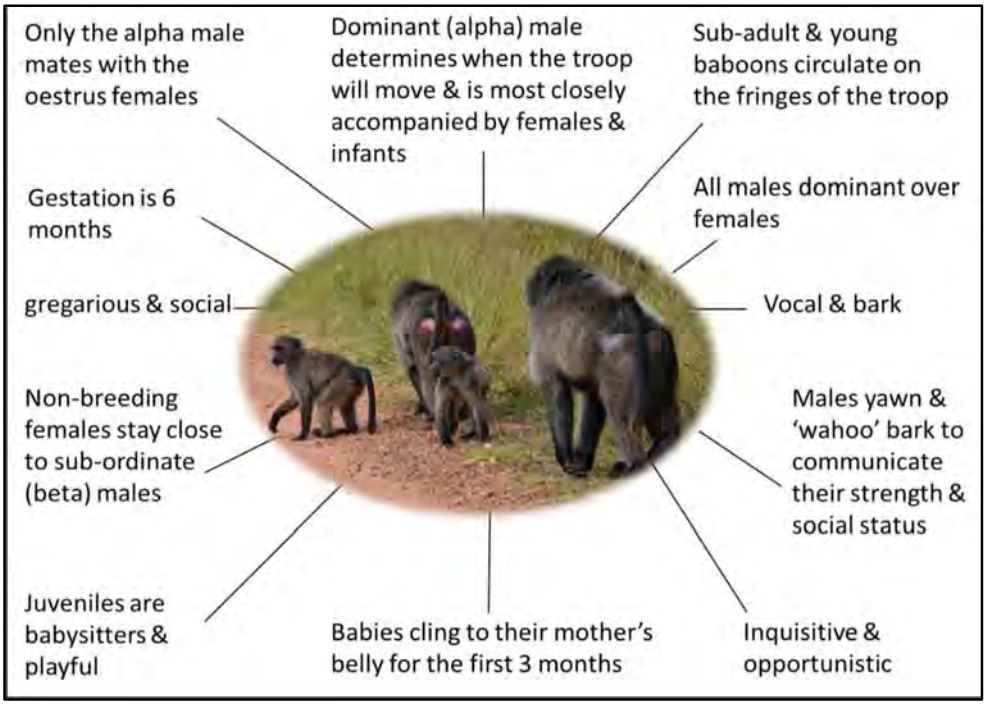

Figure 2.4: Characteristics of Chacma baboons (after Stuart & Stuart, 1993).

Chacma baboons can be described as terrestrial, diurnal and omnivorous. They have a life span of approximately 25 years with a strict troop hierarchy and are not territorial (Parker, 1999; Stuart and Stuart, 1993). Dubay (2018) stated that baboons are the most successful primates due to the fact that they thrive in a number of diverse habitats – with ecological flexibility to geographical (Gaynor, 1994; Mormile and Hill, 2017; Barton et al., 1992; Johnson et al., 2015; Barrett, 2009) and environmental factors (Pebsworth et al., 2012). Such factors include for example weather (van Doorn et al., 2010; Bronikowski and Altman, 1996) and food (Davidge, 1997). Their adaptability to land use change by man (crops and urban development) is well documented (Bronikowski, 1996; Fehlmann et al., 2017; Johnson et al., 2015).

2.3 Human-Wildlife Conflict

A review of the literature showed that the increases in human-wildlife conflict now poses one of the greatest threats to the survival of many animal species (Dickman, 2019; Western et al., 1994; Hoffman and O'Riain, 2012). Mammal populations are declining worldwide (ICUN, 2019) because of habitat loss through land use change, resulting in increased contact between people and wildlife (Kansky, 2015; Mormile and Hill, 2016; Ellis et al., 2010; Ditchkoff, et al., 2006). Humans dominate ecosystems and animals at times are forced to survive these pressures by adapting to city life (Bentley et al., 2011) and exploiting human resources (Strum, 2010). Human-wildlife conflict must be resolved with greater respect and tolerance of the urban wildlife, as this will continue to increase with time (Hadidian, 2015). Levels of tolerance by individuals, communities and farmers differ due to different impacts and damage caused and must be recognised when mitigating human-wildlife conflict (Kansky et al., 2014). Community-based conservation is a paradigm shift from the traditional "conservation in protected areas" approach to one with a bigger emphasis on the biodiversity and loss of habitat while improving negative attitudes within the community (Western et al., 1994).

Human-wildlife conflict is a global problem involving a large number of species and the literature records conflict in numerous countries, including Singapore [with human-long-tailed macaque (Yeo and Neo, 2010)]; California [racoons and coyotes (Markovchick-Nicholls et al., 2008)]; Florida [black bears (Karelus, et al., 2017)]; England [Red fox and eurasian badger (Scott et al., 2018)] and Australia and Japan [bird species (Rupprecht, 2017 and Liordos et al., 2017)]. These case studies dealt with understanding environmental factors and loss of habitat to mitigate human-wildlife conflict resolutions. This increase in human-wildlife conflict is reflected in Figure 2.5 by the number of scientific articles cited on Scopus and Google Scholar related to human-wildlife conflict over the last 22 years.

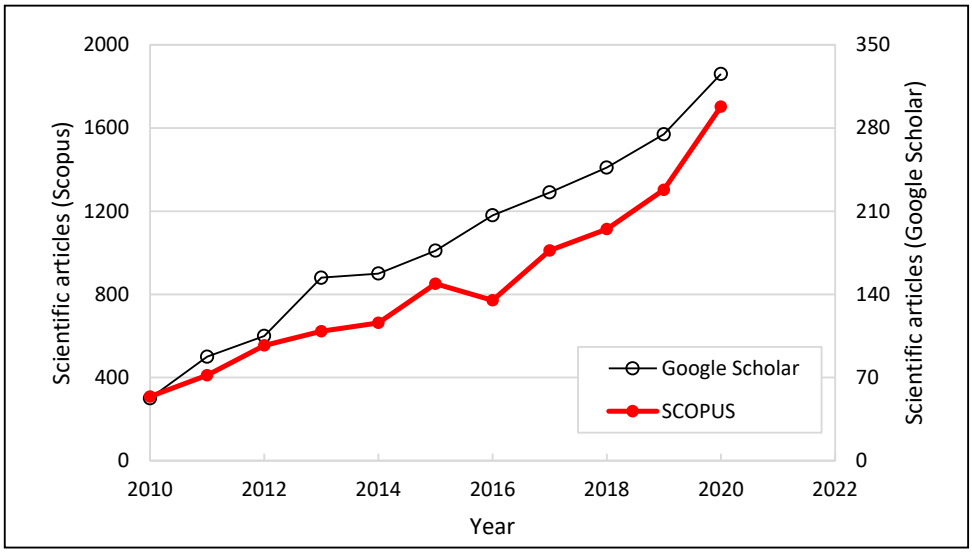

Figure 2.5: Number of Scopus and Google Scholar citations from 1990 to 2020 containing the term "human-wildlife conflict" (survey: 4 January 2020).

Half of the world's primates are threatened largely due to habitat loss and hunting (Mittermeier et al., 2009). Globally primate species are increasingly impacted by human-wildlife conflict scenarios as seen in these case studies:

- Bangladesh – Rhesus macaque, capped langur and common langur (Uddin et al., 2020);
- Malaysia – proboscis monkeys (Stark et al., 2017);
- Guinea – Chimpanzees (Bryson-Morrison et al., 2017);
- Uganda – vervet monkey (Caancelliere et al., 2018); and
- South Africa – Chacma baboon (Mormile & Hill, 2017; Fehlmann et al., 2016; Hoffman & O' Riain, 2012b; Pebsworth et al., 2012 and Hurn, 2011).

In South Africa studies on the spatial ecology of various species have been conducted where the common denominator is human-wildlife conflict. In KwaZulu-Natal vervet monkey troops foraging in suburban gardens have resulted in human-wildlife conflict (Patterson et al., 2018), while the distribution and population of Chacma baboons in KwaZulu-Natal was shown to have a reduced population which is now found in highly fragmented habitat due to land use change (Stone et al., 2012). In the Western Cape and specifically on the Cape Peninsula, Chacma baboons have been the subject of numerous studies where factors such as raiding of homes and picnic sites to get human food (Fehlmann et al., 2017; Hoffman and O'Riain, 2012, Mormile, 2014, Lewis, 2014) and the extent and severity of conflict (Hoffman and O'Riain, 2012; Beamish, 2009 and Kansky, 2015) have been

researched. Human-baboon conflict, the focus of this research, is a subset of the broader human-wildlife conflict.

Peterson et al. (2019) believed that conserving biodiversity required a productive management of the human-wildlife conflict while conservation biologists prefer to ensure management is based on science and not emotion. However, they also mention that decision-making is rarely simple as conflict among people with different values and emotions lead to polarized camps of 'love them or hate them' making management programs difficult to develop and implement in a community. Dickman (2010) conceptualized the conflict process (Figure 2.6) where attitude towards the human-wildlife conflict determines the perception towards it and consequences for the conflict.

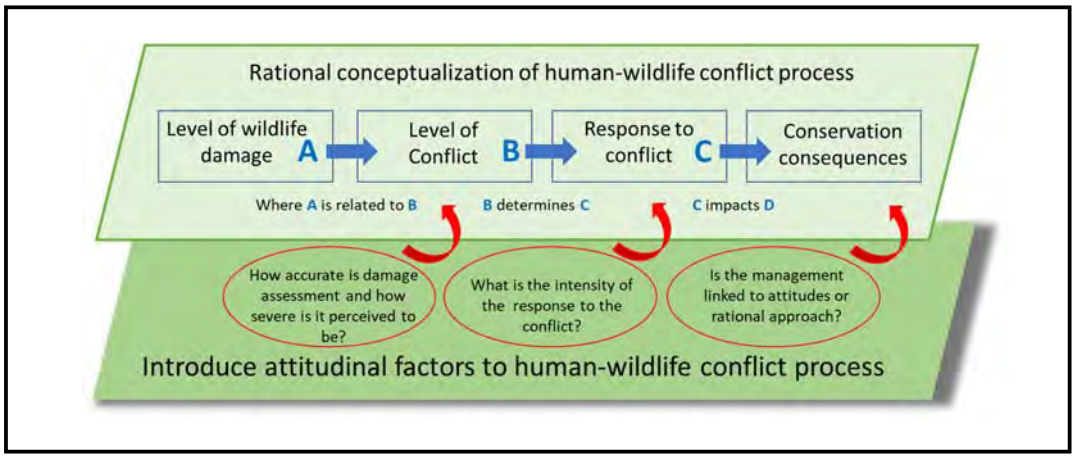

Figure 2.6: Rational conceptualization of human-wildlife conflict process and how attitudinal factors play a role (after Dickman, 2010).

Mormile and Hill (2017) explored attitudes of living with urban baboons and the implications thereof for baboon conservation and management in Knysna, South Africa. A survey of Knysna residents was undertaken to investigate the impacts of living with urban baboons and perceptions surrounding the wild animal included the attitude towards, the perceived threat from and extent to which baboons are considered a problem animal. Simultaneously, support for the local baboon management was tested. The resultant outcome from the survey suggested that the majority of residents, while frustrated and angry about the human-baboon conflict and considered them a threat and problem-animal, did not advocate their lethal removal and were concerned about the baboons. The management strategy of baboon monitors keeping the baboons out of the urban area was supported, suggesting that a management plan that supports a coexistence may be possible.

Hoffman and O'Riain (2012b) investigated the spatial ecology of Chacma baboons to understand the extent and severity of human-baboon conflict in the Cape Peninsula. This study highlighted the greatest threat to the survival of these Chacma baboon troops was 'human-baboon conflict'. The importance of understanding the ecology so that effective management and conservation plans are devised was underscored by analysing the use of the baboons sleep sites and troop territoriality. The baboons predominately used trees and cliff sites as sleep sites. It was noted that the sleep sites used close to the urban fringe should be discouraged to increase the spatial separation between humans and baboons at the beginning and end of each day, thereby increasing the ability of the baboon monitors to keep the baboons out of the urban area. The importance of troop territoriality on management strategies highlighted that if a habituated baboon troop was removed, this void may be filled by a less habituated troop, who would move into the space and discover the high energy food source associated with humans, in turn leading to the perpetuation of the human-baboon conflict.

Locally, the Pringle Bay baboon troop was shown to play an important role in seed dispersal of the fynbos (Guth, 2005) and it was reported that land use change would impact seed dispersal by offering a nutrient rich food supply from the village residents. Human-baboon conflict was investigated by Pearce (2006) and Geldenhuys (2006), while J. Mormile (PhD candidate, University Cape Town, 2020) conducted her research in Rooiels, where she investigated a coexistence model between people and baboons in a developed landscape.

Human-wildlife conflict and the management thereof is complicated (Hurn, 2011) and requires community cooperation (Treves et al., 2009). The global assessment report on biodiversity and ecosystem services (IPBES 2019) states "Nature and its vital contributions to people, which together embody biodiversity and ecosystem functions and services, are deteriorating worldwide." Figure 2.7 is a schematic diagram highlighting the typology of human-wildlife conflict after Food and Agriculture Organisation (FOA, 2009). Kansky (2015) described human-wildlife conflict as a biodiversity conflict which has two components:

- Impacts linked to humans and the animal; and
- Conflict between humans over how to manage humans and wildlife.

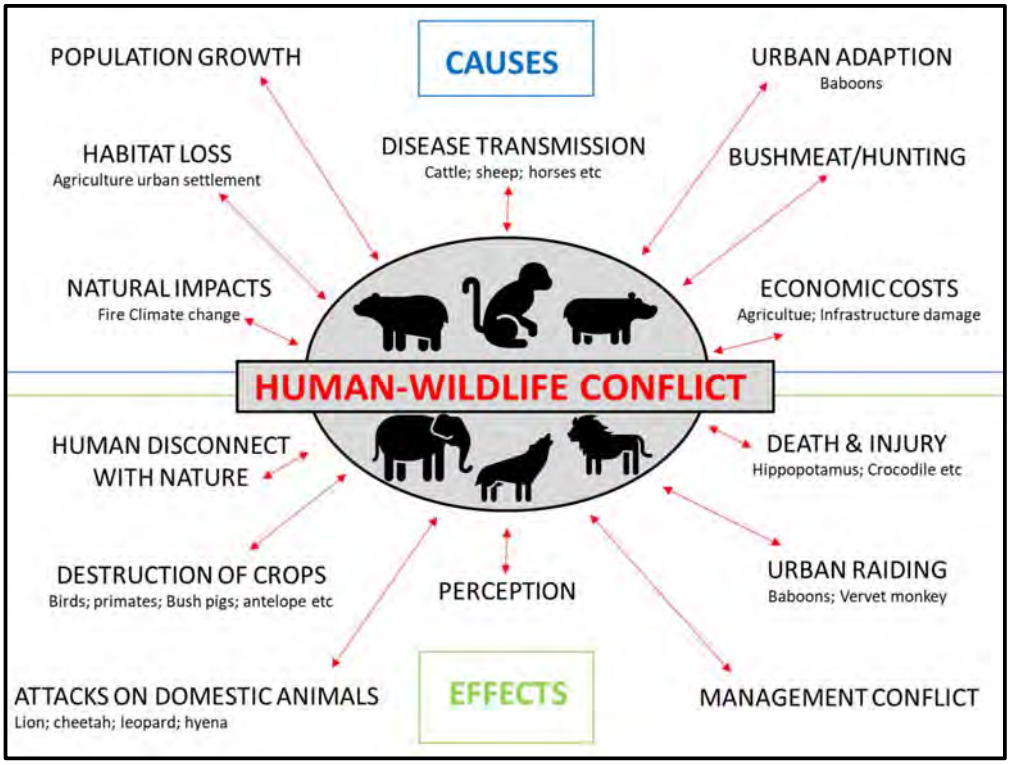

Figure 2.7: The typology of human-wildlife conflict (after Lamarque et al, 2009).

2.4 Geographic Information Systems, Spatial Tools and Applications

Geographic Information Systems (GIS) analyses spatially referenced data and information (Demers, 2009; Longley et al., 2005). GIS was initially developed to use geographic data represented on maps in a digital format. It is now a key tool used to perform spatial data analysis (Melly et al., 2017). This became a powerful tool for both predictions and planning. Clarke (2003) described GIS as a database having several layers. In the context of this research these were topography, vegetation, elevation, climate, water, urban area and waste and food raiding hotspots. GIS software represents the geographic spatial information in three ways: points, lines and areas. Table 2.1 lists GIS methods, their use and output when used in spatial and temporal analyses.

Table 2.1: GIS methods: use and output in data analyses (adapted from Demers, 2009)

Method	Use	Output	Pro vs Con
Map density by area	If data summarized by area, lines or points	Shaded fill map or dot density map	Generalizes centres of density
Create a density surface	If data shows individual locations or points	Density map or contour map	More precise, more data required
Area and features	Identify features in and outside an area	Location, lines, areas	Quick but lacking information
Overlaying areas and features	Find features inside areas, summarising how	Location, lines, areas, surfaces	Requires more processing
Straight-line distance	Define area of influence, create a boundary	Location, lines, areas	Rough approximate of travel distance
Time series	Movement or change in character	Trend cycle before and after	Required to compare maps visually
Tracking map	Movement	Trend before and after	Can be difficult to read

GIS is a tool for making and using spatial information and is defined by Bolstad (2016) as a computer-based system for the collection, maintenance, storage, analysis, output and distribution of spatial data and information. GIS is there for seen as a framework to organise, communicate and understand the science of the earth and is a technology that applies geographic science with tools for understanding spatial relationships from all types of data (ESRI, 2021). ArcGIS 10.7 (ESRI, 2018) applications were used in this research to investigate the relationship between baboons and their environment, including the urban area. Spatial data analysis methods were used to inform, identify and predict patterns (Heywood et al., 2011). In the context of this research, the tool was used to analyse spatio-temporal environmental data and to map the animal locations using two data sources (GPS collar data and WhatsApp data). The objective was to search for patterns (Cheraghi et al., 2017) and the outcome thereof was to identify:

- Location – where do the baboons roost at night?
- Patterns – what is the distribution of the baboons within the village and in the natural areas?
- Trends – what are the seasonal movements of the baboons?
- Conditions - does the weather influence the baboon's movements?
- Implications – can spatial tools be used in human-wildlife conflict management?

GIS allows for geographic data to become dynamic map layers which are geo-referenced to align them in geographic space enabling different types of data to be displayed, combined and analysed

(Dangermond, 2021). The spatial referencing of data is important (Clark, 2003; Duckham et al., 2003) as GIS depends on the proper use and definition of coordinate systems and projections (Law and Collins, 2018). Latitude and longitude are the basis of the geographic coordinate system which defines where the data is located on the earth's surface. The projected coordinate systems defines locations on a flat map based on x and y coordinates. Campbell and Shin (2011) state that choosing the correct map projection is important as it controls the distortion in a map.

The official coordinate system for South Africa since 1 January 1999 is based on the World Geodetic System 1984 ellipsoid (commonly known as WGS84) is the Hartebeesthoek94 Datum. The Transverse Mercator projection is the most widely used projected coordinate system and variations in the projection parameters distinguishing the different forms are shown in Table 2.2.

Table 2.2: Different forms of Transverse Mercator Projection (National Geo-spatial Information, 2011).

Name	Areas used	Central meridian(s)	Latitude of origin	CM Scale Factor	Zone width	False Easting at origin	False Northing at origin
Transverse Mercator	Various, world wide	Various	Various	Various	Usually less than 6°	Various	Various
Gauss Conform (Transverse Mercator south oriented)	**South Africa**	**2° intervals E of 11°E**	**0°**	**1**	**2°**	**0m**	**0m**
UTM North hemisphere	World wide	6° intervals° E & W of 3° E & W	Always 0°	Always 0.9996	Always 6°	500000m	0m
UTM South hemisphere	World wide	6° intervals E & W of 3° E & W	Always 0°	Always 0.9996	Always 6°	500000m	10000000m
Gauss-Kruger	Former USSR , Germany, S. America	Various, according to area of cover	Usually 0°	Usually 1.000000	Usually less than 6°, often less than 4°	Various but often 500000 prefixed by zone number	Various

The Gauss Conform coordinate system uses the Transverse Mercator map projection formulae to produce westings (y) and southings (x) instead of northings (N) and eastings (E) and is only applicable to the southern hemisphere. Figure 2.8 shows the Gauss Conform zones for continental South Africa, where the zones are 2^{o} wide (not 6^{o} wide as per the UTM) resulting in less distortion (Mitchell, 2011). ArcGIS 10.7 for Desktop (ESRI® Inc., 2018) software was used in this research and the Geographic Coordinate System was referenced to WGS84 datum. The Gauss Conformal Projection, locally referred to as the Lo coordinate system, was Lo19 (TM19) which is used for the Cape Town area.

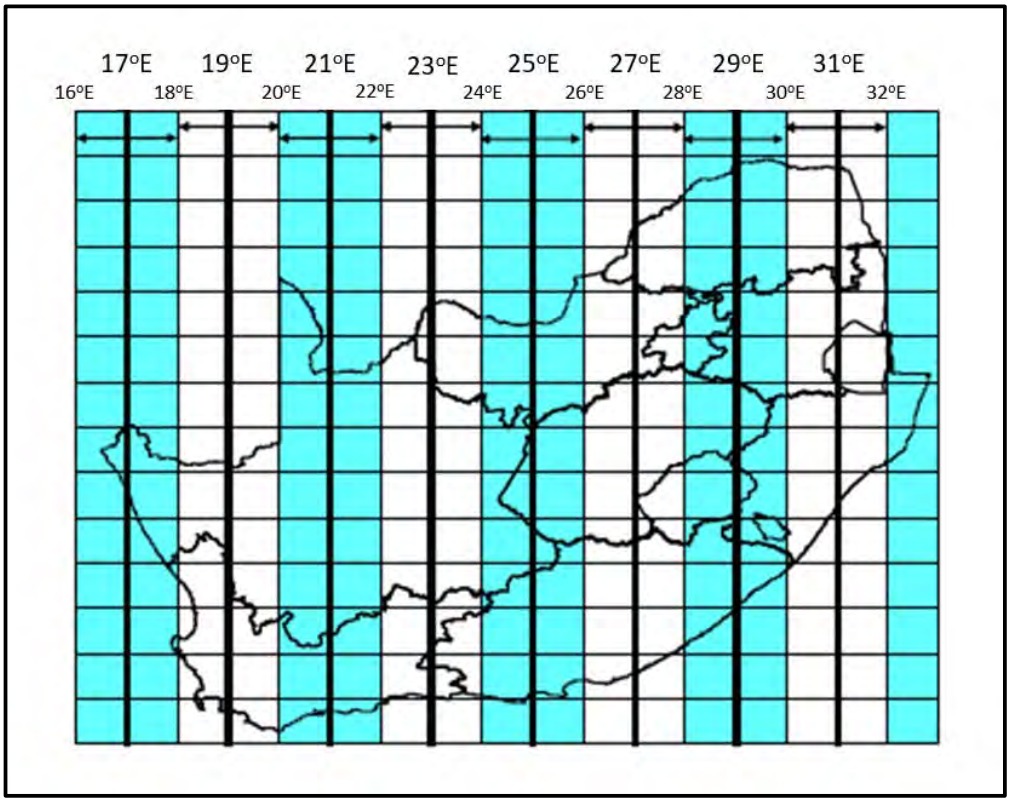

Figure 2.8 Gauss Conform zones (continental South Africa) (National Geo-spatial Information, 2011).

Geospatial analyses is a sequential operation where input data layers are subjected to a number of spatial operations, resulting in a final output data layer. Essentially, spatial analysis turns geographic data into useful information. There are several spatial analysis techniques available and these range from simple to complex (Longley et al., 2001). A schematic diagram of spatial analysis is shown in Figure 2.9. Examples of studies that have used GIS to examine the relationship between animals and the environment are outlined below.

Hoffman and O'Riain (2012b) researched spatial ecology to understand the extent and severity of human-baboon conflict in the Cape Peninsula. GIS and spatial analysis was used to understand baboon ecology and to identify sleep sites and inter-troop territoriality. The findings suggested that understanding the wildlife spatial ecology in a semi-urban area could be used to identify causes of human-wildlife conflict and improve mitigation efforts. They found that removal of the troop would have limited success in reducing the overall human-baboon conflict as the vacuum created would be filled by another troop.

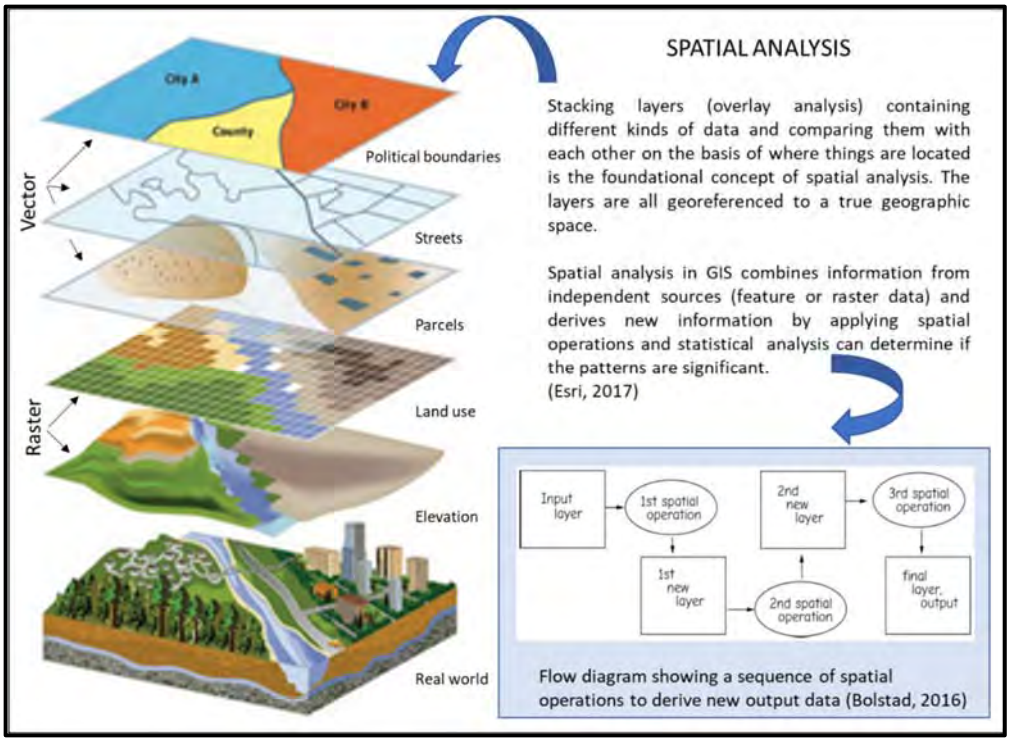

Figure 2.9: A schematic diagram of spatial analysis adapted from ESRI (2017) and Bolstad (2016).

Pebsworth et al. (2012) examined the eradication of alien vegetation and the potential impact on the feeding and spatial ecology of wild Chacma baboons in the Wildcliff Nature Reserve in the Western Cape. Using home range and day path lengths (DPL) the baboons use of vegetation types was quantified. The significance of this study was the introduction of the concept that the removal of invasive alien species should be considered in primate conservation and management policies. This study informed the methodology to identify sleep sites, season classifications, weather and preferred vegetation type as described in Chapter 5.

Thatcher et al. (2019) assessed the movement patterns of vervet monkeys *(Chlorocebus pygerythrus)* in Ballito in KwaZulu Natal. Using kernel density estimates of home ranges, the monkey's movement patterns were analysed. Interactions with humans (positive and negative) was based on field observations rather than collar data. However, it guided the possible methodology of using kernel density as a spatial analysis tool. The outcomes showed that the vervet monkey core home range increased with a higher rate of positive human encounters and were less likely to move in response to human aggression if human food sources are available, suggesting that effective management should focus on reducing human-food foraging opportunities.

Brown et al. (2005) investigated the resource utilization of the Chacma baboon in different vegetation types in the Blyde Canyon Nature Reserve, Mpumalanga. The methods used to map the home range and describe the vegetation use were GIS based. The research highlighted that baboons showed preference for certain plant communities, an outcome which could inform management strategies for the reserve.

The literature indicates that GIS spatial analysis techniques are ideally suited tools to investigate the data that informs this study. Locations from the collar data of the alpha male and female baboon are good indicators of where the troop spent most of the time. Slater et al. (2018) found that collaring one female baboon was sufficient to represent the movements of the troop as a whole as characteristically a troop moves through the home range as a cohesive group (King and Sueur, 2011). Areas with a high density or where the baboons were frequently observed can be described in a number of ways such as the animal's home range, the core area used and as hotspot areas if statistically significant. However, while "home range" is a standard concept in animal ecology and behaviour, Powell and Mitchell (2012) observed that the method to quantify the home range is an estimate which does not necessarily interpret the animals cognitive map of the environment it chooses to use.

2.5 Tracking Animal Movement

Tracking animal movement includes two common methods: observations in the field (Johnson et al., 2015) and GPS tracking units (Hoffman, 2011; Henzi et al., 2011b). Research which used these methods has looked at farming (Pebsworth et al., 2012), movements in natural habitat (Schrecengost et al., 2009; Liordos et al., 2017; Cheraghi et al., 2017) and semi-urban areas (Hoffman and O'Riain, 2012b; Fehlmann et al., 2016; Karelus et al., 2017). Baboon movement in human-wildlife conflict management studies using monitors, virtual fences and GPs tracking collars are documented for the Cape Peninsula (Kansky and Gaynor, 2000; Trethowan, 2009; Hoffman, 2011; Fehlmann et al., 2017).
For the purpose of this study, the locations of the baboons were recorded using a GPS tracking collar system and data from a WhatsApp alert group (Section 2.6). The collars were supplied, fitted and managed by Human Wildlife Solutions on behalf of PBRPA, the details of which are presented in Appendix A. The system uses GPS and Global System for Mobile Communication (GSM) technology (Dr P. Richardson, personal communication, 9 May 2018). The tracking collar data, as described by Human Wildlife Solutions, is shown in Figure 2.10. Photographs of the collar demonstrating the size and shape

are included in Appendix A. The collar data provided new information that filled a gap in knowledge of the movements of the Pringle Bay baboon troop.

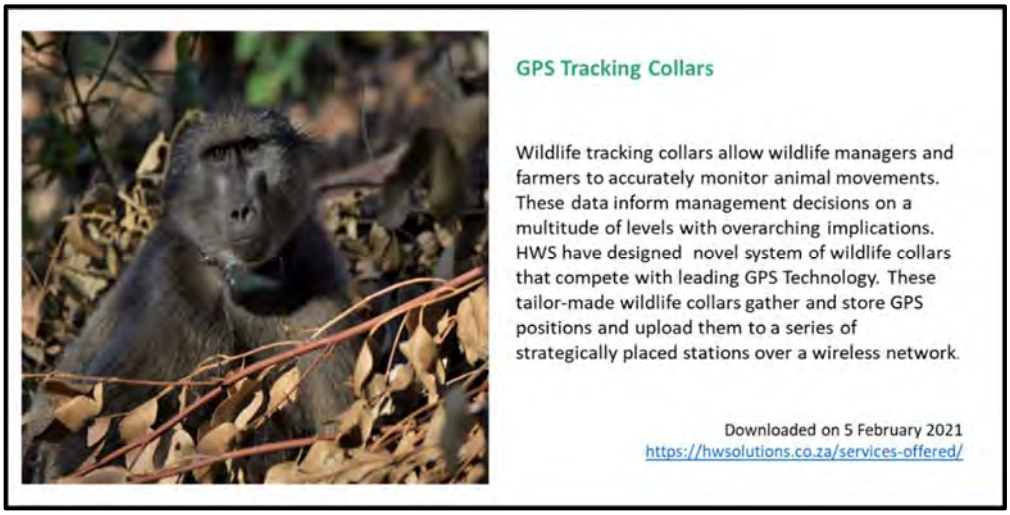

Figure 2.10: Human Wildlife Solutions information on the GPS tracking.

Understanding baboon spatial behaviour is important for informed management decisions to be made (YIU et al., 2017). Home range utilization is fundamental to understanding why they live where they do, why they spend time at certain places and why they do certain activities at certain areas (Powell, 2000). Home range for mammals was defined by Burt (1943) as "that area traversed by the individual in its normal activities of food gathering, mating and caring for young. Occasional sallies outside the area, perhaps exploratory in nature, should be considered part of the home range." This qualitative definition is still widely accepted and cited more than any other (de Raad, 2012), but is vague on how to actually quantify the home range. As a result, the literature shows that there has been numerous studies on quantifying home range (Powell, 2000; Nascimento et al., 2011; Stark et al., 2017; Yiu et al., 2017). Home range analysis of animal observations (GPS point data) is used to understand habitat use, but researchers are not necessarily interested in every point visited or even the entire area used by the animal (Rodger and Kie, 2011).

Burt (1943) highlighted that home range is not necessarily a permanent area that an animal uses during its lifetime as animals often move from one area to another. Migratory animals have different home ranges for different seasons and the migratory route is not considered part of the home range of the animal. Many migratory bird species are an example of this e.g. the Common Buzzard (*Buteo buteo*) is a palaearctic breeding migrant that arrives in the Western Cape in October and departs in March (Hockey et al., 2005). The concept of home range is complex and

the vagueness as to whether to include the area that the animal seldom visits is highlighted by Powell (2000) as to how do you define the edges of the home range and is the importance not the area within the home range that is used often not more meaningful to understanding how and why the animal lives there?

The conceptual problem of understanding an animal's home range makes it difficult to estimate and qualify the home range. However, even simply estimated areas have led to insights into animal behaviour and their environments. Gregory (2017) further highlights that when estimating home range two factors should be kept in mind – predictability of where one finds the animal and the probability of the animal being in any one place. Kernel Density Estimation (KDE) methods rely on a non-parametric approach (does not assume anything about the distribution) to provide a probabilistic measure of the space used by the animal where the density of any observation point is an estimate of how often the animal visits that point. KDE is a mathematical process which finds an estimate probability density function of a random variable (Weglarczyk, 2018) and is based on a finite set of data.

Analysing spatio-temporal data to understand animal movement first requires the animal locations to be mapped, thereafter which patterns can be identified. To quantify the area in which the animal ranges, de Raad (2012) noted that studies generally focus on two analyses - home range estimation and daily path lengths. Home range determination involves converting the location data into a raster surface that shows the intensity of habitat use (University of Southampton, 2021). In ArcMap 10.7 these types of functions are found under the Spatial Analyst, 3D Analyst and Spatial Statistics toolsets, with the kernel density tool being one of them. ArcGIS (ESRI, 2018) describes kernel density as "calculating a magnitude-per-unit area from point or polyline features using a kernel function to fit a smooth tapered surface to each point or polyline." The heat map is a density surface per square kilometer which is a probabilistic measure of animal space use in which the density of any observation is an estimate of how often the animal visited that location (de Raad, 2012).

Stark et al. (2017) evaluated methods for estimating home ranges of proboscis monkeys (*Nasalis larvatus)* using GPS collars in Malaysian Borneo. The research was to show the total area required by the monkeys, the time spent in the different areas and how frequently the different parts of the home range were used. The utilization distribution (UD) estimation methods compared were the parametric grid-cell method (GCM) and the local hull nonparametric kernel method (LoCoH).

They point out that the number of home range methods available all have varying success, making it difficult for researchers to choose between methods. The GCM is a simple and commonly used method in primate studies and was found to be comparable to other studies to identify areas of importance. While the LoCoH identified barriers (e.g. rivers), it tended to underestimate home range area. They concluded that the selection of a home range estimator needs to consider the research questions and local information about the species location and environment before determining the best method to use.

Nascimento et al. (2011) compared the home range sizes of mainland and island populations of black-faced lion tamarins (*Leontopithecus caissara*) in Brazil using three different spatial analysis techniques – minimum convex polygon (MCP), kernel density (KD) and dissolved monthly polygons (DMP). All these methods estimated home range area differently with MCP overestimating it and KD was useful for identifying intensive use within the home range.

De Raad (2012) researched the travel routes and spatial abilities in wild Chacma baboons (*Papio ursinus*) in the Soutpansberg in Limpopo Province of South Africa. The primary objective was to gain insight into the spatial cognitive abilities of the baboons to navigate their environment. Home range was estimated using KD and LoCoH, achieving similar results for both. The main difference was that the KD showed high density areas (islands) on the edge of the home range, which seemed unrealistic as the baboon troop would have to use the surrounding low use areas to get to the "islands". De Raad concluded that to assess any method, local knowledge of the animal's home range was important as most approaches estimating home range either over or underestimated the size.

Farkas (2010) looked at the foraging behaviour of Chacma baboons in Wildcliff Nature Reserve in the Western Cape Province of South Africa. Food availability within the different plant communities varied within the animal's home range. GPS locations were used to create kernel density maps using GIS and using a minimum convex polygon the area of the home range was estimated. Comparisons of the KD surfaces for the wet and dry months showed the distribution change of the baboons.

To understand where the animal spends time in their habitat can help to understand the way they percieve their world. The ambiguity that exists as to whether to include or exclude areas that are seldom visited by the animal was highlighted by Powell (2012). Worton (1989), when describing

kernel methods for estimating home range studies, suggested that keeping models simple with a reasonable fit to the data was an important approach.

2.6 Volunteered Geographic Information

With the growth of the World Wide Web (WWW), a new source of geographic information became available and this has led to citizen science originated data bases being developed. Examples on a global scale include Google Maps and OpenStreetMap which are patchworks of voluntary contributions by citizens. VGI has an important role to play in geographers' research and is defined by Elwood et al. as "geographic information acquired and made available to others through voluntary activity of individuals or groups, with the intent of providing information about a geographical world" (2012: 575). The ability to geotag observations using mobile technology led to the development of specialist applications (apps) such as iNaturalist (developed by California Academy of Sciences in 2014 to map and share biodiversity observations globally) and Birdlasser (records location of sightings of birds and is linked to the SABAP2 BirdMap protocol of the South African National Biodiversity Institute [SANBI]). Goodchild (2007) first used the term "Volunteered Geographic Information" where conventional geographic information is supplemented with efforts of volunteers. This represents an important change as to how geographic information is now created, shared, distributed and used. Blatt (2015) summarized VGI as the practise of observing and collecting data by the public on easy-to-use social media platforms.

VGI uses various "enabling technologies" such as the WWW, Georeferencing, Geotags, GPS and Broadband Internet (Goodchild, 2007). Figure 2.11 shows how VGI data can be collected both actively and passively i.e. observations from people and data from technology. Blatt (2015) cites examples of where a VGI approach is used to gather information in real time for catastrophic events such as earthquakes, fires, floods and other natural disasters.

Limitations of VGI include the reliability of data collected and privacy of the data (Senaratne et al., 2017; Blatt, 2015; Antoniou et al., 2017). The South African Protection of Personal Information Act (POPIA, 2020) regulates the use of personal information of members of the PBRPA. Reliability of crowd-sourced data is built on the premise that more records of the same observation will lead to high probability of accuracy. Foody et al. (2015) however suggested that the use of VGI data is limited by concerns with its quality. Advantages of VGI is the minimum cost (volunteered) of collecting large amounts of data, but Goodchild and Li (2012) concluded that it can be inadequate as an alternative

for more traditional scientific research methods. Sieber (2006) stated that "Public Participation GIS (PPGIS) is a unique way to engage the public in decision-making and includes local knowledge to broaden the data base". Citizen science was used in a survey method in England by Scott et al. (2018) to estimate red fox and Eurasian badger population distributions. Here it was concluded that citizen science observations can effectively add data about animal densities. Citizen scientists often mapped data for different areas to the scientists, thus improving and extending knowledge (van der Waal et al., 2015).

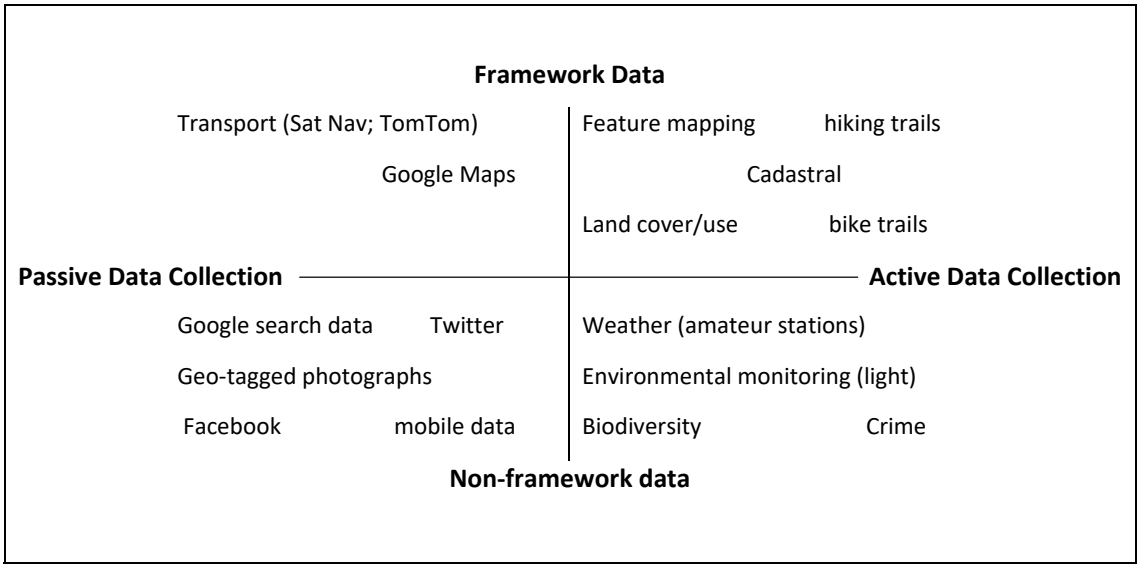

Figure 2.11: VGI data consists of both framework data (which provides the geographical context), and non-framework data (which is both actively and passively collected) (adapted from See et al., 2017).

The use of the crowd-sourced data on the movements of the baboons in Pringle Bay could benefit the management of the troop. 'Data mining' was identified by Senaratne et al. (2016) as a technique to extract data from crowd-sourced platforms. The WhatsApp Messenger was defined by Margaret Rouse (2020) as a cross-platform instant messaging application that allows smartphone users to exchange text, image and audio messages for free and provides for a group chat forum (created by WhatsApp Inc. in 2014 and acquired by Facebook, February 2020). Wikipedia claims that this messaging application is the world's most popular with over 2 billion users (Wikipedia, 2020). The WhatsApp platform was used in this study. Emerging technologies (smart mobile telephone and apps) will also make citizen science an accessible and cheap way to collect data. Examples of studies that examine the use and reliability of VGI sourced data are outlined below.

Lewis et al. (2016) researched the use of mobile phones in human-wildlife conflict in northern Tanzania. Mobile phone use has rapidly spread to rural areas traditionally not serviced with telephonic communications. The qualitative data showed that the Maasai agro-pasturalists used mobile phones to manage and reduce the number and severity of human-wildlife conflict events. However, quantitatively the relationship between human-wildlife conflict and reporting was not easy and showed that complexity and bias may have skewed outcomes.

McCall et al. (2015) developed a framework for assessing how VGI systems and practises are measured against principles of good governance and participation. They argued that Participatory GIS (PGIS) should be incorporated into VGI. The Smartphone offers potential for a cheap and simple tool to gather spatial information from individual and community perspectives. PGIS allows for people to participate in finding solutions in their communities. Credibility of the information was identified as a challenge in an un-structured framework.

Senaratne et al. (2017) reviewed VGI quality assessment methods for spatial data produced by volunteers. They introduced the concept of 'data mining' as an additional approach for quality control in VGI. Another outcome was that it is important to filter out useful information and disregard the rest. Accuracy and consistency in the reporting are key drivers to gathering VGI and filtering it.

Bannatyne et al. (2017) used an adapted citizen science approach to a suspended sediment monitoring network in Tsitsa River catchment in the northern Eastern Cape of South Africa. Two platforms were used, firstly the Open Data Kit (ODK) was used for the collection and transfer of data. This was originally developed to collect, transmit, store and use data easily and cheaply (Hartung et al., 2010). The KoBo Toolbox (Harvard Humanitarian Initiative, 2016) is a free open-source tool that enables one to collect data in the field using mobile phones was also used.

The outcomes of any VGI monitoring program depends on the commitment of a community to report timeously and correctly to set protocols. This approach to data collection can provide spatial and temporal information at low cost when compared to the traditional field observations and expensive tracking collars. However, baboon observations would be largely restricted to the urban areas were the participants live with less sightings reported in the animal's natural habitat. Human-wildlife conflict reporting is often ineffective due to inadequate and scattered data (Le Bel et al., 2016). However, according to Le Bel et al. (2016), smartphone technology has created the opportunity for recording georeferenced data simply and at low cost to improve human-wildlife conflict management.

Catlin-Groves (2012) highlighted the fact that using less standard data collection methods, such as data-mining methods of VGI, was still relatively unexplored in scientific literature, especially in biological and ecological applications. This is an area where citizen science can have the greatest impact with the potential to monitor biodiversity at large geographic scales. This was corroborated by the study which mapped the Bumblebee distribution in the United Kingdom by van der Waal et al. (2015) who found that citizen science records complemented scientific data. The use of VGI to map animal observations was less time-intensive and labour-intensive than the more scientific adopted methods for estimating species distribution (Mohd Rameli et al., 2019) when they assessed small ape distribution in Peninsular Malaysia. This study also highlighted that a well-publicized and structured citizen science program, where communities are involved in monitoring biodiversity, ultimately improves research and monitoring outcomes while at the same time building awareness of local biodiversity challenges.

2.7 Role of the Environment

The environment plays a central part in most studies of animal movements (Davidge, 1977; Johnson et al., 2015; Stillman et al., 2015; Cheraghi et al., 2017). The survival of a species is closely related to how the animal moves through the environment and Johnson et al. (2015) calls this "biological fitness." Important factors include: the distance travelled per day, home range, sleep sites, foraging areas and availability of water (Bronikowski and Altmann, 1996; Ganskopp and Bohnert, 2008; Birss and Palmer, 2012; Fleming, 2014). Topographical features (Gaynor, 1994; de Raad, 2012) and climate also influence animal behaviour (Henzi et al., 1991a; Barrett, 2009; von Doorn et al., 2010; Hoffman and O'Riain, 2012a; Marshall et al., 2014; Dostie et al., 2016 and Slater et al., 2018) and the availability of water and food, mostly dictated by vegetation type (Pasternak et al., 2013).

Stone et al. (2013) investigated the spatial distribution of the Chacma baboon habitat based on an Environmental Envelope Model as qualitative distributions were available, but quantitative data across southern Africa was not. GIS and data extracted from environmental layers was used to indicate the habitat where baboons were found i.e. altitude, temperature and rainfall (Table 2.3). This model recognised that areas well known for baboon ranges may actually be marginal habitat.

Dubay (2018) investigated the response of Chacma baboons to wildfire in the Cape Peninsula and found that the post-fire range was larger than that prior to the fires and the additional area did not include burnt habitat. The troop benefited from the release of seed from exotic pine trees as a result

of the fire, but highlighted that the proposed removal of the alien vegetation may lead to increased human-wildlife conflict as a result of a food source being removed. The behavioural flexibility of baboons suggests that they can adjust to a large-scale wildfire. Figure 2.12 shows the burnt fynbos vegetation after the 2019 wildfire in the study area indicating little or no foraging available. Figure 2.13 shows a baboon in the burnt landscape after the March 2017 Rooiels wildfire where the troop were feeding on fynbos seeds. J. Mormile (personal communications, 2019) commented on the important role baboons play in seed dispersal and germination post-fire.

Table 2.3: Environmental variable ranges of Chacma baboons adapted from Stone et al. (2013).

Environmental Variable	Minimum level	Maximum level
Altitude (m)	-6	3286
Max. Temp. (^{0}C)	14.4	38.2
Min. Temp. (^{0}C)	-6.1	17.3
Rainfall (mm)	15	1555

The impact of climate change on weather patterns and the environment is well documented in the literature. Research on extreme weather patterns (van Doorn et al., 2010), shifting seasons (Barwell, 2015) and man induced fires (le Maitre and Midgley, 1992; Dubay, 2018) lead to a change in vegetation over time (Cowling and Richardson, 1998; Guth, 2005; Turner, 2012), and hence influence baboon movement. Because of the short duration of the study and the limited observations from the collar and volunteered information being available, the potential threat of climate change cannot be included in this study.

This literature review has attempted to cover a number of applied geographical approaches which will inform a mixed method approach using both qualitative and quantitative data in Chapter 4. The aim was to be thorough, exhaustive and accurate in order to understand how the geography of the study area presented in the next chapter influences the Pringle Bay baboon troops movements. Hoffman and O'Riain (2012b) stated that "quantification of the animal landscape requirements can provide a mechanism for identifying priority conservation areas at the human-wildlife interface." The literature shows that using GIS to build a data base of environmental information which can be overlain with the baboon troop movements may lead to patterns being observed which can then be used to inform the management of human-baboon conflict in Pringle Bay.

Figure 2.12: Burnt fynbos vegetation after the January 2019 fire in Pringle Bay and Betty's Bay which burnt two thirds of the Kogelberg Nature Reserve covering an area of 12 800 hectares (reported by the Overberg Fire Protection Services on 29 May 2019, retrieved on 6 June 2019 https://overbergfpa.co.za/cool_timeline/1-jan-bettys-bay/).

Figure 2.13: Burnt fynbos vegetation after the March 2017 Rooiels wildfire where the baboons were observed eating fynbos seeds.

CHAPTER 3: STUDY AREA

This chapter describes the location of Pringle Bay in South Africa and a provides a historical overview of the development and densification of the town. The geography is described detailing the topography, drainage, geology and soils while the vegetation endemism and biodiversity is highlighted. Weather patterns are explained and the importance of fire described briefly.

3.1 Location of Pringle Bay

Pringle Bay is a coastal town in the Overberg region of the Western Cape Province, South Africa. The study area is 90 km south-east of Cape Town and along south-eastern limits of False Bay, as shown in Figure 3.1. Pringle Bay is administered by the Overstrand Municipality and is located between the towns of Rooiels (5 km to the north) and Betty's Bay (10 km to the south-east).

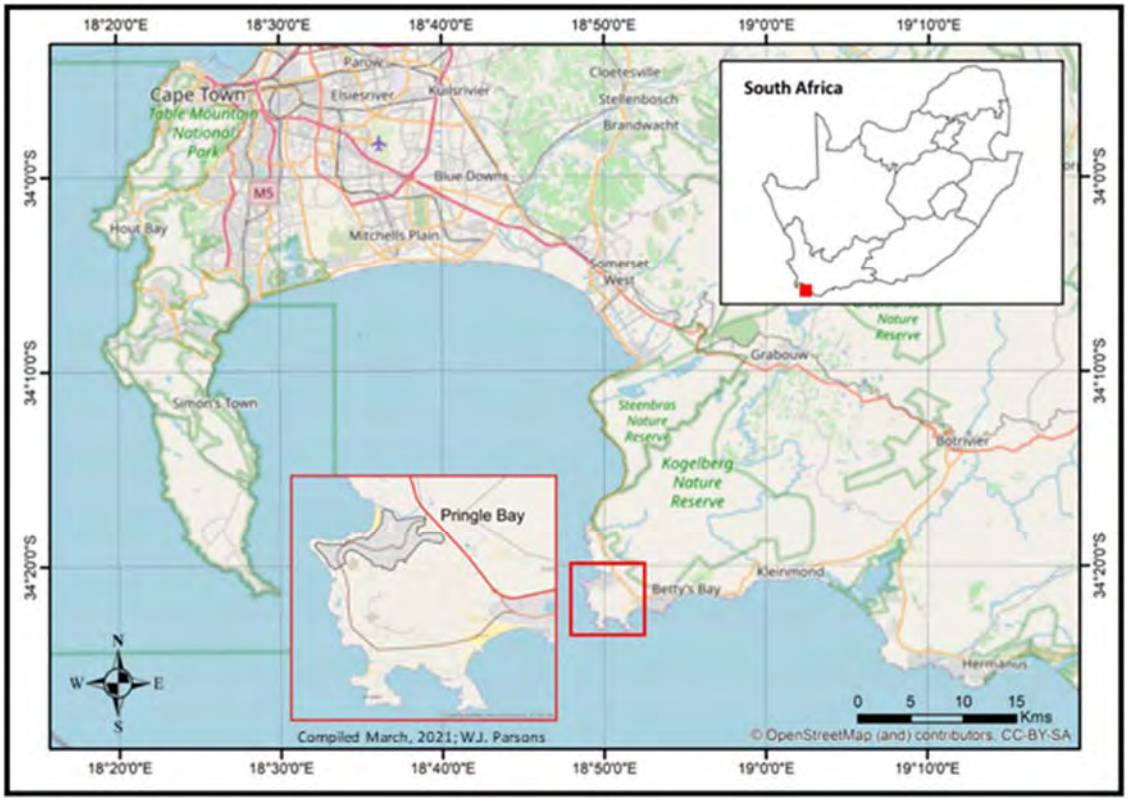

Figure 3.1: Locality map of Pringle Bay.

3.2 Development of Pringle Bay

Historically, the coastline between the Steenbras and Palmiet Rivers was inaccessible. The Steenbras River could only be crossed at low tide and there was no road to navigate the steep and rocky slopes of the Kogelberg mountains. The Hermanus Historical Society (2015) noted that it was only in the 1930s that several farms were bought with the idea of developing seaside villages. A route from Gordon's Bay to Betty's Bay was needed if development was to take place. A road was built during World War II by Italian Prisoners of War, a strategic military project to give access to the two radar stations built on the Hangklip mountain. This changed accessibility to the area and the villages of Rooiels, Pringle Bay and Betty's Bay started to develop. However, it was only after electricity was introduced in 1993 that development really took off. Figure 3.2 is a photograph of Pringle Bay taken in about 1990 demonstrating the low degree of development before the introduction of electricity. These same erven are now almost fully developed.

Figure 3.2: Photograph of Pringle Bay taken from the Point looking northwards to Klein Hangklip circa 1990 [Photo: D. Muirhead]. Four houses are seen in the photograph where 25 houses now exist, with an associated loss of habitat.

According to Statistics South Africa (Census 2011) there were 800 permanent residents living in Pringle Bay in 2011, and 401 (21%) of the erven were developed. The estimated permanent population in 2019 was 2 000, with more than 75% of the 1 890 erven now developed (J. du Toit, personal communication, 5 June 2019). Table 3.1 indicates the growth and population since inception in 1938 and Figure 3.3 shows how the towns of Rooiels, Pringle Bay and Betty's Bay have grown over a 25 year period. The development of Pringle Bay has resulted in a concomitant loss of natural habitat within the town upon which the baboons foraged.

Table 3.1: Pringle Bay population and urban growth (Cape Water Programme, 1996; Geldenhuys, 2006; National Census 2001 & 2011; du Toit, 2019 and Smith, 2019).

Year	1938	1951	1961	1970	1980	1990	1996	2001	2011	2019
Developed erven	0	3	8	unknown	unknown	319	620	836	1 048	1 418 (75%)
Permanent residents	0	0	0	15	40	50	250	690	800	2 000

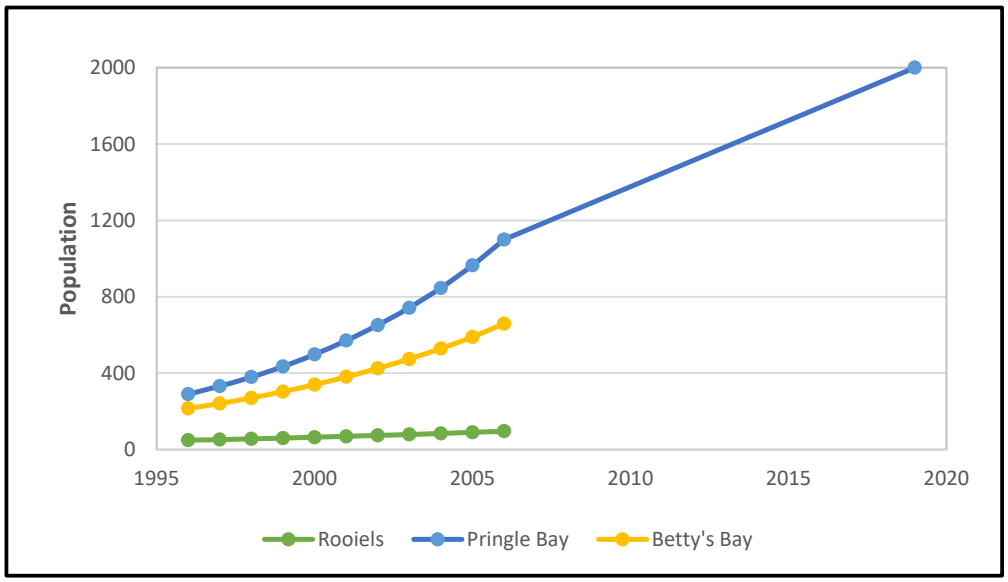

Figure 3.3: Growth of permanent residents at Rooiels, Pringle Bay and Betty's Bay after the introduction of electricity in 1993 (after Gumbi, 2011; du Toit, 2019).

3.3 Topography and Drainage

Pringle Bay is situated on the eastern coastline of False Bay on a flat coastal wave-cut platform. The slopes steeply rise to form the Klein Hangklip mountains to the north-east, the Hottentots Holland mountains to the north-west, the Groot Hangklip mountains to the south and east. Nature reserve areas, administered by Cape Nature, are the Kogelberg Biosphere and the Hangklip / Brodie Link corridor which are on the boundary to the north and south-east, respectively. The Hangklip mountain reaches 484 m above sea level and the Atlantic Ocean is to the south. Figure 3.4. presents an oblique view of the village of Pringle Bay highlighting the flat coastal plain and key topographical features.

The catchment area of Buffels River covers 5.4 km^2 of which the urban catchment is 2.3 km^2 (Qunu, 2009). The Buffels River forms a boundary to the urban edge on the northern side of the town where

it forms a small estuary and then flows over the Pringle Bay beach before entering the sea (Heydorn, 2010). The Hangklipkloof Stream has its source in the Hangklip mountain and together with other run-off from the mountains flows across the coastal plain as surface water (stream or braided streams) and subsurface water (wetlands and seeps). A surface water map of the study area is shown in Figure 3.5. Urban development has resulted in the destruction of natural wetlands and streams have been channelized to prevent in flooding (especially in winter) and erosion (Day, 2014).

Figure 3.4. Oblique aerial view of Pringle Bay showing the flat coastal plain and key topographical features (Google Earth Imagery, June 2019).

3.4 Geology and Soils

The geology of the area is underlain by rocks of the Table Mountain Group (TMG) that are some 400 million years old. They were subjected to structural forces some 280 million years ago, resulting in the rocks being folded and faulted (Newton et al., 2006). Generally, the rocks are quartzite and quarzitic sandstone with some thin shale layers in places (Rogers, undated). Figure 3.6 shows the geology of the study area, indicating both the formations of the older TMG and the more recent Quaternary sand deposits.

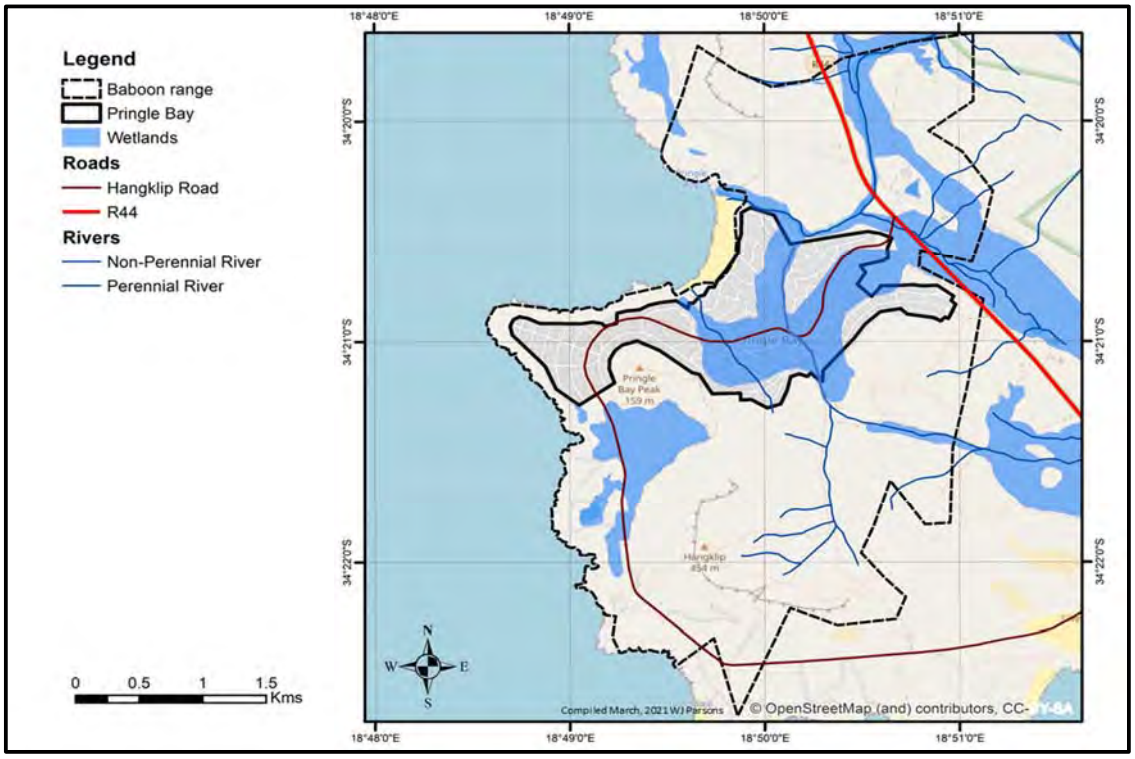

Figure 3.5: Surface water map of the study area (Data source: Cape Nature, 2017).

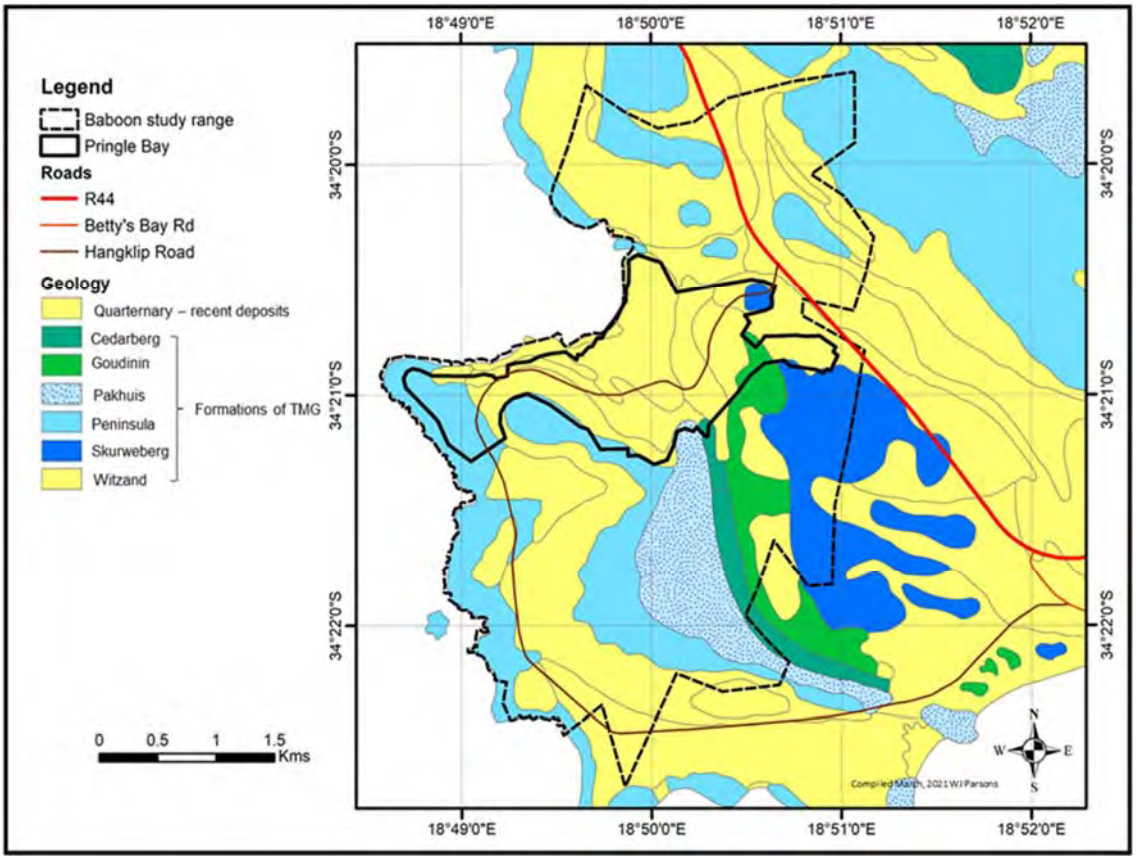

Figure 3.6: Geology of the study area (Data source: Council for Geoscience. nd.)

Guth (2005) described the soils as either being acidic (rocky sandstone slopes) or alkaline and sandy (coastal plain), both of which are nutrient poor soils upon which fynbos vegetation flourishes (Le Maitre & Midgley, 1992; Cowling & Richardson, 1995). Figure 3.7 shows the north-south elevation profile with a photographic view from the river mouth looking west towards Betty's Bay, typical of the coastal sand vegetation.

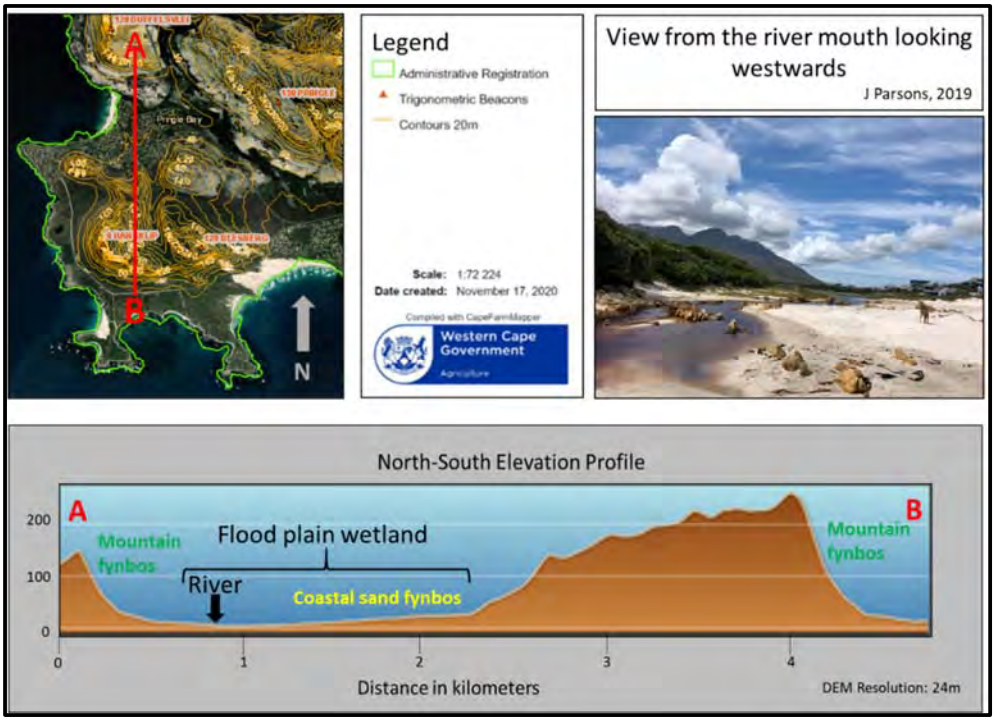

Figure 3.7: North-south elevation profile with a photographic view from the river mouth looking west with typical coastal plain vegetation along the rocky shoreline (adapted from CapeFarmMapper 2.2.3, 01/11/2020).

3.5 Vegetation

Pringle Bay lies in the Cape Floral Kingdom, the smallest of the six plant kingdoms of the world (Moll et al., 1984) and is part of Kogelberg Biosphere which is considered an important biodiversity hotspot with over 9 000 plant species occurring in the different vegetation types. Endemism is high and is under pressure due to habitat loss and development (Cowling and Richardson, 1998; Manning, 2007 and Skowno, 2019). Johns (2010) refers to the Pringle Bay urban area as a sensitive lowland environmental area primarily due to the coastal wetland flats and dune systems. The fynbos biome is an endemic species-rich vegetation type, but low in nutrients (Manning, 2007; Bean and Johns, 2005; Cowling et al., 1996) and provides low-quality forage for general herbivores, including baboons

(Davidge, 1977). The fynbos biome is dominated by proteoids, ericoids, restioids and geophytes (Cowling, 1995 and Manning, 2007).

Attwell (2015) describes seven different vegetation types in the buffer zone of the Kogelberg Biosphere Reserve, each with their own special and endemic plants. A vegetation type is a broad classification of vegetation based on appearance and functional characteristics (Mucina and Rutherford, 2006). Four vegetation types occur in the study area:

- Kogelberg Sandstone Fynbos is found on the slopes of Hangklip and Pringle and Daskop peaks;
- Hangklip Sand Fynbos covers most of Pringle Bay and the coastal plain between Hangklip and the sea;
- Western Coastal Shale Band Vegetation is found along a narrow strip in Hangklipkloof and is typically associated with the Cedarberg Formation; and
- Cape Seashore Vegetation is at Cape Hangklip area.

The diagram presented in Figure 3.8 illustrates the two dominant vegetation types and fynbos units found in the study area.

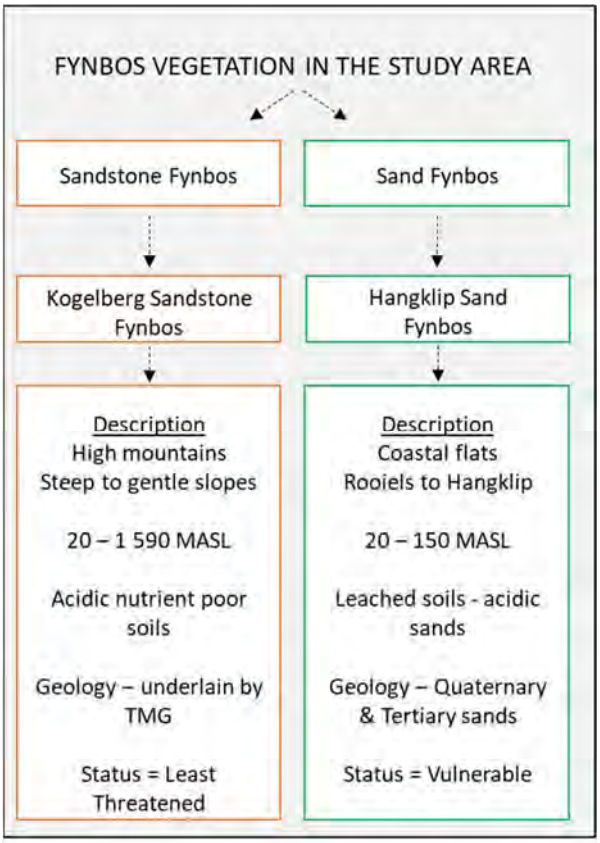

Figure 3.8: Description of the fynbos vegetation in the study area (after Rebelo et al.,2006).

Boucher (1978) described the more detailed classification of the plant communities in each fynbos unit, as shown in Figure 3.9. This was used by Guth (2005) when investigating the seed dispersal abilities of baboons in the fynbos.

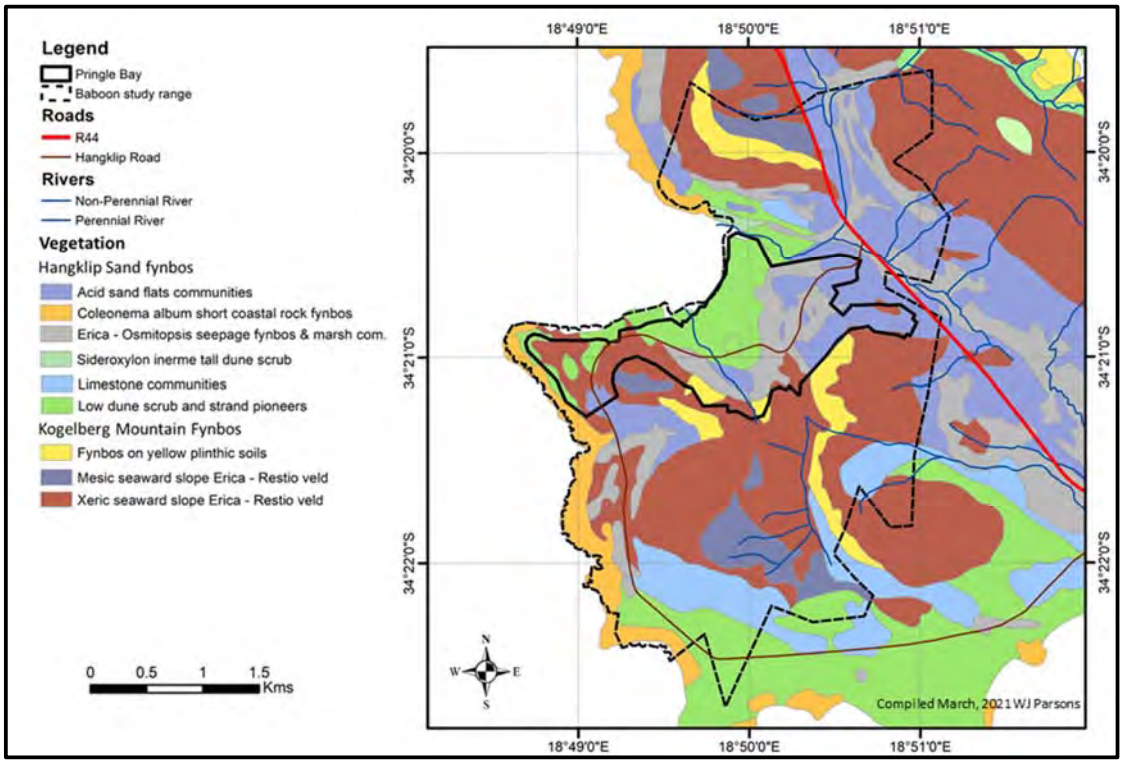

Figure 3.9: Map of plant communities found in the study area (after Mucina et al., 2018).

3.6 Biodiversity

A biosphere reserve is described as "special places for people and nature" (UNESCO, 2002) and the Kogelberg was the first recognised biosphere in South Africa when proclaimed in 1999 (Pool-Stanvliet, 2014). The Kogelberg Biosphere Reserve is a hotspot of biodiversity (Bean and Jones, 2005) and a centre of endemism (Cowling, 1990). The Critical Biodiversity Areas (CBA) and protected areas (Cape Nature Reserves) that surround the town (Figure 3.10) highlight the importance of this critical southern coastal transition zone (Johns and Johns, 2001); while the Ecosystem Threat Status 2016 for the study area (Figure 3.11) revealed that Pringle Bay and surrounds are considered Critical and or Endangered (Pool-Stanvliet et al., 2017).

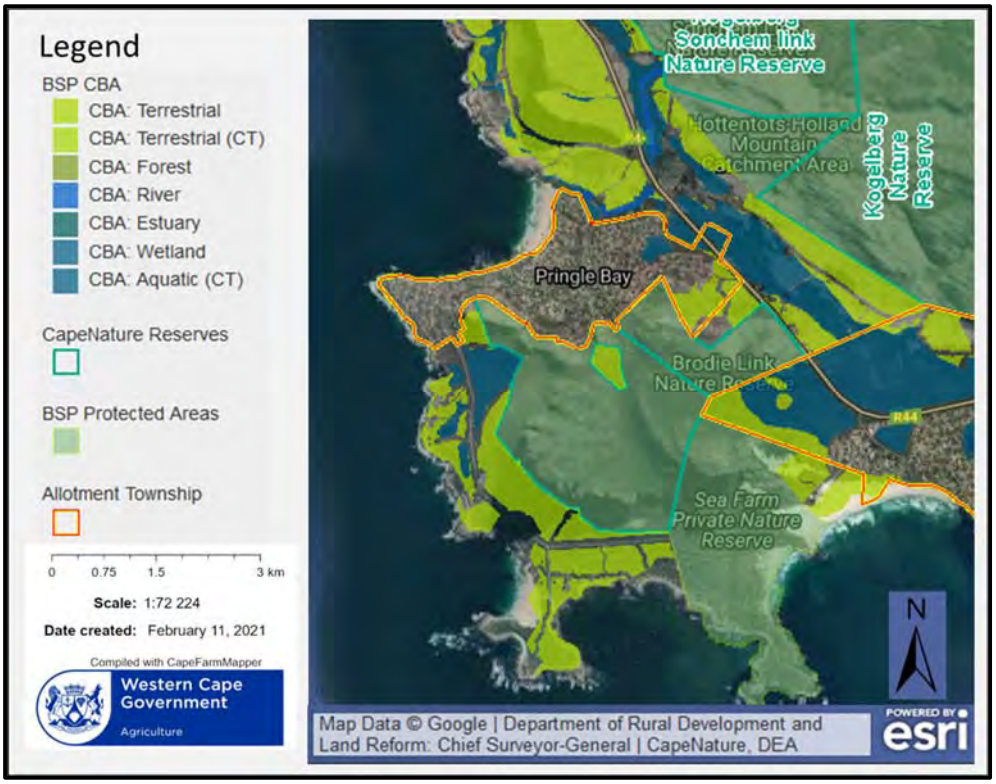

Figure 3.10: Critical Biodiversity Areas and protected areas surrounding Pringle Bay (adapted from CapeFarmMapper 2.2.3, 11 February 2021).

Figure 3.11: Ecosystem Threat Status in 2016 (adapted from CapeFarmMapper 2.2.3, 11 February 2021).

3.7 Land use of the study area

The land use cover of the baboon range study area is mapped in Figure 3.12. Most of the area has not been modified by human settlement and the town is surrounded by natural vegetation and protected areas (Cape Nature Reserves) to the south, west and north.

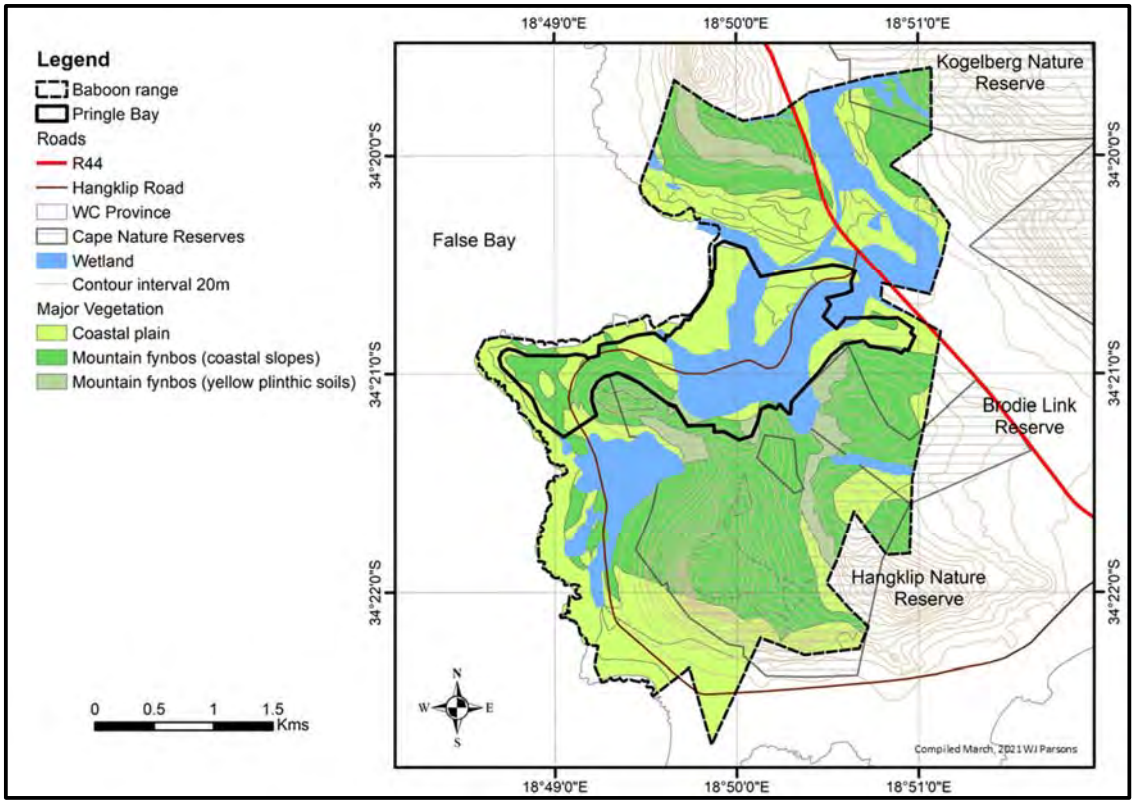

Figure 3.12: Land cover map of the study area.

3.8 Climate and Weather Patterns

Pringle Bay experiences a Mediterranean climate, moderated by the proximity to the ocean (Crosti et al., 2006; Miller, 1983). Summers are moderately hot and dry with temperatures varying between 18 - 25 ^{0}C, winters are mild and wet with temperatures between 8 – 15 ^{0}C (Cowling, 1995 and Goldblatt, 1997). This is a winter rainfall region with a mean annual rainfall of 750 mm. Prevailing winds in summer are from the south-east and in winter from the north-west. Barwell (2015) recorded that the climate is mostly influenced by the east-moving cyclones of the circumpolar westerlies and a belt of subtropical anti-cyclonic cells of high pressure and the seasonal migration of these systems.

This succession of cold fronts with rain-bearing north-west winds (Bergh, 2012) is typical of the study area. Goldblatt and Manning (2002) also mention that the south-facing mountain slopes may have higher rainfall in summer than the leeward-slopes because of the south-eastly winds. This moisture often forms clouds on the Hangklip mountains and is often referred to as “Hottentot’s Blanket” (Rebelo et al., 2006).

The seasonal wind-roses for the study area are shown in Figure 3.13 and indicate that southerly to south-easterly winds dominate during summer, spring and autumn. Onshore winds from the west occur throughout the year and north-westerly winds are strongest during the winter. The temperature records show that the highest mean temperatures are recorded during January and February while July records the lowest. The annual rainfall distribution for the south-western Cape Hangklip area reflects a unimodal winter peak and summer dry season (Boucher, 1978). The wet period is usually between April to October, while the months of June, July and August usually record the highest rainfall. The dry period is usually from November to March.

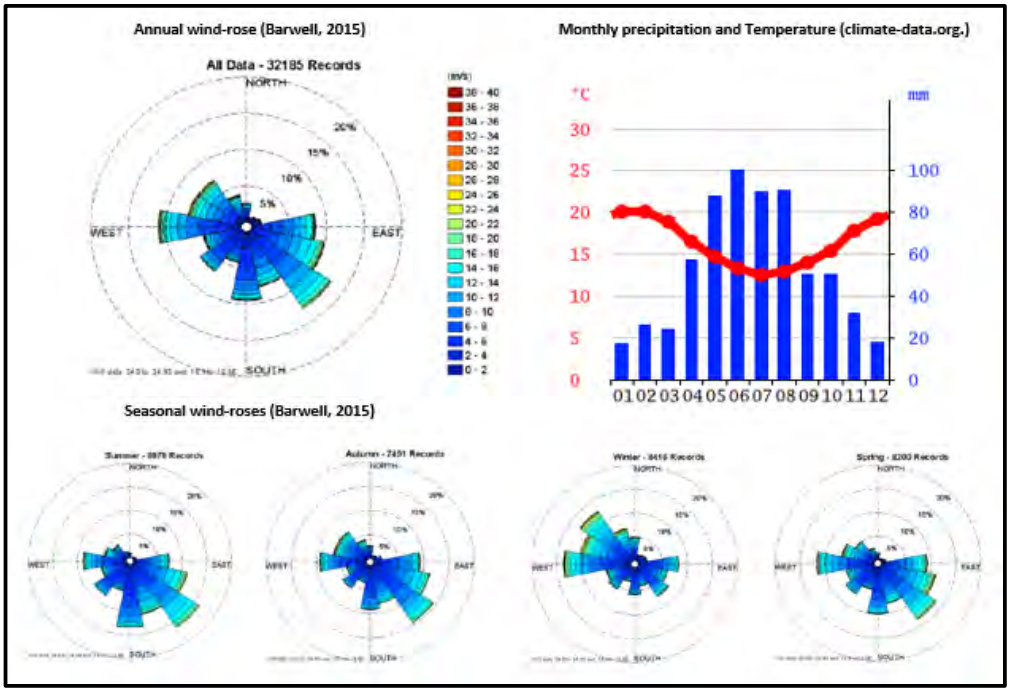

Figure 3.13: Seasonal wind (Barwell, 2015) and monthly precipitation and temperature patterns (climate-data.org) for Pringle Bay.

3.9 Fire

Fire can cause devastation to life and property but is important to the survival of fynbos biome (Crosti et al., 2006, Rebelo et al., 2006 and Bergh, 2012). Fire occurs regularly and naturally in this ecosystem and sources include lightning strikes, spontaneous combustion and friction of rolling rocks and stones according to Boucher (1972). Humans also plays an important, if notorious, role (Boucher, 1972 and Esler et al., 2014).

Fynbos is prone to fire, but it is the fire regime that is important (Esler et al., 2014). This relates to the seasonal timing, intensity, area covered and frequency. Fires occur in summer when the conditions are hot and dry and driven by strong south-easterly winds. Most fynbos communities burn every 12 – 15 years according to Cowling and Richardson (1995). Figure 3.14 shows that there were 67 fire events in the area between Rooiels to Betty's Bay between 2006 and 2018. Pringle Bay was associated with 35 of these over the last 13 years (C. Francis, personal communication, 3 December 2020).

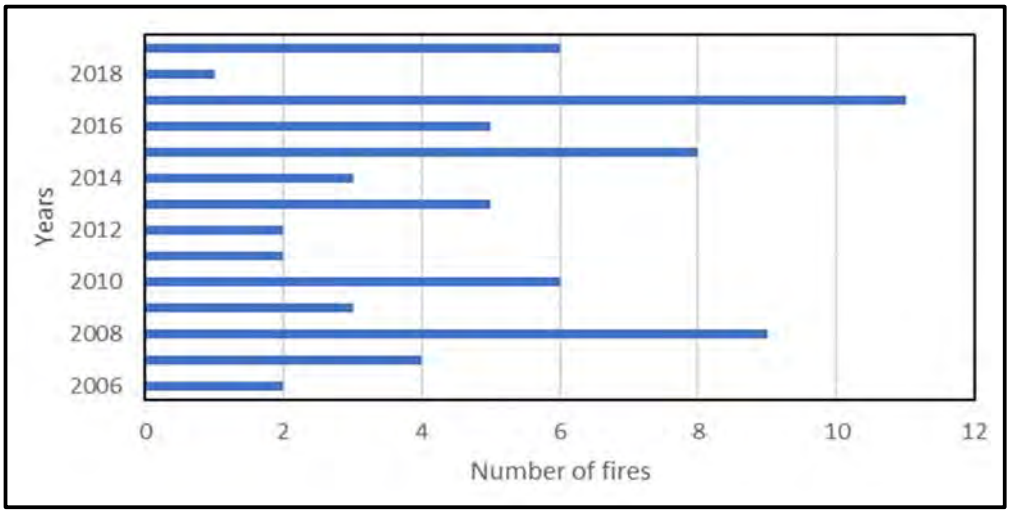

Figure 3.14: Fire incidents in or near Pringle Bay (Pringle Bay Volunteer Community Fire Fighters, Appendix D).

The catastrophic fire that started on 1 January 2019 is depicted in Figure 3.15 which shows a collage of photographs of the fire and post burn landscapes and depicts the intensity and extent. This meant that the 12 800 hectares burnt would impact the future carrying capacity for wildlife for a number of years while the fynbos recovers. While this fire occurred during the second summer of this research project, multiple fires over the past 13 years were largely due to human impacts associated with the urban development that has taken place.

Figure 3.15: Collage of photographs of the Pringle Bay fire of January of 2019 showing the extent, intensity and loss of vegetation cover.

3.10 Conclusions

This chapter has detailed the geography of the study area pertinent to the baboon troop movements. In the previous chapter the literature review included the importance of habitat and noted that baboons play an important role in biodiversity yet their role within the fynbos is not well understood or researched according to imminent specialists in their respective fields. The next chapter introduces the methodology adopted to determine the spatial and temporal distribution patterns of the baboon

troop. The philosophical approach to the methods is centred around the geography of the study area depicted in this chapter, thus providing a sense of place within the landscape and the environment.

CHAPTER 4: METHODOLOGY

4.1 Introduction

The scientific method was adopted to determine the spatial and temporal distribution patterns of the Pringle Bay baboon troop in relation to the geography of the study area. The literature review laid the foundation for the methodologies adopted. A geographical perspective using engaged research, where discovery and mobilization of knowledge to the mutual benefit of the community (Beaulie et al., 2018), rather than a primatologist or animal behaviourist specialist study, was followed. The engaged approach uses real data for a practical outcome (Boyer, 1996) when looking at the spatial distribution of the semi free-living troop of baboons in Pringle Bay. As a permanent resident of Pringle Bay my local knowledge and observations of the baboon troop and the HWC management over the last ten years provided valuable and unique insight for this research.

Data collection was conducted over a two-year period and two different data sources informed this study on the movement of the Pringle Bay troop. A mixed-method approach (Creswell, 2006) was followed, where both qualitative (WhatsApp observations) and quantitative (tracking collars) data were used, to gain a better understanding of the geographic phenomena (Yeager and Steiger, 2012) influencing the baboon movement. Goodchild and Li (2012) described VGI as a relatively new way to crowd-source data to build a geodatabase.

A desktop study approach to the environmental data was used and data were obtained through secondary sources such as South African National Biodiversity Institute (SANBI), the Chief Directive National Geo-Spatial Information (NGI), Council for Geoscience, Overstrand Municipality and Cape Nature. The history of human-wildlife conflict in Pringle Bay was based on archived sources from media, anecdotal information, Overstrand Municipality and PBRPA reports. The philosophical approaches to the methods used are centred around geography and a sense of place of the landscape, the environment and humans.

The GIS software used was ArcGIS Desktop 10.7 (ESRI® Inc. 2018) (hereafter referred to as ArcMap) under license to the Geography Department at Rhodes University. ArcMap was used to display and analyse the baboon sighting location data. The projection used to create accurate maps for the study area and to conduct spatial analysis was Transverse Mercator, central meridian 19 and was referenced to WGS84 datum (refer to Section 2.4). ArcMap was used to explore data within the data set and to

link the environmental data layers to the baboon locations to identify trends and to identify the spatial and temporal patterns of the baboon observations.

The local Points of Interest (POI), which are based on the names of places and features in Pringle Bay used by the local residents and baboon monitors, were mapped (Figure 4.1). This mapping was required so that consistent locations could be used when interpretating the collar data and processing the WhatsApp data.

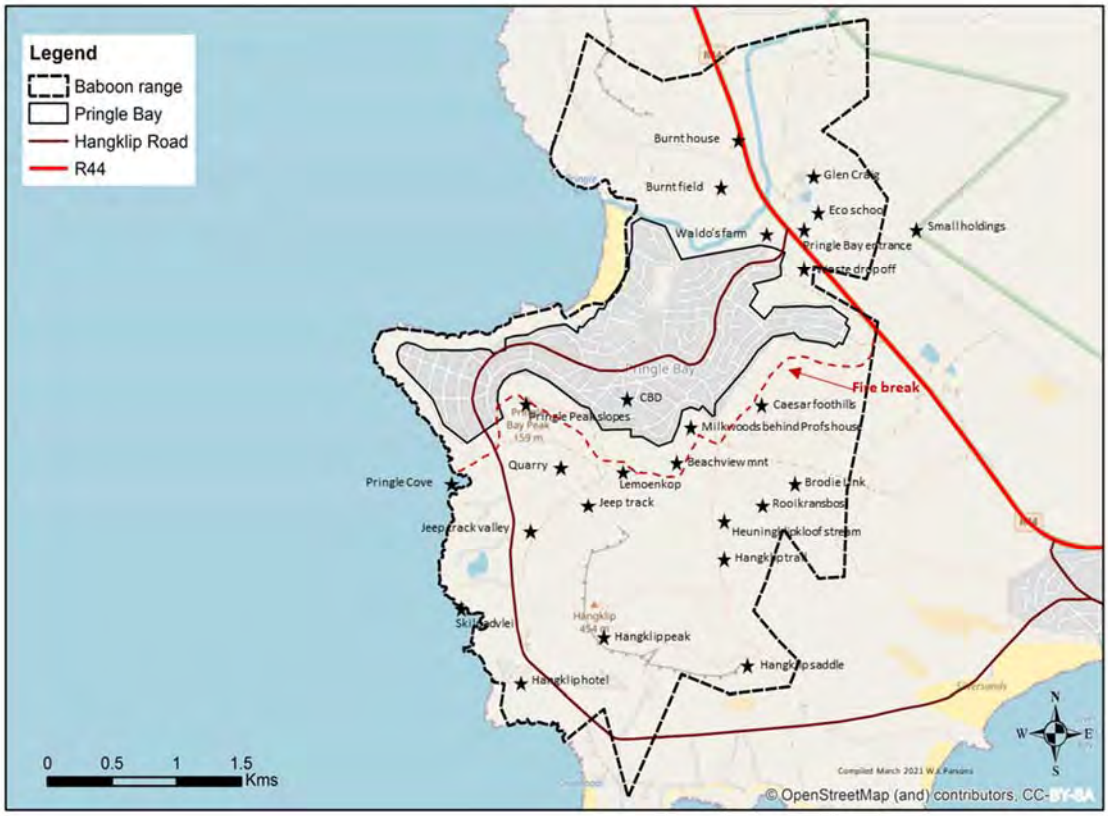

Figure 4.1: Points of interest in and around Pringle Bay identified and mapped.

4.2 Human-wildlife conflict in Pringle Bay

The objective of this desktop study was to document the history of the human-baboon conflict in Pringle Bay and to give context to the management of the Pringle Bay troop over time. The collection of data from existing reports involved two techniques of sourcing data - internally and externally (Juneja, nd). Internal information from PBRPA annual reports and the Pringle Post, together with anecdotal information (from long term residents of Pringle Bay) gave valuable information which was used to construct a timeline of the human-baboon conflict.

External sources of information included an archive search in local and national newspaper (Cape Times, Argus, Daily Maverick etc.) for any reports on Pringle Bay and baboon conflict. Scientific studies and baboon management pertaining to baboons in the Kogelberg Biosphere, Pringle Bay and surrounding towns were sourced from the Overstrand Municipality and Cape Nature. Reference was found to two surveys which were conducted in Pringle Bay to better understand the resident's perception of the human-baboon conflict. These were done 12 years apart, the first by Pearce in 2006 and the second by the PBBAG in 2018. Baboon management by the Overstrand Municipality was initiated in 2002 when a baboon management task team was set up and a program to create public awareness of the human-baboon conflict was started. When PBRPA initiated a privately funded management program in 2013, neither the Overstrand Municipality nor Cape Nature had a mandate to manage baboons within the urban boundary. A second baboon management plan for the whole of the Overstrand Municipal area was initiated by the municipality in October 2019.

Using the approaches described above, the human-baboon conflict in Pringle Bay was put in context - a timeline was created to show that while the conflict is ongoing it was first highlighted in the mid-1980's. Residents' perceptions have changed over time and baboon management mitigation measures promised by the local authorities have never fully materialized (i.e. waste management is still a current problem). This timeline is addressed further in Section 5.2.

4.3 Collar Data

4.3.1 Introduction

As outlined in Section 2.5, the PBRPA initiated a baboon monitoring program in 2012. In 2017 the decision was taken to fit GPS-based tracking collars to two baboons. This was to aid the monitors to locate the baboons before they entered town. Permission was requested and granted from Cape Nature to firstly, capture and collar two baboons to fit tracking collars for monitoring purposes (Appendices B) and secondly to deploy the radio network relay stations in the Kogelberg Reserve. Human Wildlife Solutions, a specialist wildlife management company, was mandated to manage the capturing and collaring of the two baboons together with the installation and management of the tracking system (Appendices B). Permission was sort from the PBRPA in November 2017 to use the resulting collar data for this research (D. Muirhead, personal communication, 16 November 2017).

4.3.2 Data collection

The GPS data downloaded from the two tracking collars was provided in a Microsoft Excel (2018) format by Dr P. Richardson of Human Wildlife Solutions. This data set covered a monitoring period of 22 months, with a frequency set at 30 min. intervals. This created a record of 18 280 data points.

This study combined the observations from both collared animals, as baboons are considered group living mammals and the movements of the alpha male and alpha female would generally dictate the troops movements (Beamish, 2009 and King and Sueur, 2011). The female record started in October 2017 and the male in November 2017. The male's tracking collar stopped recording mid-January 2019 when the battery life ended. The battery was not replaced and no further observations were recorded during the study period. Figure 4.2 shows the comparative monthly sighting data for both the alpha male and female during the 22 month period. The graph indicates that no data were generated for the period 6 February - 7 March 2019 as a result of the tracking system not being operational and that the male tracking collar was no longer functional, as previously discussed.

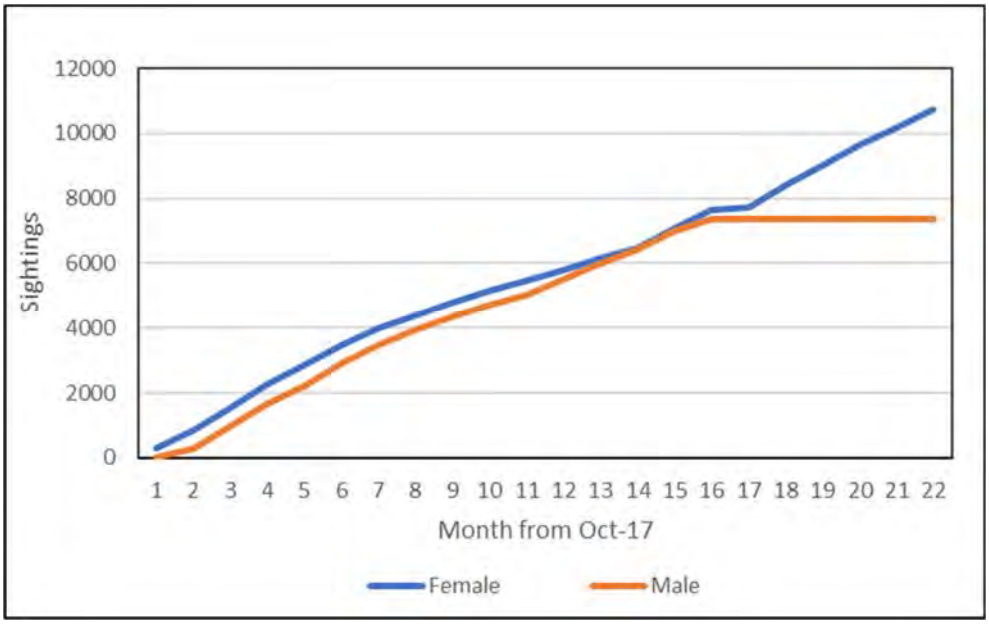

Figure 4.2: Male and female baboon data recorded between October 2017 and July 2019.

During this research, the following key assumptions were made:

- The monitoring of the baboons impacted their movements within the urban area only - the monitors were rarely observed above the fire break adjacent to the urban perimeter. This line was used to distinguish between the urban area and natural habitat (Figure 4.1);

- A dataset combining the observations from both the male and female tracking collars would inform the distribution of the baboon troop;
- The network coverage to track the baboons had blind spots towards both the south of the study area (near the Hangklip Hotel) and north of town (when they went over the "Twee Susters" mountain ridge);
- Three gaps in the data (data missing for more than 2 days) were noted. These constituted 5.8% of the total days of this study (Figure 4.3). The portion of the days lost is not considered a limitation to the study.

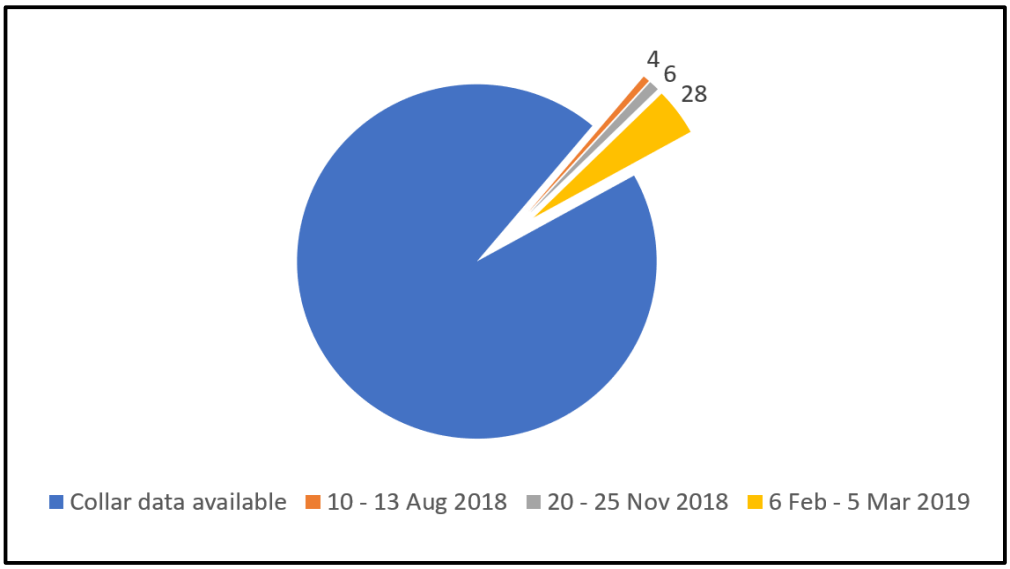

Figure 4.3: Pie chart showing the days with missing collar data in relation to the total research period of 651 days.

4.3.3 Methodology

Collar data was provided in an Excel spreadsheet recording the date, time and position (as degrees longitude and latitude). The data from the two tracking collars were combined to create a single database. Using the Conversion toolbox in ArcMap this Excel data was converted into point feature classes in a geodatabase. This was plotted on a map allowing for the visual exploration of spatial relationships and patterns. When the baboon observation data was imported into ArcMap several "outlying" data points were observed. This amounted to 0.07% of the total data points and most plotted in the ocean. Clearly these were not valid locations and were removed from the dataset by editing the features in the geodatabase. The data was projected to Transverse Mercator central meridian 19, referenced to WGS84 datum for spatial analyses. Data analyses were done using both Excel and ArcMap. A selection of tools from various ArcMap Toolboxes were used (Table 4.1).

Table 4.1: Tools used from the ArcMap Toolboxes.

ArcToolbox Tools						
Analysis	***Conversion***	***Data management***	***Editing***	***Geostatistical analyst***	***Spatial analysis***	***Spatial statistic***
Extract (clip)	Excel (excel to table)	Feature class (create feature class)	Snap	Interpolation (IDW)	Density (kernel density) & (point density)	Mapping clusters (hotspot analysis - Getis-Ord Gi*)
Overlay (spatial join)	From raster (raster to polygon)	Features (create feature to point) & (create feature to polygon)			Extraction (value to points)	
		Fields (add field)			Interpolation (IDW)	
		Generalizations (dissolve)			Map algebra (raster calc.)	
		Joins (join)			Reclass (reclassify)	
		Sampling (create fishnet)				

A simple baboon range polygon was created to show the maximum extent of the territory in which the baboons moved. This was done by drawing a polygon around all the distribution points and saving the polygon as a map layer. The minimum convex polygon approach used by Slater et al. (2018) when researching multiple troops and the overlap of troop ranges was not used as this study observed a single troop in Pringle Bay and would have possibly incorporated the ocean.

Density surfaces indicate where the baboon locations (point feature) were found in the study area and where the high and low concentrations of where the baboons were observed occured. Density mapping is a GIS tool which is used in social, environmental and applied studies such as natural disasters or crime mapping (Deng et al., 2016). However, point density analysis that is quantitative can provide valuable insight when combined with other data layers to create new feature classes.

A density map of the baboon sightings in the study area was created from the vector features, which were the locality points from the GPS data collected over the twenty-two-month study period. This was the standard map extent used to generate an animal range map. The home range in this research was defined using the 95th percentile (home range) and 50th percentile (core area), as recommended by Anderson (1982), Slater et al. (2018), Ellington et al. (2019) and Lochner and Lindenberg (nd) in their research papers on modelling animal home territories using the Kernel density method. The method used to generate the results was based on a set of practical notes by Lochner and Lindenberg (nd) and Anonymous (2020). A simplified cartographic model of the GIS analysis sequence is shown in Figure 4.4. This was repeated for each season per year and the layers were summed to give a range

map for the study period which showed the 95% isopleth (home range) and the 50% isopleth (core area), the latter delineated the territory where the baboons spent most of their time.

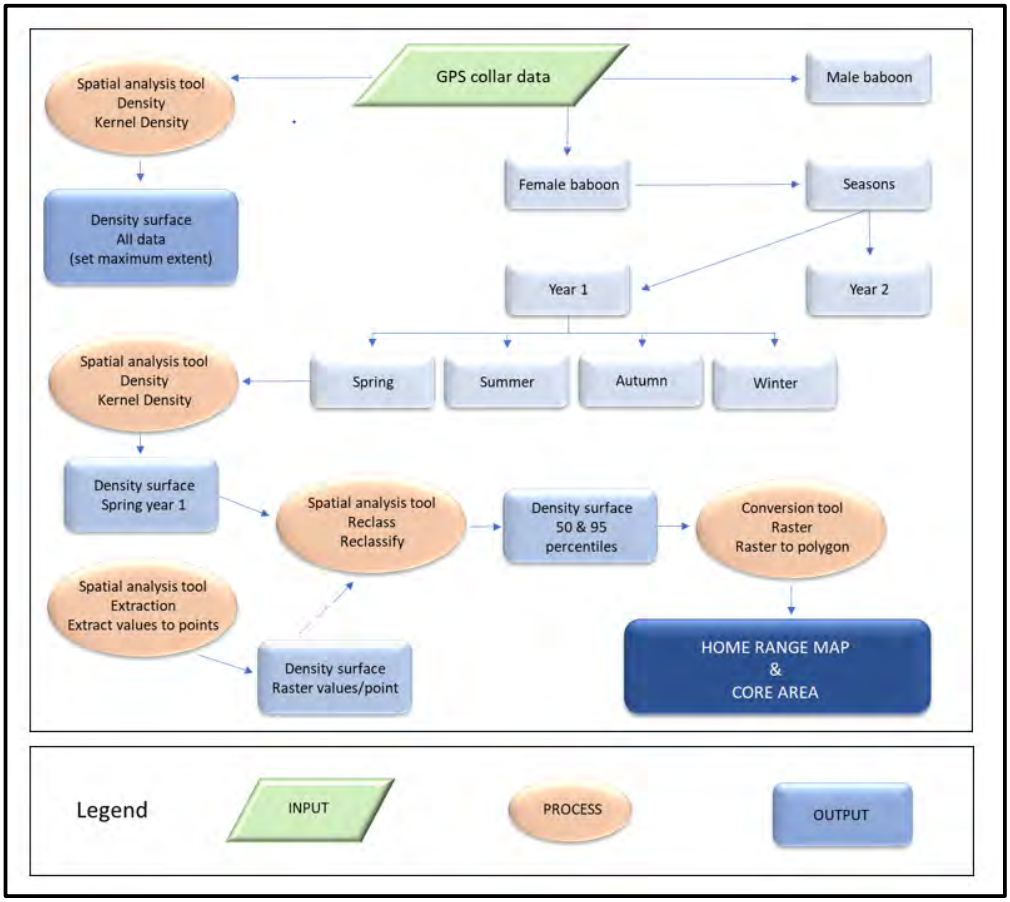

Figure 4.4: Cartographic model of the GIS analysis sequence to create a range map showing the home range as the 95% percentile and core area as the 50% percentile.

Temporal analyses identified sleep sites using the non-daylight observations. Lewis (2014) used field observations to identify sleep sites as they followed the troop from morning sleep site to evening sleep site and noted that the baboons spent from 10 to 40 minutes moving to or from their overnight sleep sites. In light of these observations the non-daylight hours were increased by 30 minutes. The seasonal variation was also taken into consideration as the day length is variable throughout the year. The times of dusk and dawn were averaged for each month (Figure 4.5). This baboon data set was mapped as a kernel density surface and sleep sites were identified.

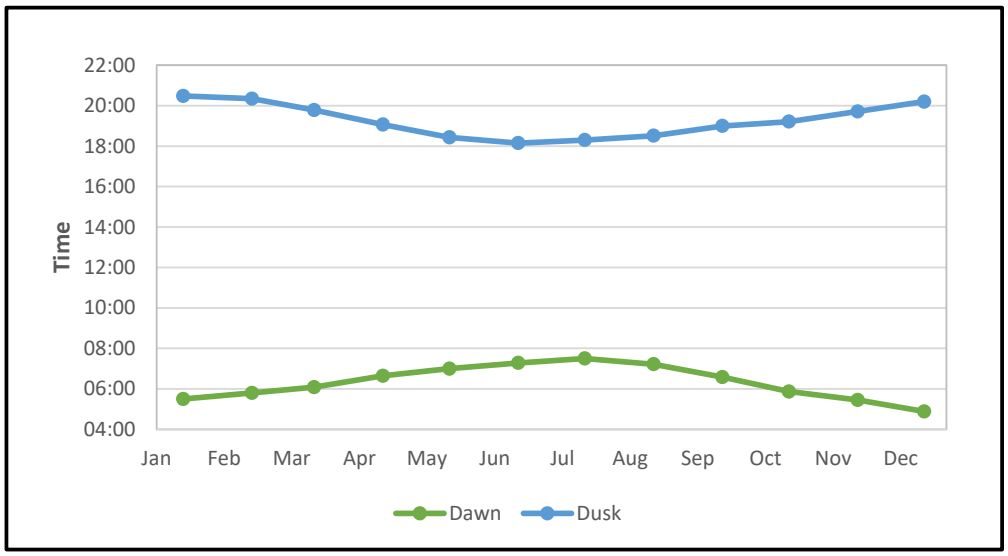

Figure 4.5: Daylight hours defined using dawn and dusk times for Cape Town (after https://www.gaisma.com/en/location/cape-town.html)

Time and seasonal analyses were also used for weather and habitat preferences (Section 4.5). Spatial analyses using ArcMap were used to identify time spent inside the urban area and that outside of it. Query definitions linked the observations to the cadastral surface of Pringle Bay and the ArcMap spatial analyst tools were used to create a point density surface, kernel density and hotspot maps. Overlay analysis was used to understand the habitat where the baboons were observed. Joining the attributes of the vegetation, wetlands and urban area allowed for spatial and statistical analysis.

The Hot Spot Analysis (Getis-Ord Gi*) in the spatial statistics toolbox for mapping clusters was used to identify statistically significant hot and cold spots for the urban baboon observations. Kernel density surfaces informs on data clusters, but it does not consider statistical significance. Before performing the Hot Spot Analysis several other geoprocessing tasks were required (Zahran et al., 2019). The method used to generate the results was based on a San Bernardino Valley College tutorial (Anon, nd). Figure 4.6 is a cartographic model indicating the process flow for the hot spot analysis of the GPS urban baboon data. Kalinic and Krisp (2018) noted that areas identified as hotspots from the Gedis-Ord Gi* statistical analyses were often not grouped into high density values in the kernel density maps. Methods using baboon locations (points), kernel density and hotspot analysis were applied, as local knowledge of the baboon movements in the urban area was known and certain areas were known to be visited often by the baboons.

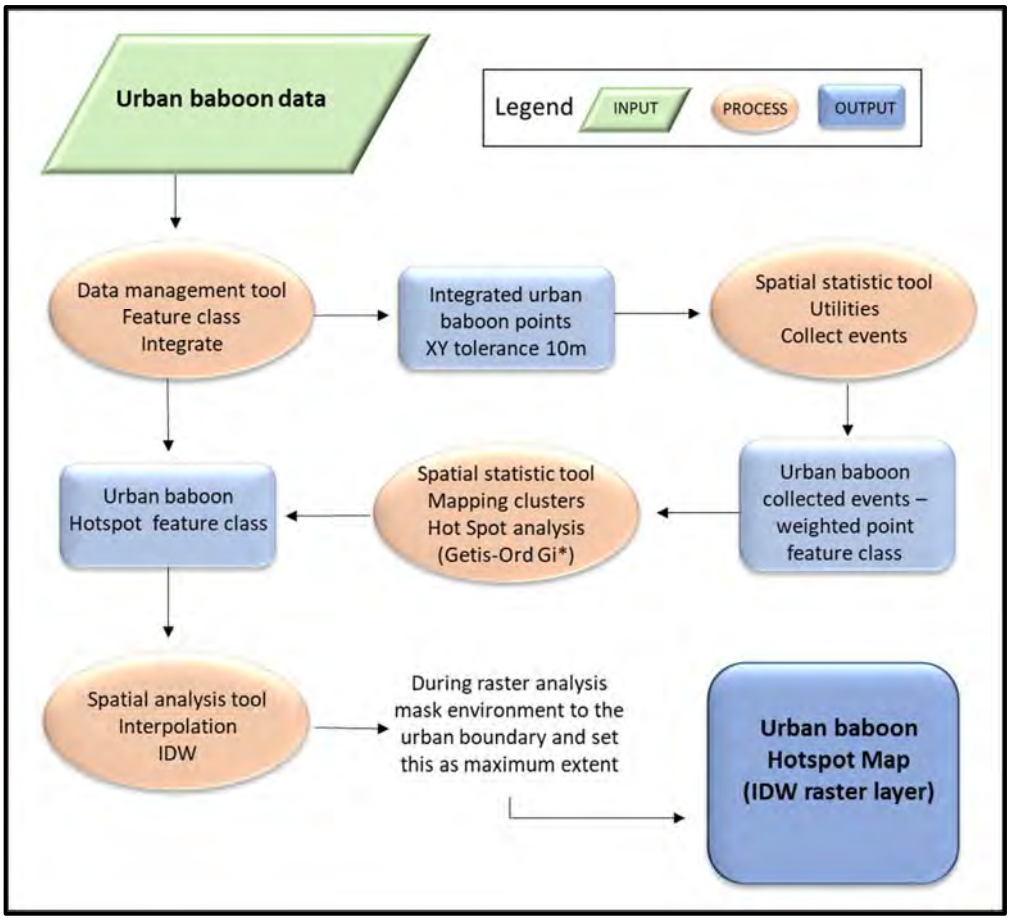

Figure 4.6: Cartographic model for the urban baboon observation hotspot analysis.

Spatial Autocorrelation (Moran's I Method) is a common statistical analysis used to determine if the patterns shown by feature locations (points) or the feature values are clustered, dispersed or random (ESRI, 2018). The result from this analysis are shown in Figure 4.7 and indicates the z-score (0.64) and the corresponding Moran's Index (-0.0012). These values indicate that the 'pattern does not appear to be significantly different than random.' The lack of clusters indicated that a Hot Spot Analysis was not required (Zahran et al., 2019). Never-the-less, the urban baboon data was aggregated and the Hot Spot Analysis (Getis-Ord Gi*) was done.

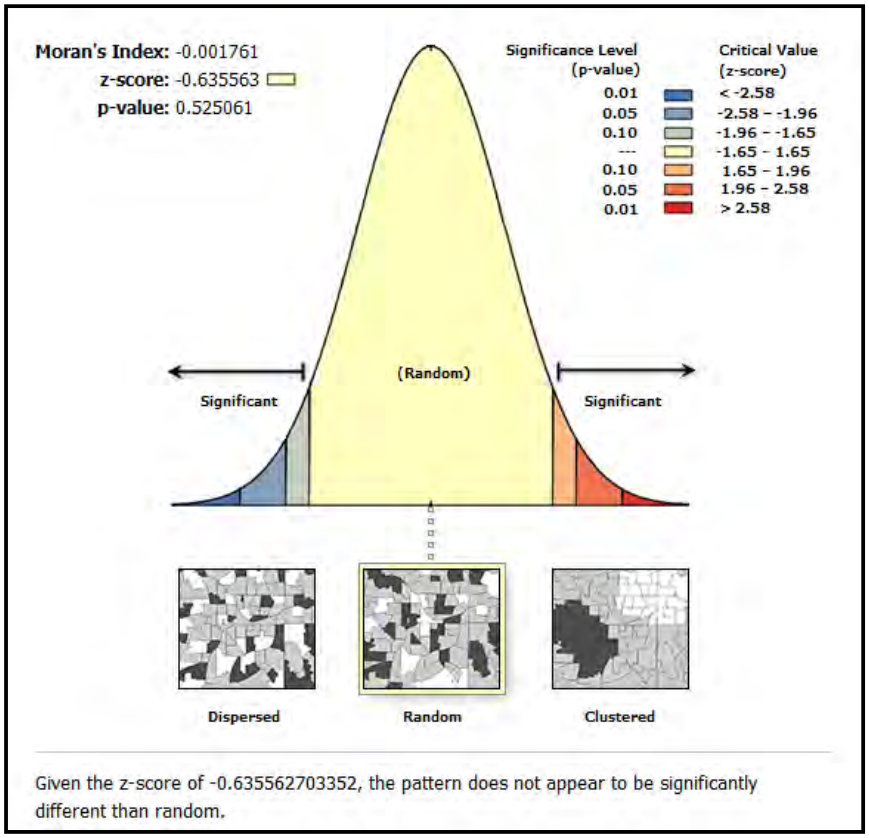

Figure 4.7: Spatial Autocorrelation output report for the urban baboon data.

4.4 WhatsApp Data

4.4.1 Introduction

WhatsApp Messenger (2009) was used to create a baboon alert group for the residents of Pringle Bay in May 2016. It was terminated in July 2019 due to a full subscription of 257 members. This was a conduit to report sightings of the baboon troop and to serve as a warning system within the community. Primarily, it was a neighbourhood awareness group created to locate the baboons and to give advance warning to take precautions to prevent opportunistic behaviour by the animals. These sightings are likened to "field observations" done in real time using the erf number as a locational identity, but without a time interval and is referred to as an irregular track by the University of Southampton (2021). The creation of this quantitative data base was based on a filter approach to the non-numerical nature of the data which is referred to as "messy data" by Dobson et al. (2020). The high-volume and unstructured nature of the data from the VGI, which was crowd-sourced, meant that the data had to be mined, an approach recommended by Senaratne et al. (2017). Information

pertinent to the geospatial analysis was recorded based on what citizens perceived to be important – which according to Antoniou et al. (2017) is an acceptable way to identify key information.

The data generation potential of social media has resulted in the phenomena known as ‘‘big data”, according to Mooney and Pejaver (2018: 2). The sorting and preparation of the VGI data was not a simple process. It was onerous and time consuming and with possible bias, resulting in loss of accuracy being a concern. According to Seeger (2008) this is a common issue with sorting ‘big data.’ It was only feasible for this research project as the researcher was intimately familiar with the study area. Local POIs were generally identifiable from the messages (Figure 4.2) and the mobile numbers could be linked to the erf number. This was done in two ways, firstly by identifying locations from the message descriptions and secondly, by contacting the group member directly. The importance of ethical issues and compliance in collecting and mining this data is regulated by the South African Protection of Personal Information Act (POPIA, 2020).

4.4.2 Data collection

The WhatsApp messaging data was downloaded from the group. This data was available for a period of more than three years from 21 April 2016 until the group was terminated on 21 July 2019. This data provided both observations and locational data on the whereabouts of the baboons and comprised of 10 100 ‘chats’ which were processed and cleaned by removing noise which was described by Connors et al. (2012) to distinguish useful information (in this scenario by removing irrelevant comments not related to baboon sightings). The data were also reduced to observations in the same time frame as the collar data (19 October 2017 to 21 July 2019).

The original data set of 10 100 records was significantly reduced by 68% to 3 252 usable data observations. The qualitative nature of the data required that the “messy data” be cleaned and filtered so that locational data could be extracted. The following guidelines were used to select suitable records:

- Observations were made by the person from or close to their home;
- Telephone numbers could be linked to a location i.e. erf number or POI; and
- Only the location data within the urban area could be used for spatial analysis.

4.4.3 Methodology

The record of the chat from the WhatsApp Alert Group was exported as a text file. This file was then imported into Excel. Data preparation involved several steps and required the joining of the different data sets as shown in a cartographic model in Figure 4.8. Firstly, the data were reviewed and all information that was not location-specific was removed. Mobile numbers were matched to erf numbers and POI were recorded so that the Excel data now included the following fields: date, time, mobile number, location names (erf and POI numbers) and coordinates (longitude and latitude). In order to join the WhatsApp location data to the Pringle Bay cadastral layer, the cadastral data first had to be extracted from the polygon to points. The centroid of each polygon was then added as a new feature using the erf number as the location identity value, leading to the spreadsheet now including the additional fields showing erf number, longitude and latitude. The WhatsApp data could now be joined to the extracted cadastral data. Each WhatsApp baboon sighting record now had a location and this spatial data could then be analysed in ArcMap projected to Transverse Mercator central meridian 19 degrees east, datum WGS84. The data were used to create a geodatabase for use in ArcMap, an example of which is shown in Table 4.2.

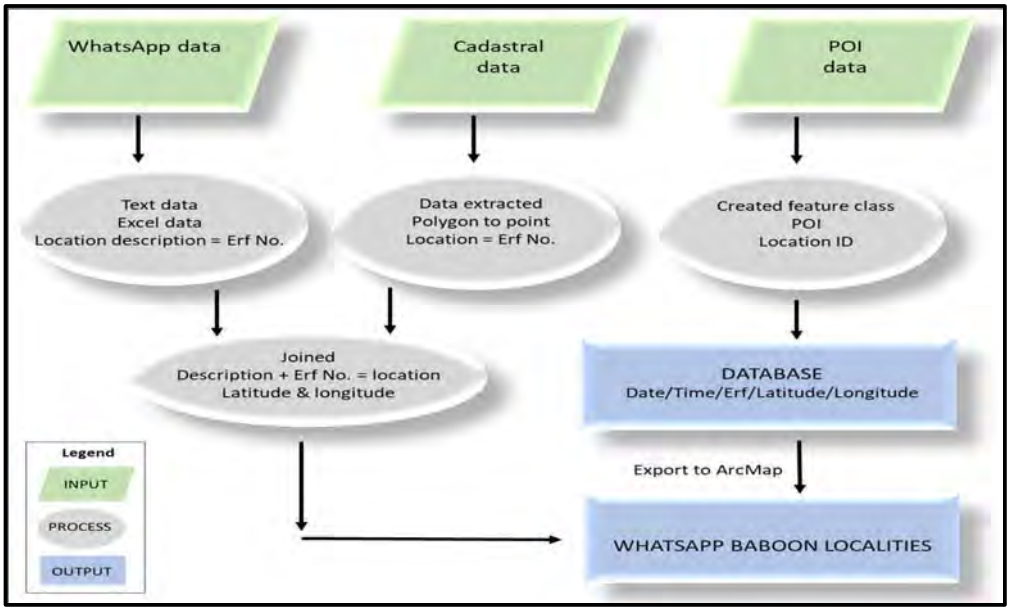

Figure 4.8: Cartographic model showing the input data, processes used to create the geodatabase where the WhatsApp data was linked to the cadastral and POI.

A similar methodology for the WhatsApp data analysis as that used in the GPS locality data was adopted (Section 4.3.3). A density surface was created using the Kernel Density tool to show locations where the baboons were sighted most in Pringle Bay. The Hot Spot analyst tool using the same

methodology as the GPS data was used to create a hotspot map. The Spatial Autocorrelation statistical analysis indicated the spatial pattern was random (Figure 4.9).

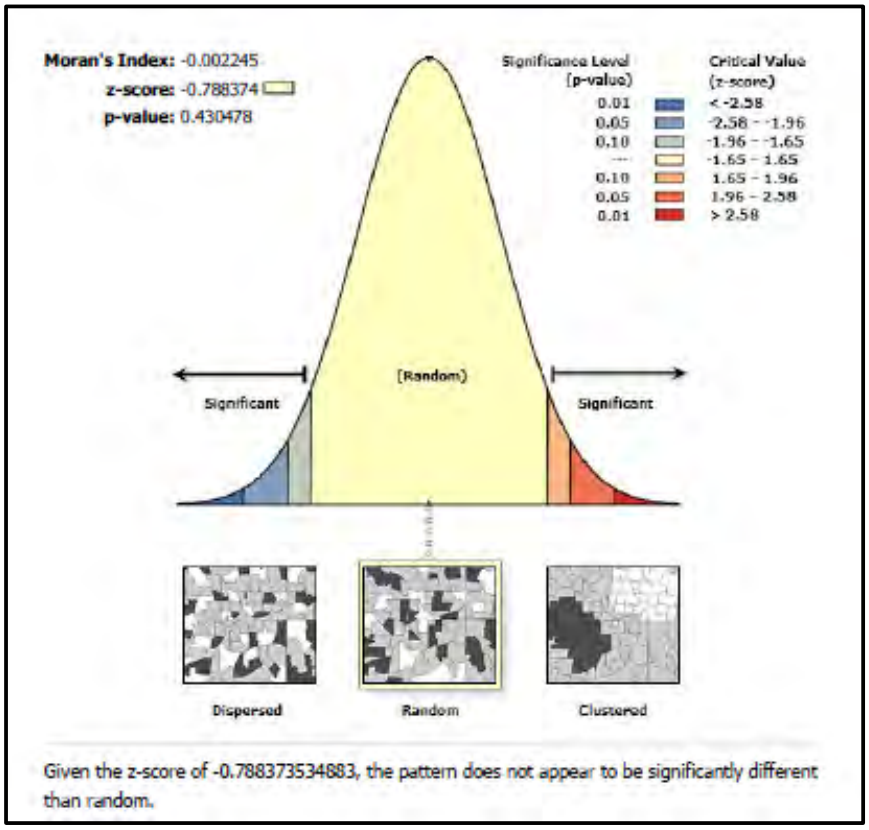

Figure 4.9: Spatial Autocorrelation output report for the WhatsApp data

The “hotspots” were identified from the high-density areas shown on the kernel density maps, these were similar to local knowledge of where the baboons often visited when in the urban area. Seasonal and temporal analysis was done to answer the Research Question 3 set out in Section 1.5.

Table 4.2: Example of collar data and WhatsApp data imported into ArcMap, where the ObjectID was the erf, POI or collar data reference. The category showed which source the data was from i.e. the female collar (F), the male collar (M) or an observation from WhatsApp (W).

Shape*	ObjectID	Date	Time	Longitude	Latitude	Category
Point	201	20/08/2019	10:44:29	18.82157	-34.36705	F
Point	246	19/08/2019	12:56:36	18.8217	-34.36519	F
Point	13993	03/07/2018	13:40:00	18.84133	-34.35818	M
Point	13994	03/07/2018	11:33:33	18.84174	-34.35736	M
Point	20852	26/02/2019	19:04:00	18.831501	-34.352162	W
Point	20853	26/02/2019	19:42:00	18.830529	-34.351782	W

4.5 Environmental Data

4.5.1 Secondary data compilation

Geographical and anthropogenic information were identified through the literature and important environmental features sourced from various national and local authorities. Key geographic information were sourced from:

- South African Biodiversity Institute (SANBI) – vegetation map of South Africa, Lesotho and Swaziland;
- Council for Geoscience – geology;
- Cape Nature – Western Cape Biodiversity Spatial Plan;
- Overstrand Municipality – cadastral information;
- Western Cape Government Environmental Affairs and Planning.
- Western Cape Government Agriculture – CapeFarmMapper.

The weather information was initially requested and obtained from South African Weather Service. Only the rainfall data were available for Pringle Bay and the wind, temperature and daylight hour information had to be sourced from two weather stations situated some 30 km away in Strand (Latitude: -34.1410 Longitude: 18.848) and Grabouw (Latitude: -34.1520 Longitude: 18.8480). The micro-climate data of the study area was considered important (Bergh, 2012), so alternative weather information was sourced from World Weather (2019). Historical data from July 2008 to October 2019 for daily and monthly intervals was downloaded for Pringle Bay (Latitude: -34.3478 Longitude: 18.8344).

4.5.2 Methodology

Overlay analysis was the foundation of the spatial analysis (Figure 2.9) where the attribute data was combined with the spatial data. The locality data from both the tracking collars and the WhatsApp sightings were spatially joined to the various GIS layers such as topography (elevation, aspect, and rivers), vegetation cover and wetlands areas. A funnel-approach (Figure 4.10) was adopted whereby all the data was considered (22 months), then the seasonal data (3 months) and lastly what local patterns were noticeable i.e. urban hotspots.

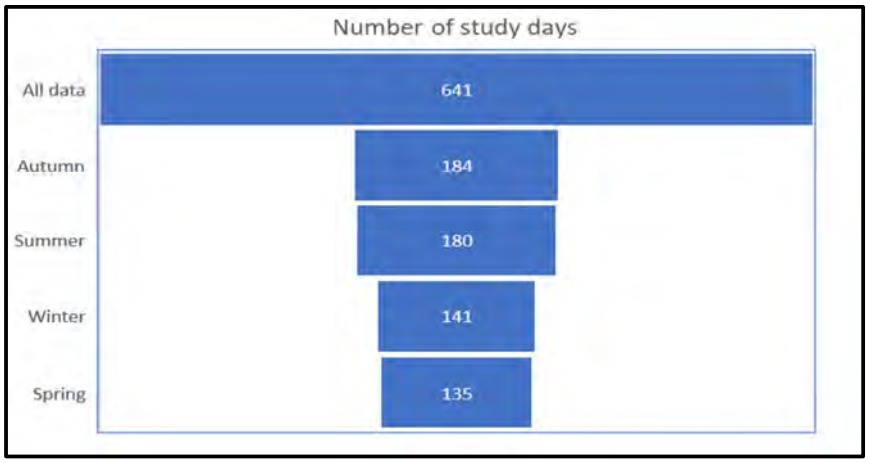

Figure 4.10: Funnel graph showing the total number of research days and the number of days per season.

Climate represents the generalization of the weather (Strahler, 1975) and the meteorological season framework formed the basis of the seasonal investigations (Moore, 1974). The weather data was processed and imported into the baboon location database. This was achieved by firstly adding an additional feature to the weather table where the date and hour feature classes were combined. Secondly, within the baboon location database, the time feature was used to create a class where each location was linked to an hour of the day. The two tables were then joined creating a geodatabase where each baboon location was linked to the hourly weather defined by temperature, wind direction and speed, rainfall, daylight hours and weather description. The seasonal variables considered when exploring the seasonal baboon movements are listed in Table 4.3. Rainfall during the two year study period was below average and included the drought which started in 2017.

Table 4.3: Variables considered when defining the seasonal periods.

Season	Months	Focus	Reason
Spring	Sep - Nov	October	bulb season; baboon monitors on holiday
Summer	Dec - Feb	January	driest month 2018 & 2019; fire
Autumn	Mar - May	April	peak holiday season
Winter	Jun - Aug	July	wettest month 2018 & 2019

Habitat was explored using data from the vegetation map of South Africa (Mucina and Rutherford, 2006). The vegetation type and plant community classification was used to link known natural food sources (Guth, 2005: Henzi et al., 2011b; Marais, 2005 and Hoffman,2011 and Mormile, 2020) to where the baboons spent most of their time.

4.6 Conclusion

This chapter has described the methodology selected for this research. It has explained the scientific method adopted using both qualitative and quantitative data. This allowed for a mixed method and engaged research approach, the outcomes of which are interpreted in the next chapter.

CHAPTER 5: RESULTS AND DISCUSSION

5.1 Introduction

The findings of this research investigating the movement of the baboon troop over a period of almost two years (October 2017 – July 2019) are presented in this chapter. The aim was to determine the spatial and temporal distribution patterns of the Pringle Bay baboon troop in relation to the geography of the area. The history of the human-wildlife conflict in Pringle Bay gives perspective to the current management and provided motivation for the research. The outcomes are presented according to the objectives described in Chapter 1 and the results are structured under three main focus areas as follows:

- Human-wildlife conflict in Pringle Bay;
    - Timeline of reported conflict
    - Perception versus reality - two independent survey results
- Collar data;
    - Baboon troop range
    - Sleep sites
    - Home range and core area – based on the 95th and 50th percentile approach
    - Seasonal and habitat patterns
    - Urban baboon patterns
- WhatsApp data;
    - Density maps of baboon sightings
    - Seasonal patterns and hotspots within town
    - Importance of wetland areas within the town

5.2 Historic Perspective of Human-Wildlife Conflict in Pringle Bay

This section presents the results stemming from the literature study and the following information was gleaned where firstly a timeline of baboon conflict in Pringle Bay is presented in Figure 5.1; secondly two historical surveys of the residents regarding baboons were found and summarized in Table 5.1; thirdly Pringle Bay troop population could be documented between 2002 to 2020 (Figure 5.2) and fourthly the role that the waste management has influenced the human-wildlife conflict.

The timeline (Figure 5.1) indicates that the conflict between residents and the baboons coincided with the development of the town. The urban growth (refer to Table 3.1) post-1993 was largely due to the electrification of the town. There was habitat loss through land use change, as the erven were developed. This also impacted the wetlands, resulting in significant ecological problems (Day, 2014). These low lying areas of the coastal plain are preferred foraging areas of the baboons and are close to the sleep site on the cliffs of Hangklip at the urban edge. This loss of habitat due to urbanisation was shown by Hoffman and O'Riain (2012b) to be an important contributor to the human-baboon conflict and the management thereof.

The first anecdotal evidence of the baboons accessing human-derived food (waste) was related by long-term resident N. Louw (personal communication, 31 January 2021) who remembers the troop visiting the local municipal waste site daily in 1995. This waste site was located northeast of Pringle Bay just off the R44 and was closed in 1999 (Parsons, 1999). Currently a drop-off for garden waste is located at the same site. Residents and holiday-makers non-compliance with municipal waste management (leaving unattended garbage bags on the verge for collection) and the lack of implementation by the Overstrand Municipality of the relevant bylaws, meant the baboons had easy access to food sources. The baboon's exposure to human-derived food offered a new source of high energy food which they have learnt to exploit. The consequence of this in Pringle Bay was threefold:

- The raiding of municipal bins in the town and at scenic lookout points along the coast and in the car parks at the beach;
- Opportunistic raiding of houses (often due to residents not being vigilant or having no form of baboon-proofing such as burglar bars); and
- Planting of exotic vegetation (kikuyu grass; palm trees etc), fruit trees and vegetable gardens provided easy access to high-value food.

The Overstrand Municipality first initiated a baboon management plan, together with the Cape Nature, in 2002. Baboon raiding had escalated with reports in the media headlined 'Baboons terrorise resort'. The Chairperson of the PBRPA (Diana Head at the time) reported that the "baboons were breaking into houses about fifteen times a month" (Appendix E).

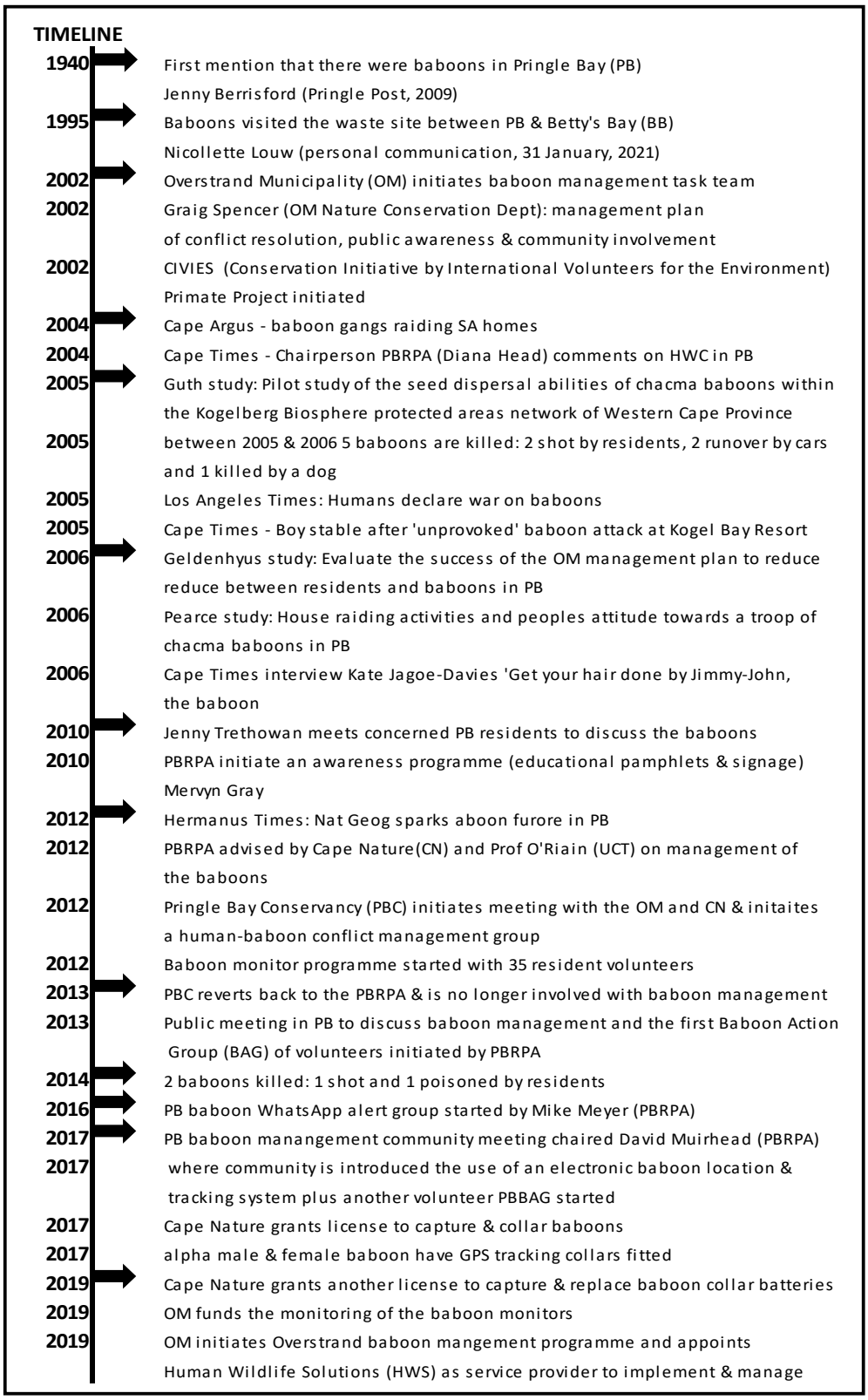

Figure 5.1: Timeline of reported conflict from a range of sources and anecdotal information on the baboons in Pringle Bay.

Mitigation measures focussed on the management of people rather than the baboons and largely revolved around educating residents on living in a biosphere. The objective was to get residents to take responsibility of their own properties without having negative implications on the baboons (Geldenhuys, 2006). A wildlife documentary "Help! my neighbours are baboons". (https://youtu.be/UeOJks5fZrY) is a historical video which recorded the efforts of what the Department of Nature Conservation (headed by Craig Spencer at Overstrand Municipality) tried to implement. Human-wildlife conflict escalated between March 2005 and August 2006 during which time 10 baboons died (two were shot by residents, one was killed by a dog and two were run over by motor vehicles). Figure 5.2 is a record of the Pringle Bay baboon troop population since 2002.

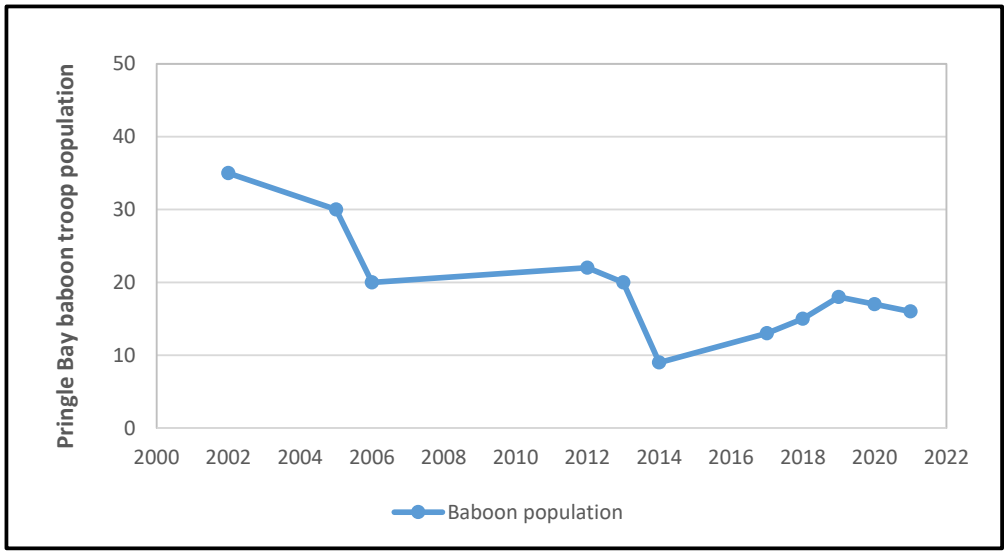

Figure 5.2: Pringle Bay baboon troop population between 2002 and 2021.

The management strategy then changed towards the management of the wild animal and not the residents. Baboon monitors were introduced to keep the baboons out of the urban space in 2012. Tracking collar technology was employed in October 2017 when the alpha male and female were fitted with GPS collars. Tracking the baboons was an aid to help the monitoring program practised in Pringle Bay, as described by the PBRPA (Appendix F). Ongoing human-baboon problems have essentially manifested and escalated for the last twenty years. The literature showed that two surveys were conducted to in Pringle Bay and the outcomes are summarized briefly in Table 5.1. Both surveys had a similar percentage of respondents who had had encounters with baboons (78% in 2006 and 72% in 2018). The number of respondents who had baboon proofing in some form or another in 2006 was 86% while this decreased to 76% in 2018 (possibly an unintended consequence of having baboon monitors). The 2018 survey indicated that the residents were better informed about the PBRPA

baboon management plan than the respondents who took part in the 2006 survey. Credit for this is assigned to PBBAG - volunteers from the community - who actively engaged with residents and holidaymakers on the do's and don'ts of living with baboons (Appendix G).

Table 5.1: Outcome of baboon surveys conducted in Pringle Bay (after Pearce, 2006; PBBAG, 2018).

Pringle Bay Baboon Surveys		
Survey information	**2006 ***	**2018 ****
Date of survey	June - July 2006	Sept - Oct 2018
Type of survey	Personal interviews and Questionnaires	Online survey (www.surveymonkey.com)
Survey number	210	270 respondents
Response to survey	60%	? (not able to assess reach of survey)
Permanent residents	68%	56%
Non-permanent residents	32%	30% (14% not reported on)
Survey questions		
Attitude towards baboons?	45.8% positive 20.8% negative	50% positive <15% negative
The level of the problem?	63.9% yes (baboons are a problem) 31.9% no (baboons not a problem)	- -
How dangerous are baboons?	63.9% baboons not dangerous 31.9% baboons are dangerous	- -
Keep baboons out of village? Let baboons move freely in village?	- -	46% 27%
Have had encounters with baboons?	77.8% had encounters with baboons	72% had baboons on property not causing damage
Do you have some sort of baboon proofing?	83.3% had taken measures to baboon proof their houses 16.7% no baboon proofing measures in place.	76% had baboon-proof burglar bars 40% had baboon proof bins
Management plan	25% knew what the management plan was 58.3% did not know what the management plan was 50% felt there should be more education about baboons 22.2% felt management should be multi-faceted and include better waste management	67% happy with the monitors 7% would prefer no monitors

* House raiding activities and people's attitude towards a troop of Chacma baboons in Pringle Bay (Pearce, 2006).

** Pringle Bay Baboon Action Group (PBBAG) https://www.surveymonkey.com/r/M7QDWQV downloaded August 2018, results published in Pringle Messenger (PBRPA) in March 2019.

The perception and attitude towards the baboons initially lent towards coexistence of humans and baboons. This changed from 2012 onwards when monitoring was introduced. The advice given and used by the PBRPA was to keep the baboons out of the urban area. Waste management and associated issues were repeatedly cited as a problem in the human-baboon conflict and will be discussed further in Chapter 6.

5.3 Collar Data

The collar observations were used to identify the range of the baboon troop for the 22 month period from the October 2017 to July 2019. The data were used to access how often they were in the urban area, where they slept, and allowed for analysis of their seasonal distribution, impact of the weather and identification of urban hotspots which is defined as a place of significant activity in this study.

5.3.1 Baboon troop range

The maximum extent of the area where the baboons visited, as recorded by the GPS collars, was mapped in ArcMap as a polygon (Figure 5.3) hereafter referred to as the baboon range. This range area was 13 km^2 of which the transformed (urban) area was 2.3 km^2 and the untransformed (natural landscape) was 10.7 km^2 which is equivalent to 17.7% to 82.3% proportional representation. These proportions were similar to the distribution of the baboon collar observations recorded. The total number of baboon collar observations for the study was 18 281 of which 15 002 were observed in the natural habitat outside of the town and 3 279 inside the urban boundary with the ratio of 82.1% to 17.9%. This is similar to the research findings by van Doorn and O'Riain (2020) which revealed that troops that had field monitors spent between 3% and 19% of their time within the urban area.

Three data gaps (data was missing for more than 2 days) were noted which constituted 5.5% of the total days of this study and the network coverage to track the baboons may not have covered all the locations where the baboons visited were highlighted in Section 4.3.2. The data from the two GPS collars which informed this research was considered adequate to determine the range of the Pringle Bay troop.

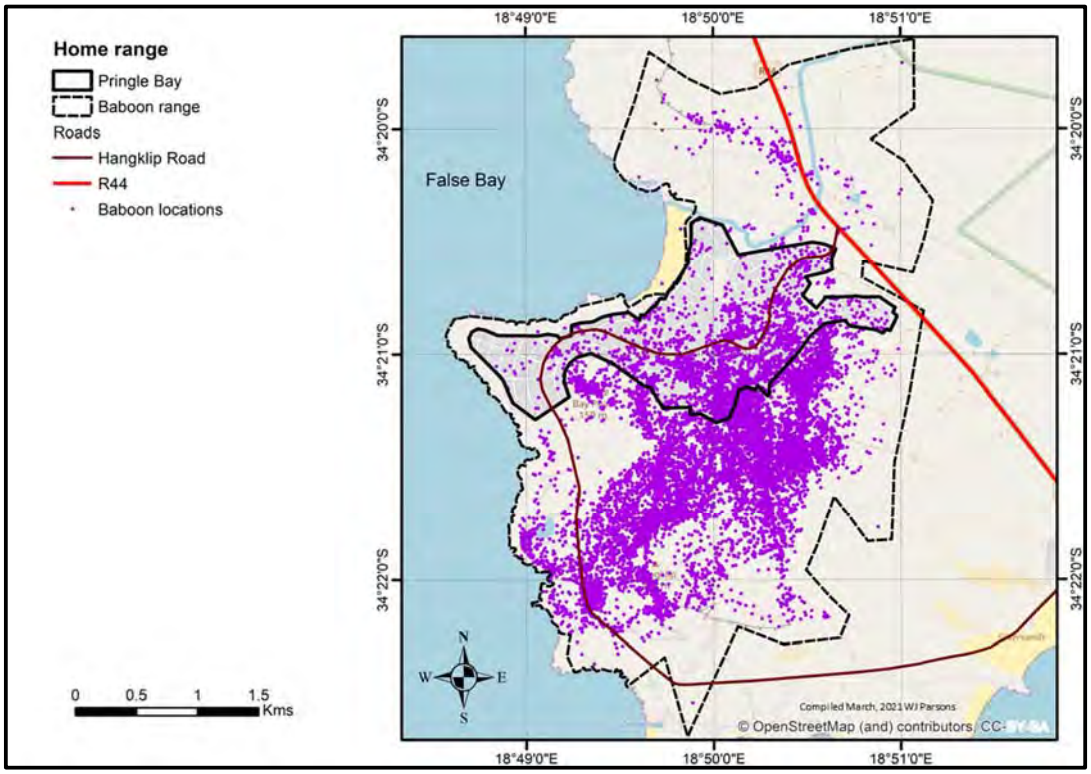

Figure 5.3: The range of the Pringle Bay baboon troop determined using the collar data.

5.3.2 Baboon troop home range and core area of use

The range map was a manual and simple approach to delineate the area where the baboons were located. The literature indicated that in animal ecology a home range defined by using a 95th and 50th percentile was acceptable to understand the animals home range use (Rodger and Kie, 2011). However, Powell (2000) did highlight that the concept of home range was complex and that defining the edges of the home range was not as important as delineating the core area the animal used.

A map showing the home range and core area of where baboons were observed (Figure 5.4) was created in ArcMap using the cartographic model displayed in Figure 4.4. The percentile parameters used were taken from various animal home range studies (Anderson, 1982; Ellington et al., 2019 and Lochner and Lindenberg, nd) where keeping the model simple was found to be a reasonable fit for the data. The 95th percentile was used to define the home range and was calculated by summing all the season variations overlays to be an area of 9.42 km^2. Similarly, the 50th percentile was used to define the core area used by the baboons and covered 2.38 km^2. Rodgers and Kie (2007: 25) highlighted that the area of a 'home range, no matter what method used to determine it, merely provides an index and not an absolute measure of the space used by the animal through time.'

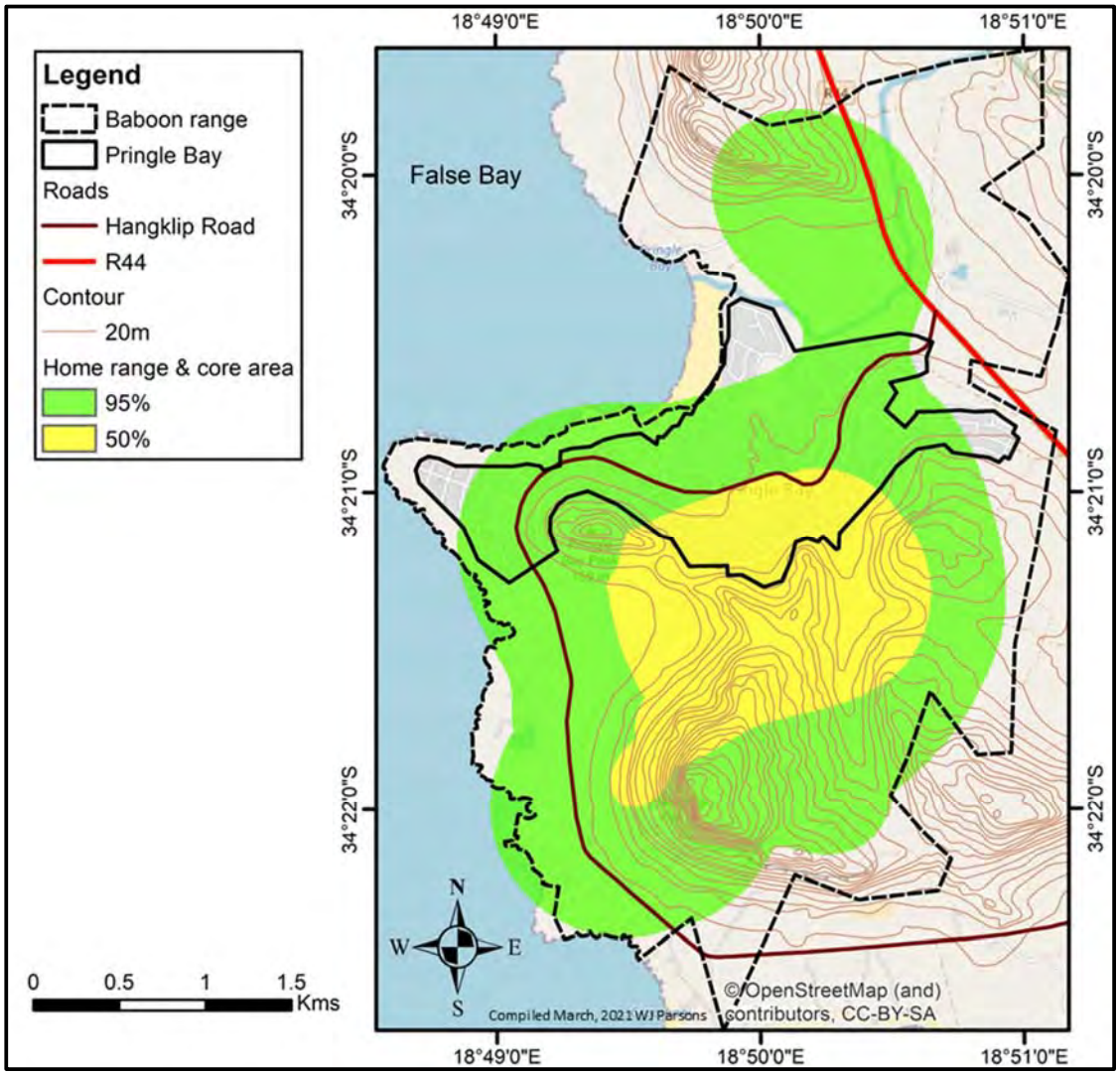

Figure 5.4: The home range and core area of the Pringle Bay baboon troop determined from the collar data.

Geldenhuys (2006) noted that in June 2006 the Pringle Bay troops range was 14 km^2 and the troop numbered 25 baboons. This study yielded a similar range, but the troop was smaller (13 – 15). However, using the 95th percentile to define the home range area as 9.42 km^2 meant that the area used was 27.5% less than the simple polygon outline range method of 13 km^2. Geldenhuys (2006) did not describe which method was used to determine the home range. The literature showed that the size of the home range positively correlates with the size of the troop (Lewis, 2014) and human modified habitat affected the ranging patterns of baboons (Hoffman and O'Riain, 2012b). Guth (2005) researched the seed dispersal abilities of the Pringle Bay baboons and reported that 41% of her observations of the baboons occurred in the urban area. This is markedly higher than the 17.9% determined in this study.

5.3.3 Sleep sites

Eight sleep sites were used by the troop during this study. Seven were south of Pringle Bay and one north of the town. The sites are mapped in Figure 5.5 in blue and the locations ranked by frequency of use, where 1 was used the most often and 8 the least often. It is apparent that the baboons like to sleep in elevated parts of the landscape (cliff faces or near rocky ledges). No sleep sites were recorded in the low flat lying areas and the troop rarely slept north of the town. This is similar to what studies on the Cape Peninsula reported (Hoffman and O'Riain, 2012b and Lewis, 2014).

The findings were also similar to sleep sites identified by Pearce (2006) as indicated by the pink squares in Figure 5.5. There were three sites to the north of Pringle Bay reaching as far as the Klein Hangklip slopes at Rooiels and none on the southern cliffs of Hangklip. Anecdotal evidence by a long-term resident who lives in close proximity to site 1 and 2 reported that the baboons have slept on the cliffs site for the last 40 years (M. Kitching, personal communication 2 February 2021).

5.3.4 Home range use

The Kernel Density map of the collar data presented in Figure 5.6 indicates the high to low density areas based on number of baboon sightings per square kilometre in the home range and the core area (refer to Figure 4.4 for POI). The high density locations are coloured red and yellow and included:

- Hangklip mountain: cliffs, slopes and adjacent Heuningklipkloof stream valley
- Brodie Link valley and western slopes
- Rooikransbos (a dense thicket of alien vegetation)
- Jeep track valley area
- Hangklip hotel

Limited presence during the day corresponds to the areas coloured in green. The sleep sites are found in the high density areas south of the town and is expected, as the baboons leave and return to these sites each day. Other important foraging areas in the high density areas included the area close to the Hangklip hotel, Heuningklipkloof valley and the Rooikransbos (which is a thicket of *Acacia cyclops)*. The core area (as defined by Davidge, 1977) are the high density red-yellow coloured areas which are areas habitually used for sleeping and feeding.

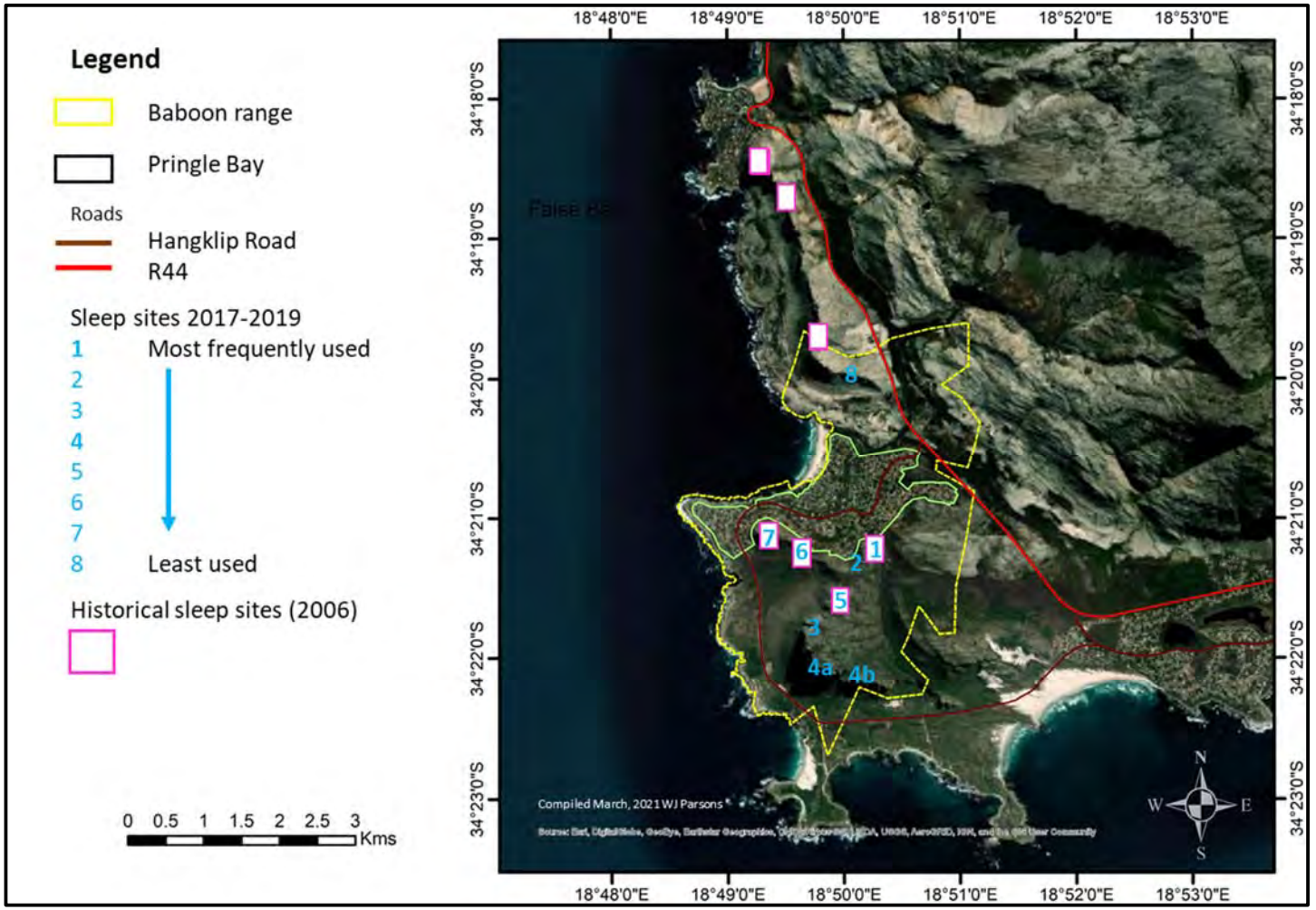

Figure 5.5: Map showing the baboon sleep sites identified in this research (2017 – 2019) and those identified in 2006.

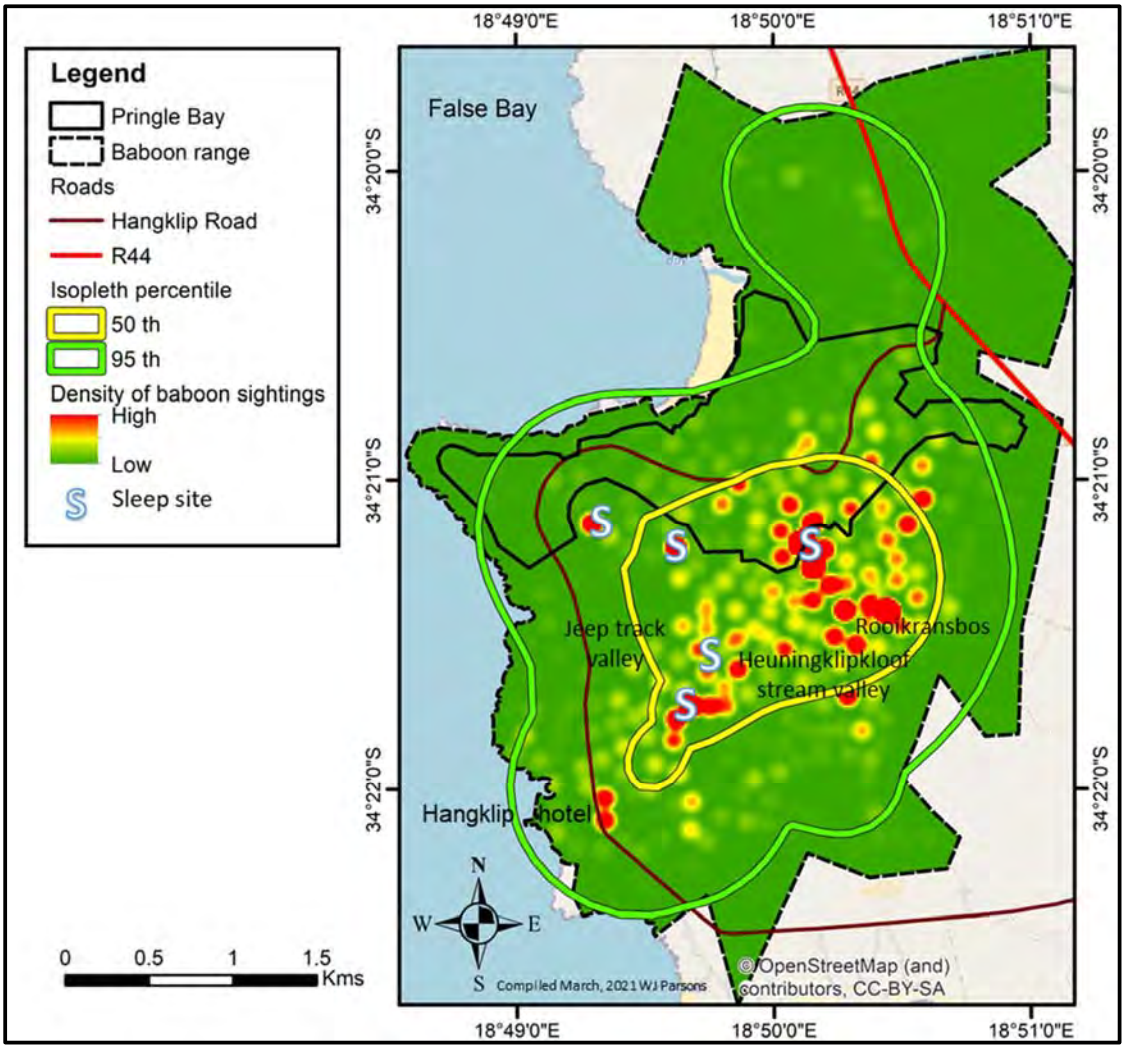

Figure 5.6: Kernel density map of baboon observations in their range using the collar data with the home range and core area also indicated.

The density surface map highlighted clusters in the data but did not statistically quantify them (Figure 5.7). The Hot Spot Analysis tool in ArcMap also identified the clusters of high and low values. Spatial statistical analysis is a key component to understanding the spatial and temporal occurrences of event points, in this case each observation recorded on the GPS collars. To have a statistical significance, hotspot features resulting from data generated by Getis-Ord Gi* statistical analysis will have a high Gi* value and is considered not to be a random occurrence as explained by ESRI (2018). According to Getis and Ord (1992) this makes it possible to detect local clusters of dependence for each feature in the dataset, in this case the baboon observations. The cartographic model referred to in Figure 4.6 was adapted for all the collar baboon observations for the 22 month study period to produce the hotspot map in Figure 5.7. The hot spot analysis tool identifies spatial clusters of statistically high or

low attribute Gi* values representing hot spots (red) and colds spots (blue). According to ESRI (2018) the former delineates clusters with higher than expected incidents and the latter delineates clusters with lower than expected incidents.

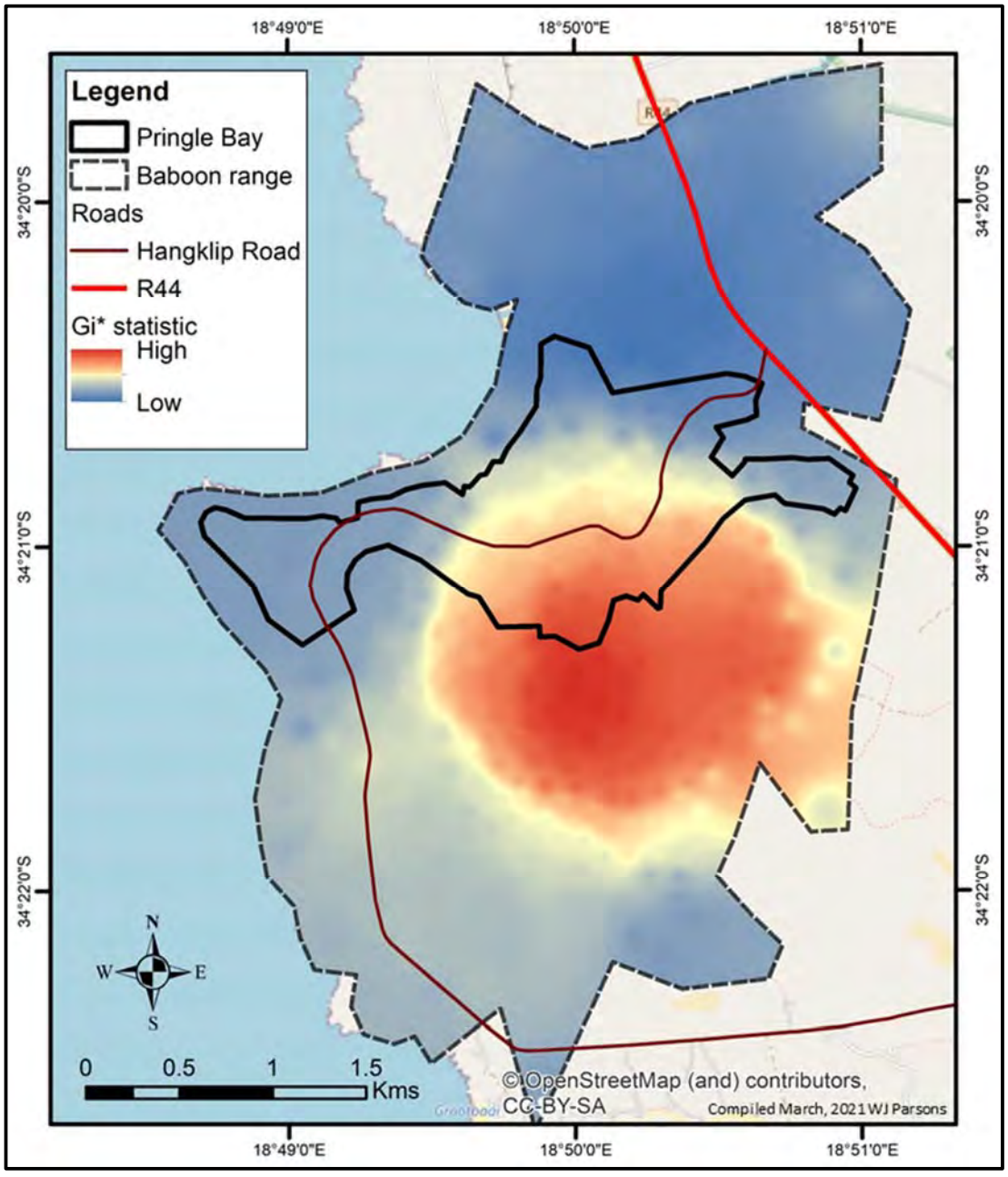

Figure 5.7: Hotspot map indicating hot and cold spots for the baboon collar data.

Spatial Autocorrelation was used to determine if the patterns shown by the collar data observations (feature points) and attribute values (ICount) which was generated by the 'collect events' statistical tool in the ArcMap statistical toolbox were clustered, dispersed or random. The Spatial

Autocorrelation (Global Moran's I) report (Figure 5.8) indicates a z-score of 464 and a corresponding Moran's Index is 0.68, meaning the collar data is significantly clustered.

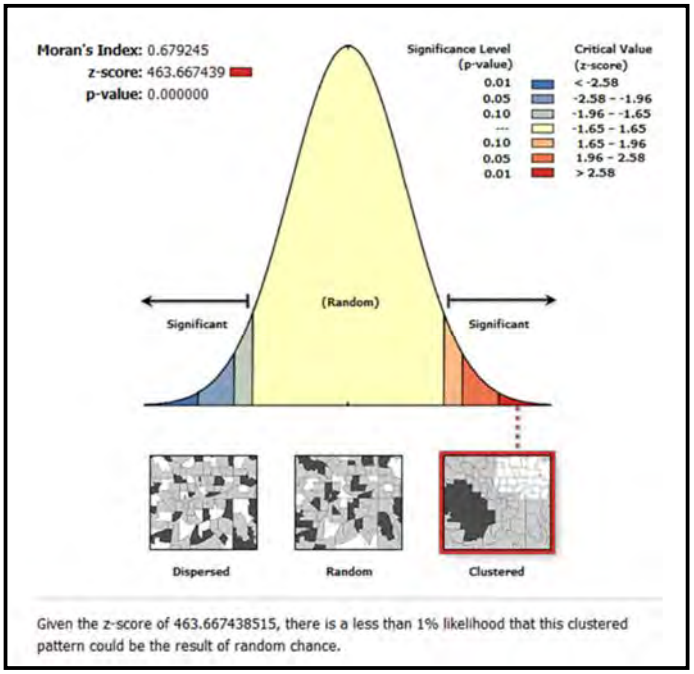

Figure 5.8: Spatial Autocorrelation output report for the collar observations (n = 18 280)

The core area of the range falls within the hotspot high density (red) area. Preference for this area is attributed to the availability of food, water and favoured sleep sites on the steep mountain slopes (Lewis, 2014). Water is available from the Heuningklipkloof stream and dense alien vegetation (Acacia cyclops) is found in the valley at Rooikransbos and on the slopes of Blesberg mountain. This area includes the sleep sites 1, 2, 3 and 5 (Figure 5.6) and is on the leeward side of the mountains providing relief from the prevailing south-easter summer winds.

5.3.5 Seasonal variations and habitat usage

The method to derive the home range and core area used by the baboons was also used to analyse the seasonal differences in the area occupied by the baboons. The seasonal home ranges varied from 3.98 km^2 to 7.94 km^2 (mean: 5.65km^2). The core area varied from 0.70 km^2 to 1.92 km^2 (mean: 1.29km^2).

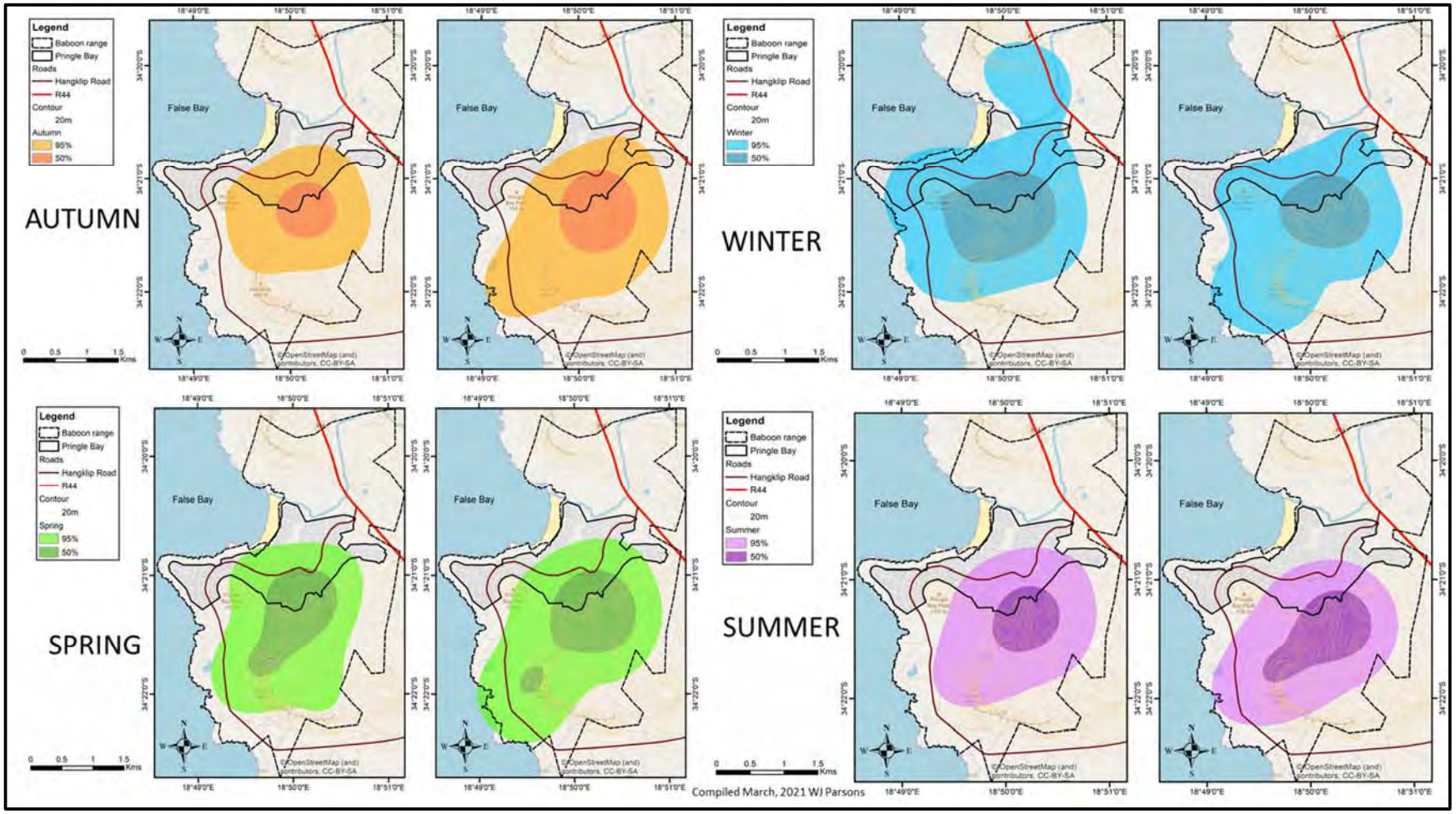

Figure 5.9: The seasonal variations in home range and core area used by the Pringle Bay baboon troop during the 22 month study period.

The seasonal ranges varied within and between seasons (Table 5.2) as is visually evident in Figure 5.9. The smallest home range and core area was recorded in autumn 2018 as 3.98 km^2 and 0.7 km^2 while the autumn 2019 showed an increased home range of 49% measuring 5.92 km^2 and core area increase of 88% measuring 1.32 km^2. Winter 2018 home range was 6.64 km^2 and core area was 1.26 km^2 both increased by 20% and 52% respectively to 7.94 km^2 and 1.92 km^2 in winter 2019, this was the largest home range and core arear recorded. Spring 2017 home range was recorded as 5.17 km^2 and the core area was 1.45 km^2, the 2018 home range increased by 19% and the core area showed the smallest of the season variations with an increase of 9% to 1.58 km^2. Summer 2017/18 home range was 4.49 km^2 and had the least variation of the seasonal differences, increasing by 9% to 4.49 km^2. The core area for summer 2017/18 was the second smallest of the seasonal variations at 0.8 km^2. This increased by 64% to 1.31 km^2 in 2018/19.

Table 5.2: Seasonal differences in home range and core areas used by the baboons.

Season	Percentage of Observations	Home range (95%) km^2	Home range core (50%) km^2
Spring 2017	7.79% (n=853)	5.17	1.45
Spring 2018	9.28% (n=1016)	6.16	1.58
Summer 2017/18	18.33% (n=2007)	4.49	0.8
Summer 2018/19	11.35% (n=1242)	4.91	1.31
Autumn 2018	14.16% (n=1550)	***3.98***	***0.7***
Autumn 2019	17.41% (n=1906)	5.92	1.32
Winter 2018	9.58% (n=1049)	6.64	1.26
Winter 2019	12.09% (n=1324)	***7.94***	***1.92***

The Pringle Bay troop used a larger home range during winter and spring than in summer and autumn. Lewis (2014) observed the opposite in the Cape Point baboon troop, who travelled further during summer concluding that possible food stress was highest in the warm dry conditions. This study fell in a drought period which was being experienced in the Western Cape. Three consecutive below average rainfall years of 2015 to 2017 resulted in what has become known as the Cape Town 'Day Zero' drought (Pascale et al., 2020). The winter rains of 2018 brought some relief and, coincidently, the baboon home range expanded (Figure 5.10). During this time, the core area appeared to be almost static with an average area of 1.29 km^2. The driest months (summer 2017/18 and autumn 2018) had the smallest core area of 0.8 and 0.9 km^2 and the wettest months (spring 2018 and winter 2019) had the larger core area of 1.58 and 1.92 km^2 respectively.

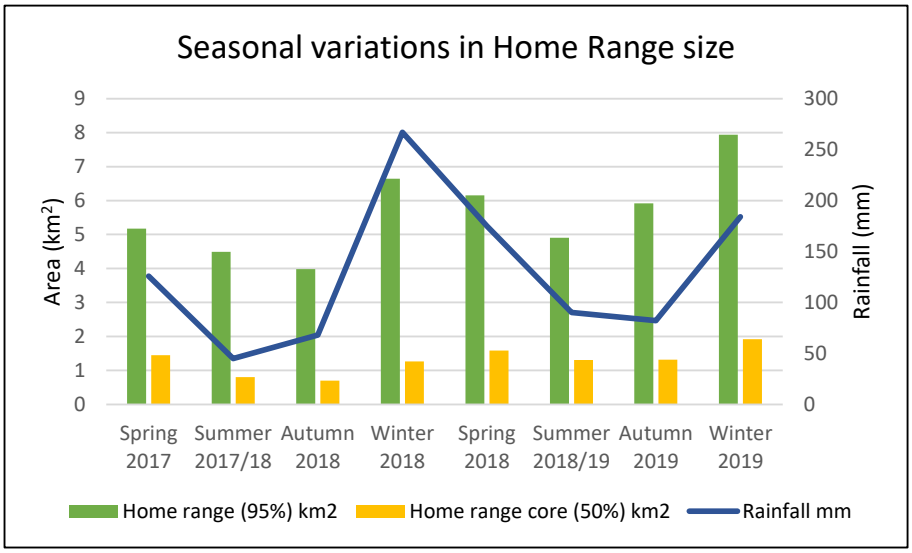

Figure 5.10: Seasonal variations in the home range and core area of the Pringle Bay troop and rainfall for the study period.

The winter of 2018 was the only season which included the area north of the Buffels river. This was for a period of 12 days when the troop was observed foraging over the river near 'Waldo's' and the 'Burnt House.' The data indicates that they spent 8 nights at the sleep site on Tweesusters mountain (sleep site 8). This activity noticeably changed the home range map of 2018 and is possibly attributed to sightings of the neighbouring Hangklip baboon troop in their home range along the ridge south of town. While baboons are not considered to be territorial, they are hierarchical and the alpha male will move the troop if threatened.

The months after the wildfire of January 2019 showed no noticeable change to the Pringle Bay troop's home range as the fire did not burn in the core area. Only the territory north of the river and the slopes of Tweesusters mountain were burnt. This area was only visited for 12 days in the winter 2018. Research on the behavioural and physiological responses of baboons to wildfire in the Cape Peninsula by Dubay (2018) concluded that the baboons preferred unburnt areas to burnt areas, increasing their home range after a fire. However, the baboon's ecological and behavioural flexibility allows the animal to respond immediately to a fire by changing their ranging behaviour, social behaviour and diet. The neighbouring troop from Rooiels was observed feeding in the burnt veld the day after the 2017 Rooiels fire (J Mormile, personal communication, 2 April 2019), which can be related to the fact that Fynbos is a fire-adapted vegetation type where fire triggers the seed release in many species. Baboons play an important role in seed-dispersal and seed-germination, especially after a fire.

5.3.6 Habitat occupancy

"Habitat preference is the consequence of habitat selection, resulting in a disproportional use of some resources over others. Habitat preferences are most strikingly observed when animals spend a high proportion of time in habitats that are not very abundant on the landscape" (Krausman, 1999: 86). The land cover of the baboon range was mapped (Figure 3.12) and the different habitats visited by the baboons investigated.

This analysis aims to show relative use by the baboons (number of observations as a percentage) against the relative extent (land cover class as a percentage of the total range) in order to identify if any land cover classes are favoured more than others. When comparing proportion of observations versus land cover class proportion, a 1:1 ratio would show no preference, anything larger than a 1:1 ration would show a preference and less than a 1:1 would suggest avoidance (Table 5.3).

Table 5.3: Index of baboon occupancy determined by a ratio of the proportion of land cover percentage to the proportion baboon observations percentage.

Land cover description	Ratio of land cover to baboon observations index
Transformed (urban)	1.0
Untransformed (non-urban)	0.3
Untransformed (Cape Nature)	2.3
Wetlands in town	1.2
Wetlands outside of town	0.5
Mountain fynbos vegetation	1.7
Coastal fynbos vegetation	0.4

The land cover of the 13 km^2 baboon range comprised of transformed (urban) areas (2.3 km^2) and untransformed areas (10.7 km^2) which included privately owned land (most with of natural vegetation) (6.8 km^2) and Cape Nature Reserves areas (3.9km^2). The Cape Nature reserve area accounted for 30% of the land cover. The proportion of baboon observations relative to the proportion and the Cape Nature reserve areas (specifically the Hangklip and Brodie Link areas) was 2.3 indicating it was the most favoured area of the baboon range. Figure 5.11 shows the percentage of baboon observations relative to the percentage of land cover in the baboon range.

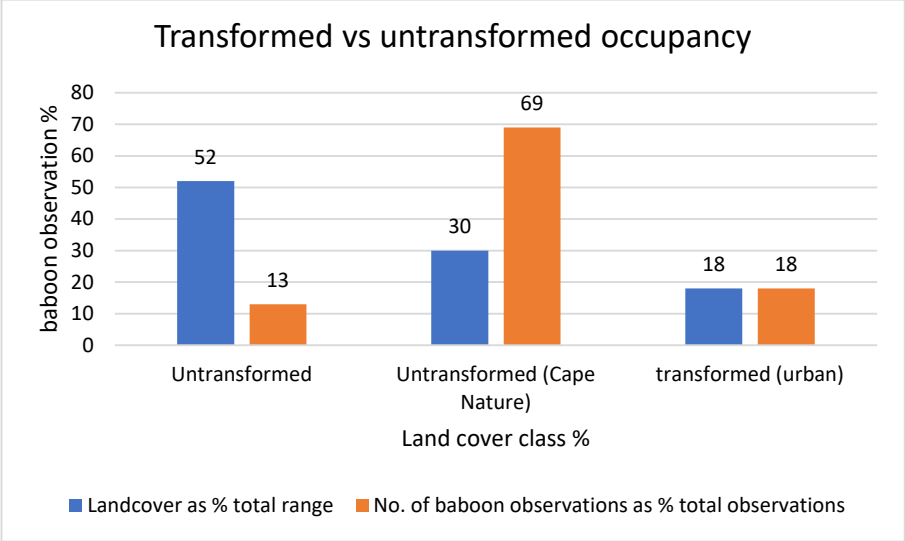

Figure 5.11: Baboon occupancy in the transformed and untransformed land cover class

The vegetation land cover classes were defined as mountain or coastal fynbos. The baboons showed a higher preference of 1.7 for the mountain fynbos and a much lower preference of 0.4 for the coastal fynbos. Figure 5.12 indicates that the baboons were observed 79% in the smaller mountain fynbos area and less in the larger area of the coastal fynbos where they were observed 21% - indicating that the baboons favoured the mountain fynbos vegetation.

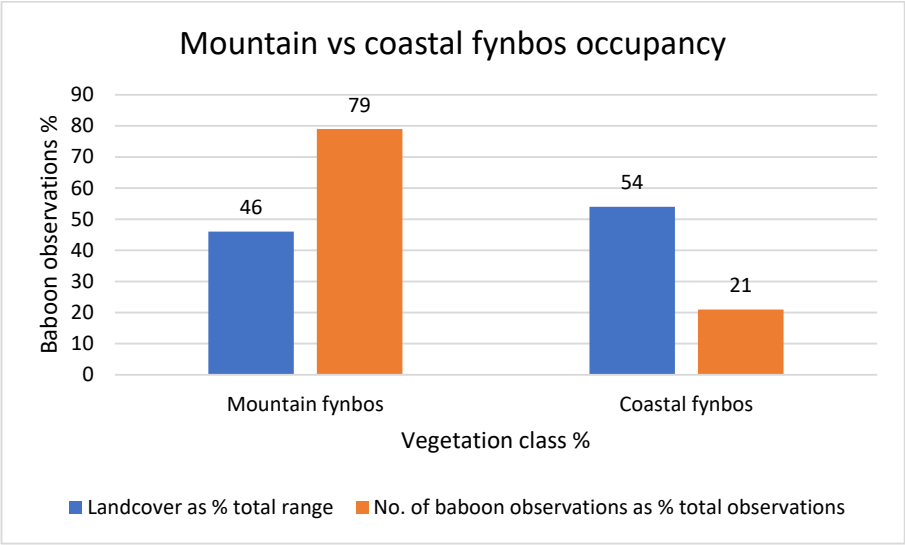

Figure 5.12: Baboon occupancy in the two vegetation classes

The wetland areas which comprised 23% (3 km^2) of the baboon range occurs in both the transformed and untransformed areas and are located in both vegetation types. However the wetlands were not

considered as a land cover class on its own as the urban area wetlands have been modified by development and the natural wetlands are largely seasonal . However, when the baboon occupancy of the wetlands was quantified, it was interesting to note that when comparing the proportion of the baboon observations to the total wetland area the ratio was 1:1 indicating 'no preference'. But when the wetland area was reclassified into 'urban wetland" and 'non-urban wetland" there was an interesting difference in preference noted.

In the transformed area the wetlands covered 1.1 km^2 of the 2.3 km^2 of the urban area i.e. 48% of the urban land cover. It is important to note that the wetland area found in the urban area has according to Day (2014) largely been destroyed by urban development and the once natural wetlands and streams have been channelized. The baboon occupancy in this area was 57% of the urban baboon observations indicating that when the baboons visited town, they favoured the areas which were considered wetland areas, but have now largely been modified (Figure 5.13).

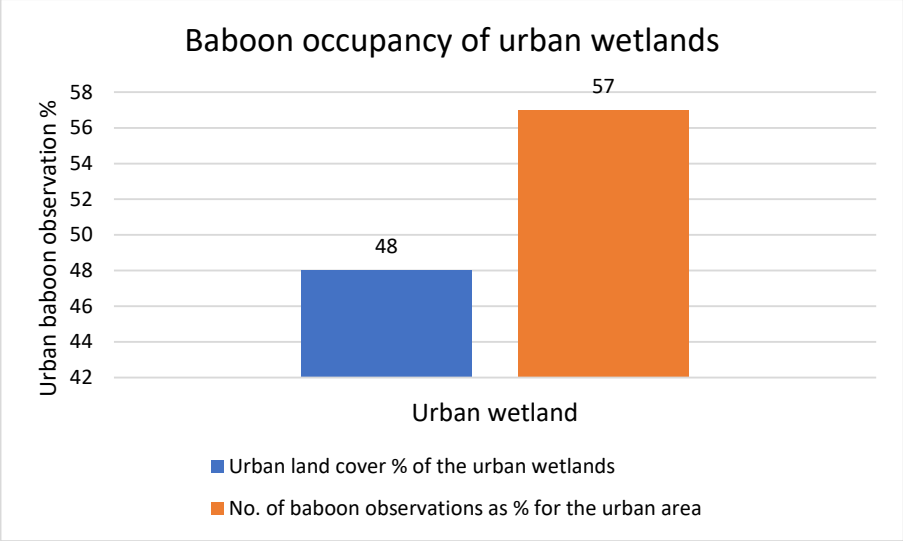

Figure 5.13: Baboon occupancy in the transformed land cover class (urban area).

In the untransformed area (non-urban) the wetlands covered 1.9 km^2 of the 10.7 km^2 of the untransformed area of the baboon range i.e. 18% of the untransformed land cover. These wetlands occurred mostly in the coastal fynbos areas. The baboon occupancy in these non-urban wetland areas was 15% of the baboon observations in the untransformed land cover class and indicates that the baboons did not visit these wetland areas as frequently as they did the wetlands in town (Figure 5.14).

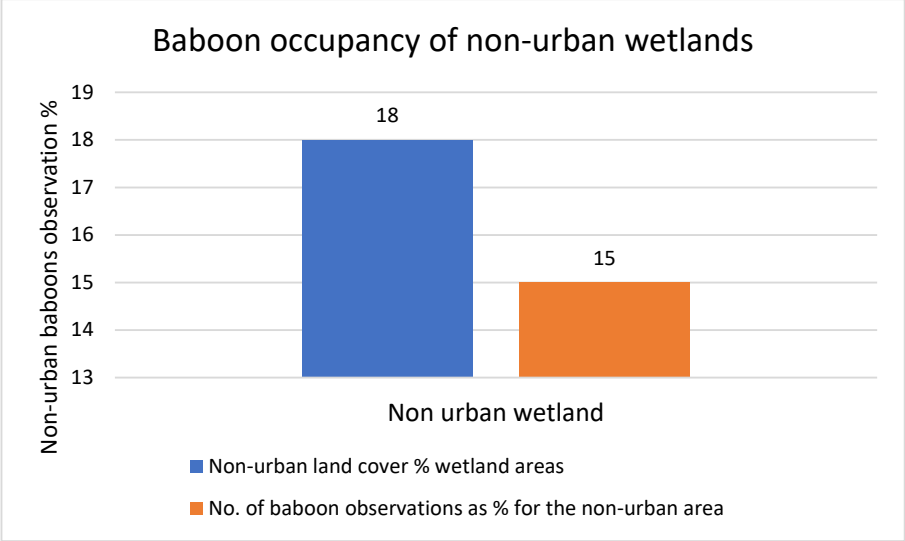

Figure 5.14: Baboon occupancy in the untransformed land cover class (non-urban area).

The seasonal change in the home range and core area was shown in Figure 5.9 and reflected in the habitats the baboons visited. The seasonal use of the two main vegetation types found in the home range (refer to Figure 3.8) is shown in Figure 5.15. where the baboon observations in the mountain fynbos was the highest in summer (83%) and autumn (82%). The highest number of observations in the coastal fynbos was in winter (26%) followed by spring (22%). This is similar to what Davidge (1977) found with the baboons at Cape Point, who showed a preference for upland mixed fynbos and Acacia cyclops thickets over coastal fynbos.

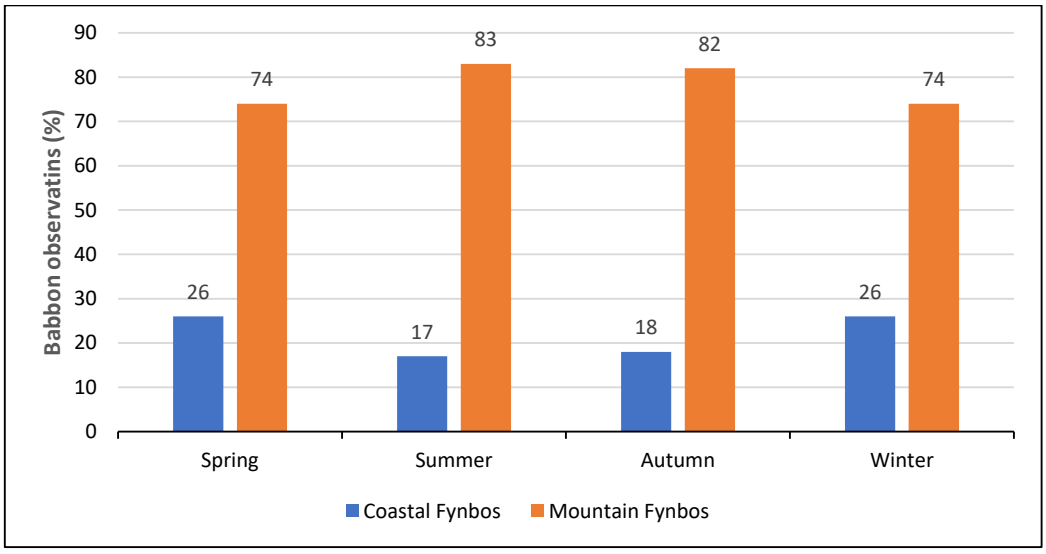

Figure 5.15: Seasonal use of the two vegetation types found in the baboon home range.

The typical erica-restio veld found in the baboon's core area is shown in Figure 5.16. This area is largely located in the valley between the Hangklip and the Blesberg slopes (Hangklip Nature Reserve), where the baboons spend time foraging. Guth (2005) observed the baboons foraging on protea and erica species, grass with seeds and geophytes when in this mountain fynbos.

Figure 5.16: A baboon foraging in the Hangklip Nature Reserve valley in erica-restio veld.

The plant communities visited by the baboons for the 22 month study period are depicted in Figure 5.17. and it is apparent that the baboons spent 62% of their time in the xeric seaward slope dominated by erica-restio veld. Fynbos on yellow plinthic soils had the second highest occupancy of 14%, followed by the erica-osmitopsis seepage fynbos and marsh communities (wetland plants) at 8%. The other five plant communities (acid sand flats; coleonema album short coastal rock fynbos; limestone communities; low dune scrub and strand pioneers and mesic seaward slope erica-restio veld) all had 5% or less occupancy rates.

The high occupancy in the xeric seaward slope is to be expected as this plant community accounts for 40% of the baboon range. However, the yellow plinthic soil fynbos only accounts for 2.3% of the home range, yet the observed occupancy is the next highest. The high observations in the xeric seaward slope and fynbos on the yellow plinthic soils can be attributed to the fact that they are the two areas in which all the sleep sites are located and include all the observations of when the baboons left and returned to their sleep refuges each day. The low dune and scrub and strand pioneers plant community was the third largest in area (17%) yet only had an occupancy of 3%.

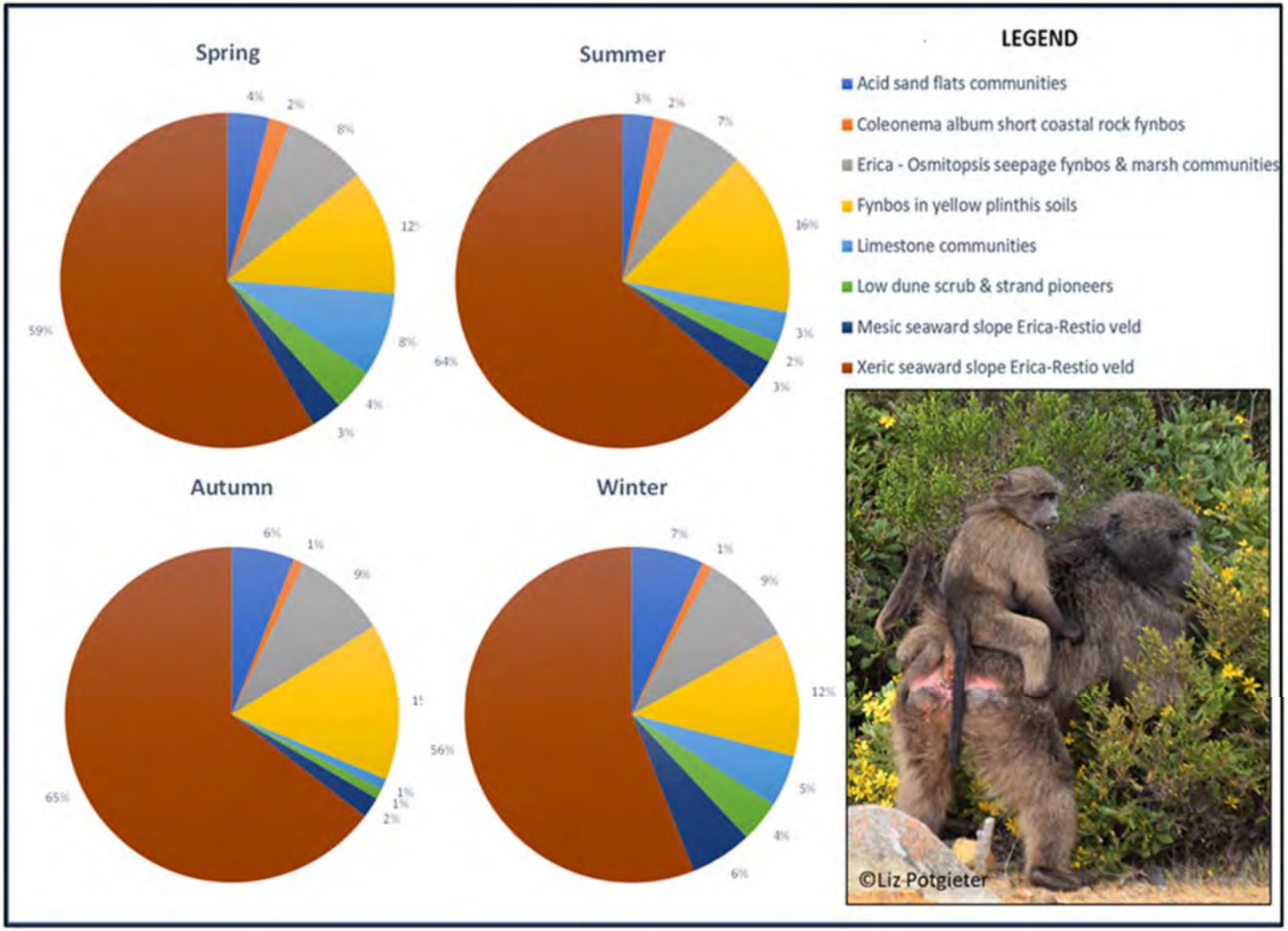

Figure 5.17: Seasonal occupancy within the eight plant communities in the baboon troop range.

No field observations of the baboon's daily activities informed this research so no quantitative comparison can be made to the research done in similar fynbos environments on the Cape Peninsula (e.g.: Davidge, 1978; Hoffman and O'Riain, 2012; Lewis, 2014) and in the De Hoop Nature Reserve (Hill et al., 2003). The assumption is made then that when the baboon observations (1%) were in the Coleonema album short coastal fynbos, which is 4% of the baboon range, they were marine foraging as the plant species in this plant community are low in nutrients and this area is adjacent to the rocky coastline. This is backed by anecdotal observations from the baboon monitors who noted that when the baboons visited the south-west edge of the home range, they foraged in coastal rock pools and were observed eating mussels and limpets. This was also shown to happen with the Cape Point troop by Lewis (2014). The second year of the study showed an increase in observations across all the seasons for this area. One example was in the summer of 2017/18 where occupancy was 0.5% which increased to 3.3% in the summer of 2018/19.

The winter habitat use over the two years showed that in the first year the baboon observations in the southern range (near the Hangklip Hotel) area in the limestone plant community was 7% and then decreased to 0.8% occupancy in the second winter season (2019). This plant community accounts for 5% of the baboon range. While this area has a high density of alien vegetation [rooikrans (*acacia saligna*), Australian myrtle *(Leptospermum laevigatum)* and eucalyptus trees (*Eucalyptus*) which are favoured by the baboons] the decrease in the change of occupancy could possibly be attributed to the disturbance caused by major road works activity in the area at that time.

The vegetation occupancy observed in this research is compared to that of Guth's (2005) findings which recorded the baboon movements over three months (May – July 2005) in Figure 5.18. The Xeric seaward slopes were occupied the most time in both studies (62% vs 48%) and the fynbos on yellow plinthic soils were also favoured by the baboons in both studies (14%). While Guth indicates the second highest occupation in her study to be low dune scrub and strand pioneers at 17%, this was much less at 3% in the current study (anecdotal evidence indicated the baboons were seen on the Pringle Bay main beach in 2005 and 2006, while this occurred infrequently between 2017 and 2019). Baboons are opportunistic omnivores (Mormile, 2014) and their diets are known to include seasonal bulbs, shoots of new growth, fruit and seeds, small mammals and invertebrates. The Cape peninsula baboon's diet has been described as 95% vegetable matter (grass, seeds, fruit, leaves) while invertebrates (ants, grasshoppers, marine shellfish) were also taken (Davidge, 1977). Mormile (personal communication, November 2018) documented the Rooiels baboon troop diet and the highly favoured plant species included bietou (*Chrysanthemoides monilifera*), dune guarri (*Euclea racemose*),

various protea species (*protea repens*) amongst others. Guth (2005) found a significant relationship between the natural food eaten to vegetation type, the highest number of geophytes (bulbs), protea and grass seeds were consumed in the Xeric seaward slope area where the baboons spent the majority of their time.

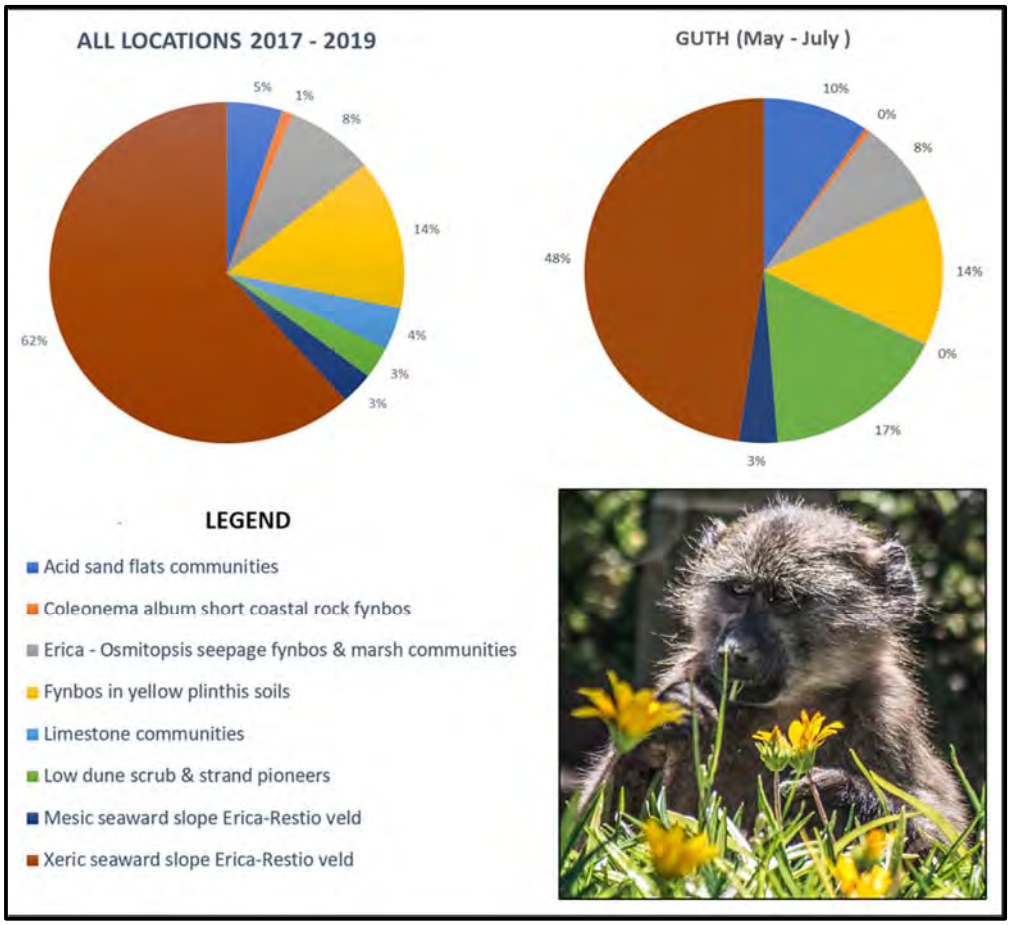

Figure 5.18: Baboon plant community occupancy in this study compared to Guth (2006).

5.3.7 Urban baboon patterns

The following findings of the research relate specifically to the movement of the baboons in the urban area where 18% of collar data observations were within the town. The distribution pattern of the observations is clustered. This was statistically quantified using the Average Nearest Neighbour in the Analysing Patterns Toolset (ArcMap Spatial statistical toolbox) with a nearest neighbour ratio of 0.01. The Hot Spot Analysis tool was used as described in Section 5.3.4 to identify the areas of high and low clustering (Figure 5.19). The urban hotspot was closest to the two sleep site most frequently used by the baboons over the 22 month study period (sleep sites 1 and 2 shown in Figure 5.5).

The hotspot map did not show areas that the community regarded as 'hotspot" areas where it was perceived that the baboons were often seen. Using the Spatial Analyst density tools in ArcMap two layers were created. Firstly, a point density surface layer, which calculated the magnitude per unit area for each feature point (baboon location) and secondly, a kernel density surface where the estimate value represents the number of sightings per km^2. The two layers were overlaid to produce a density hotspot map (Figure 5.17), showing 9 areas in the town which are locally considered to be high incident areas.

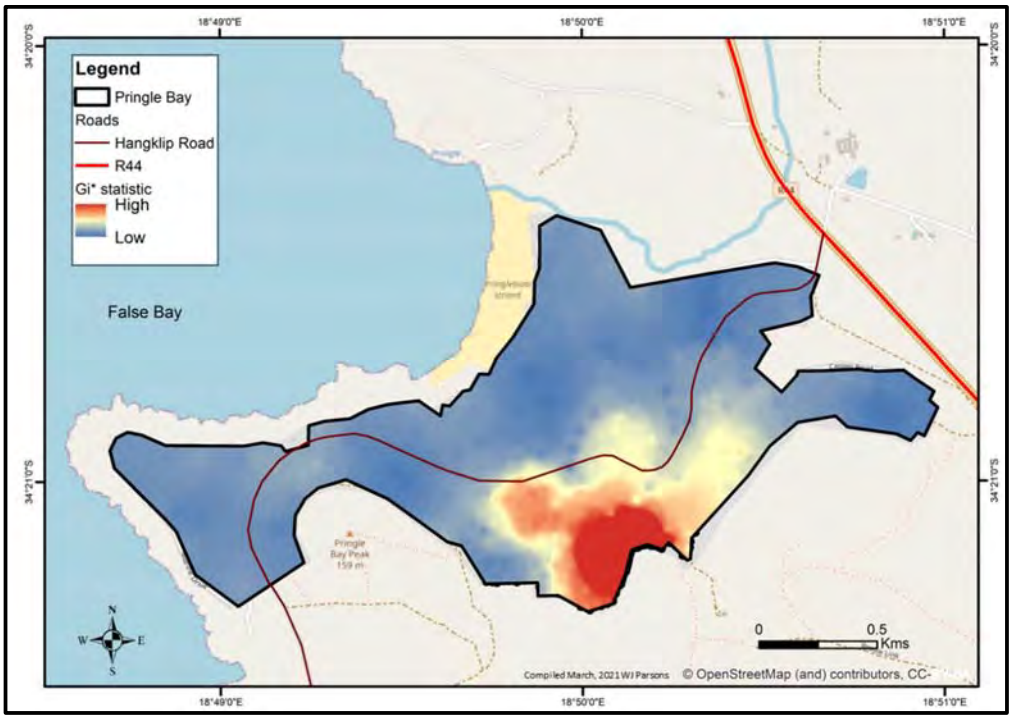

Figure 5.19: Hotspot map of the urban area indicating hot and cold spots for the baboon collar data.

The Main hotspot refers to the combined area of Hotspot 2, Hotspot 4, Hotspot 7 and Hotspot 8. This area is visible in the urban hotspot map shown in Figure 5.20 and is the main area where the baboons are known to visit when they are inside the urban area.

The central business district (CBD) of Pringle Bay (Hotspot 2 in Figure 5.17) is the area where baboons have historically been observed and have been seen to raid. Opportunistic by nature, the reward of high-energy human-derived food outweighed the risks associated with getting it. This behaviour has been documented in the behaviour of the Cape peninsula troops (Hoffman and O'Riain, 2012b; Fehlmann et al., 2016; van Doorn and O'Riain, 2020). This behaviour was often observed and reported on the WAG.

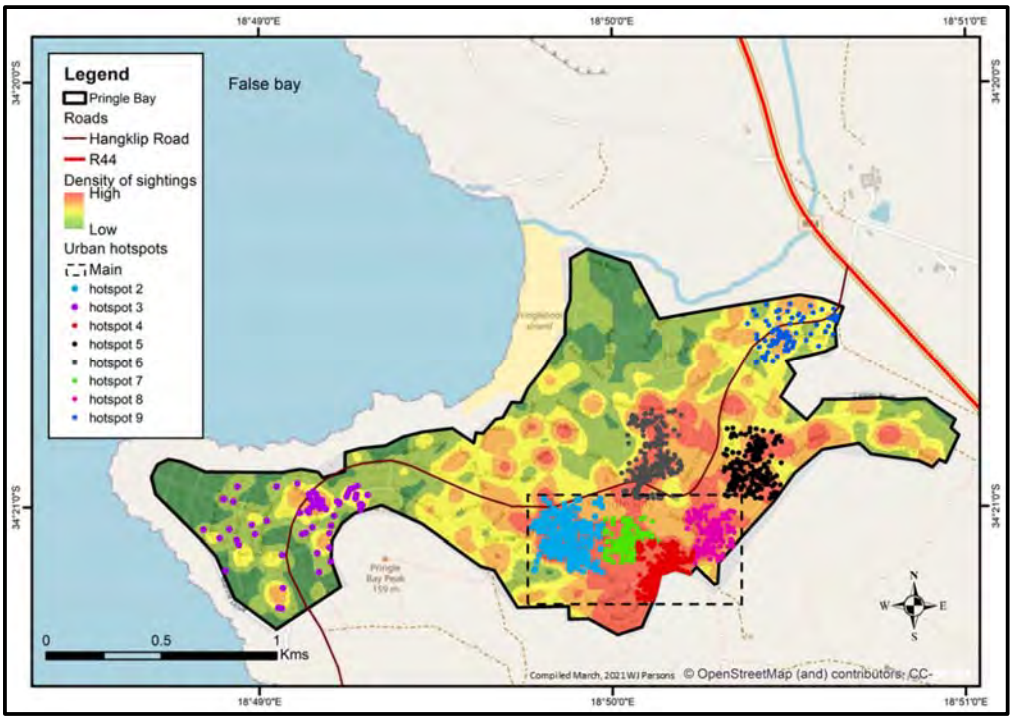

Figure 5.20: Density surface map showing the baboon observations as local hotspots inside the town.

Baboon foraging in this hotspot occurred for various reasons, including the lack of or inefficient baboon-proof municipal bins. The public bins attracted the baboons as they were often overflowing or not securely closed, providing easy access to the sought-after high energy food. The photographs in Figure 5.21 show the opportunistic behaviour of baboons which could have been avoided. Municipal waste management, or the lack thereof, played an important role i.e. public bins were not emptied timeously, some businesses did not use baboon-proofed bins to store the waste for weekly collection and municipal by-laws (Overstrand Municipality, 2013) were not enforced.

Figure 5.21: Baboons foraging in the CBD on 20 June 2019 at 18h09.

Regular food put out to feed birds by the management of a local food factory also attracted the baboons and shops and restaurants who left doors open (or do not have baboon proofing) were raided on a regular basis.

Seasonal and weather patterns for each hotspot were investigated using data from World Weather and the findings summarized in Table 5.4. No discernible patterns were apparent. The baboons visited town year round irrespective of whether it was sunny, overcast or raining. The preferred time periods in the central area marked as Hotspot 1 was late afternoon (16h00 – 18h00) and sightings were rarely reported after dark (Figure 5.22). Baboons are considered diurnal animals but are known to periodically sleep in urban areas on the Cape peninsula.

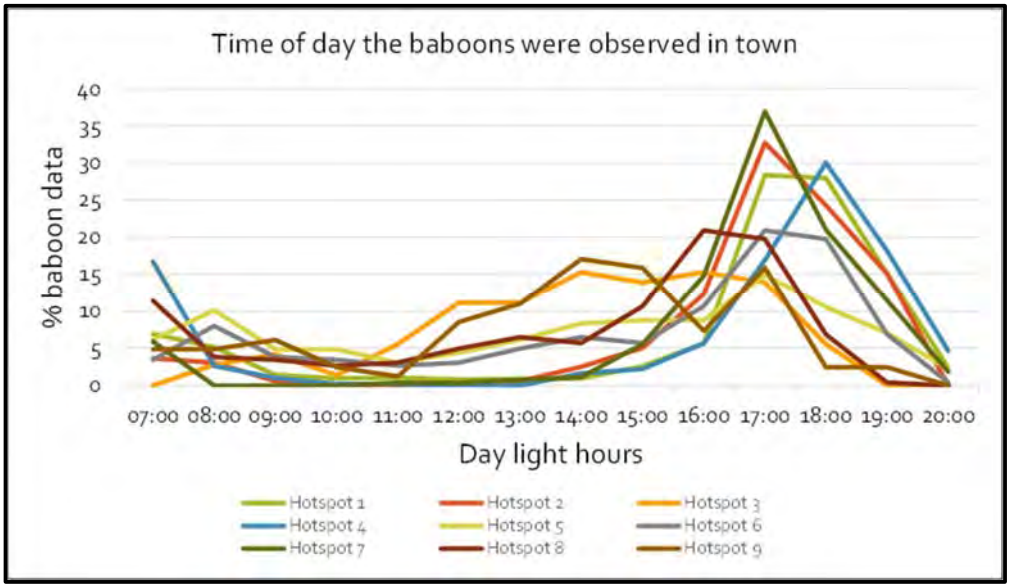

Figure 5.22: Day light hours that the baboons were observed in town at the nine hotspots.

An analysis of the seasonal distribution and wind direction for three of the hotspot areas was performed. The main hotspot (Hotspot 1) which is comprised of Hotspots 2, 4, 7 and 8 is visited more in summer and autumn when the prevailing wind is typically a south-easter (Figure 5.23).

Hotspot 3 is a relatively minor hotspot that occurs on the western side of town. The time that the baboons spent in this area made up 0.4% of all observations and 2% of the urban data for this research. Anecdotally, the residents of the Point area believe that the baboons visit in winter when it rains. The data indicates that late autumn and winter (May – July) is typically when they do visit and when the prevailing wind is from the north-west (Figure 5.24). The baboons are attracted by the large alien pine trees (*Pinus pinea*) where they have been seen eating the pine nuts.

Table 5.4: Summary of **c**ollar data linked to hourly weather data.

Variable	Urban Hotspot								
	1 (2, 4, 7 & 8)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Location name	Main area	CBD area	Point area	Prof's house	Lawrence & Diana Rd	Hilton Circle & Hilton Crescent	Diagonal & Three Way Rd	Stream Rd	Hangklip & Gerald Rd
% of all baboon locations	10%	2%	0.4%	3%	1.5%	1.5%	1%	1.5%	0.5%
% of urban visits to hotspot	56%	11%	2%	15%	7%	8%	7%	8%	2.5%
Months in which hotspots visited	All months	All months	May, Jun, Jul	All months	All months	All months	All months	All months	Apr to Aug
Seasonal pattern	Summer, autumn	none	Autumn, winter	None	none	Autumn, spring	none	Autumn, winter	Autumn, winter
Day or night -time	Daytime	Daytime	Daytime	Both	Daytime	Daytime	Both	Daytime	Daytime
Preferred hours of hotspot visit	16h00 - 20h00	15h00 - 19h00	09h00 - 18h00	<07h00 - 20h00	<07h00 - 20h00	07h00 - 19h00	<07h00 - >20h00	07h00 - 18h00	07h00 - 19h00
Temperature C^{O}	16 - 21	13 – 21	13 – 15	16 - 21	16 – 24	12 - 26	12 - >25	12 - >25	12 - 21
Prevailing wind	S/SE	W/NW/S/SE	NW	S/SE	S/SE	SE/SW/NW	SE/NW/SW	SE/NW	NW
Wind speed (km/hr)	5 – 25	15 -25	20 - >30	6 - 25	6 – 25	10 - 30	10 - 25	10 - 25	10 - 30
Wind description (Beaufort scale)	Light to gentle Breeze	Gentle breeze	Fresh breeze	Light to gentle breeze	Light to gentle Breeze	Gentle to fresh breeze	Light to gentle breeze	Light to gentle breeze	Light to fresh breeze
Weather description	71% sunny 23% cloudy 6% rain	70% sunny 19% cloudy 11% rain	4% sunny 49% cloudy 47% rain	67% sunny 27% cloudy 6% rain	61% sunny 12% cloudy 12% rain	65% sunny 22% cloudy 13% rain	67% sunny 27% cloudy 6% rain	65% sunny 22% cloudy 13% rain	43% sunny 30% cloudy 27% rain

x

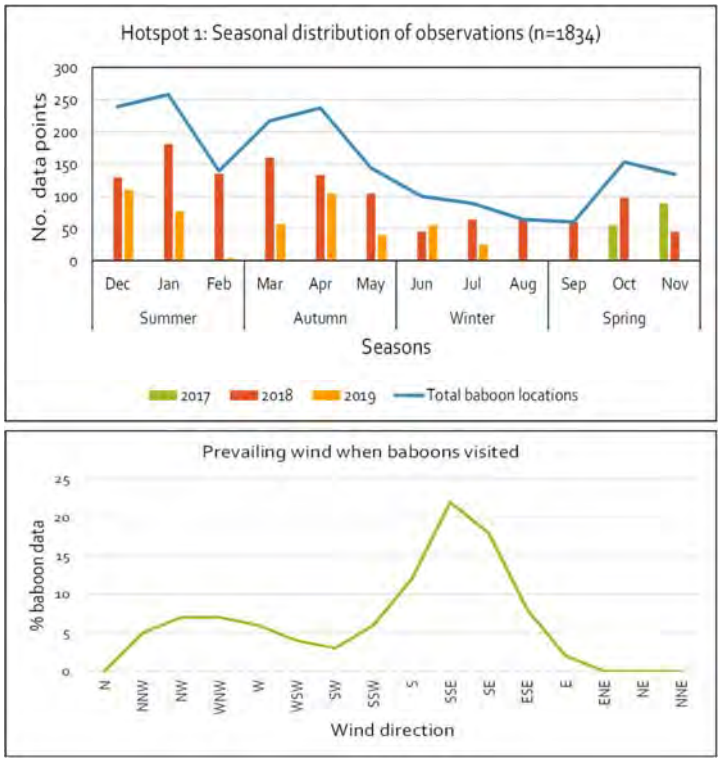

Figure 5.23: Seasonal and wind patterns derived from collar observations at Hotspot 1.

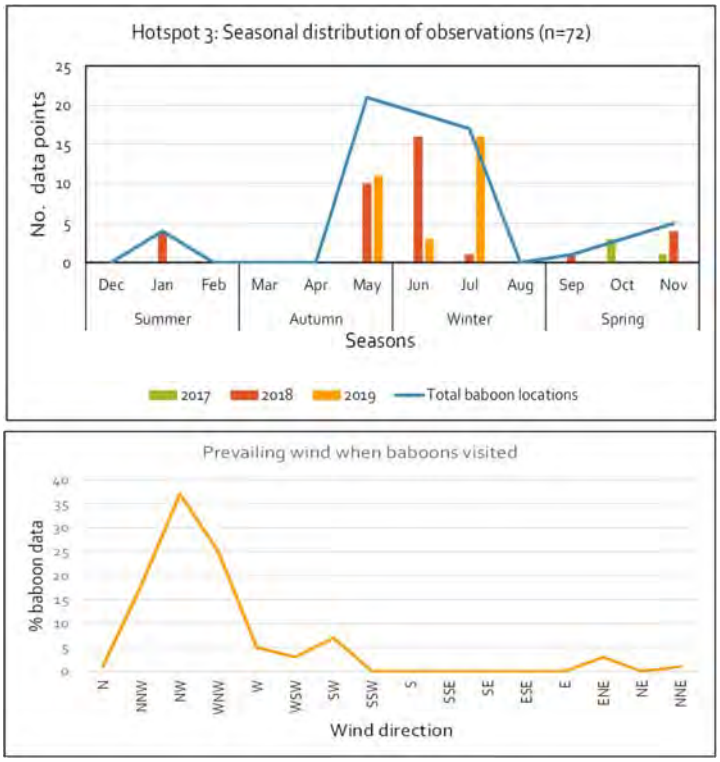

Figure 5.24: Seasonal and wind patterns derived from collar observations at Hotspot 3.

The data for Hotspot 6, located in the vicinity of Hilton Crescent and Hilton Circle and north of Hangklip Road, indicates that autumn is the preferred season for the baboons to visit this area when the wind direction is eastly to north-easterly (Figure 5.25). The baboons use a route frequently reported on the WAG from the Sleep site I and Sleep site 2 on the urban edge above Beachview Road and Clarence Drive, moving down Stream Road and /or Three Ways Road before crossing Hangklip Road and moving towards Hotspot 6. Observations in Hotspot 6 are representative of 1.5% of the collar observations and 8% of all urban observations. Day (2014: 51) described the area as a "key ecological corridor which includes the existing Hangklipkloof stream, the natural wetlands in Stream Road (upstream of Hangklip Road) and the fragmented wetlands downstream of Hangklip Road largely due to development of erven and urban infrastructure". Diversion of the stream, channelization and artificial drainage of the wetland areas provide a water source for the baboons throughout the year.

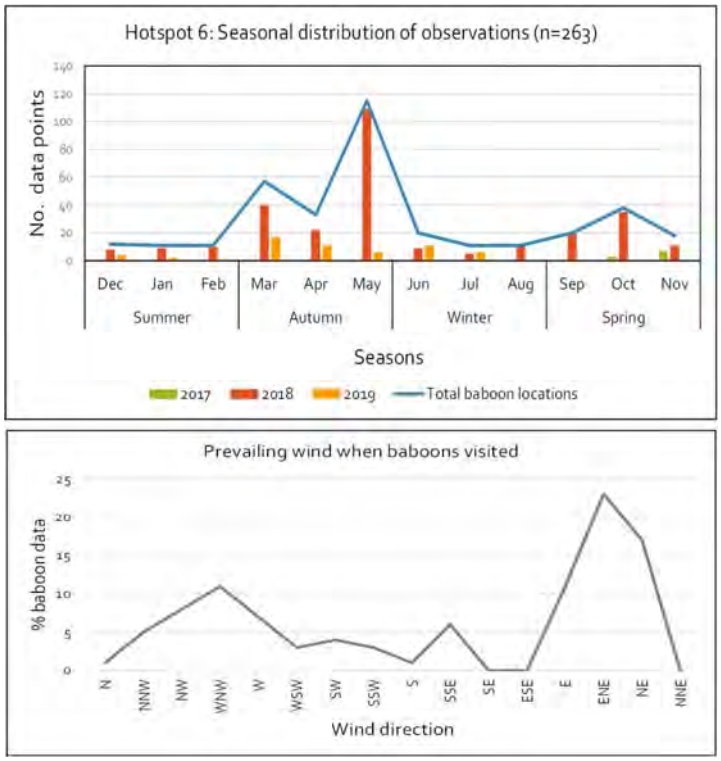

Figure 5.25: Seasonal and wind patterns derived from the collar observation at Hotspot 6.

The relationship of the baboon observations in the urban area (n = 3 279) to the wetland areas in Pringle Bay showed that 57% of the observations in town (n = 1 857) are located in the wetland areas (Figure 5.13). The baboons favour this area over the rest of the urban area which is mostly coastal fynbos type gardens. A botanical assessment of the wetland vegetation by Johns (2010) showed the wetlands to have mature and wetter phase of the Hangklip Sand vegetation with the presence of

specific wetland seepage plants such as *Neesenbeckia punctoria* (large sedge that produces large nuts); *Carpha glomerata* (large sedge also known as Vleiriet); *Halleria elliptica* (also known as Wild fuchsia which flowers and produces berries in Autumn); *Morella serrata* (Lance Leaf Waxberry produce berries in spring) and *Phragmites australis* (common reed). The baboons have been observed eating the fruit of *Syzgium cordatum* (Water berry tree) as shown in Figure 5.26 in the wetlands near the church in the CBD area. The proliferation of some exotic and indigenous, but not endemic plant species, have been identified as an attraction for the baboons e.g. baboons have been observed eating berries and fruits from exotic palm trees in Stream Road.

Figure 5.26: Baboons observed feeding on the fruit of *Syzgium cordatum* (Water Berry tree).

The seasonal distribution of the baboon observations are shown as comparative snapshots (Figure 5.27). While 57% of all the urban observations were in the wetlands there was a variation between the seasons. The baboons visited the town the most in autumn (n = 1077) of which 61% of these observations were in the wetlands and the least observations of the baboons in the urban area was in spring (n = 646). This was also the month where they were found to spend the least time in the wetland areas at 48%. Summer had the second highest number of observations of the baboons in town (n = 899) and the baboons spent 58% of their time in the wetlands. In winter (n = 657) observations in the wetlands made up 55% of the total.

The diversion of the stream, channelization and artificial drainage of the wetland areas provide a water source for the baboons throughout the year (Section 3.3) and this together with the vegetation associated with the wetland areas are possibly the attraction for baboons to regularly visit these areas. The dominant plant communities within the wetland area the Erica-osmitopsis seepage fynbos and acid sand flat communities and Guth (2005) noted that these areas offered a high percentage of foraging for anthropogenic introduced plant species such as kikuyu grass (*Pennisetum clanestinum*).

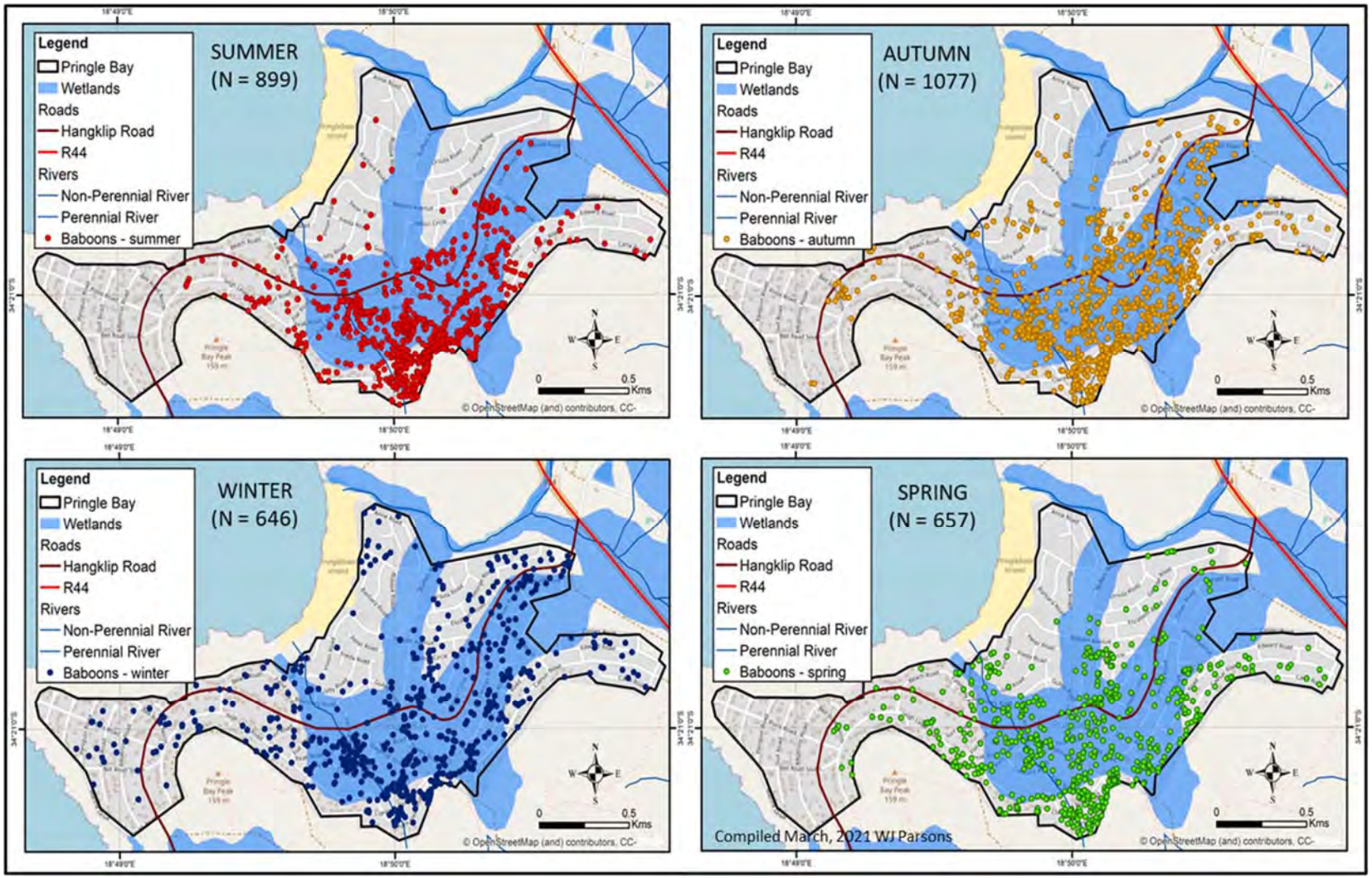

Figure 5.27: Seasonal distribution of collar data in the wetland areas.

5.4 WhatsApp Data

The WhatsApp data were observations reported by residents and visitors who joined the baboon alert group. The chat was exported from the group information of this social media platform and informed this research. POI were identified from colloquial location names and mapped in Figure 4.1. These POI were integral to the processing of the WhatsApp data as it allowed observations to become feature points with mappable coordinates. The data were filtered and processed, as described in Section 4.4.3, and 3 252 WhatsApp observations informed this study. The majority (96%) of the filtered data occurred in the urban area (n = 3 122) and 130 observations were located outside of the town. The latter observations included observations close enough to see from within the town and/or observations made by the baboon monitors when following the baboons (for example the Jeep track, Rooikransbos and Waldo's farm shown in Figure 4.1).

The locations reported via the WAG appeared to have a more widespread distribution when mapped. To quantify this Spatial Autocorrelation (Global Moran's 1) was used to determine the observations pattern, the outcome of which indicated the WhatsApp locations were random (z-score -0.79) while the data was clustered with a Nearest Neighbour ratio of 0.13. The 'voluntary' characteristic of the 'observers' reporting on the WAG meant that the coverage of the urban area was not necessarily even and the number of respondents per square kilometre was difficult to quantify as the reporting by residents was not necessarily made from one location. The primary location could have been where the observer lived but observations could have been made randomly whenever the baboons were seen. i.e. while out walking or visiting the CBD. This may have resulted in over and/or under reporting of baboon observations in the different areas of town. Thus, this tracking data was considered irregular – a term used by the University of Southampton (2021) and without a time interval (see Section 4.4.1) which allowed for multiple reporting of the same observation possibly skewing the distribution data. However, the data does provide a relative measure of high or low density observations of where the baboons were seen in town.

A hotspot map using the WhatsApp data was created using the ArcMap Spatial Statistical tool to identify the statistically significant hot spots and cold spots (Figure 5.28). This map shows a number of high density hotspots over a larger area of town compared to the collar hotspot map (Figure 5.19). These high density areas are expected as many of the observations on the WAG were made early in the morning or late in the afternoon. This is when the baboons would have been leaving or returning to the sleep sites shown in Figure 5.5.

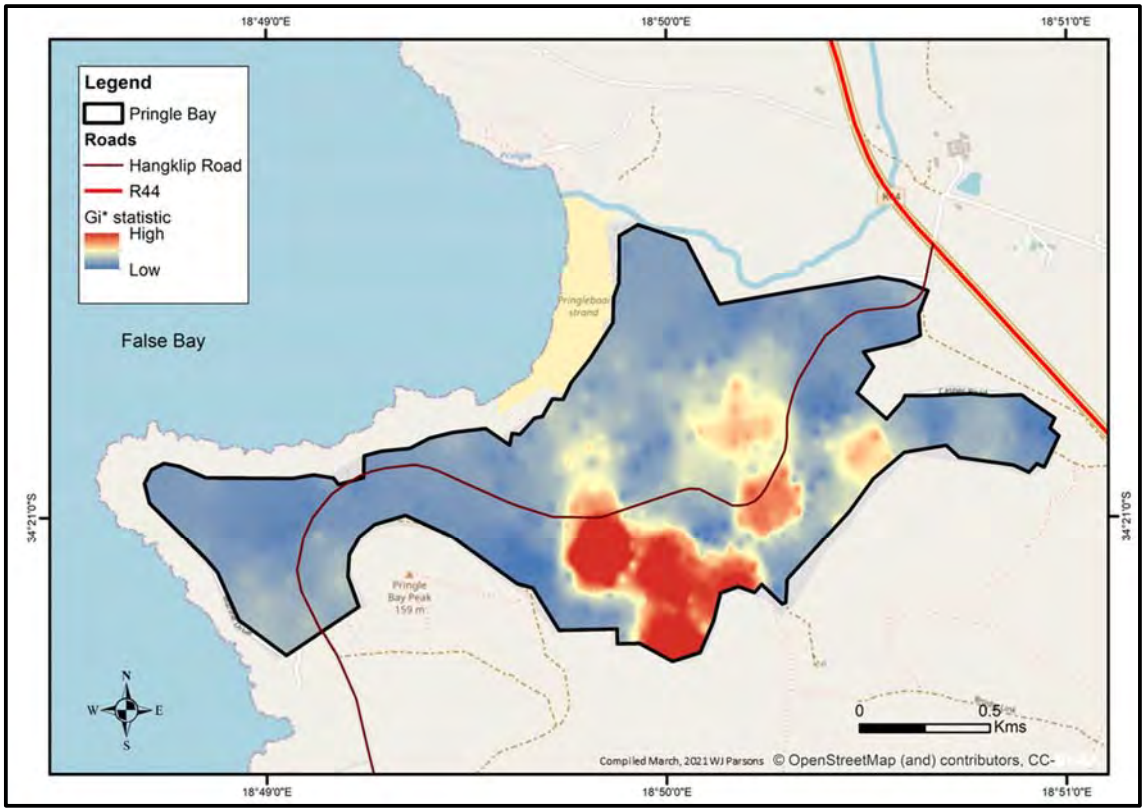

Figure 5.28: Hotspot map indicating hot and cold spots for the WhatsApp data.

The Kernel Density map of the WhatsApp observations (Figure 5.29A) indicating high (red) and low (green) density areas per km^2 was compared to the collar data Kernel Density map (Figure 5.29B). The high density areas in this map show a greater spread of where significant baboon activity was observed and reported on. However, the multiple reporting of the same sighting of a baboon, by a number of different residents in close proximity to one another (i.e. neighbours), could have led to over reporting.

The WhatsApp Kernel Density surface shows a higher density of observations north of Hangklip Road and on the Point area (Figure 5.29A) when compared to the collar data Kernel Density map of the urban area (Figure 5.29B). The WhatsApp observations north of Hangklip Road accounted for 42% (n = 1 292) of the total number of observations (n = 3 076) while the collar observations were 20% (n = 666) of the total number of observations (n = 3 279). The Point area had 8.5% (n = 52) of the WhatsApp observations compared to 1.78% (n = 58) of the collar data observations.

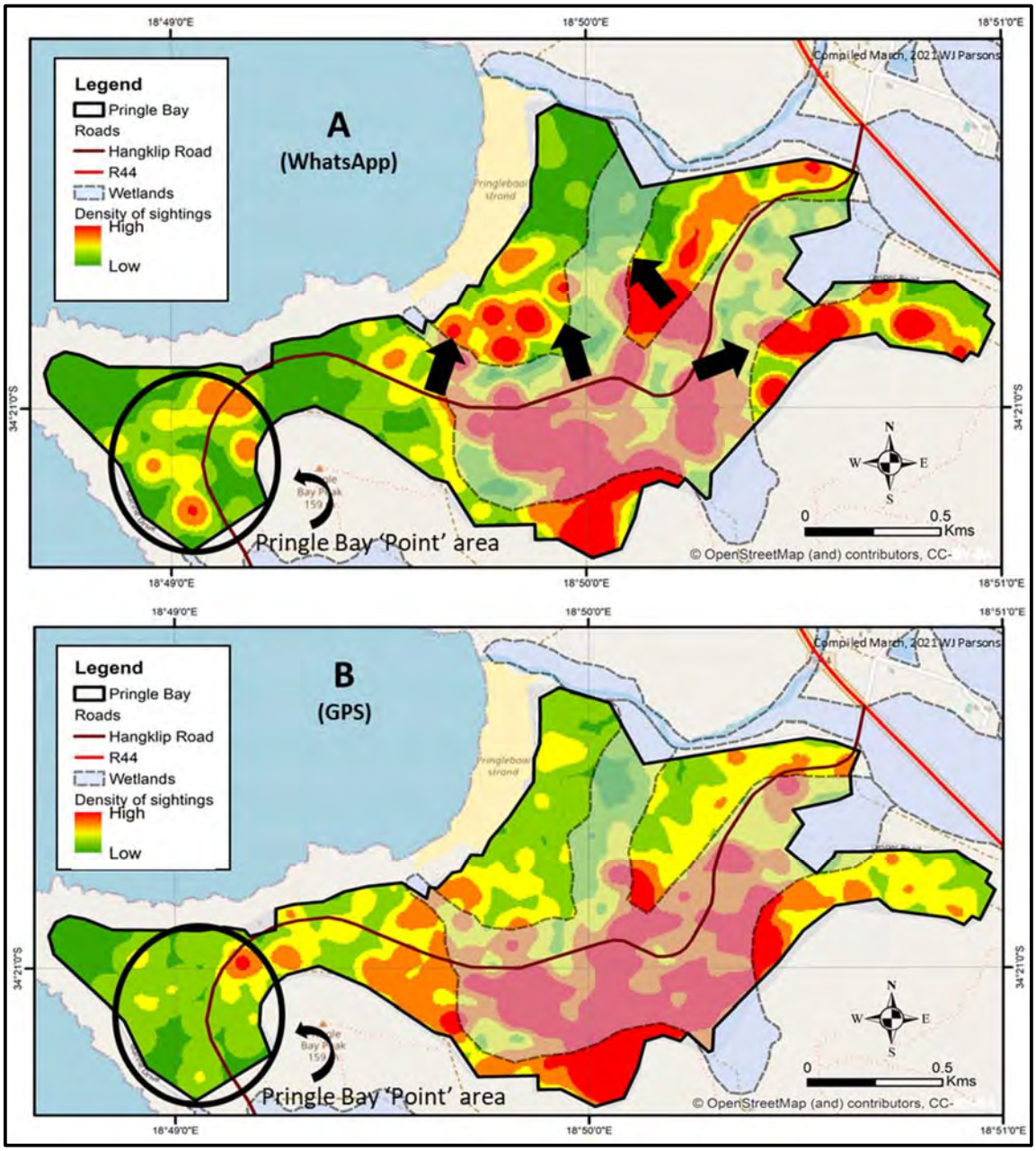

Figure 5.29: The Kernel Density map of the WhatsApp observations in the urban area (A) and the Kernel Density map of the urban collar observations (B).

In Figure 5.29A the arrows indicate the spread of the observations and the circle refers to the Point area. The wetland areas are shown in both maps and the high density areas (baboons per km^2) of the baboon sightings can clearly be seen to fall in the wetland areas of town, highlighting the baboons affinity for this area.

Apparent difference in the observations between the collar data and the WhatsApp data could be attributed to the following two reasons:

- The GPS collars recorded at 30 minute intervals while the WhatsApp observations were spontaneous. The former would have recorded a location when the baboon left the sleep site and then 30 minutes later when it was visiting the CBD area – this translates into two feature points generated over an hour. The WAG could have reported the same baboon's movements at multiple locations at shorter intervals resulting in far more locations being recorded.
- Two baboons from the Pringle Bay troop were fitted with GPS tracking collars out of a troop 15 -17 baboons which limited the hourly observations to four per hour. The WhatsApp had no such limitations i.e any baboon from the baboon troop was reported on when seen by a resident.

Similarly, the WhatsApp Kernel density map highlights the high density areas associated with the wetlands. The data analysis indicated 60% of all WhatsApp locations occurred in wetlands which was slightly higher than the 57% found in the collar data. However, both data sets corroborate that the baboons favoured the wetland areas within the town.

The WhatsApp observations were recorded primarily to warn the residents of raiding behaviour and as a means to inform the baboon monitors of where the baboons were. This was an aid to managing the troop in the urban area. However, the WhatsApp reporting often included a description of the baboons and their activities such as:

- Baboons were en route i.e. passing by on their way to another location;
- Foraging in natural fynbos and/or gardens;
- Socializing (playing or grooming); and
- Sometimes the age i.e. adult or juvenile male or female.

A review of the literature showed that VGI has a number of limitations, as evident in this research. The reliability of the data which recorded the actual sightings of the baboons was a concern that Senaratne et al. (2017) highlighted. The method to map this proved challenging and time consuming and was based on a number of assumptions discussed in Section 4.3.1. No test of accuracy as recommended by Goodchild and Li (2012) was possible.

VGI encourages public participation as described by Sieber (2008); and the WAG achieved that. It was fundamentally a warning system to alert the residents that baboons were in the neighbourhood. However, one unintended outcome, was that the WhatsApp data could verify where the baboons were when the GPS tracking collar system was not working. This is demonstrated in Table 5.5 where the WhatsApp data could be used to demonstrate that the baboons visited town and were seen at various locations during the three data gaps discussed in Section 4.3.2.

In summary, the WhatsApp data only tracked the baboons when they were in the urban area which amounted to only 18% of the time (based on the collar data). If it were the only data collection system available, it would not allow the baboons to be tracked for the majority of the time. However, the WhatsApp data did report human-wildlife interactions and behaviour of the troop. For this citizen-driven data collection methodology to be effective, the WhatsApp reporting needs to be well structured and disciplined (Elwood et al., 2012). Citizen science, in this case the WhatsApp observations, possibly does a better job of identifying human-wildlife conflict sites within the town despite the limitations mentioned above. The collar data on the other hand, represents the baboon distribution better in the non-urban range. Often this includes areas not accessible to field observations and usually where there is little human-baboon conflict.

An adapted citizen science approach, similar to Bannatyne et al. (2017), using the KoBo Toolbox to design a structured reporting system together with the ODK platform to download and store the collected data (Figure 2.12) could be adopted to track baboons. This would create an informed database using mobile phone technology and could be a cost-effective solution to gathering data on the baboon troop. This would also encourage the residents to play a role in the management of the baboon troop possibly reducing the perception and prejudices within the community towards the human-wildlife conflict. This approach was discussed by Sieber (2006) who maintained that a PPGIS approach in geography allows for engaged research where the community can play an important role.

Table 5.5: Verification of baboon presence when collar data were missing.

Data Gaps (collars)		WhatsApp observations	Reason for no data
1	10/08/2018 11/08/2018 12/08/2018 13/08/2018	Diagonal, Peak, Clarence, Diane & Lawrence Rds. Highlevel Road & Nature Reserve William, George, Caesar, Lawrence, Buffels, Ursula Rds., Waldo's farm & Hilton Circle Jally, Freda, Vivian, Hangklip, Peak & Pass Rds. & Clarence Dr	"The electronic monitoring system (BAAS) developed a problem yesterday, something with the network links in Pretoria" Mike Meyer - 10/08/19
2	20/11/2018 21/11/2018 22/11/2018 23/11/2018 24/11/2018 25/11/2018	Beachview Rd & CBD Beachview Rd & Nature Reserve Park & Diagonal Rds., Nature Reserve Carla Road CBD, Park, Diagonal, James and Beachview Rds. Park and Diagonal Rds	Unknown
3	06/02/2019 07/02/2019 08/02/2019 09/02/2019 10/02/2019 11/02/2019 12/02/2019 13/02/2019 14/02/2019 15/02/2019 16/02/2019 17/02/2019 18/02/2019 19/02/2019 20/02/2019 21/02/2019 22/02/2019 23/02/2019 24/02/2019 25/02/2019 26/02/2019 27/02/2019 28/02/2019 01/03/2019 02/03/2019 03/03/2019 04/03/2019 05/03/2019 06/03/2019 07/03/2019	Clarence Dr, Caesar & Stream Rds, Nature Reserve Nature Reserve, William & Oliver Rds, CBD CBD, Peak, William & Buffels Rds Caesar, Lawrence, Hangklip, George, Clarence & Diagonal Rds and Nature Reserve CBD & Hilda Crescent CBD & Dennys Rd Lawrence Rd & Clarence Dr CBD, Diagonal, Freda, Gully, Hangklip & Central Rds. Brodie Link, Diane & Park Rds CBD, Threeways, Hangklip, Zuya & Oliver Rds CBD, False Bay, Hangklip & Diagonal Rds Park & Buffels Rds, Hilton Circle, Hilton Crescent CBD, Beachview, Boundary & Jally Rds no baboons reported Hilton Circle, Hangklip, Caesar, Park & Highlevel Rds no baboons reported CBD, Highlevel, Hilda, & Park Rds CBD, Clarence Dr Hangklip, Dennys & Lawrence Rds, Hilton Circle Hilton Circle, William, Buffels & Hangklip Rds CBD, Jally, Freda, Peak & Crescent Rds no baboons reported Nature Reserve, Clarence Dr Caesar, Crescent, Dennys, Diane & Stream Rds Hilda Crescent, Hangklip & Park Rds., Clarence Dr Clarence Dr, Park and Crescent Rds William, Elizabeth & Diagonal Rds, CDB Diane, Clarence, Dennys & Caesar Rds. Beachview & Park Rds, CBD Hilton Circle, Beachview Rd	Female collar stopped working and was replaced on 07/03/19 “Only the female collar was working, the male collar stopped working on the 23/01/19 as reported. "Only one collar working - battery is dead on the male" Mike Meyer - 13/02/19 "Please note the monitoring system is not working at present and we are unable to track the troop" Robyn Lawson-Craig - 13/02/19

5.5 Conclusions

This chapter presented the findings pertaining to the historical perspective of human-wildlife conflict in Pringle Bay. The collar data was used to determine the baboon troop range and core area, sleep sites, habitat use, seasonal range use and urban patterns. The WhatsApp data, although confined to the urban area and qualitative in nature, corroborated the collar data and encouraged community

involvement in the management of the human-wildlife conflict. These findings and outcomes will be further discussed in Chapter 6 where the conclusions, limitations and recommendations of the study are presented.

CHAPTER 6: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 Assessment of Research Outcomes

The overall aim of this research project was to investigate the Pringle Bay baboon troop's spatial and temporal movements in relation to environmental factors. As a member of the Pringle Bay community and being involved with the Pringle Bay Baboon Action Group there was an opportunity to follow the data. The data available from the GPS tracking collars was a qualitative approach, however Cameron once said, "not everything that can be counted counts and not everything that counts can be counted" (1963, p13). By incorporating a citizen science approach, quantitative data was mined from the WhatsApp Alert Group observations which added value to understanding the baboons' movements in Pringle Bay. This mixed method approach, combined with the researcher's local knowledge and a geographer's sense of space allowed for engaged research to be undertaken while trying to address an emotive community problem. This was done in the framework of four main objectives and three research questions. The outcomes of the research in terms of these objectives and questions are considered below.

6.1.1 Review of objectives

Objective 1: To conduct a desktop study to develop an understanding of the human-wildlife conflict in a global and local context, with a focus on understanding the history of the baboon-human conflict and approaches used to manage it in Pringle Bay.

In order to address this objective, a range of literature sources were considered. In addition to more formal academic information, newspaper reports and anecdotal evidence provided by long-term residents contributed substantially to understanding the origins of the baboon-human conflict in Pringle Bay. The literature showed human-wildlife conflict is a global issue linked to numerous animal species. Population growth and the resultant loss of natural habitat are seen as key drivers together with human dominated ecosystems, forcing animals to adapt. Human waste and waste management plays a critical role in the urban habituation of baboons.

Baboon-human conflict is a subset of human-wildlife conflict. The Chacma baboon has adapted to a wide range of habitats, including fynbos. This vegetation is considered nutrient-poor. Described as

intelligent and opportunistic, the baboons forage from the rocky shores to the top of the mountains and play a role in seed dispersal.

Baboon-human conflict in Pringle Bay coincided with the initial development of the town, with the first reference to their presence dating back to the 1940's. Living close to nature in a landscape of beauty is considered important by many residents and the perception and attitude towards baboons initially lent towards one of coexistence. The baboon-human problems essentially manifested and escalated further with the provision of electricity and resulting accelerated growth of the town. The first documented baboon management plan was initiated by the Overstrand Municipality in 2002 and was supported by Cape Nature. This plan focused on the management of people and educating residents on living in a biosphere and taking responsibility for their own properties. It was well publicised that the feeding of wild animals was prohibited. Ten years later the focus changed to managing the wild animal rather than managing the residents. The PBRPA introduced baboon monitors to keep the baboons out of the town.

The literature showed that wildlife-human conflict can be described as a biodiversity conflict where the impacts are initially linked to the humans and the animal and then evolve to conflict between the humans over how to manage humans and wildlife. This is currently where the baboon-human conflict in Pringle Bay finds itself.

Objective 2: Source and compile a database of primary and secondary spatial and other data relevant to investigating the baboons and humans in the Pringle Bay area.

This objective was achieved through the sourcing of both primary and secondary data, which were used to compile a database for the Pringle Bay study area, as described in Chapter 4 and Chapter 5. Examples of the secondary geo-spatial data are listed in Table 6.1. Other secondary data collected in support of this research included:

- Population growth statistics from Census 2011, Overstrand Municipality information and various documented literature.
- Daily and monthly weather data obtained from World Weather 2019 and WeatherSA.
- Occurrence of fire
- Biodiversity of the study area

Objective 3: Map the locality data of the baboon troop and identify the environmental factors that influence the baboon's movements.

GIS was the tool used to achieve this objective. Two data sources (GPS tracking collar data and WhatsApp data) were used to map the location of the baboons over a two year period. Both data sets were used to create the geodatabase used in ArcMap. This allowed for a dynamic and multidimensional investigation when combined with the geography of the study area. Mapping the observation data helped demarcate the home range used by the baboons and was used to identify their sleep sites and consider what topography they favoured. The baboons were observed outside of the urban area 82% of the time. The area south of Pringle Bay was found to be their core range (50% percentile) where they spent the majority of the time in mountain fynbos (78.92%) rather than the low-lying areas of coastal plain fynbos (44.96%). Areas with a high density of data within the urban area were identified as hotspots where the baboons were frequently seen. These were generally close to the favoured sleep sites on the cliffs above Clarence Drive and Beachview Road and mostly fell within wetland areas (56.64%) which overall represent a small land cover of 19.33% of the total baboon range.

Table 6.1: Data layers and sources.

Online ArcMap Basemap layers used in ArcMap 10.7 for the research:
• OpenStreetMap - ©OpenStreetMap and contributors, Creative Commons Attribution-Share-Alike licence (CC-BY-SA). • 2 World Imagery: Source: ESRI, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.
GIS data layers used in creating the Pringle Bay maps:
• South African National Land Cover Data (2018). • Vegetation Map of South Africa, Lesotho and Swaziland (2018). • Geology Map (3418 BD). • Overstrand cadastral Map. • Aerial photographs. • Critical Biodiverse Areas (CBA): terrestrial and aquatic (rivers and wetlands) 2016. • Ecosystem Threat Status 2016.

Distribution patterns during the seasons remained relatively similar during the study period. Small variations were noted between the seasons such as the baboon observations increased in the area where they are known to forage on marine derived food in the summer of the second year.

While initially there was a perception that the baboons were impacted by the fire in January 2019, the data indicated otherwise. There was a marked increase in activity to the north during the winter after the fire, but this appeared to be related to a possible territorial dispute with the neighbouring Hangklip troop. Weather conditions could not be identified as an environmental factor influencing where the baboons were found. Only two urban areas were correlated with weather influences. The Point area (Hotspot 3) was visited in the winter when the north-west wind blew and it was raining. Hilton Circle and Hilton Crescent (Hotspot 6) were visited in autumn when the east or north-easter winds were blowing.

Objective 4: Develop a conceptual model to understand the relationship between the baboons and their environment.

At the start of this research, it was envisaged that a conceptual model predicting the movement of the baboons would be developed. However, no discernible distribution or seasonal weather patterns were conclusively identified. It was noted that the baboon hotspots in the urban areas were all close to their sleep sites. Observations inside town noted that the baboons were either moving through the area, socializing or foraging and raiding when the opportunity arose. The lack of specific environmental drivers dictating the troop's movement resulted in the development of the conceptual model not being pursued.

6.1.2 Research questions

Three research questions were based on the initial literature review and provided a framework within which to conduct the research. A brief summary is given in answer to each question showing what was interpreted from the data.

Question 1: The range of the baboons includes the urban area, but do the baboons spend most of their time outside of the town.

The research showed that the 13 km^2 range of the Pringle Bay baboon troop included 2.3 km^2 of urban area. Some 82.1% of the observations were outside of the town, leading to the conclusion that the baboons are only in town 17.9% of the time. When in town they were observed 56.6% in wetland areas, which have now been developed and modified. The home range was defined using the 95% percentile which covered 9.42 km^2. The core area defined as where the baboons were found 50% of

the time, was much smaller with a mean area of 1.29 km^2. The data showed that the baboons are not in town at night and were mostly observed early morning or late afternoon in the urban area.

Question 2: The Volunteered Geographic Information (reported on the social media WhatsApp platform) is credible to identify locations of the baboons while in the town.

The research identified that the WhatsApp observations can be used to identify the location of the baboons when seen in town. The WAG group was never intended to be a data source as it was set up as a warning system by the PBRPA to alert the residents to the whereabouts of the baboons as a management tool. However, this public information was mined, providing data that once filtered and processed was valuable in tracking the baboons. While the baboons may have been observed 17.94% in town, the WhatsApp information provided insight into the daily behaviour of the troop which were often seen to be en route, socializing and foraging in natural fynbos or gardens – highlighting that the baboons did not 'raid' every time they were seen in the urban area. However, the credibility of the data was not measured and the resultant bias due to over- or under-reporting was not determined.

Question 3: The movement of the baboons is seasonal and habitat based.

The research showed no discernible seasonal patterns that influenced baboon movement in and around Pringle Bay. However, the observations could be linked to the habitat. The baboon sleep sites were all elevated and on cliff faces and that they spent the majority of their time in the mountain fynbos. The troops core area of the home range was small with slight shifts between seasons noticeable. However, the baboons had access to water all year round and favoured a dense thicket of alien vegetation (Rooikrans) which was located in the core area. Much of the baboon activity was in close proximity to their sleep sites, but they venture into the town and the low-lying areas during the day to source food. This study occurred during a drought and after a fire in the study area, neither of which impacted the baboon troops range according to the data.

6.2 Conclusion

Documenting human-wildlife conflict that has taken place in the last twenty years provided context to the perceived problem and management of the Pringle Bay baboons. Increased urban development and population growth of Pringle Bay has seen a parallel increase in human-baboon conflict. Feeding of wild animals and household waste management were highlighted as ongoing problems. However,

the primary objective of this research was to develop an understanding of where the baboons can be found in Pringle Bay and surrounds. With biogeography being fundamental to understanding the geographic distribution of animal species, combined with a geographical approach to quantifying a sense of space using traditional tool such as maps, which were created using GIS. This led to a dynamic and multidimensional understanding of the troops movement from a geographical perspective:

- **Why** are the baboons located where they have been tracked?

  All baboon observations occurred within a range of 13 km^2. The home range was smaller and considered to be the area where the baboon troop eat, sleep and procreate. The core area, where they spent 50% of their time, covered a smaller area of 2.4 km^2 and included part of the southern urban edge and the Hangklip/Brodie Link Nature Reserves. Four of the eight sleep sites occurred on the steep slopes of the Hangklip mountain within this core area. The Heuningklipkloof stream and wetland areas were sources of water and the valley provides a refuge from the weather. The home range is not considered to be permanent, thus understanding their use of their habitat will allow some predictability of their movement.

- **What** does the spatial distribution tell us about the environment?

  The baboons spent 82% of their time outside the town in their natural habitat, mostly in the Hangklip Nature Reserve. They preferred the mountain fynbos vegetation where they spent the majority of their time (79%) but they did venture into the coastal fynbos and urban area. When in the urban area, they were mostly attracted to the wetland area (57%) and the hotspot southeast of town stretching from the CBD south of Hangklip Road to Beachview Road and the Hangklip Nature Reserve. Residents living in these area should take precautions to baboon-proof their homes and manage their waste using baboon-proof bins in order to reduce opportunistic baboon behaviour.

  The baboon distribution showed slight seasonal variations. Winter had the largest variation while autumn the smallest. This is possibly related to the availability of food. The baboons visited the area north of the Buffels River and slept at Sleep Site 8 on the slopes of Tweesusters mountain for approximately twelve days in winter of 2018. This is thought to be the result of a territorial dispute with the neighbouring Hangklip troop. The January 2019 wildfire had no observed impact on the baboon's movement No discernible patterns were linked to the

weather and the local perception that the baboons left the area for extended periods of time was shown to be inaccurate for the study period. The WhatsApp data provided valuable information on their whereabouts when the GPS collar system was not operating.

- **How** has man impacted the distribution?

The land use of the study area is characterized by natural habitat, wetlands, nature reserves and urban development. The urban area has reduced the natural habitat of the study area by 18%. Garden landscaping has resulted in exotic plants (palm trees, fruit trees and kikuyu grass) being planted, similarly indigenous but not necessarily endemic fynbos plants have been introduced (*Syzgium cordatum*) and vegetable gardens established. The baboons are attracted to this vegetation and were often reported on the WAG to be "garden foraging." The natural vegetation of the lowlands provides perennial plant species which are part of the baboon's natural diet and they have been seen to feed, for example, on *Chrysanthemoides monilifera* (bietou) , pelargonium and species of searsia.

Food provisioning by residents who fed wildlife (porcupines, birds etc.) and poor waste management by residents, businesses and the Overstrand Municipality all provided opportunistic urban foraging. The baboons are opportunistic by nature and while they have enough natural food, they come into the town to eat high calorie food. This habituation has resulted in raiding behaviour which, in turn, has led to the troop being considered semi-wild.

The baboon troop has been monitored since 2013 to keep them out of the urban area. This has impacted on their daily activities. However, this management action aimed to prevent them gaining access to human-derived foods, to stop their raiding and to keep them safe from harm (dogs, residents shooting at them and road accidents etc.), healthy and unhabituated. Wild baboons are considered to play a critical role in maintaining the biodiversity of an area.

- **At what scale** does loss of habitat impact the animal?

The urban area comprises 18% of the baboon's range. The urban wetlands, described as an important ecological corridor, have largely been destroyed by artificial drainage and channelizing associated with urban development. The baboons visited this area 57% of the time they spent in the town.

For most of the time (82%) the baboons were located outside of the urban area in the natural fynbos, parts of which have thickets of alien vegetation on which the baboons feed. The study area is largely natural fynbos in protected areas (Cape Nature reserves). The footprint of the urban area has not increased in the past two decades but has densified. The risk of further natural habitat loss is considered low. However, the increase in population over the last twenty years has coincided with the increase in human-wildlife conflict in Pringle Bay.

- **What is the importance** of the human-wildlife conflict on the social, economic and natural environment of Pringle Bay?

  Human-wildlife conflict in Pringle Bay was first documented twenty years ago. The baboons were attracted to the waste site on the R44 and habituation to human-derived food. The Overstrand Municipality in 2002 initiated the first baboon management program encouraging property owners to baboon-proof their properties and to manage their household waste responsibly. This coexistence approach has since changed to one where the baboons are managed. Overstrand Municipality now declares animal problem areas and the strategic baboon management program mandates that baboons are kept out of the urban area 100% of the time. The economic cost of this program in 2019 for the Voelklip (Hermanus) and Pringle Bay troops was R 2.6 million.

  Pringle Bay falls in the critical southern coastal transition zone of the Kogelberg Biosphere and urban development poses a significant threat to the biodiversity of the area. Baboons are recognised to play an important role in the ecosystem where they are the largest mammal seed disperser. The impact of relocating a troop on the biodiversity of an area is unknown and experts consulted acknowledge there is a gap in our knowledge on this topic. They recommend retaining all natural components of the ecosystem and highlighted the importance of not dictating the baboon movements outside of the urban area. Considering that Pringle Bay falls within a Critically Biodiverse Area and that the ecosystem status is considered Critical for the mountain fynbos and Endangered for the coastal fynbos, management of the baboons could impact the area surrounding the town.

This research has added new knowledge regarding the movement of the Pringle Bay baboon troop. Both the GPS collar and WhatsApp tracking methods successfully informed the study. GIS and the

associated spatial analyst tools were used to map where the baboons were found. The home range and core areas were identified and habitat use was quantified. Spatial analysis was used to identify that the baboons were observed outside of town 82% of the time and highlighted that they ventured into the urban area in the late afternoon. While no overall pattern was found linking the weather to their movement, both hotspots and sleep sites were identifiable. The outcome of the research on the movement of the Pringle Bay baboon troop provides a knowledge base from which current and future management of the baboons can be compared. The use of a mixed method approach, where both quantitative observations by the residents and qualitative data of the GPS tracking collars, provided valuable input into understanding an emotive baboon-human conflict in Pringle Bay. My local knowledge and observations of the Pringle Bay baboons since 2011 was valuable to the engaged research approach taken to understand the troops movements between October 2017 and July 2019.

6.3 Research Limitations

Shortcomings identified during the research included that the daily routes and distances travelled by the baboons were not calculated. GIS tracking analyses could have been used but was beyond the scope of this study. No distinct geographical or environmental drivers emerged from the research to inform a conceptual model to predict the movement of the baboons. Sleep sites and hot spots were identified, but specific movement or patterns were not found.

The WhatsApp data provided a tool to track the baboons when they were in the town. This equated to 18% of observations. If it had been the only data source, the WhatsApp data would not have allowed the baboons to be tracked for most of their day when they were outside the urban area. However, the WhatsApp data did corroborate that the baboons were seen in Pringle Bay during the three periods during this study when the GPS tracking system was not operational. Nonetheless, this citizen science approach added valuable data and was able to identify human-wildlife conflict sites within the town, albeit with limitations.

6.4 Recommendations

Monitoring of the baboons should continue. The baboon monitoring and management has, since the completion of the study, been incorporated into a new management plan. Since November 2020, the Pringle Bay baboon troop has been relocated north of the R44, which is outside the range identified in this research. Ongoing education around human-baboon conflict is critical to the success of any

human-wildlife conflict management program as it is dependent on residents being aware of the baboons, aware of how to baboon-proof their homes and how to manage their household waste. The probability of the Pringle Bay troop returning or another troop filling the void is high given the outcomes of other baboon management studies.

If VGI from the residents is used going forward, the chosen platform needs to be structured and community participants properly instructed how to report their observations. Strong administration is required to reduce the noise and geotagging should be mandatory to reduce the processing of the data. However, citizen science can play a valuable role as a monitoring tool and can also create awareness among the affected communities, highlighting patterns of animal behaviour and what is attracting them to certain parts of town.

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Appendix A

Baboon management in Pringle Bay:

PBRPA 2017 notice: Pringle Bay virtual fence baboon monitoring system

Cape Nature Permit: CN43-29-6748 July 2017: Pringle Bay baboon monitoring program – to capture and collar two baboons for monitoring purposes.

Human Wildlife Solutions GPS tracking collar information

PRINGLE BAY RATEPAYERS' ASSOCIATION

PRINGLEBAAI BELASTINGBETALERSVERENIGING

SARS Reg. 9101/138/16/3
PBO 930013685
NPO Reg. 214-205

www.pringlebayratepayers.co.za

P O Box 409, Pringle Bay, 7196 / Posbus 409, Pringlebaai, 7196

Chairman / Voorsitter: chairman@pringlebayratepayers.co.za / Tel: 083 556 3345

PRINGLE BAY VIRTUAL FENCE BABOON MONITORING SYSTEM

Supplied by Human Wildlife Solutions (HWS) July 2017

1. Background

Following the withdrawal of municipal support and funding of the Pringle Bay(PB) baboon monitoring programme a decision was taken to continue with a community funded process employing a skeleton team of trained monitors from the local Mooiuitsig community. Advice and guidance was obtained from Professor Justin O'Riain (U.C.T Baboon Management Research) and Cape Nature to deploy the tracking component of the HWS Virtual Fence system to facilitate the monitoring process by providing accurate knowledge of troop location and movement patterns. The effectiveness of the system was evaluated onsite in the Kogel Bay / Steenbras Reserve behind Gordon's Bay. Cape Nature granted permits for the PBRA to conduct the monitoring process and deploy relays in the Kogelberg Reserve.

2. Radio Network

2.1 Three relay stations mounted as follows:

180 degree South facing relay sited on mountain ridge North of PB village

270 degree central West facing relay sited on mountain ridge East of PB village within line of site of the other relays and the Internet Gateway

270 degree South facing relay sited on Pringle Peak mountain ridge South of PB village overlooking Hangklip Valley / Skilpadvlei

2.2 Internet Gateway.

The Gateway interacts with the relay stations to receive and transmit signals to and from the baboon collars and also operates as a relay station. It interacts via a cellphone network with the internet based tracking system operated by HWS. It was originally used in place of the South relay but the need to periodically reboot the network SIM card required a location that provides easier access for servicing. It is best located in the Pringle Point area to eliminate blind spots around Pringle Peak and the Hangklip Hotel.

3. Baboon Collars

Location signaling collars are fitted to the alpha male and female baboons. Collar specifications are superior to international standards set for animal research. They are generally set to emit a location signal every 30 minutes and store a location log for several days until acknowledgement is received from the Gateway. In the event of network downtime the Gateway starts to retrieve data from the collars as soon as live signal is detected. Online settings and program updates can be made to the collars through Gateway interaction.

4. Online Web Application

Access to tracking data is provided through a secure online application that enables a user to select and display graphic and spreadsheet reports by collar, date and time ranges.

Dave Muirhead (Chairman PBRPA, 2017)

Western Cape Province

Telephone No: (027) 021 483 0000
E-mail: permits.fax@capenature.co.za
PGWC Shared Services Centre
cnr Bosduif and Volstruis Streets
Bridgetown
7764

Facsimile No: (027) 0865507734
Internet: www.capenature.co.za
Private Bag X29
Gatesville
7766

PERMIT TO
HUNT WITH PROHIBITED HUNTING METHOD OF WILD ANIMALS

Issued in terms of the provisions of the Nature Conservation Ordinance 1974, (Ord 19 of 1974)(Section 27, 29, 33 & 47A)
Not Transferable

HOLDER

Full Name:	Mr. DH Muirhead	**Identity No:**	4802195103084
Trade Name:	Pringle Bay Ratepayers Association	**Registration No:**	
Postal Address:	PO Box 409	**Physical Address:**	Pringle Bay area
City / Town:	Pringle Bay	**City / Town:**	Pringle Bay
Province / State:	Western Cape	**Province / State:**	Western Cape
Country:	South Africa	**Country:**	South Africa
Postal / Zip Code:	7196	**Longitude:**	
		Latitude:	

In terms of and to the provisions of the abovementioned Ordinance and the Regulations framed thereunder, the holder of this permit is hereby authorised to Hunt (capture/disturb/stam/pedorkill) the protected / endangered wild animal(s) specified below on the property mentioned on this permit. See conditions on last page.

DETAILS

Permit / License No:	CN43-29-9748	**Stamp:**	CapeNature FAUNA • FLORA • HUNTING • CITES
Expiry Date:	19/11/2019		
Date Issued:	20/11/2018		
Amount Paid:	R 0.00		
Reference:			
File Code:	1/2/1/6/3/1/L13(a)		

DESCRIPTION	PROPERTY
Organization:	Pringle Bay Ratepayers Associa
Full Name:	Mr. DH Muirhead
Identity Number:	4802195103084
Postal Address:	Pringle Bay area
City / Town:	Pringle Bay
Province / State:	Western Cape
Country:	South Africa
Postal / Zip Code:	7196
Longitude:	
Latitude:	

SPECIES (SCIENTIFIC NAME)		QTY	NOTE
Chacma Baboon	(Papio ursinus)	2	Conditions apply note special conditions

D Kleinhans 20/11/2018

Issued By:	Approved on Behalf CEO	Effective Date:	Signature of Holder:
Daniella Kleinhans	Western CapeNature Conservation Board		I acknowledge, accept and understand fully the permit conditions as described

STANDARD CONDITIONS

1. When the holder of this permit *kills/captures/collect any wild animal in terms thereof, he shall, before leaving the abovementioned property, or if he does not leave it, after each day's hunt/capture/collection, record the particulars regarding the date, species and number of each sex of each species, or if it is impossible to distinguish the sex, the total number of each species of such wild animals which he has *killed/captured/collected.
2. The holder of this permit shall return it to the Chief Executive Officer: Western Cape Nature Conservation Board, Private Bag X29, Gatesville, 7766, within 14 days of the date of expiry thereof.
3. THIS PERMIT IS SUBJECT TO THE SPECIAL CONDITIONS AS SET OUT IN THE ADDENDUM HERETO.

SPECIAL CONDITIONS

This permit is issued subject to the following special conditions:

1. Hunting methods allowed with this permit:
a) Cage trap - the use of cage traps is to expressly trap and collar TWO baboons only for monitoring purposes
b) Bear bangers
c) Pepper balls (spray)
d) Paintball markers (guns)
d) Firearm discharging only non-lethal projectiles (i.e. pepper shot)
e) On or from a public road
f) On or from a motor vehicle

2. This permit does not allow the holder to track / collar / hunt baboons in areas for which he has not gained a permit and written permission from a landowner.
3. This permit does not authorize the holder to hunt any species which is not listed on the permit.
4. This permit may also be used by Dr P Richardson - ID: 5307115113080 and the personnel of Human Wildlife Solutions subject to the same conditions listed in this permit.
5. Everyone using this permit is subject to the Paintball Marker Standard Operating Procedures to be signed by the permit holder.

CHIEF EXECUTIVE OFFICER

HUMAN WILDLIFE SOLUTIONS
specialists in wildlife management services

GPS TRACKING COLLARS

Wildlife GPS tracking collars allow wildlife managers and farmers to accurately monitor animal movements. These data inform management decisions on a multitude of levels, with overarching implications. HWS recommends using GPS tracking collars to manage damage causing wildlife, especially in conjunction with the virtual fence.

HWS, and partners Sensorian, have developed a novel system of wildlife collars that compete with leading GPS technology. HWS collars are tailor-made wildlife collars which gather and store GPS positions. Our collars are low-powered and consequently the HWS GPS collar can transmit more data (up 10 times more than traditional GPS collars) and still have a long battery life (up to 2 years transmitting every 30 min). The collar allows animals' movements to be accurately monitored in real time. Adding collars to the system is inexpensive and the system becomes more cost-effective with each collar added. The collars are also refurbishable, meaning they can be re-used at a significantly reduced cost.

Data from the collars as well as geo-fence alerts can be managed and viewed on the Sensorian web-based platform. To get more information or to see a Sensorian demo click here.

HUMAN WILDLIFE SOLUTIONS
specialists in wildlife management services

- Longer battery life at a higher sample rate (10x more samples).
- Collars are refurbishable.
- Near real-time coverage, that can be user specified
- User-specified geo-fence alerts.
- Manufactured with a strong and durable textile exterior and soft leather inner lining.
- Adaptable to fit a wide variety of species.
- Ability to collar multiple species, that all link to one gateway.
- Cost effective, especially for collaring multiple animals.
- Remotely monitor animal movements.
- Receive Geo-fence linked alert messages.

HUMAN WILDLIFE SOLUTIONS
specialists in wildlife management services

The potential applications of these collars are far reaching, and can include:

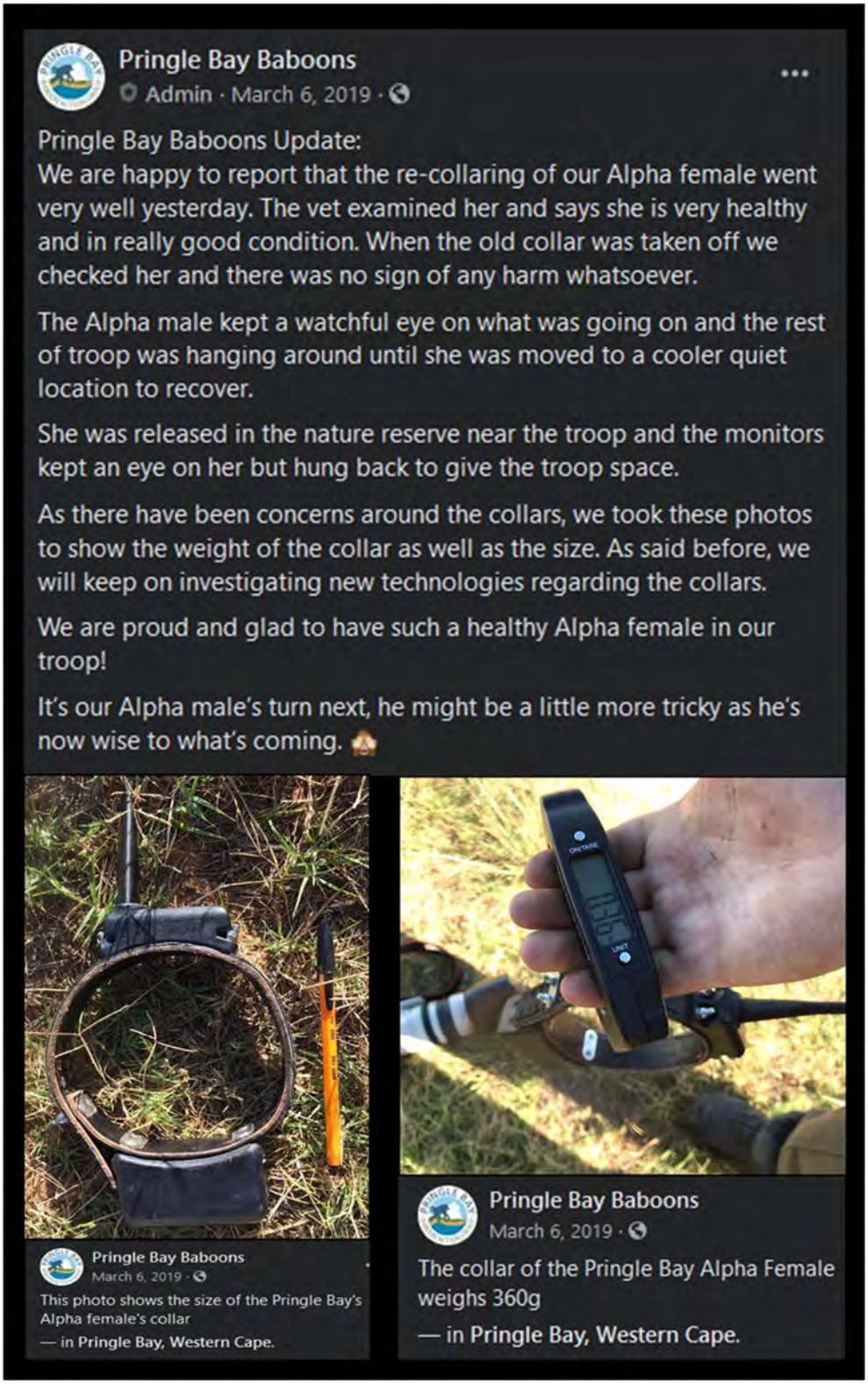
- Gathering valuable animal movement data for research and management applications.
- Gathering fine scale movement data for accurate and specific movement analyses.
- Tracking real time livestock movements for management.
- Predator tracking for the prevention of livestock loss.

For more info contact HWS.

Source: Collar data information downloaded from Human Wildlife Solutions on 5 July 2019

https://hwsolutions.co.za

Tracking collar information as shared on the Pringle Bay Baboon Facebook page on 6 March 2019 when the alpha female baboons collar battery was replaced by HWS.



Source: Pringle Bay Baboons Facebook page (downloaded 5 February 2021)

https://www.facebook.com/photo/?fbid=729453471256904&set=p.729453471256904

Appendix B

National Geographic infographic

What is geography?

RESOURCE LIBRARY | INFOGRAPHIC

NATIONAL GEOGRAPHIC

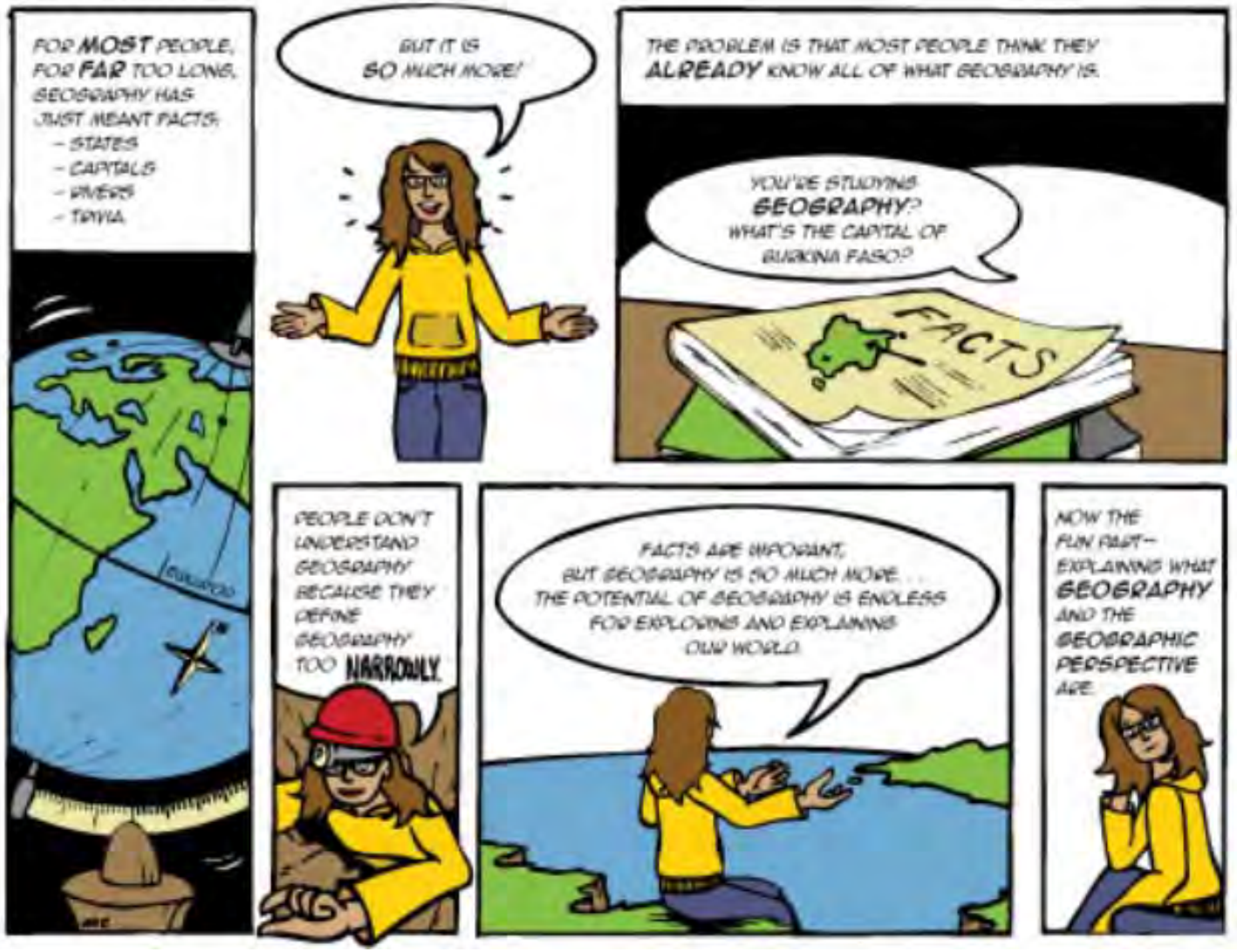
What is Geography?

Geography: setting the record straight.

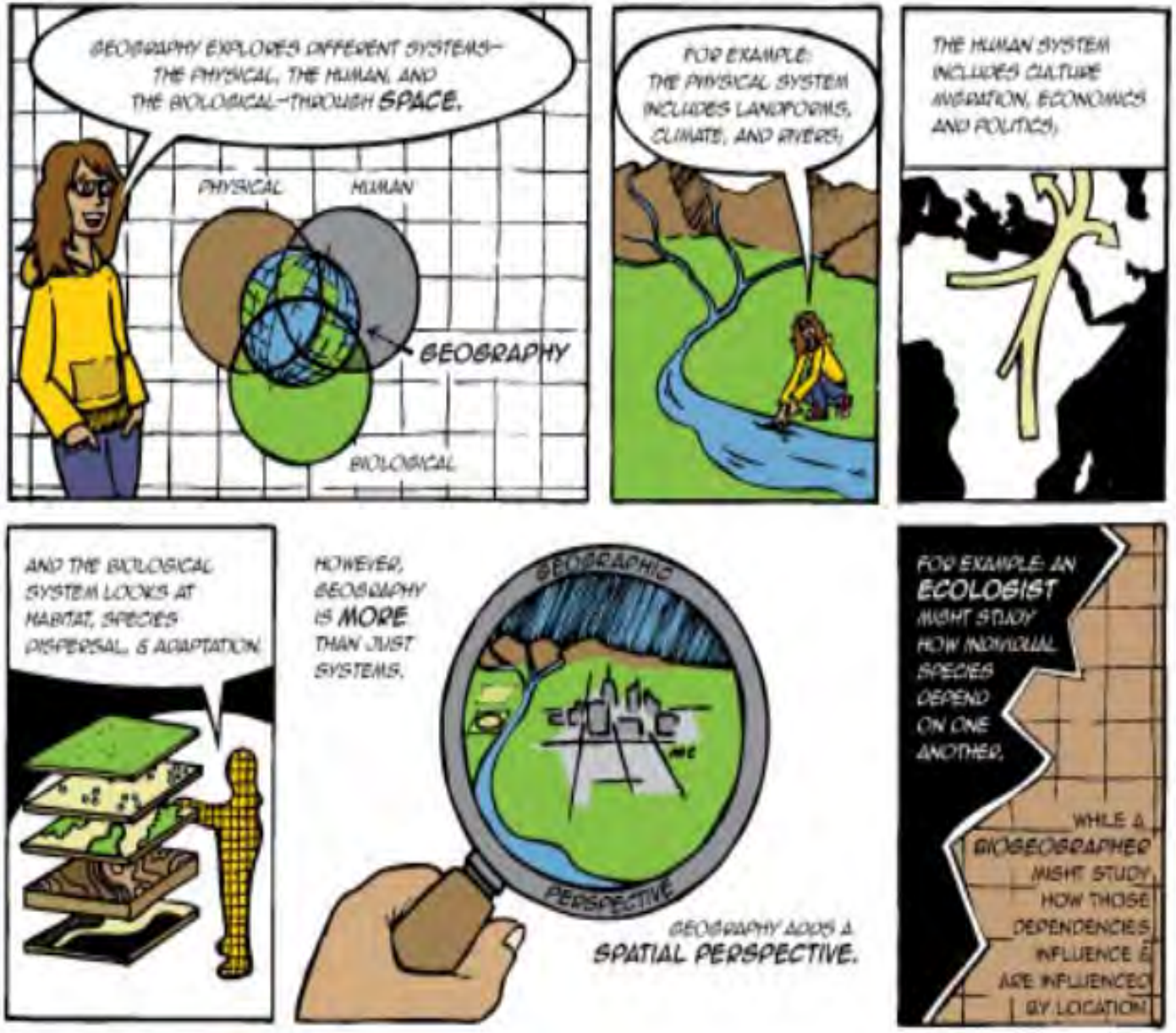
WRITTEN AND ILLUSTRATED BY
MARY CROOKS

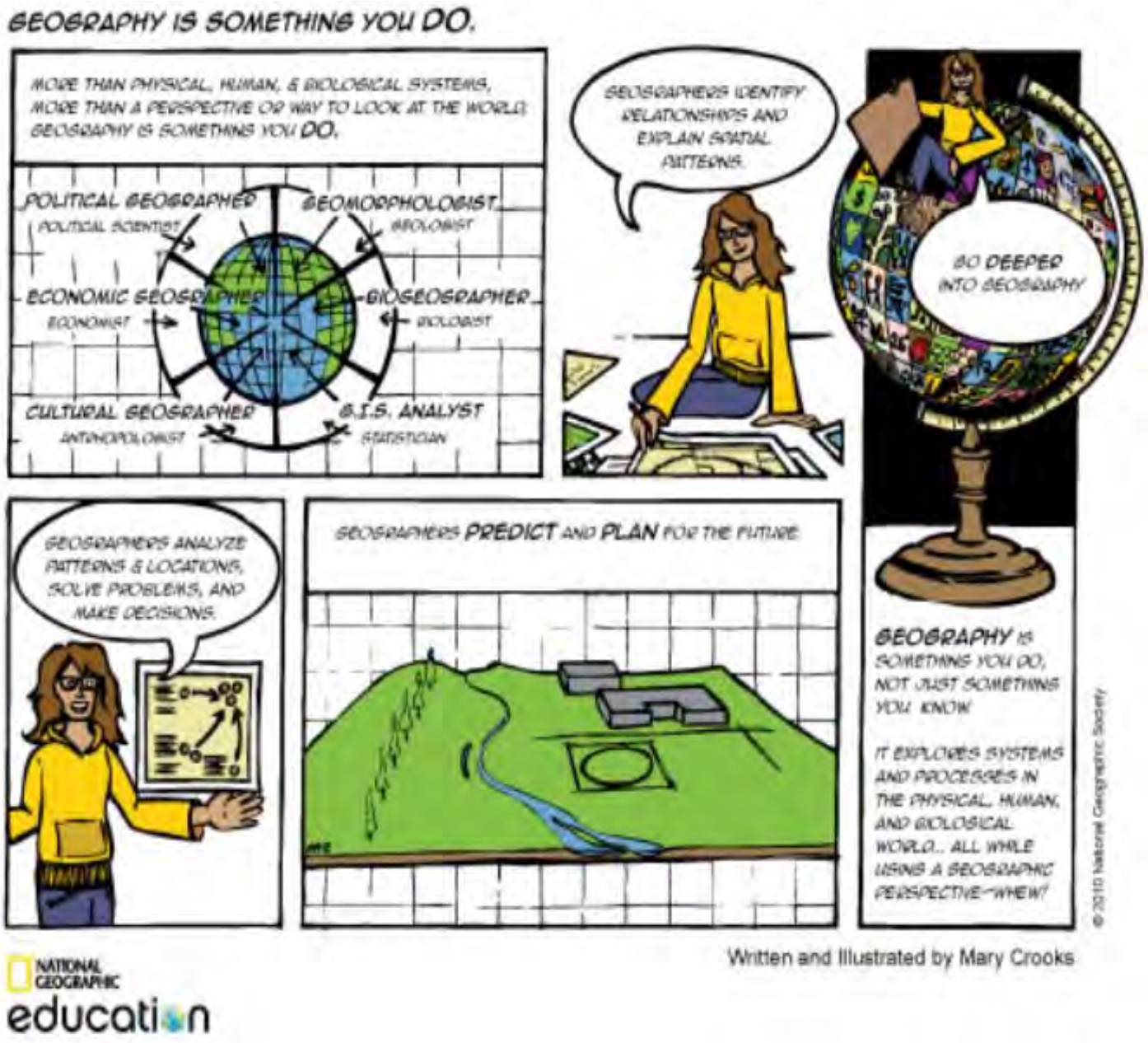
WHAT IS GEOGRAPHY?

MISCONCEPTIONS



GEOGRAPHY HELPS YOU UNDERSTAND HOW THE WORLD WORKS.





https://www.nationalgeographic.org/media/what-geography/

Appendix C

Pringle Bay Rate Voluntary Community Firefighters:

Fire record for Rooiels, Pringle Bay and Betty's Bay from 2006 – 2019

Pringle Bay Volunteer Community Fire Fighters

Enquiries / Navrae:

Please address all correspondence to: P.O.Box 14, Pringle Bay, 7196
Rig asseblief alle korrespondensie aan: Posbus 14, Pringlebaai, 7196
Clayton Francis
Telephone / Telefoon / Fax: 028 273 8371
Cell: 072 129 9788
Email: rockyct@telkomsa.net

Hi Jenny,

Hope all is well and that this can be of value to you. Just to put in perspective I have only included Bettys bay, Pringle Bay, Rooi Els and the small holdings in our area alongside the R44.

2006		
14/01/2006	Bush fire	Pringle bay
09/12/2006	Bush fire	Hangklip
2007		
18/01/2007	Bush fire	Seafarm
19/01/2007	Bush fire	Seafarm
23/06/2007	Bush fire	Rooi – Els
25/06/2007	Bush fire	Pringle bay
2008		
01/01/2008	Bush fire	Pringle bay
09/01/2008	Bush fire	Bettys bay
15/01/2008	Bush fire	Bettys bay
28/04/2008	Bush fire	Pringle bay
01/05/2008	Bush fire	Pringle bay
06/05/2008	Bush fire	Bettys bay
08/05/2008	Bush fire	Bettys bay
18/10/2008	Bush fire	Pringle bay
20/11/2008	Bush fire	Pringle bay
2009		
27/01/2009	Bush fire	Rooi – Els
07/02/2009	Bush fire	Small-holding on R44 between Rooi-Els and Pringle bay
24/12/2009	Bush fire	Bettys bay
2010		
14/02/2010	Bush fire	Small-holding on R44 between Rooi-Els and Pringle bay
23/03/2010	Bush fire	Pringle bay
20/08/2010	Bush fire	R44 road side
04/09/2010	Bush fire	Small holding between Pringle bay and Bettys bay
12/09/2010	Bush fire	Pringle bay
31/10/2010	Bush fire	Pringle bay
2011		
17/05/2011	Bush fire	Rooi – Els
28/08/2011	Bush fire	Pringle bay

2012		
01/01/2012	Bush fire	Pringle bay
06/01/2012	Bush fire	Pringle bay
2013		
13/01/2013	Bush fire	Small- holding between Pringle bay and Rooi – Els
14/01/2013	Bush fire	Small – holding between Pringle bay and Rooi – Els
16/01/2013	Bush fire	Small- holding between Pringle bay and Rooi- Els
28/01/2013	Bush fire	Hangklip slipway
30/03/2013	Bush fire	Rooi – Els
2014		
28/02/2014	Bush fire	Rooi – Els
03/04/2014	Bush fire	Pringle bay
06/05/2014	Bush fire	Water plant Buffels river
2015		
11/01/2015	Bush fire	Bettys bay
01/02/2015	Bush fire	Pringle bay
08/02/2015	Bush fire	Kleinmond
17/02/2015	Bush fire	Pringle bay
28/02/2015	Bush fire	Bettys bay
02/03/2015	Bush fire	Bettys bay
04/03/2015	Bush fire	Bettys bay
06/03/2015	Bush fire	Pringle bay
2016		
05/01/2016	Bush fire	Pringle bay
06/06/2016	Bush fire	Bettys bay
19/11/2016	Bush fire	Pringle bay
18/12/2016	Bush fire	Bettys bay
19/12/2016	Bush fire	Bettys bay
2017		
01/01/2017	Bush fire	Pringle bay
03/01/2017	Bush fire	Kleinmond
08/03/2017	Bush fire	Arabella
20/01/2017	Bush fire	Bettys bay
20/02/2017	Bush fire	Pringle bay
27/02/2017	Bush fire	Kleinmond
05/03/2017	Bush fire	Bettys bay
19/03/2017	Bush fire	Rooi-Els
17/09/2017	Bush fire	Bettys bay
09/12/2017	Bush fire	Pringle bay
10/12/2017	Bush fire	Bettys bay
2018		
11/11/2018	Bush fire	Bettys bay
2019		
01/01/2019	Bush fire	Bettys bay
01/01/2019	Bush fire	Glenn Graig
02/01/2019	Bush fire	Bettys bay
10/01/2019	Bush fire	Pringle bay
07/02/2019	Bush fire	Bettys bay
30/10/2019	Bush fire	Bettys bay

CLAYTON FRANCIS
STATION COMMANDER: PRINGLE BAY
PRINGLE BAY VOLUNTEER COMMUNITY FIRE FIGHTERS

Appendix D

Media report on Pringle Bay and Betty’s Bay 2019 fire

Opinionista · Tony Weaver · 10 January 2019

Runaway Overberg fire started by a flare caused rejuvenation and scorched earth

The New Year fire in the Overberg burnt a fynbos area that needed a good burn, but also burnt areas that have burnt too often, and haven't yet recovered from recent fires. That is where the real ecological damage will happen.

Tony Weaver

Follow Save More

Tony Weaver is a freelance photo-journalist, environment writer, columnist and editor.

As the clock struck midnight and 2018 became 2019, some idiot in Betty's Bay fired a flare.

Throughout most of New Year's Day, the fire the flare started burnt high in the mountains, with the Working on Fire choppers and ground crews containing it as best they could. We commented that as fires went, this was a "good fire", burning an area that hadn't burnt for years and needed rejuvenation.

On *Tweedenuwejaar* (2 January), the wind changed from west to east-south-east, and a vagrant tongue burning high in the reserve eluded the fire crews. The wind picked up and became too strong for the choppers to fly.

View from the main road, the house completely obscured by fire. Jan 3 2019, 8.15am. Photo: Tony Weaver

Our family home sits on 12 hectares of fynbos neighbouring the Kogelberg Biosphere Reserve between Pringle Bay and Rooi Els, and is one of the original portions of the farm, Hangklip.

My parents bought it nearly 60 years ago, and we have survived many fires. Part of that survival is because we keep the property clear of alien vegetation, remove dead and encroaching bush, maintain a clean perimeter of buffalo grass (big enough to land a helicopter) and vetplantjies, and have planted fire-resistant indigenous trees for shade.

Late into the night, we watched the glow intensify behind us. By midnight, it was looking very scary, and at 1am on January 3, I woke the household, and we evacuated to the main road.

We're old hands at this — pack up the treasured family photographs dating back to the 1920s, the paintings of the house and False Bay, disconnect the gas cylinders (we are completely off-grid), take down the curtains and switch on the sprinkler.

Beating a hasty retreat as the fire turns on the house, the fire trucks about to get out. Photo: Tony Weaver

At first light, three fire crews arrived — Hermanus, the Pringle Bay Fire Watch, and the Helderberg Fire Watch and set up on our lawn, and we tensely watched the fire approach. At first, it was all good, running parallel to the house along the Buffels River which runs through our land.

Then, just before 7am, the wind swung from east to full south-east, and the fire roared straight at us. We got the hell out of there, but one truck from Helderberg couldn't get out in time. They switched on their sprayers as the fire overran the house and trapped them. We thought we had lost them, and the house.

The only serious damage to property, January 2019 fire. Photo: Tony Weaver

But they were safe, shaken, but safe — the lawn saved them. Our house survived to fight another day, just a scorch mark on one wall where a mop caught fire, a burnt picnic table, a destroyed washing line and a charred gatepost as damage.

Hangklip top shot with Pringle background after the January 2019 fire. Photo: Tony Weaver

The veld looks, to the untrained eye, devastated, a wasteland. But for us, this was an ecologically very good fire: The fynbos was in desperate need of a burn, last having burnt 15 years ago. This winter is going to be an exciting time, botanically speaking.

But at the time of writing this, the fire was raging on, having spread almost to Kleinmond in the east, Grabouw in the north, and Kogel Bay in the west. It burnt areas that have burnt too often, and haven't yet recovered from recent fires. That is where the real ecological damage will happen when the winter rains come, and there is nothing left to hold the soil — no seedbeds, no pioneer species, just scorched earth.

And it all began with a flare. **DM**

This Man Friday column was first published by Die Burger, republished here with permission.

IN PICTURES – THE HORRIFIC AFTERMATH OF THE OVERSTRAND FIRES RAGING THROUGH BETTY'S BAY, HERMAUNUS AND FRANSKRAAL IN JANUARY 2019

https://www.hermanusonline.mobi/hermanus-blog/in-pictures-the-horrific-aftermath-of-overstrand-fires

In pictures - The Horrific aftermath of Overstrand fires raging through Betty's Bay, Hermanus and Franskraal in January 2019

Thursday, 17 January 2019 | Jeanette du Toit | **Page Views:** 8986

Bettys Bay Fire:

Residents in Betty's Bay are picking up the pieces after a fire raged through parts of the small town and other parts of the Overstrand area in the Western Cape over the last two weeks.

In Betty's Bay, where 102 firefighters were deployed, the fire reached homes on both sides of the R44, the main coast road.

A preliminary structural assessment reports 31 residential properties destroyed and 28 damaged. Firefighting and mop-up operations are in progress and will continue for several days. Still-active fire lines pose risks for this area.

A 71-year-old man was seriously injured while evacuating his Betty's Bay home during a series of wildfires that ravaged the Overberg coast in the Western Cape, it emerged on Saturday.

Betty's Bay suffered the most damage with many houses completely destroyed as the fire burned right to the shoreline.

Scores of people ordered to evacuate their homes on Friday afternoon as 3 fires from Bettys Bay, Hermanus to Fransktaal were propelled by a north-west wind gusting at almost 100km/h, around 40 houses and 13 000 ha of land was destroyed.

At one stage, 52 emergency vehicles were counted with 226 firefighters and 8 choppers doing active firefighting with the assistance of 8 helicopter teams. The number continuously altered, depending on the conditions and where it was needed most.

The Overstrand fires which began almost 3 weeks ago have already destroyed over 14 000 hectares of land. In Betty's Bay ± 12 000 ha has burned, ± 1 300 ha in Hermanus and almost 1 000 ha in Franskraal. It is important to note that the area has not yet been declared safe," the Overstrand municipality reported.

Betty's Bay suffered the most damage with many houses completely destroyed as the fire burned right to the shoreline.

At least 31 houses have been completely destroyed and 28 partially damaged by wildfires on the coastal Overstrand region in the Western Cape.

The Harold Porter Botanical Gardens did not escape unscathed either. Thousands of hectares of mountain fynbos was also destroyed along with countless animals such as snakes and tortoises.

disasters 3.1.2019 10:00 am

One killed, two injured in Betty's Bay, Pringle Bay fires

Citizen reporter

Picture: Rene Nel on Twitter

'We request the public to keep the communities of Betty's Bay, Pringle Bay, Hangklip and surrounding rural area in their thoughts.'

One person was killed and two seriously injured on Thursday in the Betty's Bay and Pringle Bay blaze.

The Greater Overberg Fire Protection Association said in a statement: "With huge regret we have to report the loss of a life during the early hours of this morning. Our sincere condolences to the family. Cause of the fatality is currently unknown, SAPS and forensic services investigating.

"We request the public to keep the communities of Betty's Bay, Pringle Bay, Hangklip and surrounding rural area in their thoughts, it was a traumatic night full of uncertainty.

"Warnings and evacuations were done though-out the early hours of this morning whilst fire fighters brave high mountains and waves of fire. This was anticipated however the wind conditions were so adverse that avoiding the worst case scenarios were not preventable."

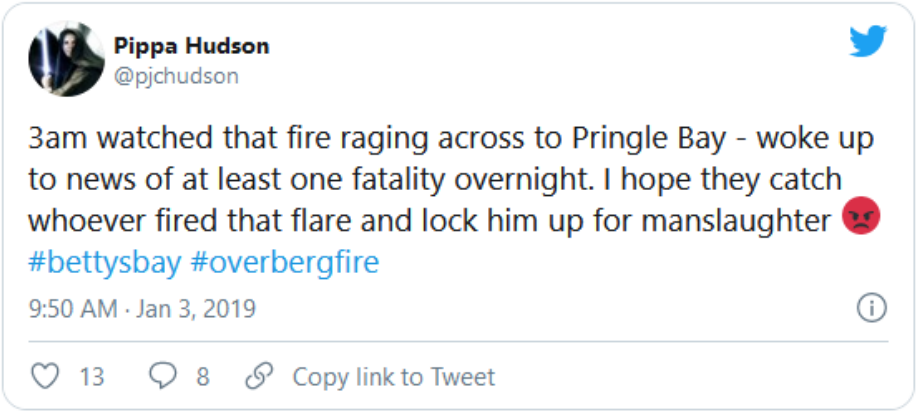
Firefighters in the Western Cape were battling veld and mountain fires between Betty's Bay and Pringle Bay on Thursday morning. Residents have been evacuated as a precautionary measure. The province's traffic chief Kenny Africa said the R44 between Betty's Bay and Pringle Bay was closed for now.

People have taken to social media to share videos and pictures of the fire that has engulfed the area,

https://twitter.com/TrafficSA/status/1080669239437127680

https://twitter.com/TrafficSA/status/1080705151877480448

https://twitter.com/TrafficSA/status/1080719541171302400



Appendix E

Media reports on human-wildlife conflict in or near Pringle Bay

14 Jun 2004 (CAPE TIMES)

Baboons 'terrorise' resort

Cape Town - Residents of a small South African coastal town are threatening to declare all-out war on baboons which have terrorised pre-schoolers, raided homes for food and urinated on clothes after pulling them out of closets.

Diana Head, chairperson of the local taxpayers' association in Pringle Bay, an hour's drive east of Cape Town, said baboons had broken into the local nursery school - located in a church - three times, using the same method.

"The baboons lifted a window latch and stormed a church hall where the children were," she said. "They grabbed sandwiches and cold drinks out of the children's hands.

"The kids were traumatised afterwards. One teacher was so upset that she resigned."

Head said baboons were breaking into houses about 15 times a month on average.

"They have strong nails which they use to pull sliding doors off the hinges. When they get inside the houses, they ransack cupboards for food and have parties on the beds.

"On a few occasions they have pulled clothes out of cupboards and urinated on them."

Last week, two female baboons in the area had to be put down after they were found with bullet wounds in their stomachs.

New 'leadership' brings change

Local conservation officials said they believed the shootings were revenge attacks by residents.

Head said the problem escalated late last year when the head male in the baboon troop changed.

"An alpha male whom we had named Charlie kept the troop under control, but then he was replaced by a newcomer known to us as Stoffel," she said.

The taxpayers' association approached the municipality about employing baboon chasers, but were told this would increase baboon stress levels.

"If nothing is done about this problem, more people are going to start taking the law into their own hands," said Head.

Local official Craig Spencer told the Cape Times newspaper the town did not have the authority to intervene, adding that the municipality had hired a nature conservation student to manage the baboons and printed pamphlets on how to keep baboons at bay.

https://www.news24.com/News24/Baboons-terrorise-resort-20040614

downloaded 31/01/2021

ODD NEWS

JUNE 14, 2004 (reported in Cape Argus)

Baboon gangs raiding S. African homes

CAPE TOWN, South Africa, June 14 (UPI) -- A South African town is plagued by a group of baboons that pry sliding doors off their rails, smash windows and open refrigerators to get food.

So troublesome have the animals become that two were recently shot in an attack officials called a "revenge" killing by angry residents of Pringle Bay, the Cape Times reported Monday.

One resident, Johann Grobler, says her neighbors are taking matters into their own hands because local officials are not taking the baboon issue seriously.

"In the past six months baboons have broken into houses at least 70 times," Grobler said. "At my house they broke my sliding door. They lifted it and smashed it. I've written to the municipality but they say the baboons were here before me. The police laugh us off. Cape Nature Conservation refers us to the municipality."

https://www.upi.com/Odd_News/2004/06/14/Baboon-gangs-raiding-S-African-homes/18881087238585/ downloaded 10 January 2021

Los Angeles Times

Humans Declare War on Baboons

By CLARE NULLIS
JULY 10, 2005 | 12 AM

ASSOCIATED PRESS WRITER

KOMMETJE, South Africa — Georgie was bashed in the head and is missing part of his ear. Penny's right hand was mangled in a trap. Tammy's bullet-riddled leg had to be amputated. Golden Arrow was shot dead, leaving her infant to starve to death.

The baboons of South Africa's Cape Peninsula are caught in a war with their human neighbors, who are sick of having their kitchens ransacked by marauding primates with an uncanny knack for breaking into houses.

"People love them or hate them. Very few people are ambivalent," says Jenni Trethowan of the local Baboon Matters Organization. "The hating community is the most vociferous."

As she speaks, William, a hefty 9-year-old male, leaps over the wall of a house and dances on the roof, oblivious to the frantic barking of dogs.

join the rest of the baboon troupe, who are dozing peacefully or foraging among the trees.

"He is so naughty," sighs Trethowan, who has named all the baboons in the area.

She manages nine monitors who try to keep baboons away from Kommetje and other populated areas near South Africa's wind-swept southern tip, seeking to reduce the potential for conflict with humans.

Trethowan says her project has helped reduce the number of baboons killed. Twenty-one were slain in 1999 and just eight last year.

But a spate of attacks hit the headlines in May. Trethowan reels off a list of baboon victims.

One baboon was shot and killed in a wealthy Cape Town suburb, reportedly by an irate homeowner.

Another, Golden Arrow, was found shot to death in a coastal village after Trethowan received threatening anonymous phone calls. The baboon's 5-day-old baby starved despite the efforts of his

traumatized brother, Quizzie, to care for him, Trethowan says.

The conflict is a result of the throngs of camera-toting tourists who crowded this scenic part of the country and ignored warning signs that threaten fines for feeding the baboons.

The animals got used to the treats and became increasingly aggressive in their search for more.

Dave Gaynor, a primatologist, says baboons get as much nutrition from half a loaf of discarded bread as from four hours of forage in the undergrowth.

"Once baboons know the value of human food, they will definitely go for human food," he says. "It's like having a permanently open candy store."

Nobody knows how many baboons are in South Africa, but most experts agree the numbers of the protected primates are dwindling as humans encroach on their living space. There are between 250 and 270 chacma baboons in 20 to 30 troupes around Cape Town.

While humans have resorted to violence, there are no known incidents of baboons attacking people. But even their defenders concede they can be intimidating.

National park rangers had to kill one large male at Cape Point last year after it became too aggressive about grabbing food out of cars.

Many people who buy houses in the area are not warned by real estate agents that they are moving into a baboon hot spot, says Gavin Bell of the South African National Parks authority.

They are advised to keep trash in a secure place, close doors and windows, install burglar bars or electric fencing, uproot fruit trees and keep a high-pressure hose handy.

Bell says most people enjoy the baboons, but Diana Head isn't one of them.

A resident of the seaside village of Pringle Bay, Head removed all the gutters and had electrified fencing put up around her house after baboons tried to force open her upstairs windows.

She and her large Rhodesian ridgeback dog are active in a neighborhood watch group designed to chase off baboons. Locals also carry whistles to sound the alert if the 30-strong troupe comes near the village.

Pringle Bay, a popular whale-watching spot where many Europeans have bought vacation homes, was in a virtual state of siege late last year after baboons repeatedly raided the local store and even invaded a children's nursery.

Things have calmed, Head says. The dominant male who led the raids -- and specialized in removing sliding glass doors -- apparently was replaced by a more placid baboon, she says.

Villagers also think there is a leopard in the region that may be acting as a deterrent.

"There are still opportunistic break-ins if you leave a window open," Head says. "They are so quick to spot anything, it's incredible."

https://www.latimes.com/archives/la-xpm

Humans declare war on baboons – Los Angeles Times (downloaded 10/01/2021)

Nat Geo sparks baboon furore in Pringle Bay

Date: July 9, 2012 | Posted in Hermanus Times | News

Hermanus Times
Jou Koerant • Your Newspaper

A furore has erupted about the conduct of a National Geographic crew that filmed a documentary about a troop of baboons in a modified cottage on the premises of the Hangklip Hotel near Pringle Bay.

According to Bernard Heydenrych, chair of Pringle Bay Conservancy, he only became aware of the seemingly unethical methods that were employed to lure the baboons into the house after viewing clips from the documentary series on the National Geographic website.

A statement released by Nat Geo Wild explains that the object of their documentary Big Baboon House was "to observe the behaviour humans and baboons may better coexist". Although the channel has denied luring the baboons into the house, asserting that they "entered it of their own volition", Heydenrych says it is obvious from the clips that the house, which was modified with two-way mirrors and installed with hidden cameras, was well stocked with food and that the animals had access to the house through open doors and windows.

"What it boils down to is the feeding of wild animals, plain and simple," Heydenrych says.

"In one scene a person dressed up as Santa Claus goes into the house with a black bag filled with 'gifts' of food, and then lies down on a bed pretending to be asleep while the baboons climb over him and dig into the food. This encouragement of human interaction with wild animals is contrary to conservation principles and leads to behavioural problems."

Pringle Bay residents have experienced an increase in baboon raids since the documentary was filmed last year and Heydenrych says there is an indirect link between the baboons' behaviour and the methods employed during filming. "As part of the documentary, various tests were devised to observe the baboons' behaviour. This involved stepping up the security of the house to see how they managed to gain access and has in fact 'taught' them to break-and-enter homes in the area."

Pringle Bay Conservancy has established the Pringle Bay Baboon Action Group who are doing a baboon monitoring project with the help of 28 volunteers. "It is important to understand that this is not a baboon problem, but a human problem," Heydenrych says.

https://showme.co.za/hermanus/news/nat-geo-sparks-baboon-furore-in-pringle-bay/

National – Mail & Guardian Newspaper

National Geographic in Pringle Bay baboon brouhaha

Sapa
3 Jul 2012

Pringle Bay residents in the Western Cape are outraged at a National Geographic documentary that used food to lure baboons to a house in the area.

The *Cape Times* reported on Tuesday that the primates were filmed with hidden cameras placed in a specially modified and fully furnished cottage, part of the Cape Hangklip Hotel.

The television series, *Big Baboon House*, had angered residents as it undermined years of effort to keep the animals out of their houses. The Pringle Bay Baboon Action Group said there had been a steady increase in aggressive baboon activity in the past three months. "What they did is completely unacceptable. To lure baboons with food is not only illegal, it also disrupts the peaceful cohabitation we've been trying to maintain between humans and baboons." On the show's official blog, development director Jaco Botha reportedly said his biggest thrill had been the first time the baboons broke into the house as it showed they could be filmed without "having any effect on their natural behaviour". Digital media content producer Meghan Gleason was reported as saying they had "undertaken a simian social experiment of a lifetime" to understand baboon behaviour. This was "so we can learn how to keep them out of homes and coexist peacefully with their human counterparts … all while having a little fun along the way as we observe these baboons having free reign over a posh house". – Sapa

https://mg.co.za/article/2012-07-03-national-geographic-in-pringle-bay-baboon-brouhaha/

(online) downloaded 10 January 2020

09 Jul 2012

Bold baboons take over Cape village

City Press

SHARE

TV crew accused of helping animals behave more brazenly

A National Geographic series has been accused of fuelling a crime wave with a difference in Pringle Bay: housebreaking by troops of clued-up baboons.

An average of three homes in the Western Cape town are "burgled" daily by baboons that have learnt to break in through secured windows and sliding doors, says Wayne Kruger, the security manager
for ASK Security, based in Pringle Bay.

While the small seaside village has long battled with opportunistic baboon raids, some residents believe the TV series, shot in a cottage at nearby Hangklip Hotel, has contributed to "new", more trained break-in behaviour.

Big Baboon House, filmed from June to October last year, kitted out a cottage for baboons to raid and filmed the results.

Baboons were presented with challenges, with food as reward.

One clip on YouTube shows baboons being left "gifts" of potato chips packets by a Father Christmas figure.

The animals entered the house freely during filming, eating food from a fridge.

One "challenge" had them trying to get to fruit by climbing a greased pole.

CapeNature, the Pringle Bay Baboon Action Group and UCT Baboon Research Unit head Justin O'Riain – who says he appears in Big Baboon House in a context he was not expecting after he was filmed – have all labelled the clips unethical.

Residents have now told City Press of further "experiments" they feel helped habituate the baboons to humans: a research vehicle drove around the village with fruit attached to spikes on the roof and a fridge stocked with food was placed on the side of Edward Street to see how the animals reacted.

National Geographic spokesperson Thandi Davids said a "responsible, independent local production company" was used to film the show and all necessary permits had been obtained.

The food on the roof of the vehicle "was in fact fake food manufactured in plastic". She said the permits did not refer to specific shoot scenarios.

"The filming was responsible and conducted within strict Nat Geo principles?.?.?.?baboon behaviour in the area was the same prior to the shoot taking place and this behaviour is in fact the key reason we were there to shoot."

Fanie Kriger, the communication manager for the Overstrand municipality, said the film team did not initially have the correct permit to film on municipal land and only applied for one after being confronted for interfering "with our waste management system".

Kriger said the municipality has distanced itself "in no uncertain terms from the practices followed during the filming (as seen in the clips)".

On Wednesday, City Press met ASK Security employees just after they had evicted a troop of baboons from a home.

Noise from a stun gun had to be used to move the baboons on.

Inside, holiday-maker Chantal Swart and her family were cleaning up spilt sugar, empty food wrappers and baboon excrement.

The baboons had lifted a locked sliding door off its rails.

Long-term resident Elli Wessels said: "I'm for the baboons, but my house has been trashed more times than I can count. It's intolerable. I live like a prisoner – no open windows."

A baboon recently took goods from a customer exiting her shop.

"They're more aggressive. They've become fearless in the last year or 18 months."

Wessels thinks this is because of several factors, including the National Geographic filming.

"It's appalling. All these years of trying to educate the public (not to feed baboons) has been erased in three months."

https://www.news24.com/news24/Archives/City-Press/Bold-baboons-take-over-Cape-village-20150429 (online) downloaded 10 January 2020

The baboon action group, a subcommittee of the Pringle Bay Conservancy, is working with CapeNature and the Overstrand municipality to try and solve the problem.

A programme of action has been drawn up, said Pringle Bay conservancy chair Bernard Heydenrych.

Almost 30 people have volunteered for a baboon-monitoring project that, should it be municipally approved, will follow troops for three months and identify problem individuals.

There is fierce debate about whether to then kill such animals

On the Cape peninsula, zero-overlap policies are now employed to prevent any form of habituation between baboons and humans.

O'Riain's recommended solution is baboon-proof fencing around the village – something Heydenrych said 60-70% of residents were against.

Regular weekenders to Pringle Bay, Darryn Te Roller and Robyn Luyt, said they have learnt to live with the baboons.

Luyt's home has electric fencing and baboon-proof windows, but the troop got in one day when the electricity was down.

Appendix F

PBRPA correspondence with respect to baboons in Pringle Bay

PBRA CHAIRPERSON'S REPORT - 2010 CONTINUED..

Ian Cushny (028 273 8589) be notified immediately if any such development is considered or started on any of the smallholdings.

1.13 Nature Reserves
- Ian Cushny -

Pringle Bay has a number of Municipal owned large pieces of land that have been declared municipal registered Nature Reserves. The remaining smaller pieces (road reserves, etc.) are merely zoned as Open Space 111.

The registration of nature reserves by the Municipality is pressed in order to secure these reserves from development.

Efforts have been made to have a number of the Open Space 111 areas consolidated and registered as Municipal nature reserves. So far we have not been successful, but the matter will be pursued.

1.14 Conservancy
- Bernard Heydenrych -

In March, we decided on 3 projects that would make up the Conservancy's objectives for the rest of the year. They were:

1) The development of Pringle Bay's footpaths and the printing of brochures for these paths.
2) The design and realisation of a small Conservancy Information Centre in Pringle Bay to provide general related information to all residents and visitors.
3) The development of a miniature botanical style garden at the Pringle Bay Community Hall, and incorporating this with the current garden area at the entrance as well as the Jenny Berrisford design. The CBD gardens were also included in this objective.

Since no funds were available at the time for these projects we made it our main objective to organise a fundraiser event to realise these. The decision was made in April to have a Pringle Bay Conservancy Day and Saturday, 11th September, was decided on. Besides the fundraising objective it was also decided that the festival should be a tool for the Conservancy to inform all residents, businesses and visitors of the mission and objectives of the Conservancy. The festival would therefore be a Conservancy related event and the majority of the stalls and exhibitors should be nurseries or other garden related products. The event would also include the TruCape Kogelberg Mountain Challenge as well as a spitbraai.

The event was a huge success with almost 1500 people attending the one day festival. People felt that the success was due to the combination of a conservation-related event with a fitness-related sporting event, as well as good entertainment and an enclosed food and wine area. One hundred and eighty eight meals were sold on the day and currently approximately R36 000.00 has been raised through this event. It was however decided after the event that the funds raised would go towards the Pringle Bay Security project.

Plans for a 2011 event will offer a two- or three-day schedule including a mountain bike event within the festival. It is also our objective to involve the Pringle Bay CBD in next year's plans.

The Conservancy also in 2010 organised a very successful Boland Leopard Project event at the Community Hall which 128 guests attended, 101 of which had dinner. The Ladies' Club, as with the Conservancy Festival, attended to the food and yet again it was a huge success. News that the Leopard Trust intend to erect approximately 60 cameras for this project was welcomed and left the residents speculating on where the first leopard would be spotted. The Pringle Bay Conservancy also received funding to acquire a camera of its own that would be erected on the Hangklip Mountain. The Conservancy would own all images collected from this camera and plan to use this for advertising and fundraising initiatives.
(See page 11)

I attended several Ratepayers, Ward as well as other related meetings this year and was surprised that the local Conservancy played such a minor role in marketing and promoting our beautiful area. Related issues seem to take a back seat at these meetings and input and advice were not widely received. This needs to change since our fauna and flora is the area's greatest asset and all residents and visitors should be given the opportunity to enjoy it.

The Conservancy group is planning several fun events for young and old during the December holidays. Events include weekly mountain hikes, a beach day (which will include a sandcastle competition, kite flying lessons as well as educational events for the kids), several educational events held by Mr Bruce Copley such as the Original Fire where groups are taught the ancient methods of making fire. A beach clean-up and other street and hall events are also planned by both the Ladies' Club, Conservancy and Ratepayers' Association.

1.15 Environmental Affairs
- Mervyn Gray -

Baboons:

In recent months the Environmental portfolio has been dominated by concerns over the baboon problem, which persists and raises blood pressures at every turn. Recent events have moved this issue to a higher gear: Firstly, the closed meeting of prominent members of the Pringle Bay community, which was addressed by Jenny Trethowan, founder of Baboon Matters on the Peninsula. Jenny presented a good picture of similar problems in other parts of the South Western Cape, and left those present to form their own opinions as to how we should go about solving our local problem.

The model she used was Simonstown, where they had come a long way to establishing the built-up area as no-go zones for baboons. Various methods were adopted, most significantly, the introduction of monitors who patrolled the set imaginary boundaries and chased baboons out when they made moves to enter. Nevertheless, it was established that such employment was expensive and would take up a considerable portion of the annual budget. It was clear from all this that basic rules could be observed that would alleviate the problem

Pamphlets, sign-boards and circulars were developed to encourage locals to persue the same paths. This is a long-term operation which will improve gradually as everyone understands the need to work together.

BABOON MATTERS

THESE ARE THE FACTS:

1. Baboons are here to stay...
2. PB residents are here to stay...
3. Our homes are an essential investment to all of us...
4. What we do with the baboons will one day affect the value of our investment

TO CONTROL THEM WE DO NOT NEED TO HUG THEM!
BUT WE NEED TO DOMINATE!! THEY MUST BE ENCOURAGED TO DO AS WE WISH.

THIS IS WHERE OUR DUTY BEGINS:

1. We must NOT feed them! Left to themselves they will forage enough to live on.
2. We must NOT feed birds - however much we love them! They will not die off if we do not feed them!
3. NB - Feeding birds = feeding baboons!
4. We cannot leave doors/windows open unguarded - this is an open invitation to baboons to come in and party!
5. Check locks and catches to ensure that they are baboon-proof. Do NOT leave the inspection to the baboons! They can be mildly dishonest!!
6. Do NOT leave black (or any colour) refuse bags outside your house - they provide good food resources and mark your place as an irresistible baboon restaurant!
7. Acquire baboon-proof bins and ensure with a small catch in the right place that they remain baboon-proof!

What to do after the break-in

1. *Report to ASK Alarms (028 2738695)*
   Or Baboon hotline (028 2738026)
   Or leave a description with "Lemon and Lime"
2. *Keep a record of the damage (+ Erf No.)*
3. *Repair the weakness that contributed to the break-in*
4. *Usher the baboon(s) out carefully*

OUR MUTUAL OBJECTIVE

Monitors will play an essential part in establishing our control. This will mean an extra cost, which will be worth it in the end if we all take a responsible role in this process.
The objective of all of us must be to make Pringle Bay a no-go zone for baboons.

We must all contribute or suffer the consequences!!

PRINGLE BAY RATEPAYERS ASSOCIATION | PRINGLEBAAI BELASTINGBETALERSVERENIGING

THE PRINGLE POST

AUGUST 2012 | *AUGUSTUS 2012* VOLUME 17, ISSUE 2 | *JAARGANG 17, UITGAWE 2*

PRICE R5 PRYS

FAMILY FEST IN PRINGLE BAY

Pringle Bay Conservation Family Day 2012

" Our diversity - your destination! "

Apple and pear home-bakes take centre stage at the Tru-Cape Pringle Bay Festival and 21-km Kogelberg Marathon on **September 8**. Breakfast will be available from 7am.

There will be apple and spoon races; pass the pears without your hands; bobbing for apples in a barrel of flour; a recycling competition; puppet making and a puppet show as well as a snake and reptile interactive show hosted by eco school, Pringle House, between 9am and 1pm.

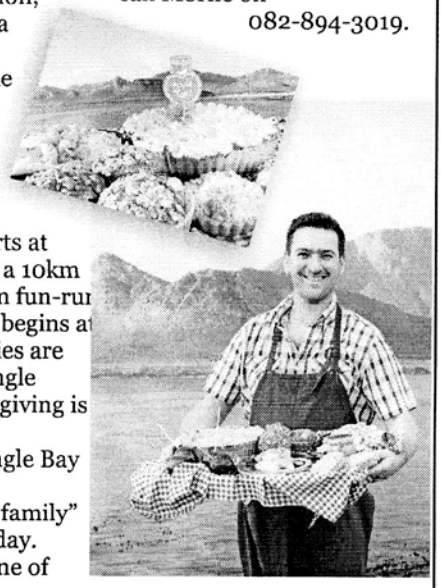
The main race starts at 7.30am, followed by a 10km route and then a 5km fun-run for the whole family begins at noon. Shower facilities are being offered by Pringle House School. Prize giving is at 1pm.

Hosted by the Pringle Bay Business Forum, "Conservation & the family" is the theme for the day. Trix Pienaar is but one of the faces who will pick the best fresh bakes from our village bakers, and also one of the judges picking the best Apple-sportsman.

The athletes will be starting their race from Centre Point at the Pringle Cove centre in Pringle Bay. Please note that Peak Road will be closed off between 7am and 1pm.

A colourful day packed with education, fresh bakes and lots of fun and laughter is our promise to you! See www.Tru-Cape.co.za for information about the day's activities , call Sandi on 079-413-6610 to register for the race or see www.hangklipathletics.co.za

For more information about entering the Tru-Cape Best Apple Bake competition call Morne on 082-894-3019.



PRINGLE BAY RESIDENTS ASSIST WITH CONSERVANCY BABOON FIELD RANGER PROJECT

Approximately 35 local residents have volunteered to assist the Pringle Bay Conservancy with its Baboon Field Ranger Project. The project also receives assistance from the Overstrand Municipality in the form of three Working for the Coast employees, as well as supplying equipment for the project. Local residents will identify the field rangers from their bright yellow bibs.

What is the mandate of this project?

The project has three important mandates:

1. To establish a perimeter line early morning (before the baboon troop leaves it roosting area) and to try and prevent the troop from crossing this line. Field rangers use paintball guns, sticks and whistles to discourage the baboons from entering the residential area. The paintball guns are only used should the baboons approach the rangers and try to cross the perimeter line. Rangers are instructed to shoot in the direction of the animals and not to try and hit them with the paint balls. During the first two weeks of the project results have been very promising. On several days the rangers were able to keep 80 percent of the troop above Highlevel and Clarence drives in Pringle Bay till 2 pm. Residents in certain areas as well as businesses in the central business area have reported a significant drop in the number of baboons. The point area in Pringle Bay has however seen a rise in baboon activity. Due to the weather, the baboons tend to roost in the "koppie" above the point area and the geography and high vegetation makes it extremely difficult for the field rangers to keep a secure perimeter line.

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INSIDE THIS ISSUE:

PRINGLE BAY RATEPAYERS' ASSOCIATION | PRINGLEBAAI BELASTINGBETALERSVERENIGING

THE PRINGLE MESSENGER

APRIL 2013

VOLUME 1, ISSUE 2 | JAARGANG 1, UITGAWE 2

PBRA MEMBERSHIP

This is the last Messenger you will receive if you are not a paid-up member of the Ratepayers' Association. The basic cost is only R50 per annum. PBRA is the community watchdog in respect of developments, services and many other issues which affect Pringle Bay. Even if you do not wish to join, please advise us of your contact details so that we are in a position to communicate when the need arises, eg undesirable property development.

BABOONS

A public meeting was held which endorsed the monitoring programme and future community involvement. This will include a recognition and incentive programme to support the monitors and the manning of a dedicated cell phone to deal with baboon related incidents A Baboon Action Group is in the process of being formed. PBRA will manage a fund for contributions.

REFUSE

All refuse bags must be secured in baboon proof bins which are available from the Municipality and will be delivered. These are compulsory and must be secured in an upright position which prevents them being knocked over by baboons or the wind, using wooden or steel pegs or chained to a support. The Municipality will start imposing a R500 fine on the property owner for any refuse bags left outside.

CRIME

Unfortunately we have experienced another recent spate of break-ins and we will need to re-launch a neighbourhood watch. The January break-ins were caused by an organized gang walking in and out to the R44 via Rooi Els. Our cameras are proving very effective and useful in crime prevention and detection; in general we have experienced significantly less crime than surrounding areas. Recently a person was spotted by the cameras and arrested with a backpack containing stolen taps prior to the crime being reported.

RATES

Overstrand have published the new budget and integrated development plan which are available on their website (www.overstrand.gov.za) . Developed residentialrates will increase by 6.9% and vacant property rates by 63.5% off a low base. The 6 kl free water allowance has been removed and the aggregate water increase is approximately 9.8%. We have raised our concerns with the council but do not expect a positive response. Objections need to be lodged by 31 April.

CONSERVANCY TANKS

Did you know that there are options to pay for emptying of tanks on an ad hoc basis or as an additional monthly levy on your water account with unlimited emptying? This is more economic for frequent use. However, the council must be notified by mid-year if you wish to change from your current basis.

PRINGLE POST

We are looking to increase contributions to the Pringle Post and would appreciate articles of general interest about the community, its history or the environment. Contact Mike Bisset at editor@pringlebayratepayers.co.za

COMMUNITY HALL

The hall is under-utilised and we would encourage you to use it for functions and other activities. Please contact Rina Scholtz for bookings on 0732031487. We intend to organize a braai and work party to enhance the interior in the near future.

SARS Reg. # 9101/138/16/3

www.pringlebayratepayers.co.za

Email: chairman@pringlebayratepayers.co.za

Kindly address all correspondence to PO Box 409, Pringle Bay 7196

Geliewe alle korrespondensie te rig aan Posbus 409, Pringlebaai 7196

PRINGLE BAY CRIME AND CCTV UPDATE Continued

A special thank you to ex-PBRP chairperson Graham Utton who spends many hours reviewing footage and contributing to our low crime success. To ensure the highest level of privacy he is the only other person having access to confidential information on the system.

A reminder to keep your houses alarmed and secured. You can phone me on 083 286 4144 on crime related issues and all information will stay confidential.

While there were five house break-ins in Rooiels plus three in Betty's Bay in just one night and Kleinmond reported a shocking 81% increase in house break-ins in July, Pringle Bay only recorded two incidents that month! "Safety isn't expensive, it's priceless".

Thank you Pringle Bay!
Axel Maier

PRINGLE BAY – BABOON UPDATE

The Baboons

The resident troop currently comprises 9 animals (down from 22 this time last year) following the arrival of a new alpha male earlier in the year who killed the babies and drove away other adult males. The monitors call him Stubborn and think he is responsible for keeping the Rooiels troop out of Pringle Bay. His first baby was born recently with more on the way. A group of females and youngsters broke away and are thought to have joined the Hangklip troop which now numbers 38 animals.

The monitoring process

"Stubborn is leaving Titanic and heading to Professor. Rasta and Stompie are missing". This is the sort of conversation you would hear on the two way radios if you were to pop into the baboon monitor shelter behind the village. Translated it means the alpha is leading the troop away from Hangklip towards the southeast mountain peak.

Monitoring mostly involves keeping the baboons out of sight in the mountains and informing the supervisor below of changes in location so that reinforcements can be dispatched when needed. Life is not always so easy. Finding the animals in the morning can be difficult (they tend to hide from the monitors). Should they enter the village they must be driven back up the mountain. Unfortunately the monitors do not have access to a vehicle and are currently not equipped with waterproof clothing so that adverse weather conditions contribute to an increase in property damage. We hope to deal with some of the problems by fitting a collar to the alpha female so that movement and location can be tracked by cellphone. The new Working for the Coast project is expected to supply proper clothing once it comes on stream. This is a national government initiative. At time of writing we are waiting for money to be released from the new two-year programme and we have had to appeal to ratepayers and residents for donations during the bridging period. There has been an excellent response to this appeal and we have even been able to keep the monitors in action over weekends.

The monitors have been trained to use paint ball guns in a controlled manner so that baboons associate them with something nasty and will normally run away on sight. Bear bangers are used periodically to reinforce fear of humans and keep the animals on the mountains for a couple of days.

The programme is overseen by Overstrand Environmental Services based in Hermanus.

Continue on page 4...

PRINGLE BAY BABOON UPDATE Continued

They provide regular support and training and maintain contact with authorities in Cape Town regarding approaches to baboon management.

Alternative Approaches

We receive occasional E-mails from ratepayers who query whether monitoring is the correct approach to dealing with the baboons. One can hardly blame people for being very angry after their home has been broken into several times and the immediate answer seems to be to shoot the animals. However if this were to happen the territory would immediately be invaded by surrounding troops and it would therefore not solve the problem (apart from being both unethical and illegal).

Another approach would be to erect an electric fence around the mountain. This solution is being tested in hot spots in parts of the Peninsula. Fencing would be costly and it is doubtful if ratepayers would be prepared to fund it.

What about the future?

The end goal is to have a troop that is naturally scared of humans and has not learned break-in techniques. Delinquent animals should be removed by Cape Nature before they teach youngsters bad habits.

We must try to keep the troop away from the village at all times and are investigating whether it will be possible for ratepayers to fund the monitors over weekends and public holidays.

All residents and property owners need to do their share by ensuring that there is no easy access to human food and that houses are effectively protected from break-in.

PRINGLE BAY RATEPAYERS ASSOCIATION | PRINGLEBAAI BELASTINGBETALERSVERENIGING

THE PRINGLE MESSENGER

JANUARY 2014 / JANUARIE 2014

VOLUME 2, ISSUE 1 | JAARGANG 2, UITGAWE 1

CRIME

Feedback from the recent SAPS Imbiza in Pringle Bay confirms a serious escalation in house break-ins over the last four months in Pringle Bay and Betty's Bay. The SAPS in Kleinmond is currently understaffed and not able to cope with the demands of the area. Although an additional five recruits are to be appointed, they will only be available for duty in 2015, after training. As an interim measure special patrols have been introduced to deal with the current crime wave.

Good news is that Tony and Delene Breytenbach have agreed to resuscitate the Neighbourhood Watch in Pringle Bay. Tony is a retired senior police officer. If you are interested in joining or suporting this initiative please respond by email.

BABOONS

Two female baboons were recently found dead; one appeaerd to have been shot in the leg and the other had been bleeding from the mouth and anus, possibly as a result of poisioning. Cape Nature have completed an investigation into the deaths including interviews and taking statements from residents but have not been able to gather sufficient evidence to conduct a prosecution. If anyone can provide any additional information on this matter please contact Cape Nature on 021 483 0000. As a point of interest a recent successful prosecution in Fish Hoek resulted in the culprit having his weapon confiscated, losing his firearm licence and receiving a fine.

On a happier note, we wish to thank Sonja du Toit for a donation of R2000 for the baboon monitors raised from entry fees for the monthly run. We also received R2500.00 from the collection boxes and have had offers of two bicycles and a fridge. Thanks to all our contributors and keep supporting the runners

THE ENVIRONMENT

Bernard Heydenrych has resigned from the PB Conservancy. Conservancy functions will revert to the PBRA and we are looking for someone to take over committee responsibility for the environment and conservation activities. If you have an interest please respond by email.

A group of concerned ratepayers have recently raised the issue of collection of kelp from the main beach. It is believed that removal of kelp contributes to destabilisation of the dunes at the back of the beach. The Department of Agriculture, Forestry and Fisheries have been formally requested to exclude Pringle Bay when permits are re-issued in March 2014.

HOUSE NUMBERING

A question was asked at the AGM regarding the introduction of street numbers. This matter was debated by the Ward Committee and it was agreed to defer implementation. Neither the municipality nor ratepayers are ready to make a successful switch to the use of street instead of erf numbers. We are aware that certain plots, particularly corner plots, have been allocated duplicate or inappropriate numbers. If you wish to query the street number appearing on your municipal account, please contact the accounts department in Kleinmond.

MAYOR'S TEA PARTY

The Mayor will be holding a tea party for "Over Sixties" on Monday 10th February at 10.00 in the community hall. If you would like to attend please complete the register sited in the Mini Mart in the village centre.

LOGO

The campaign to select a logo for Pringle Bay has stimulated a lot of interest. Many people responded to the questionaire and we thank you all for your interest and input. The final votes were evenly balanced and your Committee decided to refer the decision to professional advertising firms for a decision. The results were presented at the AGM and received support and applause for the work that has been done. The design chosen is the original "classical design" which was selected as being more appropriate for Pringle Bay than the "contemporary" alternative. Please refer to the AGM minutes for more information.

SARS Reg. # 9101/138/16/3

www.pringlebayratepayers.co.za

Email: chairmanpbra@gmail.com

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Geliewe alle korrespondensie te rig aan Posbus 409, Pringlebaai 7196

Continued from page 14

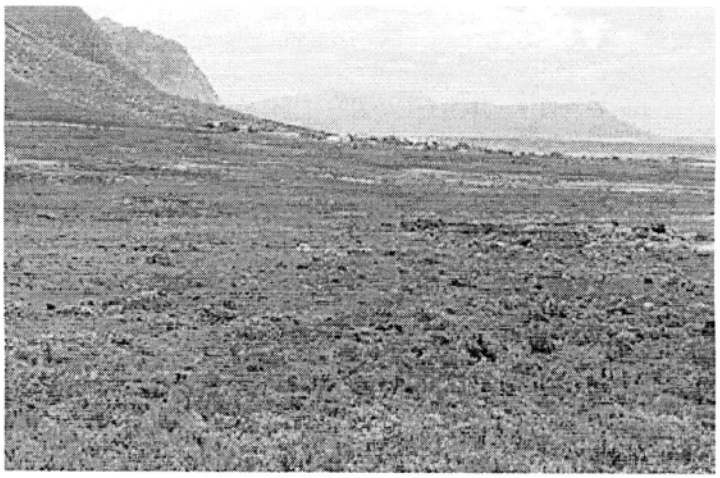
honour of Edward Silberbauer, who was the convenor, motivator and inspiration to save the Fynbos of that specific piece of valley!!!

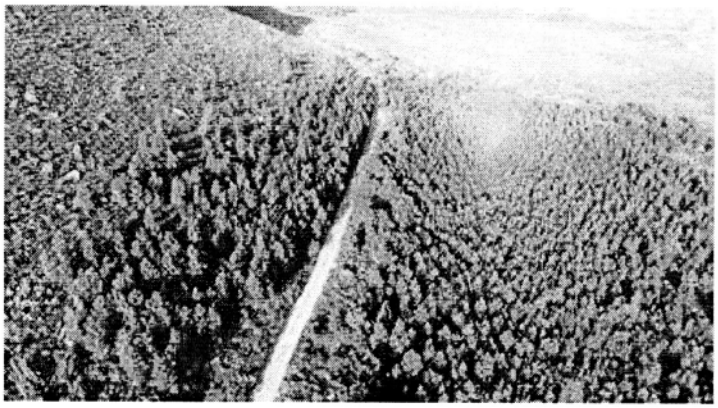
The second example is the story of the Pine Forest. The farming plot area between Rooi Els and Pringle Bay was seriously invested with a fast spreading Pine forest. It gave a false sense of privacy and safety, but the real fire danger and threat to the Fynbos was not realised. After the February 2017 Rooi Els fire, the residents came to realise the life threatening danger, and the Wednesday Hack Group volunteered to cut down the forest. With a Wednesday attendance, varying between 8-12 members, it was estimated that the project would last about 18 – 24 months. The task commenced on 6th June 2017 and every Wednesday, as the weather allowed, the pines were hacked. In August 2017 the Hack Group realised that the adjacent plot owner tasked a private company to eradicate the pines on their plot as well. That support helped the Hack Group considerably. A breakthrough was achieved on 1st November 2017 when the last of the main forest was cut down. Although the main part of the forest is down, there is still a lot of work to be done to clear the lone standing pines on the periphery of the original forest. It is surely inspirational and wonderful to see how the Fynbos seedlings are recovering after the fire now that the pines are eradicated.

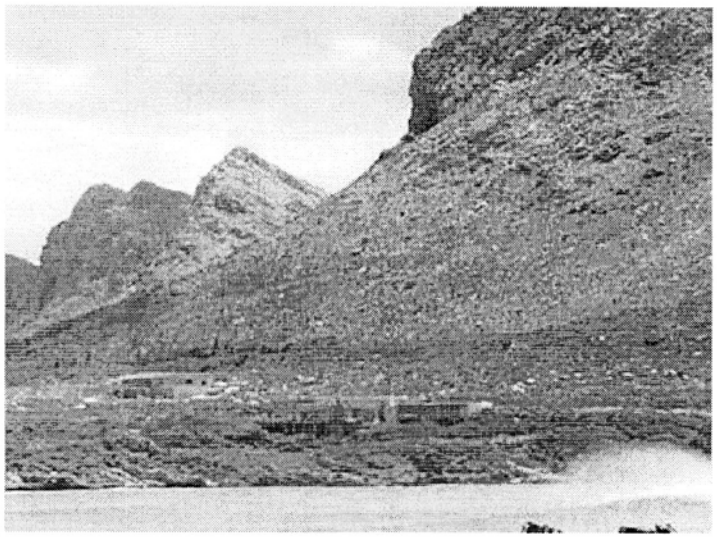
All credit must go to the few Wednesday Hackers, namely Ed Silberbauer, John Whitehead (unfortunately John passed on since), Tom Dreyer, Frik Potgieter, Jan Joubert, Ulli Niemann, Claude Moine, Mike Robinson, Willem Stiglingh, Chris Cadman, Richard Smeda, Natalie and Bernard van Wulven, Jeannie Harning, Carol Wilson, Selwyn Botha, Sandy Middleton, Robert Schaefer, Ivan and Ria Staegemann. Congratulations guys, you are honouring your environment!

These are only two examples of a number of hack successes. It is essential that all residents of the Kogelberg Biosphere take note of the National Environmental Management Biodiversity Act (NEMBA) Environmental Impact Assessment Regulations of October 2014. It is our duty to ensure that we secure our heritage, the Fynbos, for the generations to come. There are some stiff penalties for land owners who do not comply with the eradication of invasive exotics. The sooner you address the invasion, the easier and cheaper it is to address!

Any person who wants to become involved in the fight against the invading exotics is welcome to liaise with either of the Hack Convenors, namely Chris Geldenhuys in Pringle Bay (082 900 8299) or Frik Potgieter in Betty's Bay (084 600 9891).







From the top: the pristine Fynbos in Ed's Valley, free from any exotic infestation; the Pine forest before the hack and after the forest is gone!

PRINGLE BAY BABOONS - Times are changing

By Dave Muirhead (incorporating an article written by Melanie Goslin 13 years ago)

18 JUNE 2004, 07:41AM

Residents urged to baboon-proof their homes

It's early morning in Pringle Bay and the baboons are on the move.

They spent the night on the koppie above the town and now, after grooming and play-wrestling among the rocks, they move towards the coastal plain to forage for food as their ancestors have for thousands of years.

But life is not as it was for their ancestors. Hundreds of houses have mushroomed in the traditional foraging range of the Pringle Bay troop. There is plenty of high-calorie food in these houses, which, if doors or windows are open, present easy-pickings for these opportunistic animals. A loaf of bread or an apple pie will provide more calories than a day's foraging.

This is the crux of Pringle Bay's "baboon problem" - and many residents are fed up. The animals

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trash houses regularly, breaking open bottles and packets, defecating and urinating as they eat. They have even learnt to rattle sliding doors off their rails, which fall down and smash. Even when they play, they are destructive, breaking gutters and TV aerials.

As we follow the troop, we see many of the residents are ready for them. A woman peers from a window, her three dogs on the steps below. She's as alert as they are. The baboons move on.

Down the road another woman rounds her house with a catapult in her hand. She's on guard, her windows are shut and there's no way the baboons will get into her house.

Further on, at the Ticklemouse bakery, a flustered woman exclaims: "The bloody things got into my bakkie. You must just smell the stink!"

Others in the troop gambol up a roof and then tumble down and eat bitou flowers and berries from guarrie plants.

There's a commotion in one road. A woman, clutching her hysterical dog under her arm, lobs sticks at baboons which have overturned a dustbin.

"Don't these people know they can't leave rubbish outside? It makes me so mad!"

Residents' reaction to the baboons varies. In research done by Overstrand on 39 residents, 80 percent regard baboons as "a problem". However, 80 percent said they were prepared to "baboon-proof" their properties. This doesn't take much, according to Bryan Davies, who lives just beneath one of the troops' sleeping places. "We love the baboons and feel privileged to live with them. If baboons do get into the house, we blame ourselves," Davies said.

Not everyone agrees. In the past three weeks, two baboons have been shot, presumably by angry residents.

***

THIRTEEN YEARS LATER

Baboon Tracking System – up and running

The morning scenario described by Melanie Goslin has changed significantly. Baboon movement on the mountain is watched by the Pringle Bay Monitors on an Ipad. A couple of monitors move to intercept the troop before they descend on the village and quietly persuade the animals to head back to the Hangklip valleys where there is abundant food but not always the tastiest choice.

The tracking system has revealed that the animals utilise a far greater range than was previously known and choose to spend much of the day grazing and sleeping on and around Hangklip rather than the urbanised coastal plain. It is suspected that preferred grazing areas are influenced by seasonal vegetation and climate cycles. This is one of the aspects that the

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Research Team of the Baboon Action Group will be studying.

In the meantime the debate still rages among human occupants – the so called "Baboon lovers" and "Baboon haters" i.e. those who believe the animals should be able to roam freely around the village and those who would prefer not to have them around.

The newly formed Baboon Action Group has adopted a mission reading as follows: *To encourage and promote the harmonious coexistence of local baboon troops with the residents, business operators and visitors of Pringle Bay; through research-based knowledge, natural feeding practices, and interventions that are environmentally and conservation friendly.*

The immediate objectives of the group which supports the team of monitors is to:

Keep the troop wild and alive

i.e. retain the natural sense of human fear, prevent malicious or inadvertent harm from or to humans, prevent human food addiction, prevent development of raiding behaviour and subsequent euthanasia

Allow humans to enjoy life in Pringle without constantly being "on guard"

This is particularly pertinent in the holiday season when there are many additional visitors, summer residents, and families with children.

Environment Monitoring becoming a reality

Use of the tracking system enables our monitors to keep tabs on the animals while undertaking additional environmental activities. It is still early days but the intention is to expand the function to patrol and remove invasive alien regrowth in fire-burnt areas and on municipal verges and do the weekly inspection and repair of the dune footpaths to the beach. Training of the monitors is in progress.

The municipality has been requested to allow the old fire vehicle garage to become the monitor shelter which will then be used for storage of equipment and promotion activities. The building is ideally located behind the village in an area earmarked for environmental use and may in future include the display of a whale skeleton. The Overberg Grootbos Foundation have been approached for a grant to refurbish and equip the building as a base from which to expand the role and scope of environmental work done by the monitor team.

Our current Baboon Monitoring team. From the left: Joseph van Wyk, Emile Smith, Waldo van Niekerk, Shaun de Bruin.

PRINGLE MESSENGER
DECEMBER 2019

Pringle Bay Ratepayers Association, PO Box 409, Pringle Bay 7196
Pringlebaai Belastingsbetalersveeniging, Posbus 409, Pringlebaai 7196
NPO 214-205

AGM Reminder
The AGM will be held on Thursday 19th December at 16.00 in the Community Hall. The Overstrand Mayor is the guest speaker. We encourage all who can make it to attend the meeting. A glass of wine or grape juice will be available on conclusion. Year end reports, membership renewal docs and committee nomination forms will be distributed later this week.

Brightening Up our Village Centre
The PBRA is on a mission to make our CBD more attractive and inviting, for our resident community, as well as for our visitors. One idea is to create an appealing mural at the children's play area, outside Simply Coffee. If you have experience with wall art and would like to participate, or even if you don't and would like to lend a helping hand, please contact secretary@pringlebayratepayers.co.za or call Coco on 076 563 0960. We welcome your ideas and involvement!

Crime, Safety and Security Meeting Feedback
Please go to https://www.pringlebayratepayers.co.za/security to access the presentation and Q&A from the meeting of 9th November. Attendance was excellent with positive feedback received in respect of the recommendations of the joint PBRA & PBSW workgroup. The long term plan is to take a pro-active preventative approach to crime by establishing a Virtual Ring Fence around the village using unobtrusive modern technology to monitor and control access to the area. A request for proposals has been submitted to 9 organisations. Evaluation of recommendations will be done in early December. The intention is to take an incremental approach to implementation concurrently with applying for a Special Rating Area to fund the ongoing cost of operation.
Almost no crime reported during November with poaching also under control although still with us.

Providing Jobs – a big thanks to all who have helped our Baboon Monitoring Programme
Our community takes pride in the voluntary programme that has run since 2013. It is now funded by the municipality who have contracted HWS to manage the process until June 2020. We anticipate that the contract will thereafter be renewed for three years. It was always a principal to provide work opportunities to the Mooiuitsig community and several donors supported the programme for this purpose. Additional monitors (now called rangers) have been employed and as the days get longer they will now be able to cover full daylight hours from 6.00 a.m. to 8.00 p.m. The team of six have received new uniforms, footwear and rain gear and will soon be doing a First Aid course to complete their training.

We no longer need donations to fund payment of ranger salaries. **However we are appealing for donations for "year-end bonuses" and in support of ongoing education and awareness campaigns.** Please do not give money directly to the rangers – it should be sent to the PBRA or placed in the collection boxes in Lemon & Lime or La Galleria.

The "rangers" are having a tough time with the animals at present. The Pringle Troop is spending a lot of time on the Rooiels side of the river and roosting on the northern slopes behind the beach. This is due to the very large Hangklip troop moving into the valley above Stream Road which we think is a result of the Hangklip road construction upsetting their usual range movements. The rangers are also keeping an eye on the Hangklip troop to ensure they don't visit our village.

Proud to Announce: The CHACMA LOCK. The new, tried and tested baboon-proofed wheelie bin!
Please refer to the display image below.. The Chacma Lock has been designed by one of our very own Pringle Bay BAG members and developed in conjunction with the municipality to ensure that it is compliant with all of the Overstrand Municipality's requirements. The Chacma Lock is hot dip galvanised for exterior durability and comes with a carabiner clip for locking the bin.

Many traditional baboon-proof locks only use one or two clasps at the front, leaving the sides and back corners vulnerable. The Chacma Lock has been specifically designed to strengthen the whole lid, from corner to corner.

You can buy now and get a new black recycled plastic 240l wheelie bin WITH the Chacma Lock pre-installed, ready to use for only R1200. Pick-up in Pringle Bay (if need be, special arrangements can be made for delivery). Chacma locks can also be retrofitted to existing standard wheelie bins for R500. Email chacmalock@gmail.com or WhatsApp 079 515 0553

Municipal Affairs
The municipality are investigating closing the waste disposal site at the entrance and enforcing the bylaw which requires all households to have baboon proof bins so the time is right to invest in a Chacma Bin.

- **Public Toilets** will be fixed up and cleaned
- **Post Box Reminder.** It is time to renew your postbox if you have one. They are free to residents. The Post Office in Betty's Bay re-opened on 15th November so you can do it there.
- **Honeysucker service otherwise known as Sucking Suzy.** You need to request tank emptying two days in advance. Consider installing a sensor (available from Rudi du Plessis 072 376 7838). There have been reports of suction point breakages so check yours. If there is a problem with a driver please note the number, date and time and report the issue to the municipality.
- **Refuse Collection.** This starts early in the morning and the municipality requests that refuse should be placed outside by 7.00 a.m. Do NOT leave black bags outside; they WILL attract baboons. The municipal bylaw requires use of a baboon proof bin.
- **Plot Clearing. Ph**one 028 271 8419 to report overgrown plots and request clearance. The PB Hack group are prepared to cut alien vegetation for a small charge to cover equipment and fuel but the owner needs to arrange removal of cuttings. For contact details visit https://www.pringlebayratepayers.co.za/conservation
- **Speed Control.** There are plenty of Guinea Fowl and Francolin chicks wondering around on the roads at this time as well as small tortoises and other young creatures. Respect that we live in a Reserve and drive at reduced speed.

Baboon Management

As previously reported the management of baboons in the Overstrand has been delegated to the Overstrand Municipality(OM) who contracted Human Wildlife Solutions (HWS) to do the job. The OM are in the process of establishing Baboon Liaison Committees for the different areas but are encountering significant bickering and argument from representatives / activists of local communities accompanied by inflamed rhetoric on social media. The intention is to develop an acceptable "Terms of Reference" and "Standard Operating Procedures" for the Overstrand to guide the workings of the liaison committees.

The Pringle Bay Baboon Action Group (BAG) has held extensive discussions with both OM and HWS in respect of the management approach and requested the adoption of a "softer approach" to monitoring. This is now being implemented. We understand that things are going well in the Hermanus area following introduction of the HWS Virtual Fence.

We wish to record thanks to Robyn Lawson-Craig and Cornelia de Villiers for their able and empathetic leadership of the PB BAG. Unfortunately they decided to step down earlier in the year for personal reasons. Thank you for your enthusiasm, your hard work and willingness to manage this group over the previous years - but mostly thank you for the compassion and caring shown for the welfare of the troop, whilst not losing sight of the interests of the residents. We all salute you!

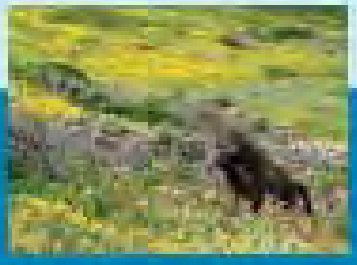
The Pringle Bay Baboon Facebook page has been archived until further notice due to it being used as a platform to publish misinformation, making false accusations, attacking OM and HWS as well as mostly negative postings. This was intended to be a site for awareness and educational purposes about own baboon troop, not a site where quasi-verbal battles are being fought over other troops and baboons.

Appendix G

PBBAG educational pamphlets

PRINGLE BAY
BABOONS

Our natural fynbos environment provides ample nutritious food for our baboon troop. However, human food is delicious and irresistible – and baboons are smart opportunists! **So we need to act responsibly.**



DO

- Treat baboons with caution at all times. They are focused on food and are not naturally aggressive towards humans unless threatened or cornered
- Close windows and lock doors when away or not in the immediate vicinity
- Use baboon proof latches to ensure windows do not open more than 8cm
- Put rubbish out in baboon-proof bins and on collection days (usually Mondays) - or drop off at the waste station at the entrance to Pringle Bay
- Instruct young children to drop any food and quietly walk away if a baboon approaches
- Drive slowly when you see a baboon on or next to the road

DON'T

- DO NOT harm, feed, interfere or set your dog on a baboon. It is a finable offence
- DO NOT shoot baboons with paintball or pellet guns, it is an imprisonable offence
- DO NOT leave food outside where a baboon may be able to find it (e.g., dog food, bird seed, fruit trees)
- DO NOT try to grab back something that a baboon has taken
- DO NOT scream or react aggressively if baboons are in your house. Remain calm and give baboons a clear route to exit
- DO NOT leave trash bags beside the road or next to municipal bins
- DO NOT leave food where it can be seen through a window

See reverse for more information >

SUPPORT US!

Baboon Action Group

We are a volunteer group that promotes education, raises funds, manages the monitoring process, improves waste management and conducts research on the local troop.

Our Mission

To encourage and promote the harmonious coexistence of local baboon troops with the residents, business operators and visitors of Pringle Bay; through research-based knowledge, natural feeding practices, and interventions that are environmentally and conservation friendly.

Monitors

The monitors aim to keep the baboon troop on the mountain and out of the village. They patrol the area on bicycles and also assist with removal of alien invasive vegetation, maintenance of beach access paths and waste management in the village centre. They are identifiable by their fluorescent vests and identity cards. The monitor programme provides job opportunities for the local community.

The alpha male and female have been collared to track their movement, thereby enhancing our monitoring capability.

Baboon Alert WhatsApp Group

Join the Baboon Alert WhatsApp group to receive and share information on the troop's whereabouts, alerting you to secure your home and to enable the monitors to respond promptly. To join email info@pringlebayratepayers.co.za with your name and cellphone number.

Funding

We receive no funding from the authorities and are entirely dependent on the generosity of residents and visitors to operate the monitoring programme.

Please support us by donating via EFT, SnapScan or collection boxes in the village centre shops. For EFT payments please state "BABOONS" and provide your ERF number in the bank reference.

Donate NOW!

Nedbank
Pringle Bay Ratepayers
Savings Account: 2315001714
Branch: 131505

SnapScan

BE BABOON AWARE

DO

- Treat baboons with caution They are focused on food and are not aggressive unless threatened
- Close windows and lock doors when away or not in the immediate vicinity
- Use baboon-proof latches on windows
- Put rubbish in baboon-proof bins or drop off at waste station
- Children should drop food and walk away if baboon approaches
- Drive slowly when near baboons

DON'T

- DO NOT harm, feed or set your dog on a baboon
- DO NOT shoot baboons with paintball or pellet guns
- DO NOT leave food outside (e.g. dog food, bird seed)
- DO NOT try to grab something back from a baboon
- DO NOT react aggressively if baboons are in your house Remain calm and give baboons a clear route to exit
- DO NOT leave trash bags beside the road or next to municipal bins
- DO NOT leave food where it can be seen through a window

Pringle Bay Baboons Group

PRINGLE BAY BABOON ACTION GROUP

BE BABOON AWARE

NEVER FEED BABOONS!

- Baboons lose fear of humans
- Can become aggressive
- Feeding baboons has dire consequences

SECURE RUBBISH

- Use Baboon-proof bin
- Do not put black bags on curb
- Keep compost in locked compost bin

BABOON-PROOF HOUSE

- Burglar bars/gates, gaps no larger than 8cm
- Double latches on windows, max 8cm gap
- Check all windows and doors before leaving

SEE BABOONS?

- Close doors and windows
- Bring dogs indoors
- Report location on Baboon Alerts WhatsApp

Pringle Bay Baboons Group

PRINGLE BAY BABOON ACTION GROUP