Tourist Impacts in Masai Mara National Reserve

PhD in Biodiversity Management

By

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June 2002

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Abstract

Increased numbers of tourists in Kenyan protected areas have resulted in dozens of lodges, unplanned road and track proliferation, and pushy drivers and tourists harassing wildlife. In turn, these have created negative impacts on the wildlife and habitat resource base that supports the tourism industry. However, data on limits of use and impacts by tourism are scanty. The aim of this study, which was carried out in Masai Mara National Reserve (MMNR) in Kenya, was to examine tourism impacts in the study area, in particular the nature, causes and consequences of impacts on habitats and wildlife, the role of law enforcement and knowledge and adherence to reserve regulations.

Direct observations of both tourists and animals were made and a record of various potential explanatory variables associated with tourism-wildlife conflict recorded; aerial photographs were used to map and measure vegetation degradation by tourists; questionnaires were administered and findings analysed to assess implications of current management practices on the sustainable use of MMNR.

Results suggested that the major impact is uncontrolled off-road driving that occurs in accessible areas where vehicle pressure is greatest. This has damaged or destroyed several square kilometres of grassland, although its aesthetic significance may be greater than its ecological significance. Impacts on wildlife appeared limited to short term disturbance by vehicles passing, which increased with increasing vehicle speed. Wildlife was not displaced permanently by tourism, and habituation in heavily visited areas served to limit the amount of disturbance. Drivers and visitors were generally aware of MMNR regulations, but these were broken in over 90% of lion and cheetah viewing events. The presence of Animal and Habitat Protection Unit patrol personnel limited some infringements, but not others.

It is recommended that a management plan that encompasses all the aspects of tourism impacts be prepared and implemented to diminish the detrimental effects of tourism.

Dedication

This work is dedicated to my wife Anne, my daughters Grace and Milkah, and my sons Jeremiah and Peter for their support and enduring my long absences from home

Acknowledgements

Valuable co-operation, assistance and encouragement were accorded to me by many people. I regret that only a few can be mentioned here. However, to all I extend my sincere gratitude.

I thank my supervisor Professor Nigel Leader-Williams for his total commitment to the progress of my work. Prof. Nigel read this work, put logic into it and made motivational comments and criticisms. Special thanks go to Dr. Matt Walpole who was a constant resource person both in the field and during write-up. I also thank Dr. Jethro Odanga of Moi University for his advice during the time of data collection.

I thank the staff of the Department of Resource Survey and Remote Sensing, especially Mohamed Said who facilitated the acquisition of remote sensing data; Mr. Charles Matankory, my assistant in the field who provided companionship while there was nobody else to talk to; Mr. Tom Esipila of Moi University for providing technical support in the initial GIS work; and, Dr. Bob Smith for GIS help thereafter.

I am also grateful to the staff of DICE for all the administrative assistance they provided. This gratitude goes especially to Mrs Joan England, Ms Shelley Roffey and Ms Nicola Kerry-Yoxall.

Lastly, I would like to thank the Department of Environment, Transport and the Regions of the UK Government for funding this programme of work under the Darwin Initiative for Survival of Species, and WWF Regional Programme Office for East and Central Africa for supporting the costs of my PhD programme.

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CHAPTER ONE

General Introduction

A lot of research has been conducted into the wider environmental, economic and social impacts of tourism. However, there still remain knowledge gaps in our detailed understanding of the relationship between conservation and tourism in protected areas. Although theory has advanced and sustainable principles have been defined, the conflicts inherent between tourism and protected area conservation are still predominantly unresolved in practice. Wildlife tourism development (**Chapter 3**) will undoubtedly affect both the wildlife **(Chapter 6)** and wildlife habitats **(Chapter 4).** Nevertheless, little has been done to isolate the natural ecological factors from the effects of tourism (**Chapter 5**). This study examines the case of tourism to Masai Mara National Reserve, Kenya, and assesses its impacts in relation to sustainable tourism.

1.1 Introduction

Conservation of wildlife grew out of concern that game animals were being over-exploited and/or losing habitat by, or as a result of, growing human populations. Realisation that wildlife preservation could not proceed successfully without generating economic benefits emerged early in the history of conservation. The phrase 'sustainable development' was used to link conservation and economic development of the people who bore the cost of conservation. The beguiling phrase, 'sustainable development', was used in the *World Conservation Strategy* (IUCN/UNDP/WWF, 1980), and by the World Commission on Environment and Development (Brundtland Commission) (WCED, 1987). It was used again in *Caring for the Earth* (IUCN/UNDP/WWF 1991), where it was employed to express profound concern for both humanity and the environment (Keating, 1993; Westing, 1996). The aim was to link and integrate conservation and development positively so that development does not compromise the ability of the earth to support life. Tourism was seen as an important means where by conservation and development can go hand in hand (World Bank, 1998).

In the 1990s, tourism received increasing attention as a low-impact, non-consumptive development option, in particular for developing countries. It was

argued that tourism allowed for the use of areas which were otherwise of low value but perfectly met the demands of the growing travel industry (WWF, 1995; World Bank, 1998). In line with the concept of sustainable tourism, it was believed that negative social and environmental impacts could be avoided or minimised if tourism development was thoroughly well planned and controlled. This view can be contrasted with the fact that what may be considered sustainable forms of tourism still represent an extremely small share of all tourism, possibly less than 5% (Gössling, 2000).

As background to this study, this chapter traces the history of establishment of protected areas and how protected areas came to relate with tourism. **Section 1.2** discusses how protected areas started and developed. The initial ideas on protected areas are considered in **section 1.2.1** and how nature conservation became entwined with protected areas is examined in **section 1.2.2**. **Section 1.2.3** assesses the introduction of economic benefits to protected areas and this is followed by a consideration of introduction of protected areas to Africa (**section 1.2.4**) and then Kenya (**section 1.2.5**). The growth and development of tourism is reviewed in **section 1.3** by considering the development of mass tourism (**section 1.3.1**) and the realisation of the negative impacts of tourism (**section 1.3.2**). Impacts of tourism specifically to wildlife is looked at in **section 1.3.3** whilst **section 1.3.4** and **section 1.3.5** look at how tourism started having negative impacts in Kenya and Masai Mara respectively. The aims and objectives of the study are stated in **section 1.4** and lastly, **section 1.5** outlines the organisation of the thesis.

1.2 Early Development of Protected Areas

1.2.1 Initial Themes on Protected Areas Establishment in the Developed World

The idea of protected areas has existed since time immemorial, initially as sacred groves. Royal hunting reserves stocked with game were preserved for the enjoyment of the privileged ruling classes in Medieval Europe (Runte, 1987). The New Forest in southern England was one of the earliest, established in 1057. Ideologies associated with the French revolution in 1789 led to the democratisation of royal parkland for the enjoyment of the masses. In 1842, the first public park, Victoria, was established in London, England. In addition, the anti-urban sentiment

associated with the harsh realities of post-industrial revolution living, and the rise of romanticism, helped to popularise nature in the eyes of the public (McHenry and Van Doren, 1972; Nash, 1982; Runte, 1987). This resulted in a prolific development of urban parks in Europe.

A young American, Fredrick Law Olmsted, was so impressed by the public park in England that, in 1850, he returned to America and lobbied successfully for the establishment of Central Park in New York, which was followed by others mainly in the Eastern United States. These comprised landscaped areas that were constructed for recreation.

The shift from the construction of landscaped parks to the protection of natural landscapes in America can be attributed to a number of factors. Firstly, independence from Britain left America without an established past, a cultural identity to rival the artistic, literary and architectural traditions of Europe. It was more for want of something to rival Europe's castles and cathedrals, the works of Michelangelo and DaVinci and the writings of Homer and Shakespeare, rather than a conscious effort to preserve nature's splendour. Out of this grew a cultural nationalism, which found its identity and pride in the wild beauty and unique natural grandeur of the Western frontier of their continent.

Secondly, America was acutely conscious that the newly discovered natural wonders of the Western frontier were not immune from private commercial exploitation. She had already witnessed the massive development and commercialisation of Niagara Falls by private entrepreneurs aiming to cash in on the scenic value of the spectacle, which by the mid-19th century was attracting tens of thousands of visitors from home and abroad. The ruination of the scenic experience by uncontrolled development right up to the rim of the falls was commented on by many overseas visitors, who criticised the patriotism of the American people for allowing such destruction of their natural heritage (Runte, 1987).

This criticism struck at the nation's pride at a time when it was struggling to establish its cultural identity. The genocide perpetrated by the colonists upon the Native American people had also robbed them of a cultural history. However, the natural wonders emerging from the new continent appeared to offer compensation

for a nation without a cultural heritage. Niagara had been the continent's only claim to scenic superiority over Europe until the western frontier was pushed back after 1850. With the discovery of new Western wonders, the nation was determined not to repeat the mistakes of Niagara (Nash, 1982).

It was, therefore, the romantic appeal of the Western frontier, the guilt of the Eastern population over the desecration of Niagara and the scramble for private appropriation of Western wonders, and the need for some form of monumentalism on which to base national pride, that conspired to provide the inspiration for wilderness preservation (Runte, 1987). Hence, Yosemite Park was established in California in 1864 to protect its spectacular landscape for public use, resort and recreation.

1.2.2 Linking Protected Areas and Wildlife Conservation

The idea of a national park first emerged in 1832 when an artist and traveller, George Catlin, came up with the idea of establishing a 'nation's park' to house wildlife and Indians. However, the first resolution of the 'national park' idea appeared in 1864 when the Yosemite Act was passed by Congress to preserve the Yosemite Valley and a grove of Sequoiaital redwoods 'for public use, resort, and recreation', 'inalienable for all time'. Although the term 'national park' was not officially used until the designation of Yellowstone eight years later, Yosemite was, in all but name, the first national park.

Public parks were at that time being established for recreation purposes and monumentalism. These two objectives were the motive behind the establishment of Yellowstone, which was enacted by the U.S. Congress as the first national park in 1872. The purpose was expressly to preserve the hot springs for public use, and Congress had first to be convinced that the region had no commercial value before consenting to the park.

Five public parks were established in America between 1890 to 1902, but wildlife conservation never featured in the establishment of these parks. In fact, the five parks were among America's grandest monuments and, like Yellowstone, had no commercial value as far as Congress was concerned. It was not until 1894 and the

Act to Protect Birds and Animals that hunting was banned in Yellowstone. Nevertheless, fishing still continues to this day.

In 1916, the National Parks Service was established in America and national parks began to focus on areas for wilderness preservation. In 1934, the Everglades became the first national park in America to be established primarily to protect fauna and flora. Its establishment had its hitches, with conservation champions such as William Hornaday commenting in 1932 that the park had absolutely nothing that was picturesque or beautiful. "A swamp is a swamp," he said. "It is a long way from being fit to elevate into a national park, to put it alongside the magnificent array of scenic wonderlands that American people have elevated into that glorious class". Yet another conservationist argued that total preservation as an afterthought of the 20th century was nowhere more apparent than in the national parks (Runte, 1987).

1.2.3 Integration of Economic Benefits in to Protected Areas

The defining features of the original national park ideal in America were threefold. First and foremost, they should be scenic wonders worthy of national pride; secondly, they should be open to the public for recreational use, and; thirdly, they should be 'inalienable for all time'. However, their foundation was based primarily on the 'worthless lands' hypothesis, this being that proposed areas were of no material value and that designation would not impede the economic progress of the nation (Runte, 1987).

Towards the end of the nineteenth century it became apparent that natural resources were limited, whilst consumption was growing. In the face of rampant deforestation and commercial over-exploitation of resources, a new philosophy of use emerged. Professional natural resource managers argued in favour of the efficient use and manipulation of all natural resources to achieve greater efficiency without depriving future generations (Hays, 1959). This philosophy became known as utilitarian conservation, proponents of which viewed scenic preservation as an indefensible waste of potentially valuable resources.

The Forest Reserve Act was enacted in 1891 and later two new government bureaux, Reclamation Service and the Forest Service, were established in 1902 and 1905, respectively. These allowed for the utilitarians to make inroads into the national

parks in the early 1900s, and a number were reduced in size as peripheral areas were reclaimed for timber, minerals or agricultural use. However, the ultimate failure of the worthless lands hypothesis came in 1913, when the Hetch Hetchy Valley at the heart of Yosemite National Park was deproclaimed to make way for a hydroelectric scheme (Nash, 1982; Runte, 1987).

The Hetch Hetchy controversy illustrated that the preservationists did not yet have a strong enough rationale with which to defend national parks in America. In an attempt to place utilitarian value on national parks, some proponents argued that national parks were good for the spirit of the workforce, that inefficiency was a direct symptom of unfavourable surroundings and a lack of psychological well-being which could be remedied by wilderness. They argued that tired, nerve-shaken, over-civilised people found the wilderness as a necessity; and that mountain parks and reservations were useful as fountains of life that regenerated their spirit (Hays, 1959; McHenry and Van Doren, 1972). Stronger arguments were put in economic terms, giving the example of Switzerland where scenic attraction was regarded as a money-producing asset to the extent of some two-hundred million dollars annually (Runte, 1987).

The economic argument gained plausibility because it coincided with the beginnings of the leisure society that popularised travel. However, to entice the American public to remain on home soil for its scenic experiences demanded the development of improved access to, and facilities within, national parks. The impetus for this came in the form of an alliance with the railways and roads, the industry most likely to benefit from increased park visitation. The railways and roads actively promoted scenic preservation and helped to raise public support and pressure for a bureau of national parks equivalent to the utilitarian Forest and Reclamation Services.

The institutionalisation of the national park idea within the political and legal framework of American government was finally achieved in 1916, when the National Parks Service was established. Its legal mandate was to promote and regulate the use of national parks in line with their fundamental purpose of conserving the scenery, the natural and historic objects, and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will

leave them unimpaired for the enjoyment of future generations (Grosvenor, 1966; Runte, 1987).

With the establishment of the National Parks Service, attracting tourists became the principal operational objective of national parks. The immediate goal of the service was to build a constituency for expansion of the system (Mitchell, 1994). The successful 'See America First' campaign was a joint marketing initiative with the railways and road companies, designed to appeal to cultural nationalism and to persuade the American public to take their scenic holidays at home rather than in Europe. It was the start of an expansion of national park visitation throughout the century that reached 270 million visitors by 1994 and is predicted to reach 500 million by the year 2010 (Mitchell, 1994). It also served to stimulate the promotion of recreation as a non-material value of national forests (Nash, 1982), and subsequently wildlife refuges (DiSilvestro, 1993).

1.2.4 Expansion of Protected Areas to Africa

The origins of modern formalised conservation in Africa can be traced to the perceived environmental crises in the Cape colonies of South Africa in the mid-nineteenth century (Grove, 1987). Rapid deforestation and soil erosion caused by increased flooding alerted some observers to the impact that colonial resource exploitation was having on the environment. The earliest themes to be promoted were twofold: the scientific and medicinal values of specialised flora threatened by deforestation; and, the linkage between deforestation and rainfall decline, with the resultant occurrence of famine. The first forest conservation legislation in the Cape, the Forest and Herbage Preservation Act, was enacted in 1859. The conservation concept at this time was clearly in the utilitarian vein, focusing on improvement of the environment and resource management. A second and ultimately more important theme in Africa, was that of wildlife decline in the face of massive hunting pressures (MacKenzie, 1987). Commercial hunting for ivory and skins, subsistence hunting, and eventually sport hunting by the colonial elite, each contributed to the decline of wildlife. This decline was accentuated by rinderpest epidemic, which spread south from Eritrea (MacKenzie, 1987; Homewood and Rodgers, 1991). It eventually led to the extinction of two species, the blaubok and quagga, and the severe endangerment of the southern white rhino, bontebok and white-tailed gnu. These

disappearances, coming at the same time as the American bison was seen to be almost annihilated, led colonial sport hunters to become the biggest proponents of interventionist conservation policy, leading pressure groups to promote legislation for the creation of Game Reserves (MacKenzie, 1987; MacKenzie, 1988). In 1900, the first-ever International Convention on Wildlife was held at Lancaster House in London. Here, eight European nations with territories or protectorates in Africa discussed ways to prevent the destruction that was affecting wild animals in southern Africa and in other parts of the globe, and ratified various articles covering trade, hunting and wildlife reserves.

Game reserves were proclaimed from the late nineteenth century onwards. Sabi Game Reserve was established in 1898, and a dramatic recovery of bushveld and game was witnessed in the space of a decade. However, as with the early national parks in America, game reserves received opposition on the grounds that they impeded colonial economic progress. Again, the emergence of tourism proved to be the best economic defence of protectionist policy.

The drafting of the 1933 'Agreement for the Protection of the Flora and Fauna of Africa' at the International Conference on African Wildlife marked the transition of protected area conservation in Africa from game reserves to the creation of national parks, using the model developed in America (Boardman, 1981; Nash, 1982; MacKenzie, 1988). National parks were distinguished from game reserves in four principal ways: (i) they were established in perpetuity; (ii) their management was often separated from direct government control; (iii) the ultimate objective was that they should be self financing; and (iv) they were established both for flora and fauna preservation and for public recreation (MacKenzie, 1988).

The railway passing through the Sabi Game Reserve was soon stopping to provide passengers with game viewing opportunities. The economic incentive of tourism proved a forceful argument for greater government protection of the area, and in 1926 the Sabi Game Reserve was transformed into Kruger National Park. Tourist development started immediately, and by 1938 there were 38,000 visitors in 10,000 cars, 1200 miles of road, six entrance gates and 14 visitor camps (MacKenzie, 1988). National parks blossomed in South Africa throughout the 1930s, with considerable interaction between African and American parks and wildlife preservation groups.

The earliest expansion of the protected area network occurred in Southern Africa, where an urban population with private transport existed, and which was already located on an international tourist trail. The development of protected areas in Eastern African colonies was slower due to the lesser extent of urbanisation and foreign visitation. West Africa had only a small European population, a reputation as an unhealthy area, and a dense African population with traditional hunting rights, and so gazettement was virtually impossible (MacKenzie, 1988).

By the 1960s, when many former colonies gained their independence, national parks and equivalent reserves had been established throughout east and southern Africa. These have grown to 727 protected terrestrial areas (approximately five per cent of the total land area) and 112 protected marine areas (WRI/UNEP/ UNDP/WB, 1996). However, there was a fear that, perceived as white men's playgrounds by the indigenous population, they would suffer after independence. Again, the economic value of international tourism was used as the rationale by conservationists in trying to persuade African leaders to continue to support protected areas (Runte, 1987; MacKenzie, 1988). It was a powerful incentive, and wildlife tourism based upon protected areas soon became the second or first source of foreign exchange for many African nations (Nash, 1982).

1.2.5 Development of Protected Areas in Kenya

Late in the 19th century, firearms became readily available to the indigenous populations, who soon commercialised their traditional hunting economy. In the first six months of 1888, more than 37,000 firearms and a million rounds of ammunition were imported through Zanzibar. When the British Empire was establishing itself in East Africa, many of its missionaries and administrators were sportsmen and naturalists who were well aware of the wildlife slaughter that had accompanied colonisation in America, India and South Africa. They were genuinely astounded by the unimagined plethora of wildlife and aware of the large migrations and the need for sufficient area in which to protect them. This introduced an early concern for rapid loss of game through hunting pressures.

In 1896, following the formal declaration of the East African Protectorate, the British Foreign Secretary wrote to the commissioners asking for a report on wildlife, urging tighter protective measures. This was followed in 1897 by a call for an international

agreement on ivory trading and wildlife protection in Africa. At the same time, Sir John Kirk, the then Governor of Kenya, asked for a sufficiently large wildlife sanctuary in British East Africa to encompass a number of habitats in Kenya. This led to the establishment of a 13,000-square-mile Southern Game Reserve in 1899 and to the 13,800-square-mile Northern Game Reserve in 1900. Both reserves were intended to protect wildlife and the rights of indigenous peoples who, the colonial government thought, would preserve wild animals. Hunting without a license became illegal shortly after the turn of the century, although funds were very limited for implementation of rules created by the Society for the Preservation of the Fauna of the Empire, based in Britain (Berger, 1993).

In 1899, the Queen's Regulations under the African Order in Council refused commercial animal trade, except in crocodiles, explicitly to protect the interests of indigenous tribes and wildlife in East Africa. In 1900, the first-ever International Convention on Wildlife was held at Lancaster House in London. Here, eight European nations with territories or protectorates in Africa discussed how to prevent the destruction, which had overtaken wild animals in southern Africa and in other parts of the globe, and ratified various articles covering trade, hunting and wildlife reserves. In 1901, the first game ranger was employed in Kenya and instructed to protect wildlife, especially in the reserves. In 1906, the Society for the Preservation of the Fauna of the Empire was formed in Britain and urged the British Government to establish protected reserves covering the migratory routes of wildlife, arguing that action should be taken before settlement made the proposition difficult and expensive. Wildlife, they stressed, should be protected for posterity and had great economic potential in East Africa. In the same year, the Secretary of State in Britain was lobbied by the Society for the Preservation of the Fauna of the Empire to redouble conservation efforts. Their request was favourably received and in his reply he stated that we owe the preservation of these interesting and valuable and sometimes disappearing types of animal life as a debt to nature and to the world. He added that Britain was trustee for the prosperity of the natural contents of the Empire and reserves ought to exist not for the gratification of the sportsmen, but for the preservation of interesting types of animal life (Berger, 1993). The Game Department was established in 1907 in Kenya by the colonial government and was charged with enforcing the hunting laws and protecting the reserves (Honey 1999).

These remarkable beginnings did not prevail for long. A wave of white settlers arrived at the turn of the century and began to repeat the wildlife slaughter which was so familiar in North America, India and South Africa. They argued that wildlife was the vermin that destroyed crops and livestock and that the reserves should be dismantled in favour of settlement. It was only the limited agricultural potential of the reserve land and the combined forces of the Game Department and the British Government, which still honoured many of the tribal reserves, that prevented a large-scale annexation of the reserves and confined wildlife slaughter to the arable highlands and the coastal belt of East Africa. The extensive savannahs were inhospitable, lacked water and harboured sleeping sickness.

Alerted to Africa's wildlife spectacle by films, books and returning tourists, a small group of Europeans and Kenya Settlers became alarmed by the mounting threats. In the 1930s, they sought to establish national parks and reserves free of all human settlement. The movement was halted temporarily by the Second World War but succeeded soon afterwards with the enactment of the National Parks Ordinance of 1945. This marked a shift in approach, from protection through hunting legislation, to preservation through land protection and eviction of local people (Honey, 1999). The first national park in Kenya, Nairobi National Park, was established in 1946.

Most land now protected was designated between 1945 and 1960, in areas deemed low in economic potential. National parks came under the authority of the National Park Service, with mostly European game wardens and external funding mostly from World Wildlife Fund for Nature (WWF), International Union for the Conservation of Nature and Natural Resources (IUCN) and the New York Zoological Society. National reserves, in areas where human activity could be allowed, came under control of the Game Department. However, human activities were deemed incompatible with wilderness preservation, and the presence of local people was considered to interfere with the wilderness experience which foreign tourists came to expect (Adams and McShane, 1992). As such, local people were excluded from national reserves, areas which they had previously inhabited or depended on for resources (IIED, 1994).

Since Kenyan parks were created by the government with little regard for local needs, Kenyan reactions to park designation have been described as baffled and

angered (Berger, 1993). With the perception that subsistence hunting was decimating wildlife, game patrols jailed Africans hunting without permits. Anti-poaching campaigns, for example, are alleged to have decimated the Waliangulu people around Tsavo National Park who were dependent on elephant hunting. At one time, about one-third of the adult male Waliangulu were in prison for poaching (Berger, 1993). Early conservation policy saw Maasai people as somewhat compatible with wildlife, and they were not excluded from game reserves but removed from national parks.

After gaining independence from Britain in 1963, Kenya adopted and strengthened its system of wildlife protected areas that had been established by the Kenya National Parks soon after World War II (Ceballos-Lascurain, 1996). The original Kenya National Parks administration was combined with the former Game Department under the Wildlife Conservation and Management Act of 1976 to form Wildlife Conservation and Management Department (WCMD). Attempts to develop economically viable consumptive wildlife utilisation projects were halted in light of decreasing wildlife populations as agricultural development consumed habitat and poaching pressures became severe (Berger 1993). In light of declining game populations and increasing poaching for the ivory and rhino horn trade, a comprehensive hunting ban was instated by presidential decree in 1977, and with it ended all legal forms of consumptive wildlife utilisation. Tourism remained as the only form of wildlife utilisation and development of tourist facilities was highly encouraged. WCMD was replaced by a self–funding and semi-independent parastatal in 1989 when Kenya Wildlife Service (KWS) was formed to manage wildlife both within and outside the protected areas (KWS, 1996; ODA, 1996; Weaver, 1998).

1.3 Growth and Development of the Tourism Industry

1.3.1 Development of Main Stream Tourism

Section 1.2 has shown how tourism provided an economic rationale for maintaining national parks, although it may not have provided the initial impetus for their establishment. However, the origins of tourism on a large scale stem from the industrial revolution when the development of the steam railway provided the first cheap mass transport. This stimulated the development of holiday resorts,

particularly in coastal and scenic areas away from urban centres. International travel began to flourish in the latter half of the nineteenth century, but did not take off until the development of aeroplane technology, stimulated by the two World Wars. Post-war affluence and the advent of the consumer society, with its resultant cheap mass transport and increased leisure time, heralded the onset of modern international mass tourism (Pearce, 1981).

Over the past few decades, tourism has been one of the most consistent growth industries. In 1950, there were estimated 25 million global international tourist arrivals (WTO, 1991). In the following 20 years the total had increased over six-fold to 166 million, and in the next two decades it had increased a further three-fold to 459 million. By 1995, an estimated 561 million international tourist arrivals were occurring annually, and international tourism receipts (excluding international transport) were estimated to exceed US$380 billion (WTO, 1996). In the late 1980's, tourism was ranked the third largest global export industry (Boo, 1992). It is now considered to be the world's largest industry, and arrivals are expected to exceed 1 billion by the year 2010 (WTTC, 1992; Goodwin, 1996).

The growth of tourism over recent decades has been accompanied by a geographical shift in emphasis towards less developed countries. Between 1980 and 1995, Europe and the Americas experienced a declining share of international arrivals, whilst Africa and Asia commanded progressively more of the international market. East Asia and the Pacific experienced particular growth, doubling their share of the market from 7.3% to 14.8% (WTO, 1996). It has also been suggested that consumer demand has contributed to the expansion of tourism into less developed and more remote regions of the globe, as certain types of tourist have extended the geographic boundaries of the 'pleasure periphery' (Prosser, 1994) due to development of transport infrastructure.

Nature tourism, 'with the specific motive of enjoying wildlife or undeveloped natural areas' (WTTERC, 1993), is a growing sector of the industry. Since the 1960s there has been a great increase in nature tourism, for two main reasons. One is the increasing accessibility and promotion of huge and well-stocked national parks in Africa, which have become prime destinations for wildlife safaris. The other is the increasing number and popularity of nature and wildlife television documentaries

(Ceballos-Lascurain, 1993). Nature tourism now commands a considerable segment of the international travel market. Estimates range from 10% (Giongo *et al.*, 1993), to 20-25% (Giannecchini, 1993), to 40-60% (Filion *et al.*, 1992) depending on definitions (see Jenner and Smith, 1992). Much of this sector of the industry is based upon protected areas, particularly in developing countries.

1.3.2 The Tourism Conscience

In the early 1950s the realisation that the growth of tourism in American national parks was causing environmental problems began to surface (Nash, 1982). The response of the National Parks Service was a programme of increased development to cope with increased demand (Grosvenor, 1966; Wirth, 1966). However, a concurrent growth in biocentrism, stemming from the non-economic, ecological ethic promoted by Aldo Leopold (Leopold, 1949) heralded an alternative perspective which recognised the environmental values of protected areas. A seminal report on the state of national parks in America advocated an ecosystem approach to wilderness management and controls on the spread of tourism development within national parks (Leopold, 1963).

It was not until the 1970s that a more general disillusionment with tourism became widespread. The previous decade had witnessed the global promotion of tourism as an economic panacea. As the industry grew, an expanding body of evidence began to highlight the negative cultural, political and environmental changes which were associated with tourism in reality (de Kadt, 1979; Mathieson and Wall, 1982; Krippendorf, 1987; Smith and Eadington, 1994). The ideological rejection of mainstream, mass tourism amongst hosts, guests and pressure groups resulted in the emergence of what has been termed 'alternative tourism' (Krippendorf, 1987; Lea, 1993; Prosser, 1994; Smith and Eadington, 1994).

Alternative tourism, together with its many synonyms, is a loose term that has been applied to anything which is perceived as alternative to mass tourism. As such it has been equated both with minority segments of a continually fragmenting market, such as adventure tourism, cultural tourism or nature tourism, and with principles of less damaging tourism. This has led to confusion and criticism since many alternative forms of tourism may be no less damaging than mainstream tourism (Krippendorf,

1987). In the 1980s, the decade of 'green consumerism', the promotion of alternative tourism became fashionable.

1.3.3 Tourist Impacts on Wildlife

Scattered results from different protected areas around the world show that animals respond to tourists by either avoiding them, changing their behaviour or becoming habituated (Roe *et al.*, 1997). For example, human traffic makes African felids more nocturnal (Haltenorth and Diller, 1971); and its increase on the rivers of Sumatra causes an increase in proboscis monkeys (*Nasalis larvatus*) roosting along them (Griffiths and van Schaik, 1993). In Katembe, wild pigs respond to humans by fleeing a short distance and then simply continuing to forage. Like pigs, most primates, some squirrels and hornbills are gradually becoming habituated to humans without any special effort (see Wright, 1992). Thus the continuous presence of humans affects species differently. Some species move out or change their activity period, others remain unaffected or become habituated (Wright, 1992).

In cases where human traffic leads to prey animals becoming habituated to tourists, reduction of predation on the habituated species may occur. For example, leopard predation on monkeys (*Cercopithecus aethiops*) in Amboseli, Kenya, was most likely when the researchers were not at the site (Isbell and Young, 1992). Thus, habituated species in research and tourist areas may be expected to increase in their numbers. Indeed, most long-term primate studies report increases in population size, a phenomenon mainly ascribed to reduced predation (van Schaik and Rao in preparation)

Tourism impacts on habitats occur through trampling when walking or driving. Two major effects of trampling may be observed: (a) the direct effect of mechanical forces which damage all or part of the plants and (b) the indirect effects of trampling on the physical and/or chemical characteristics of the soil, which in turn affect plant establishment, growth and reproduction. Some plant communities are more resistant to the direct effects of trampling than others, while others may be more resilient after direct impacts have ended (Cole, 1988; Cole and Trull, 1992). This has been attributed to the fact that the resistance and resilience of different plant species to trampling vary depending on their morphology, anatomy, reproductive potential and biomass (Bates, 1935; Kellomachi and Saastamoinen, 1975). Cole (1988) suggests

that resistance is determined mostly by plant characteristics, while resilience is influenced by habitat properties. These differential responses of vegetation to trampling explain why the composition of plant communities subjected to such stress will change over time. Communities that include species which are competitive in nature i.e. not stressed environments, can thus shift to communities with species that are less competitive in non-stressed environments, but more competitive in stressed environments, such as trampled soils (Grime, 1973).

The primary effect of trampling on soil is compaction, a reduction in soil volume accompanied by an increase in soil bulk density. The decrease in large soil pores, and increase in small pores, results in an increase in matrix potential and soil water potential. During the dry season this allows compacted soils to have greater moisture content per unit weight than non-compacted soils (Bates, 1935; Liddle and Greig-Smith, 1974). The collapsing of the large pores also restricts the air porosity of the soil and can lead to periods of deficient soil and root aeration (Grable, 1971). Compacted soils will also generally have a higher thermal conductivity than non-compacted soils of the same type (Willis and Raney, 1971). Compaction affects the mobility of inorganic ions, and therefore their availability to plant roots. It also influences the mineralisation of nutrients from soil organic matter by micro-organisms. Nitrogen mineralization and nitrification can be reduced by even slight increase in compaction (Kemper *et al.,* 1971)

1.3.4 Growth of Tourism in Kenya

Prior to independence in 1963, Kenya supported an appreciable tourism industry. The arrival of the railway in 1899 made Nairobi the focus of a new safari hunting industry. In the early 1900s, the Uganda railway promoted the potential of East African tourism in London, and posters appeared in newspapers and clubs (Weaver, 1998). Hunting became big business in Kenya, and East Africa at large, when Theodore Roosevelt, former president of the United States was inspired by the writings of F.C. Selous and sailed to Kenya to embark on the most elaborate hunting safari East Africa has ever seen. With many animals killed by the Roosevelt trip and quality trophies collected, East Africa and especially Kenya was put on the map as a big game hunting destination. Since then, there has been a great increase in the numbers of people visiting Kenya, for both beach and game viewing holidays.

History has it recorded that as early as the 1930's, overseas visitors and explorers were coming to Kenya mainly for big-game hunting expeditions while others came in search of solitude. These expeditions were locally referred to by the Swahili word 'safari', meaning journey, thus bequeathing a new word to the literature associated with the travel world. Among the early visitors were statesmen, royalties and celebrities such as Theodore Roosevelt, Her Majesty Queen Elizabeth II, and Ernest Hemingway, respectively.

Soon after independence, the Kenya Government realised the enormous potential of the nascent tourism industry. Hence, it formulated Sessional Paper No. 8 of 1969 on the Development of Tourism in Kenya. This defined the growth targets that it hoped to achieve in the years ahead and outlined the areas where the Government would participate jointly with private investors in developing the tourist industry. The Government encouraged local and foreign entrepreneurs to invest in the tourism and hospitality industries, thus paving the way for the future development of the sector.

This followed a spectacular growth in the Kenyan tourism industry. There were 35,000 arrivals in 1960 and this rose dramatically to 334,000 in 1978. During the thirteen years between 1978 and 1991, arrivals in Kenya further doubled, rising to 750,000 (Figure 1.1). By 1987, the tourism industry directly employed 110,000 persons. The real employment figure is certainly higher than this when indirect and induced employment resulting from income and employment multiplier effects outside the formal labour market are taken into account.

Numbers of visitors have not been the only aspect of the industry that has seen immense growth. Revenue from tourism has also grown steadily since the country's independence in 1963 to the point where tourism was the leading foreign exchange earner in 1987 after it surpassed coffee and tea. Hence, tourism has been said to transform some of East Africa's natural beauty into "gold", especially in Kenya.

The Kenyan Government's policy towards tourism and wildlife conservation is guided in particular, both by the benefits accruing to people living around wildlife areas and to the whole country in general. Wildlife tourism mainly relies on the national parks and national reserves that occupy approximately 8 % of the country's total land area. The importance of tourism can be deduced from the fact that the

Ministry of Tourism and Wildlife has repeatedly set numerical targets, for example, attaining a million tourists in protected areas by 1990, and maintaining this as the number of incoming tourist per annum (Sinclair, (1992)

Tourist arrivals in Kenya show great temporal and spatial variation. In terms of

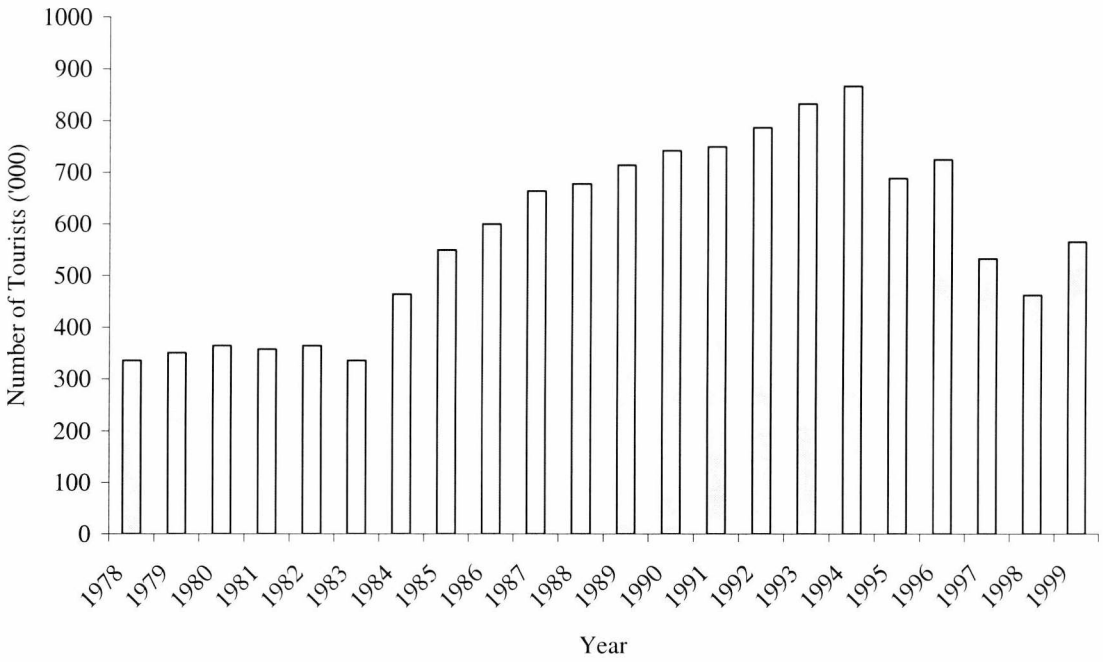


Figure 1-1: Total number of tourists visiting Kenya from 1978 to 1999 based on visitor arrivals

temporal variation, the high season for tourist is mainly from July to October. The low season has very few tourists and runs from November to June. Spatial variations in tourist visitation mainly go with abundance of wildlife and accessibility. Highly visited national parks and national reserves are accessible with abundant wildlife while remote parks and reserves with little wildlife have very low rates of visitation.

Some land use conflicts have already been brought about by tourism development in Kenya's conservation areas. Such conflicts question the continued expansion of the tourism industry at the expense of agriculture. Evidence suggests that tourism, especially wildlife-based tourism, reduces food production in Kenya's rangelands, where the majority of Kenya's nomadic communities live (Awuondo, 1982). It is also argued that national parks and national reserves occupy large tracts of land that could be agriculturally productive. In turn, this has increased population pressure on high and medium potential land, and hence landlessness, out-migration, and spontaneous settlement problems in the marginal areas (Mbithi and Barnes, 1975).

Apart from these land use conflicts with conservation, tourism has been shown to affect habitats, animals and local communities in Kenya. Uncontrolled and unregulated tourist use in some wildlife areas is a source of concern for a variety of perceived or actual ecological and social impacts (e.g. Myers, 1972; Olindo, 1972; Jewell, 1974; Henry, 1980). Effects of pollution, which is a negative attribute of tourism, are profoundly apparent. They may take the form of weeds on beaches or noise from loud discotheque entertainment in resort hotels, or even the sheer number of vehicles and the exhaust fumes they emit.

The vast majority of parks are not equipped to maximise the benefits to be derived from tourism. National parks and national reserves lack trained guides, interpretative information, visitor centres and the other infrastructure necessary to manage visitors. For example, the 'Big Five' did much to promote Kenya's tourist economy in the 1960s through safari hunting. Today the 'Big Five' mentality is doing more harm than good. Traffic jams are forming around prides of lions in the vastness of Kenya's wildlife areas (Onyeanusi, 1986; Muthee, 1992).

1.3.5 Tourist Impacts in Masai Mara

Masai Mara National Reserve (MMNR) is undoubtedly the jewel in Kenya's wildlife. However, it is becoming just as well known for its uncontrolled tourism as it is for its wealth of wildlife. Studies done in MMNR have documented driver guides going off designated tracks resulting in localised degradation of grasslands and thereby destroying the naturalness of the area (Onyeanusi, 1986; Muthee, 1992; Bhandari 1998).

Disturbance of wildlife by tourists especially with the cheetahs changing their hunting time has also been reported (Muthee, 1992). Additionally, balloon safaris have been said to disturb animals along their flight paths. To counter these problems, MMNR management started surveillance patrols whose effectiveness has never been monitored. Therefore, it is necessary to fill these existing knowledge gaps especially as regards the resident herbivores that have never been studied with respect to tourist impacts.

1.4 Aims and Objectives of the Study

The main objective of this study is to quantify a number of tourism impacts and identify ways of resolving tourist-wildlife conflicts in MMNR. To achieve this objective, several aspects of tourist-environment dynamics will be examined. These include: the patterns of tourist and wildlife distribution; habitat degradation; and, tourist management practices. To meet the principle objectives, the following research topics will be investigated:

- Spatial and temporal patterns of development of tourist facilities in MMNR.
- Spatial patterns of habitat degradation in relation to infrastructure development and management intervention.
- The relationship between tourist and wildlife distribution.
- Wildlife response to tourist behaviour and activity.
- Awareness of and compliance to MMNR regulations by visitors and tour drivers.

1.5 Thesis Organisation

This thesis is organised into eight chapters. The first chapter has introduced the study themes and reviewed literature relating to the different aspects of the study. **Chapter 2** introduces the study area and the general research methods. **Chapter 3** looks at the patterns of tourist development in the study area, while **Chapter 4** analyses the degradation of wildlife habitat by tourists. Factors that may affect the distribution of wildlife are examined in **Chapter 5**, whilst **Chapter 6** determines the effects of tourist behaviour on wildlife. **Chapter 7** then looks at sources from which visitors obtain information on MMNR regulations, and the levels of compliance to these regulations. This is followed by **Chapter 8** that presents some recommendations for a better management of MMNR. Lastly, **Chapter 9** offers a discussion of the findings of the study together with conclusions those can be made from the results.

CHAPTER TWO

Study Area and Research Methods

2.1 Introduction

This chapter describes the study area and the general research methods. It introduces the MMNR in the context of the research objectives of this study. Information on the study area is mainly derived from secondary sources, but it also includes observations made during the period of field data collection.

Section 2.2 provides an outline of the study area, and starts by describing the biogeography of the area (**section 2.2.1**) including the location (**section 2.2.1.1**), the physical features (**section 2.2.1.2**) and the biological features (**section 2.2.1.3**). The conservation status of MMNR is described in **section 2.2.2**, based on a description of its history (**section 2.2.2.1**) and conservation values (**section 2.2.2.2**). The management of MMNR is outlined in **section 2.2.3**, while some aspects of tourism in the area are provided in **section 2.2.4**, which describes how tourists can access the area (**section 2.2.4.1**) and tourists activities available (**section 2.2.4.2**). **Section 2.2.5** looks at the available accommodation, whilst the land use practices in areas surrounding the study area are described in **section 2.2.6**.

The general research methods are outlined in **section 2.3**. An explanation is provided of the sources of archived and published information used in **section 2.3.1** whilst **section 2.3.2** describes the field techniques and **section 2.3.3** deals with the questionnaires.

2.2 Study Area

2.2.1 Biogeography of MMNR

2.2.1.1 Location

MMNR is located in southwest Kenya and borders the Serengeti National Park in Tanzania (Figure 2-1). MMNR is in the Rift Valley Province of Kenya, and its borders extend into the two districts of Narok and Transmara.

MMNR lies between latitudes 1° 15′ and 1° 45′ South and longitudes 34° 45′ and

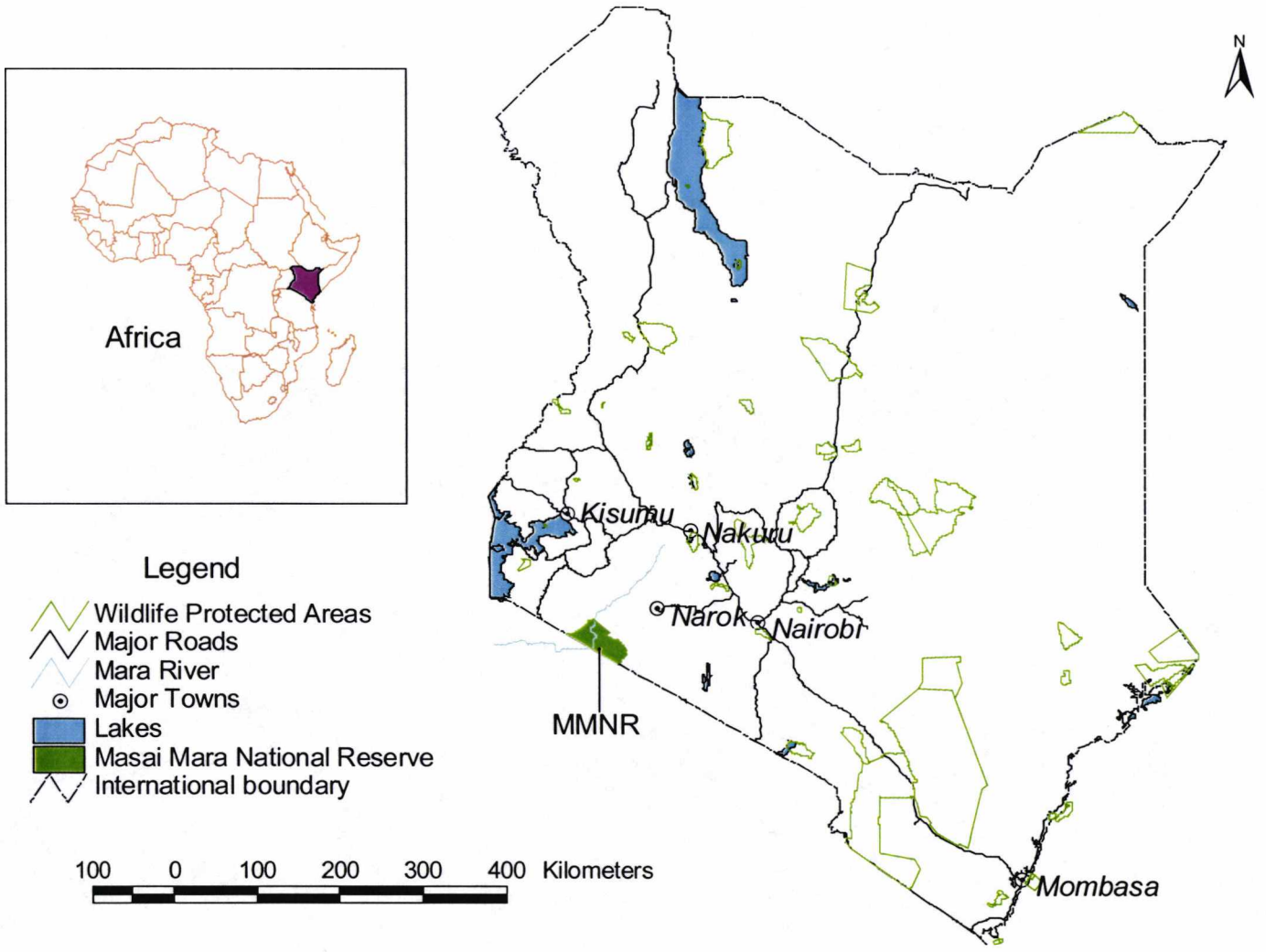


Figure 2-1: Map of Kenya showing the position of Masai Mara National Reserve. The inset is a map of Africa with Kenya shaded

35° 25´ East. It is at an altitude of between 1,400 and 2,170 m above sea level and occupies a total area of 1,510 km². This area is contiguous with the 14,766 km² Serengeti National Park in Tanzania, and is part of the northern portion of the Serengeti-Mara ecosystem (Burney, 1980). Narok County Council (NCC) and Transmara County Councils (TMCC) jointly own this land, with NCC controlling the part east of the Mara River and TMCC controlling the part to the west of Mara River (Figure 2-2).

2.2.1.2 Physical Features

2.2.1.2.1 Climate

The local climate of MMNR is relatively warm with mean temperatures (1971-77) ranging from a minimum of between 12°C and 14°C and a maximum of between 26.5°C and 31°C (Burney, 1980; Amuyunzu, 1984). The general physiography strongly influences the local rainfall pattern. The rainfall gradient increases from east to west across MMNR, according to the position of the Inter-Tropical Convergence Zone (ITCZ) (Brown and Cocheme, 1973). The pattern of rainfall is bimodal with two peaks. The long rains fall from March through May, and the short rains fall in November and December. The main dry period is from mid-June to mid-October with a shorter dry season during January and February (Stelfox *et al.*, 1986). The mean annual rainfall varies from 800 mm to 1200 mm/year (Dublin, 1991).

2.2.1.2.2 Topography

MMNR comprises mainly undulating to flat plains with isolated rocky outcrops, especially south of Mara Triangle. The area to the east is quite different from the rest of MMNR in being quite hilly. An escarpment runs to the west in a north-east direction with an elevation of up to 2290 m. The major plains are as follows: the Burrangat Plain lies just south of the Talek River; the Central Plains lie to the north-east of where the Mara River flows into Tanzania; the Eluai Plain lies towards the middle of the Mara Triangle; the Meta Plains lie to the south-east of the Burungat Plain; the Paradise Plains lie in the curve formed by the upper part of the Mara River;

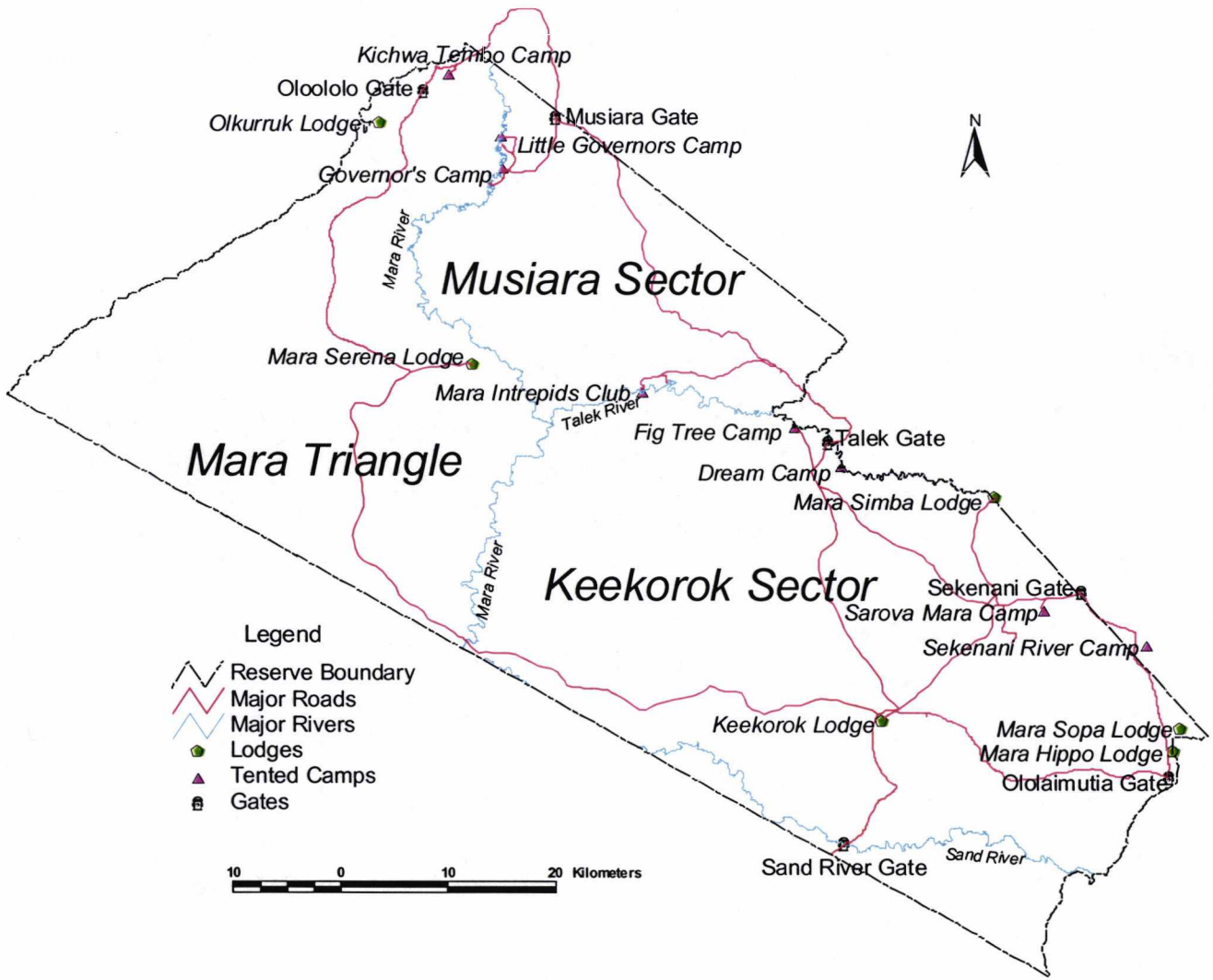


Figure 2-2: Map of Masai Mara National Reserve

and, the Posee Plains lie south of the Talek Gate. There is a ridge known as RhinoRidge that runs north-west to south-east, midway between the Oloololo Gate and the Talek Gate.

The escarpment, Siria Escarpment (also sometimes known as the Esoit Oloololo Escarpment), forms the north-western border of MMNR. Among the most prominent hills are the Ngama Hills to the Southeast and just below the Sekenani Gate.

2.2.1.2.3 Hydrology

The drainage of MMNR is determined by its topographic features, which tend to slope gently downwards to the south-west from Lemek Hills in the north-east. The Mara River, which is a major international river, bisects the area from north to south. The Mara River originates from the Mau Hills and flows south-west through the foothills of the Siria Escarpment and then south through the MMNR after which it turns west to discharge into Lake Victoria. All the watercourses in the various plains of MMNR drain into the Mara River. The Talek River and Sand River are the largest permanent tributaries of the Mara River in the MMNR (Figure 2-2). In contrast, most of the other tributaries are temporary and dry up in the dry season.

2.2.1.2.4 Soils

The soils in MMNR are primarily alkaline and of volcanic origin. The soils range from brown sandy loam to black heavy clay. The upper layers of soil covering a large part of MMNR consist of fine lava dust and other pyroclastic material, which is sometimes more than 6 m deep, and consists of a succession of layers of varying texture (Ottichillo, 1984). The metamorphosised sediments of the basement system underlie large areas of central and southern parts of Narok District. The Nguruman escarpments, west of Mara River, have exposed rocks of quartzites, gneisses, schists, amphibolites, migmatites, mylonites and pegmatites (Williams, 1966; McNaughton, 1983). The Loita Hills, the Siana Hills and the hills around Lemek are dominated by quartzites derived from original sandstones and grits.

2.2.1.3 Biological Features

2.2.1.3.1 Vegetation

The MMNR is classified as being in the Biogeographical Province 3.05.04 (East African Woodland/savannah) (Taiti, 1973). Its vegetation varies from grasslands to shrublands to wooded grassland, with areas of shrubby and wooded riverine vegetation. Grassland is the dominant vegetation community in the Mara, gently covering most of the plains and the poorly drained black cotton soils of the Mara Triangle. Most of the grasslands are derived as a result of, and are maintained by, fire and grazing (Dublin *et al.*, 1990). Pure grassland communities are widely dominated by *Themeda triandra*, *Bothriochloa insculpta,* and *Setaria phleoides*, whereas the open grassland plains are dominated mostly by *Themeda triandra Pennisetum* spp., *Aristida* spp., and *Sporobolus* spp. (Onyeanusi 1986). Swamps and other low-lying areas support a diverse community of the taller grass species. Termite mounds are characterised by distinctive plant communities dominated by *Rhus natalensis* and *Cordia ovalis* (Glover *et al.*, 1964).

The plains also support areas of short and tall, as well as wooded, grasslands. The wooded grasslands are mainly composed of *Themeda triandra* interspersed with trees of *Acacia* and/or *Balanites* spp. *Acacia* woodlands also cover isolated areas of MMNR (Walpole *et al.*, 2001), and some six species of *Acacia* are found in the Mara.

The bushlands are dominated by the woody shrub *Croton dichogamus*, easily recognised by its leaves, which have a silver underside when young and turn orange or red when they age. *Euclea dinovorum* is another woody shrub that forms bushlands in the Mara (Stelfox *et al.*, 1986). In some areas, old termite mounds add an extra dimension to the community supporting *Euphorbia candelabra* trees and wild sisal, *Sanseveria*, and thorny *Acacia* twigs.

Although in extent the riverine forests are the smallest vegetation type in the Mara, the gallery forest bordering parts of the Mara River and its major tributaries is home to a wide variety of birds and mammals. *Warburgia ugandensis*, *Olea africana*,

Diospyros abyssinica and *Ficus* spp. dominate these riverine forests (Stelfox *et al.*, 1986).

2.2.1.3.2 Fauna

The MMNR is home to a wide range of mammal, bird, and reptile species. It is especially famous for its concentration of migratory herbivores, including approximately 100,000 zebra (*Equus burchelli*) and over 1 million wildebeest (*Connochaetes taurinus*), during the dry season of July to October (Maddock, 1979; Sinclair *et al.*, 1985). Thomson's gazelles (*Gazella thomsoni*) also migrate, but only as far as the edge of the woodlands. This movement of wildebeest and zebra from the Serengeti in the south has occurred on a significant scale only since 1972, when wildebeest numbers increased as a result of the successful control of rinderpest (Stelfox *et al.*, 1986; Dublin *et al.*, 1990). The sight of hundreds of thousands of these animals moving together through the grasslands has been described by many popular accounts as one of the greatest wildlife spectacles on earth (Costich and Popp, 1978).

MMNR is also famous for its other large mammals. Among these are the so-called "Big Five" which include the cape buffalo (*Syncerus caffer*), elephant (*Loxodonta africana*), leopard (*Panthera pardus*), lion (*Panthera leo*) and black rhinoceros (*Diceros bicornis*). An extension of this concept comprises the "Big Nine", which includes cheetah (*Acinonyx jubatus*), Burchell's zebra (*Equus burchelli*), giraffe (*Giraffa camelopardalis*) and hippopotamus (*Hippopotamus amphibius*). A non-exhaustive list of other larger mammals includes: topi (*Damaliscus lunatus*), spotted hyena (*Crocuta crocuta*), banded mongoose (*Mungos mungo*), impala (*Aepyceros melampus*), kongoni (*Alcelaphus buselaphus*), eland (*Tragelaphus oryx*), warthog (*Phacochoerus aethiopicus*) and rock hyrax (*Procavia capensis*). All in all, 65 mammal species have been recorded in the MMNR (Costich and Popp, 1978).

Over 500 resident and migratory species of birds are listed for the Masai Mara. This large number of bird species includes 53 birds of prey, including six out of the seven species of Kenyan vultures (Egyptian, hooded, Griffon, Nubian, white-backed and white-headed). Other birds recorded include the ostrich (*Struthio camelus*) African hobby (*Falco cuvierii*), peregrine falcon (*F. peregrinus*), cuckoo falcon (*Aviceda*

cuculoides), open-billed stork (*Anastomus lamelligerus*), osprey (*Pandion haliaetus*), blue quail (*Excalfactoria adansonii*), crested guinea-fowl (*Guttera edouardi*), ross's turaco (*Musophaga rossae*), pel's fishing owl (*Scotopelia peli*), red-headed quelea (*Quelea erythrops*), and parasitic weaver (*Anomalospiza imberbis*) (Costich and Popp, 1978).

Reptiles found in MMNR include Agama lizards (*Agama* spp.), crocodiles (*Crocodylus niloticus*) and monitor lizards (*Varanus* spp.). Agama lizards are often found basking on rock outcrops throughout the MMNR. Large crocodiles bask on the riverbanks or on rocks in midstream, while monitor lizards, some up to 1.5 m long, favour riverbanks.

2.2.2 Conservation in MMNR

2.2.2.1 History of Legislation

MMNR was first established as a Wildlife Sanctuary in 1948 (Koikia, 1992). It comprised a smaller area than the present reserve and included the Mara Triangle, a 520 km² area between the Siria Escarpment, the Tanzania border and the Mara River. Hunting was regulated in this area. In 1961 the borders were extended east of the river to encompass a 1,831 km² area, made into a Game Reserve and brought under the direct control of the NCC. Some 1,672 km² of this area was given the status of National Reserve in 1974, under Legal Notice 271 (WPU, 1983). The area of 159 km² that was not gazetted as a national reserve was returned back to the local communities. There were discussions in 1976 between the Kenyan Government and NCC to further reduce the area by 162 km². Following these discussions, sections in the north-east, south-east and the mid-north were excised through formal notice in 1984. These excisions reduced the area of MMNR to its present size of 1,510 km². In 1995, the control of the MMNR was divided between NCC and TMCC when the Mara Triangle was placed under the control of TMCC. In May 2001, the Mara Triangle was put under the management of Mara Conservancy, a non-profit making conservation foundation.

2.2.2.2 Conservation Values of MMNR

Biodiversity Values

The species richness of MMNR is relatively high. As noted previously, there are 65 species of mammals listed in the MMNR and about 500 species of birds. Some of these mammals appear in IUCN's Red List and are categorised as either vulnerable (cheetah, leopard and lion), endangered (elephant) or critically endangered (black rhinoceros). As part of the northern part of Serengeti-Mara ecosystem, MMNR is important for the ecological functions of the ecosystem.

Socio-Economic Values

The economic value of MMNR for surrounding communities relates to the tourism industry. Group ranches own the land surrounding the MMNR and their members are the local communities. These group ranches receive a percentage of the revenue collected by the management of MMNR and the money is divided among their members. The local communities have also allowed entrepreneurs to develop tourist facilities on their land. By doing so they collect rent for their land and charge tourists for viewing animals on their land. Some of them have even established campsites for which they charge tourists.

Livestock keeping is the major economic activity for the communities around the MMNR. The tourism industry provides a market for the animals that are kept by the local people, who supply beef to the lodges and tented camps that cater for the tourists. Additionally, mutton and goat meat is sold in several kiosks that are near the MMNR. These kiosks serve driver guides and other people who visit the MMNR.

Local people have established sheds along the major roads leading to the MMNR from where they sell curios to the tourists. Traditional homesteads are also built along the major roads to attract tourists. When tourists come, they are shown around at a fee.

The MMNR has also provided employment to the local communities. Most of the rangers who work within the MMNR are from the surrounding areas. The lodges and tented camps also employ local people to work in them, as driver guides, cultural lecturers, traditional dancers and even to do general hotel chores.

2.2.3 Park Management

Although MMNR is known as a National Reserve within Kenya, it is fully protected and falls under IUCN's Management Category II (National Park). Since 1995, MMNR has had two headquarters, one in Sekenani Gate and the other in the Mara Serena Lodge. The Sekenani headquarters manages the Narok part of MMNR while the Mara Serena Lodge headquarters manages the Transmara part of MMNR. There are two senior wardens, one at each of the headquarters, and the senior wardens report to their respective County Council Clerks.

In the Mara Triangle there are two assistant wardens below the senior warden. One is based in Oloololo Gate and is in charge of the northern part of the Triangle. The second assistant warden, who is in charge of the southern part on the Triangle, is based in Mara Serena Lodge. Below the assistant wardens are the non-commissioned officers comprising sergeants, corporals and rangers.

The Narok part of MMNR has more staff than the Mara Triangle. Below the senior warden are several wardens and assistant wardens. However, apart from the wardens in charge of Rhino Surveillance and Animal and Habitat Protection (AHP), the roles of the other wardens are not well defined. Of the wardens, there are four based in Sekenani, three in Keekorok, and one each in Mara Intrepids Club and Musiara Gate.

Rangers and clerks man all gates into the MMNR. Rangers provide security while clerks collect revenue. There are also rangers in most of the lodges and tented camps inside and at the periphery of the MMNR.

A development plan for game viewing tracks was prepared by the Wildlife Planning Unit (Thorsell, 1980) in 1980 and a management plan was prepared in 1983 for NCC (WPU 1983). However, neither plan was implemented. However, several recommendations in the plans were proposed for adoption in a new five-year development plan from 1985 to 1990 for the MMNR.

The main management problems are illegal grazing and poaching around the periphery of the MMNR. There are also uncontrolled fires emanating mainly from outside the MMNR. High tourism impact through off-road driving and animal harassment by tourists are further sources of concern.

2.2.4 Tourism in MMNR

2.2.4.1 Visitor Access to MMNR

Access to MMNR can either be by road or air. Road access is through one of the six gates (Figure 2-2). These are: Oloolollo on the northern-most border; Musiara on the upper north-eastern border; Talek towards the middle of the north-eastern border; Sekenani on the lower north-eastern border; Ololaimutia on the eastern-most border; and, Sand River towards the southern end of the south-western border.

The MMNR is about five hours drive from Nairobi. The main route into the reserve is via Narok, on the main B3 road that leaves the old Nairobi – Naivasha road at Maai-Mahiu. At Ewaso Ngiro, 15 km beyond Narok, is a junction where the left branch forms the C12 road and is tarred for a further 40 km. At the end of the tar, the right branch leads to Sekenani Gate. Alternatively, the MMNR may be entered through the Ololaimutia Gate by taking the left branch and following the signs to Keekorok.

The right branch at Ewaso Ngiro forms the B3/C13 to Kichwa Tembo Camp, Oloolollo Gate and Musiara Gate. At Aitong, another track (E177) branches off on the left and leads to Talek Gate. To enter via Musiara Gate one follows the road to Oloolollo Gate and then branches to the left at Mara Riata.

It is also possible to approach the MMNR from Migori, on the main A1 Kisii – Tanzania road, via Kilgoris. At Kilgoris, one may either branch to the right to go via Lolgorien or left to go via Kiridon. Both roads lead to Oloolollo Gate. Access through Sand River Gate is from Serengeti National Park in Tanzania.

In terms of public transport, buses from Nairobi go as far as Narok, but, thereafter, private transport has to be arranged. Alternatively, it is possible to take a public

minibus that goes up to Sekenani and Talek Gates, but this does not enter the MMNR. Arriving from the west, there are buses to Kilgoris from Migori or Kisii.

There are daily scheduled flights on several airlines from Nairobi's Wilson Airport to many destinations in the Mara. The airstrips inside MMNR are at Mara Serena Lodge, Mara Intrepids Club, Governor's Camp and Keekorok Lodge and the flights take around 45 minutes. The airstrip at Keekorok Lodge is currently under repairs. Charter flights are also available.

2.2.4.2 Visitor Activities

The primary visitor activity is game viewing from vehicles. Animals in MMNR are wild and potentially dangerous to people on foot. Therefore, walking inside the MMNR is not allowed for reasons of security, and viewing animals is only allowed in covered vehicles. The MMNR is renowned for game viewing and is among the few protected areas in Kenya where one can view all the "Big Five". It is also reported to have the largest population of lions in Kenya.

Game viewing at the Hippo Pools is a different experience, as tourists are allowed to alight from their vehicles. Here, hippopotamuses can be viewed either in the river or basking along the riverbanks. At the Hippo Pools, crocodiles can also be watched basking either on the riverbanks or on rocks in the midstream.

Another high profile activity is game and scenic viewing from hot air balloons. These balloon safaris can be booked from any of the lodges or tented camps, but flights take off from specific areas. Inside the MMNR, these sanctioned launch areas are Mara Serena Lodge, Keekorok Lodge, Sarova Mara Camp and Little Governor's Camp.

Night game drives and game walks are offered at some lodges and tented camps outside the MMNR. This also applies to daytime game walks. However, *Nightsight*, which is based at Mara Intrepids Club, offers a different concept in night game drives. Here, visitors are provided with night vision equipment and night game viewing is done without vehicle headlights or searchlights.

Flights to Rusinga Island in Lake Victoria for big game fishing can also be organised from any of the tented camps or lodges in MMNR.

2.2.5 Accommodation Facilities

There is a wide choice of accommodation in and around the MMNR. There are two lodges and four tented camps inside the MMNR, with a total bed capacity of 644 beds. Several others are located just outside the MMNR (Figure 2-2) and more are sited in group ranches around the MMNR. There are also numerous campsites that are available. A full discussion of accommodation facilities is given in **Chapter 3**.

2.2.6 Surrounding Land Use

Serengeti National Park borders MMNR on the southwest. On the Kenyan side the local communities through group ranches communally own most of the land bordering MMNR. The local Maasai people are pastoralists. Therefore, it follows that the major land use is livestock keeping. However, the group ranches are also used as wildlife dispersal areas. As a result of the presence of wildlife in these areas, game viewing is also practised in them. The local communities have also rented part of their land to entrepreneurs to develop tourist facilities. Additionally, some of them have established tented camps and campsites. Therefore, a lot of tourism activities take place in these areas together with livestock keeping.

The tourism industry has attracted other people to areas around the MMNR. Due to immigration of these people small commercial centres have started to establish around the MMNR. This has mainly happened near the gates. There are now small commercial centres near Ololaimutia Gate, Sekenani Gate, Talek Gate and Oloololo Gate. Development of commercial centres has led to an increase in the size of human population. This, in turn, has led to establishment of primary schools. There is now a primary school near Ololaimutia, at Sekenani, Talek and Mara Riata between Musiara Gate and Oloololo Gate.

Crop farming is not a major activity in areas immediately bordering the MMNR. However, some crops are farmed near the north-western border above the Siria Escarpment. Quarrying is also done in isolated areas outside MMNR.

2.3 General Research Methods

Three general methods were used to collect data in this study. These were: retrieval of archived and published information; field experiments; and, observations and use of questionnaires. The different methods of acquiring data often overlapped to achieve the different objectives of the study.

2.3.1 Retrieval of Archived and Published Information

Patterns of tourist arrivals in Masai Mara were documented from 1980 to 2000 from tourist statistics in the MMNR headquarters and in the lodges, and from published literature. This information was used to investigate trends of tourist arrivals over time.

Long-term animal distribution data was extracted from aerial censuses carried out by the Department of Resource Survey and Remote Sensing (DRSRS). This information on distribution patterns of both wild and domestic animals from 1970's to date were mapped using Arcview GIS software. The distribution maps were overlaid on maps of tourist facilities and roads (see below), to examine the extent to which patterns of animal distribution are affected by tourism development.

To document the extent and distribution of roads and tracks in 1991, aerial photographs were obtained from DRSRS, and all roads and tracks were digitised. These were used to compare the extent and distribution of tracks between 1991 and 1999. Specifically, the impact of enforced closure of some areas to traffic and the development of a new lodge, which has taken place in the intervening period, was assessed. Temporal and spatial comparisons were conducted with the aid of Arcview GIS software.

2.3.2 Field Experiments and Observations

The Reserve regulations stipulate that the Animal and Habitat Protection Programme (AHP) aims to undertake enforcement, including: of vehicle speed limits; of minimum distances from wildlife; of the maximum number of vehicles; and, of the length of stay permitted at an animal viewing. There is also a moratorium on off-road driving. To identify to what extent these regulations alleviate the disturbance of different species, different animals were approached at speeds of 10, 20, 30 and 40

km/h and their responses and the distance at which those responses occurred, were recorded. These approaches were conducted with a direct approach to the animal and repeated with an oblique approach. The experiments were done in areas that have high and low visitation, to assess the levels of habituation to tourism in heavily visited areas.

Secondly, focal observations were conducted to record the response of wildlife to tourist presence and behaviour. Both the activities of tourists (proximity, number, behaviour, length of stay etc.), and the behavioural responses of focal animals, were recorded. Observations were conducted in the presence and absence of the AHP personnel, and in areas within and outside the area patrolled by this vehicle. The results provided a quantitative test of the efficacy of current regulations, together with a scientific rationale for their implementation in their current or in a future altered form.

To determine where tourists went for game drives, driver guides were issued with GPS receiver units to take on their game drives. These units were programmed to record a position after every 45 seconds. Data from the units were downloaded into a computer at the end of every day of recording.

A survey of all roads and tracks in MMNR was conducted to map the road and track network, and to measure the extent of degradation. All tracks were driven and mapped using a GPS. At 1 km intervals, the total and bare width of the track were measured, along with slope, substrate, vegetation type and rut depth. This was used to estimate the total area of degradation to compare with earlier estimates, as well as to compare the relationship between underlying environmental features and degradation. The map produced showed the distribution of tracks in relation to tourism infrastructure and was used to compare the situation in 1991 and 1999 (see **section 2.3.1** above).

2.3.3 Questionnaires

The chronological establishment of facilities encouraging the establishment of tourist accommodation including capacities was obtained from questionnaires administered to the management of these facilities.

MMNR regulations for tourist behaviour exist, but the extent to which they are enforced and adhered to was unknown. Questionnaires examined visitor awareness of these regulations, their adherence to them, and the level and effect of enforcement by MMNR staff.

Appropriate questionnaires were distributed to tourists (Appendix 1), and to driver guides (Appendix 2), to examine their awareness of regulations and sources of information (for tourists) and training (in the case of driver guides). The local availability of information regarding regulations was also assessed.

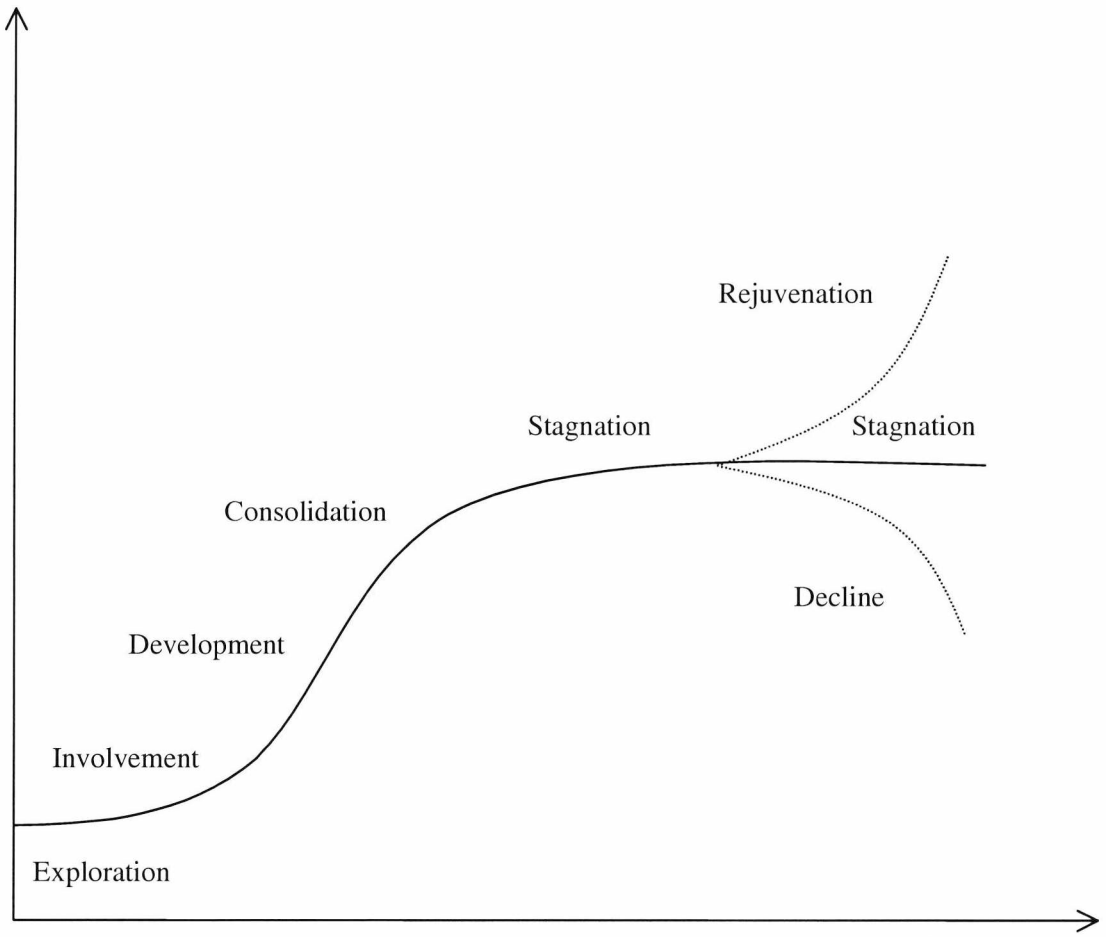
Following this description of the study area and of the general methods used throughout this study, I now move to consider the results that originate from this study. In **Chapter 3**, I examine the patterns of tourist development in the MMNR in the context of traditional ideas about the tourist life cycle.

CHAPTER THREE

Patterns of Tourist Development

3.1 Introduction

It has been postulated that, unless intervention occurs, a tourist destination conventionally undergoes a life cycle of six stages (Butler, 1980). These are: exploration; involvement; development; consolidation; stagnation; and, decline or rejuvenation (Figure 3-1). The stages hinge on the assumption that the resources in a destination will become over-utilised and eventually decline. Equally, deviations from the predicted model would suggest that tourism is sensitive to external factors.



Source: Butler (1980)

Figure 3-1: Tourist-area cycle of evolution

Additionally, patterns of tourism are constantly changing.

Temporal changes in the volume of tourist traffic to a destination may be either directional, cyclical or both. Directional changes may be either increase or decrease in numbers over time whilst cyclical changes are mainly variations among seasons annually. The spatial distribution of visitors at a destination may also be uneven and change over time. In addition, characteristics of the visitors themselves may vary in the form of a tourist typology (Cohen, 1972; Cochrane, 1993). The type of visitor and visitation will affect the level of impacts, both ecological and economic, which tourism has on a destination (Krippendorf, 1987; Lea, 1988; Cole, 1995). It is assumed that the type of visitor and patterns of visitation associated with wildlife tourism relates to the kind and extent of impacts to a destination. Thus it is an important prerequisite for studies of tourism impact to identify and measure these patterns.

This chapter is essentially exploratory in examining the development and nature of tourism to MMNR. It attempts to identify patterns in visitor profile in MMNR by focussing on four areas of enquiry:

- The chronological patterns that can be identified in the development of tourist accommodation and facilities in MMNR;
- The long-term changes in the numbers of tourists visiting MMNR;
- The characteristics of tourists visiting MMNR with regard to their nationalities, length of stay and mode of transport;
- The seasonal and spatial patterns in tourist visitation and their activities within MMNR

The first two areas of enquiry examine development of tourism in MMNR and how it relates to conventional models of tourist destination life cycle. The third and fourth areas of enquiry examine the characteristics of tourists and their patterns of visitation, which are used in succeeding chapters when examining their impacts on MMNR.

Data sources, collection methods and analytical procedures are presented in **Section 3.2**. A section of results (**Section 3.3**) in turn present an analysis of development of tourist accommodation facilities (**Section 3.3.1**); of long-term trends (**Section 3.3.2**); of tourist characteristics (**Section 3.3.3**); of seasonal patterns (**Section 3.3.4**); of daily activities (**Section 3.3.5**); and of spatial distribution patterns (**Section 3.3.6**). The concluding discussion (**Section 3.4**) considers the explanatory variables in the previous sections and how they relate to wildlife tourism in the MMNR.

3.2 Methods

3.2.1 Development of Tourist Facilities

Questionnaires were distributed round the tented camps and lodges located in, and immediately outside, MMNR, which a person in the management was requested to complete. Questions pertinent to development of tourist facilities comprised: when the establishment was started; whether it has expanded and how often since its establishment; its current capacity in terms of rooms and beds; and, whether there are any future plans for expansion. Other infrastructural developments were also noted. These included: the geographic position of the establishment; presence of airstrips; the condition of major roads; and, the availability of balloon safaris from that tented camp or lodge.

3.2.2 Numbers of Visitors Annually

Data on long-term trends in tourist arrivals in Masai Mara were available from two sources. First, there was published data from previous work done in MMNR (Koikai, 1992; Bhandari, 1998). Second, there was raw data from MMNR headquarters. I compiled data from these two sources to determine tourist arrivals to Masai Mara from 1980 to 1999. Data for the year 2000 could not be used, as they were not yet complete.

3.2.3 Tourist Characteristics

Information on tourist characteristics was collected through questionnaires that were administered to tourists in the various tented camps and lodges in, and immediately outside, MMNR. The questionnaires were availed to tourists by placing them in the rooms. Room service collected completed questionnaires in the morning and handed

them over to the management from whom I collected them. A total of 234 usable questionnaires were collected from this exercise.

3.2.4 Seasonal Patterns of Visitation

Seasonal patterns of visitation were determined from bed occupancy in permanent tented camps and lodges, derived from two sources. The first source was from filed reports in MMNR headquarters. The second source was directly from the respective tented camps and lodges, compiled either by their staff or myself. Both sources provided same data for the period from January 1997 to July 2000, with one complementing the other where some reports were missing from either. Data from earlier years could not be used as reports for some months were missing from both sources.

3.2.5 Diurnal Activity Patterns

Patterns of visitor activities within MMNR were examined, focusing on mode of transport and diurnal activities of visitors. Data on mode of transport for viewing game in MMNR (lodge vehicle, tour van, private/rental car, overland truck, and hot air balloon) and activities undertaken in a day were collected by giving tourists questionnaires to complete from June 1999 to July 2000.

3.2.6 Game Drive Distribution Patterns

The spatial distribution of tourists within MMNR was examined by first training tourist driver guides from four tented camps and two lodges on how to operate hand-held GPS receiver units (GPS 12 and GPS 12XL; © 1998 Garmin Corporation, Olathe Kansas). GPS receivers were then issued for their use during their normal game drives (see **Chapter 2**). The driver guides were instructed to turn on the GPS receiver units before starting on a game drive and to turn them off after returning to their base. The GPS receivers were pre-programmed to take a position every 45 seconds.

The data from the GPS receiver units were downloaded each evening onto a computer. These data provided a track of where the game drive was taken and the time spent in different areas of MMNR. A total of 243 complete game drives were recorded from four tented camps and two lodges.

3.2.7 Data Analysis

This being an exploratory chapter, general descriptive statistical procedures were followed for most analyses. However, more specific analyses were undertaken as follows:

3.2.7.1 Development of Facilities

The tourist accommodation establishments were mapped on to a base map of MMNR using Arcview GIS software. Their dates of establishment and capacities were also included. Plots were constructed of cumulative number of establishments and cumulative number of beds to visualise trends since the first establishment was opened.

3.2.7.2 Annual Temporal Patterns

Annual growth rates were calculated as the percentage change compared to previous year's number of tourists. These together with the number of tourists entering MMNR were plotted against year to show the trend in tourist arrivals since 1980.

3.2.7.3 Seasonal Patterns

First the monthly bed capacity of a lodge or tented camp was calculated, which was derived from the number of beds multiplied by the number of days in the month. Then the monthly percentage of bed occupancy was calculated as the total beds occupied in the month divided by the monthly bed capacity expressed as a percent. The monthly percentage of bed occupancy was used for analysis after examining and eliminating those lodges and tented camps that had more that 10% months with missing data.

3.2.7.4 Game Drive Distribution Patterns

Line track data downloaded from GPS receiver units were first assessed for completeness. All tracks that indicated an incomplete game drive, by either starting or ending away from the tented camp or lodge the tourists were residing in, were deleted. The beginnings and endings of complete game drive tracks logs were then checked to ensure that all recorded positions were really part the game drive, in order to remove all positions that were recorded if the GPS receiver unit was either turned on before the start of a game drive or turned off long after the game drive was over.

The resulting line track data were then cleaned of all other information to record only position coordinates and the time of recording during the actual game drive. The track data were then exported to Arcview GIS software for analysis.

Next, the study area was divided into 1-km² grid cells using Arcview GIS script. These grids were used to clip all the track lines that fell within each grid cell. The lengths of all lines within a 1-km² grid cell were summed to give the total length of tracks within each grid cell.

To assess the contribution of use of a 1-km² grid cell by each of the sampled establishments, first the establishments' occupancies were standardised by using Dream Camp as a base line. I did this by dividing the absolute numbers of bed-nights of each establishment in the previous year (1999) by Dream Camp's bed occupancy in the same year. This provided a weighting of the establishments by taking into account their bed occupancy, which gave standardised bed occupancy. Secondly, each establishment's contribution of use within a 1-km² grid cell was calculated by multiplying its standardised bed occupancy by the total track length within a grid cell divided by the number of game drives recorded from it. The game drive pressure index on a grid cells was then got from summing up all of the establishments contribution of use on a grid cell. This provided an index quantifying the use of a grid cells by the sampled establishments, that was entered on to a map.

3.3 Results

3.3.1 Development of Tourist Facilities

Masai Mara was initially gazetted as a 520-km² wildlife sanctuary in 1948 and later extended in 1963 to cover 1831 km² (**Chapter 2**). At the time of its initial gazettement no permanent tourist facilities were established. Accommodation was only available in the former hunters' camps in areas like the current Keekorok Lodge, which then lay outside the wildlife sanctuary.

The first permanent accommodation in the then expanded and re-gazetted MMNR was started at the current Keekorok Lodge when a campsite was initially developed into self-help bandas in 1961, and later transformed into a lodge in 1965. This was followed with the opening of Mara Serena Lodge and Governor's camps in 1972. No further lodges were established until 1977 when prolific establishments ensued

(Figure 3-2). The rate of establishment of new tented camps and lodges seems to have started declining after 1992. The trend of increase in the number of available beds followed a similar, but slightly faster trajectory (Figure 3-3). Currently, 24 permanent tented camps and lodges provide a total of about 2,230 beds

Accommodation facilities in and around MMNR can be categorised into three classes, comprising: (1) lodges which have permanent public areas and sleeping quarters; (2) tented camps where living quarters are tents but the public areas may be either permanent or tent; and, (3) campsites where both public areas and living quarters are tents that are erected only when tourists are present. Some of these campsites are in the process of being converted into tented camps, for example Riverside and Safari Camp campsites near Talek.

The distribution of accommodation facilities is clustered in three areas (Figure 3-4). One cluster is around the northern tip of MMNR, comprising Kichwa Tembo Camp, Mara River Camp, Mpata Club, and others. A second cluster occurs in Talek area, composing of Fig Tree Camp, Dream Camp and others. The third cluster occurs to the south of Sekenani, composing of Sekenani River Camp, Mara Sopa Lodge and Mara Hippo Lodge. Only two lodges (Keekorok and Mara Serena) and four tented camps (Sarova Mara, Little Governor's, Governor's, and Mara Intrepids Club) are found within the boundaries of MMNR. Establishment of facilities inside MMNR stopped in 1986 with the putting up of Mara Intrepids Club. All the recent facilities have been developed outside MMNR. Nevertheless, most of those outside are sited just along the boundary (Mara Simba Lodge, Mara Sopa Lodge and Kichwa Tembo Camp (Figure 3-4 (a) and (b)). Most campsites, apart from those to the east and north of Talek, are situated outside the boundary of MMNR.

3.3.2 Annual Visitor Patterns

Numbers of tourists visiting Masai Mara have fluctuated over the last two decades (Figure 3-5). Numbers of visitors grew fairly steadily from 1980 to 1989, apart from a decline in 1986. This was followed by a decline from 1990 to 1994, when numbers were maintained between about 140,000 and 160,000. 1994 produced another huge increase in numbers but this was followed by a steady decrease to

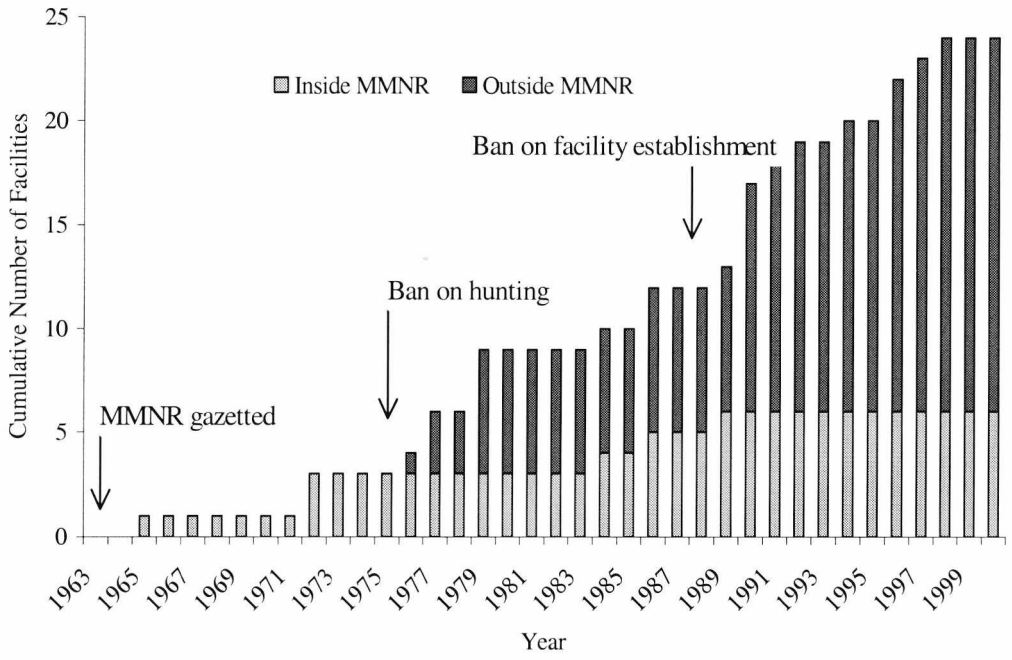


Figure 3-2: Cumulative number of permanent accommodation facilities established in Masai Mara

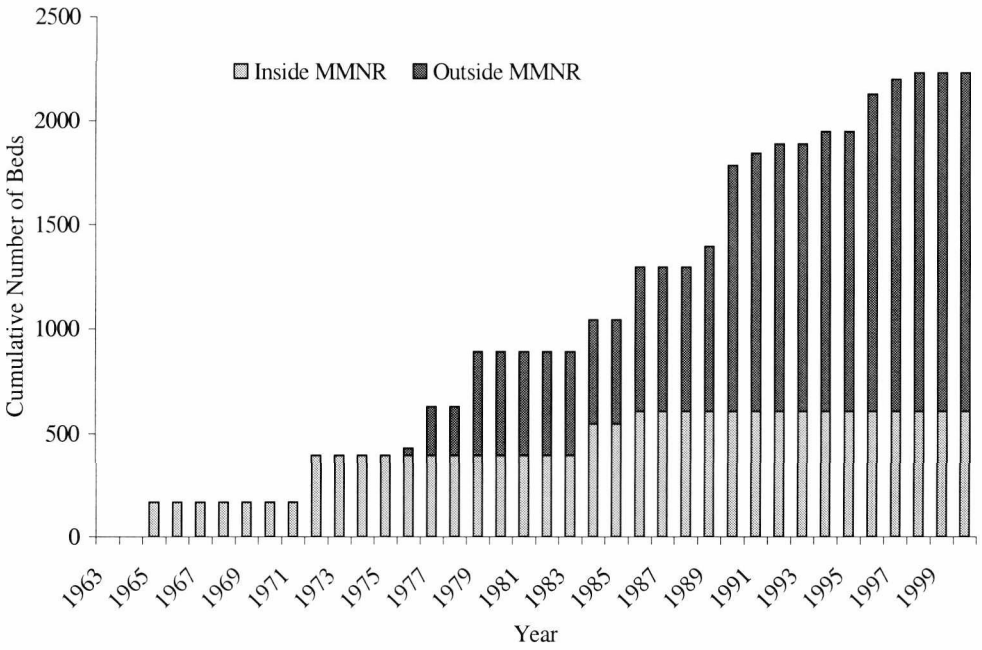


Figure 3-3: Cumulative number of beds in permanent accommodation facilities in Masai Mara

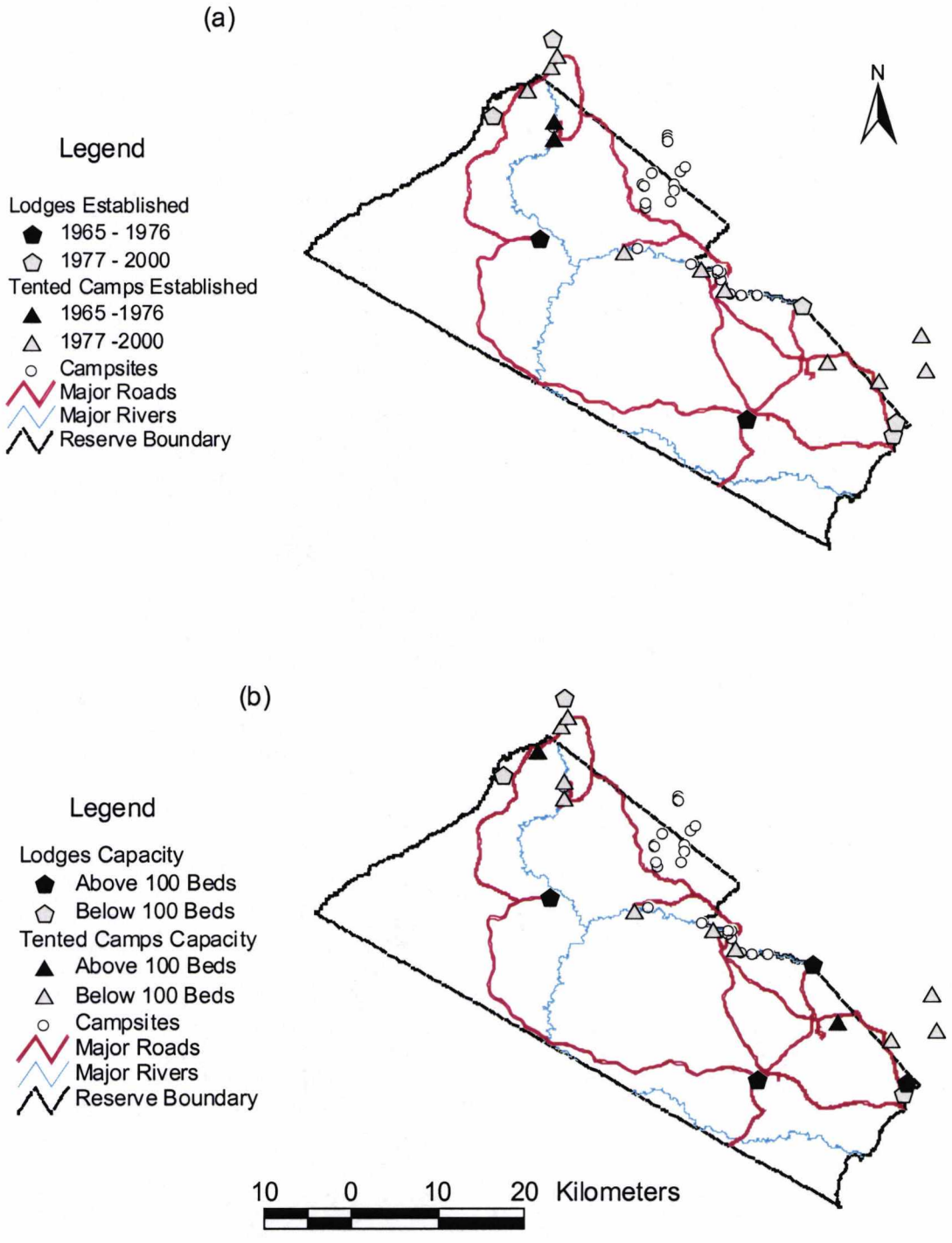


Figure 3-4: Accommodation facilities in and around Masai Mara National Reserve indicating (a) their dates of establishment and (b) their current capacities

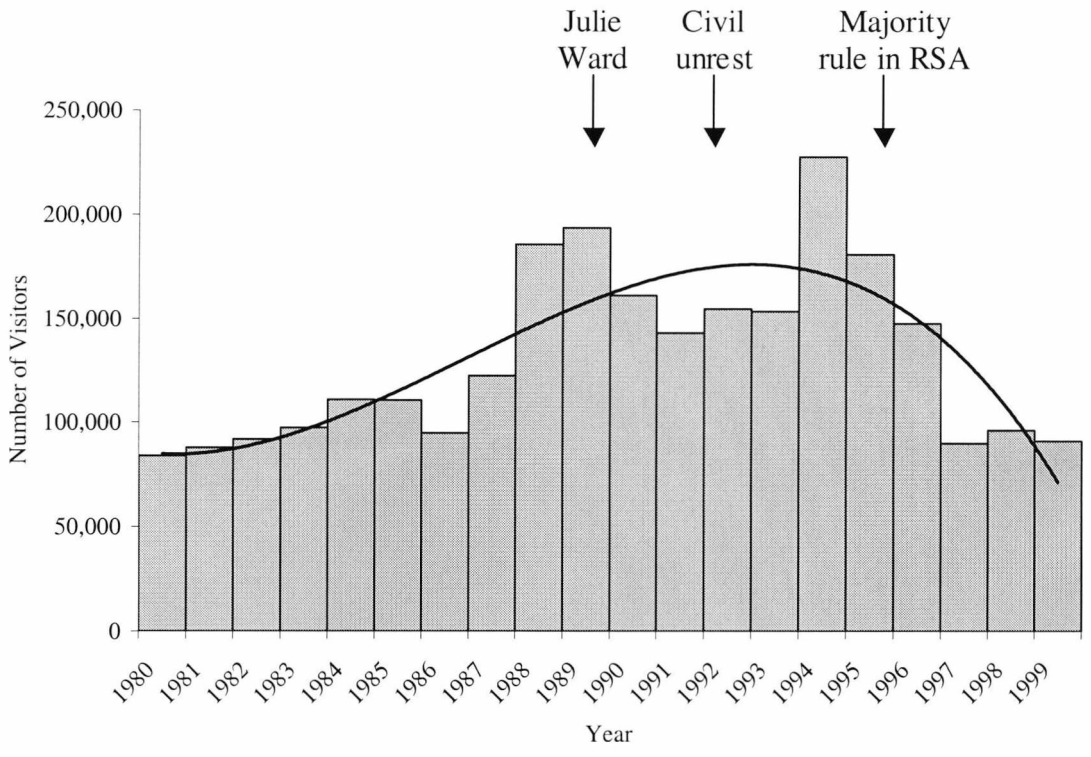


Figure 3-5: Number of tourists who visited Masai Mara National Reserve (1980 – 1999) based on published information and records in MMNR headquarters.

1996, followed by a levelling in numbers at 80,000 from 1997 to 1999 (Figure 3-5). In turn, this gives very irregular patterns of positive and negative growth in numbers (Figure 3-6).

3.3.3 Tourist Characteristics

The country of residence of 234 respondents indicated that they came from 25 different countries. Britain and USA provided over 50% of respondents, comprising 32% from Britain and 21% from USA. These countries were followed by Kenya (10%) and Sweden (8%). The remaining 21 countries accounted for 29% of visitors with none having more than 4% on its own (Figure 3-7).

The nationality of respondents followed a similar pattern except that few Kenyan nationals visited than residents, while the opposite was true, particularly of British Nationals (Figure 3-7).

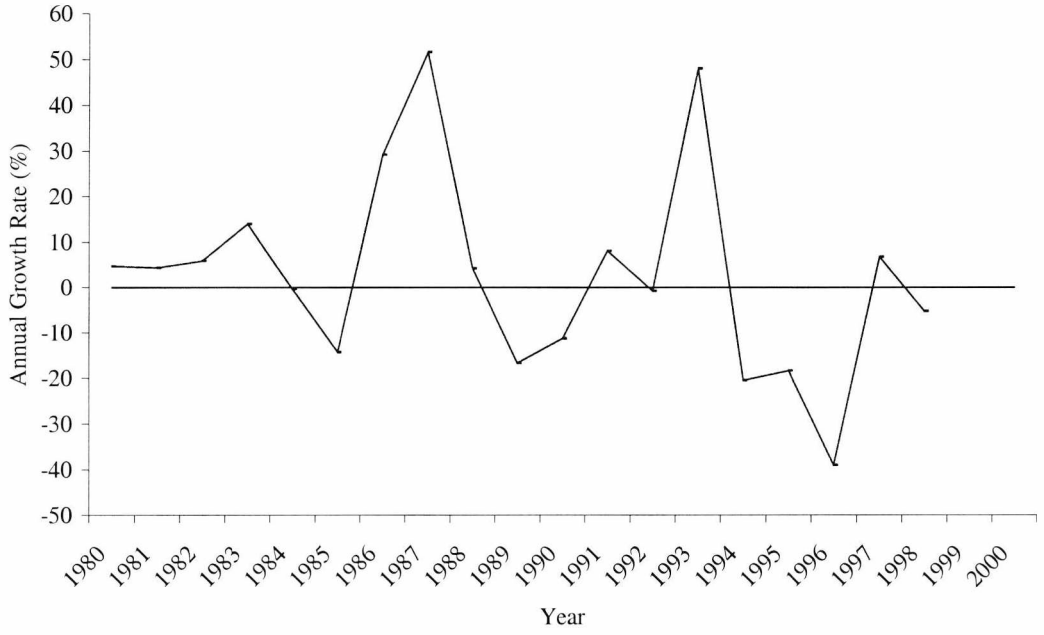


Figure 3-6: Annual growth rates in tourist numbers in Masai Mara National Reserve (1981 – 1999)

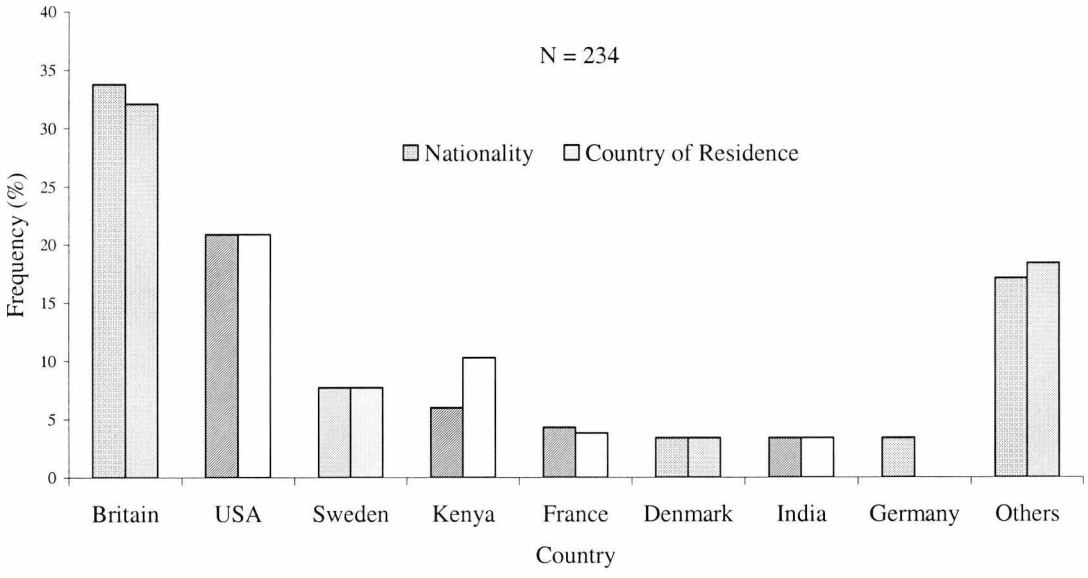


Figure 3-7: Nationalities and countries of residence of tourists visiting Masai Mara National Reserve during 1997 – 2000.

Visitors mainly used tour company vans to reach Mara while private and rental cars were less frequently used. Overland trucks were the least favoured mode of transport (Figure 3-8).

On average visitors planned to stay for 2.6 days, with a range of 1 – 15 days.

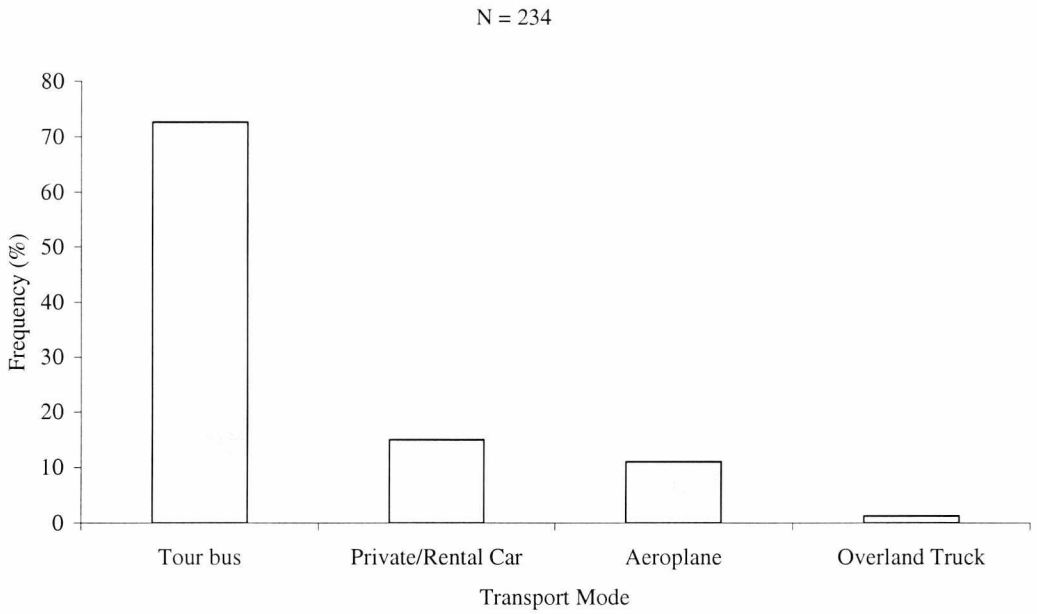


Figure 3-8: Modes of transport used by tourists to reach to Masai Mara National Reserve

3.3.4 Seasonal Patterns

Tourist arrivals in Masai Mara showed bimodal pattern with two peaks and two troughs during the year, when examined in terms of monthly percentages of bed occupancy. Bed occupancy was highest in August while May recorded the lowest (Figure 3-9).

3.3.5 Diurnal Activity Patterns

Tourists who visit MMNR take part in two main activities, comprising game drives and balloon safaris. Most questionnaire respondents (N = 234) had participated in at least one game drive. The average number of game drives that were taken was 3.5±0.16. These game drives comprised three types: morning; afternoon; and, full day. The average number of morning game drives taken was 1.5±0.88, but 10% of

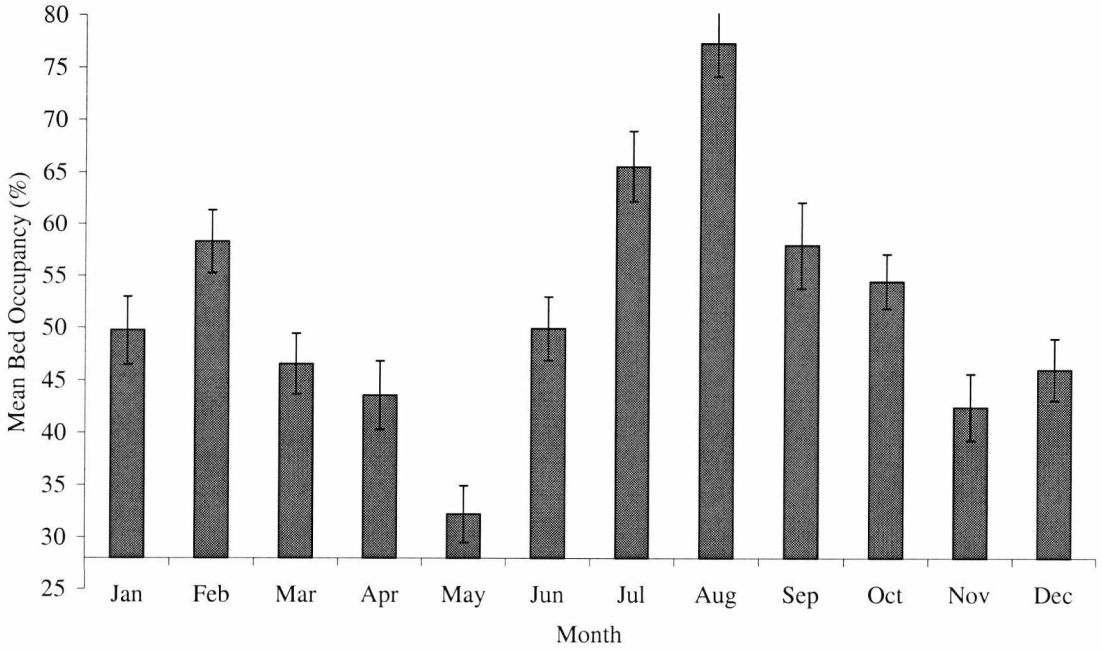


Figure 3-9: Mean monthly bed occupancy from a sample of tented camps and lodges in Masai Mara (1997 – 2000)

respondents did not take any. Afternoon game drives appeared to be slightly more popular and were taken by 93.3% of respondents who went on game drives on an average of 1.9±0.8 times (N = 224). Full day game drives were the least popular (Table 3-1).

All game drives were taken using one of four types of vehicles. These were: private or hire cars; tour company van; overland truck; or, lodge vehicle. Among these different categories, tour company vans were the most used and accounted for 66.2% of all game drives. Lodge vehicles and private or car hire cars accounted for 18.3% and 14.7%, respectively. Overland trucks only accounted for 0.9% of game drives.

Balloon safaris were not up taken by as many visitors (10%) as game drives.

Table 3-1: Average number of different categories of game drives and percentage of respondents who participated.

Type of Game Drive	N	Uptake by Respondents (%)	Mean No. of Game Drives	Std Error
Morning	223	90	1.5	0.88
Afternoon	223	90.3	1.9	0.80
Full day	224	15.2	0.2	0.34

3.3.6 Spatial Patterns of Tourist Distribution

Two lodges and four tented camps, all south of Mara River, were used to monitor the spatial distribution of tourists. Game drives from these lodges and tented camps are rarely taken north of the Mara River. When the study area was divided into 1-km² grid cells, results also suggested that most of the areas are visited during game drives (Figure 3-10).

Game drive pressure indices within 1-km² grid cells ranged from zero to 12082. This range was then categorised into three equal classes representing low pressure, medium pressure and high pressure (Figure 3-10a). When this was done, results indicated that some areas had more game drive pressure than others (Figure 3-10a). Three areas were prominent in having high game drive pressure. One area was to the north of Talek gate and west of Fig Tree Camp moving north-west. The second area was within the polygon formed by the roads from Talek to Keekorok Lodge, Sarova Mara Camp, Mara Simba Lodge and Talek. The third area was west of Keekorok Lodge (Figure 3-10a).

Game drives from different lodges and camps overlapped in some areas (Figure 3-10b). The most prominent area of overlap was between the roads to Talek and Sekenani from Keekorok, which experienced overlap from more than three lodges or camps. Another area that experienced similar degree of overlap was along and east of the road to Musiara gate from Talek. The area along the road from Keekorok to Serena Lodge experienced overlap from two lodges or camps (Figure 3-10).

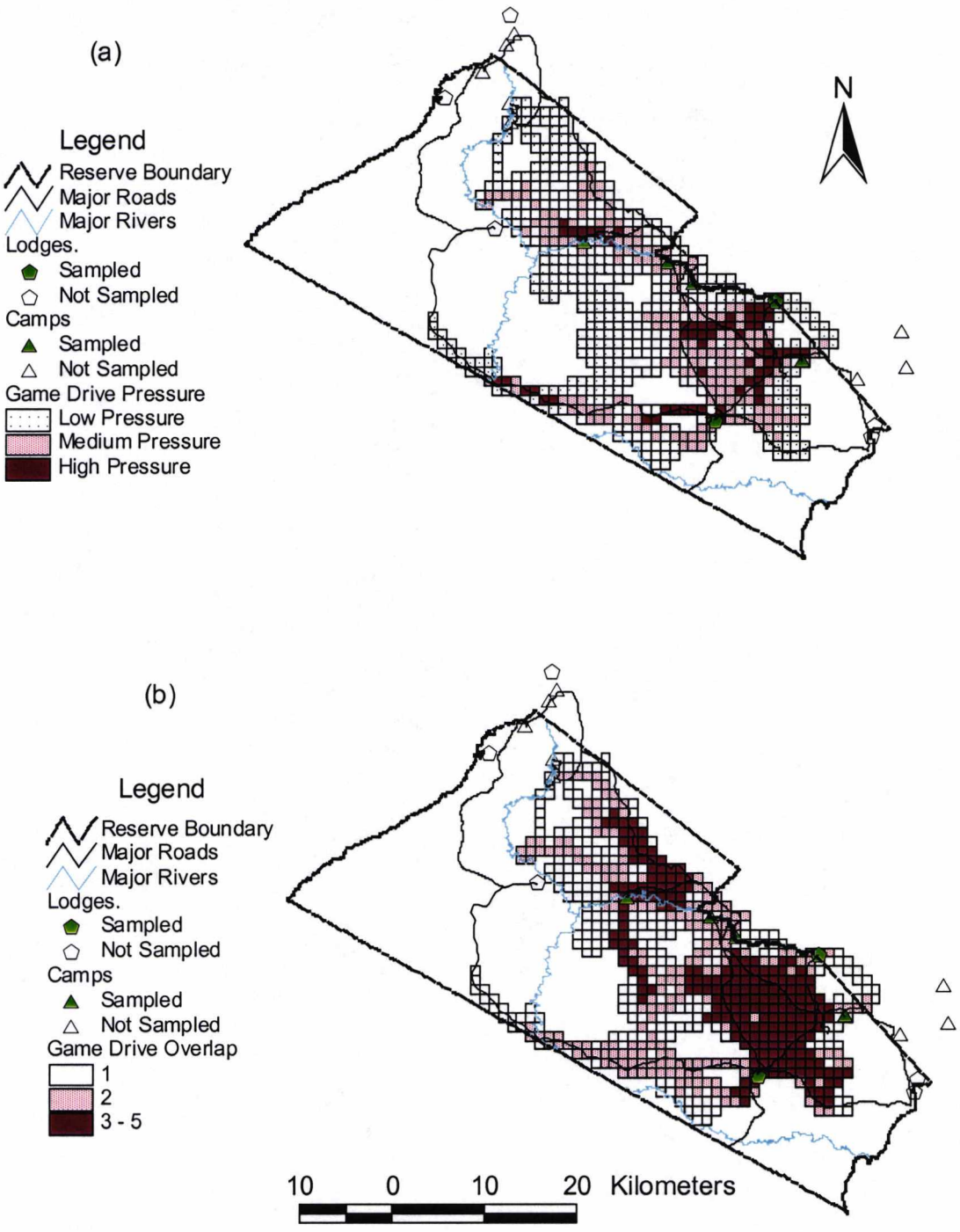


Figure 3-10: Distribution of game drives monitored from six different lodges and camps. The grid cells are categorised according to (a) low, medium and high pressure and (b) overlap of visitation from different lodges and camps.

3.4 Discussion

Conventional tourist life cycle is postulated to begin with an exploratory stage where the tourists are wildlife specialists. These are few in number, have pre-knowledge about the destination and require little supporting infrastructure or interpretive facilities (Roe et al., 1997). However, as awareness of destination increases, the number of visitors to the destination increases exponentially and then levels off when the destination falls out of fashion. Ideally, the supporting infrastructure facilities should follow the same trend. There was supporting evidence in this study that the development of tourist facilities in Masai Mara followed a similar trend. However, the trend of visitation over the years has been irregular with negative and positive annual increments.

MMNR was also found to be highly seasonal in terms of visitor arrivals. Additionally, the visitors were also found to be concentrated in specific areas within MMNR.

3.4.1 Development of Tourist Facilities

The development of tourist facilities in and around MMNR has been influenced by changing land use policies in the area. There appears to be a relationship between the establishment of facilities and the status of hunting. Hunting was first banned within the area that comprised MMNR when it was gazetted in 1963. Tourist accommodation facilities then started appearing inside MMNR. The Kenya government introduced a total ban on hunting in 1977, which affected areas outside MMNR. Hence many professional hunters were encouraged to open permanent tented camps in the former hunting blocks in group ranches neighbouring MMNR (Koikai, 1992; Sindiyo, 1992). These hunters negotiated with the owners of the group ranches under the auspices of a committee founded to bring together the local leaders of the group ranches, NCC the provincial administration and the then Wildlife Conservation and Management Department (WCMD), now KWS. This resulted in development of several tented camps outside MMNR. They included Siana Springs (Cottar's Camp), Fig Tree Camp, Mara Buffalo Camp, Mara River Camp, Mara Sara Camp (which later closed down) and Kichwa Tembo Camp

(Sindiyo, 1992).

However, despite this influence from hunting status, the trend of the increase of accommodation facilities in Masai Mara seems to follow what could be predicted from conventional models (Butler, 1980). There was an initial slow increase in the rate of their increase, which later picked up. The rate of increase now appears to have started slowing down.

From the late 1980s there was a perceived feeling by certain conservationists that Masai Mara was overcrowded with tourists. This led to enactment of policies that try to limit the increase of number of tourists. Among these was a moratorium on further establishment of lodges and tented camps both within MMNR and surrounding group ranches. This does not seem to have worked as further facilities continued to be established even after the moratorium. Worthy of note here is the establishment in 1996 of Mara Simba Lodge, a 180-bed lodge just along the reserve boundary.

3.4.2 Annual Temporal Patterns

Unlike the development of tourist facilities, the annual tourism numbers, though showing increase have not been uniform. These portray erratic growth rates that do not fit any predictive model. These trends suggest that MMNR, as a tourist destination area, is vulnerable to external factors. In this respect it does not differ from other destinations, which are dependent predominantly on international arrivals (McNeely, 1989). For example, the outbreak of pneumonic plague near Goa depressed tourist arrivals to India in 1996 (Goodwin *et al.*, 1998), whilst political unrest has deterred tourists from visiting numerous developing countries (Kayanja and Douglas-Hamilton, 1984; Lea, 1988; Child and Heath, 1990).

Factors that could cause these erratic variations could either be national or international. On the national level there was much negative publicity about Kenya in general, and about Masai Mara in particular, in the international press in late 1980s and early 1990s following the Julie Ward case, which could have contributed to the decline in visitation after 1990 (Figure 3-5). There has also been increased competition from southern Africa countries towards the later part of 1990s coupled with ethnic clashes that might have contributed to decreased numbers. 1997 and

early 1998 were particularly affected by *El niño* rains which made the reserve inaccessible by road.

3.4.3 Seasonal Patterns

Seasonality can be defined as the systematic, although not necessarily regular, intra-year movement caused by changes of the weather, the calendar, and timing of decisions, directly or indirectly through the production and consumption decisions made by the agents of the economy (Hylleberg, 1992). The endowments, the expectations and the preferences of the agents, and the production techniques available in the economy influence these decisions. It is a common feature of tourism, and is driven by climate and socio-cultural factors such as the timing of holiday-taking around religious festivals or school holidays in originating countries, or dates of regular cultural events in destination countries (Lea, 1988). Much effort is made by both the private and public sectors to reduce seasonality in destination countries because it contributes to the "problem of maximising the efficient operation of tourism facilities and infrastructure, and results in unnecessary excess capacity for most of the year in most destinations" (Butler 1994).

In general, there are two types of seasonality: natural and institutional. The former is related to the regular and recurring temporal changes in natural phenomena at a particular destination, which are usually associated with climate and seasons of the year. The latter is the result of religious, cultural, ethnic, and social factors. The most important form of this seasonality is the school vacations in summer. Related to these two types of seasonality, four types of international tourism have been developed: summer tourism associated with sun-seeking holidays; winter sports tourism; cultural tourism (museum, cathedrals, and other tourist sights) and pilgrimages; and, business and conference tourism.

The major tourism season is in the northern summer because of the lengthy school holidays in originating countries from July to August. Incentives such as off-season discounts on airfares, hotels, and package tours are used to discourage tourism in the high season, or to entice people to consider taking a second vacation, which is becoming increasingly popular in many industrialised countries.

In MMNR high tourist numbers occur from July to October. This coincides with the summer school vacations in industrialised countries and also the migration of wildebeest from Serengeti. It is this part of the year that is most marketed to tourists. This is also the time of the year that most degradation of wildlife habitats occurs due to high numbers of vehicles.

3.4.4 Tourist Characteristics

Various studies have been done to investigate the role of national cultural characteristics in affecting tourist behaviour. Researchers have tried to discover empirically what if any differences actually exist in the behaviour of tourists of various nationalities. These studies have looked at the residents of host countries perception of tourists (Pi-Sunyer, 1977; Boissevain and Inglott, 1979; Pizam and Telisman-Kosuta, 1989) as well as tourists' general behaviour in destination countries (Szalai, 1972; Ibrahim, 1991; Cho, 1991). As regards behaviour, for example, Japanese were found to travel in groups and were described as indefatigable photographers (Cho, 1991). Americans on the other hand have been described to love of newness, desire to be near nature, freedom to move, individualism and social acceptance (Holzner, 1985). These traits make Americans likely to spend holidays in a relatively simple way in wilderness prompting them to visit natural parks, which they try to preserve.

One of the aspects that come out with regards to tourist characteristics in MMNR is that most come from developed countries. It therefore follows that tourists would be concentrated in those months of the year that most people in these countries take their holidays. Since recreation options in MMNR are limited to either game drives or to balloon safaris, their quality needs to be maintained if they are to continue attracting visitors.

Only a small percentage of tourists who visit MMNR drive themselves as most use tour company vehicles. This means that most spend a lot of their time with driver guides during their stay in MMNR. These driver guides are therefore the ones who control the behaviour of most tourists in their game viewing.

3.4.5 Game Drive Distribution Patterns

In national parks and other protected areas world-wide, roads and trails of various types commonly exist in support of three major functions, namely providing access, offering recreational opportunities, and protecting park resources by concentrating visitor use impacts on specific areas. Roads are generally regarded as a necessity in national parks and reserves, a recreation and tourism resource that requires both maintenance and protection. They limit the dispersal of visitors and control the disturbance of animals in these areas.

In a situation where roads are well maintained in a national park and tourists only follow where access is provided, one would expect the spatial distribution of tourists to be limited to areas where roads are present. Looking at the spatial distribution of tourists in MMNR one finds that tourists use almost all one-kilometre grid cells. This would suggest that game viewing roads and tracks are either not well maintained or they are non-existent. It would also suggest that there is disturbance of animals as visitors can go to almost any part of the reserve.

The results of this study indicated that the areas west of the Mara River were not being used by the sampled establishments in their game drives. However, this should be interpreted that these areas are not used for game drives as not all tourist establishments were considered in the study. Further, the establishments that were sampled were all east of the Mara River. Were all establishments that use MMNR considered, there possibly would have been game drive pressure in some of these areas that showed no pressure. Nonetheless, these results were enlightening in demonstrating that some areas are under more pressure from these establishments, than others areas.

After examining the patterns and profiles of tourists in MMNR, the next chapter will embark on determining their impacts in terms of habitat degradation

CHAPTER FOUR

Extent of Habitat Degradation

4.1 Introduction

Tourism and tourist facilities have shown extensive development in Masai Mara since 1961 (**Chapter 3**). However, there has been increasing concern that such extensive tourism development poses negative impacts on the environment and on the lives of the people in the host community. Nevertheless this concern must be offset against the fact that some degree of ecological and social change is an inevitable consequence of tourism, or indeed any other activity in the sphere of human development. Nevertheless, several conservationists have argued that the risk of tourism in causing pollution and inflicting damage on flora and fauna is too great (Goldsmith, 1974; Crittenden, 1975; Liddle, 1975). Additionally, the lucrative tourism industry is under the control of the private sector, who despite selling the environment, have mainly concentrated on the welfare of their clients and profit making, rather than on conserving the environment upon which they trade. Problems arise because of the difficulty of excluding visitors from sites and species of real interest, and this in turn can lead to congestion and disturbance as visitation rates increase. Nevertheless, the tourist suppliers are encouraged to continue to expand since all suppliers share the environmental damage, while the individual supplier retains profits from each tourist (Butler, 1994). The end result is often heavily over-utilised local areas with severe resource degradation.

There is a widespread recognition that the wilderness resource, which attracts tourists and visitors from around the world, is being over-run by tourist activities. In popular destinations, there are dozens of lodges, roads and tracks everywhere, and pushy drivers and tourists harassing wildlife. Studies have shown that tourism has caused loss of habitats (Holland & Olson, 1989); damage as a result of the pressure of human feet or vehicles on soil (Grable, 1971; Kemper *et al.,* 1971; Willard & Marr, 1971; Grime, 1973) and vegetation (Onyeanusi, 1986), among others. Such concerns have been raised about MMNR in different fora.

Muthee (1992) suggested that drivers go off designated tracks and criss-cross the grasslands in search of elusive predators. Repeated off-road driving has resulted in

localised degradation of the grassland and the development of multiple tracks, which destroy the naturalness of areas affected (Muthee, 1992). A report on MMNR presented to the Kenya Wildlife Service stated that off road driving is an especial problem, which causes both deterioration in the state of the vegetation cover and changes in the behavioural patterns of wildlife (Bhandari, 1998). It has also been argued that semi-arid and arid savannah ecosystems like MMNR are characteristically fragile and easily become vulnerable to uncontrolled vehicular traffic (Onyeanusi, 1986).

Based on unquantified concerns of the extent of the degradation of MMNR's vegetation, this study aims to quantify the extent and distribution of vegetation damage over time due to driving off-road, and to identify factors that may explain the proliferation of off-road tracks. Specifically, **section 4.3.1** quantifies the total area that is affected by off-road driving. **Section 4.3.2** maps out and compares the tracks over a period of ten years. Factors affecting track density distribution are investigated at in **section 4.3.3,** while **section 4.3.4** looks at track proliferation. The chapter concludes with a discussion of the importance of this habitat destruction in **section 4.4**.

4.2 Methods

4.2.1 Road and Track Measurements

My initial intention was to categorise all the roads and tracks in MMNR into four categories based on their origin and their extent of wear. Graded roads were easy to categorise since they were distinct from other tracks. However, other tracks became impossible to categorise individually, since what would be considered as a single track varied in wear along its length. I therefore ended up with a two category classification; graded roads and tracks if they were not graded.

Before I started driving to map the tracks as explained below in **section 4.2.2**, I took note of the vehicle's odometer reading. I then stopped after every one-kilometre increment in the odometer reading and measured the total width, the bare width and the depth of any ruts that were present at the point of measurement. The total width was measured as the widest length of the track that showed any signs of having been used. Where multiple tracks were present at a point, the combined width was

measured. To measure the bare width, a tape measure was put across the track and all the bare portions under the tape measure were noted. Their lengths were measured and tallied and recorded as the bare width.

4.2.2 1999 Mapping with GPS

I mapped all roads and tracks in MMNR using a hand-held GPS receiver unit (Garmin GPS 12). This I did by first programming the GPS receiver unit to automatically record positions when the road curved. I then drove through all roads and tracks carrying the GPS unit, which recorded a track as I drove along. Graded roads were quite distinct from all other tracks. These were therefore mapped separately from other tracks. As the GPS receiver unit could only record up to 1024 positions, I carried a notebook computer and downloaded the recorded data from the GPS receiver unit every time the unit was full.

To avoid any overlap in recording, I switched the GPS receiver unit recording mode to 'off' every time I came to the end of a road or a track. I would then drive to the beginning of the next road or track to be mapped, switch the unit back on to "record" mode before proceeding to drive along. Additionally the screen on the GPS receiver unit could show a track of what it had recorded, and this further helped not to double record roads or tracks.

All the downloaded data from the GPS receiver units were merged together using Cartalinx, a spatial data builder software. To remove any existing duplicate mapping, all the duplicate arcs were removed. The resultant data were then exported to Arcview GIS software for further processing and analysis.

In Arcview GIS, the data were clipped to include only those roads or tracks inside MMNR, after which the total length of all the roads and tracks was calculated. MMNR was then divided into 1 km^2 grid cells in which the roads and tracks were further clipped to get the length of roads and tracks falling within each grid. These lengths represented the density of roads and tracks within a 1 km^2 grid cell and were categorised into: low (less than 1 km per grid cell); medium (between 1 and 4 km per grid cell); and, high (over 4 km per grid cell) in further analysis.

Each 1 km^2 grid cell was further sub-divided into grids of 100 m squares. The

distance from each of these grids to the nearest main road and lodge/tented camp was then calculated. The average for each 1 km² grid cell was found and was taken to be the nearest distance from that grid cell to the main road and lodge/tented camp, respectively. Data on the game drive pressure index (see **Chapter 3, section 3.2.6**) were used together with data in this section to determine the relationship between track density and the game drive pressure index, distance from main roads, and distance from lodges/camps.

4.2.3 Track Mapping from 1991 Aerial Photographs

Aerial photographs that were taken in 1991 were obtained from the Department of Resource Survey and Remote Sensing (DRSRS). The photographs were at a scale of 1:20000, and had a side and top-bottom overlap of 60% and 30%, respectively. The aerial photographs were taken along transects oriented in an east-west direction. The following steps were followed in the analysis of these photographs:

First, consecutive aerial photographs were joined together by their side overlap, according to their positions in the transect. Consecutive transects were then joined to the first transect until the whole of the MMNR had been covered, and the result was a mosaic display of the MMNR.

Second, a transparent roll was overlaid to cover all the photographs, and was held down onto the photographs using masking tape to prevent it from slipping. All the tracks were then traced from the aerial photographs onto the transparent roll using an overhead marker. Prominent features on the aerial photographs were also marked to be used later for georeferencing the overlay. The traced tracks were then transferred to a tracing paper roll from the transparency roll. This tracing paper roll was then divided into overlapping rectangular areas based on the size of the digitising tablet and several control points in the area of overlap identified. The tracks within each rectangular area were then individually digitised. I followed this by performing a linear registration of the plane reference system of consecutive digitised areas' to a new reference system, through a least-squares fit to a set of control points present in overlapping areas. These control points defined the relationship between the reference system of consecutive areas. I then merged all the rectangular areas together to produce a complete road and track map for 1991. Overlapping tracks were deleted from the resultant map, and the map was then exported to Arcview GIS

software.

I clipped the track map to exclude all tracks outside the MMNR, measured their total length and further clipped them into 1 km² grids as described in **section 4.2.2** for tracks produced through GPS mapping in 1999.

4.2.4 Data Analysis

I used one-way Analysis of Variance (ANOVA) to determine whether there were any significant differences between the different track categories in terms of total width, bare width and rut depth. Where significant differences were found I further employed Duncan's Multiple Range Test and critical ranges (Duncan 1955) to investigate which of the categories differed significantly for each other.

All spatial data were analysed using GIS, which is generally accepted as referring to a computer based system for storing, retrieving manipulating and analysing spatially-referenced data and presenting the results to the user in the form of information (Burrough, 1986; Aronoff, 1991). The percentage proportion of each track category derived from track measurements encounters (**section 4.2.1**) was calculated and used as an estimate of the proportion of that category in the MMNR. The averages of total and bare widths were calculated for each category, and these were used to estimate the area of the MMNR covered by tracks and bare due to roads and tracks using the lengths determined in **section 4.2.2**. The lengths of tracks within each grid cell were used to estimate the distribution and density of tracks in MMNR.

Spearman's correlation was used to test whether there were any linear relationships between track density in each grid cell and grid cell game drive pressure index, distance from the main road and distance from lodges/tented camps.

4.3 Results

4.3.1 Road and Track Measurements in 1999

Results from road and track mapping in 1999 indicated a total road length of 222.5 km and a total track length of 2166.7 km, giving a total length of roads and tracks of 2389 km throughout MMNR (Table 4-1).

Roads had a mean width of 5.76 m and were wider (Mann-Whitney U = 2839.5;

$p<0.0005$) than the mean widths of 3.46 m for tracks. Based on a multiplication of length by mean width, the respective areas covered by roads and tracks would appear to be 1.28 and 7.49 km², respectively. Therefore, total roads and tracks cover 8.78 km² (Table 4-1), which comprises 0.6% of the total area of the MMNR.

Unsurprisingly, most of the width of graded roads was bare of vegetation, while much of the width of a track was covered with vegetation (Table 4-1). Thus, there was an even greater difference (Mann-Whitney U = 809.5; $p<0.005$) in the bare widths of roads than of tracks (5.67 m versus 1.58 m). Based on a similar multiplication, the bare area covered by roads was 1.26 km² and that by tracks was 3.42 km². Therefore, the total area of roads and tracks bare of vegetation was 4.68 km² (Table 4-1), which comprises 0.3% of the total area of MMNR.

Table 4-1: Lengths, mean ± S.E. of widths and estimated areas of roads, tracks, and bare ground due to roads and tracks in MMNR

Category	Length (km)	Mean Total Width (m)	Total Area (km²)	Mean Bare width (m)	Bare Area (km²)
Roads	222.5	5.76±0.27	1.29	5.67±0.25	1.26
Tracks	2,166.7	3.46±0.16	7.49	1.58±0.09	3.42
Total	2,389.2		8.78		4.68

4.3.2 Road and Track Mapping

Results from digitised aerial photographs indicated that in 1991 the total length of roads and tracks in MMNR was 1,844.9 km. Most of these were tracks comprising a length of 1656.3 km (Figure 4-1 and Appendix 3). In 1999 the total length of roads and tracks was 2389.2 km (Figure 4-2), comprising a length of 222.5 km roads and a length 2166.7 km tracks. A comparison of road and track length in 1991 and 1999 (Table 4-2) showed an overall increase in the lengths of roads and tracks of 544.3 km, or of 30% overall. However, most of this increase occurred in the length of 510.4 km in tracks.

When the reserve was divided into 1-km² grid cells, results indicated that 56.8% of the grids had tracks in them in 1991, but this had increased to 60.3% of the grids in

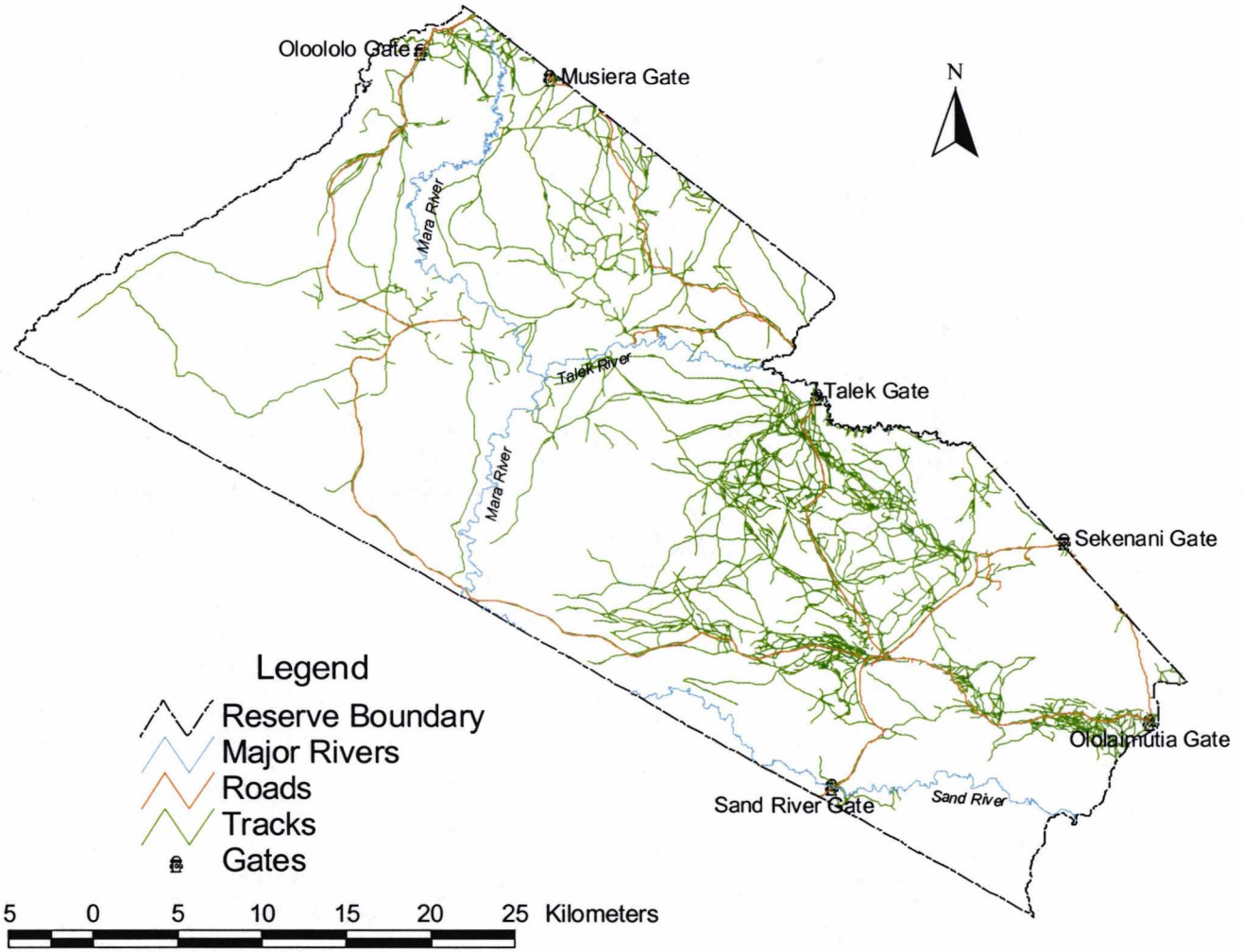


Figure 4-1: Extent of tracks mapped from 1991 aerial photographs. Roads (marked in red) are the graded tracks present in 1999 and some of them may not have been present in 1991.

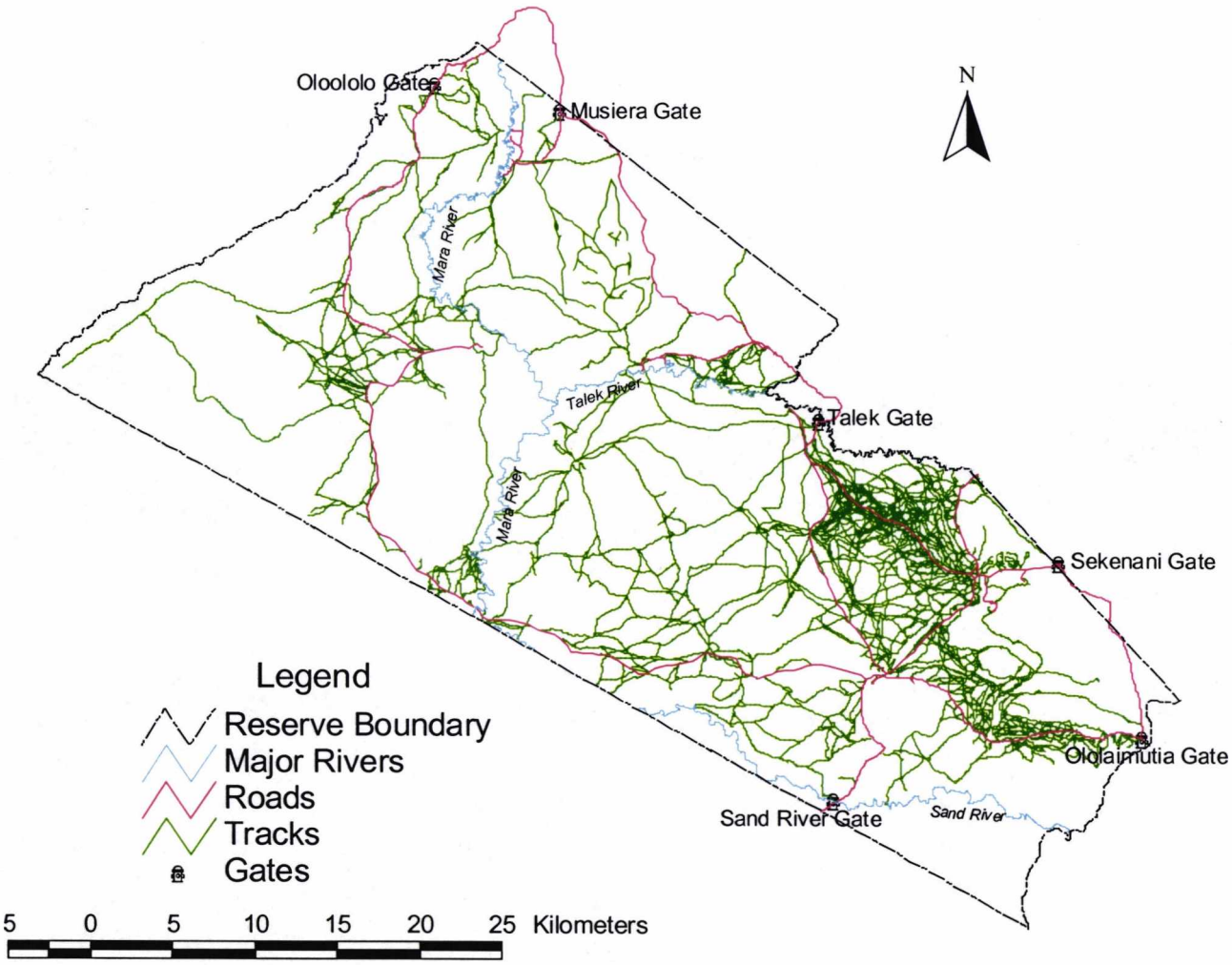


Figure 4-2: Extent of roads and tracks mapped with a GPS receiver unit in 1999

1999. In terms of track density, medium density of 1 – 4 km/grid was the most widespread in the reserve both in 1991 and 1999, constituting 32.1% and 34.8% of the grid cells respectively (Table 4-3). A general comparison of track densities in grid cells showed that there has been a change (paired samples t-test t = -6.699, df = 1688, $p < 0.0005$) of track density from 1991 to 1999. The proportion of grid cells with no tracks or with low density tracks decreased, but there was an increase of grid cells with medium and high track densities. The highest increase was with medium density, which registered a 2.7% increase (Table 4-3).

Table 4-2: Comparison of road and track length changes between 1991 and 1999 in Masai Mara national Reserve

Category	Length in 1991 (km)	Length in 1999 (km)	Increase (km)	% Increase
Roads	188.6	222.5	33.9	18.0
Tracks	1656.3	2166.7	510.4	30.8
Total	1844.9	2389.2	544.3	29.5

Table 4-3 Percentage of one kilometre grid cells having various categories of track densities in Masai Mara National Reserve

Density Category*	Percent Grid Cell Frequency		
	1991	1999	Change
None	43.2	39.7	-3.5
Low	17.6	16.1	-1.5
Medium	32.1	34.8	2.7
High	7.1	9.5	2.4

* None = No tracks; Low = < 1km/km²; Medium = 1 - 4 km/km²; High = > 4 km/km²

4.3.3 Factors Affecting Track Density Proliferation

Spearman's correlation indicated that there were significant relationships between track densities in 1999 and the game drive pressure index (**Chapter 3**), the distance from the main roads, and the distance from lodges/tented camps (all $p < 0.005$).

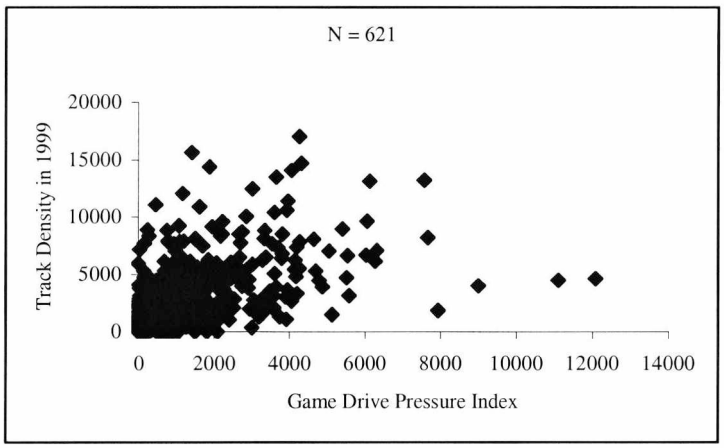
However, the relationships with track density were strongest for game drive pressure and distance from main roads, but less strong although significant with distance from the lodges/tented camps.

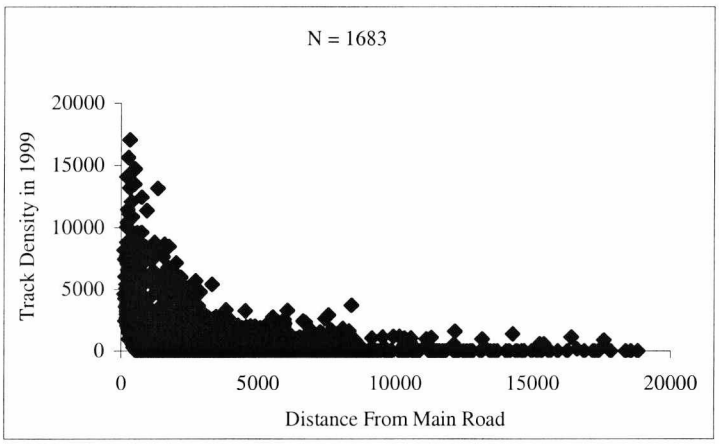
With respect to game drive pressure, the relationship was very strongly positive (R = 0.56; $p < 0.0005$), indicating that track density increased with an increase in game drive pressure (Figure 4-3 (a)). Equally, there was a strong negative relationship with distance from main roads (R = -0.51; $p < 0.0005$), suggesting that track densities were higher nearer to the main roads (Figure 4-3 (b)). A weaker although significant relationship appeared between track density and distance from lodges/tented camps (R = 0.26; $p < 0.005$). A scatter plot of this relationship indicated that although the general trend was a clear negative relationship, there were also two high peaks of track density as the distance from the lodges/tented camps increased (Figure 4-3 (c)). One peak occurred at around 5 km and another smaller peak one appeared at about 15 km from the lodges/tented camps.

4.3.4 Track Distribution

Roads and tracks were not uniformly distributed in MMNR in both 1991 and 1999. In 1991 grid cells with track densities of more than 1 km/km² were found to be concentrated in four pockets (Figure 4-4). The largest of these pockets was approximately in the area defined by Mara and Talek Rivers and the roads from Sekenani to Keekorok and then to southern Mara Bridge. Almost all grids in this area had tracks apart from the area immediately west of Mara River (Figure 4-4). Another pocket occurred north of Mara Intrepids Club within the area between the Talek – Musiara road and the Mara River. Again, in this pocket, track densities in the area immediately west of Mara River were not very concentrated. This pocket crossed the Mara River around Governor's Camps and extended to Kichwa Tembo Camp and Oloolo gate. Smaller pockets of medium and high density track concentration appeared east of Mara Serena Lodge and east of Ololaimutia gate along the road to Keekorok Lodge.

In 1999, the distribution of tracks had become even more widespread than in 1991. However, the same pockets that were identified for 1991 could still be distinguished in 1999 (Figure 4-5). The most prominent of these was approximately enclosed by the reserve boundary and the road from Talek gate to Ololaimutia gate through





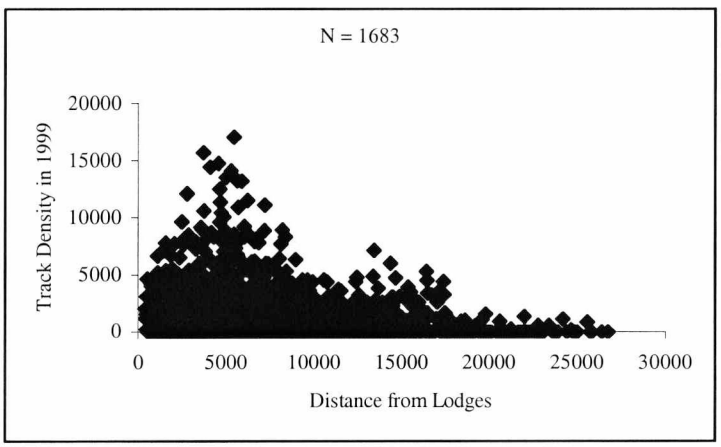


Figure 4-3: Scatter plots showing the relationships between track densities in 1999 and (a) game drive pressure index; (b) distance from the main roads; and, (c) distance from lodges/tented camps.

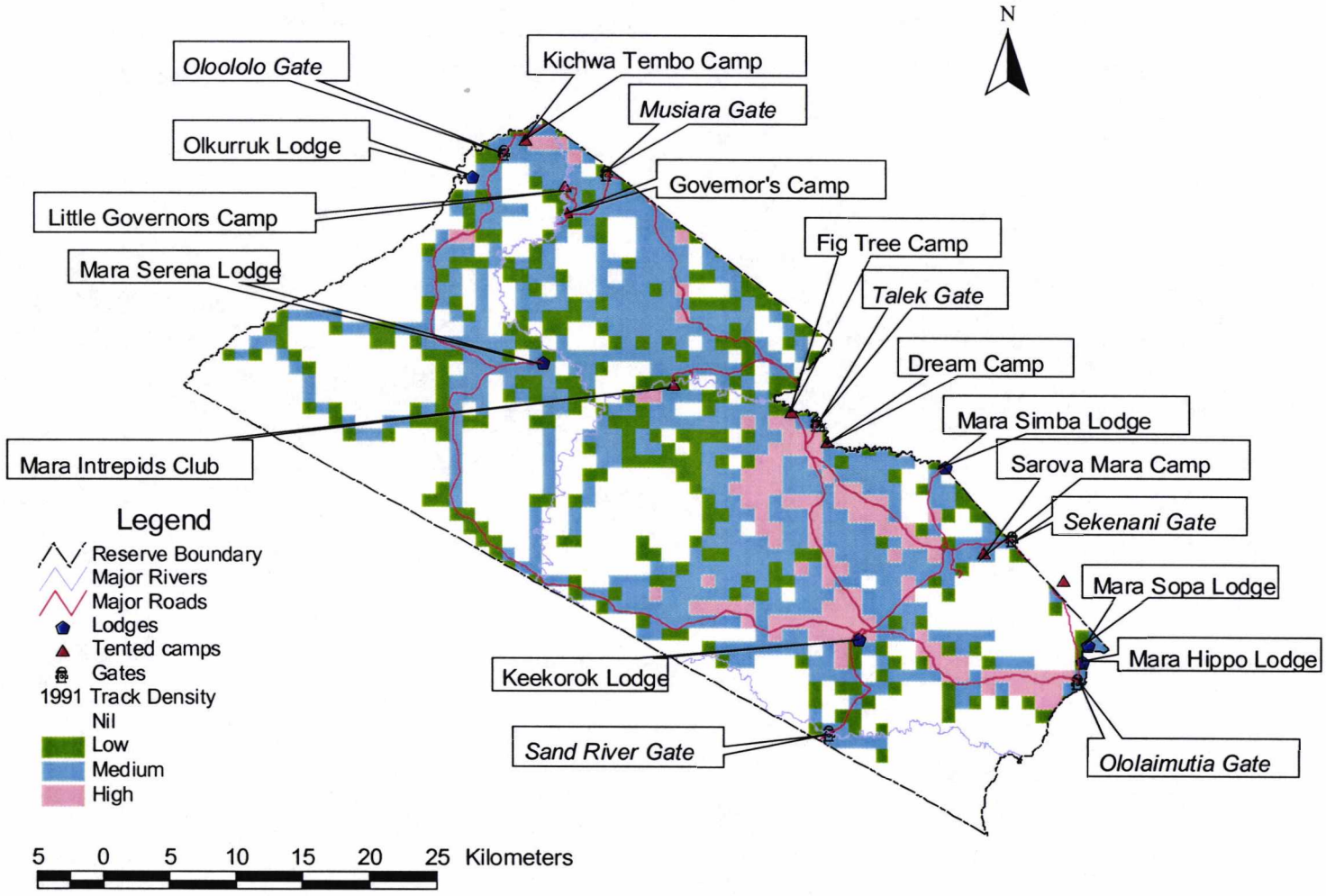


Figure 4-4: Density of tracks in 1991 in 1-km² grid cells. Low = < 1 km/ km²; Medium = 1-4 km/ km²; and High = > 4 km/ km²

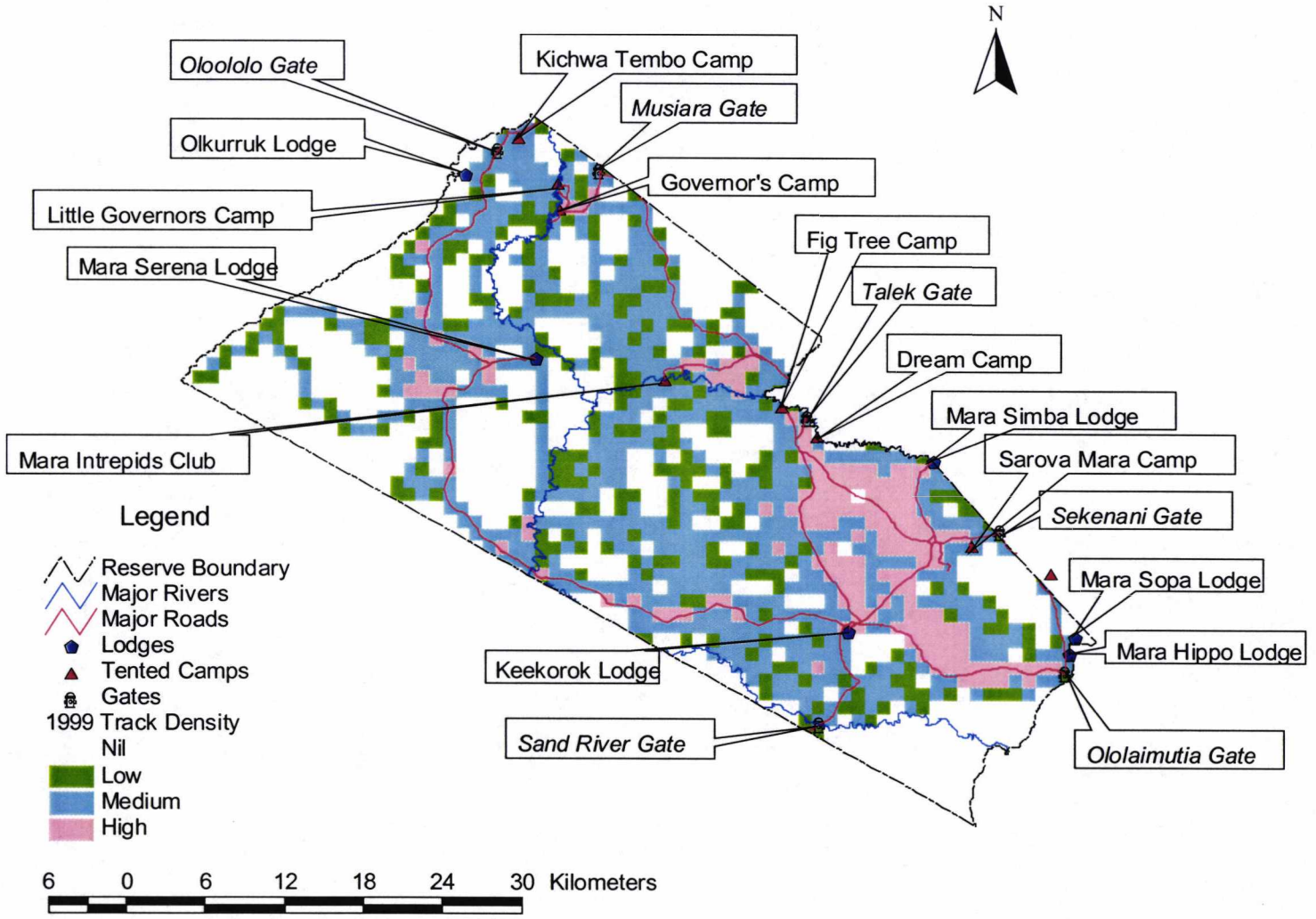


Figure 4-5: Density of tracks in 1999 in 1 km grid cells. Low = < 1 km/ km²; Medium = 1-4 km/ km²; and High = > 4 km/ km²

Keekorok Lodge (Figure 4-5). This area also had the highest concentration of grids with densities above 4 km/km². These high density grids occurred in two locations. One lay between Sekenani and Talek gates and the second lay between the roads from Keekorok lodge to Sekenani gate and Keekorok lodge to Ololaimutia gate (Figure 4-5). There were also some grids without any tracks in this area. These were found south of Sekenani gate and to the west of the reserve boundary.

Another pocket of grids dominated by medium track densities lay between Keekorok Lodge and southern Mara Bridge. Here, these grids were mainly in areas adjacent to the main road. The area to the west and north of Serena Lodge formed yet another pocket of grids with track densities of at least 1 km/km². A few grids in this area even had densities of more than 4 km/km². Several other pockets with track densities of at least 1 km/km² appeared scattered in the MMNR. Examples of these were between Fig Tree Camp and Mara Intrepids Club, north-west of Mara Intrepids Club and around Oloolololo gate. Among these it was only between Fig Tree Camp and Mara Intrepids Club where densities of more than 4 km/km² were found (Figure 4-5).

A comparison between 1991 and 1999 was achieved by subtracting 1991 track densities from those in 1999. Differences of between -1 km/km² and +1 km/km² were considered as negligible and any grids showing such small levels of change were taken not to have undergone any change. Differences of less than -1 km/km² were considered to have undergone a decrease in track density while an increase was considered to have occurred in grids with differences of more than +1 km/km². After carrying out this classification, results indicated that most grid cells (64.7%) had not undergone any change in track density. Equally, 15.3% of the grid cells had shown a decrease in track density, while 20% had shown an increase in track density (Figure 4-6).

In terms of distribution, those cells showing a decrease in track density were generally scattered, apart from a few instances of concentration. Large areas of decrease covering more than ten contiguous grid cells were located in areas west of Talek gate and west of Keekorok Lodge. There were also smaller areas covering more than five contiguous grid cells south of Kichwa Tembo Camp, west of Musiara gate, and west of Ololaimutia gate. All other areas of decrease contained less than

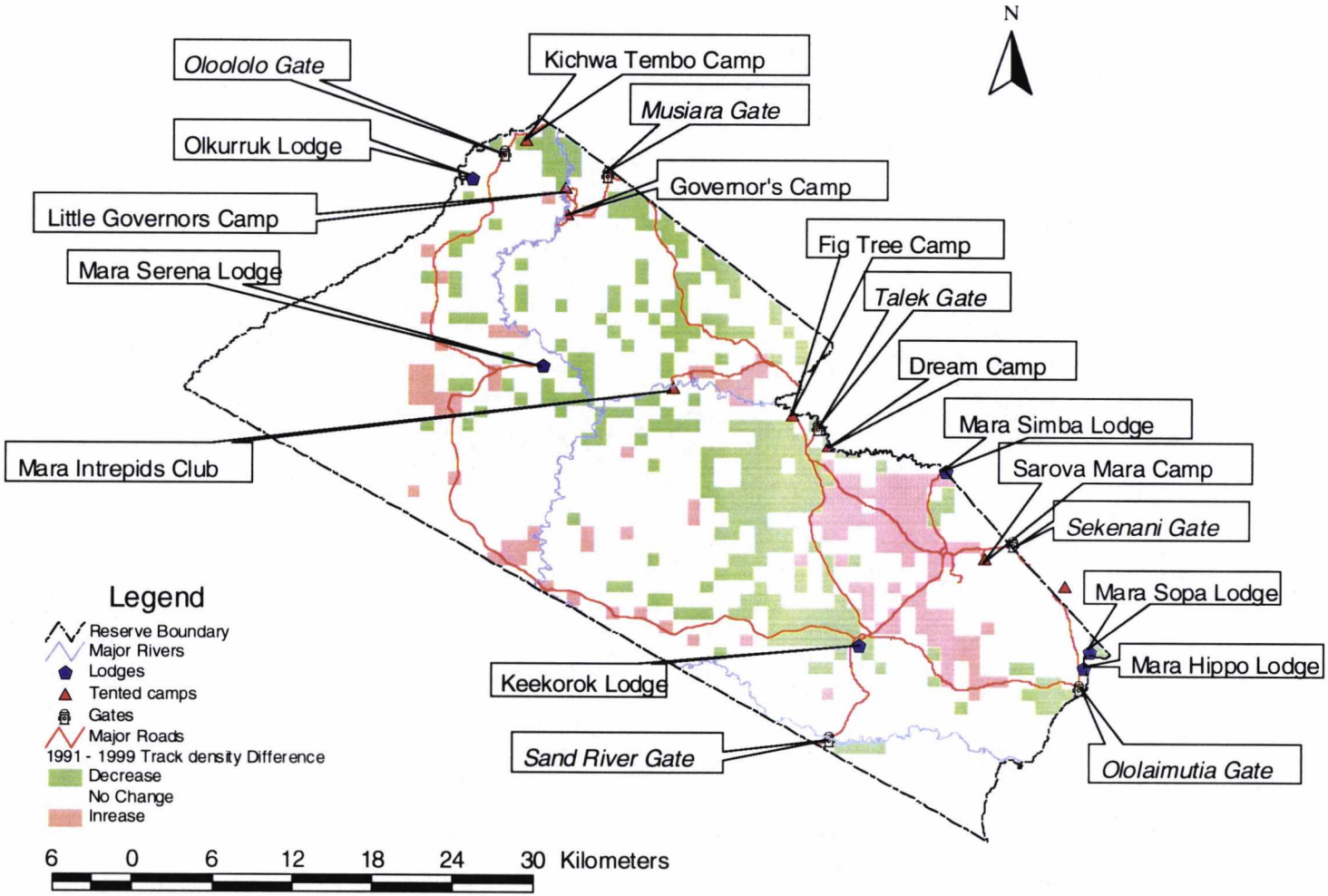


Figure 4-6: Difference in track density between 1999 and 1991 in 1 km grids. Decrease = < -1 km/ km²; No change = -1 – 1 k / km²; and Increase = > 1 km/ km²

five contiguous grid cells and were mainly scattered in Musiara sector (Figure 4-6).

The most noticeable area to have showed an increase in track density was the area bordered by the reserve boundary and the roads from Talek Gate to Ololimutia Gate via Keekorok Lodge. In this area only a narrow strip just west of the reserve boundary did not show any increase in track density. Other noticeable areas of increase were west of Serena Lodge, around southern Mara Bridge, and along Talek River from Fig Tree Camp to Mara intrepids Club (Figure 4-6).

4.4 Discussion

A topic that is often discussed among conservationists is the impact that tourism causes to the habitats and species (Goldsmith, 1974; Liddle, 1975). Yet qualified studies of such impacts are often lacking (Roe *et al.*, 1997). This study is one of the few to measure impacts of tourism upon habitats, and the most extensive attempt in MMNR to quantify the impacts of road development upon the vegetation. This study has established that only 0.6% of the total area of MMNR comprises of roads and tracks, and that 0.3% of the total area of MMNR is bare of vegetation as a result of such roads and tracks. Nevertheless, the area covered with roads and tracks has increased from1991 to 1999 by 30%. The concentration of and change in the distribution of roads and tracks is not uniform, but is highly localised in certain areas. Track density was found to be positively related to the game drive pressure index and negatively related with both distance from main roads and lodges/tented camps.

4.4.1 Road and Track Measurements

Wildlife tourism is the major tourism activity in MMNR. Tour vehicles traverse the MMNR primarily in search of the big predators and, in some cases, of migratory and other large herbivores (Onyeanusi, 1986; Muthee, 1992; Henry *et al.*, 1992). In doing so, numerous off-road tracks have been created, because one of the features of such tourist attractions is that they are highly mobile and will tend to move about as part of their daily activity patterns. Nevertheless, these animals have home ranges within which they will tend to be always found. The extent and length of time a track is used depends on the mobility and the period of time an animal attraction is in an area. Highly mobile animal attractions such as predators and migratory

herbivores will result in the creation of numerous new tracks within an area, providing that the habitat does not provide barriers to the formation of such new tracks.

Previous studies have attempted to estimate the vegetation damage due to off-road driving in the MMNR. Onyeanusi (1986) estimated that 0.00038 % of the standing crop was lost due to a single vehicle entering the MMNR. Henry *et al.* (1992) estimated vegetation damage in some zones of the reserve, but did not estimate for the whole of MMNR. On the other hand, Muthee estimated that the overall damage to vegetation cover to be 15.3 % (Muthee, 1992) but did not explain how she arrived at this figure. Using a Landsat TM satellite image, Bhandari (1998) estimated that 25.83 km² (1.7 %) of MMNR was covered by roads and tracks. Of all these earlier estimates the satellite image estimate is likely to be the most reliable as it covered the whole of MMNR. However, it is bound to be inaccurate as the image only had a 30 m × 30 m resolution while roads and tracks are a lot narrower (see Table 4-1).

The estimates from this study are both extensive, in that they cover the whole MMNR, and more accurate, as they were based on mapping all the roads and tracks coupled with measuring their widths. However, they were based only on the tracks that were apparent to the observer. Some studies have assessed vegetation recovery after cessation of off-road driving (Onyeanusi, 1986; Muthee, 1992; Bhandari, 1998). These studies examined the recovery of both general vegetation cover (Onyeanusi, 1986) and individual grass species (Muthee, 1992; Bhandari, 1998). The recovery of vegetation cover was found to be rapid, especially in the wet season, and in areas subjected to low vehicle pressure. In terms of individual species, *Themeda triandra*, which is the most palatable of grass food plants of most herbivores, was found to be the most susceptible to off-road driving, and showed the lowest recovery capabilities. Indeed, this species was found to be replaced by less palatable species like *Cynodon dactylon* in areas affected by off-road driving (Muthee, 1992; Bhandari, 1998). Bhandari (1998) found this species replaced even in areas that had been closed from off-road driving for 8 years. Following on from this, although the area of current roads and tracks within MMNR was found to be only 8.77 km² or 0.6% of the total area of MMNR, their impact is most probably more severe than this relatively small area would indicate. Hence, old tracks were

no longer apparent to the observer and so were not mapped. Yet, such old tracks may well still exhibit important differences in species composition that were not considered in this study.

4.4.2 Distribution of Off Road Tracks

This study looked at the distribution of off-road tracks by mapping all the tracks that were present in 1991 and 1999. Their distribution in terms of track density was found to be highly localised both in 1991 and 1999. Only in a few instances were there many grid cells adjacent to each other and having similar track densities (see figure 4-5).

Previous studies undertaken in MMNR have examined off-road track distributions based on various different methods of estimation. Onyeanusi (1986) estimated track distribution by driving along major roads and counting the number of tracks on either side of the road. Henry *et al.* (1992) divided MMNR into zones, and placed rectangular sampling blocks with two lengthwise and two perpendicular transects in each zone and counted the number of tracks along these transects. On the other hand, Bhandari (1998) used topographic maps, tourist maps and Landsat TM imagery to prepare track maps. He pointed out that the Landsat TM imagery had a resolution of 30 m × 30 m and could not therefore show narrow tracks. Additionally, he proposed that aerial photographs or hyperspectral radar images should be used, as they could clearly show the off-road tracks. Among the various studies, only Henry *et al.* (1992) and Bhandari (1998) tried to show off-road track densities across the whole of MMNR.

Two different methods with different levels of precision were used to acquire the necessary data on track densities. Aerial photographs were good at identifying worn tracks that were bare of vegetation cover, but they probably could not pick out tracks that were still covered with vegetation. On the other hand, there was a risk of omitting some tracks when mapping on the ground using GPS. These differences could limit the usefulness of comparing results based on using the two different methods. However, given the size of the changes that were found in 1991 and 1999, these possible methodological limitations are likely to be small in relation to the actual changes measured (Table 4-2).

Several factors may have contributed to the changes that were found in track distribution and density between 1991 and 1999 (Figures 4-1; 4-2). Track density was found to correlate with distance from main roads and distance from lodges/tented camps Figures 4.3 b, c). Equally, a new lodge, Mara Simba lodge, has been established since the aerial photographs were taken in 1991. A new road has also been built connecting Mara Research Station and Talek Gate. Hence, these two developments may explain the large increase in track densities between Sekenani and Talek gates. Furthermore, concern about proliferation of off-road tracks has led the management of MMNR to close some areas from game drives, especially around Keekorok Lodge. This might explain the reduction of track density around this area.

In addition to the factors that this study found to correlate with track distribution and density, other variables not investigated in this study could also affected track distribution and density. Areas that had high densities of tracks were also found to be frequented by cheetahs and lions (pers obs). Thus, these were also areas that were rich in resources sought after by the tourists.

Given that this chapter has documented the extent, distribution and temporal variations of tracks in MMNR, the next chapter will look further at some possible explanations of influences that might underlie the creation and distribution of roads and tracks in MMNR.

CHAPTER FIVE

Factors Affecting Animal Distribution in Masai Mara National Reserve

5.1 Introduction

Many studies have examined the distribution of African herbivores on both macro- and micro- scales (Dorst and Dandelot, 1970; Smithers, 1983), but this topic has yet to be fully understood. On a local scale, the most comprehensive and rigorously quantitative study (Ferrar and Walker, 1974) measured the distribution of 14 herbivore species in relation to 26 habitat variables in Kyle National Park, Zimbabwe. When discriminant function analysis was applied to these data, it identified three complex habitat gradients that segregated the species. The first major axis reflected a gradient from open, pure grassland, where wildebeest, zebra, warthog, and tsessebe were concentrated, to patchy vegetation within woody over-storey where dik-dik and bushbuck were found. Occupying the specialised habitat of isolated, rocky inselbergs, klipspringer was an outlier on this and the other axes. The second major axis described a topographic and geological edaphic gradient from deep soils on flatlands, favoured by tsessebe, to rocky shallow soils in dissected landscapes, where warthog and kudu were prevalent. The third major axis recorded primarily the character of the herbaceous layer, as sparse and open at low axis values, and tall and dense at high axis values. Wildebeest and warthog had low values on this axis, while steenbok and reedbuck had high values.

The niche breadth of each species as indexed by the values of the different discriminant functions also varied widely among the species. For example, bushbuck and dik-dik were broadly distributed in relation to the moisture of grass and woody cover in the vegetation, but were very narrowly distributed on the axis of soil and landscape characteristics. Warthog were comparatively broadly distributed across all three habitat axes. In contrast, reedbuck tended to occupy only very specialised habitats. This emphasis on habitat type as the most important factor controlling herbivore distribution is appropriate only for species that are not dependent on water or whose access to water is not limiting (Western, 1975). Antipredator behaviour also affects the structure and distribution of multispecies groups (Sinclair, 1985).

Greenacre and Vrba (1984) analysed the distributions of herbivore species in 16 different ecosystems scattered throughout eastern and southern Africa. Correspondence analysis demonstrated that monophyletic groups of species, such as members of a given tribe, are associated with ecosystems having similar gross vegetation physiognomy, best described by the ratio of woody to grass cover. Therefore, the same primary factor affects their distribution on both a regional and a local scale. Soil nutrient status, latitude, primary productivity, biogeography, rainfall and altitude were considered of secondary importance in their effects on herbivore distribution. They hypothesised that primary cladistic characters, i.e. those characters in all species in a clade, may be adaptations to particular gross vegetational physiognomy.

However, the cladistic organisation of herbivore feeding strategies has not been widely recognised. Anatomical, physiological, and behavioural characteristics associated with different feeding characteristics represent specialisations to different physical and chemical characteristics of the diet. Therefore, it seems reasonable to conclude that among ungulates, the primary cladistic characters are adaptations to physical and chemical properties of leaves, rather than to gross vegetation physiognomy. Therefore, herbivore clades, consisting of species with similar feeding strategies, are likely to have arisen after ancestral species evolved the ability to process a particular type of diet (McNaughton and Georgiadis, 1986).

The complexities involved in explaining wildlife distribution patterns have been in existence even before tourist activities compounded the problem by their presence in wildlife habitats. Various behavioural responses have been reported on animals in the presence of tourists. Quite a number of such responses have been displacement, occurring when animals tend to move away from tourists. For example, Asian rhinos were reported to move away from their feeding grounds due to the presence of tourists (Lott and McCoy, 1995). Likewise, non-habituated brown bears delayed their use of an Alaskan river when a lodge along the river delayed its traditional closing date (Olson *et al.*, 1996). However, habituated animals would not be so affected by the presence of tourists. In Borneo, Griffiths and van Schaik (1993) reported that human traffic led large mammals to avoid certain areas and change their activity periods. It also is thought that rhino carrying capacity in MMNR has

declined as a result of declining woodland (Dublin, 1991; 1995), increased competition and disturbance from other herbivores, particularly elephants, and increased human pressure in terms of tourism and cattle encroachment (Walpole *et al*, 2001). It has, however, never been conclusively determined whether or not tourists affect the distribution of animals.

Wildebeest and zebra in Serengeti-Mara ecosystem migrate between Serengeti and Masai Mara (Maddock, 1979; Stelfox *et al.*, 1986; Ottichilo *et al.*, 2001). In contrast, many other species remain as residents throughout the year in Masai Mara. This study aims to determine whether the distributions of these resident herbivores in MMNR are affected by tourist pressure. The hypothesis is that if tourists affect the distributions of resident herbivores, then there will be a relationship between tourist pressure and animal distribution. Alternatively, if tourists do not affect resident herbivore distributions, these would correlate instead only with the traditional biological and physical factors that have determined the distribution of herbivores in other studies (Ferrar and Walker, 1974; Western, 1975; Greenacre and Vrba, 1984; Sinclair, 1985).

The methods that were used in this study are outlined in **section 5.2**. The section starts with an explanation of the animal census methods (**section 5.2.1**) followed by how the drainage data was acquired (**section 5.2.2**). The descriptions of the determination of elevation and vegetation cover are treated in **sections 5.2.3** and **5.2.4** respectively, and these are followed by how visitor pressure was determined in **section 5.2.5**. Analysis of data is considered in **section 5.2.6**.

The results are presented in **section 5.3** in the order of: animal distribution in **section 5.3.1**; livestock distribution in **section 5.3.2**; drainage in **section 5.3.3**; elevation in **section 5.3.4**; vegetation in **section 5.3.5**; and the factors affecting animal distribution in **section 5.3.6**. A discussion of these and other results are presented in **section 5.4**.

5.2 Methods

5.2.1 Animal Census

Distributions of eight different species of resident herbivore are considered in this study, comprising: zebra; kongoni; topi; warthog; giraffe; impala; waterbuck; and, ostrich.

In this study, I extracted data from the aerial censuses conducted in MMNR between 1977 and 1997. The data were collected by the DRSRS using a systematic reconnaissance flight (Norton-Griffiths, 1978). These data, and the data collection method, have been previously reported to be reliable (De Leeuw *et al.*, 1998). The censuses were undertaken along transects oriented in east-west direction and spaced at 5 km intervals. Flying heights were c. 90 m (1977-1985) and 120 m (1985-1997). Two experienced and well-trained observers (Dirschl *et al.*, 1981) occupied the rear seats of a high wing aircraft (Cessna 185 or Partinevia) and counted animals that appeared between two rods attached to the wing struts. The field of vision between these rods was calibrated by flying repeatedly across ground markers of known spacing (Ottichilo and Sinange, 1985). The numbers of animals falling within the survey strips on either side of the aircraft along each 5 km transect segment were counted and recorded into tape recorders by the two rear seat observers (RSO). Groups of animals greater than 10 in number were also photographed and later counted with the aid of a 10× binocular microscope and overhead projector.

I received these data from DRSRS in the form of maps with population figures for each species printed on the grid where the count was completed. Therefore, I transformed these grids into their Universal Transverse Mercator (UTM) coordinates and transferred each record to its corresponding coordinates. Although data were available from 1977 to 1997, I only used data from 1994 to 1997, which was the closest period to the time I collected other data from the field.

In addition to the distribution data on the resident herbivore species, I also extracted data on the distribution of livestock. The presentation of livestock distribution on the maps from DRSRS was in form of a map each for cattle, sheep and goats, and donkey. All these different values for different livestock species were combined for the purposes of this study.

Since the census transects were spaced at 5 km intervals, the study area was divided into 5 km² grids and all data were considered within these grids.

5.2.2 Drainage

Digitised data on all the rivers in the reserve were acquired from DRSRS. Animals require water for their survival, as does vegetation for its production. Therefore, two aspects of water were considered as factors that may affect animal distributions. Firstly, the distance was calculated from the major rivers to each grid cell. The major rivers, i.e. Mara, Talek and Sand River are the only sources of water during the dry season. Secondly, the distance from all the other rivers was also calculated. These included the seasonal streams, some of which have water only when it rains. Due to their nature, these seasonal rivers and streams modify the vegetation along them.

5.2.3 Digital Elevation Model

A digital elevation model (DEM) is a digital file consisting of terrain elevations for ground positions at regularly spaced horizontal intervals. DEM's may be used in the generation of three-dimensional graphics displaying terrain slope, aspect (direction of slope), and terrain profiles between selected points. In the Masai Mara, the terrain elevations correlate closely with the soil types (Williams, 1966).

The DEM data were acquired through the internet from GTOPO30, which is a global data set covering the full extent of latitudes from 90 degrees south to 90 degrees north, and the full extent of longitudes from 180 degrees west to 180 degrees east (U.S. Geological Survey, 1993). The horizontal grid spacing is 30-arc seconds (0.00833 degrees). The horizontal coordinate system is decimal degrees of latitude and longitude referenced to WGS84. The vertical units represent elevation in meters above mean sea level. Due to the nature of the raster structure of the DEM, small islands in the ocean less than approximately 1 km² are not represented.

The absolute vertical accuracy of the data varies by location according to the source data. Generally, the areas derived from raster source data have higher accuracy than those derived from vector source data (Defense Mapping Agency, 1986; U.S. Geological Survey, 1993). Using certain assumptions, the vertical accuracy of each source (and the derived 30-arc second grid) can be estimated from the contour

interval. One assumption is that the original map sources meet the commonly used accuracy standard which states that 90% of the map elevations are within + or - one-half of the contour interval. It is unknown if any of these maps actually meet this standard. For any application, the horizontal grid spacing (which limits the resolution), and the vertical accuracy of the data, must be considered. The 30-arc second grid spacing equates to about 1 km^2, although that number decreases in the east/west (longitudinal) direction as latitude increases.

5.2.4 Normalised Difference Vegetation Index

Normalised Difference Vegetation Index (NDVI) is produced from the Advanced Very High Resolution Radiometer (AVHRR) on board the USA's NOAA polar orbiting meteorological satellites. It uses the normalised difference between the near infrared and the red channels. The differential reflectances in these channels provide a means of monitoring density and vigour of green vegetation growth using the spectral reflectivity of solar radiation. NDVI was originally used as a measure of green biomass (Tucker, 1979). It has a solid theoretical basis as a measure of solar photosynthetically active radiation absorbed by the canopy (Sellers, 1985; 1987). Green leaves commonly have larger reflectances in the near infrared than in the visible range. As the leaves come under water stress, become diseased or die back, they become more yellow and reflect significantly less in the near infrared range. Clouds, water, and snow have larger reflectances in the visible than in the near infrared, while the difference is almost zero for rock and bare soil. Vegetation NDVI typically ranges from 0.1 up to 0.6, with higher values associated with greater density and greenness of the plant canopy. Surrounding soil and rock values are close to zero while the differential for water bodies such as rivers and dams have the opposite trend to vegetation, and the index is negative. Therefore, NDVI was used to differentiate between the various vegetation types in the MMNR.

5.2.5 Visitor Pressure

All tracks created by tourists were mapped as described in **Chapter 4 section 4.2.2**. The lengths of tracks were clipped according to the grid cell they fell in and the total length within each grid cell was taken as the first measure of tourist pressure. A second measure of tourist pressure was the distance of each grid cell from the main roads. Main roads were considered to receive the highest traffic and, therefore, the

nearer an area is to the main road, the higher the pressure from tourists. Additionally, the average distance of each grid cell from tourist accommodation in lodges and tented camps was calculated. This was as the third measure of tourist pressure, since areas surrounding accommodation facilities are bound to be the most visited areas of the reserve.

5.2.6 Data Analysis

When recording the coordinates of where a record was made during animal counts, I recorded the coordinates of the centre of the grid that the count was made. The table so formed from these records was converted into an Arcview GIS theme. The resultant data were in a point theme form, where each record was associated with a point on the map. All the records were then assigned to the grids they fell into from an already prepared 5 Km grid of MMNR. This resulted in the addition of another column into the table that identified the grid to which each record belonged.

All records from 1994 to 1997 were then selected to form a data set from which the analysis was undertaken. Each animal species was then selected individually from this data set. For each species, its presence or absence within each grid was determined. Further, the total number of individuals counted within each grid was calculated together with the average over the time period under consideration. These were attached to the 5 Km grid data table via their grid identification number. The process was repeated for all the eight animal species that were considered. Apart from the number of individuals of each species in each grid cell, the number of different species that occurred was also determined and recorded as the species diversity in that grid cell.

The DEM data were acquired in resolutions of 1 km^2 representing the mean elevation within that area. For the purposes of conformity with the animal census data, the average of the values within a 5 Km^2 grid cell were calculated and taken to be the mean for that 5 Km^2 grid cell. A similar approach was followed for averaging NDVI data. However, the variation in NDVI values for each grid was also determined and recorded as another variable.

The digitised data on MMNR rivers that were acquired from DRSRS were in vector format. First, a grid theme having grids measuring 100 m $\times$ 100 m and covering the

whole of MMNR was prepared using Arcview GIS. Then, the nearest distance from each of these grids to the rivers was calculated. The average for the 5 Km^2 grid cell was calculated and it is this average that was used for analysis. This procedure was used to acquire data on grid distance from major rivers, all rivers and lodges/tented camps.

The total length of tracks within each 5 Km^2 grid was taken as a measure of tourist pressure within that grid (see **Chapter 4**).

A stepwise regression analysis was performed on the number of each different species in each grid cell as the dependent variable, with as explanatory variables: the livestock numbers; mean distance from main roads; mean distance from major rivers; mean distance from all rivers; mean distance from lodge/tented camps; mean DEM value; mean NDVI value; and, NDVI variety in each grid cell. For each species, I marked whether it was either present or absent in each of the grids. I then performed a stepwise logistic regression on absence/presence data with the eight explanatory variables mentioned above.

5.3 Results

5.3.1 Resident Herbivore Species Distribution

When all eight species of resident herbivores were combined, results showed that resident herbivores were distributed in almost all grids in the MMNR apart from very few. All but one of the grids that showed no records of resident herbivores were along the reserve boundary (Figure 5-1). Results also suggested that grids with more than two different species were mainly located towards the middle of the MMNR and those with only one or two species occurred along the boundary.

Looking at individual species, it was found that each species had different distribution patterns (Figure 5-2). Topi, zebra and impala had the widest distributions all over the MMNR. Warthog were also quite widely distributed but appeared more distributed towards the western part of the MMNR. Giraffe and kongoni had very similar distribution patterns, although kongoni were more widely distributed than giraffe. The species that appeared to be least widely distributed were waterbuck and ostrich. Waterbuck were found at the southern tip, in the mid-

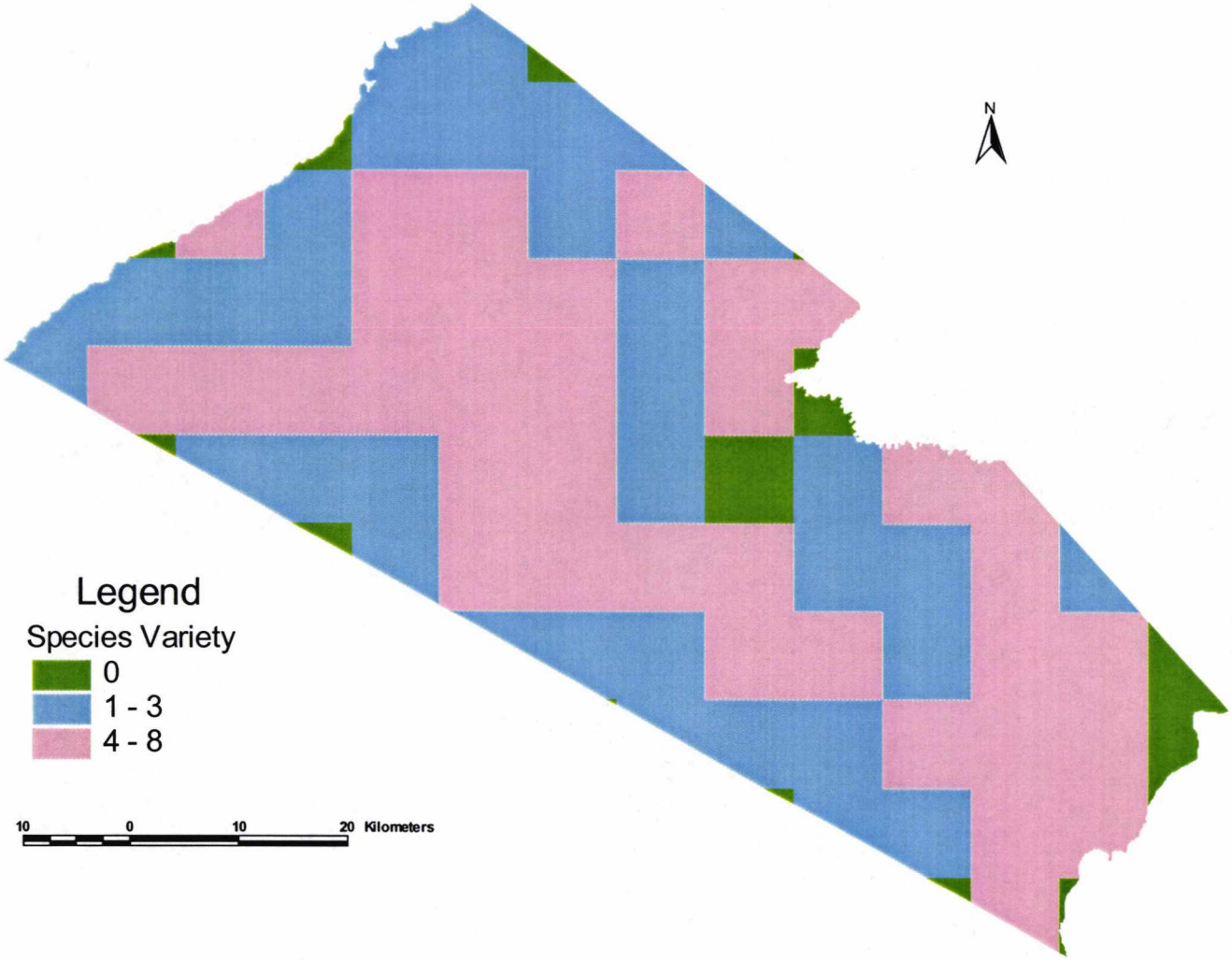


Figure 5-1: Recorded number of different resident herbivore species in 5-km grids inside Masai Mara National Reserve between 1994 and 1997

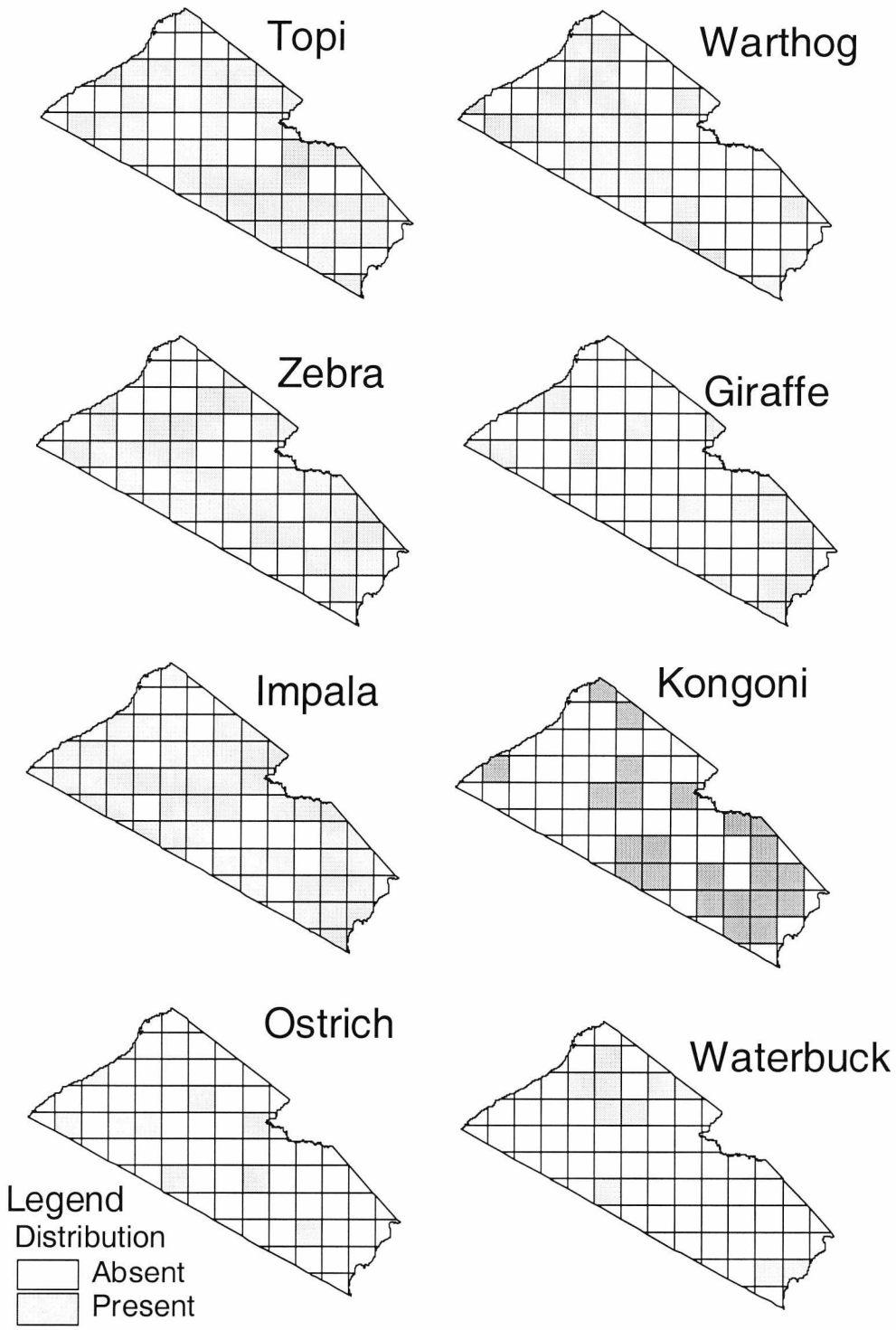


Figure 5-2: Presence and absence of different animal species in 5-km grids of Masai Mara National Reserve between 1994 and 1997

west and towards the north-eastern of MMNR. Ostrich on the other hand occurred in very few grids that were widely scattered inside the MMNR.

5.3.2 Livestock Distribution

The distribution of livestock was found to occur along the MMNR boundary that does not border the Serengeti National Park (Figure 5-3). The area with the highest concentration of livestock was around Talek Gate followed by the area near Musiara Gate and the area to the southern end of MMNR. All areas further inside the MMNR were devoid of livestock (Figure 5-3).

5.3.3 Drainage

The drainage system in MMNR comprises three perennial rivers and a multitude of smaller seasonal rivers (Figure 5-4). The perennial rivers are the Mara River, Talek River and Sand River. Mara and Talek rivers cross MMNR almost at the middle while Sand River lies towards the south-western part of MMNR. Hence, at the north-western and south-eastern parts of MMNR there are large mean distances from major rivers (Figure 5-5).

Seasonal rivers only hold water during the rainy season, and many are simply luggas that only hold water when it has rained. These seasonal rivers are scattered all over the reserve and especially south of the Mara River (Figure 5-4). Since they are close to each other, the mean distances between each are generally small and do exceed 4 km.

5.3.4 Digital Elevation Model

The DEM data indicated that the central part of the MMNR is a lowland that is surrounded by higher elevations especially towards the north and the south (Figure 5-6). The low elevations corresponded closely with the Mara River, while the higher areas correspond to the Siria Escarpment in the north and to the Ngama hills in the south

5.3.5 Normalised Difference Vegetation Index

NDVI index did not appear to substantially differentiate the various vegetation types inside MMNR (Figure 5-7). Most of the middle part of the MMNR appeared to

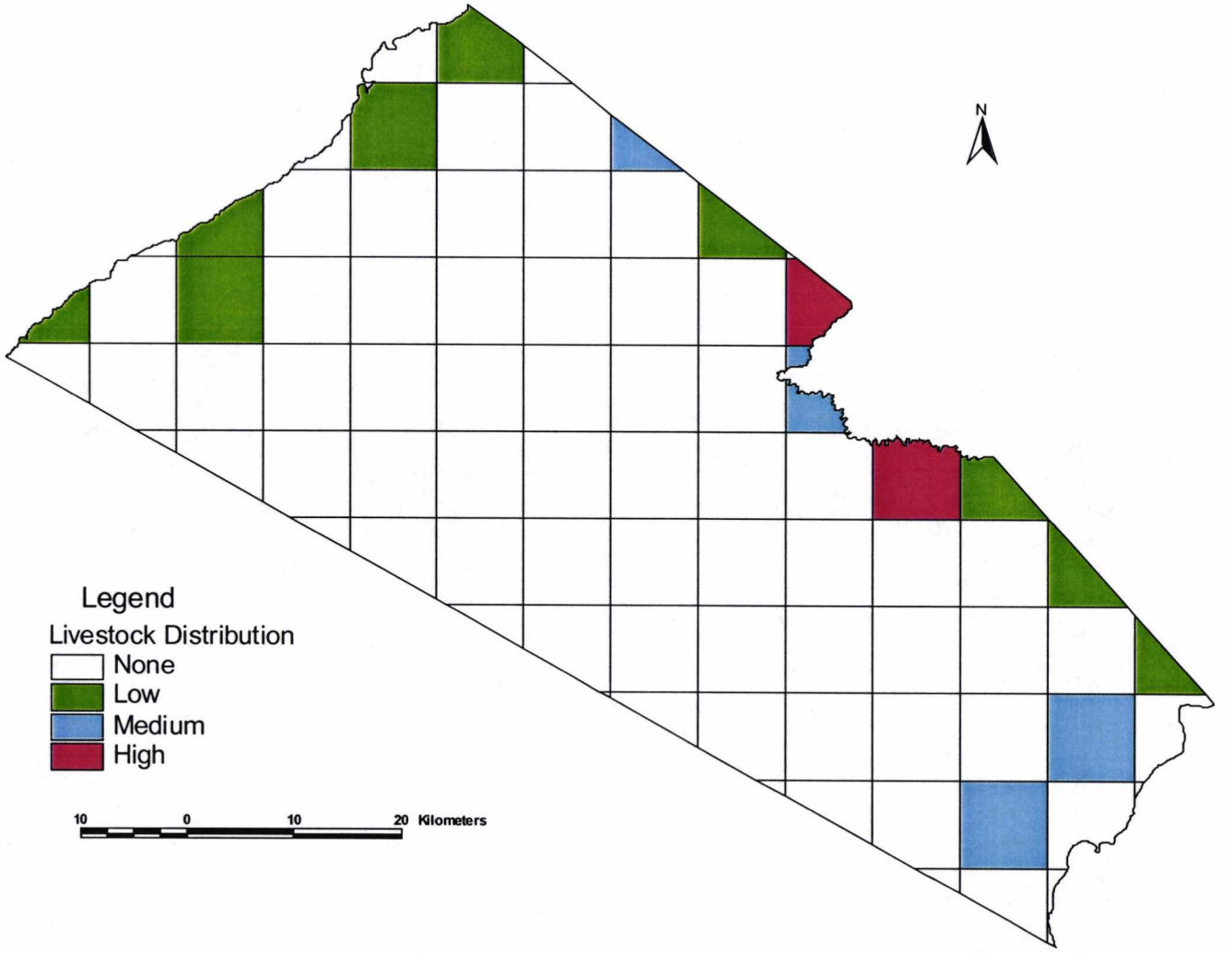


Figure 5-3: Distribution of Various densities of livestock in 5-km grids inside Masai Mara National Reserve between 1994 and 1997. Low = 1-425 animals; Medium = 426-950 animals; and High = > 950 animals

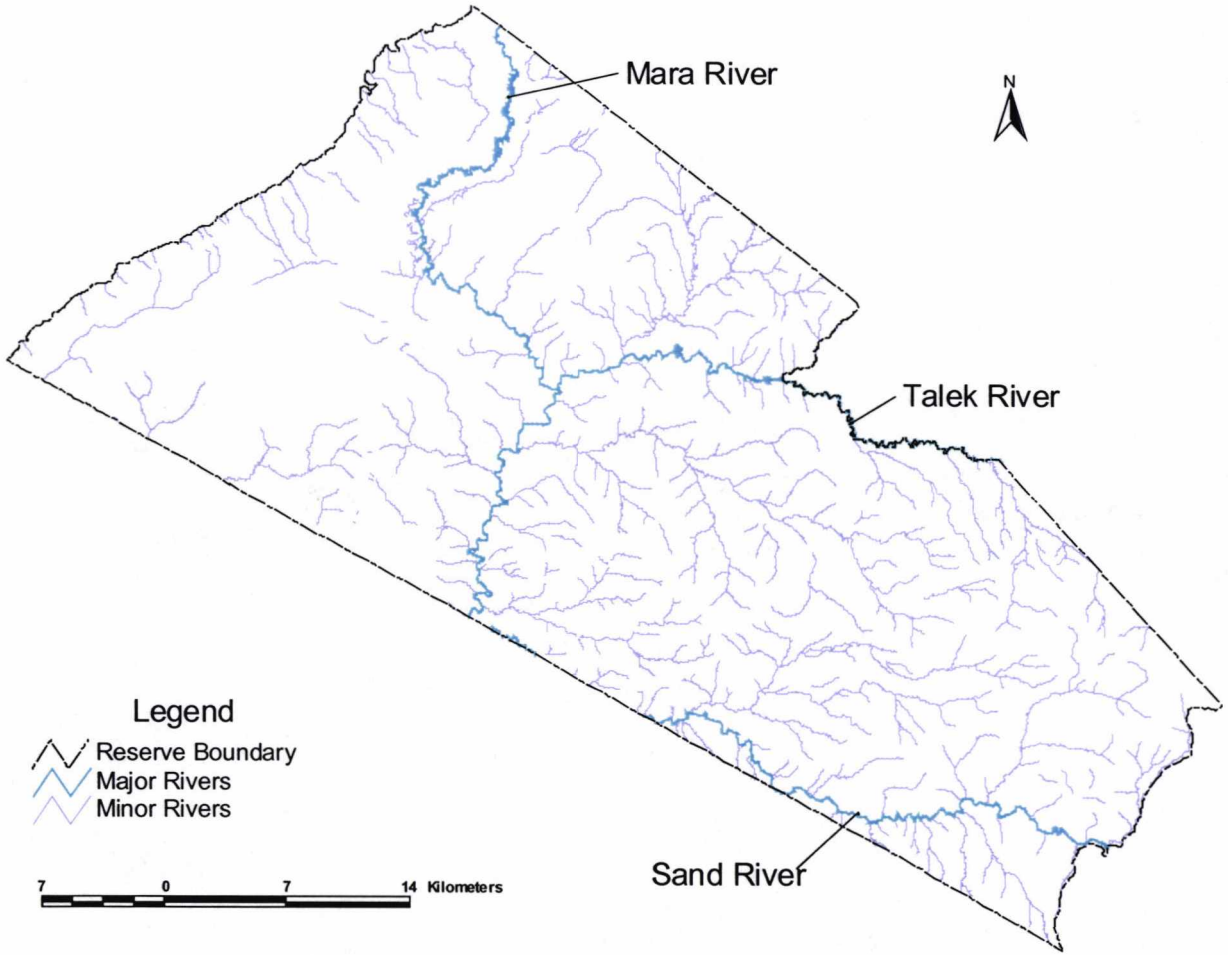


Figure 5-4: Masai Mara National Reserve drainage system

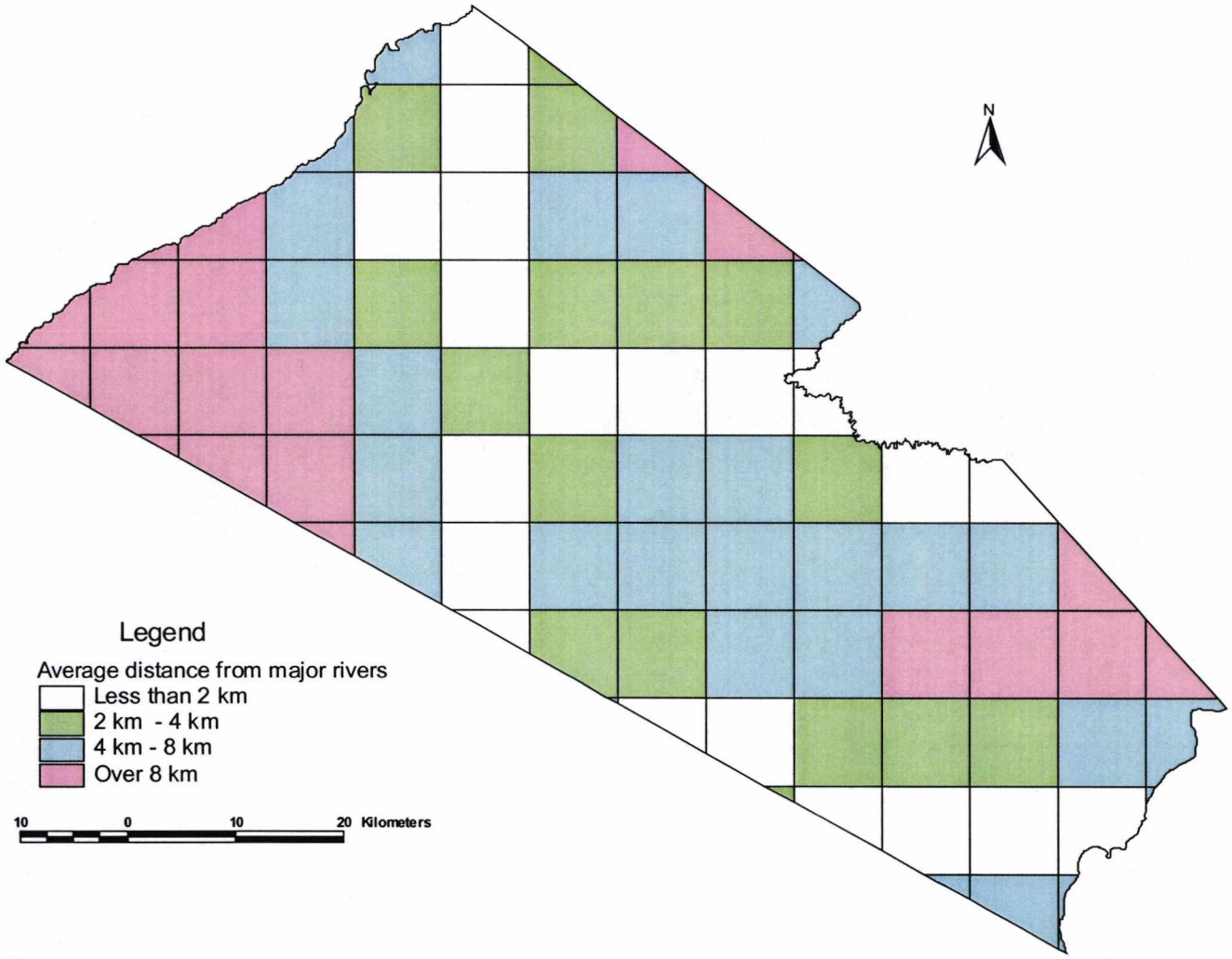


Figure 5-5: Mean distance of 5-km grids from major rivers in Masai Mara National Reserve

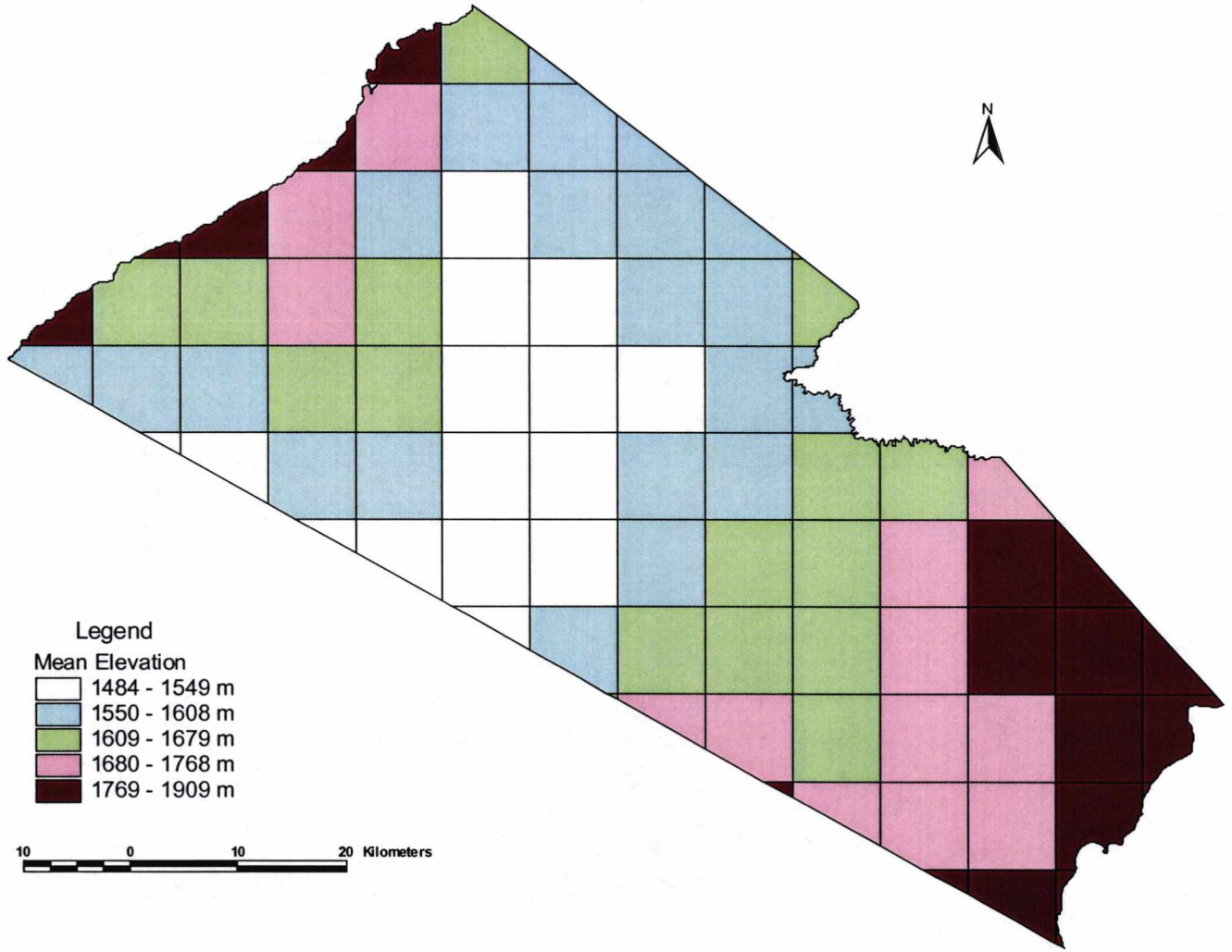


Figure 5-6: Mean elevation ranges of 5-km grids inside Masai Mara National Reserve

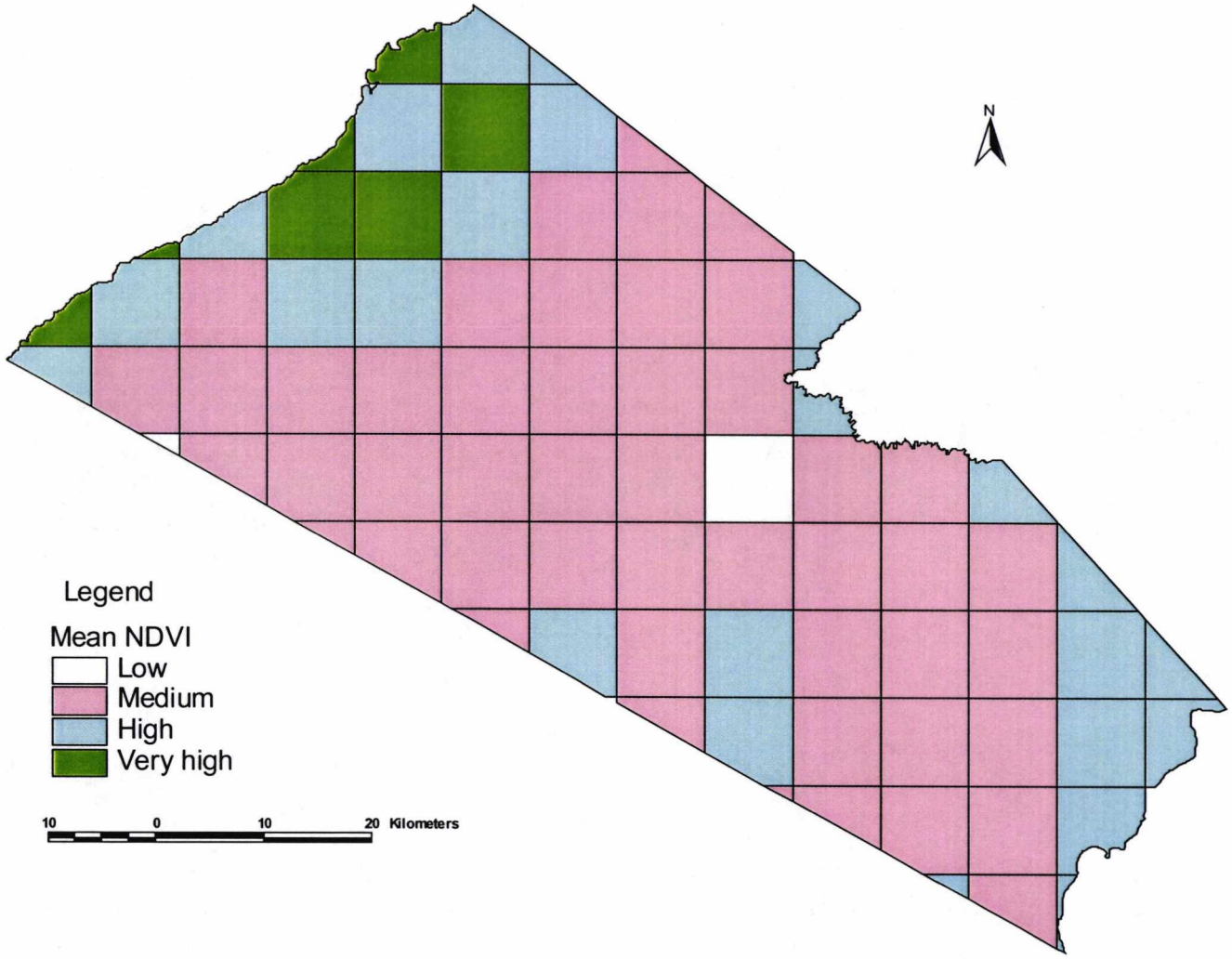


Figure 5-7: Distribution of mean NDVI values in 5-km grids inside Masai Mara National Reserve. The classification was achieved by dividing the NDVI range into four equal classes

support uniform NDVI values within the medium range of values. Low NDVI values appeared in only one grid cell inside the MMNR, whilst high NDVI values were found concentrated to the north and south of the MMNR, where higher ground supported more woodland.

5.3.6 Factors Affecting Herbivore Species Distribution

Stepwise linear regression analysis entered only mean distance from all rivers in the model. This indicated that among all the explanatory variables that were tested it was only the mean distance from all rivers that had significant relationship with the diversity of animals ($F_{1,83} = 42.667$; $p < 0.00005$). The relationship was negative showing that grids nearer to the rivers tended to have higher species diversity.

With the presence of individual animal species, stepwise logistic regression indicated that different explanatory variables explained the presence of different species (Table 5-1). It was only in ostrich where no explanatory variable was entered into the

Table 5-1: Results of linear logistic regression analysis indicating explanatory variable that correlated with presence of herbivore species in MMNR

Species	Variables in the Equation	Wald Statistic	df	P- value	R
Species diversity	Mean distance from roads	3.2083	1	.0733	-.1212
	Mean distance from all rivers	11.3940	1	0.0007	-.3380
	Mean distance from lodges	5.6325	1	0.0176	.2102
Zebra	Mean distance from all rivers	8.0906	1	0.0044	-0.2287
Kongoni	Mean distance from all rivers	7.8217	1	0.0052	-0.2422
Topi	Mean distance from all rivers	13.9745	1	0.0002	-0.3201
Warthog	NDVI variety	10.5510	1	0.0012	0.2769
Giraffe	Mean DEM value	8.0299	1	0.0046	2.519
	Mean distance from all rivers	4.7501	1	0.0293	-0.1701
Impala	Mean distance from all rivers	12.2024	1	0.0050	-0.2986
Waterbuck	NDVI variety	3.9891	1	0.0458	0.1797
	Mean distance from major rivers	3.2920	1	0.696	-0.1449

model.

In waterbuck two explanatory variables were entered, first NDVI variety and second mean distance from major rivers. There was a positive relationship between presence of waterbuck and NDVI variety. This indicated that the animals were present where vegetation was more varied. Relationship between presence of waterbuck and mean distance from major rivers was negative indicating that waterbuck were present near major rivers.

Result also suggested that presence of zebra, kongoni, topi and impala were related to the mean distance from all rivers. This was the only explanatory variable that was entered in their model. In all cases the relationship was negative suggesting that these animals were present nearer to the seasonal rivers. In the case of giraffe, both the mean DEM value and mean distance from all rivers were entered in the model. This suggested that they preferred higher elevations that were nearer to seasonal rivers. Warthog, on the other hand were related to NDVI variety, occupying areas with higher NDVI variety values more than lower NDVI variety values.

None of the explanatory variables associated with tourist pressure was related to the presence of resident herbivore species. Similarly, presence of livestock did not seem to relate to the presence of other species. This suggested that tourist pressure and livestock did not play any role in determining the presence of any of the resident herbivores in MMNR whose distribution appeared to be largely determined by ecological parameters without any apparent effect from existing levels of tourism.

5.4 Discussion

Most studies of herbivore distribution have examined ecological factors (Dorst and Dandelot, 1970; Ferrar and Walker, 1974; Western, 1975; Smithers, 1983;), without considering the possible effects of tourist pressure. Hence, this study adopted the approach of explicitly considering the possible counteracting effects of ecological requirements versus tourist pressure on the distribution of resident herbivores in MMNR. The study found that grids that were nearer to rivers tended to support a greater variety of animal species than those that were far from rivers. At the level of individual species, presence of different species related only to different explanatory variables of an ecological nature. Explanatory variables that depicted tourist

pressure were not found to correlate with the presence of any of that animal species that were investigated.

5.4.1 Animal Census

The distribution of animals was determined from aerial census data collected by DRSRS. The censuses were carried out over a short period of a few days each year, but not necessarily in the same month or season. For example, in 1994 the census was completed between 15th and 21st May, between 27th July and 8th August in 1996 and between 28th and 31st May in 1997. These differences in the time of census may have contributed to some variations in the distribution of animals. There have been some anecdotal perceptions that plains herbivores avoid areas with tall grass since tall grass hinders their detection of predators. After the rainy season and before the arrival of wildebeest in the migration, there are areas in MMNR that have tall grass.

One problem that is associated with aerial census is the differential detection of different species, especially if the animals are in an area with dense vegetation. Under such conditions, it would be easier to spot a giraffe than a waterbuck from the air. Difficulties in detecting some animals may have resulted in some animals present in some grids not being counted. Due to these problems conclusions from these data should be interpreted with some caution.

5.4.2 DEM Values

DEM values were originally derived at a resolution of 1 km². These values were then averaged for a 5 Km grid. The original resolution and this further processing of the data may have resulted in diluting the elevation details in MMNR. Equally, 1 km² resolution cannot pick out small hill outcrops or anthills that are smaller that one 1 km² in area. Additionally, the averaging to 5 Km grids may have removed details of features such as valleys, which contribute to the animal habitat details at a local level. Nevertheless, this was the only approach that could be adopted, given the 5 km² resolution of the animal census data.

5.4.3 NDVI Values

The same resolution problems mentioned for DEM data also apply for NDVI data. In this case, it was impossible to pick out differences in vegetation types within the 5 Km grids. These local differences may influence animals more than the average for

the whole area. There are thickets in grassland areas and vegetation along seasonal streams and luggas that is different from that in the surrounding area. All these nuances in habitat diversity could not be isolated when the NDVI values were scaled to 5 km². However, variation in the NDVI values gave some indication as into how varied the vegetation was within the 5 Km grid during the dry season in 1999. This may have resulted in giving low values to some areas that are otherwise green in wet season.

5.4.4 Animal distribution

Previous studies have indicated that distribution of different species of large mammals is determined by vegetation (Ferrar and Walker, 1974) water, (Western, 1975) and topographic, geological and soil factors (Ferrar and Walker, 1974). Despite the aforementioned limitations of the data available for MMNR, the findings of this study support these previous studies. Distribution of giraffe was found to correlate more with topographic features, while distribution of waterbuck was found to correlate more with distance to water and greenness. For most other resident herbivores apart from ostrich, their distribution was most closely related to distance with water (Table 5-1). The correlations that were found with distance from all rivers, which are dry in most time of the year, could be due to the vegetation along these seasonal streams rather than water.

With regard to tourism pressure, previous studies have reported short distance movement of animals from tourists (Lott and McCoy, 1995). Other reports have reported animals being habituated (Johns, 1996; Olson et al 1997) and change their behaviour (Burger and Gochfeld, 1993; Mather, 1993), but no changes in distribution have been reported. Likewise, the study has shown that the distributions of eight resident herbivore species are not related to any form of tourist pressure, whether this is considered as track density, distance to main roads or distance to lodges/tented camps. Thus in terms of this chapter, tourist pressure at its present levels at least, would not appear to affect the distribution of resident herbivores at any macro-scale across the MMNR.

Given these findings, the next chapter will consider what effects tourist behaviour has upon wildlife species.

CHAPTER SIX

Effects of Tourist Behaviour on Animals

6.1 Introduction

Chapters, 4 and 5 have documented the distribution of tracks in MMNR and the factors that influence their distribution. In the MMNR there has been no real or perceived disturbance of animals by tourists, with perhaps one notable exception. Muthee (1992) reported that cheetahs had changed their hunting time due to disturbances by tourist. Other concerns have focussed on the separation of young from their mothers and their restricted mobility as a result of tour vans surrounding animals. Nevertheless, studies have focussed only on impacts on predators, and there have been little investigations of impacts on herbivores either in the MMNR or elsewhere. There is, therefore, an important knowledge gap in the effects of tourists on herbivores in the Mara.

Studies from different protected areas around the world have reported that tourists affect animals in different ways (Roe *et al.*, 1997). For example, human traffic has made African felids more nocturnal (Haltenorth & Diller, 1971). The increase in human traffic on the rivers of Sumatra caused an increase in proboscis monkeys (*Nasalis larvatus*) roosting along them (Griffiths and van Schaik 1993). In Katembe, wild pigs responded to humans by fleeing a short distance, and then simply continuing to forage. Like pigs, most primates, some squirrels and hornbills gradually became habituated to humans without any special effort (Wright, 1992). However, Elephant-borne tourists disrupted Asian rhinos (*Rhinoceros unicornis*) in Chitwan National Park, Nepal, frequently displacing them from meadows where they preferred to feed (Lott and McCoy, 1995). Thus the continuous presence of humans can affect some species which move out or change their daily activity pattern, whilst others remain unaffected or become habituated (Wright 1992).

In cases where human traffic leads to prey animals becoming habituated to tourists, a reduction in predation on the habituated species may occur. For example, leopard predation on vervet monkeys (*Cercopithecus aethiops*) in Amboseli, Kenya, was most likely when researchers were not present at the site (Isbell and Young, 1992). Thus,

habituated species in research and tourist areas may be expected to increase in their numbers.

Tourists show distinct behavioural differences towards herbivores and predators in MMNR. Where herbivores are present, tourists tend to drive past at a fast speed. In contrast, tourists stop and crowd around predators. This would suggest that if herbivores were disturbed, this would be by fast driving vehicles, whilst predators will be affected by the crowding of vehicles around them. To counter any such disturbances on the predators, the management of MMNR in conjunction with the non-governmental organisation Friends of Conservation, prepared a code of conduct for tourists in MMNR (Appendix 4). According to the MMNR regulations, visitors are not supposed to drive off defined roads and tracks (Appendix 3). They are also not supposed to: expose themselves by sticking out their heads through vehicle windows; follow animals; make or create noise; drop litter; throw burning objects; or, have pets. When viewing animals, visitors are supposed to keep a distance of at least 20 m from the animals and stay for a maximum of ten minutes. Tourists are also supposed to maintain a speed limit of 50 kmh^{-1} on roads (Appendices 3, 4). A special management unit, the Animal and Habitat Protection (AHP) unit, was created to enforce these regulations in 1992.

Therefore, this chapter examines two separate issues of animal disturbance. The first issue is the response of herbivores to moving vehicles. The second issue is visitor behaviour at predator viewing. Additionally, the chapter examines the effectiveness of the AHP unit in promoting adherence to MMNR regulations.

The response of herbivores to approaches at different speeds is considered in **section 6.3.1**. This is followed in **section 6.3.2** by determining the extent to which regulations are observed, and the effectiveness of AHP unit is looked at in **section 6.3.3**. Lastly the results are discussed with reference to other work in **section 6.4**.

6.2 Methods

6.2.1 Herbivore Response to Vehicle Speed

The study of herbivore response and flight distance in relation to approaches by vehicles was carried out between 0900 and 1200 hours. The study area was sub-divided into two, one with areas that were highly visited by tourists and the other with

areas that had low tourist visitation. This division was based on the density of tracks used for game drives (see **section 4.2.3**). Five different herbivore species were studied in each area, comprising: impala; topi; warthog; wildebeest; and, zebra. First, an individual herbivore was observed through a pair of 8×50 binoculars and its activity was noted. A recognisable feature was also noted at the place where the animal was first located. I then approached the animal at a constant speed and noted its first change of activity. I then stopped the vehicle and recorded the change of activity. I then returned back to where the vehicle was when the animal first changed activity. From there I measured and recorded the distance from the vehicle to where the animal was when I started my approach. This was done using a range finder and the feature that was previously identified as the marker.

Apart from distance, other variables recorded for this exercise were:

a) Location: this was recorded as 'H' for areas with high visitation, and 'L' for areas with low visitation levels.

b) Wind direction: this was recorded as 'D' if the herbivore was downwind, and 'U' if it was upwind. 'P' was recorded if the wind direction was perpendicular to my approach direction and 'N' was recorded for no wind.

c) Approach speed: approaching herbivores at speeds of 10, 20, 30 and 40 km h^{-1} varied this.

d) Approach angle: this was recorded as 'D' for a direct approach or 'I' for an indirect or oblique approach.

e) Response: this was recorded as 'ran' or 'walked' for a single continuous change of activity, resulting either in a trot or a walk away, respectively. 'Stood' was recorded if the animal was lying down and rose up. 'Turned' was taken for the animal turning its head to face me.

6.2.2 Tourist Behaviour

Initially this study aimed to examine how different animals responded to different tourist activities. Records were made of tourists' behaviour and the corresponding animal behaviour. However, I soon noted that animals did not markedly change their

activities to correspond to different tourists' activity change. Therefore, I concentrated on recording the activities of tourists and only recorded the activities of animals when there was a characteristic change.

At the outset, I recorded tourist activities while watching different animal species. However, tourists were spending most of their game viewing time either searching for the large predators or watching them, and ignoring most of the herbivores. This prompted me to change my approach and concentrate my recording to occasions when tourists were watching either lions or cheetahs.

I first had to search for lions or cheetahs, by driving around just like an ordinary tourist. When I found lions or cheetahs, either tourists would be already watching them or I would be the first to get to the animal. If tourists were already there, I would wait for the approach of a new tourist vehicle. I would then record the time it arrived, the number of tourist vehicles already there, the distance from the animal to the nearest vehicle, and whether the staff of the AHP unit were present or not. During the time that the vehicle was present, I would watch all the vehicles and tourists and record the occurrence of any of the activities forbidden by the MMNR authorities (see Appendix 4). Of those relevant to disturbing large predators, I specifically examined the following: driving off visible tracks; following the animal; making a noise; dropping litter; creating fire; and having pets. I also recorded whether the tourists were acting in any way that might put them at risk to the animals. All these would comprise a single record until the noted vehicle left.

6.2.3 Data Analysis

One-way analysis of variance, coupled with Duncan's multiple range test were performed to compare means to determine whether there were differences in response distance among the different species studied. The same statistical approach was followed to determine whether there were differences in response behaviour and response distance. A Generalised Linear Model (GLM) analysis was carried out to investigate the effects of vehicle speed, level of visitation and approach angle.

General descriptive statistical procedures were employed to analysing visitor behaviour when viewing large predators.

6.3 Results

6.3.1 Animal Response and Flight Distance

A total of 329 herbivores were approached, comprising 166 individuals in the highly visited and 163 individuals in the lowly visited areas (Table 6-1). The numbers of individuals of the five different species of herbivores were very similar in highly visited and lowly visited areas.

Table 6-1: Number of individuals of different species investigated on their response to vehicle approach

Species	High Visitation Level		Low Visitation Level	
	Frequency	Percent	Frequency	Percent
Impala	32	50.0	32	50.0
Topi	34	50.7	33	49.3
Warthog	34	50.7	33	49.3
Wildebeest	31	50.8	30	49.2
Zebra	35	50.0	35	50.0
Total	166		163	

Initial analysis of the whole sample from both highly and lowly visited areas indicated that there were significant differences in response distance among the five different species studied ($F_{4,324} = 35.458$; $p < 0.00005$). Topis were the least timid to vehicle approach while warthogs were the most timid (Figure 6-1). Consequent analyses were therefore based on different species groups.

An analysis of variance (Table 6-2) did not show any difference in response behaviour with the distance at which a response occurred for impala ($p = 0.659$) or wildebeest ($p = 0.667$). In contrast, differences were found for topi ($p = 0.006$), warthog ($p = 0.001$) and zebra ($p = 0.022$). Where a significance difference was found, Duncan's multiple range tests did not find any differences in the displacement behaviours (walking and running) and the non-displacement behaviours (turning and standing) that each species followed. Therefore, all these behaviours were therefore combined and considered as a single type of response.

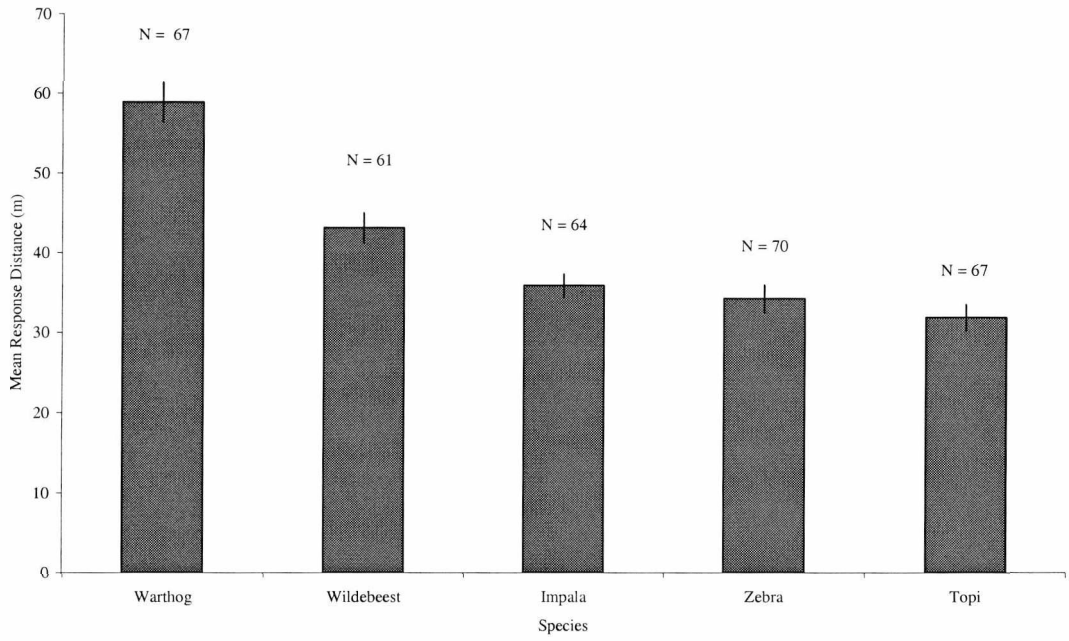


Figure 6-1: Mean overall response distance of different species

Generalised Linear Model analysis (Table 6-3) indicated that among those explanatory variables examined, including: vehicle speed; level of visitation; approach angle; and, wind direction, vehicle speed, level of visitation and approach angle were the main effects that influenced the distance at which some animals responded. In contrast, wind direction did not appear to affect the distance at which any of the species studied responded to a vehicles approach (Table 6-3).

Vehicle Speed

The general trend across all five species was a positive relationship between the vehicle approach speed and the distance at which each species responded (Figure 6-2). Each species tended to respond at closer distances when the vehicle was at lower speed than at higher speed. Impala, showed no difference in response distance when the vehicle approach speed was increased from 10 to 20 km h^{-1}. However, response distance increased successively when the vehicle approach speed was increased to 20 km h^{-1} and 40 km h^{-1}. In contrast, successive increases in response distance were found in all other species as the vehicle's approach speed increased at successive 10 km h^{-1} intervals to 40 km h^{-1}. Indeed, vehicle approach speed was the most important variable, and explained 92 %, 90 %, 98 %, 87% and 96 % of the variations in response distance in impala, topi, warthog, wildebeest and zebra, respectively (Table 6-3).

Table 6-2: Result of analysis of variance comparing different species response behaviour with the distance at which a response occured

Species	Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Impala	Between groups	214.11	3	71.37	0.536	0.659
	Within groups	7982.75	60	133.05		
	Total	8196.86	63			
Topi	Between groups	2073.43	3	691.14	4.492	0.006
	Within groups	9692.84	63	153.86		
	Total	11766.27	66			
Warthog	Between groups	5306.46	2	2653.23	8.032	0.001
	Within groups	21141.01	64	330.33		
	Total	26447.46	66			
Wildebeest	Between groups	343.91	3	114.64	0.524	0.667
	Within groups	12463.76	57	218.66		
	Total	12807.67	60			
Zebra	Between groups	1898.07	3	632.69	3.429	0.022
	Within groups	12178.63	66	184.53		
	Total	14076.70	69			

Visitation Level

Generally each species appeared to respond at shorter distances in areas with high visitation levels than in areas with low visitation levels (Figure 6-3). These differences were significant in topi, warthog, wildebeest and zebra but not in impala (Table 6-3). Visitation level explained 21 %, 81 %, 72 % and 69 % of variations in topi, warthog, wildebeest and zebra respectively.

Table 6-3: Results of a General Linear Model analysis using response distance as the dependent variable and approach speed, visitation level, approach angle and wind direction as explanatory variables.

Species	Source of Variation*	Sum of Squares	df	Mean Square	F	p	Eta Squared
Impala	Speed	3884.27	3	1294.76	119.01	0.000**	0.92
	Visit	7.20	1	7.20	0.66	0.422	0.02
	Approach	35.54	1	35.54	3.27	0.080	0.10
	Wind	44.44	3	14.81	1.36	0.273	0.12
Topi	Speed	4195.92	3	1398.64	89.75	0.000**	0.90
	Visit	131.85	1	131.85	8.46	0.007**	0.21
	Approach	37.90	1	37.90	2.43	0.129	0.07
	Wind	38.52	4	9.63	0.62	0.653	0.07
Warthog	Speed	21018.56	3	7006.19	971.37	0.000**	0.98
	Visit	1439.46	1	1439.46	199.57	0.000**	0.81
	Approach	193.15	1	193.15	26.78	0.000**	0.37
	Wind	13.05	3	4.35	0.60	0.616	0.04
Wildebeest	Speed	3142.75	3	1047.58	57.65	0.000**	0.87
	Visit	1200.75	1	1200.75	66.08	0.000**	0.72
	Approach	137.43	1	137.43	7.56	0.011**	0.23
	Wind	37.63	4	9.41	0.52	0.723	0.07
Zebra	Speed	7278.23	3	2426.08	280.93	0.000**	0.96
	Visit	743.09	1	743.09	86.05	0.000**	0.69
	Approach	385.76	1	385.76	44.67	0.000**	0.54
	Wind	52.96	4	13.24	1.53	0.212	0.14

* Speed = Approach speed; Visit = Levels of visitation; Approach = Approach angle; Wind = Wind direction

**Variations are significantly different at $p < 0.05$

6.3.2 Tourist Behaviour Watching Top Predators

A total of 251 records were made of game viewing on top predators in which 1136 vehicles were counted. Of these records, 183 (72.9%) involved lions, while 68 (27.1%) were made on cheetahs. These records consisted of 43.4 hours of direct observations, of which 29.3 hours were spent on watching lions while 14.1 hours were spent on watching cheetahs.

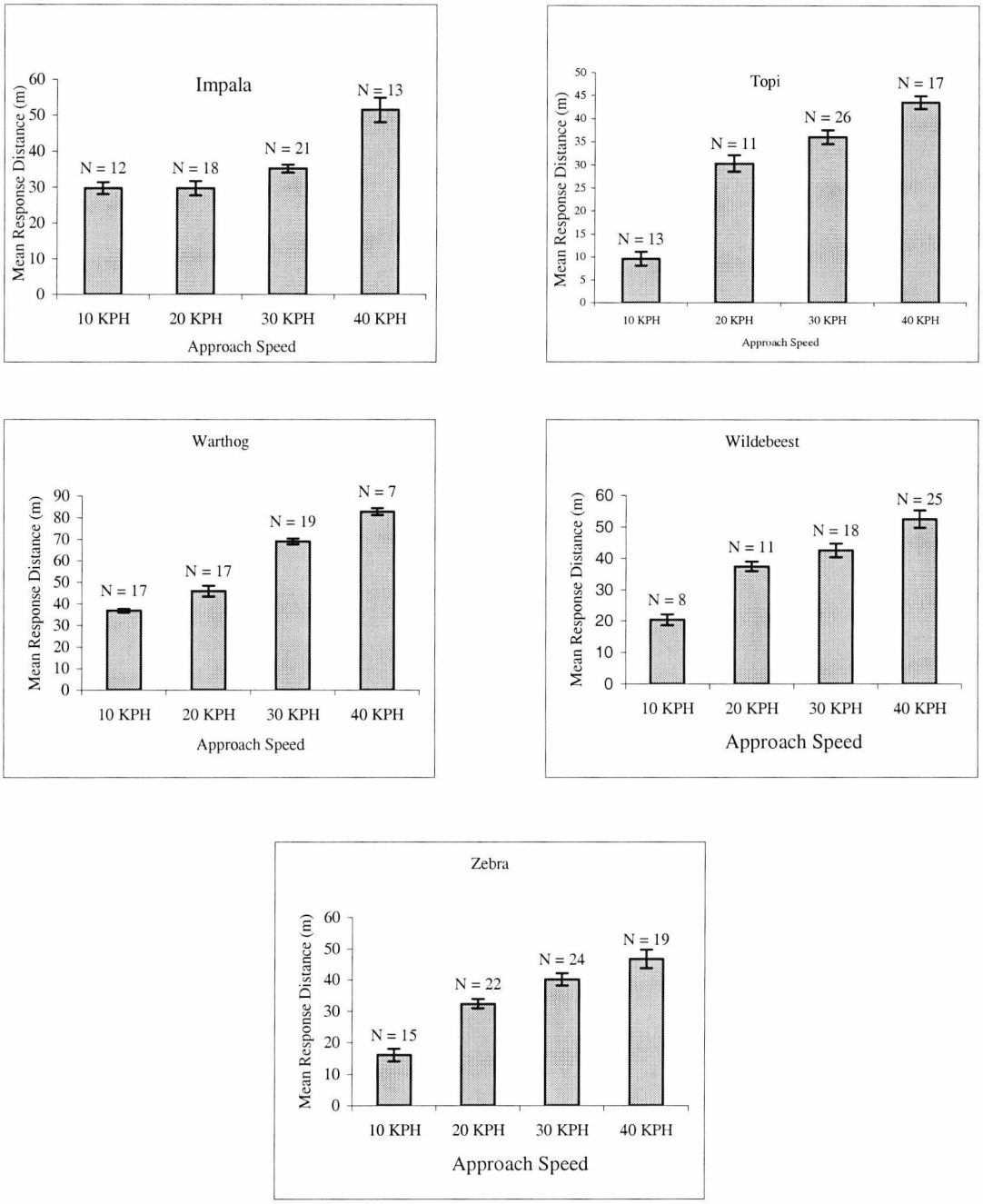


Figure 6-2: Mean response distance of different animals approached at different speeds

Results from observing visitors during game drive indicated that the MMNR regulations are not always fully observed. Out of the 251 records, only in 17 cases (6.8 %) did tourists observe all the regulations (Table 6-4). Of the 11 regulations in force, results indicated tourists commonly broke between one and three of them

(Table 6-4). The most regulations broken on a single case was six, which was only witnessed once.

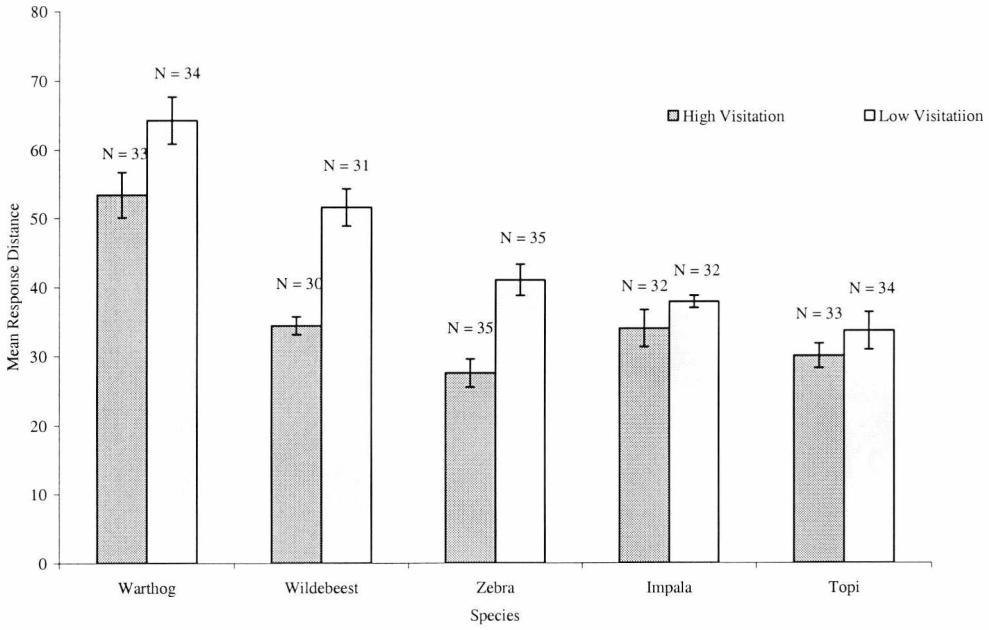


Figure 6-3: Mean response distance of different animals when approached in areas with high and low tourist visitation levels

Table 6-4: Frequencies of tourists breaking combinations of different reserve regulations in MMNR

Number of Rules Broken	Frequency	Percent	Cumulative Percent
0	17	6.8	6.8
1	65	25.9	32.7
2	80	31.9	64.5
3	56	22.3	86.9
4	24	9.6	96.5
5	8	3.2	99.7
6	1	0.4	100.0
Total	251	100	

The most broken regulations were too many vehicles around animals and driving too close to the animals. The next most broken regulations were visitors taking longer than 10 minutes on an animal and driving off-road. Making a noise and following

animals were the only other activities which were broken on more than 10 % of occasions. There were no records of dropping litter while visitors were watching predators (Figure 6-4).

Generally tourists appeared to break regulations more often when viewing lions than when viewing cheetahs (Figure 6-4). Thus, more tourist vehicles crowded around lions than cheetahs, and more tourist vehicles got close to lions than to cheetahs, as well as driving off-road and making a noise. The only regulation that was broken more often for cheetahs than for lions was remaining over the ten-minute time allowance.

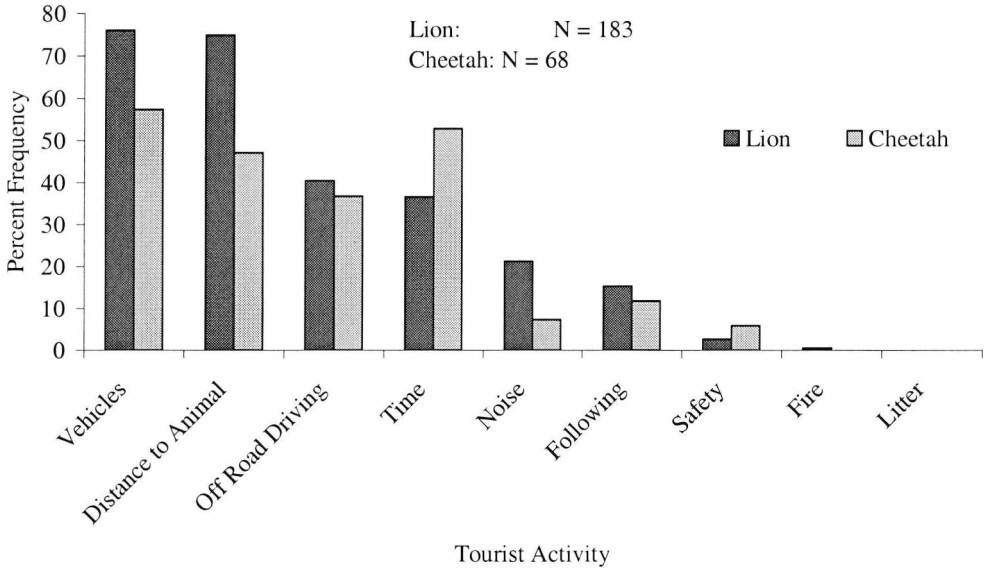


Figure 6-4: Observed frequencies of tourists breaking various reserve regulations while watching lions and cheetahs

6.3.3 Effects of AHP Unit

Results documenting the effect of the AHP unit on tourist behaviour (Figure 6-5) suggested that there were instances where the presence of the unit influenced the behaviour of tourists. In cases where the AHP unit was present, there were no records of off-road driving, noise, and tourists exposing themselves by sticking their heads out of vehicle windows. These rules were often broken in the absence of AHP unit.

In the presence of AHP unit, incident of too many vehicles around a predator, driving too close and following animals only decreased in frequency but still occurred.

However, the AHP unit did not seem to have any effect on the frequency with which tourist vehicles stayed longer than 10 minutes (Figure 6-5).

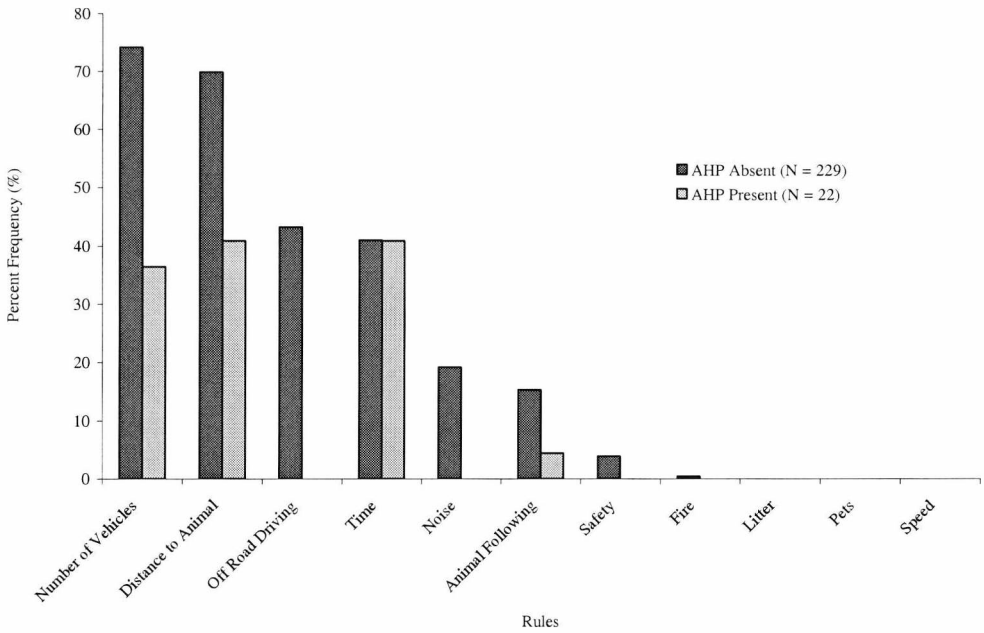


Figure 6-5: Percentage frequencies of tourists breaking various reserve regulations in the presence and absence of Animal and Habitat Protection personnel

6.4 Discussion

This study focussed on the key issues related to disturbance of herbivores by moving traffic, and to disturbance of top predators by game viewing vehicles, both of which constitute the most frequent activity of tourists with respect to these two groups of wildlife. The study found that herbivores tended to be more tolerant to vehicles moving at slow speeds than to those moving at high speeds. Tolerance to vehicles was higher in areas that are highly visited by tourists than in areas with low levels of visitation. In terms of visitors' propensity to break reserve regulations when watching top predators, the crowding of vehicles around predators and driving too close to them were the most frequently broken. Driving off-road and spending more than 10 minutes watching the predators were also broken highly. However, the presence of the AHP unit reduced the propensity of tourists exposing themselves by sticking their heads through vehicle windows, driving off-road and making a noise.

6.4.1 Herbivore Response and Flight Distance

Wildlife disturbance by tourists can occur at individual, population or community levels. Disturbance to animals has been shown to cause either behavioural changes or physiological effects, which in turn can affect survival and productivity (Gabrielson and Smith, 1995; Knight and Cole, 1995). Among the most common immediate physiological effects to be identified is a change in heart rate (Gabrielson and Smith, 1995). The ultimate effects of physiological changes are unknown but it has been suggested that they may affect an individual's competitiveness in a natural environment.

Studies of effects of disturbance on behavioural changes on individuals and populations have mainly focused on survival and productivity of animals. Some have demonstrated the interruption of feeding and roosting behaviours of birds (Hulbert, 1990; Keller, 1991; Pierce *et al.*, 1993) to be the immediate effects of recreational activity on behaviour. Amongst other animal groups, increased agitation or avoidance behaviour has been demonstrated in primates (Johns, 1996; Kinnaird and O'Brien, 1996), and in beluga whales (Blane and Jaakson, 1994). Visitor presence has also been reported to disrupt animal activities such as feeding in Asian rhinoceros (Lott and McCoy, 1995), hunting in cheetah (Henry, 1980), denning in black bears (Goodrich and Berger, 1994), and reproductive behaviour in Thompson's gazelles (Edington and Edington, 1986) and Galapagos iguanas (de Groot, 1983). A reduction in breeding success due to increased egg predation has also been demonstrated for nesting crocodiles in Uganda (Cott, 1969).

The spatial distribution of species, and their growth rates and abundance, have been reported to be affected at the population level by tourist disturbance (Anderson, 1995; Knight and Cole, 1995). At the community level, changes have occurred in species composition, diversity and abundance, as well as in interspecific interactions (Gutzwiller, 1995; Knight and Cole, 1995). For example, it was reported that the disturbance of top predators such as cheetahs resulted in lower hunting success. This species has been shown to suffer increased competition for prey from lion and hyena as a result of recreational pressure (Haysmith and Hunt, 1995).

Results from this study suggested that tolerance to vehicles was species-specific (Figures 6-1, 6-2, 6-3). Among the species studied, topi appeared to be the most

tolerant to the approach of vehicles whilst warthog were the least tolerant, with mean response distances of around 30 m and 60 m, respectively. As vehicle approach speed was increased, topi were found to have a mean response distance of 43 m at 40 km h^{-1}, and this was the shortest response distance at that speed among the species studied (Figure 6-2). Therefore, the combination of the speed limit of 50 km h^{-1} and a minimum approach distance of 20 m would seem to be high, in terms of disturbance to these abundant herbivores. However, there appeared to be at least some level of habituation developing among these species to vehicles, given that their response distances were longer for a given speed in less visited areas compared with highly visited areas (Figure 6-3).

6.4.2 Tourist Behaviour

The salient characteristics of ecotourism that encompass the multitude of definitions that surround the term are as follows: that it is ecologically sustainable and based on relatively undisturbed natural areas; that it is non-damaging and non-degrading; that it provides a direct contribution to the continued protection and management of protected areas used; that it benefits local people; and, that it is subject to an adequate and appropriate management style (Goodwin, 1995; Roe *et al.*, 1997). Other names such as "alternative", "soft", "sustainable" and "responsible" have also been espoused, but the overall message is the same (Jarviluoma, 1992; Nash and Butler, 1990; Wheeller, 1992). Therefore, an ecotourist is a tourist interested in wildlife and nature who fulfils these ideals.

The regulations in MMNR (Appendix 4) were made in an attempt to promote some of these ideals especially the ecological ideals. These regulations were adopted mainly as a result of studies carried out, and observations made on the "pressure point species" of lion, cheetah and leopard. In her results, Muthee (1992) reported that an increase in the number of vehicles coincided with a decrease in walking activity in cheetahs and vice versa. Too many vehicles forced the cheetah to respond by sitting down or hiding, resulting in greatly restricted movement particularly at times of day when diurnal hunters like cheetah should be active and looking for prey. Although lions did not seem to respond greatly to vehicle numbers, leopards walked off into hiding immediately they noticed a vehicle (Muthee, 1992).

The regulations indicate that there are officially defined roads and tracks present for use by tourists (Appendices 3, 4). The situation on the ground is totally different (Chapter 4). Apart from the major graded roads, a tour driver or independent tourist driving their own vehicle cannot distinguish the official game viewing tracks from the unofficial ones. Therefore, driving off-road can only be distinguished as driving on grass where there are no signs of any track whether official and established or unofficial.

MMNR is marketed as one of the few protected areas in Kenya where tourists are able to view the "big five" in their natural environment. However, wildlife can be very difficult to observe in its natural habitat. Since visitor expectations are often high fuelled by close-up images and dramatic action sequences portrayed by wildlife films and documentaries (Goodwin *et al.*, 1998 Goodwin & Leader-Williams, 2000) tour driver guides often flout regulations to satisfy their clients. This would appear to be the case especially when vehicles followed and crowded around animals. Similar results have been reported in Keoladeo National Park where unregulated guiding occurs when guides take visitors too close to wildlife, since the closer they get, the more likely they are to receive a good tip.

None of the records made in this study suggested that vehicles were being driven over the 50 Kph. Indeed, as even abundant herbivores are sensitive to speed (Figure 6-2), driving fast would scare them away. This would in turn defeat the purpose of game viewing.

6.4.3 Effects of AHP Unit

Ecotourism or alternative tourism have emerged as some of the most widely used and abused phrases in the tourism industry. These phrases suggest some concern and thought for the environment. As a new approach and philosophy towards an old problem, it is hard to disagree with (Butler, 1994), yet can be used to mean anything to anyone. Additionally, tours and destinations advertised as environmentally friendly could just be market ploys and not necessarily as what they are advertised.

This state of affairs appeared to be the case in MMNR. There is considerable flouting of the regulations when tourists are in the presence of top predators (Figure 6-4), which tourists view as their top priority or inalienable right to view as part of their

safari. Furthermore, there was an apparent cessation in cases of off-road driving, noise, and tourists exposing themselves by sticking their heads out through vehicle windows when the AHP personnel were present. Hence, it would appear that tour drivers and tourists know that there are regulations in force, which they choose to ignore when the AHP unit is not present. Further, it would appear that the AHP is more concerned with enforcing only certain regulations in that there was a reduction in crowding around top predators and moving too close to them when the AHP was present. In contrast, the AHP appeared lax in enforcing regulations on the 10-minute time allowed, given that there was no reduction in cases of it being broken (Figure 6-5).

It has been reported elsewhere that law enforcement is required to manage tourist behaviour, for example, in preventing the disturbance of Siberian cranes in Keoladeo National Park. In one case, there was a fight between two tourists and a forester over the visitors getting too close to the birds in order to photograph them. Apparently, the fight ensued since the forester had no proof of authority to stop the tourists from getting too close to the birds (Goodwin *et a*l., 1998). In some cases, protected areas may have voluntary codes of conduct to which visitors are meant to adhere. However, there may be a lack of awareness of these regulations and, as a consequence, wildlife disturbance does occur (Goodwin et al, 1998). Therefore, in the next chapter I will look at the accessibility and awareness of the regulations in MMNR.

CHAPTER SEVEN

Tourist Information

7.1 Introduction

The previous chapter looked at the prevalence of visitor activities that are perceived to affect wildlife in a detrimental manner. Since the publication of the Brundlandt report, *Our Common Future* (The World Commission on Environment and Development, 1987), tourism has often been associated with sustainable development. This may be considered as a policy and management orientation that aims to manage all assets for increasing the long-term socio-economic well-being of host communities, and to encourage practices that minimise degradation and damage to tourism resources (Ziffer, 1989; Slater, 1991; Carter, 1993).

Many leaders in the tourism industry have become well aware of their potential impacts in ecologically and culturally sensitive destinations, and of the values of conservation (Allcock *et al*, 1994). Therefore, the industry has adopted various environmental management procedures, for which tourism destinations can be categorised into four groups (Mihalic, 2000):

- Environmental management by environmental codes of conduct;
- Environmental management by uncertified environmental practice and self-declared labels or brands;
- Environmental management by green branding on the basis of broader known (a) environmental competition prize for excellent environmental practice, or (b) certified environmental good practice; and,
- Environmental management by green branding on the basis of accreditation schemes by internationally known environmental friendly labels.

The need to set industry codes of practice for tourism operations in ecologically sensitive sites has been realised and used by producing various industry and visitor guidelines (Orams, 1995). Currently, there are numerous guidelines available for tour guides, tourism businesses and visitors that encourage them to adopt practices in line with the goals of sustainable tourism. The Ecotourism Society, Canadian

Environmental Advisory Council, Ecumenical Coalition of Third World Tourism, Society Expeditions, Mountain Travel and Travel Dynamics, are just a few organisations that have developed such guidelines in order to protect the resource base, to mitigate the adverse impacts of tourism and to enhance the benefits of tourism (The Ecotourism Society, 1993; Sirakaya, 1997). Consequently, they are considered as integral communication instruments designed to foster sustainable tourism development (Blangy and Wood, 1993).

Environmental codes of conduct for tourism vary greatly in coverage, scope and content. There are local, national, regional and international industry codes. They also may address the tourism industry, host communities, visitors or governments and other authorities. Nevertheless, codes of conduct are ineffective unless they are accessible to the target group they aim to address. It is normal practice for visitors to search for information on a destination area that they are about to visit (Jenkins, 1978; Filiatrault and Ritchie, 1980; Perdue, 1985; Snepenger *et al.*, 1990; Fodness and Murray, 1997; 1998). A number of typologies of information sources exist (Fodness and Murray, 1997).

One fundamental classification is internal versus external. An internal search is based on the retrieval of knowledge from memory. On the other hand, an external search consists of collecting information from the marketplace (Engel *et al.*, 1990). When the internal search provides sufficient information regarding a trip decision, then an external search is obviously unnecessary (Beatty and Smith, 1986). Whether travellers rely solely on an internal information search will heavily depend on the adequacy or quality of their existing knowledge. For example, travellers may not need to collect any additional information from external sources for a routine trip to family or friends, or for repeat visitation of a certain destination because they may utilise only past experiences (Etzel and Wahlers, 1985; Snepenger and Snepenger, 1993).

When the internal information search proves inadequate, the travellers may decide to collect additional information from four broad external information sources. These are: (1) family and friends; (2) destination specific literature; (3) media; and, (4) travel consultants (Snepenger and Snepenger, 1993; Gursoy and Chen, 2000). After visitors have acquired any external information on codes of conduct and are in

destination areas they may or may not comply with the codes of conduct. There are basically two categories of compliance theory, the economic and non-economic theories of compliance. The first paradigm emphasises rational choice based on expected outcomes, whilst the second stresses on individuals' or organisations' internalised norms and commitments, their social situations and individual decision making process (Sirakaya, 1997).

The foundation of the economic theory is the assumption that human beings are purposeful and rational, with well defined preferences and that they act accordingly to maximise satisfaction under constraints of limited information, resources and budgets (Byrns and Stone, 1984). The rational individual in any condition will weigh the benefits and costs of his/her actions and choose the action that maximises the net result (Heineke, 1978).

Researchers in other social sciences and professional disciplines such as sociology, psychology, law and recreation resource management view compliance and non-compliance with law and regulations as a function of both an individual's intrinsic capacities and extrinsic influences of the environment. They seek to explain compliance behaviour of individuals based on the premises that receiving incentives will encourage conformant behaviour while sanctions will deter people from engaging in unlawful acts (Sirakaya, 1997).

The MMNR visitor regulations are local and address MMNR visitors. This study looks at the environmental management of MMNR by use of codes of conduct. The study aims to investigate compliance of MMNR visitor regulations by tourists and driver guides. Specifically it addresses:

- The sources of MMNR visitor regulations;
- The understanding of MMNR visitor regulations by driver guides and tourists; and,
- The compliance with the regulations by both driver guides and tourists.

First I describe the methods used (**section 7.2**) before presenting the results (**section 7.3**). The results first discuss the profiles of tourists and driver guides (**section**

7.3.1). This is followed by a description of the sources of MMNR visitor regulations in **section 7.3.2**. The understanding of the regulations and compliance with these regulations are examined in **section 7.3.3**, while **section 7.4** discusses the results in the light of this and other studies.

7.2 Methods

To acquire information about the profile of tourists visiting the MMNR, questionnaires were given to visitors (Appendix 1) that asked them to state whether they were travelling as part of a package or independently. They were also asked to state how many they were in their group, and to what nationality they all belonged. The number of people in a group was later classified as either small (having ≤ 9 individuals) or large (> 9 individuals). This classification was based on the seating capacity of the minibuses that are used by tour companies in Kenya, which is limited to 9 passengers.

Driver guides were asked to provide information on the length of time that they had been in their current employment and the name of their employer. The employers were then checked to discern whether they were members of Kenya Association of Tour Operators (KATO). Other questions on driver characteristics investigated their professional training and whether their employers had organised any training for them. They were then requested to indicate the frequency with which they visited MMNR in connection with their employment (Appendix 2).

To investigate the awareness of visitors of the MMNR regulations (Appendix 4), the questionnaire distributed to visitors asked them whether or not they were aware of regulations governing the code of conduct of visitors to the MMNR. If they were aware of the regulations, this was followed by a request to indicate how they had learned about them. The questionnaire went on to investigate the visitor's understanding of regulations by asking them to answer five questions that tested their knowledge of the regulations. Visitors' knowledge of MMNR regulations was grouped into those who were ignorant (scored ≤ 2) and those that were proficient (scored ≥ 3). The knowledge questions were followed by a question that assessed the visitor's inclination to comply with the regulations.

To investigate the awareness of driver guides to the MMNR regulations, the

questionnaire distributed to driver guides (Appendix 2) asked them to first indicate whether or not they were aware of regulations. If they were aware, they were then asked to indicate how they had learned about them. The questionnaire went on to investigate the driver guide's understanding of regulations by asking them to answer five questions that tested their knowledge of the regulations. The knowledge questions were followed by two questions: (1) to assess whether the driver guide knew why the regulations were in place; and, (2) to assess the driver guide's inclination to comply with the regulations.

7.2.1 Data Analysis

General descriptive statistics were used to analyse data for categorical variables in this study. Cross-tabulations and Chi-square statistics were used to examine relationships between different categories. For analytical purposes the only tourist nationalities considered were the British and Americans, since none of any other nationality had more than 18 respondents.

7.3 Results

7.3.1 Respondents' Characteristics

Tourists

Out of a total of 700 questionnaires that were distributed to lodges and tented camps for visitors to fill, 234 usable questionnaires were completed and collected. This translated to a response rate of >30%. Visitor group sizes ranged from one to 48, with a mean of 7.2±0.67. In terms of size category, 77% (n = 234) of the respondents were in small groups while 23% were in large groups. 83.7% of the respondents were package tourists and 16.3% were travelling independently. Respondents came from 25 different nationalities, but the British and Americans predominated, given that only 106 respondents were from the 23 other nationalities.

Driver Guides

The personnel manning the reserve gates issued 150 questionnaires to driver guides. Out of these, only 45 completed questionnaires were returned back. This represented a response rate of 30% suggesting some reluctance on the part of driver guides'

participance in the exercise. Nevertheless, this response rate lies well above the minimum expected in return rates of questionnaires

Driver guides who responded came from 22 different tour companies. All but two of these companies were members of KATO. A total of 64.4% of the respondents indicated that their companies offered them in-service training or workshops to improve their performance. Fields of training that were offered in tour companies varied from company to company, but were mainly concerned with vehicle mechanics, first aid, public relations, tourist circuits and natural history. Both companies that were not KATO members also offered training to their employees. In no case was training provided on reserve regulations.

Most (83.7%) respondents had attended college training in one of the two basic fields, either tour guiding or foreign languages. Many (51.5%) of those who went to college had taken both courses, while 6.1% and 42.4% had taken only languages and tour guiding, respectively.

Of the 45 driver guides who responded, most had worked for their companies for a long time, on average 6.6±0.64 years. The longest serving driver guide had worked for one company for 20 years while the shortest serving had only been recruited and had worked for a fortnight.

Many of the respondents took visitors to the Mara at least once a month (51.1%) or once a week (40%) (Figure 7-1). Very few (4.4%) driver guides went to Mara less than once a month.

7.3.2 Knowledge of Existence of Regulations

Tourists

Of the 234 tourists respondents, only 1.7% did not indicate whether or not they were aware of the MMNR regulations. Of those 230 respondents who answered the question 68.8% indicated that they were aware of the regulations while 31.2% indicated that they were not aware of them. When asked where they learned about the regulations, ten different sources of knowledge were identified. Among the frequent ones were pamphlets (29.7%), notice boards (28.5%) and driver guides (27.2 %) (Figure 7-2). A number of visitors indicated that they had learned of the

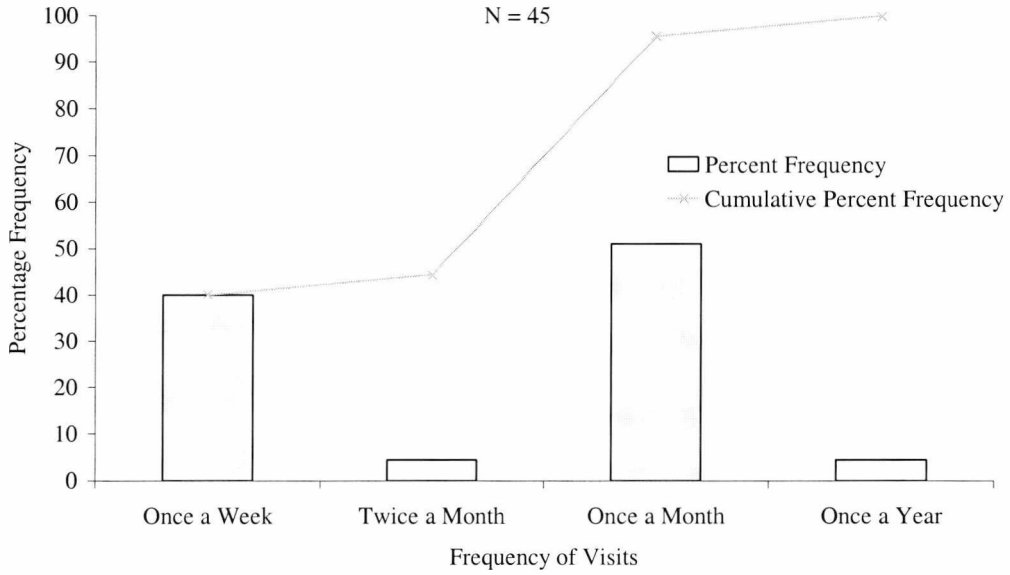


Figure 7-1: Percent frequencies and cumulative percent frequencies of driver guides visits to MMNR

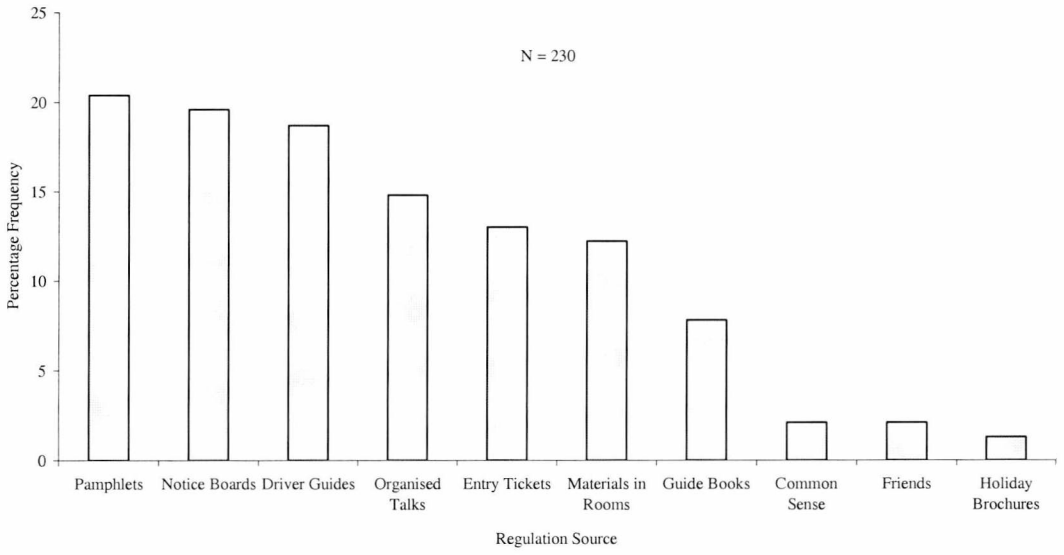


Figure 7-2: Percentage frequencies of visitors' sources of MMNR regulations

regulations from more than one source, and even some had up to five sources (Figure 7-3). When all sources were combined, this produced a total of 45 different combinations.

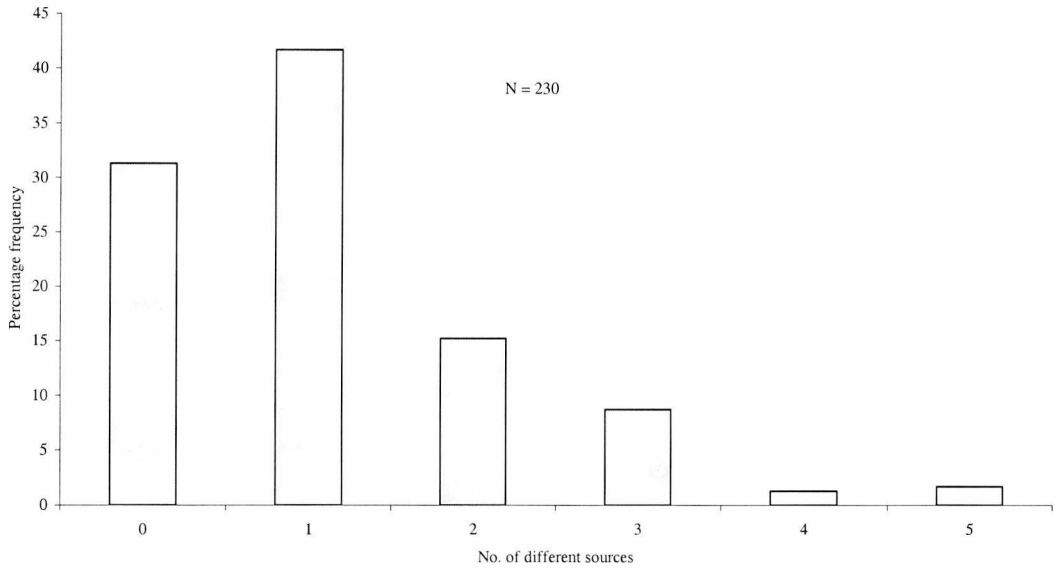


Figure 7-3: Percentage frequencies of visitors acquiring MMNR regulations from a number of different sources.

In terms of comparing nationalities, almost equal percentages of British and Americans were aware of the MMNR regulations (χ^2 = 0.45; df = 1, p>0.05). However, more British appeared to have gained knowledge of the existence of the regulations through sources that required reading on their own initiative. In contrast, Americans had more often gained knowledge from discussions with driver guides, organised talks, friends and use of common sense (Figure 7-4).

The ten different regulation sources were classified into three categories according to the stakeholders involved in their provision. These were the reserve management authority, tour or hotel operators and the tourists' own initiative. When these were analysed, the tour and hotel operators with 58% emerged as the category with the highest frequency in providing regulations. The reserve management and the tourists had almost equal frequencies of 13% and 12% respectively.

Driver Guides

All drivers who responded indicated that they were aware of the reserve regulations. With respect to from where they had learned them, the most frequent (88.6%) source that emerged was the pamphlet that is issued at the gates on entry to the MMNR (Figure 7-5). The only other less common sources of knowledge of existence of the

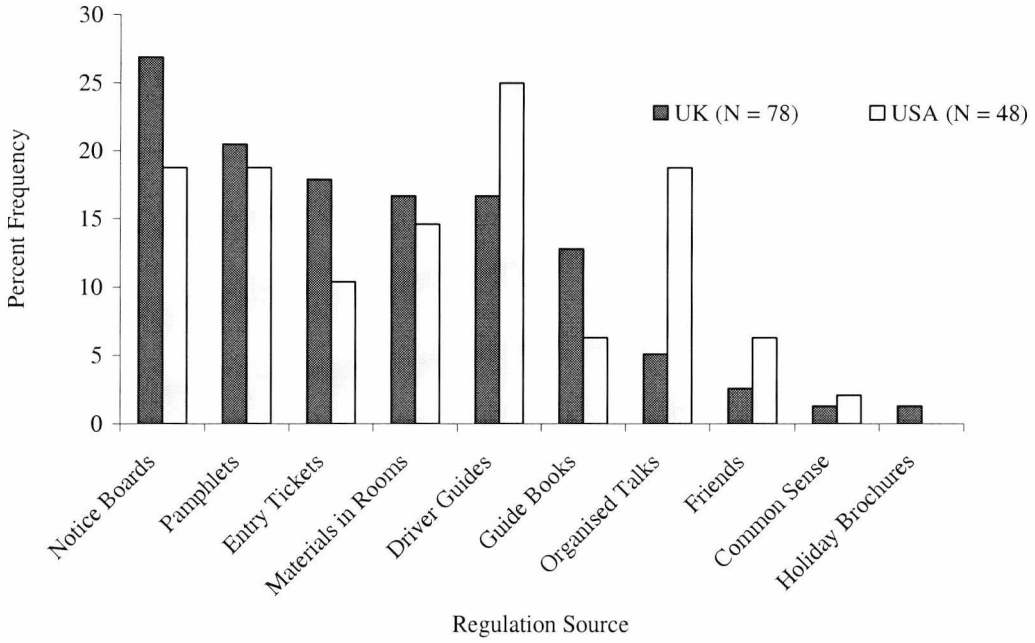


Figure 7-4: Percent frequencies of British and Americans sources of MMNR regulations

regulations were college training, tour company workshops and informal talks with friends (Figure 7-5). Most driver guides (95.5%) had only a single source of regulations while only 4.5% had more than source. For those who had more than one source, the pamphlet issued at the reserve's gates was always one of them.

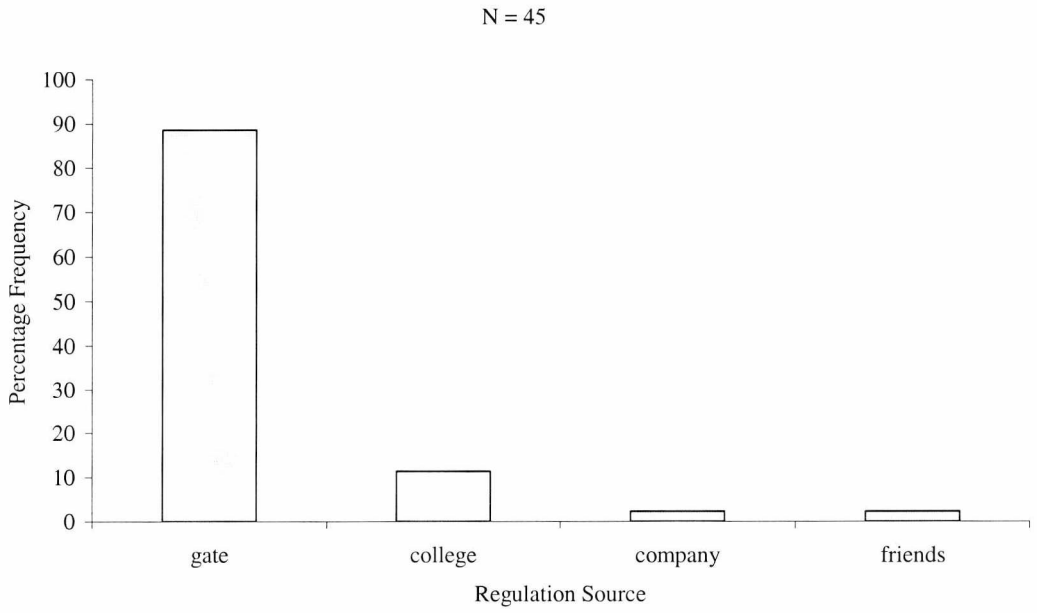


Figure 7-5: Percentage frequencies of driver guides' sources of MMNR regulations

7.3.3 Knowledge of Specific Regulations

Tourists

The evaluation of the proficiency of visitors in MMNR reserve regulations indicated that many of them had a good knowledge of the regulations. More (33%) of the respondents scored full marks than the very few (3.5%) who did not score any marks. Most (82%) of the respondents were proficient (scoring three marks and above out of five) while only 18% scored in two or less questions (Figure 7-6).

The relationship between regulation awareness and proficiency in the regulations appeared to be significant (χ^2 = 20.426; df = 1, $p < 0.00005$). There were more respondents who had claimed to be aware of the regulations and were proficient in them than would have been expected (Table 7-1). Similarly, fewer respondents than expected indicated that they were aware of the regulations and analysis found them to be ignorant. The converse was true for those who had indicated that they were not aware of the regulations.

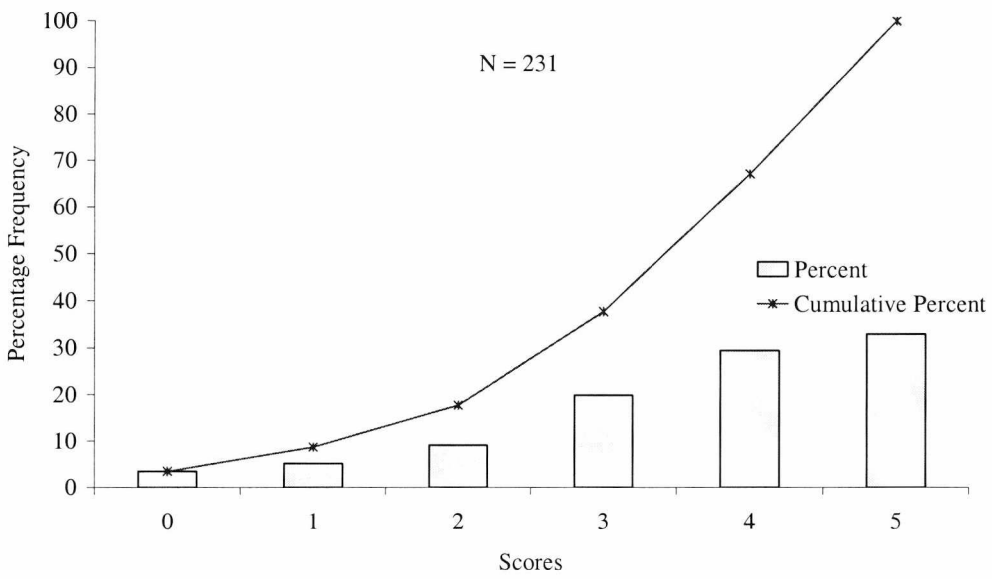


Figure 7-6: Percent frequencies and cumulative percent frequencies of scores obtained by MMNR visitors after answering questions testing their knowledge of reserve regulations

Comparison between visitors' knowledge of regulations and the sources of regulation indicated that there was no significant relationship between the visitors'

proficiency in regulations and whether they got the regulations from a single source or multiple sources (χ^2 = 1.514; df = 1, p = 0.218). There was also no relationship between visitors' proficiency in regulations and the type of tourist (whether package or independent) (χ^2 = 0.330; df = 1, p = 0.566). Similarly, no significant association was found between visitor's group size and regulation proficiency (χ^2 = 1.522; df = 1, p = 0.217), and males and females and regulation proficiency (χ^2 = 1.497; df = 1, p = 0.221: Table 7-1).

Table 7-1: Observed and expected counts in cross-tabulation of regulation knowledge by regulation awareness, regulation source, tourist type, gender and visitor group size together with their Chi-square results

Variable	Value	Regulation Knowledge		N	χ^2	df	p
		Ignorant	Proficient				
Regulation Awareness	Aware	16(28.2)	142(129.8)	230	20.426	1	0.000
	Not Aware	25(12.8)	47(59.2)				
Regulation Source	Single	12(9.7)	84(86.3)	158	1.514	1	0.218
	Multiple	4(6.3)	58(55.7)				
Tourist Type	Package	33(31.8)	157(158.2)	227	0.33	1	0.566
	Independent	5(6.2)	32(30.8)				
Gender	Male	18(14.7)	72(75.3)	227	1.497	1	0.221
	Female	5(6.2)	32(30.8)				
Group Size	Small	25(27.8)	149(146.2)	225	1.522	1	0.217
	Large	11(8.2)	40(42.8)				

NB. Expected counts are given in brackets

Fewer visitors, 17.4% (n = 224), were inclined to break the reserve regulations as compared to 75.4% who were inclined to comply with them. 7.1% of the respondents were not committal on whether they would break the regulations or not.

Significantly more visitors who were proficient with the regulations were inclined to comply with them (χ^2 = 27.903; df = 1, p < 0.00005) and fewer visitors who were proficient were inclined to violate the regulations (Table 7-2). The converse was true for those ignorant of the regulations. However, neither was there any relationship between visitor's group size and inclination to violate the regulations (χ^2 = 0.046; df = 1, p = 0.826) nor between tourist type (package and independent) and inclination to break regulations (χ^2 = 2.656; df = 1, p = 0.103). Same results applied to relationship between respondents gender and inclination to break regulations; Being a male or female did not affect the inclination to either comply or violate them regulations (χ^2 = 0.306; df = 1, p = 0.580).

Table 7-2: Observed and expected counts in cross-tabulation of inclination to violate regulations by regulation awareness, regulation source, tourist type, gender and visitor group size together with their Chi-square results

Variable	Value	Inclination		N	χ^2	df	p
		Violate	Comply				
Regulation Knowledge	Ignorant	14(4.3)	9(18.7)	208	30.114	1	0.000
	Proficient	25(34.7)	160(150.3)				
Group Size	Small	30(28.9)	131(132.1)	205	0.226	1	0.634
	Large	7(8.1)	38(36.9)				
Tourist Type	Package	28(31.3)	146(142.7)	206	2.656	1	0.103
	Independent	9(5.7)	23(26.3)				
Gender	Male	16(14.5)	63(64.5)	207	0.306	1	0.580
	Female	22(23.5)	106(104.5)				
Regulation Awareness	Aware	24(27.4)	125(121.6)	207	1.796	1	0.180
	Not Aware	14(10.6)	44(47.4)				

NB. Expected counts are given in brackets

Driver Guides

All driver guides indicated that they were aware of the regulations, and it also emerged that all were proficient with the dos and don'ts, but not all (22.2%) knew why the regulations were in place. However, most driver guides (73.3%) felt that the regulations were good, and only a few felt that they were bad (11.1%) or had no opinion (11.1%).

Most (76.3%) of the driver guides indicated that visitors asked them to drive off-road to get better view of the animals. However, only 19% of them indicated that they would drive off-road, if they were requested to do so.

7.4 Discussion

Numerous guidelines that encourage visitors to adopt practices in line with sustainable tourism are available. These guidelines need to be accessible to the target group if they are to be effective. A theory that tries to explain compliance to such guidelines postulates that compliance will depend on an individual's maximisation of compliance under limited resources and information (Byrns and Stone, (1984). This study found that a high percentage of tourists who visit MMNR were proficient with the reserve regulations. Driver guides on the other hand were found to be good in knowing what the regulations forbade, but many of them did not understand why certain regulations were there. Results also suggested that proficiency in regulations promoted compliance.

7.4.1 Regulation Sources

Uysal *et al.* (1990) studied the information search behaviour of German, French, British and Japanese travellers who travel to the United States. They found that travellers from different countries were more inclined to utilise different types of information with varying frequency. British travellers tended to use travel agents as the main source of external information source followed by family and friends, brochures and pamphlets, and magazine and newspaper articles. Family and friends was found to be the most important external information source for German travellers followed by travel agents, brochures and pamphlets, and books and library

materials. Like German travellers, 'family and friends' was found to be the most important external information source for French travellers, followed by travel agents, brochures and pamphlets, airlines, and articles in magazines and newspapers. Japanese travellers were more likely to use books and other library materials first, then brochures and pamphlets, family and friends, and travel agents. This study differed slightly from these reports in identifying pamphlets and driver guides to be the most important sources of regulations to British and American tourists respectively. Notice boards also featured prominently as another source.

These differences may be explained by the nature of information each of these sources would provide. 'Family and friends' might be an important source in some cases, but with regard to the MMNR regulations, it may require that the 'family and friends' had visited MMNR in the past. In addition reserve regulations would not be priority information to be included in travel brochure advertising a destination area. The sources that were identified by tourists in this study may be therefore an indication of where these regulations are readily available.

In another study carried out in MMNR, Henry *et al* (1992) reported that only 16% of respondents indicated that they or anyone in their vehicle received a copy of regulations from reserve gates. The amount and type of information visitors receive before their trip or onsite influence visitor interest in and use of the reserve. Visitors generally felt that the information they received on the reserve was adequate, and they identified the drivers as the most important source of this information (Henry *et al* 1992). However, observational data suggested that most drivers were responsive to clients' questions but did not volunteer much information or interpretation. The same study also found driver guides to be poor in knowledge-related skills. These findings are similar to the findings of this study. Although driver guides are an important source of information, they did not appear to be well informed.

Deficiency in information with regards to drivers may be a reflection of inadequacy in training. Sindiga (1996) who decried lack of continuing vocational training and education in tourism industry expressed similar sentiments. Munyori (1992) reported that among the members of KATO less than 25% have a training budget and only three tour firms have their own in-house training programs. In addition

tour companies refuse their staff to participate in training for more than a week (Munyori, 1992)

Researchers who have investigated tourism information sources have typically focussed exclusively on users of single information sources ignoring multiple source users (Fodness and Murray, 1997). These studies have had one of the three forms: studies of single information sources or users of single information sources in isolation; studies where users of single information sources were compared with users of other single information sources; or studies where users of single information sources were compared with users of a combined category of other information sources. These studies have been used to compare tourist demographic characteristics, travelling party and trip characteristics, trip behaviour and expenditures (Codez and Hunt, 1978; Howard and Giltelson, 1989; Snepenger *et al*, 1990; Fodness and Murray, 1997), but not their compliance with codes of conduct. In situations where combined sources of information were used tourists appeared to undergo a reallocation to accommodate changing trip circumstances and problem solving demands when faced with a host of individual, situational or market place contingencies more readily than those who had used a single source of information. Results from this study suggested that tourists understood the regulations regardless on the number of sources that they had. Application of the knowledge could not be tested as most tourists relied on the driver guides as they visited MMNR as part of package.

7.4.2 Regulation Compliance

Compliance researchers have enhanced the non-economic compliance theory model by including variables such as social norms (Bandura, 1969; Mischel and Mischel, 1976; Grasmick and Scott, 1982; Akers, 1989), and level of moral development such as belief in or obligations to do the right thing (Kohlberg, 1969; 1976; 1984). Other variables that have been included are group pressure and presence of an authority figure (Asch, 1956; Milgram, 1974; Grasmick and Bursik, 1990), knowledge levels of individuals regarding expected regulations in outdoor recreation areas and parks, awareness of consequences of ones actions (Heberlein, 1972; Butler 1980), and perceived rationality and fairness of the regulations (Schwartz, 1977; van Der Stoep and Gramann, 1987).

Compliance studies have also used socio-demographic data such as income level, age, sex, occupation or status, morality and education as predictors of compliance (Jackson and Milliron, 1986). Being a male significantly decreased compliance with guidelines (Jackson and Miller, 1986; Sirakaya, 1997). Females were more inclined to comply with the guidelines than their male counterparts indicating gender effects in compliance. According to Title (1980), the relationship between gender and non-compliance may be a function of both lifestyle variations and generation differences. Traditionally females have been identified with conforming roles, moral restraints and more conservative lifestyles, all of which could tend to promote compliance. This study did not, however, find any significant differences in compliance and non-compliance between male and females. This could be explained by today's Western societies where the roles of women have changed as more of them have entered the labour force and become self-reliant.

The findings of this and previous five chapters were presented in a stakeholders workshop where they were deliberated on and recommendations proposed. The next chapter will now look at the management recommendations based on the findings of this workshop.

CHAPTER EIGHT

Stakeholders Workshop

8.1 Introduction

The last five chapters presented the data that were collected and the results derived from those data. In turn, this chapter will discuss the management recommendations made by the stakeholders based on the findings of this study.

This study formed part of a wider project entitled *"Wildlife and People: Conflict and Conservation in Masai Mara, Kenya"*, which was a three year research and training programme based in and around MMNR, Kenya. It was a collaborative programme between the Durrell Institute of Conservation and Ecology, UK and six Kenyan partner institutions, namely NCC, TMCC, Moi University, WWF, KWS, and the DRSRS. One objective of the study was to *develop management recommendations for mitigation of tourist-wildlife conflicts in MMNR*. A prerequisite to achieving this objective was to disseminate, discuss and utilise the findings locally. Towards that end, a series of workshops were held from 13th to 16th August 2001, to which local stakeholders were invited. The main study findings were presented at these workshops and the participants proposed how regulations, law enforcement, information dissemination, field management, and monitoring can be improved to achieve more successful management of tourism in Masai Mara (Walpole *et al*, in press).

The recommendations that were developed are presented in this chapter. **Section 8.2** outlines how the workshops were organised. **Section 8.3** then presents these recommendations, on tourism regulations and law enforcement in **section 8.3.1**, and on tourism impacts, management and monitoring in **section 8.3.2**. **Section 8.4** then looks at future prospects for tourism management.

8.2 Methods

Participants to the workshops were invited from the two county councils in charge of MMNR (NCC and TMCC), MMNR staff, KWS, DRSRS, the surrounding group ranches, tourism industry, Moi University and conservation related non-government organisations. During the workshops, participants assembled to listen to the formal

presentation of the findings. After the findings were presented, workshop participants were divided into small working groups.

The task of these working groups was to discuss particular aspects of the findings from the formal presentations and to develop recommendations for decision-making, monitoring and management. This was achieved through debate and consensus. After these discussions, participants assembled again and a member of each working group served as a repparteur to present their outcomes in plenary.

As regards tourism impacts, working groups were presented with two different issues to consider. Firstly, there was the issue of tourism regulation and law enforcement. Secondly, there was the issue of tourism impacts, management and monitoring. Within each issue, participants were also given topics to guide them in their discussions. With respect to tourism regulation and law enforcement, working groups were required to discuss the following topics: the regulations governing tourist behaviour; how to publicise regulations; the codes of conduct for drivers and tour operators; the role of law enforcement; and the role of non-governmental organisations, lodges and tour companies. Tourism impacts, management and monitoring working groups were required to discuss the following topics: visitor impacts; managing off-road driving; managing wildlife disturbance; and monitoring tourism impacts; and, monitoring law enforcement effectiveness. The results from these discussions formed for the basis for the management recommendations.

8.3 Results

In order to minimise tourism impacts a certain level of regulation, law enforcement, and field management is required. Where regulations are used, it is important that awareness of visitors and drivers is raised through education. This could be through a simple explanation of the impacts caused by tourism and how particular regulations can help minimise those impacts. Equally important is finding ways to distribute information about regulations to ensure they reach the targeted groups.

Field management entails the practical activities that help to limit impacts. To decide on what, and how, to manage, it is imperative that impacts are monitored. This study illustrated some of the ways that monitoring can inform management, but there is a need to know what monitoring should be continued. Further, the effects of

management need to be monitored so that the success of management can be effectively evaluated.

8.3.1 Tourism Regulations and Law Enforcement

Participants felt that current regulations were necessary and sufficient. However, respect for regulations was lacking and they were broken regularly. At a policy level, it was decided that softer management, focusing on information dissemination and the provision of infrastructure to guide behaviour, was a better approach than hard management relying on law enforcement, although the latter should still be applied as part of the mix. Moreover, it was felt that a collective responsibility falls upon tourism and NGO stakeholders to contribute to better understanding and behaviour regarding impacts and regulations.

Specifically, with regards to the regulations governing tourist behaviour, it was felt that the rationale for why regulations were in place was not adequately presented. Some explanation of the effects of not observing the regulations could enhance their compliance. Therefore, participants recommended that the importance of the regulations, and the reasons for their existence, should be made clearer to guides and visitors.

Equally, it was felt that the language used to phrase the rules was negative in that it was dictatorial. Less dictatorial language, such as "please avoid ..... because....." rather than "do not ...." or "it is prohibited to ....." would be more encouraging to visitors and drivers, whilst also providing more of the underlying rationale for regulations. Thus, there is a need for the regulations to be framed in a more positive manner.

It was also felt that rules might be broken because visitors and driver guides do not understand them. To ensure that the regulations were well understood, it was recommended that drivers and visitors should read the regulations when entering the MMNR and sign to indicate that they have understood them. Additionally, since it is quite difficult to control self-drive visitors, it was suggested that they should be accompanied by a ranger or trained driver to ensure that regulations are adhered to. This would also provide greater employment opportunities for Maasai rangers. However, the practicalities of implementing such a scheme were questioned.

Visitors may not be willing or able to accommodate an extra passenger in their vehicle, and it may be seen as an overly intrusive measure. Moreover, transporting rangers back to their point of origin, and accommodating them at campsites and lodges, may prove problematic.

When participants considered the publishing of MMNR regulations, it was felt that these regulations are not readily available to the visitors. To ensure that all visitors have access to them, a manned information point should be established at every point of entry to the MMNR. Further, a MMNR website should be created for visitors to access information and MMNR regulations prior to their visit. It was noted that a website currently exists for the Narok side of the MMNR but not for Trans Mara. Therefore, it was recommended that a combined website be developed that clearly publicises MMNR regulations and their rationales.

Another omission that was apparent was the lack of signboards in MMNR. It was recommended that a greater use of signboards be made on the main roads within the MMNR, especially to remind drivers the speed limit they are supposed to observe and to show directions. Similarly, there was a need to encourage lodges and tented camps to act as centres of information dissemination. In doing so, they will be adhering to the principles of ecotourism by increasing the awareness of their clients regarding regulations and sustainable practice.

As regards the conduct of drivers and tour operators, it was observed that there is no code of conduct to monitor the professionalism of drivers, although Friends of Conservation produced an informal tourist code of conduct for visitors to Kenya. Such an initiative should be adapted for driver guides. The onus to develop such a code of conduct lies with the Kenya Association of Tour Operators and the Kenya Professional Safari Guides Association or any other equivalent body.

In addition, it was felt that tour companies were not doing sufficient to educate their drivers, some even employing driver guides with no professional training. To mitigate this, it was recommended that tour companies should develop or improve their in house training and education of drivers. As further encouragement, all driver guides should be licensed to indicate their knowledge and acceptance of regulations within protected areas.

In national parks and other protected areas world-wide, roads and trails of various types commonly exist in support of three major functions, namely: providing access; offering recreational opportunities; and, protecting park resources by concentrating visitor use impacts on specific areas. Roads are generally regarded as a necessity in national parks and reserves, a recreation and tourism resource that requires both maintenance and protection. They limit the dispersal of visitors and control the disturbance of animals in these areas.

A proper network of well-maintained roads and tracks should help to alleviate the problem of off-road driving. By expanding the network into less used areas, congestion and animal harassment should be reduced. Whilst it is recognised that some areas are best kept under-utilised as sanctuary zones, and some fragile or sensitive areas may not support increased infrastructural development and visitation, there is a perception that the current distribution of visitors is over-concentrated and contributes greatly to animal harassment. For this reason, improvement, expansion and maintenance of a wider network of official tracks was recommended. Additionally, there should be an establishment of proper viewing circuits in less used areas of the MMNR, within a well-defined system of zoning.

In theory, a system is in place where driver guides who are found breaking reserve regulations are penalised on the spot and supposedly reported to their employers. In practice, this system does not seem to work well. To identify perennial offenders, it was recommended that a record of offenders be maintained at the MMNR headquarters. These could then be banned from bringing visitors to MMNR and assist in applying pressure to their employers to rectify the behaviour of their employees through negative publicity.

On the spot penalties were taken for granted in MMNR. This was in part due to the fact that they were too low. Whilst penalties are considered to be a last resort for managing impacts, it was felt that they should continue to be used but at a level that acts as more of a deterrent to regulation infringement. It was therefore recommended that they be stiffer.

Participants also recognised the importance of involving other stakeholders in the tourism industry in ensuring that regulations are adhered to. NGOs and researchers

were recognised as the bodies that are involved in research on impacts of tourism. However, they were accused of not disseminating their findings to other stakeholders in order to facilitate their implementation. Therefore, it was recommended that they maximise the exposure of lodges, tour companies, and MMNR management to their findings on tourism impacts and management. Further, NGOs were encouraged to sponsor information dissemination through publications.

On the part of tour operators, adherence to the principles of ecotourism was emphasised. In this respect, driver guides were required to create awareness among their clients of MMNR regulations and of their efforts to observe them during game drives.

8.3.2 Tourism Impacts, Management and Monitoring

Participants felt that plant species are particularly vulnerable to off-road driving and vegetation communities can take many years to recover. Visual impact of off-road driving for visitors was also considerable. Wildlife is in part becoming habituated so displacement appears minimal although disturbance is still an issue. It is unlikely that impacts can be eradicated but all must be done to minimise them. Equally, monitoring must be implemented to ensure that impacts (such as changes in animal behaviour) are minimised.

It was felt that to manage the impacts of tourists in MMNR a number of tactics were needed. This was because of the multiplicity of the factors that contributed to the negative tourism impacts. These included: lack of professional training; lack of signboards and interpretation; lack of game viewing circuits; the profit motives of the tour companies; and, inadequate AHP equipment.

To alleviate the problem of the deficiency in professional training among the driver guides, it was recommended that KWS, as the custodian of the country's wildlife, and tour companies, in line with the principles of ecotourism, ensure that driver guides are well trained (see **Section 8.3.1**).

It was also observed that negative tourism impacts arose due to lack of interpretation and of game viewing circuits. These could be alleviated through locating signs in the MMNR that provide better interpretation so regulations are better understood and

adhered to. Game viewing circuits should also be provided (see **Section 8.3.1**). In addition, observation points should be established for surveillance of drivers' behaviour and to provide early warning of congestion and harassment.

As an incentive, tour companies should be rewarded for good environmental performance in the MMNR. This could be achieved by holding an awards ceremony every year at which incentives and certificates are presented. The ceremony should be widely publicised to provide maximum marketing gain for the best companies, as an incentive to perform better. Further, all operators in MMNR should be encouraged to reinvest part of their profits into management programmes geared specifically towards reduction of tourism impacts. Other stakeholders should also contribute.

Driver guides have been found to communicate the presence of highly sought wildlife, such as large cats, on various radio frequencies. This impedes the efforts of the AHP unit as driver guides also communicate the whereabouts of the AHP unit to avoid being caught. If the AHP unit could tap into these communications, they would have a better idea of where to patrol, thereby increasing their effectiveness. Therefore, it was recommended that, apart from intensifying their patrols, the AHP unit should be provided with an universal radio system that could tap into the frequencies used by the driver guides.

It was also recognised that MMNR management lacks the capacity to undertake monitoring and so specialist partners should be identified to perform this role. However, regular surveys to monitor and evaluate effectiveness of management practices should be carried out. Therefore, it was recommended that MMNR management should encourage regular surveys and continuous monitoring by research and education institutions such as universities.

8.4 Prospects for Better Future Tourist Management

The paradigm of 'conservation with development' has attracted increasing support from conservation organizations and international development agencies in recent years. This approach emphasises the need for mutually beneficial co-management partnerships between rural communities, the state and other stakeholders in place of

the antagonistic relations and resource-use conflicts caused by protectionist conservation strategies (Hough 1988).

To this end, the African Conservation Centre initiated the formation of Mara Management Committee. This tries to assemble all the stakeholders of Masai Mara and involve them in the management of the Masai Mara ecosystem. Thus, it incorporates: both the Narok and Trans Mara County Councils as the bodies holding MMNR in trust for the local communities; the local communities in the surrounding group ranches; the management of MMNR; the management of the lodges and tented camps in Masai Mara; and, any other bodies (e.g. NGOs) with interest in the Masai Mara.

The aim of this committee is to involve all the stakeholders in the sustainable management of the Mara ecosystem. Its other major concern is that local communities should benefit from tourism. These would be accomplished through a development of an integrated management plan that encompasses the whole of the Masai Mara ecosystem.

Another bold initiative that has taken place and that may give some hope to the future management of MMNR is private sector management. In the Mara Triangle, the previous county council management was devolved to a non-profit company known as the Mara Conservancy. This company plans to disburse part of the levies and gate fees it collects to local communities and the TMCC, while retaining part to manage and develop the Mara Triangle. The bulk of what will be retained will go to road building and maintenance, anti-poaching patrols, and administrative costs (Walpole & Leader-Williams, 2002).

In the past, management plans were developed for the MMNR, but were never implemented. The reason for their non-implementation was usually lack of application of adequate funds, even though tourism was earning considerable revenue. This revenue was supposed to go to the county councils, which were then supposed to allocate the MMNR money for management purposes. Very little money used to come and salaries were usually late, thereby demoralising the MMNR staff. The money was insufficient to maintain the existing roads, which explained their sorry condition. Building of new roads relied on donations from external

funding bodies. With these new private sector initiatives, it is hoped that the situation will change and provide greater accountability.

These new initiatives are wholly relying on tourism to provide the revenue to implement their decisions. This is true for both MMNR and the local communities surrounding it. The local communities are being encouraged to invest in tourism so as to benefit even from its trade outside the borders of the MMNR. However, this study found Mara tourism to be influenced by external factors and increased numbers would only be maintained if both international and local conditions are favourable. Therefore, the success of these initiatives will depend on continued success in tourist arrivals.

The next chapter will discuss the findings of this and the previous five chapters in relation to each other. It will also discuss the wider implications of the findings of the discussed studies and also present suggestions of further research opened by this study.

CHAPTER NINE

Discussions and Conclusions

9.1 Introduction

The previous six chapters have presented the main findings of this study. This chapter does not seek to reiterate these results, but rather to present an integrated discussion of these findings. Therefore, the chapter considers the overarching objective of the study, which was to quantify tourism impacts and identify ways of resolving tourist wildlife conflicts in MMNR. In an effort to achieve this overarching objective, this study examined the following: the development and nature of tourism in MMNR (**Chapter 3**); the extent and distribution of vegetation damage over time due to off-road driving (**Chapter 4**); whether the distribution of resident herbivores is affected by tourist pressure (**Chapter 5**); the disturbance of animals by tourists (**Chapter 6**); the compliance of MMNR visitor regulations by tourists and driver guides (**Chapter 7**); and, the recommendations that were proposed by stakeholders after they were given the findings of the study (**Chapter 8**).

This chapter starts with a brief overview of tourism in MMNR in s**ection 9.2**, followed by a consideration of the significance of the results in biodiversity conservation in s**ection 9.3**. **Section 9.4** then examines how this may affect the way Mara tourism should be managed, whilst **section 9.5** looks at funding of management of tourism in Mara. **Section 9.6** in turn considers the wider implications of the study that could be applied elsewhere, and finally, **section 9.7** provides suggestions of further research opened up by this study.

9.2 An Overview of Masai Mara Tourism

Levels of visitation to MMNR remain at the mercy of external forces, in that long term visitor numbers did not follow the conventional tourist destination life cycle (Butler, 1980). The changes in visitation rates varied irregularly over the years, with negative and positive annual increments portraying variations in external factors such as local political instability or international market conditions. In terms of seasonality, high visitation rates occurred during the northern summer with few visitors in other seasons.

This study has also provided evidence that tourism development in Masai Mara was largely unmanaged and unregulated. Firstly, the moratorium on establishment of lodges and tented camps both within and outside MMNR has not been fully adhered to. The moratorium has been completely ignored outside the MMNR where lodges and tented camps still continue to be established. Although the moratorium appears to be observed inside MMNR, existing facilities continue to be expanded in order to accommodate more visitors. Furthermore, 'fly camps' are erected seasonally to accommodate excess visitors during high tourist seasons.

Secondly, the Wildlife Planning Unit prepared a development plan for game viewing tracks in 1980. This plan was never implemented although there are officially defined roads and tracks indicated on MMNR regulation pamphlets issued to tourists. Currently there are graded roads from lodges and tented camps to the gates and airfields, but tracks are not maintained specifically for game viewing.

This study also showed that, despite there being an AHP unit that is empowered to enforce the MMNR regulations, off-road tracks were proliferating in localised areas in the MMNR. Along the roads and tracks that were present, there was complete lack of signposts except to lodges or tented camps. Additionally, it was observed that some regulations were flouted even in the presence of the AHP unit.

9.3 Implications of Results to Biodiversity Conservation

The results of this study may have far-reaching implications for the conservation of biodiversity. The number of visitors to MMNR has increased, and most are general tourists who rely heavily on supportive infrastructure, and therefore require management intervention if biodiversity is to be successfully conserved in MMNR. However, the immediate impacts of tourists on biodiversity are not obvious due to the inherent complexities of ecological systems, nor are the long term and cumulative effects of those impacts. Thus, even when an impact from tourism is quantified successfully, a further difficulty may arise in determining if that impact is biologically important in the long-term.

The fact that the moratorium on further tourist establishments is largely overlooked could result in the impacts of tourists being manifested more widely as tourist

facilities become spread further. These impacts could be manifested both inside and outside the MMNR.

Group ranches own the land outside MMNR. This land is largely unmanaged and is mainly used for livestock grazing. Furthermore, there are no management plans in place for its future development. If tourist facilities were to proliferate on this land, there would be no control on where they would be placed or who should be responsible for their supporting infrastructure. Because the moratorium on developing further tourist establishments is ignored, this could be devastating to the biodiversity, as developments can proceed without even carrying out any environmental impact assessments.

Lack of well-planned game viewing tracks could result in off-road driving degrading wider areas in the Masai Mara. Plant species are particularly vulnerable to off-road driving, which causes vegetation loss in areas where it occurs. However, recovery of vegetation can be rapid, especially in the wet season, and in areas subjected to low vehicle pressure. Nevertheless, in terms of individual species, some species such as *Themeda triandra* lack capability to recover quickly. These vulnerable species could eventually disappear with a consequence of loss of diversity in the vegetation communities. Additionally, an increase in tracks also results in an increase in habitat edge with the associated edge effects. Thus, off-road driving may cause a significant drop in the plant cover, plant height, species richness and species diversity, leading to an increase in soil compaction and a decrease in soil organic matter and moisture contents (Weaver & Dale 1978; Hylgaard & Liddle 1981; Kuss 1986; Cole 1987), particularly in heavily used areas.

Roads and tracks can also represent barriers to wildlife. Tourist vehicles can separate young ungulates from parents. If it is a separation, this can interfere with the parent-offspring recognition bonds, resulting in the rejection of young and increasing the risk of attack by predators (Edington & Edington 1986)

The flouting of regulations that govern visitor behaviour while viewing animals may have opposing effects. Firstly, animals are disturbed and may change their behaviour. The proximate effects of such behavioural changes may not be immediately obvious. However, such changes may result in animals becoming

active when it is hot and expending energy that would normally be required for other activities. The ultimate effect could be a reduction in the population fitness of the species.

Secondly, there was evidence that some herbivore species were becoming habituated to tourists. On the face of it, habituation is a good thing because tourists are able to approach wildlife without disturbing them. However, other studies have suggested that habituation interferes with predator-prey dynamics (Isbell and Young, 1992), as well as making wildlife more vulnerable to legal or illegal hunters. Thus, habituation may ultimately interfere with population survival.

Apart from cheetah, large cats in MMNR are nocturnal or crepuscular in their hunting habits (Muthee, 1992). There are virtually no tourists on game drives at this time. Therefore, habituation of herbivores would have little effect on the interaction of these predators with the habituated animals. However, cheetahs hunt by day when tourists are on their game drives. Nevertheless, they are very timid such that they do not hunt in the presence of tourists (Muthee, 1992). Consequently, habituation of herbivores may result in an increase in herbivore population while that of cheetah decreases.

There is no form of hunting that is allowed in MMNR. Nonetheless, poaching is usually a management problem in the MMNR. Thus, if animals were habituated, then they would be more prone to taking by illegal hunters.

A different facet of the changing levels of tourism in the MMNR is that availability of funds to carry out conservation endeavours will vary greatly from year to year. This could contribute to the problem of maximising the efficient operation of conservation programmes by providing unnecessary excess capacity in good years or seasons and deficiency in bad ones. However, this does not apply to MMNR as almost no money goes back into its conservation or management, irrespective of the amount of revenue collected from tourism (**Section 9.5**).

9.4 Effects on the Management of Mara Tourism

The preceding sections have shown tourism development and activities are unmanaged and unregulated in MMNR. Given this scenario, it is important to

consider how Mara tourism ought to be better managed. The key issue is to ensure that ecosystem integrity remains, both to function effectively and retain its capacity to maintain healthy the diversity of species and their interrelationships that have evolved over time (Norton 1992). In turn, this requires protection from irreversible impacts. However, there is a problem of deciding rationally the scale from which to manage these natural sites and their supporting natural systems. What is required is a more or less precise idea of the degree and extent of impacts related to tourist activities that can be tolerated without destabilising the integrity of the natural systems. Thus, biodiversity conservation decisions always have to be based on a range of considerations, including ethical ones. Managers may choose to adopt the safe minimum standard, not because it arises from a rigorous model, but simply because they feel that the safe minimum standard is the right thing to do (Bishop & Ready 1991).

Several schemes exist on how best to determine when it is necessary to control levels of visitors in protected areas. These include those of defining carrying capacity, Limits of Acceptable Change (LAC) and Visitor Impact Management (VIM).

The idea of carrying capacity as applied to tourist management considers the maximum use an area can sustain. It considers all natural areas to have limited ecological, physical and aesthetic carrying capacities, where:

- the ecological carrying capacity is reached when the number of visitors and characteristics of visitor use start to affect the wildlife and degrade the ecosystem;

- the physical carrying capacity is reached when all available facilities or infrastructure are saturated; and,

- the aesthetic (or social) carrying capacity is reached when the number of visitors reaches a level where tourists frequently encounter other tourists, or see their impacts, such as litter, and lack of wildlife, so that their enjoyment of the site is diminished.

Thus, the idea of tourist carrying capacity assumes that there is a level of development, and a maximum number of visitors, that a protected area can tolerate without adverse effects on the environment (Giongo *et al.*, 1993; Roe *et al.*, 1997).

A number of factors need to be considered in determining the various carrying capacities of an area. These include: the size of the area and the amount of usable space within it; the fragility of the environment; numbers, diversity and distribution of wildlife; topography and vegetation; sensitivity of wildlife to human visitors; tourists' viewing choices; visitors' perceptions and behaviour; and availability of facilities (WTO and UNEP 1992).

Further, the concept assumes that there is a linear relationship between the volume of visitation and the level of impact. Therefore, it is rarely used, as its estimation is almost impossible (Macnab, 1985). LAC and VIM are more practical because they focus on the attributes of the ecological and aesthetics in the system rather than numbers of visitors *per se*.

The system of LAC (Stankey *et al.* 1985) is associated with the Limits of Acceptable Use (LAU). The LAC and LAU system differs from carrying capacity in that it places emphasis on the conditions, both physical and social, desired in the area rather than on the maximum amount of use the area can tolerate. Therefore, LAC requires managers to define the desired conditions and to undertake actions to achieve and maintain those conditions. After defining the LAC, the management strategy is to use LAUs to restrict visitor numbers in order to minimise environmental impacts.

VIM, on the other hand, was derived from carrying capacity literature after considering the obscure link between level of use and level of impact. It comprises a sequential process that is designed to deal with: the identification of unacceptable visitor impacts; the determination of potential causal factors affecting the occurrence and severity of the unacceptable impacts; and the selection of potential management strategies (Loomis & Graefe 1992).

Based on the findings of this study, it would appear that the physical carrying capacity of MMNR is regularly overshot during the high tourist season, when 'fly camps' are erected to accommodate excess tourists. However, the facilities remain under utilised during the rest of the year when tourist numbers are low. An effective

management strategy here would focus on trying to have a more uniform distribution of visitors throughout the year. This may be achieved through marketing domestic tourism, which is yet to be exploited fully. Additionally, low season discounts may be given to entice more visitations during low season.

The ecological and aesthetic carrying capacities would also appear to have been exceeded in those areas that are highly impacted by the tourists. Although LAC has not been defined for MMNR, some areas are possible candidates for having exceeded their LAC, for example the area between Talek and Sekenani gates. Nonetheless, no form of management takes place in these areas. Thus, if more effort were to be put on the design and maintenance of roads and tracks, then these areas would be aesthetically more appealing. However, concentration of visitors in these areas may also have negative effects in that visitors would feel too crowded, thereby diminishing their satisfaction.

An alternative to concentrating visitors would be spreading them over a large area. This would have the advantage of improving on visitor aesthetics and spreading use and thereby reducing over utilisation of localised areas. However, it would also have drawbacks such as: straining the management capacity since larger areas would need to be actively managed; and, it would be unpopular to driver guides who operate under limitations to fuel and distance they are to cover.

Apart from reconciling the negative interactions between the tourists and the attractions over time, the sustainability of tourism is also tied to direct maintenance of tourist attractions, such that they continue to attract interest. Thus, a manager should review not only the tourists and the attractions, but also the feedback between them. This should enable better tie up with the kind of tourism that is desired, whether this is high volume tourism or high quality, low-density tourism. In turn, such considerations should inform actions to be taken in managing tourism.

Zoning is another method that can be used to reduce impacts through restricting or preventing visitor access to certain areas. Zones may include: those which aim to preserve naturally representative areas from virtually any human use; those which provide for recreation and tourism; and, those which provide for general use

(Woodley 1992). All Biosphere Reserves are managed in theory through a zoning system where a central core area is out of bounds to tourists (Batisse 1986).

Similarly, areas may be closed to tourists because of their particular ecological sensitivity or because they are particularly important. Additionally, tourists may be confined to some fixed viewing points, both to control their activities, and to ensure good views of wildlife. However, this often requires some modification of the area in order to make it attractive to animals, such as the provision of artificial water holes or salt licks. Conversely, this can result in artificial concentrations of animals, habituation and subsequent vegetation damage.

Zoning in MMNR could be done to create different zones to provide for different types of activities and experiences. These should then be managed to control impacts. For example, designating zones: for watching hippopotamus and crocodile where tourists may be allowed to leave their vehicles; for watching wildebeest crossing during their migration; for taking night game drives where nocturnal animals will be least disturbed; and, for balloon safaris. Additionally, areas that are already degraded should be closed down until they have recovered to facilitate regeneration.

Tourist dispersal is a common strategy used to overcome some of the local problems of environmental degradation when impacts are concentrated in a small number of locations. It may be used to disperse tourists both spatially and temporally, or alternatively, to stop them concentrating at 'honey pot' sites. Again, there are advantages and disadvantages of either concentrating or dispersing tourists, as earlier discussed. Decisions have to be taken on whether to have 'honey pot' sacrificial areas of live with the problems of spreading tourists.

From the results of this study, the dispersal of tourists may not greatly help in reducing tourist impacts. Many tourism-induced changes, such as vegetation loss, occur exponentially, so even a little use may cause much impact in the areas where tourists are dispersed. Hence, dispersing visitors to avoid overcrowding may actually result in greater overall or local impact. Similarly, allowing access to a new site may result in rapid accumulation of damage at that site, whilst little or no

recovery takes place at the old site. Additionally, dispersal may also result in habituating animals in these new sites.

Limiting the numbers of visitors to an area or closing it temporarily is a direct method of controlling visitor impacts to avoid degrading the environment or disturbing wildlife. Indirect strategies for managing tourist impacts also exist and they mainly aim to modify the behaviour of visitors. One of the most important ways to achieve this is to educate visitors about the potential disturbance they can cause and to provide advice on how to reduce it. Tourist groups accompanied by a tour guide, confined to specific locations and transported in large numbers, provides the ideal opportunity to target information and to provide quality educational and interpretative experiences. As well as helping to reduce visitor impacts by advising tourists how to behave, education and interpretation programmes increase visitor awareness about the areas they are visiting and help to foster concern for conservation.

Information dissemination and the use of rules and regulations have also been used to control tourism impacts in MMNR. This mainly deals with controlling the behaviour of tourists while in MMNR. Ideally, if the MMNR tourists were ecotourists, then compliance with the regulations would be total or nearly so. This would be so because ecotourists behave in a manner that is conducive to environmental protection, without even being prompted to do so, so long as they have been made aware of the impacts of their behaviour.

However, in MMNR, information dissemination alone did not work in controlling the behaviour of tourists and some form of law enforcement had to be applied to elicit compliance. Apart from suggesting that not all of MMNR tourists were ecotourists, this may also reflect on the satisfaction of the tourists and the way MMNR is marketed. Tourists may also have been 'guaranteed' seeing the big cats, and if the only opportunity requires, they will drive off-road. If management was more authoritative, this might negatively affect visitor satisfaction and eventually result in a decrease in visitor numbers.

For many, MMNR has been looked at as somewhere where visitors are not heavily managed. Visitor satisfaction is always enhanced with a certain degree of freedom.

Moreover, very heavy management would remove the natural aspect of the area. However, too much visitor freedom may result in negative impacts to the environment. Therefore, management should seek to achieve a balance so that environmental integrity is not affected, but equally that visitors should feel that their privacy not being infringed.

In conclusion, tourist management in MMNR would require a balance between: visitor dispersal and confinement; and, education and law enforcement. This calls for active visitor management, as a *laissez-faire* approach to management would not stabilise the complex system.

9.5 Funding the Management of Tourism in Mara

Revenue from tourism has long been viewed as a potentially benign source of funding for conservation of protected areas. For this to be successful, there is need to reinvest the revenue collected into the management and conservation of the protected area. Additionally, the funds collected should be adequate for these purposes.

This study showed that MMNR received on average 130,000 tourists between 1980 and 1999, and they stayed for an average of 2.6 days. Tourists pay $US20 per day to enter into MMNR. This equates to an annual revenue of $US6.76 million. This is far beyond the money that would be needed for conservation purposes. However, very little, if any, of this money is reinvested back into management and conservation of MMNR.

For tourism to be sustainable in MMNR, active management would be required. In turn, this would require part of the revenue collected to be invested back. In turn, a proper management and allocation of revenue is required.

9.6 Wider Implications of the Research

The debate over the impacts of tourism on wildlife and their habitats in MMNR has been ongoing for more than a quarter of a century. However, previous research has not adequately quantified these impacts to conclusively resolve possible conflicts. This study clearly demonstrates the value of research in providing the information

necessary to resolve such conflicts. It explicitly shows how controversial issues such as off-road driving can be quantified.

This study has also indicated how data collected using different techniques could be analysed together. In particular, the study utilised data collected using traditional observational techniques alongside those collected using technological innovations such as remote sensing and GPS. These data were integrated together in the analysis. Such techniques could be applied in other areas where different variables are measured using different techniques.

The capabilities and objectives of different stakeholders in the tourism industry differ according to their specialities and interests. However, for sustainable development and management of the industry, all these stakeholders need to come together to formulate appropriate strategies. This study recognised the value of collaborations among these stakeholders in monitoring and decision-making and used them in gathering data. Such collaborations could be emulated in other areas where diverse data are required.

MMNR has been lacking in management control of tourism. This has resulted in negative tourism impacts, which could be minimised through some more intensive management. Similar problems of *laissez faire* development and management of protected area tourism probably abound elsewhere. Further, the study illustrated the value of law enforcement where information dissemination alone does not work.

9.7 Suggested Further Research

This study looked at the impacts of tourists in MMNR and suggested recommendations, which if implemented, should mitigate the negative impacts due to tourists. To evaluate the effectiveness of these recommendations, it is imperative that future impacts are monitored adaptively to provide a feedback on the success of management options taken.

The study mainly looked at the impacts inside MMNR, but tourist impacts, possibly equally severe, are also experienced outside the MMNR. Research should be carried out outside MMNR to determine the extent of impacts in order to formulate management options outside the MMNR.

An aspect of tourism in MMNR that was not dealt with in this study is the effect of balloon safaris on wildlife. It is perceived that balloon safaris cause considerable distress to particular wildlife species, but this has not been fully documented, and this requires study.

Studies on the factors that affected the distribution of herbivores had limitations in the scale of sampling resolution that was used. These should be repeated using a finer resolution to bring out any effects hidden in the low resolution that was used.

Finally, this study focused on response and disturbance of individuals or species. Further research should consider long term effects on populations or communities.

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Appendices

Appendix 1: Questionnaire administered to tourists

Date: (Day:_____Month:_____Year_____)

We are a team of researchers attached to WWF and universities in UK and Kenya. We are undertaking a study to assess tourism in Masai Mara. Could you please spare some time to answer a few questions about your visit to Masai Mara? Please just give us your opinions and your answers will be treated in confidence. Thank you very much for your help.

1. What is the country of your permanent residence? .....

2. How long are you staying in Kenya? .....(days)

3. How long are you staying in Masai Mara? ..... (days)

4. What are the names of camps/lodges that you will stay in during your visit to Masai Mara?
   1. _____
   2. _____
   3. _____
   4. _____

5. Are you aware that there regulations governing visitors in Masai Mara National Reserve? Yes ___ No ___ (Please tick). If 'yes', how did you learn about them?

Source	**Please tick or specify**
Organised talks	
Materials in the room	
Notice boards	
Pamphlets	
Entry tickets	
Other (Please specify)	

6. What is the maximum speed limit while driving in the National Reserve? (Please tick one) 20 Kph ____ 40 Kph ____ 50 Kph ____ 60 Kph _____ 80 Kph ____

7. If you were watching an animal and it started walking away, what are you supposed to do? (Please tick one) Climb on top of the vehicle to get a better view _____ Let it walk away ____ Follow it _____ Sound the horn to attract its attention ____ Block its way _____.

8. When watching animals, what distance from the animal are you supposed to keep? (Please tick one). At most 20 m. ____ At least 50 m. _____ At least 100 m. _____ As close as possible _____.

9. One of the regulations governing visitor activities in Masai Mara is not to drive off the road. Do you think this is a good rule? Yes ___ No ____. Why do you think this rule is in place? _____
_____

10. If you were to see an animal that you really wanted to get a picture of, would you ask your driver or drive off the track to get closer to it if it were a bit far from the road, (Please tick) Yes __ No __.

11. What form(s) of transportation did you use to get to the reserve and to travel around it?
(Please Tick)

Transport mode	*Get to the reserve*	*Around the reserve*
Private auto/ Rental car		
Overland truck		
Matatu/Public transport		
Aeroplane		
Commercial tour bus		
Hot air balloon		
Lodge/Camp vehicle		
Other		

12. How many game drives will you have during your stay in Masai Mara?
Morning _____ Afternoon _____ Full day _____

13. Which of the following best describes you? (Please tick one)
Travelling as part of a package _____ Travelling Independently _____. If package, what is the name of the tour company? _____

Could you now please give me some details about yourself.

Age (Please tick)

Less than 14	15-24	25-34	35-44	45-54	55-64	65-74	Above 75

Sex (Please tick) Male _____ Female _____

Nationality _____

Number of people in your group _____

Appendix 2: Questionnaire administered to driver guides

Date: (Day:_____Month:_____Year_____)

We are undertaking a study to assess tourism in Masai Mara. Could you please spare some time to answer a few questions about your visit to Masai Mara? Please just give us your opinions and your answers will be treated in confidence. Thank you very much for your help.

1. What company do you belong to? _____

2. For how long have you been working with this company? _____

3. What sort of training have you undergone and where were you trained?

Training	**Have you trained**	**Where trained**
Natural history/ Guiding	Yes ____ No ___	
Foreign languages	Yes ____ No ___	
Visitor behaviour/ Regulations	Yes ____ No ___	

4. Does your company organise any training or workshops for you? Yes ___ No ___ If yes, on what?
_____
_____

5. How often do you come to Mara? (Please tick) First time ___ About once a week ___ About once a month ___ About twice a year ___ Once a year ____

6. Are you aware of the animal and habitat protection rules in the Mara? Yes ___ No ___ If yes how did you find out about them? _____
_____

7. What do you think about these rules? *Please choose one from the following.*
   1. Very bad 2. Bad 3. Neither good or bad
   4. Good 5. Very good 6. Don't know

8. What is the maximum speed limit while driving in the National Reserve? (Please tick one) 20 Kph ____ 40 Kph ____ 50 Kph ____ 60 Kph _____ 80 Kph ____

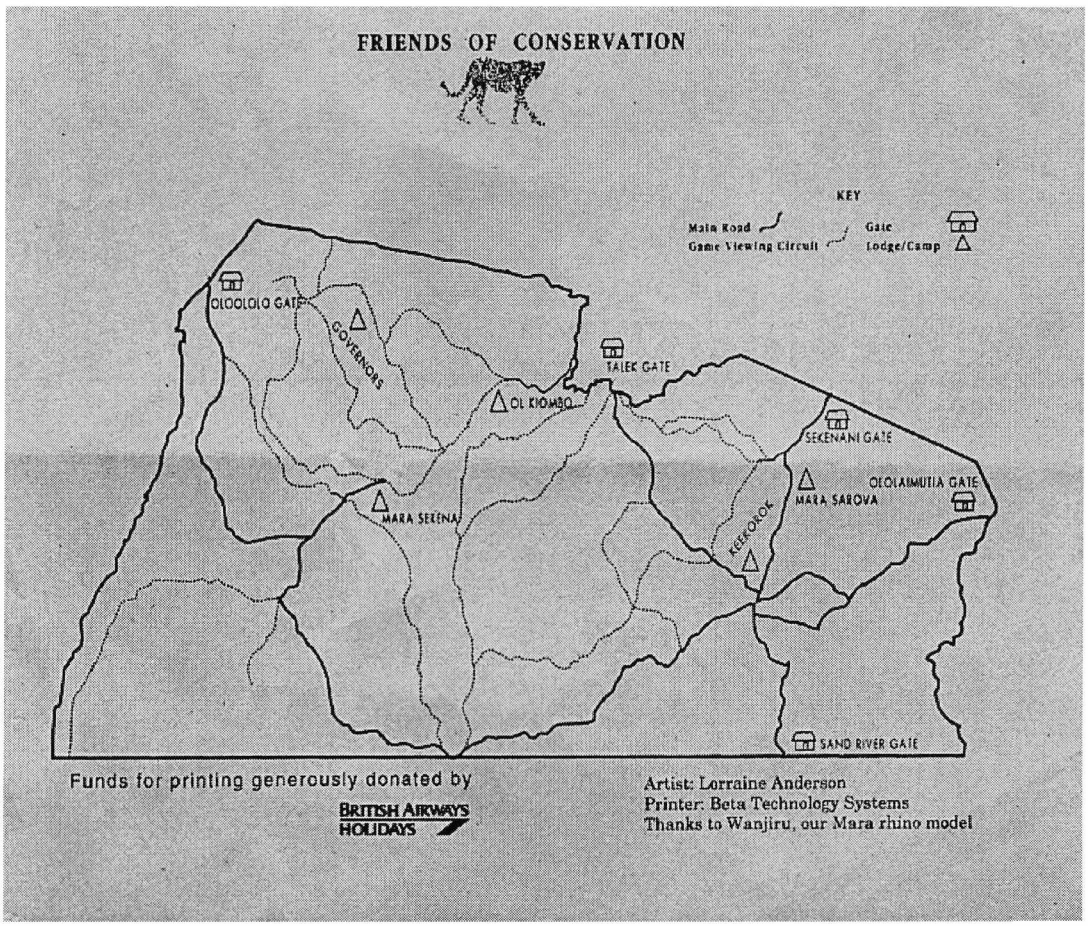
9. If you were watching an animal and it started walking away, what are you supposed to do? (Please tick one) Climb on top of the vehicle to get a better view _____ Let it walk away ____ Follow it _____ Sound the horn to attract its attention ____ Block its way _____.

10. When watching animals, what distance from the animal are you supposed to keep? (Please tick one). At least 20 m. ____ At least 50 m. _____ At least 100 m. _____ As close as possible _____.

11. One of the regulations governing visitor activities in Masai Mara is not to drive off the road. Do you think this is a good rule? Yes ___ No ____. Why do you think this rule is in place? _____
_____

12. Do you have tourists who ask you to drive off the road? Yes __ No __ If yes, would you comply? Yes ___ No ___

Appendix 3: The official road map of Masai Mara National Reserve as contained in the regulations pamphlet



Appendix 4: Masai Mara National Reserve rules and regulations

Dear Mara Visitor,

On behalf of the Government of Kenya, Narok and Trans Mara County Councils, my staff and I heartily welcome you to the Masai Mara National Reserve.

Masai Mara is one of the fifty seven conservation areas in Kenya which comprise approximately 7.5% of the nation's land area. The Reserve has been widely acclaimed and variously described as "The Jewel of Kenya", "A Paradise and an Eden never lost", "A land which has managed to enshrine for the space-age the wonderment of a pristine wilderness."

We want your stay to be as memorable and adventurous as possible. We hope you fulfill your dream of observing and photographing the Big Five (lion, leopard, buffalo, rhino and elephant) as well as plains game and the tremendous diversity of bird life in the Reserve.

Please help us to conserve this area for the generations to come by strictly observing the following regulations.

James Sindiyo, Senior Warden, Masai Mara National Reserve, August 1996

COMPOUNDABLE OFFENCES

❖ **Driving off the road:**

Section 4 (1) The .. Warden may, ... as [he] may consider necessary for the protection of the animals or vegetable life therein, or for the safety of the public or for the protection of any road, or for climatic reasons -

(a) Close to visitors the whole or any portion of the Reserve including a road or any part thereof;

(b) Prohibit any class or kind of traffic, or travel or vehicle from any area other than a road ... A map showing the main roads, secondary roads, and game viewing circuits is available on the back page of the Masai Mara National Reserve regulations. Only those routes noted are approved for traffic.

❖ **Animal Harassment and Disturbance:**

Section 6 (1): Any visitor who, without permission of the Warden, while within the Reserve disturbs any animal, shall be guilty of an offence against these By-Laws.

Section 6 (2): For the purpose of this By-Law, any visitor who intentionally approaches or follows any animal, or makes any sudden movement or noise or flashes a light, or does anything else in such a manner to cause an animal to move away from where it is, or speed, or to become frightened or to stampede shall be deemed to have disturbed an animal.

Each of the above infractions carries a fine of KSh. 2,000, payable at the time the citation is written. A Warden has been empowered by the Reserve management to explain the offence to the driver or passenger and immediately issue a citation and collect a fine for any or all of the violations. In case of inability to pay the fine or any dispute, the driver will be taken to the Headquarters and bonded to appear in a court of law.

- **Time:** Allow plenty of time to enter and leave the Reserve. All gates open at 6.30 AM and close at 7.00 PM. No exceptions can be made.
- **Driving off road:** Keep to the roads or well-defined tracks and do not cut, break, or drive over vegetation. Driving off the tracks destroys vegetation in the Reserve. The scenery and habitats are as important as the animals. Refer to the official map of the Reserve as contained in the Mara Regulations pamphlet. This offence carries a severe penalty.
- **Animal Disturbance:** Do not go too close to animals. Do not expose yourself by standing or sitting on the roof or roof rack or by hanging out of the windows. Do not follow the animals when they start to move away. Do your utmost not to disturb the wildlife. Radios and cassette recorders are forbidden in the Reserve. Do not sound your horn, bang on your car or startle the wildlife in any way. Any of these offences carry a fine.
- **Harassment:** Keep a distance of 20 metres from the animal. About five vehicles can view an animal at any one time at this distance. If there are 5 vehicles already, wait for your turn. Those viewing the animal should not stay more than 10 minutes to give others a chance. Your courtesy will always be appreciated.
- **Speed:** Do not exceed the speed limit of 50 kph. Strictly observe this speed limit. Wild animals always have the right-of-way.
- **Cheetah Alert:** Cheetahs only hunt during the day. They are very sensitive to noise and interference by vehicles. When surrounded by vehicles, they are unable to hunt.
- **Removal of items from the Reserve:** Do not collect or remove bones, skins, horns, teeth, hair, feathers, eggs, rocks, plants, seeds, animal cadavers, nests, or shells. Live mammals, insects, birds and reptiles must never be touched or removed from the Reserve. Firewood collection is strictly prohibited.
- **Litter:** Do not leave litter in the Reserve. Keep it in your car until you can dispose of it properly. This applies especially to film cases, cigarette packets, water bottles and lunch boxes.
- **Fire:** Do not light or cause fires. Do not throw out any burning objects; a lit cigarette may lead to the death and suffering of many animals.
- **Pets:** Do not take any domestic animals or pets into the Reserve. The area is for wild animals only.
- **Safety:** Please stay in your vehicle and do not get out during a game drive. Remember that these are wild animals and they can be dangerous.

FEEL FREE TO VISIT THE WARDEN-IN-CHARGE AT ANY OFFICE OR GATE OF THE RESERVE TO DISCUSS THE MARA OR TO ASK ANY QUESTIONS WHICH MAY ARISE. THANK YOU.

This pamphlet is sponsored by the Friends of Conservation,
P.O Box 74901, Nairobi, Kenya

For more information contact: Narok County Council,
P.O Box 19, Narok, Kenya

"THERE WILL NOT BE A SECOND CHANCE"