Knowledge and Attitudes of South African Stakeholders regarding Conservation of the African penguin (*Spheniscus demersus*)

By

Takdeera Lewis

Submitted in partial fulfilment in accordance with the requirements for the degree.

MSc Wildlife Health, Ecology and Management

In the Faculty of Veterinary Science

University of Pretoria

April 2023

Supervisor

Professor D. Abernethy

Co-supervisors

Dr K. Ludynia and Dr R. Burroughs

DECLARATION

I, Takdeera Lewis declare that the thesis/ dissertation, which I hereby submit for the Master of Science degree at the University of Pretoria, is my own work and has not previously been submitted previously for a degree at this or any other tertiary institution.

_____

Takdeera Lewis

ACKNOWLEDGEMENTS

Firstly, I would like to thank the Almighty for always guiding me in the directions I have taken with my life. For granting me the ability, motivation, and courage to complete this thesis and for blessing me with everything that I have.

To my parents, Ruweida and Lukmaan Shukran for always supporting my dreams and passions, for always helping me out at any time that I have needed your help and for being wonderful grandparents to my cats and sacrificing so much for us.

To my wonderful sister and best friend, Iman thank you for always listening to me and supporting me.

I would like to express my heartfelt gratitude to my supervisor, Prof Darrell Abernethy. This thesis journey has been a challenging one to say the least, so thank you for your support, invaluable insights, and absolute passion for your work. I am in awe of your dedication to making a difference. Thank you for your role in having me meet wonderful like-minded conservation people from around the world and working with wonderful species. Thank you for making a border of me and thank you for being a wonderful mentor.

To Dr. Katta Ludynia for your invaluable guidance, and exceptional editing skills throughout the process of reading my work. I would like to think that your expert insights and constructive feedback have hopefully helped me improve my writing and research skills.

Thank you to Dr. Richard Burroughs for generously lending your time to read and provide invaluable feedback on my work. I am also grateful for the introduction to "People and Parks", which has been a major source of inspiration for undertaking this project.

To Charles America, thank you for your positivity and willingness to share your life experiences with me. Even though your experience only made up a small part of my work, I'm incredibly grateful for your openness and generosity in sharing it. I'm thankful for your introduction to other fisherfolk who were able to provide valuable insights and perspectives. Your contributions have been invaluable, and I feel lucky to have had the opportunity to learn from you.

Table of Contents

DEDICATION

I would like to acknowledge the Black and Coloured fishing communities in South Africa who inspired a part of this research. Thank you for all you have done and for your resilience in continuing the fight.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AP	African penguin
AP-BMP	African penguin Biodiversity Management Plan
DFFE	Department of Forestry, Fisheries, and the Environment
KAP	Knowledge Attitudes and Practices
MPA	Marine Protected Area
SANCCOB	Southern African Foundation for the Conservation of Coastal Birds
TEK	Traditional ecological knowledge
WWF-SA	World Wide Fund for Nature - South Africa

ABSTRACT

The population of the African penguins (*Spheniscus demersus)* (AP) has declined by more than 97% in the last century and continues to face a wide range of threats. The most prominent threat remains food shortages due to a variable distribution of anchovy (*Engraulis capensis)* and sardine (*Sardinops sagax)* in the environment and competition with purse seine fisheries. South Africa is home to 77% of the total population of African penguins and has developed a Biodiversity Management Plan (BMP) for the species that guides conservation actions with the objective of halting the decline. The AP-BMP has highlighted the need for coordinated research action between seabird working groups. Even though the species breeds across only two provinces in South Africa, it holds a wide range of intersecting social, political, environmental, and economic issues, therefore, constituting a comprehensive group of stakeholders in African penguin conservation. The main objective of this study was to assess the variable knowledge and attitudes among different stakeholders involved in the conservation, management, and policy of AP's. Stakeholders included members of the public at varying distances from colonies, fishers and specialist stakeholders involved in research and policy pertaining to African penguin management. A survey of 376 people, using online and in-person questionnaires was conducted between August and October 2021. Four stakeholder groups were surveyed: people living within five kilometres of two land-based AP colonies and those living further away; people involved in the fishing industry and people with specialist knowledge of AP's. The surveys collected demographic information, knowledge and general attitudes on AP conservation and attitudes towards fishing measures. The specialist survey gathered attitudes towards the current strategies in place to halt the decline and the challenges and priorities needed to conserve the African penguin. A mixed method (quantitative and qualitative) analysis was performed on the data. Bivariate analysis (X^2) was used for the knowledge response and qualitative and descriptive analysis including

1

content analysis was used to dissect attitudes and open-ended questions. High knowledge was reported in 33.5% (n= 119 out of 236) of the study population and significant differences were reported for people living more than 5km from colonies and for the age, income, and distance categories and people who observed penguins in the wild. Approximately 66.4% (n= 250 out of 376) of the study population reported an interest in learning more. Positive attitudes were reported in 83.1% (n = 295 out of 355) of the population. However, only 56.3% (200 out of 355) of the study population reported positive attitudes pertaining to conservation laws and policies, the regulatory authorities, and marine protected areas. The least positive attitudes toward conservation laws and policies and MPA were noted by fishers 37.4% (n= 9 out of 23). Total allowable bycatch and area restrictions were viewed as the most negative fishing measure implemented in the fishing industry and closed seasons and monitoring and or record-keeping were most favoured by fishers. Researchers and policymakers differed on whether there was sufficient knowledge on the current state of the decline. However, all felt more action is needed to halt the decline and only 52.3% (n= 11 out of 21) felt the AP-BMP goal to increase breeding pairs by >5% above the 2018 estimate is achievable. The major priorities listed by specialist stakeholders were MPAs, fisheries regulations, AP health studies and the highest political intervention, followed by reduced human interference, stakeholder participation, further research, environmental education, climate change mitigation and the improvement of breeding colonies. A moderate proportion of the study population were aware of the conservation issues pertaining to the African penguin. The mode of information and its access to the population are good but domain-specific initiatives may be adopted to improve knowledge and attitudes and likely influence conservation behaviour. Despite the limitations, the findings of this study present valuable information about the knowledge and attitudes among local and specialist

stakeholder groups of African penguin conservation and can be used to guide policy and management.

INTRODUCTION

The African penguin (*Spheniscus dermersus)* is endemic to the Benguela upwelling ecosystem and can be found breeding in 27 sites between Northern Namibia and the Eastern Cape in South Africa (DEA 2018). Migrant birds have been observed in KwaZulu-Natal, further east of breeding colonies in the Eastern Cape. Non-breeding birds have been recorded in Mozambique and as far as Gabon. (Birdlife International 2021). The South African population accounts for 77% of the total breeding population, presently breeding on 12 islands and 2 mainland colonies. The last count recorded in South Africa revealed as few as 10,300 breeding pairs in 2021(DFFE unpubl. data), a further decline from 13,300 pairs in 2019. The last count undertaken in Namibia was in 2015 and yielded 5,800 breeding pairs (Birdlife International 2021). The African penguin population has witnessed the most drastic decline during the 20th century (Kemper 2006) due to a depletion of fish stock by commercial fishing, varying distribution of prey species and large-scale human activities such as egg collection and guano removal (Birdlife International 2021). Today the species is listed as Endangered by the International Union for the Conservation of Nature (IUCN 2022). Predation by land, aerial and ocean predators, climate change, seismic activity, and development, a shift in prey species, competition with purse-seine fisheries, human disturbance, diseases, pollution, and catastrophic weather events are all contributing factors threatening the survival of the species (DEA 2018, Birdlife International 2018). The African penguin holds significant ecological and economic value, and it also represents a unique African heritage that necessitates urgent and collaborative efforts for its protection and conservation. While acting as a proxy of ecosystem health and providing significant

ecotourism benefits, the loss of penguins will have immeasurable effects on biodiversity and the economy.

The role of people is pertinent to the conservation of the African penguin. Conservation scientists and people working with African penguins help identify threats and advocate for improved conservation measures and policies to be developed to protect the species. The managing authorities and scientists work collaboratively to mitigate ongoing threats at colonies that include oiled response and preparedness, disease outbreaks, improving breeding habitat, providing solutions to counteract extreme climatic events, controlling predators, limiting human disturbance and rehabilitating sick and injured penguins for release back into the wild (SANCCOB; https://sanccob.co.za/ & DEA 2013).

The most alarming threat facing African penguins is a lack of food availability as a result of a highly dynamic prey species and competition with the commercial purse seine fishing industry. The Department of Forestry, Fisheries, and the Environment (DFFE) has appointed seabird and fishing working groups to present proposals with regard to the future state of fishing closures around the main penguin breeding colonies in South Africa (SANCCOB; https://sanccob.co.za/). SANCCOB, BirdLife South Africa, WWF-SA and renowned seabird researchers advocate for the cessation of fishing around the colonies, underpinned by research that has revealed positive associations with chick survival and condition under experimental fishing closures (Sherley *et al* 2014 & Sherley *et al* 2018).

The South African pelagic fishing industry has opposed the recommendations to continue the closures of African Penguin Island, claiming that it would have a significant impact on their business and livelihoods. The industry argues that the closures are based on limited scientific evidence to suggest that the impact would have a significant effect on the annual African

4

penguin growth rate. Additional suggestions require reliable multi-species models to determine the inference of commercial fishing on prey availability to penguins. (Butterworth 2020). Despite the lack of indisputable evidence available, a precautionary approach is advised by the scientific community to protect a rapidly declining species of seabirds.

As protected area management has expanded and strongly intersected politics, scientific research and social aspects, the literature on social aspects has shown considerable growth. The literature has indicated that local people appear to be at the centre of protected area management (Dhanda 2015). Strong support from local people influences the outcome and subsequent success of the protected area. Thus, exploring local people's perceptions and attitudes towards protected area management is pertinent.

Over the years African penguins have established colonies close to human settlements. At Boulders the colony developed as first-time breeders arrived and began to settle (Pichegru *et al* 2016, Peterson *et al* 2006 & Ragaller & Jarre 2016). Property and developments have since expanded around the penguin breeding colonies and have led to a multitude of distinct challenges that penguins and residents at mainland colonies face (Peterson *et al* 2006). Penguins have expanded and nested in people's backyards and residents have claimed they are noisy and cause a bad smell, penguins crossing streets has increased the incidence of being run over and residents have had to adjust to restricted user access to beach amenities. Moreover, during the peak holiday season, residents have to manage an increased number of tourists. On the other hand, the penguin colony has become a significant attraction for tourists, generating income for local businesses such as restaurants, shops, and tour operators and has led to an increase in property values and rental income, boosting the local economy. The conservation of the African penguin and its habitat is crucial for the sustainable development of the Simon's Town community (Van Zyl 2014).

Public opinion is a powerful tool for political change, as popular opinion dominates mainstream media and it holds a strong potential to influence mass groups of people and places pressure on policymakers to re-enact change. The response to public outcry from the government is crucial for the systems in place to demonstrate political integrity and rigidity.

A good example of this is the mass public petitioning observed against a major petroleum stakeholder, Shell, who intended to initiate gas and oil exploration in December 2021 off the West Coast of South Africa. The seismic survey was predicted to have damaging effects on marine life cycles and the fishing industry, small and commercial fishers alike. Public opposition included boycotting shell petrol stations, protests and a petition that gathered 291 000 signatures. This led to a court ruling to cease the oil and gas exploration contract on the West Coast (https://theconversation.com).

The rationale for the study

The African penguin population experienced a rapid decline throughout the 20th century due to various factors. One significant factor is the increased pelagic fishing activities in the vicinity of the penguin breeding colonies, resulting in a decreased availability of forage fish in these areas (Sherley et al., 2020). Furthermore, human activity around the mainland breeding colonies of the African penguin has intensified over time, leading to a rise in human activities that directly affect the species. This includes more human exposure through research and tourism , an increase in human waste pollution, climate change effects and road traffic accidents, and the risk of predation by domestic animals like dogs and cats (Miller 2020 & Vanstreels et al., 2019). The resulting human-wildlife conflicts will continue to contribute to the decline in the population of the African penguin. These factors justify the involvement of stakeholders in addressing the conservation needs of this species. Therefore,

prioritizing stakeholder engagement and implementing species-specific actions are crucial steps in mitigating the threats faced by the African penguin.

Aim of study

The aim of the study was to examine stakeholder engagement as essential priorities for addressing the conservation needs of African penguin species. Specifically, this research focuses on the role of local people in South Africa as a vital stakeholder group for penguin management and conservation. The overall aim of the study was to assess the knowledge and perception of different stakeholders regarding the conservation of African penguins. Specific objectives were to determine:

1. The level of awareness and general attitudes among stakeholders in South Africa concerning the African penguin plight, based on their proximity to mainland colonies and selected occupations.
2. The general attitudes/perceptions of specialist groups regarding current strategies to halt the decline in African penguins.
3. The priorities/challenges needed in the conservation of African penguins, are based on stakeholders with specialist knowledge or experience.

1. LITERATURE REVIEW

1.2 Breeding of the African penguin

Seabirds continue to be the most threatened group of birds with half of the entire species recognized as Vulnerable or Endangered (Birdlife International 2021). The African penguin (*Spheniscus demersus*) and the Galapagos penguin (*Spheniscus mendiculus)* both from the genus *Spheniscus* are listed as Endangered by the IUCN (IUCN 2020).

The African penguin is the only penguin of the genus *Spheniscus* that breeds in Africa and can be found breeding throughout the year with peak months fluctuating locally between regions. African penguins, on average, begin to breed between the ages of 4 and 6 years old (Whittington et al 2005) and normally lay two eggs, at times only one egg and can seldom be as much as three eggs (DEA 2018). Both the male and female birds will alternate incubating the eggs, a period which lasts around 40 days. Thereafter, adults will alternate daily with foraging and rearing of chicks. Chicks will usually start congregating in creches at about 26-30 days, where they will be left unguarded while adults are away foraging at sea. The conditions during the rearing period determine the survival from hatchlings to fledglings and include factors such as nesting conditions available (open vs burrows) which in turn determines the occurrence of predation, burrow collapse and heat stress. Other factors include drowning and starvation. After successful rearing, fledglings will flee nests and will disperse from colonies in their first year at sea, often travelling several hundred kilometres (Sherley et al. 2017) before selecting breeding sites. Penguins generally show a strong inclination towards settling at natal colonies although birds can also start breeding at non-natal colonies (Sherley *et al* 2014, Birdlife International 2021).

Birds will leave colonies and travel far distances to forage optimally and fatten up between pre-moulting and post-moulting recovery periods. They can be found foraging independently

or collectively within a large group (Birdlife International 2021). McInnes *et al* 2017 suggested that catch per unit effort is improved during group foraging. This is a specialist penguin hunting adaptation that will impact survival as threats continue to target the populations and the subsequent success of hunting associated with group foraging. Moulting is the process of replacing the plumage and assists birds with waterproofing when at sea (Stonehouse 1967, Waller 2011). Moult in African penguins takes a fairly short period (13-40 days) when compared to other birds and the process comes at a great energy expense to the bird (Stonehouse 1967) as moulting birds cannot access the water to forage and are tied to land, relying on their reserves. Moulting can be interrupted before it is completed when birds do not accumulate enough energy reserves prior to moulting. It can cause the bird to lose 40% of its pre-moult mass (Cooper 1978, DEA 2018). This is a risk to the birds as they cannot forage at sea when their plumage is compromised and can result in mortalities (Cooper 1978). Moulting in South Africa generally takes place from September to January and has been observed to be somewhat synchronous between birds. In Namibia, birds tend to moult between August and March (Crawford et al. 2006).

During the pre-moulting fattening period the birds will go out to sea for about five weeks and accumulate fat reserves gaining up to 31% of their normal body weight. During the moulting process birds will shedand replace old feathers with new ones.During this time, their feathers are not yet waterproof, rendering them unable to forage in the sea the birds are unable to forage at sea. The post-moult recovery period phase lasts for around six weeks and involves the birds returning to the sea to replenish the fat reserves lost during moulting. This period of recovery prepares the penguins for the upcoming breeding season (BirdLife International 2013).

Therefore discerning the time and location of pre-moulting fattening and post-moult recovery are important factors for consideration in penguin conservation and management as this affects penguin survival (Waller 2011).

1.3 Population trends of the African Penguin

The African penguin breeds within the Benguela upwelling ecosystem. The species can be found breeding from Hollam's Bird Island in central Namibia to Bird Island in the Eastern Cape along the coast of South Africa. In South Africa, the African penguin has bred in 19 locations between the Western Cape and the Eastern Cape, currently extant at only 16 locations (14 coastal colonies and two mainland colonies). As the penguin population has declined, it has witnessed the extinction of colonies at Bird Island in Lamberts Bay (DEA 2013), De Hoop reserve, and Geyser Island. Although the South African population has seen the extinction of African penguins at three locations, it still accounts for 77% of the complete breeding population of the species (DEA 2018)**.** The management of the colonies is overseen by relevant management authorities like South African National Parks, City of Cape Town, CapeNature and the Robben Island Museum.
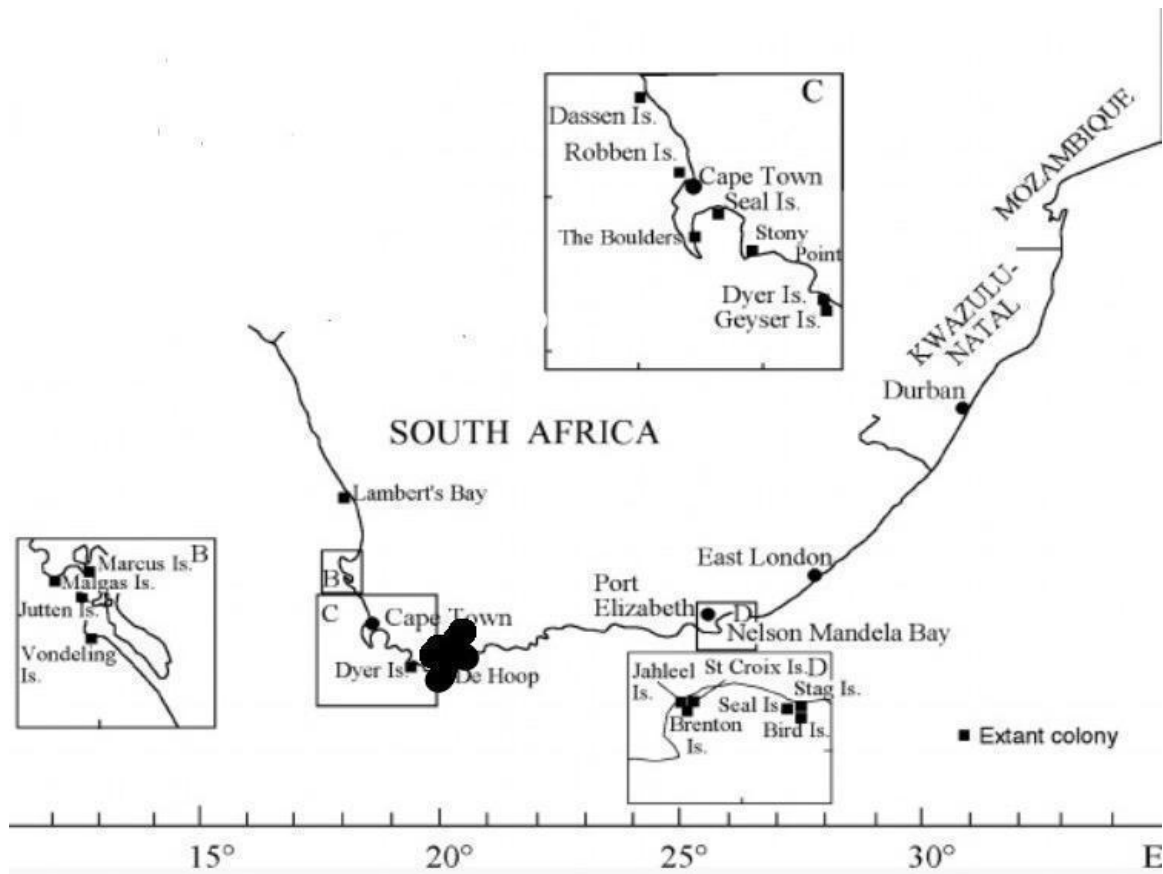
Figure 1. Crawford et al. (2007). Map of African penguin colonies in South Africa. De Hoop colony marked recently extinct. [map]. Scale not given. An altered carrying capacity of the Benguela upwelling ecosystem for African penguins (*Spheniscus demersus*). ICES Journal of Marine Science, 64: 570–576

Anecdotal evidence and photography from the 1930s indicate that a decline was likely evident before an official census was conducted in both the South African and Namibian populations. The global population of African penguins is estimated to be at 1.5-3.0 million birds at the beginning of the 20th century (Crawford, Underhill *et al.* 2007). Namibia has witnessed a downward trend in the population since records of its first count in the 1950's (Kemper 2006) following a reduction of approximately 72% during the second half of the 20th century (Kemper, Roux *et al.* 2001). The South African population declined by 250,000 pairs at the start of the 20th century. Following that, the total population drastically declined and was estimated to be at 141,000 pairs by 1956/1957. In South Africa, stable populations were observed between 1950-1970 even though Dassen Island saw an estimated decline of

115, 000 birds, the decline was balanced by expansions in the population at Dyer Island and Algoa Bay. Thereafter during the 1978/1979 count more evidence of a decline was evident when a census of the total population revealed a count of 70 000 breeding pairs. A further population decline was observed in 1993 at 44,000 breeding pairs until it increased for a short period between 1999/2001 where 63,000 pairs were counted. Further counts revealed 57,000 pairs in 2004/05, and 36,000 pairs in 2006/07. The total population between Namibia and South Africa then witnessed a substantial decrease to 26,000 pairs in 2009, the lowest number recorded causing the IUCN status of the penguin to be down listed from Vulnerable to Endangered (Crawford, Altwegg *et al.* 2011, DEA 2018, Birdlife International 2018). Research priorities shifted to investigate the decline and results were coincident with a decrease in sardine (*Sardinops sagax)* abundance. The population continued to plummet and the most recent estimates from 2015 approximates 5,700-5,800 pairs for the Namibian population (MFMR *unpubl.data*). Over the last 30 years the Namibian population has shown a slower decline compared to populations in South Africa along with more vulnerability to stochastic events at lower population levels. The last recorded count in South Africa yielded 10,300 breeding pairs in 2021 (DFFE unpublished data) down from 13,300 pairs in 2019 (Birdlife International 2018). In the last 20 years, there has been an approximate 10% annual rate of decline for colonies along the West Coast of South Africa and a relatively stable low population trend observed in the South- West coast region. The Eastern Cape has witnessed the slowest decline in South Africa and coupled with the eastward movement of the main prey source for the African penguin, approximately 50% of the South African penguin population now occurs in the Eastern Cape (Sherley *et al* 2020). However, a recent crash at the St Croix colony in Algoa Bay with a decline of over 70% in the last six years may be linked to increased ship traffic and underwater noise (Pichegru et al. 2022).

1.4 African penguins as ecological indicators

Seabirds provide important information about the dynamics of the marine ecosystem in which they forage. The nature of African penguins, as marine top-order predators and with wide-ranging foraging efforts outside of the breeding season and more centrally focused during the breeding season, allows the species to be an ideal candidate as a marine sentinel. African penguins have a narrower foraging range compared to that of other seabirds due to their flightless ability which is even further constrained during the breeding season. African penguins feed on pelagic sardines and anchovy at the sub-trophic level in the Benguela upwelling ecosystem. Pelagic fish stock abundance and distribution in the Benguela ecosystem are shaped by a multitude of systemic factors like hydrography, climate, life cycles, migratory patterns (Coetzee, de Moor et al. 2018) and commercial fisheries (Durant, Hjermann et al. 2009, Campbell 2016) that seabird populations ultimately react to. As a result of the complex oceanographic and social interlinking of this dynamic system, it is difficult to predict the abundance of local pelagic fish stocks from seabird population responses (Durant, Hjermann et al. 2009, Robinson 2013, Campbell 2016). The variation in prey distribution will affect subsequent foraging behaviour, effort, and success and will not be able to reflect changes in seabirds thus seabird indicators cannot be a reliable proxy of fish availability (Montevecchi 1993, Durant, Hjermann et al. 2009).

Seabirds are reliable indicators of pollution present in the marine environment, which tends to build up at trophic levels and thus accumulate in top predators such as penguins. African penguins are able to provide evidence through research sampling that can determine the presence of pollution spatially across regions and ascertain changes in the level of pollution over time (Furness 1993). When using seabirds as indicators for pollution, species behaviour is an important tool to understand when interpreting the distribution of pollution, as African penguins are more localized in their environments than other seabirds, they provide a rather manageable method of pollution presence. Seabirds are highly sensitive to oil pollution, and

it has detrimental effects at both individual and population levels. The presence of oiled seabirds serves as an indicator of oil pollution at sea and provides valuable data for damage assessment (Burger and Gochfeld 2001). Seabirds provide data on the variation of oil pollution at a temporal scale and currently fingerprinting methods are available to trace oil back to its source, which provides a functional method for prosecution for pollution (Furness and Camphuysen 1997). Most penguin colonies are situated close to existing or planned large shipping ports and this has caused an increase in oiled penguins since the 1990s. Birds that undergo rehabilitation after oil spills and recovery experience challenges with lower fledgling success compared to birds that do not experience oiling. This could be a result of many factors associated with the toxicity of oiling, extended periods in captivity and the period between oiling and washing (Barham *et al* 2007, Wolfaardt *et al* 2008).

1.5 African penguins and eco-tourism value

Ecotourism produces a unique opportunity for wildlife to sustain itself and make a great contribution to surrounding socio-economic development. The two penguin mainland colonies, Boulders Beach (Simon's Town) and Stony Point (Betty's Bay), both in Western Cape, South Africa are both popular tourist destinations. The Boulders Beach colony is situated in Simons Town and recent updates estimated an annual total expenditure of nearly R311 million as a result of international and local visitors. (Van Zyl and Kinghorn 2018). It became the world's most visited penguin colony and has a predicted value of R6.78 billion estimated over the next 30 years (Van Zyl and Kinghorn 2018). Visitor numbers have tripled from 310,000 visitors in 2006 to 930,000 in 2017. The success of the colony has aided in upholding the organisation and the conservation of South Africa's national parks (Miller 2020). Additionally, it has had immediate socio-economic effects on the surrounding area. There are approximately 885 jobs in all parts of Cape Town, because of the colony. Not far behind the success of the Simons Town colony is the Stony Point colony in Bettys Bay which

has seen 77 500 visitors annually (2010-2019, CapeNature, unpub. data). The restaurant associated with the colony is operated by the Mooiuitsig community and is pertinent to the immediate economic development of the local community which has provided job opportunities to residents. Planned upgrades can be expected for the Stony Point colony which will increase visitor numbers and can be expected to boost the local economy (McInnes, Waller et al. 2020). Each colony adds an aesthetic value to the Western Cape while also adding to the individual branding of Simons Town and Bettys Bay. The eco-tourism value associated with the colonies enhances the surrounding property value and adds to the heritage and socio-cultural values of the area.

It is apparent that the residence of African penguins in mainland colonies and the associated eco-tourism value gives rise to many beneficial attributes to local communities and beyond. Well-informed management interventions are thus pertinent to the persistence of the species. The disappearance of the African penguin poses a threat to social and economic sustainability at a local, provincial, and regional level.

1.6 Threats

1.6.1. Egg Collection

Historical egg collection was extensive during the start of the 20th century. Birds and eggs were collected and utilized as a food source (Shelton, Crawford et al. 1984). Frost et al (1976) report that eggs were collected for a period of two to five months annually, during the period ranging from 1900-1930. The number of eggs collected required a minimum of 300,000 birds given their annual reproductive capacity. Reports of egg collection at Dassen Island in 1925 were estimated to be around 500 000 (Shelton, Crawford et al. 1984), entirely collected from one island. The commercial collection of eggs was terminated in 1968.

1.6.2. Guano removal

The commercial collection of guano was exploited for use as an industrial fertilizer. The practice began in 1830 and was described to be initially undertaken with both a lack of control and an absence of law (Rand 1950). Many islands were exploited up until 1884 during which it was under the responsibility of private enterprises. Thereafter, the government stepped in and enforced stricter legislation and maximum protection (Rand 1950). The direct exploitation by humans occurred for 150 years and managed to drastically reduce the African penguin population by 90% during the twentieth century (Pichegru 2013). Seabird guano is an important material that is suitable for burrow formation. It ensures safety from aerial predators and protection from heat stress. The latter is possible through the provision of a sustained microclimate, high relative humidity, buffered temperatures, and limited wind exposure. Even though the commercial exploitation of seabird guano has long ceased, it has had lasting effects on the population of African penguins. Lack of suitable nesting material has caused birds to nest on the surface, rendering them susceptible to predation by Kelp gulls (*Larus dominicanus)* and heat stress (Frost, Siegfried et al. 1976). The overall predation of seabirds' chicks and eggs affects breeding success, recruitment, and dispersal (Harris and Wanless 1997, Pichegru 2013). Lei *et al* 2014 compared the microclimatic conditions in artificial nests and found that natural nesting made up of guano burrows provided the best temperature and humidity suitable for successful breeding, cement nests provided more moderate temperatures than fibreglass nesting.

1.6.3. Predation

Cape fur seal

The Cape fur seal (*Arctocephalus pusillus pusillus)* has been well documented for its conspicuous attacks on African penguins and other seabirds like the Cape Gannet (*Morus

16

capensis), Cape Cormorant (*Phalacrocorax capensis)*, Crowned Cormorant (*P. coronatus*)and White-breasted cormorant (*P. carbo)*. Dyer Island is separated 230m from Geyser rock and together they form the Dyer Island group. Geyser rock hosts the largest colony of Cape fur seals in the Western Cape and a small population of African penguins, along with other seabird species, the locality of the seals attracts the White Shark (*Carcharodon carcharias)* as a primary prey species (Wcisel 2013). Johnson et al.,2006 reported that the shark attacks on penguins at Dyer Island could most likely be due to curiosity because of the gentle nature of the bites and proved less of a threat. The Cape fur seal has caused alarming mortalities across the Gannet and cormorant populations on Dyer Island. Estimates reveal a 7% mortality rate by the Cape fur seal (Makhado, Crawford et al. 2013).

;   ;
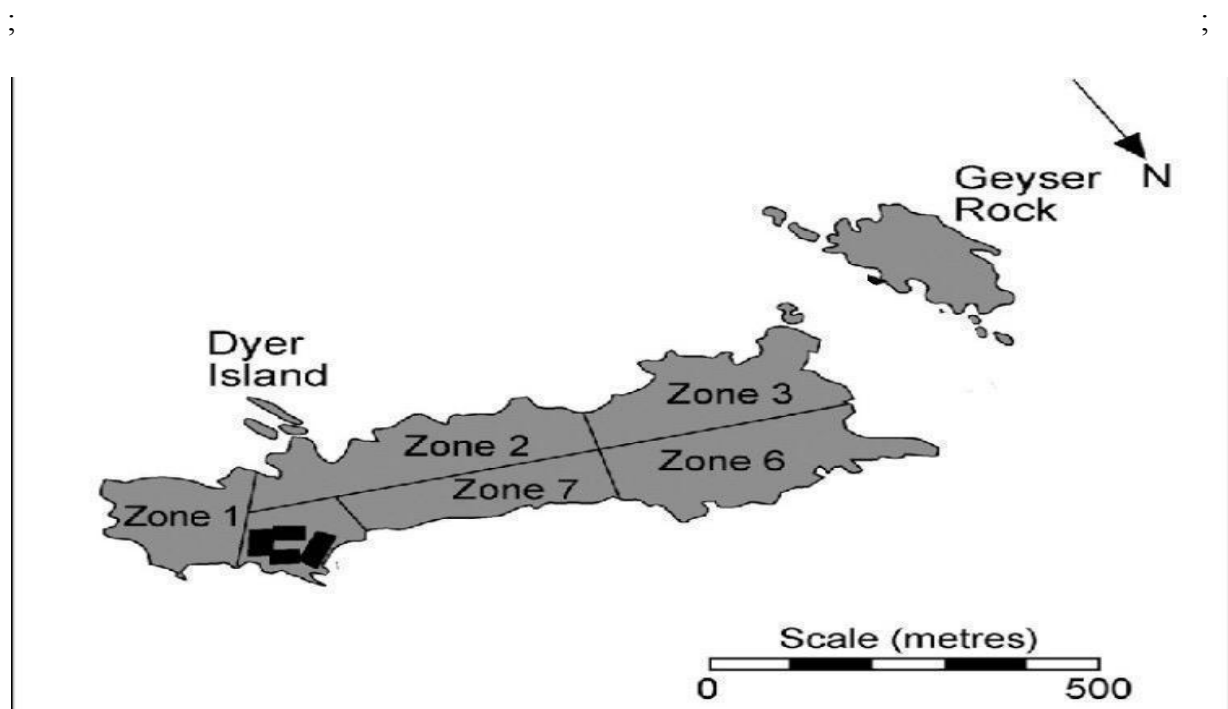
Figure 2: Makhado (2013). Map of Dyer Island and Geyser Rock. [map]. 1: 50 000. An assessment of the impact of predation by Cape fur seals (*Arctocephalus pusillus pusillus)* on seabirds at Dyer Island, South Africa. *Ostrich: Journal of African Ornithology, 84.*

Kelp Gulls

Kelp gulls (*Larus dominicanus)* are listed as Least concern by the IUCN and are observed having an increasing population trend (Birdlife International 2022). It was previously suspected that human activities like fish waste and open refuse tips have made a notable contribution to their population abundance, but recent results studying their foraging behaviour has revealed that they depend less on human activities than previously assumed (Reusch, Suárez et al. 2020). Kelp gulls are known aerial predators of the African penguin and can be observed preying on penguin eggs and chicks in surface nests when the parents have left the nests. This has direct effects on the breeding success and recruitment of the penguin population.

Terrestrial predators

The mainland colonies in South Africa, Boulder's Beach, and Stony Point face isolated threats of terrestrial predators. Identified attacks on penguins are largely due to caracal (*Caracal caraca)l*, leopard (*Panthera pardus)*, domestic dog (*Canis lupus familiaris)* , and Cape grey mongoose (*Galerella pulverulenta)* (Vanstreels, Parsons et al. 2019). The mainland colonies have recently shown favourable population growth numbers however, terrestrial predators can cause significant destruction throughout a population (Vanstreels, Parsons et al. 2019, Miller 2020).

1.6.4. Oil spills

Oil spills cause mortalities amongst seabirds as well as a multitude of detrimental effects. The African penguin is particularly susceptible given the species' flight inability. Oil has an impact on the plumage of the bird as it causes feathers to combine and clump. This interferes with the insulation of the bird and can lead to hypothermia. The ingestion of oil can lead to

ulceration of the mouth, throat, and stomach. In extreme cases, the ingestion of oil can cause significant blood loss (Nel, Crawford et al. 2003, Nel and Whittington 2003, King, Elliott et al. 2020). Oiling has the potential to cause reduced reproduction in de-oiled birds.

1.6.5. Human waste pollution

African penguins, located at higher trophic levels, are good indicators of pollution present in the marine environment. It is widely known that anthropogenic pollution (plastic, glass, nylon) occurs in the ocean, however, the ingestion of plastic and subsequent breakdown into microplastics in marine life has yet to be fully quantified. Vanstreels et al., 2020 found that most penguins researched in their study were females that ingested seashells, possibly to offset calcium intake, in addition to accidentally ingesting discarded anthropogenic waste (Vanstreels, Pichegru et al. 2020).

Marine metal contamination waste in South Africa was reported to be relatively low in global comparison (Wepener and Degger 2012). However, pharmaceutical and industrial chemical compounds have been identified circulating in marine environments, leaving behind traceable amounts in concerning concentrations in marine life caught off the Cape coast (Ojemaye *et al* 2019). The accumulation of contaminants is a result of untreated or badly treated sewage that eventually makes its way into the oceans. Contaminated marine life proves a risk for the marine life itself and humans who consume it (Tijani *et al* 2016). Wild African penguins have reported showing levels of antimicrobial resistance when brought into rehabilitation facilities (David Roberts pers comm). The concentration of pharmaceutical and industrial pollutants is of interest at the higher trophic level for the consequences they might have on population dynamics such as breeding success and overall health.

1.6.6. Seismic, oil and gas exploration

Seismic exploration is a source of underwater noise pollution for marine life and lacks evidence-based impacts. Pichegru et al., 2017 found that penguins avoided areas with seismic activity and subsequently increased foraging efforts. More recent research is focussing on the effects of underwater noise on population trends (Pichegru *et al.* 2022).

South Africa is estimated to have a possible 9 million barrels of oil and 6 trillion cubic feet of gas offshore. Oil and drilling exploration is underway to access resources, projected to contribute significantly to the region's economy by creating jobs and alleviating poverty (https://www.operationphakisa.gov.za/Pages/Home.aspx). A major discovery of oil was found off the South Coast of South Africa.

SANCCOB, lending its conservation expertise as a stakeholder in this project, has identified the project to be a high risk to seabirds in terms of oil spills and pollution (SANCCOB; https://sanccob.co.za/).

Coastal and inshore mining taking place in Namibia has caused sediments to be released into the water, which causes subsequent prey reduction and precludes foraging (Trathan, García‑Borboroglu et al. 2015). Furthermore, sediments can cause temporary land bridges to develop, allowing land predatory access to colonies (Kemper 2006, Trathan, García‑Borboroglu et al. 2015).

1.6.7. Fishing gear pollution

Fishing gear impact on penguins in South Africa has been minimally reported. Many fisheries in South Africa such as trawl and longline fishing do not intercept with the foraging ranges of penguins and thus have negligible reports of penguin mortality (Crawford, Ellenberg et al. 2017). Nonetheless, the bycatch incidence of penguins is thought to be from illegal fishing activity and a lack of independent fishery observers. SANCCOB records from 2013 to 2018

show an increase in the number of seabirds admitted with debris-related injuries, with African penguins being the third most reported species. Fishing-related debris and plastic pieces were the most frequent type of debris impacting seabirds admitted to the centre (Maurer, Ludynia et al. 2018).

1.6.8. Climate change

The impacts of climate change over a larger- scale have shown evidence that affects the breeding phenology of seabirds. A study undertaken on penguins at Dassen island showed that a decrease in the Southern Oscillation Index caused an earlier onset of breeding in penguins. An increase in sea surface temperature at sardine nurseries and spawning grounds resulted in a mismatch between chick-rearing and local prey availability which ultimately caused a decrease in the penguin per capita growth rate (Durant, Crawford et al.2010).

Extreme weather events have led to large-scale abandonments in seabirds in South Africa in recent years, including African penguins, both during heat waves leading to egg and chick abandonments and during cold spills and storm events when nests get flooded (K Ludynia pers com, SANCCOB unpubl data).

1.6.9. Diseases

An extensive assessment was conducted on serological samples of birds at 11 breeding colonies and a rehabilitation centre in 2016. Diseases that were tested for were avian encephalomyelitis virus, avian infectious bronchitis virus, avian reovirus, infectious bursal disease virus, Newcastle disease virus, *Mycoplasma gallisepticum* and *Mycoplasma synoviae.* A total of 68 penguins tested positive for at least one pathogen and babesia was concurrent with other pathogens. Avian influenza antibodies were absent in the samples (Parsons, Gous et al. 2016). In January 2019 a high mortality rate was observed on Halifax Island, Namibia and samples tested positive for Highly Pathogenic Avian Influenza H5N8 that were not

previously observed in the population (Molini, Aikukutu et al. 2020). In 2017, cases of HPAI H5N8 were detected in coastal seabirds in South Africa. Among the positive cases, three endangered seabirds were affected, namely the African penguin (*Spheniscus demersus*), Cape Cormorant (*Phalacrocorax capensis*), and the Cape gannet (*Morus capensis*) (Roberts, Abolnik et al. 2023). This was followed by another outbreak in September 2021 and largely affected endangered Cape cormorants. (SANCCOB; https://sanccob.co.za/). Ecto- haemo and helminth- parasite identification was explored in a 2019 study and results showed that parasite prevalence and load differed between seasons, life stage of penguin (chick vs adult), location (mainland vs island) and nest occupation. The study showed that chicks in mainland colonies were more vulnerable to parasitic infestations during the spring season (Espinaze, Hui et al. 2019).

1.6.10. Human disturbance

The human impact exerted on African penguins' ranges from directly competing with the species for food through fishing activities, mining exploration, and pollution, to visitation and research at colonies. The two mainland colonies in South Africa offer a unique experience for humans to observe and visit the penguins in their natural habitat.

Researchers and colony rangers are required to observe nests throughout the breeding season and assess the condition and survival of all birds including chicks and eggs. This is an essential task undertaken to effectively monitor population dynamics. Mainland colonies are more frequently subject to human presence by both visitors and researchers than island colonies. Research has shown that human tolerance varies with species and between colonies (Van Heezik and Seddon 1990, Seddon, Ellenberg et al. 2008). The response in birds can either be beneficial to populations who can tolerate human presence or birds can exhibit fleeing behaviour that is associated with energetic costs which ultimately affects survival and

reproductive success (Pichegru, Edwards et al. 2016). Pichegru et al., 2018 suggested that the trade-off between the ecotourism benefits of the existing mainland colonies to conservation and the human disturbance that could potentially habituate birds causing them to alleviate mechanisms that leads to lower survival success, granted that it is managed appropriately. This is a more manageable approach than extending ecotourism to new colonies. It is recommended that physiological responses to human disturbance be used as a better indicator of the effects of human disturbance on African penguins (Scheun, Miller et al. 2021).

1.6.11. Competition with fisheries

Food scarcity seems to be the main threat that African penguins presently face. The African penguin feeds mainly on sardine and anchovy in the Benguela upwelling ecosystem. These pelagic species make up 80% (Coetzee, de Moor et al. 2018) of the species targeted by the purse-seine fisheries and are the main prey source for other seabirds such as the Cape cormorant (*Phalacrocorax capensis)* and Cape gannet (*Morus capensis)* (Crawford 2007). It is a challenge to quantify the substantial, natural effects of predation on forage species like sardine and anchovy. It is usually estimated to be much higher on average than the impacts of fishing. However, the impact of the fishing industry in both previous and recent years cannot be disregarded and has contributed to the change in trophic levels. Initially, purse-seine fisheries selected only anchovy for catch and then moved on to sardine off the coast of Namibia and South Africa (Crawford 2007). In Northern Benguela, the purse-seine industry had a significant effect on the collapse of sardine in the mid-1970s while large-scale changes in the ecosystem contributed to stock fluctuations (Kemper 2006, Waller 2011). Followed by a small recuperation in the 1990s until 1995, stocks remained relatively low. Fishing efforts were then diverted to anchovy which saw a collapse in 1996 (Kemper 2006). The diet of the penguin population in Namibia has since been replaced by mainly Bearded goby and Cephalopods (Kemper 2006, Ludynia *et al* 2010), which provides an energetically poor diet

in contrast to the former sardine and anchovy one. In South Africa, regime shifts caused anchovy to replace sardine in the early 1960s. In 1982 sardine biomass was seen increasing and both species peaked in 2003. During this time cooler water temperatures were observed East of the Cape and anchovy spawner stocks shifted on the Aghulas bank (Roy, Van der Lingen *et al*. 2007). Thereafter poor sardine recruitment followed coupled with the changes in the environment which led to lower levels of sardine stock and subsequent decreases in the Total Allowable Catch for the industry. Recent estimates indicate that sardine stocks are depleted, and anchovy is optimal (DEFF (Department of Environment 2020).

The purse-seine fisheries in South Africa are managed by Operation Management Procedure and conduct bi-annual hydroacoustic surveys that provide reliable data required to capture the variable nature in the abundance of pelagic species (DEFF (Department of Environment 2020).

1.7 . Actions to address threats.

1.7.1. Biodiversity Management Plan

In 2013 a Biodiversity Management Plan for the African Penguin (APBMP) was drafted because of the rapid decline in the population. The objectives of the BMP were outlined with the purpose of downlisting the IUCN status of the species from Endangered, to ensure a viable marine population and a sustainable outcome for all that depend on the African penguin. The BMP did not manage to achieve the outlined aims, and this followed the drafting of a 2nd BMP for the African Penguin. The 2nd AP-BMP has highlighted many objectives, all aimed at halting the decline, by addressing the contributing threats and ensuring that the existing populations in the three regions in South Africa persist and maintain a stable status or show increases in their respective populations and that no existing colonies become extinct. Although the second BMP has not yet been gazetted it calls for the

coordination of research, working groups and stakeholder engagement (DEA 2018). The economic and employment benefits derived from the ecotourism of the African penguin is recognized for their value in the blue economy and should thus be maintained and potentially expanded. Decision-making between intergovernmental departments and regional organisations is encouraged for collaborative efforts.

1.7.2. Monitoring and managing authorities.

The presence of terrestrial predators at mainland colonies poses a threat to African penguins. Research centring around the correct identification of the predator and the subsequent predator mitigation measures for the management of the species, especially given the support for the establishment of more mainland colonies was undertaken and should be investigated further (Vanstreels, Parsons et al. 2019). Managing authorities monitors mainland colonies and remove individual predators as soon as attacks are discovered (SANCCOB; https://sanccob.co.za/). The managing authorities offer direct guidelines for visitor approach and prohibit direct contact with penguins. Miller 2020 Investigated urofaecal samples to measure stress levels in African penguins at Stony Point and Robben Island and found that there were no apparent negative effects in the samples measured and thus no negative effects associated with eco-tourism at the Stony Point colony. However, chick condition and breeding success were lower when compared to the Robben Island colony and was thought it could be a result of factors like high nest density, surface nesting, mainland predators and the detection of humans that could likely make birds hesitant when returning to nests. A multi-disciplinary approach is encouraged and further research investigating stress levels at more colonies and over more years (Miller 2020). Furthermore, the managing authorities play an important role in the mitigating conflict at mainland colonies between residents and penguins.

1.7.3. New colony development

Efforts to establish a new colony at the De Hoop nature reserve started in 2018 after the colony was wiped out by a single caracal event in 2003. A predator-proof fence was erected to safeguard the birds and over 160 fledglings have been released between 2021 and 2022. (BirdLife International 2021, SANCCOB). Following the sighting of two chicks, the first breeding attempts of the African penguins that were released as fledglings have been observed to be successful (BirdLife International 2022).

1.7.4. Rehabilitation efforts

The conservation value of de-oiling seabirds was debated to have an insignificant effect at the population level and raised animal welfare concerns as the birds had the potential to suffer long-term effects after release along with low success rates at rehabilitation. However, given the endangered status of the African penguin and its continuous decline, rehabilitation interventions have proven to be invaluable to the species, including the de-oiling of almost 20,000 African penguins in 2000 (Barham, Underhill et al. 2007, Wolfaardt, Underhill et al. 2008) . South African National Foundation for the Conservation of Coastal Seabirds (SANCCOB) is the foremost for centre seabird rehabilitation in South Africa. It is dedicated to rescuing and rehabilitating sick, oiled, and injured seabirds. SANCCOB helps the government develop site-specific oiled wildlife contingency plans, which allows effective responses to oil spills and increases the chances of success (SANCCOB; https://sanccob.co.za/). SANCCOB works alongside various conservation partners and managing authorities and has an active involvement in disease surveillance at colonies.

1.7.5 Marine Protected areas

Marine protected areas are a global, core management strategy for protecting oceans, the ecosystem services it extends, and the resources contained within them. Today 5% of South Africa's coastal waters are recognized as MPA and have had a rapid expansion since 2016 when only 0.4% of marine ecosystems were protected (Sowman, Hauck et al. 2011, Driver, Sink et al. 2012). In 2014 it was reported that over 90% of commercial fish stocks are either overexploited or fully exploited (Sunde 2014). Other threats to marine ecosystems in South Africa include coastal development, pollution, climate change and freshwater flow into the marine environment. Marine Protected areas account for scientific uncertainty and protect unstudied and more sensitive ecosystems and species in the ocean (Sink 2016). MPA controls human activity in marine ecosystems by imposing restrictions in areas that either allow controlled fishing activity or prohibit it completely and is known as no-take zones. Moreover, Sanctuary and Wilderness areas forbid economic activity but tend to allow limited eco-tourism activities to take place that is contingent on the overall health of the ecosystem (WWF; http://mpaforum.org.za/). The recovery of marine species in designated MPAs has been well documented in South Africa and in some cases, has provided evidence for effective fishery management of commercially harvested species. Results are consistent with the spill-over effects into neighbouring areas and even showed decreasing fishing efforts and higher catch rates in local fisheries (Sink 2016). Although Marine Protected Area establishment seems like a solution to sustaining marine ecosystem health. Marine Protected Areas in South Africa have been identified as a key management strategy to protect the African penguin from selecting ecological traps and from counteracting shifts in prey movement.

1.7.6. Island closure

A feasibility study was implemented in 2008 to explore the effects of island closures on African penguins' life-history parameters and ascertain the effects of fishing pressure on penguin population dynamics. In 2010 it was deduced that the findings were insufficient for the traits monitored and the closures were extended for an additional four years (Hagen, Sherley et al. 2015). The fishing closure experiment continued until 2019 and results showed an increase in chick growth and condition and a decrease in foraging efforts but were opposed as the results were based on individual observations and required annually aggregated analyses (Butterworth & Ross-Gillespie 2019). Still, visible positive results were obtained and recommended by Sherley & Henning 2019 and support the continuation of the fishery closures. Results showed that some fishing closures reduced the rate of decline in penguin populations but would not be sufficient to stop it. Proposals by scientists and seabird task teams include limiting fishing around six of the major penguin breeding colonies in South Africa that account for 88% of the local population this will offer some relief from competing with fisheries with an already volatile foraging fish (SANCCOB; https://sanccob.co.za/, DFFE; https://www.dffe.gov.za/). The DFFE is yet to deliberate on all proposals and make a decision. The cost analysis lies between a highly commercial industry with socio-economic impacts and a local endangered penguin species, important to our economy and environment that is at risk of dying out if immediate intervention is not applied.

1.7.7. Educational Awareness

Campaigns are launched year-round to raise awareness and funds for the species by various conservation organizations. Information is readily available at the Two Oceans Aquarium, Pretoria National Zoological Garden and Boulders Beach and Stony Point colony, UShaka Sea World, SAMREC (South African Marine Rehabilitation and Education Centre),

BAYWORLD, and Dyer Island Trust as well as an abundance of information made available on the internet to many people that are interested and have access to it. SANCCOB launched an educational initiative, to raise awareness about the African penguin plight amongst young school learners and visitors undertaking tours at the facility, SANCCOB is also regularly active in beach clean-ups.

1.8 . Stakeholders

1.8.1. MPA and coastal communities

Marine Protected Area expansion in South Africa sets out to achieve international biodiversity and ecosystem goals. Incorporating the socio-economic needs and the preservation of customary rights of coastal communities constitutes the majority of environmental legislation frameworks in South Africa. This includes the Marine Living Resources Act of 1998, the National Environmental Management Act of 1998 NEM: Biodiversity Act of 2004, and the NEM: Protected Areas act of 2004. The framework encourages cooperative environmental governance and provides a premise for participatory decision-making and benefit sharing to be carried out along with marine protected area management (Sowman, Hauck et al. 2011).

The leading objective for marine protected area planning and augmentation has always been the protection of important coastal marine habitats and the restoration of overexploited stocks and degraded areas. Recently expansion of marine protected areas in South Africa has been centred around increasing marine populations to meet fishery management objectives.

The history of social dimensions in MPA implementation in South Africa has cited many negative impacts such as the forced removals and exclusion of fishing communities from local waters, restricted or lost access rights that have led to compromised incomes, livelihoods, health, culture, identity, gender relations and traditional practices, to name a few

(Sowman, Hauck et al. 2011). The associated impacts can largely be attributed to the lack of engagement with stakeholders in the planning and decision-making process and militarized conservation efforts constructed to protect MPAs. It is important to note the history of MPAs in South Africa and the progress it has made. Many black communities living alongside natural resources and wildlife were subject to forced removals and displacement under the apartheid regime that sought to protect vested state interests and maintain segregated conservation and land development. This had devastating economic impacts on households that had relied on natural resources such as the ocean as a source of income. The post-apartheid constitution involved the redress and restoration of equitable rights to communities and involvement in MPA planning. The progress pertaining to the restoration of rights and access to local and traditional communities has been slow and challenging. The MPA approach has been criticized for precluding the customary and traditional rights of fishers in a marine environment and prioritizing scientific recommendations above it. The militarized approach can reflect past injustices and be counterintuitive to conservation efforts (Daffe, Massé et al. 2019). Moreover, the broader political and commercial interest has fashioned fisheries management in South Africa and local and traditional fishermen continue to be inconsequential when compared to commercial industries and recreational fishers (Sowman, Hauck et al. 2011, Sunde 2014). As traditional fishers become more aware of their rights there is increasing pressure on marine governance to shift its approach to a more inclusionary planning and decision-making process.

1.8.2. Purse-seine fishing industry challenges

The sardine catches have been remarkably low with the lowest record level in over 70 years, in 2019 of 2100 t. This has put a strain on major sardine canning facilities that have had to counteract shortages in the South African sardine catch with sardine imported from Morocco and elsewhere to remain operational. The sardine canning industry may not be able to persist

longer if the catches remain at current levels because of unfavourable exchange rates on profitability (Coetzee and Badenhorst 2013, Coetzee, de Moor et al. 2018, DEFF (Department of Environment 2020). Anchovy catches have been lower than the designated Total Allowable Catch. The industry is challenged with highly volatile quotas, non-viable allocations, and possibly an estimated 2-7% decline in TAC around Robben Island and Dassen Island and from 6.6% in Algoa Bay. The under-catches apparent in both species require the assessment of spatial and temporal variation and the likelihood of managing and subsequently harvesting sardine as different stocks as opposed to a single stock (DEFF (Department of Environment 2020).

The largest commercial fishing industry in South Africa generates R4.5 billion per annum, namely, the hake and snoek fishery are reliant on healthy forage fish populations as a large component of their prey.

1.8.3. Mainland colony residents

Human-dominated landscapes and impacts have resulted in wild animals living in close proximity to people. A shared environment has the potential to cause human-wildlife conflict that has devastating results for both people and wild animals and remains a challenge in conservation. Even so, both people and animals have the capacity to impact each other both positively through education and eco-tourism activities. Eco-tourism positively benefits surrounding communities by providing employment opportunities and economic development as well as contributing to conservation efforts. Moreover, community-based natural resource management is a method that has evolved from communities living alongside wildlife and natural resources and has shown beneficial impacts were implemented accordingly (Bhatia, Redpath et al. 2020). The African penguin shares the natural environment alongside people at two mainland colonies in South Africa: Boulders Beach and

Stony Point penguin colony. The penguin population at the mainland colonies in South Africa face some unique challenges to their island conspecifics. Mainland penguins are exposed to daily occurrences of human disturbance, increased pollution, and the presence of terrestrial predators. Both populations of the mainland colonies have seen increases throughout the years and have since expanded onto nearby residents' properties (Ragaller and Jarre 2015). While some residents view wild penguins nesting in their backyards as a privilege, others have voiced concerns over the noise and smell of the guano and the loss of or restricted access to beach amenities.

1.8.4. Local people and conservation

The biological and ecological science of African penguin conservation has been explored in the sections above. Although these aspects provide a more technical understanding of managing the species, they are not the only constituents required for effective management. Understanding the issues that involve people as local stakeholders produce nuanced approaches to conservation and management.

1.9 . Conservation social science

Conservation social science is a recent discipline that examines individual social attributes (e.g., values, perceptions, and knowledge), social phenomena (e.g., socioeconomics, governance, and policy) and social processes (e.g., local development and decision making). Interpreting the impact of social values on perception can provide important insights into managing conflict (Arias-Arévalo, Martín-López et al. 2017, Bennett, Roth et al. 2017)

The value that humans place on ecological systems can be disseminated into instrumental, intrinsic, and relational values. Instrumental value refers to the monetary value that can be derived from ecosystems, while in contrast, the intrinsic value represents a moral obligation to the system. The practicality of ecosystems has since expanded to include relational values

which are concerned with the relationships and responsibilities between people or between nature and people. Relational values can be associated with cultural values and aesthetic appreciation (Arias-Arévalo, Martín-López et al. 2017). Moreover, the determinants of values can be drawn from motivations that ultimately affect behaviour and attitude towards ecological systems. The motivations can be grouped as egoistic, altruistic and biospheric. Egoistic motivations embrace principles that maximise individual gain. Whereas altruistic motivation favours concern towards other humans and biospheric motivations broaden these concerns to include nonhuman species and the natural environment. Identifying and understanding the different value systems of people towards nature can offer new management interventions, identify values as direct or indirect drivers of change, synchronise management strategies with peoples' values and recognize conflicting values linked to management approaches. In any society, it is important to note that values are expressed together with socioeconomic factors and governmental bodies should therefore consider diverse arguments, philosophies, practices, and values on conservation. The contribution of social science research is vital when drawing up conservation policy and can improve management and governance processes, guide conservation design and models, justify conservation actions and aid in more socially equitable outcomes and processes (Bennett, Roth et al. 2017, Pimid, Mohd Nasir et al. 2022).

1.10. Stakeholder engagement

Conservation conflicts arise when there is a disagreement between the utilization and protection of natural resources between stakeholders. Stakeholders are broadly defined as the people or organizations involved and affected by the decisions of a policy and can directly or indirectly be included in the implementation of a project (Vogler et al. 2017; Freeman 1984; Annan 2007; Sterling et al. 2017). Organizations can extend the definition to suit situation-specific groups of stakeholders. For instance, the Biodiversity Management Plan for

the African penguin defines stakeholders as any group or individual that can affect or is affected by the actions of the BMP.

Stakeholder engagement in conservation policy discerns the sociological dimensions that need to be addressed for the best management practices to be developed. The role of each stakeholder adds to the complexity of managing the species. Human-wildlife conflict for instance at the penguin mainland colonies involves the destruction of the property of residents and as the economic costs lie with the residents, there is a motive from mainland stakeholders to expect the species to be controlled. Conversely, conservation representatives anticipate increased restrictions on fishing zones and small-scale fishers are hoping for more access to marine resources.

Stakeholder engagement should be executed in a just and participatory manner that sets out to incorporate a range of stakeholders. A theory-driven approach in comparison is more conventional and considers prior research to establish outcomes. This method is often opted for to avoid political stagnation and lengthy deliberations (Vogler, Macey et al. 2017).

Public participation has been encouraged as one method of effectively providing a solution to conservation conflict. Although, the effectiveness of public participation in resolving conflict has not been widely studied (Young, Seaele 2016). Young et al. 2016 provide empirical quantitative evidence that conflict resolution has a greater potential to be solved through increased fair participatory processes. A fair process can be described as independent and where stakeholders have influence and in turn, can generate trust. A participatory approach to solving conservation-based conflicts can have positive outcomes for increasing democratic legitimacy and public trust in politics and decision-making.

This is particularly important as citizens regard their impact to be minimal which in turn feeds into a lack of trust in conservation agencies and has the potential to result in

non-compliance and strong resistance to conservation initiatives. Young et al. 2016 highlight the importance of the recognition of conflict by conservation agencies as a healthy indicator and as an opportunity to build trust between stakeholders. A failure of this approach can stem from the lack of willingness to share power and knowledge and acknowledge the role of traditional knowledge by user groups (Ferranti, Turnhout et al. 2014).

Moreover, employing the public in conservation matters can translate into wide-ranging support and efforts aimed at protection. As conservation agencies and approaches depend on continuous funding and acceptance, an inclination from the public to conserve biodiversity could persuade decision-makers to implement policy that could contribute to supplementary protection (Home, Keller et al. 2009, Hooykaas, Schilthuizen et al. 2019).

The use of stakeholder engagement in conservation strategies can provide valuable opinions from scientists and experts and gather local opinions and needs while shedding light on the realities of policy implementation. Stakeholder engagement can be used as a pragmatic tool that can foster solutions and management decisions better suited for the conservation of the African penguin (Volger, Macey et al. 2017) (Arias-Arévalo, Martín-López et al. 2017)

1.11. The policy of environmental management

In South Africa legal frameworks such as the Southern African Development Community's Environment and Land Management Sector (1996:34), the Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), and the National Environmental Management Act, 1998 (Act 107 of 1998) guides environmental policy implementation.

Environmental policy processes involve a range of stakeholders that differ in their ability to exert varying levels of influence on policy formation. The legal framework for formulating conservation and environmental policy highlights the importance of cooperative governance.

This ensures information is exchanged between intergovernmental agencies and the opportunity to monitor plans at a national level is possible.

The NEMA 1998 (Act 107 of 1998) stipulates that policy should be aimed at the protection of ecological processes and natural systems as well as the conservation and preservation of biological diversity in the natural environment. The promotion of the effective management of cultural resources and of environmental education (to educate communities on the sustainability of the environment and the coordination of integrated environmental monitoring programmes) are important reasons for the creation of a conservation and environmental management policy for South Africa. Every competent authority (including organs of the state and the provinces) who has the authority or power by law to influence the environment, should exercise that authority or power in accordance with the policy for environmental management and conservation.

South African conservation policy implementation has been apprehended for its inconsistency across its institutions. As a result of joining the agricultural and tourism sectors to conservation, this has impacted the allocation of funds and has hindered appropriate top-down management that overlooks local consultation and fails to supply government capacity that effectively monitors the implementation of policy.

1.12. Precautionary principle

The precautionary principle has been an approach that has been widely established in environmental law, management, and policy. The principal notion can be viewed as a medium that averts actions that are presumed to favour the advancement of development and economic activity when there is a lack of clear evidence regarding its impacts. The precautionary approach establishes guidance for governments in the face of uncertainty (Cooney 2004).

The precautionary approach can be exercised on a scale exerting both weak and strong applications. The approach is varied across biodiversity related policy sectors and is limited under international trade agreements. This produces unparallel challenges at both international and national levels for biodiversity management. Detrimental implications guided by the precautionary principle may often limit poor and natural resource users and communities more rather than imposing on industrial interests. The application of the precautionary approach requires an extensive assessment of conservation threats and the benefits derived from alternative strategies. Here it is important to institute not only scientific knowledge but also local and traditional knowledge in the relative socio/economic and political contexts that will influence the results of conservation decisions. The precautionary approach can be misused when applying highly restrictive or protectionist approaches and the strategy should discern who bears the burden of proof and who is involved in and influences the decision-making (Cooney 2004).

In South Africa, the precautionary principle is consolidated as a guiding principle for the management of the environment and natural resources in South Africa's National Environmental Act 1998 provides that sustainable development includes consideration of, inter alia ", that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions" (Cooney 2004, Singh and Mashiyane 2020)

The impact of applying the precautionary principle in environmental law does not equate to the principal having a substantial impact in practice. In some instances, the precautionary principle may be viewed as procedural rather than substantial where the precautionary measure was considered in the decision- making but a precautionary decision was not made (Cooney 2004).

1.13. Traditional ecological knowledge

Traditional knowledge constitutes many years of experience acquired through the direct contact with the natural environment (Johannes 1993). The practice of integrating traditional knowledge into many academic disciplines like botany, pharmacology, and agriculture has been an integral component of the various fields and a relatively recent development in ecology (Berkes 2017). The similarities between western and traditional knowledge are that the knowledge is based on a curiosity-driven scientific attitude and a desire for knowledge. Traditional ecological knowledge differs from the western knowledge substantially by being mainly qualitative as opposed to quantitative, intuitive compared to being purely rational, holistic as opposed to reductionist, moral rather than value free, and spiritual instead of mechanistic, the information is collected by resource users themselves relative to western knowledge that is conducted by specialized researchers and traditional knowledge is based on the prolonged accumulation of data on a single locality relative to short time data on over a larger area. The traditional ecological knowledge further differs from western knowledge in that it is restricted in its capacity to demonstrate predictions and the knowledge growth rate is relatively slower (Johannes 1993). The IUCN has listed that traditional knowledge is relevant for contemporary natural resource management and that people who are dependent on local resources for their livelihood are often able to assess the true cost of value and benefit better than any evaluator coming from the outside (IUCN 1986). However, widespread recognition of traditional knowledge and its integration into modern science remains a challenge. In most ecologically fragile and marginalised regions in Africa, knowledge of navigating the natural environment simply equates to survival. Altering traditional natural resource management systems thus holds much at stake for these communities. One of the major challenges with integrating traditional fishery knowledge in fisheries management is the lack of readily available formats of traditional information. However, there is a growing body of literature on

the methods that can be utilized to access information from different knowledge systems. A common requirement of these methods is the participation of resource users in all stages of the problem identification, data collection, analysis, evaluation of options and decision-making processes (Sowman 2011)

1.14. Conservation education

The goal of conservation education is to expand awareness and incite interest and concern among individuals regarding the natural environment. Conservation education forms the foundational aspect for developing knowledge, skills, attitudes, and a commitment to foster solutions to environmental issues through individual and shared action. Investigating the social science aspects of a targeted population can provide guidelines for educational development and determine existing knowledge, and barriers to success. Moreover, social science can be utilized pragmatically for the evaluation of program objectives. An example of this is altering civic engagement and providing ecological indicators (Bennett, Roth et al. 2017).

Species literacy includes the knowledge of a species and the information related to the diet, position in the ecological food chain, natural environment, threats, information about its life cycle and its behaviour. Exploiting species knowledge holds great potential for developing a connection with the environment and contrary low knowledge can translate to a lack of a relationship with the local environment (Hooykaas, Schilthuizen et al. 2019). Additionally, it is possible that engaging with species knowledge can help people discern changes in the environment and make informed decisions.

Concurrent research has reported that local people tend to have limited knowledge of local species and instead insights are drawn more towards exotic and domesticated species (Ballouard, Brischoux et al. 2011, Genovart, Tavecchia et al. 2013). Furthermore, people that

39

live in close proximity to species are likely to appreciate and know more about the species than those that do not (Schuetz, Soykan et al. 2015, Correia, Jepson et al. 2016).

Evaluating knowledge and values as a conservation strategy enables citizens to become informed about their environment and its problems and ultimately enables consciousness in subsequent actions (Padua 1994). In 2014 a study was conducted assessing the perceptions of people in Cape Town towards African penguins. Preliminary results revealed knowledge gaps by local citizens pertaining to African penguin issues, discord between conservation representatives concerning conservation strategies and overall mixed views of fishermen towards penguins and their interactions (Holcombe 2015).

2. MATERIALS AND METHODS

2.2. Problem or hypothesis

The most prominent threat driving the ongoing decline of African penguins in South Africa is food scarcity, due to the spatial distribution of pelagic fish and competition with commercial purse-seine fisheries. Technical task teams have been assigned to coordinate research and address the various other threats experienced at colonies.

The human dimensions centring around African penguin conservation extend to the lack of awareness about the indigenous species and associated ecosystem and economic benefits, that could potentially influence the contribution of local citizens. The human-wildlife conflict at the mainland colonies presents unique socio-ecological challenges for penguins, managing authorities and residents. Furthermore, a final decision pending the outcome of the fishing closures around six of the main penguin breeding colonies has significant implications for the commercially important purse-seine fishing industry as well as the African penguin. Lastly, Marine Protected Area management affects livelihoods and is criticised for the exclusion of

local communities in the planning and decision-making processes. To make well-informed management decisions, stakeholder surveys can gather insight into the perception and knowledge that drives conflict between the different stakeholder groups and can subsequently guide colony-specific management efforts outlined for the African Penguin.

2.4. Survey design

2.4.1. Stakeholder groups

Stakeholder groups were identified whilst designing the project. Specialist stakeholders including those involved with African penguin research and policy; most were recruited during an African penguin research conference and to a smaller extent snowball sampling. Snowball sampling is a purposive sampling technique commonly used in qualitative research when it is difficult to access samples with the desired characteristics (Naderifar, Goli et al. 2017). Various rehabilitation groups and government agencies were approached, and questionnaires were distributed among those who responded positively.

Fishermen were largely enlisted through snowball sampling and e-mail communication. Fishing groups like Oceana, FISH-SA, SAPFIA, and Masifundiswe were contacted for correspondence with the commercial and small-scale fishing communities. Telephonic calls were then conducted with individuals in the fishing community to garner participation in the survey. Fishing harbours in Simons town and Langebaan were visited to conduct in-person interviews with local fishermen who operated charter fishing boats.

Mainland residents were enlisted by visiting the mainland colonies and moving door to door as well as handing out surveys on beaches and at local malls. The Betty's Bay ratepayer's association was contacted and offered to post the survey link in the monthly newsletter.

Local stakeholder surveys were largely gathered by randomly canvassing nearby malls and hotels and leaflets with the survey link were distributed in random areas.

Sample size

A sample size of 390 participants was calculated for the study using the following sample size equation:

$$n = \frac{z^2 p(1-p)}{e^2}$$

Where....

n = sample size required

z = score with a corresponding confidence level of 95%

e = margin of error

p = population proportion

$$n = \frac{z^2 p(1-p)}{e^2}$$

p = 0.5

z = 1.96

e = 0.05

$$n = \frac{1.96^2 0.5(1-0.5)}{0.05^2}$$

n = 385

n = 390

2.5. Questionnaire design

A questionnaire was designed for different stakeholder groups using both closed and open questions. It was drafted with the assistance of the supervisors and then distributed to key experts within the government to ensure it complied with local requirements.

The questionnaire was made available in two formats. A hard copy version was designed for preliminary distribution and an electronic version was accessible from the web. The survey was available in English and each stakeholder group (see below) had an individually designed questionnaire that was targeted to obtain information specific to the group they represented.

2.5.1. Demographic information

All stakeholder surveys included questions about the biographical profiles of individual participants regarding the age, gender, education level, and monthly income range.

2.5.2. Distance from penguin colonies

There were three questions that followed the demographic information, which sought out how far participants resided from wild African penguin colonies and if participants had ever seen African penguins at either a zoo or in the wild.

2.5.3. Local stakeholders

The survey for members of the public that lived at varying distances from colonies covered three main topics.

- Knowledge-based questions that combined easier and more challenging questions concerning African penguin conservation.
- The general accessibility and availability of information relating to African penguins.
- Attitudes towards African penguins and their conservation

The surveys targeted people living within 5km and members of the fishing industry and included topics relating to the variable impacts of African penguins.

2.5.4. People living within 5km.

The survey for people living within 5km of colonies included a section that assessed attitudes concerning the impact of the local penguin population on the community and the view towards the local authorities.

2.5.5. Fishers

The survey for members of the fishing industry covered three main topics.

- Knowledge-based questions that combined easier and more challenging questions concerning African penguin conservation.

- The general accessibility and availability of information relating to African penguins.

- Attitudes towards African penguins and their conservation

- Attitudes towards fishing policies that affect fishing activity.

2.5.6. Specialist stakeholders

Researchers and policymakers

The survey for researchers and policymakers covered topics relating to

- The involvement with African penguins

- Contact with African penguins.

- Assessment of views regarding the decline of African penguins

- Attitudes towards reversing the downward population trend.

- Future strategies, policies or interventions believed to make a significant difference to enhancing the conservation of African penguins.

The time it took to complete the survey was about 10 minutes for every stakeholder group except the researcher and policymakers survey as these questions required more open-ended views and discussions. All participants were allowed to provide more in-depth perspectives relating to the topic if they chose to do so.

2.5.7. Knowledge

The total knowledge score was out of 15. The knowledge table measured the awareness of the African penguin's description, habitat, distribution, threats, diet, behaviour, breeding, and conservation status.

Knowledge questions are shown in Table 1 and were included in the surveys for local, mainland and fisher surveys. The questions comprised 15 correct and incorrect statements that were further categorised as 8 easy and 7 more challenging level questions. Knowledge was measured using a three-point scale that included 'Agree', 'Disagree' and 'Don't know'. The correct answers were then coded as (1) when analysed in excel.

Participants across the three local surveys were divided into two groups based on the score achieved. Scores of 10 and above, representing the upper third of respondents, were categorised as "good" and scores ranging from 1 to 9 were categorised as "poor". The knowledge scores were assessed per group. The data for researchers and policymakers were excluded from this analysis.

2.5.8. Accessibility of information

Table 2 shows the questions pertaining to the general accessibility and availability of information relating to African penguins that were included in the local surveys. The questions determined the general accessibility of information from sources like the internet, pamphlets and brochures and the willingness to want to know more about African penguin

conservation. Participant responses were indicated using the following two-point scale: 'Agree' and 'Disagree'.

2.5.9. Attitudes

Table 3 includes eight items that assess the attitudes of individual participants towards African penguin conservation on a 5-point Likert scale (1= 'Strongly Agree', 2= 'Agree', 3= 'Disagree', 4= 'Strongly Disagree' 5= 'Don't know'). This component of the survey sought out participant attitudes towards African penguins and the protection of their habitats, the basis of conservation laws and policies, whether conservation laws and policies integrate people's needs and values, whether there is conflict between penguin conservation and the sustainability of the fishing industry, the value of African penguin conservation to the participant, whether participants mind being inconvenienced if it protects penguins, and whether participants feel that they are well informed regarding the conservation status of the African penguin.

The local survey concluded with questions that assessed respondent's feelings towards concern for African penguin conservation on a 2-point Likert scale (1= 'Agree' and 'Disagree'). Questions included whether participants would be more concerned if they knew more whether the African penguin population must be protected from further decline at all costs and whether there are greater conservation priorities in South Africa than the African penguin and further sought out attitudes towards conservation actions by asking if participants would be prepared to donate to save the penguin population.

Mainland participants were asked to report on their attitudes towards living near African penguins by selecting one of the following points demonstrated in Table 5. Participants were then asked to report the influence penguins had in residing at their current addresses by selecting an option in Table 6.

Table 7 was composed of statements that evaluated the attitudes of participants residing within 5km of penguins. The statements sought to determine why residents valued penguins and what the source of conflict with penguins was by selecting from four items: "Strongly Agree", "Agree", "Strongly Disagree" and "Disagree".

Table 8 was exclusively for members of the fishing industry. Questions assessed the general attitudes towards fishing policies by asking participants to select the option that best described their attitudes. Questions sought out attitudes towards measures like total allowable catch, total allowable bycatch, closed seasons, issuing of permits, area restrictions and monitoring and or record keeping.

Participants that made up the researcher and policy maker survey were asked to describe their contact with penguins by selecting from 5 items displayed in Table 8 (At least once per day, at least once per week, at least once per month, less than once per month and No contact). Table 7 measured participant views towards current threats and management strategies on a 5-point Likert scale (Strongly Agree, Agree, Disagree, Strongly Disagree and Don't know). The statements in Table 7 sought views on whether historically, human activities resulted in the population showing a downward trend and that it cannot be significantly changed or whether human activities in the past triggered the downward trend but current efforts will make a significant positive impact, whether reducing or changing prey availability is the single, biggest threat African penguins face, whether climate change is a major threat to African penguin survival, whether conserving the penguin is important too, whether there is enough knowledge as to why the penguin population continues to decline, whether more action is needed to reverse the downward trend, whether MPA is integral to conserving the African penguin, and lastly whether the BMP objective to increase the breeding pairs by more than 5% above the 2018 estimate is possible. Respondents rated their optimism towards reversing the downward trend in the penguin population by selecting the statements

in Table 8. Open-ended questions on future priorities included Existing policies/Strategies, Additional/Future policies and strategies, Further research, Resources or Development, Political/ Stakeholder roles and or coordination, and others and list the most important two or three strategies indicated above.

2.6. Distribution of Surveys

Data collection was carried out between the 20th of August and the 9th of October 2021. In the Western, Cape locations included rural areas like Mitchells Plain, peri-urban regions like Oudshoorn, and coastal towns in Fish Hoek, Simons Town, Bettys Bay, Ocean View and Lamberts Bay, West Coast. Urban areas like Somerset West. Coastal towns in Gqeberha, Eastern Cape included Cape Recife and Summerstrand and a rural town Uitenhage. Urban town in Bloemfontein, Free State and urban areas in Pretoria, Gauteng. Surveys and leaflets were distributed in frequently visited places like shopping malls and hotels. Mainland colonies were visited, and a poster and banner were set up in the mall to entice participants. Door-to-door canvassing was undertaken at both mainland colonies. In-person canvassing comprised the bulk of the data collection for all stakeholder groups except researchers and policymakers and stakeholders were emailed to complete it online. Pelagic fishermen were enlisted through the help of email and asked to complete it online. Small-scale fishermen were contacted prior to distributing the surveys and gathered in groups to complete them.

2.7 Data management

The online version of the survey was set up on an online platform called "Online surveys" that would gather responses from participants and allow the data to be extracted for data analysis at a later stage.

Survey information that was completed on hard copies was entered into the survey website as soon as possible and careful attention was made not to duplicate responses.

2.8 Data analysis

The data from each stakeholder group was captured in Microsoft excel. The data was coded and summarised. Inferential statistics such as the chi-square test of independence was used to determine the associations between variables and stakeholder groups. The significance level was set at p-value <0.05.

Bar plots were created using the R Studio bar plot function and Pie charts as well as 100% Stacked bar charts were created using the Microsoft Excel chart option.

Errors revealed in some of the attitude statements by participants and therefore only five neutral attitude statements were used to determine if respondents possessed positive or negative attitudes. The following statements were included:

- Penguins and their habitats should be protected.

- Conservation of the African penguin is important to me.

- I do not mind being inconvenienced if it protects penguins.

- I am concerned about the conservation status of the African penguin.

- I might be concerned about the conservation status of the African penguin if I knew more.

Likert scale statements were each assigned a value that totalled a score out of seventeen as the first three statements were evaluated on a five-point scale and the last two were evaluated on a dichotomous scale. Participants that agreed or strongly agreed with 80% (13.6 out of 17)

of the statements were assigned a positive attitude and participants that achieved less than 80% were assigned a negative attitude.

2.9 Ethical consideration

Informed consent for participation was included on the first page of the study. Participation was voluntary and participants could withdraw submissions at any point in the study. Confidentiality was ensured by recording no identifying information. Ethical clearance was approved by the Faculty of Humanities Research Ethics Committee on 09 November 2020.

3. RESULTS

3.7 General Description

(a) All Stakeholders

Figure 4.1 shows the distribution of stakeholders in the study. The largest representation was observed among participants residing more than 5 km away from colonies, with a total of 286 participants (77.1%). The group with the lowest representation was the researcher and policy maker group, made up of only 21 participants (5.7%)

Figure 3.2: Stakeholder Composition
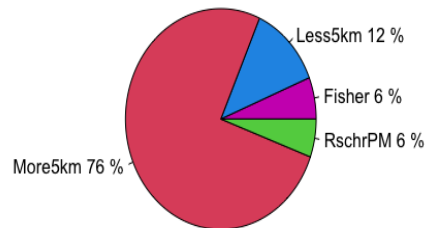
3.7.1. Age

The majority of participants (55.3%, n=208 out of 376) belonged to the age group of 26-50 years, while a small proportion (1.3%, n=5 out of 376) of participants were in the age category of 18 and younger.

Among the participants, a higher proportion of individuals residing more than 5km from colonies (58.0%, n=166 out of 286) and researcher and policymakers (90.5%, n=19 out of 21) were distributed within the age range of 26-50 years. On the other hand, participants from the fisher group (52.2%, n=12 out of 23) and those residing less than 5km from colonies (52.2%, n=24 out of 46) were mostly aged 50 years and older.

3.7.2. Gender

Among the sample population, 52.1% (196 out of 376) of respondents identified as male. However, in the specific group of stakeholders residing less than 5km from colonies, the majority of participants (54.3%, 25 out of 46) identified as female.

51

3.7.3. Education

College or university education was the dominant level of education in 59.0% (n= 222 out of 376) of respondents. Primary level schooling saw only 1.6% (n = 6 out of 376) participants belonging to this group.

Tertiary level education was the highest reported education overall. However, among fishers 69.6% (n=16 out of 23) reported having a secondary level schooling as their highest level of education.

3.7.4. Income

Among the participants, the majority (26.9%, n=101 out of 376) reported monthly earnings below R5000. In contrast, only a small proportion (5.0%, n=17 out of 376) stated incomes exceeding R50,000 per month.

In the researcher and policymaker group, a significant majority (66.6%, 14 out of 21) reported monthly earnings falling between the range of R10,000 and R50,000. However, among fishers, the majority (56.5%, 13 out of 23) indicated a monthly income below R5000

3.7.5. Distance from colonies

The majority of participants (35.4%, 133 out of 376) reported living more than 100 km away from the penguin colonies. Only participants residing within 5km reported distances of less than 5km from the colonies.

For fishers, the majority (47.8%, 11 out of 23) were surveyed at distances ranging from 5km to 20km from the penguin colonies. In contrast, participants residing within 5km of the colonies were mainly surveyed at distances between 500m and 5km (58.2%, 25 out of 46),

while the least represented group (18.6%, 8 out of 46) reported distances between 101m and 500m.

The stakeholder group residing more than 5km from the colonies reported the furthest distances, with a majority (45.5%, 133 out of 286) located at distances more than a 100km.

3.7.6. Seen AP – zoo.

The majority of participants (39.6%, 149 out of 376) reported that they had not observed African penguins at a zoo or aquarium. Among those more than 5km from the colonies, the highest proportion (45.8%, 131 out of 286) had visited penguins at a zoo or aquarium. In contrast, fishers had the lowest percentage (26.1%, 6 out of 23) of participants who reported observing African penguins at a zoo or aquarium. Participants living within 5km from the colonies did not report any instances of observing African penguins at a zoo or aquarium.

3.7.7. Seen AP – wild.

The majority of participants (43.9%, 165 out of 376) reported observing African penguins in the wild. Within the fishing group, the highest proportion (78.3%, 18 out of 23) had encountered African penguins in the wild. Similarly, among participants living more than 5km from the colonies, the majority (53.1%, 152 out of 286) reported observing African penguins in the wild.

Table 13: Associations between knowledge and demographic variables of local stakeholders.

Variables	Good (Group 1) (n=119)	Poor (Group 2) (n=236)	Chi-square value	P value	CI Lower limit Upper limit
Stakeholders			**11.407**	**.003**	
Fisher			--	--	
Less than 5km	12 (52.2)	11 (47.8)	0.029	.847	
More than 5km	23 (50.0)	23 (50.0)			
	84 (29.4)	202 (71.5)	**5.169**	**.022**	0.3431 0.491
Age			**7.082**	**.0280**	
18-25 years old	24 (25.8)	69 (74.2)	--	--	
26-50 years old	62 (29.8)	146 (70.2)	0.504	.478	
50+ years old	33 (44.0)	42 (56.0)	6.13	**.013**	**0.035 0.3171**
Gender					
Female	60 (35.7)	108 (64.2)	0.76		
Male	58 (31.4)	127 (68.6)		0.382	
Education School Post school	37 (26.1)	105 (73.9)	--	--	
	77 (34.7)	145 (65.3)	2.998	.0834	
Income Less R5000 R5000 -R10000 R10000-R50000			**6.611**	.0854	
	28 (27.7)	73 (72.3)	--		
	23 (35.9)	41 (64.1)	1.238	.266	
	35 (35.4)	64 (64.6)	1.349	.245	
More R50 000	10 (58.8)	7 (41.2)	6.447	**.0111**	**0.062 0.520**
Distance				0,00	
100m-1km	19 (46.3)	22 (53.7)	--	--	
5km < 20km	21 (52.5)	19 (47.5)	0.307	.579	

20km < 100km	45 (34.4)	86 (65.6)	1.922	.1657		
>100km	30 (22.6)	103 (77.4)	8.764	**.0031**	**0.0673**	**0.392**
Zoo				.0811		
Yes	52 (37.4)	87 (62.6)	--			
No	42 (27.8)	109 (72.2)	3.035			
Wild Yes No	72 (42.4)	98 (57.6)	--	**.0001**		
	23 (20.0)	92 (80.0)	15.428			
					0.11	0.322

CI = Confidence Interval. Values in parentheses indicate percentages.

3.8 Level of Knowledge

Approximately 33.6% of respondents obtained high knowledge scores of which most were made up of members from the fisher survey (52.2%). Good knowledge was less evident in members from the public >5km (29.4%). The former group were comprised of nearly all males (83%), aged older than 50 years (50%), with more participants holding a secondary schooling qualification (67%), reporting an income of less than R5000 per month (50%) and located at distances of 5-20 km (50%) from colonies.

Good knowledge scores differed significantly between different stakeholder groups, age, income, distance from colonies and participants who observed penguins in the wild.

There was no significant difference in the proportion of fishers and those living within 5km who achieved good and poor knowledge scores, X^2 (1, N = 64) = 0.029, p = .847. However, there was a significant difference among participants living more than 5km from colonies for good and poor scores, X^2 (1, N = 286) = 5.17, p = .022.

There was no significant association among the two groups for incomes ranging between less than R5000 to R50 000. However, there was a significant association, X^2 (3, n = 17) = 6.45, p = .011 when more participants achieved good knowledge scores for those who indicated incomes exceeding R50 000. The knowledge gap among participants in this study seemed to decrease as participants' monthly earnings increased.

There was no significant difference among the groups for distances of less than 100m to 100 km from colonies. However, there were significantly more participants, X^2 (3, N = 133) = 8.76, p = .003 who achieved poor knowledge scores at distances of more than 100km from colonies.

Lastly, significant associations were found among the groups for participants who indicated having observed penguins in the wild X^2 (1, N =115) = 15.4, p = 0,00. Further analysis revealed that 28.6% of participants with good knowledge of penguins from this group indicated distances between 5 and 20km.

Attitudes

Table 14: Bivariate analysis of attitude and knowledge.

Attitudes	Knowledge score	
	Good (n= 118)	Poor (n= 236)
Positive (n=295)	107 (90.7%)	188 (79.7%)
Negative (n= 59)	11 (9.3%)	48 (20.3%)

The chi -square test of independence revealed that there was a significant relationship between the knowledge and attitudes of African penguins among participants in this study, X^2 (1, N =354) = 6.87, p =.00087.

There is a 59.4% difference in proportion in the attitudes of participants who scored poorly on the knowledge of African penguins. It is estimated that negative attitudes can be found in 44.6% to 69.7% of the true population at a 95% confidence interval.

Good attitudes were observed in 90.3% of the sample population that indicated a willingness to donate to conserve the African penguin.

3.9 Stakeholder Group 1: Live Less than 5km from Colony

3.4.1. Duration

The majority (52%) of respondents indicated residence periods of more than 5 years at their current address and 2% reported a period of less than a year. Most (85%) reported to be aware of the presence of the penguins before deciding to move to the area, but many participants (65%) claimed that the penguins had no influence on their initial decision to move. Even so, most residents indicated a love and appreciation for the local penguin colony.

3.4.2. Aware of AP when moved?

Majority (85%) reported to be aware of the presence of the penguins before deciding to move to the area and only a few participants (13%) indicated their unfamiliarity.

3.4.3. Is AP a factor in moving?

Many participants (65%) claimed that the penguins had no influence on their initial decision to move. However, 26% of participants reported at least some influence.

Figure 3.5: Were the Penguins a Factor in Moving?
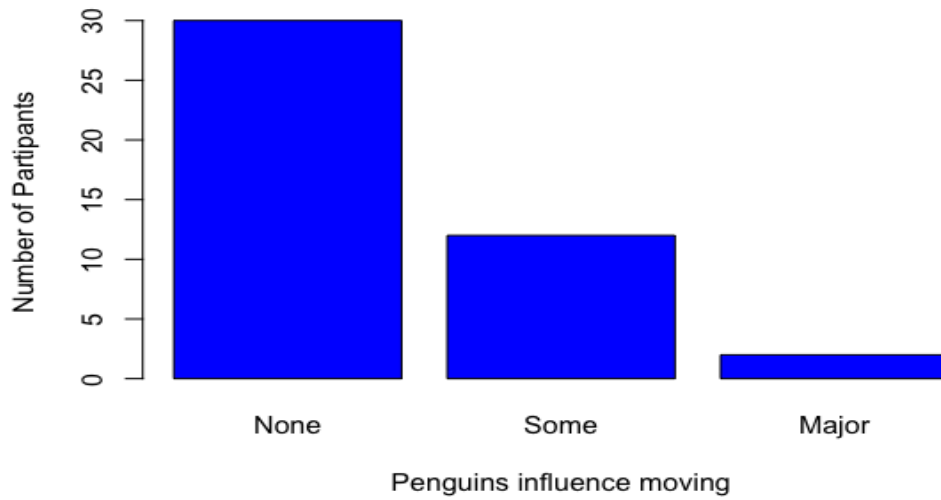
3.4.4. Value AP

Most residents indicated a love and appreciation (78.2%) for the local penguin colony, while others reported a neutral stance (13.0%) and only a few residents (4%) expressed that they tolerated the presence of the penguins.

Figure 3.7: Attitudes about the Local Penguin Population from People Living Less than 5km.
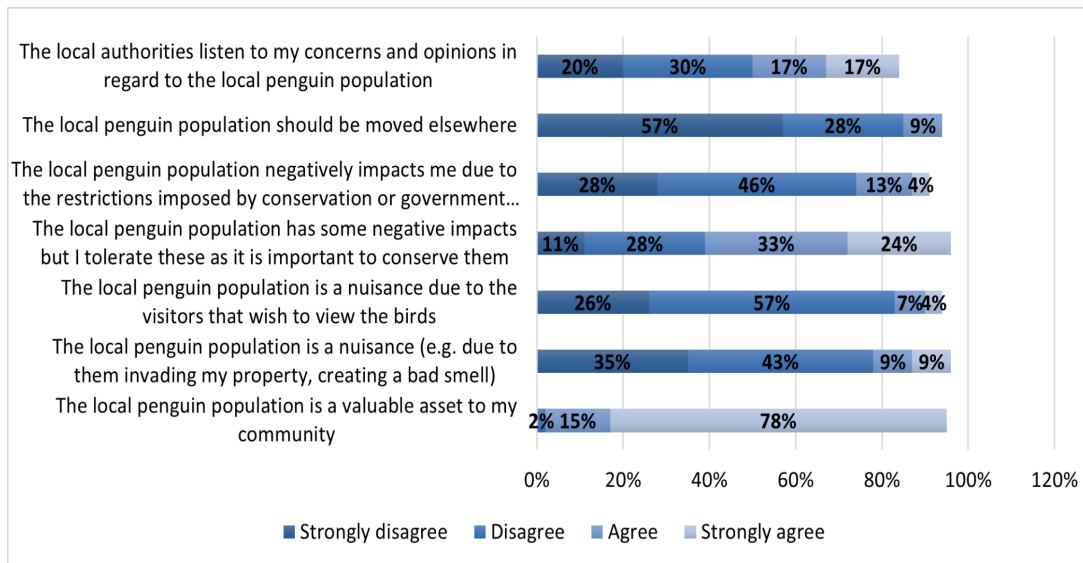
3.4.5. Attitudes

3.4.5.1. African penguin

Figure 3.8 demonstrates the perceptions held by local participants in living in proximity to African penguin mainland colonies. A significant majority of respondents (93%) from this group view the African penguin as valuable. A small minority felt they were a nuisance – 18% due to penguins in the garden or fish-like smell; 11% due to visitors. However, only 9% felt the birds should be moved elsewhere.

3.4.5.2. Conservation

Half of respondents (50%) felt local authorities did not listen to them and 17% felt inconvenienced due to regulatory restrictions.

3.4.5.3 Attitudes towards conservation

All participants felt positively towards AP penguins and the protection of habitats (100.0%) and nearly all viewed the AP's plight to be of personal importance (97.8%).

There was vast support from participants for MPA's in this group (95.7%), conservation laws and policies as scientifically sound practices (69.6%) and a fair amount felt supported by the regulatory authorities (54.3%). One user who indicated distances of less than 100m detailed a personal relationship with the staff at Cape Nature: "They respond to after hour calls as we live close by, and my wife does her bit to report suspicious activity in the colony at night".

Other comments detailed different experiences by residents in this study. One participant summarised a concern for the safety of the birds as they cross the roads and felt management should be geared towards ensuring this aspect while including that "sometimes it feels as though we are living in the middle of a zoo." Additional comments pertained to the "lack of maintenance for years and it [Stony Point] is not safe for elderly and wheelchair people". In addition, a lack of communication and confusion was noted by residents as one user reported "Cape Nature knows nothing about managing penguins" another pointed "I would like communication between the Boulders Park and local residents" and one user felt "they [penguins] should develop naturally, there is too much intervention. Other comments indicated "I wish Cape Nature would inform residents what to do with penguins". Another user reflected that "SANCCOB trespasses and removes eggs and birds without giving us a heads up." And relayed that "counts are prioritised over helping birds.

Figure 3.9: Attitudes on AP Conservation among Participants Living Within 5 km.
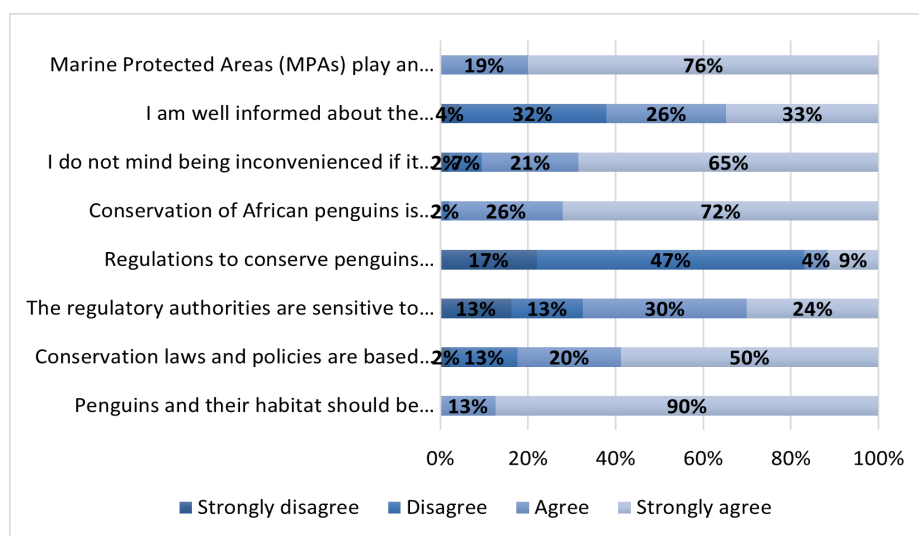
Table 15: Bivariate analysis about knowledge, attitudes, and comments

	Good knowledge and good attitude	Poor knowledge and poor attitude
Positive comments	3	1
Negative comments	6	1

A Fisher's exact test was performed on the frequency of good comments from people with good knowledge and good attitudes versus the frequency of poorer comments from people who achieved poorer knowledge scores and depicted poorer attitudes. The relationship between these variables were not significant at p is 1 and a good knowledge and attitude about AP did not mean positive comments about the experiences with managing authorities.

Many participants felt that AP conservation regulations did not threaten fishing industry sustainability (65.2%)

3.4.5. Views

Majority of participants felt concerned about the conservation status of AP's (84.8%). However, much less felt that more information would change their concern (56.5%).

Many felt that the AP must be protected from further decline at all costs (89.1%) and more than half were willing to donate (63.0%). Some participants that indicated no to the former statement had expressed that they were financially unable to donate. Only 34.8% of participants felt there are greater conservation priorities in South Africa than the African penguin.

Figure 3.8: Views on AP Conservation among Participants Living Within 5 km.
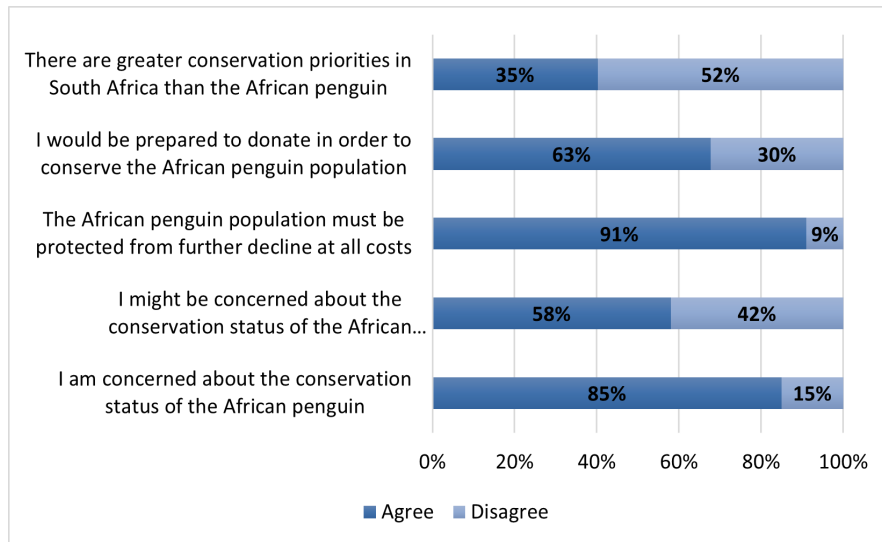
3.4.6. Information

Half of participants living <5km felt sufficiently informed regarding AP conservation (45.7%) and only a few respondents (34.8%) did not wish to have any more information. The internet was reported (78.3%) to be the most accessible source of information for participants followed by printed sources (60.9%).

Figure 4: Access to information across participants living within 5km from colonies.
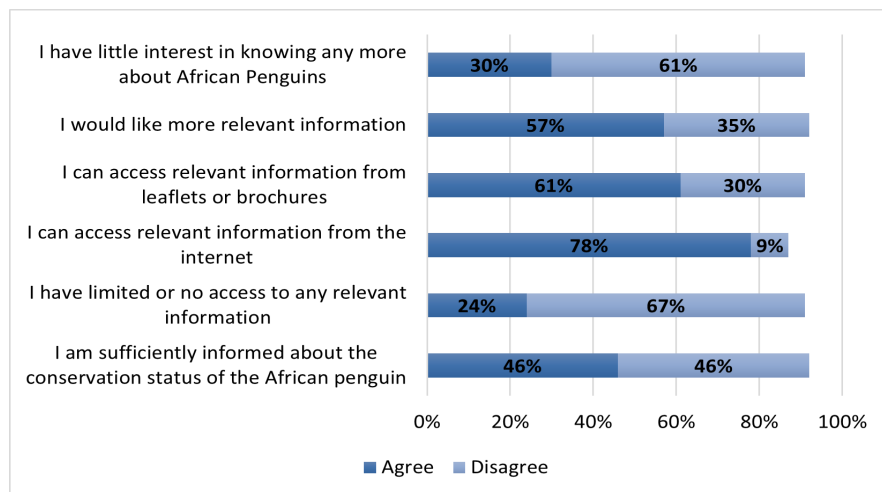
3.5. Stakeholder Group 2: Live more than 5km from Colony

62

3.5.1. Attitudes to Conservation

A large proportion of good attitudes pertaining to AP conservation and the protection of habitats was noted in 97.6% of participants in this group and more than 80% considered the plight of the AP to be of personal importance.

There was a strong support for MPAs (80.4%) and conservation laws and policies (97.6%) from participants in this group. Participants felt mixed in the views regarding the concern received from regulatory authorities.

Majority of participants felt that penguin conservation regulations did not coincide with fishing industry sustainability (51.4%).

Figure 4.1: Attitudes on AP Conservation among participants living more than 5km from colonies.
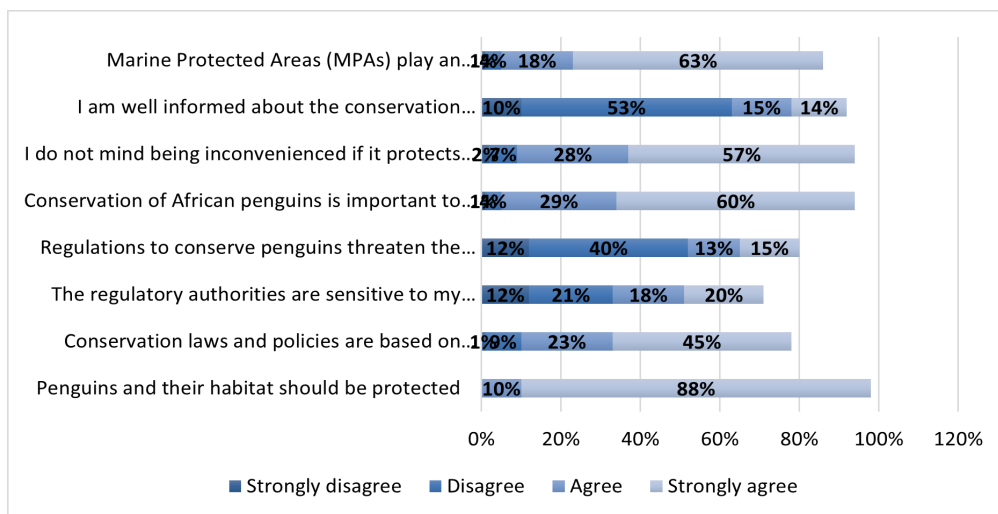
3.5.2. Information

Majority of participants in this group felt uniformed regarding AP conservation (76.9%) and most felt that they would like more information (77.3%). Participants reported the internet to be the most readily available source of information 89.9%.

Figure 4.2: Access to information across participants living more than 5km from colonies.
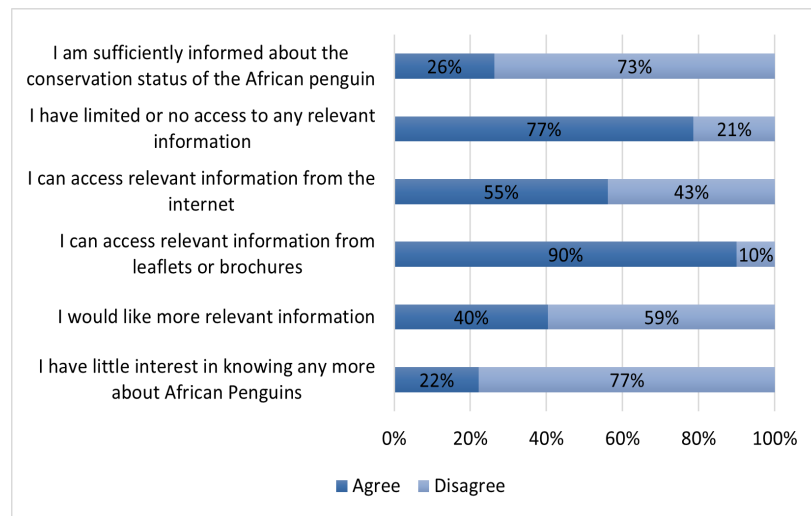
3.5.3. Views

A significant proportion of participants expressed their concern for the species (89.2%), while nearly an equal number of participants believed that their concern could be increased by providing them with more information (87.8%). The majority of participants were in agreement that the AP must be protected from further decline at all costs (93.0%). While many participants indicated a willingness to donate to protect the species (70.6%) some indicated not being able to by expressing comments like "I do not have an income so I cannot donate." There was considerable disagreement (52.8%) among participants regarding whether there are more pressing conservation priorities in South Africa than the AP. Furthermore, the final statement suggests that several participants who left the question unanswered expressed uncertainty about how to respond and shared similar sentiments, such as "The conservation of all vulnerable or threatened species are equally important."

Figure 4.3: Views on AP Conservation among Participants living more than 5km from colonies.
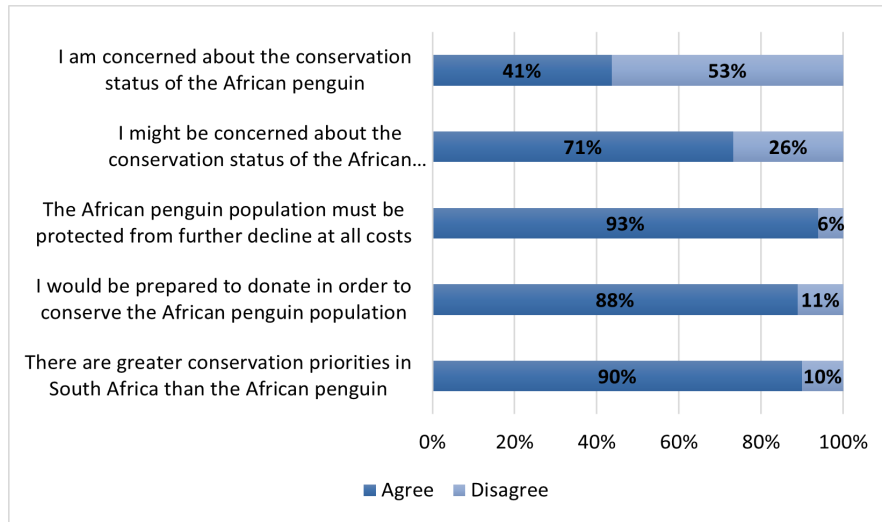
3.10   Stakeholder Group 3: Fishers

3.6.1. Fishing Industry Composition

Figure 4.5 shows the composition of different fishers that made up the fisher survey. Many fishers categorized themselves as small-scale fishers (48%) involved in catching rock lobster and line fish, the least proportion of fishers came from the charter fishing boat industry (9%).

Figure 4.4: Fishing Industry Composition of Participants.
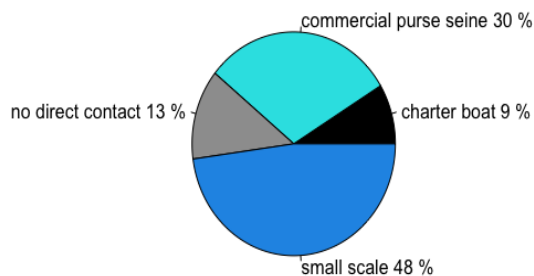
3.6.2. Information

Nearly half of fisher participants felt that they were well informed about AP conservation (47.8%), but the majority wanted more information (73.9%). The internet was the primary source of information (73.9%).

Figure 4.5: Access to information across fisher participants.
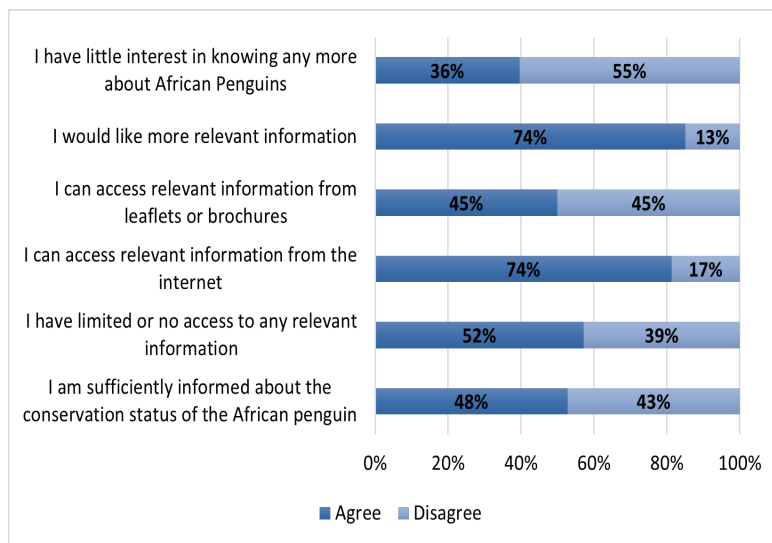
3.6.3. Fishing measures and policies
Figure 4.6: Attitudes of Fisher Respondents towards Fishing Measures.
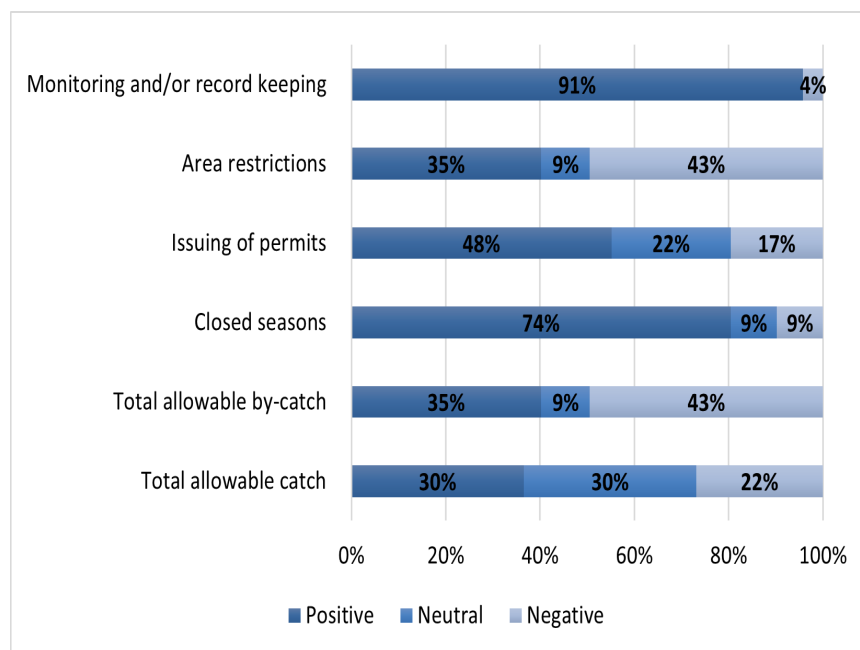
In figure 4 it can be seen that respondents reported equally positive (30%) and neutral (30%) attitudes on TAC. TAB was viewed as a mostly negative measure (43%) by majority members (54%) of the SSF industry along with Area restrictions (43%). The issuing of permits presented mixed views across participants. Monitoring and or record keeping was viewed as the most positive fishing measure (91%) followed by closed seasons.

3.6.4. Attitudes to Conservation

Over 90% of fishers had positive attitudes toward AP conservation and the protection of habitats, and over 80% considered the AP's plight to be of personal importance.

Just 30.4% of participants rated conservation laws and policies as scientifically sound. A majority of fishers said that regulators failed to consider their concerns (47.8%). In addition, more than half of the respondents supported MPAs (56.5%).

There was mainly a disagreement among participants regarding the threat that penguin conservation regulations pose to the fishing industry's sustainability (56.5%). Many felt fishing off the southern African coast reduces the fish stock available for penguins (56.5%).

Figure 4.7: Attitudes towards AP Conservation across Fisher group.

Chart legend: Strongly disagree, Disagree, Agree, Strongly agree

Categories (top to bottom):
- I would like to receive more information… 4%, 43%, 35%
- Fishing off the southern African coast… 22%, 22%, 35%
- The regulatory authorities are sensitive to… 9, 39%, 17%
- Marine Protected Areas (MPAs) play an… 30%, 43%, 39%
- I am well informed about the… 35%, 35%, 4%
- I do not mind being inconvenienced if it… 39%, 26%
- Conservation of African penguins is… 61%, 22%
- Regulations to conserve penguins… 13%, 43%, 17%, 9%
- The regulatory authorities are sensitive to… 30%, 26%, 17%, 9%
- Conservation laws and policies are based… 9%, 39%, 26%, 4%
- Penguins and their habitat should be… 0, 61%, 35%

3.6.5. Views

There was a widespread concern reported about the AP among participants (95.7%). Most participants claimed that if they knew more about the issue, they would be more concerned (82.6%). Participants generally agreed that the AP must be protected from further decline (82.6%). Many participants expressed their willingness to contribute to the species' protection through donation (69.6%). More than half of participants agreed that South Africa has more pressing conservation priorities than the AP (52.2%).

Figure 4.7: Views on AP Conservation across Fisher group.
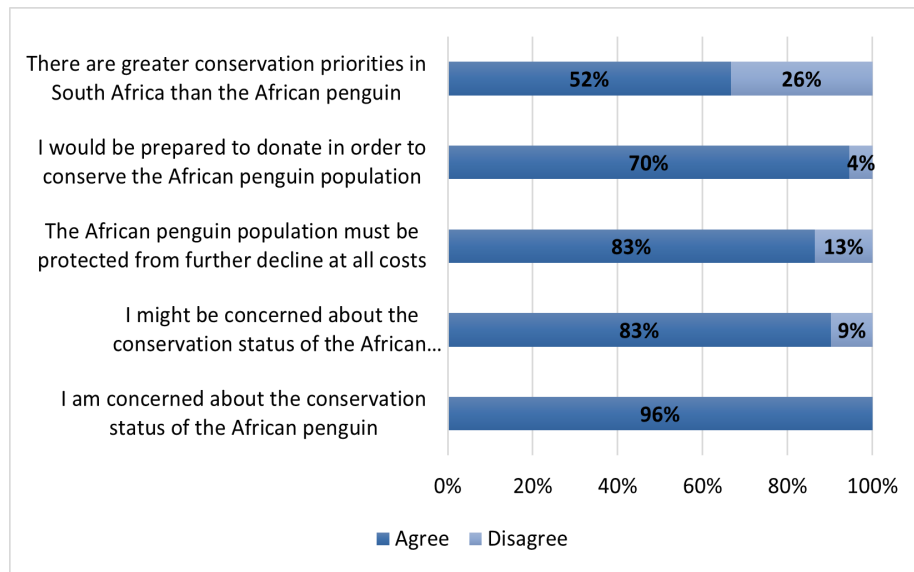
3.11   Stakeholder Group 4: Scientists/Policymakers

3.7.1. Composition of specialist stakeholders.

Figure 4.8 Composition of Specialist Stakeholders.
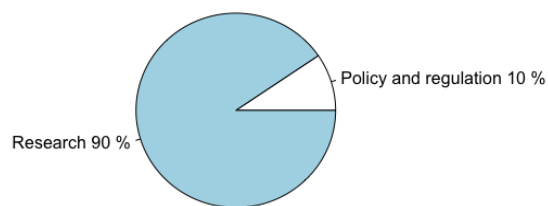
Figure 4.1 looks at the occupations of specialist stakeholders where the majority of participants noted research (90%) as their involvement.

3.7.2. Contact

According to the participants, the most common form of association was daily contact (28.6%), while no contact (14.3%) was reported the least.

3.7.3. Attitudes

All participants reported a personal concern for conserving the AP (100%), most viewed prey availability (85%) and climate change (71%) as the major threats to AP survival but mixed views were reported on whether there was sufficient knowledge on the current state of the decline. All participants felt more action is needed to halt the decline and only 53% felt the goal to increase breeding pairs by >5% above the 2018 estimate is achievable. Most participants (86%) supported the role of MPAs.

Figure 4.8: Attitudes of Researchers and policymakers towards AP Conservation.
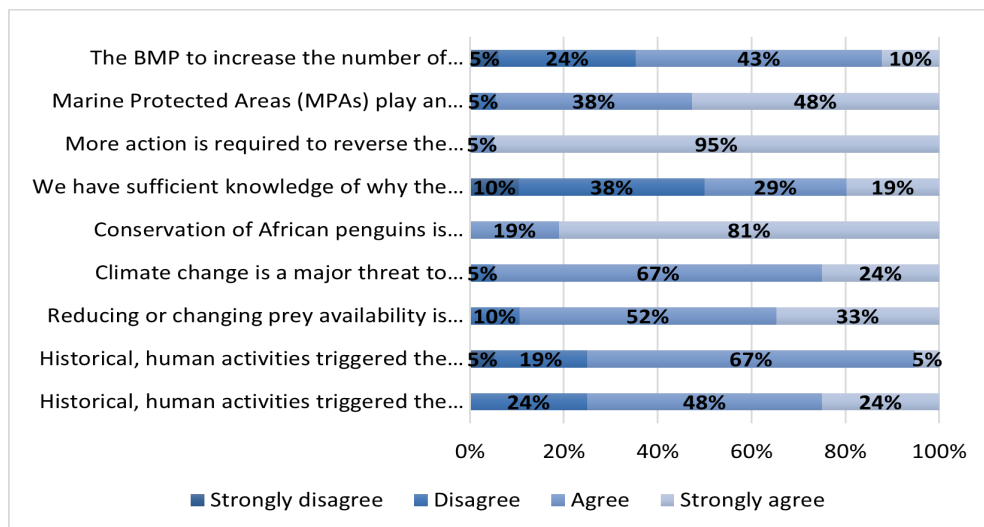
3.7.4. Optimism

Figure 4.10. Optimism of specialist stakeholders towards reversing the decline of the AP population.
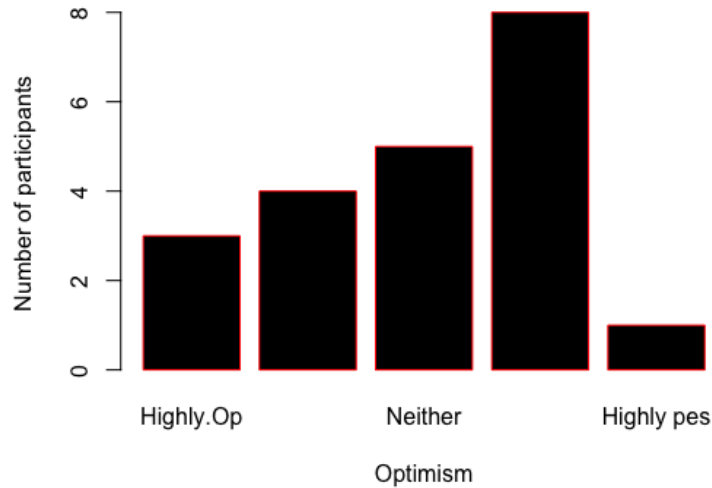
Figure 4.2. shows that the majority of participants in this group expressed a slight pessimism (38.1%) towards the attempts at reversing the downward decline in the AP population. A highly pessimistic attitude (4.8%) was less commonly expressed among participants.

3.7.5. Challenges

Figure 4.11. Challenges that threaten conservation of the AP.

71
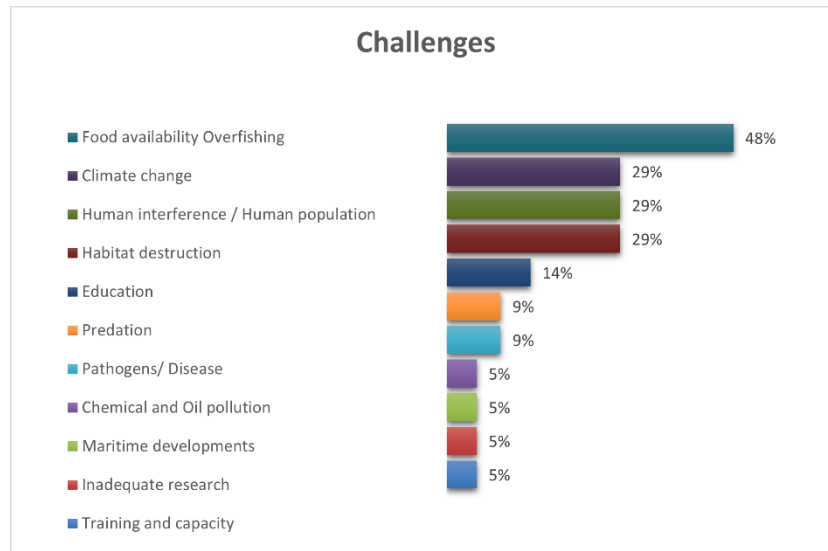
According to the figure above, the challenges cited by participants are mainly related to the availability of food and overfishing, which accounted for 48% of the responses. The following most commonly cited challenges were habitat destruction, the effects of climate change on the environment and the expanding human population. One user provided their perspective on the issue, "As top predators the African penguin will not survive if the ocean ecosystem continues to collapse as it is doing at present. Therefore, a lot of intervention is needed to protect the entire ecosystem, from all sorts of threats that range from pollution and the climate crisis to disturbance, human encroachment, and overfishing." The user continued by pointing out that "All these problems can only be solved if the ocean ecosystem is managed sustainably as a whole, and this is impossible if the human population continues to grow."

3.7.6 Existing policies and Strategies

Figure 4.12: Existing policies/ strategies enhancing AP conservation.
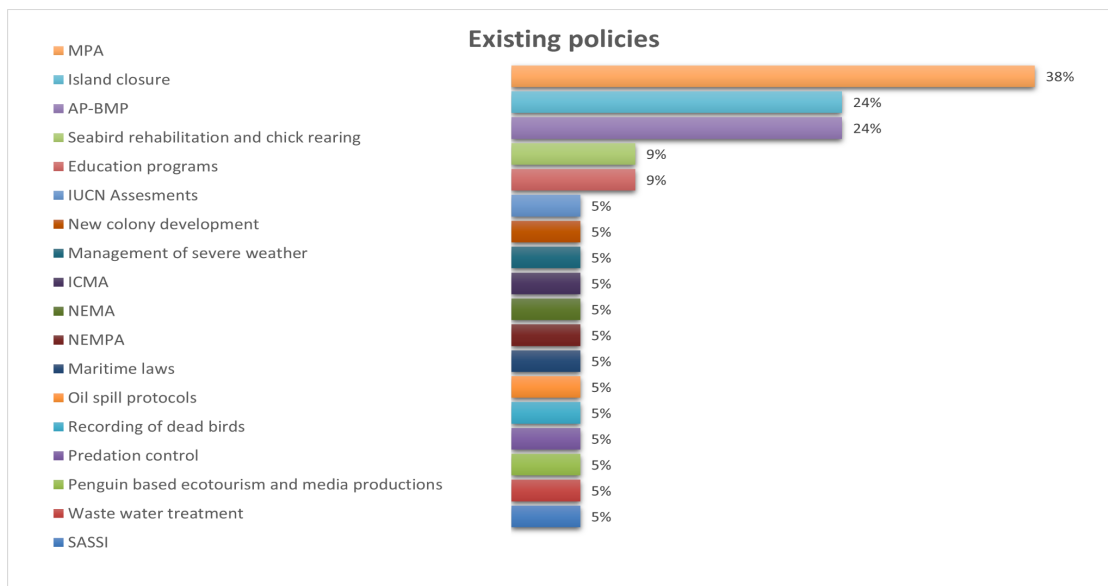
Among the participants, the most useful existing policy mentioned was related to Marine Protected Areas (38%). The Island closure experiment was the second most useful policy (24%) reported equally alongside the AP Biodiversity Management Plan (24%). It is worth noting that some participants who had more regular contact with penguins emphasized the importance of developing new colonies, although this was mentioned by the least number of participants (5%).

3.7.7. Figure 4.13: Additional/ Future policies or strategies

Additional/ Future Policies

- More MPA — 38%
- Marine spatial planning/Fisheries regulation — 29%
- Island closure — 19%
- Improve environmental education — 14%
- Establish new colonies — 9%
- Improve waste water tmt — 9%
- Stop bunkering at sea — 9%
- Co-ordinate testing of dead birds — 5%
- Continued research — 5%
- Improve rehabilitation protocols — 5%
- Improve greenhouse gas production — 5%
- Improve oil spill contingency plan — 5%

The foremost strategy that could support additional /future policies, as mentioned by 38% of participants, was the establishment of more MPAs. This was followed by improved marine spatial planning and fisheries regulation (29%) and island closures (29%). Less popular initiatives included coordinated testing of dead birds, continued research and improved rehabilitation protocols.

3.7.9. Resources and Development

Figure 4.14: Resources and development contributing to AP conservation.
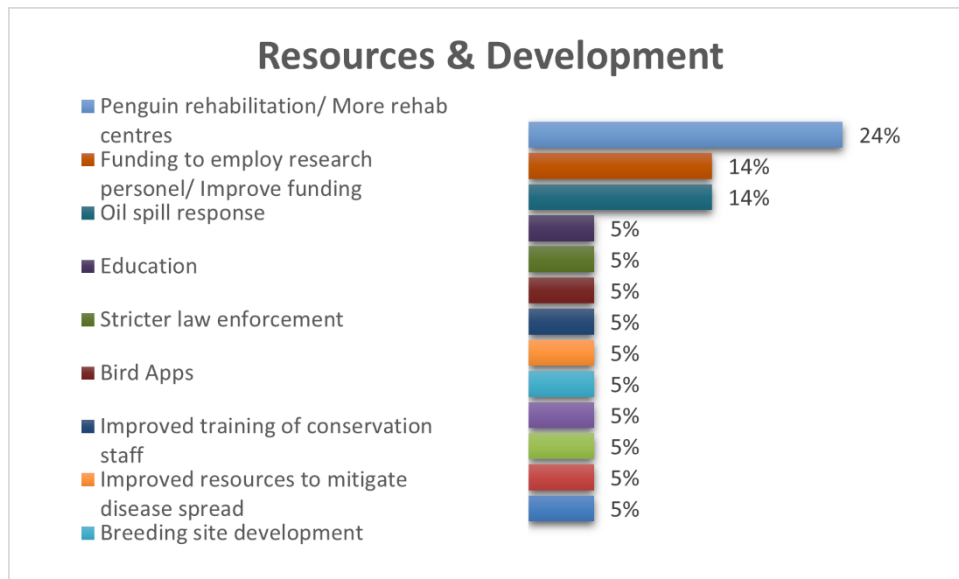
Rehabilitation centres (24%) was the most valuable resource and development initiative cited followed by oil spill response (9%) and more funding to employ research personnel (9%). While one respondent further elaborated that "the rehabilitation of African penguins will treat the symptom of the population decline, but not the cause. There is little value in treating individual penguins with ailments only to send them back into an environment that cannot sustain them. The penguin population is limited by the fish population. Fish numbers need to be allowed to grow so they can be harvested sustainably and leave enough for marine life".

3.7.10. Political/Stakeholder roles and coordination

Figure 4.15: Political / stakeholder roles or co-ordination contributing to AP conservation.
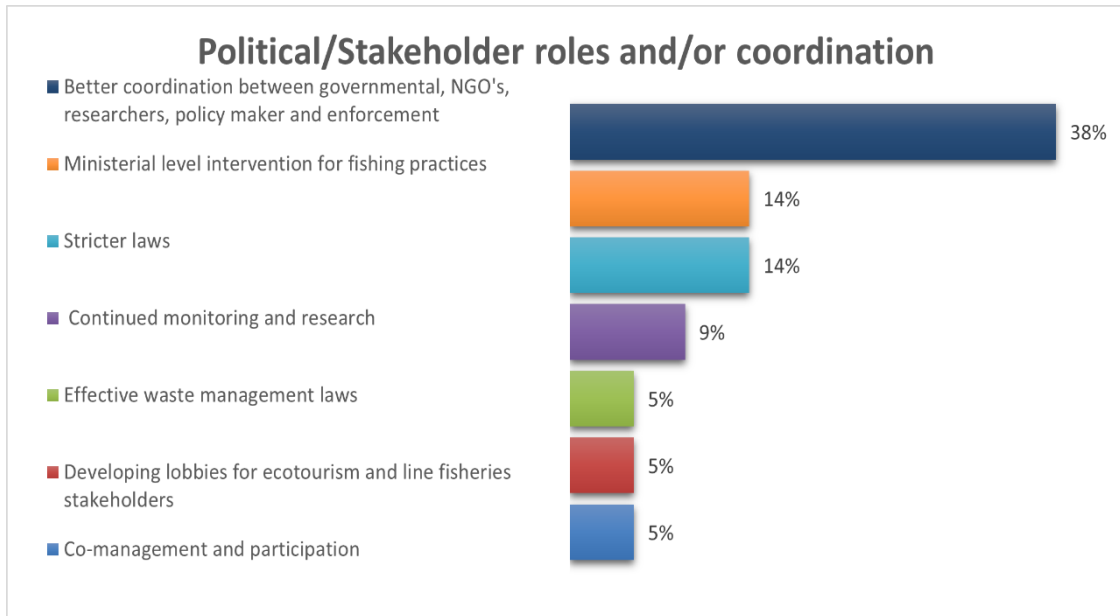
Responses on strategies to enhance political/ stakeholder roles included better coordination between government, research, policy makers and law enforcement (38%) as the foremost political and stakeholder role highlighted.

3.7.11. Most important initiatives

The majority of participants ranked MPAs (24%) as the most important initiative, followed by island closures (14%), restrictions on marine/ shipping activities close to colonies (14%), and fisheries regulations (14%).

Figure 4.16: The Most important initiatives.
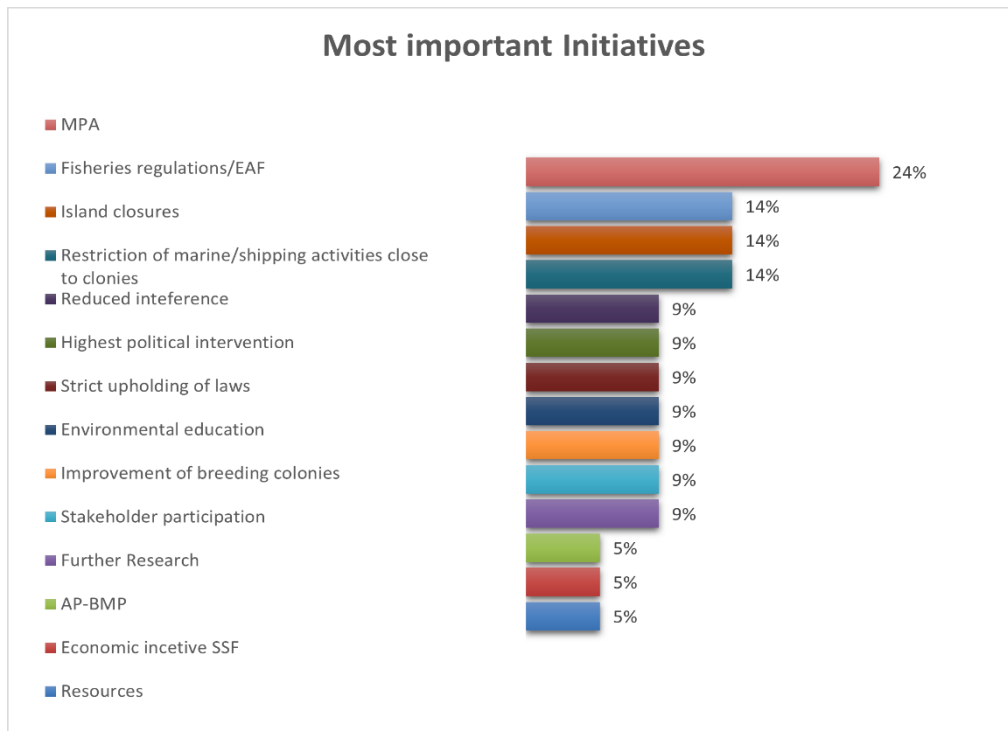
4. DISCUSSION

4.7 Demographic information

Demographic characteristics revealed that the study population was diverse. However, in contrast to the South African 2016 census (https://www.statssa.gov.za) results the study population was skewed towards highly educated citizens of which 59.2% of study participants had attained a post school qualification compared to 17.8% of South African citizens. Moreover, the sample underrepresented people under 18, people with incomes of more than R50 000 and people living less than 5km from colonies. Therefore, the study may not have captured a comprehensive view of the challenges faced by community members in living with African penguins. A large proportion of young citizens were also omitted, which could have resulted in the exclusion of important knowledge and perspectives from this demographic.

Overall, the demographic characteristics of the study population highlights the need for caution in generalizing the study's findings to the broader South African population. It also justifies the need for future research on this topic to be comprehensive in adopting a more representative sample to provide a nuanced overview of the challenges faced by various stakeholders and the conservation and management of the African penguin. Nevertheless, the study design is based on the standard practice of Knowledge Attitudes and Practices (KAP) method. Although practices were not assessed in this study, the knowledge and attitude attributes of the KAP method were employed. This method is well-suited for assessing easily accessible populations and is designed to provide a representative assessment of a specific target population. It gathers valuable information about what individuals know, believe, and do concerning a particular topic of interest. Additionally, the results of the survey can be highly beneficial in informing further research and decision-making processes (Andrade et al., 2020).

4.8 Knowledge

The findings of this study indicate that high knowledge of African penguins exists in a small proportion of respondents across South Africa. The knowledge gap appeared to increase at distances further from colonies which could indicate less awareness and that the most effective mode of information appeared to be localised at distances closest to colonies. People further than 5km reported written material to be the most available source of information (90%). However, the data illustrates that 59% of participants that reported this achieved moderate and low knowledge scores which could suggest that the question may have been incorrectly interpreted and that this is in fact not the case. The results of the study support the work of previous studies which suggest that local people are less concerned about local biodiversity (Huxham, Welsh et al. 2006, Ballouard, Brischoux et al. 2011, Hooykaas, Schilthuizen et al. 2019).

A high proportion of citizens reported internet access (87.3%) in the study. However, accessibility to the internet did not necessarily indicate informed participants. This study demonstrates the oversight of mass media to inform the public at large as media campaigns tend to engage with those least in need, particularly individuals already interested and informed. Targeted engagement with information on the internet dually coincides with higher incomes of participants in the study and a consequently better socio-economic status (Bonfadelli 2002).

The association between knowledge and people who observed penguins in the wild is an interesting one as it is challenging to identify the participants who engaged with the topic as a free choice learning experience and those who are more knowledgeable simply due to their proximity to colonies and the overwhelming amount of media and sources of information accessible to people who may not necessarily share an interest in penguins but are instead a chief characteristic of mainland colonies.

As the study population of fishers only reported distances ranging from 5-100 km from colonies where printed sources of information seemed to be much more limited, the literature on traditional ecological knowledge supports the high knowledge findings found among fishers in this study. It appeared to be a strong contributor to the knowledge held by fisher participants due to the direct experience with nature. One fisher reported that his knowledge on African penguins stems from his observations on fishing trips, "the number of penguins has become less over the years as we visit the Islands when we are away at sea".

There is immense value in adopting the use of Traditional ecological knowledge (TEK) to shape small-scale fisheries management which includes inclusionary benefits that promotes the protection of customary livelihoods and participatory governance while developing the current understanding of complex systems (Borrini, Kothari et al. 2004, Plummer and

Armitage 2007). One example of integrating TEK into small- scale fishery planning and management has produced spatial representations and management planning of high pressure harvest zones of spiny lobster fisheries in Turks and Caicos by merging community maps and maps used via geographical information systems (GIS) (Hall and Close 2007), yet despite the call for traditional knowledge incorporation at a policy level in South Africa, practical evidence of this has been slow (Sunde and Isaacs 2008). Policies that seek to support an ecosystem approach to managing fisheries need to build on the understanding of the knowledge systems of the fisher community.

There was a poor response rate from fishers in this study and small- scale fishers represented the bulk of this group. This aspect should be considered when making comparisons from this study.

4.9 Members of the public within 5km of colonies

Mainland residents showed a high awareness and appreciation for the local penguin colonies. Positive perceptions regarding the colonies were expressed in the comments of residents and related to the tourism benefits to the local community, the unique opportunity of sharing a living space with wildlife as well as the conservation and educational privileges afforded to younger generations. The study found that many residents had expressed concerns about their experiences with the managing authorities. Specifically, they reported a lack of correspondence and general communication, as well as the dissatisfaction with the level of service delivery. Participants that indicated that the local penguin population should be moved elsewhere (9%) also felt that penguins and their habitats should be protected and interestingly 50% felt negatively affected by the restrictions imposed by the local authorities. This is a telling observation where it seems that the attitudes of some residents towards the

local penguin population could likely be impacted by their discontentment with the managing authorities.

SANParks and Cape Nature as managing authorities of the two mainland colonies both constitute a stakeholder engagement platform with the purpose of providing participatory community processes (https://www.capenature.co.za/stakeholder-engagement). However, the residents that have participated in this study have pointed out acute issues that affect their lives because of the obscured relationships with the parks. Ragaller and Jarre 2015 have previously noted the importance of structuring relations with the local communities which subsequently allows for a better understanding of the role of research and the pertinent role of the reserve. The rapid decline of the African penguin may inundate the managing authorities as catastrophic events occur more frequently, however establishing open channels for communication holds benefits for both the reserve and communities and could aid in the support and acceptance of the managing authorities and potentially foster pro- conservation attitudes and behaviour (Holness, Harris et al. 2022).

Results from this study show that the attitudes towards African penguin conservation from respondents situated at the mainland colonies may be confounded by a lack of correspondence with the managing authorities. Community communication forums therefore need to be prioritized by the managing authorities along with an adaptive management approach that seeks to record the progress and develop the management plan. A concern from a SANParks spokesperson was that residents'(e.g., residents vs B&B/semi-permanent residents) bordering the parks differ in their views and that many of their concerns have no relation to the park or the plight of the AP, however many of these residents have an expectation from the park to resolve these issues. The comment raises an important issue on the general confusion by residents surrounding the duties and efforts of the managing authorities which was a matter previously observed at the Betty's Bay colony (Ragaller and

Jarre 2015). Consultation forums with residents can provide the opportunity for the managing authorities to foster valuable relationships built on a mutual understanding and determine the priorities and actions that are able to resolve concerns.

4.10   Attitudes

Most people indicated positive attitudes associated with African penguin conservation however, more positive attitudes were related to those who had greater knowledge on the subject. Although behavioural associations were not widely explored in this study, more people with eco-centric attitudes were willing to donate. However, this question may have been misinterpreted as a request to donate even though there was not an opportunity to donate with the survey, and the uncertainty may have impacted responses.

The lack of support for MPA by fishers is a finding that is corroborated by Pita, e Costa et al. 2020. Similarly, to this study fisher's vast knowledge on the topic explored did not relate to a wider acceptance of marine protected areas but was in fact impacted by top-down approaches and a failure to legitimize the rights of fishers. The study sample of fishers expressed similar sentiments to the finding of fishers examined by Sowman & Sunde 2018 where there is a lack of functional mechanisms in place to ensure effective community participation in decision making and debilitating local governance and processes ultimately impedes on MPA success.

An interesting finding from the majority that represented an association with the purse seine fisheries was the agreement (66.7%) on the impact of fishing on forage fish availability to penguins. It is possible that the large quantities of fish that are caught daily by this sector and the individual perception of fishing over restricted spatial and large temporal scales (van Oostenbrugge 2003) as well as the overlap or detection of African penguins on fishing trips might explain this finding.

4.11   Fishers

In terms of attitudes towards the various fishing management regulations, many fishers reported positively towards the measures and valued the importance of having these strategies in place. However, small scale fishers who made up the bulk of respondents in this study related mostly negative drawbacks with the various measures. One small-scale fisher reported on the disproportionate monitoring, "the monitoring is not equal across the different fishermen groups. Recreational fishers are not monitored by how much they fish even though they have permits whilst we are". Griffiths et al, 2002 have validated that together with commercial line fishing, recreational fishing in Kwa-Zulu Natal has contributed to the depletion of bottom dwelling offshore line species. The lack of effective monitoring of fish stocks and non-compliance in the recreational sector is a crucial component that undermines the management framework required to replenish depleted line fish stocks (Griffiths and Lamberth 2002).

Total allowable By-catch was viewed negatively by most respondents, but the rationale differed between fishers from different sectors, one commercial fisher reported "TAB depletes species" and another who identifies as a small- scale fisher reported "I used to earn an extra income with the bycatch I caught by selling it to people in my community and now that is no longer". It's easy to see why many view this measure negatively when fisheries like pelagic and demersal longline fisheries, which are considered to be the most dangerous form of fishing, captures incidental species when fishing for a target species. Longline commercial fishing operations have contributed to the threatened IUCN status of at least eight species of turtles and sharks found in the inshore waters in Southern Africa (Petersen 2008). Though,

for small scale fishing communities who are impacted by food security the benefits of TAB have provided certainty to vulnerable livelihoods.

The small-scale fishing policy allows rights to be allocated for a basket of multispecies. However, not every bona-fide fisher has received rights and the rights allocation process in 2016 is criticised for unfairly and inaccurately allocating rights, this process has since been audited and the Western Cape roll out of formal rights allocation has been initiated as recently as September 2022. For the time following up to the formal rights allocation process of small-scale fishers in the Western Cape, fishers in this study have been utilizing Interim relief permits that are managed as part of a community-based cohort to sustainably harvest and utilize resources according to the ecosystem approach. However, fishers have voiced many grievances with the process that coincides with the statements found in this study such as the late issuing of permits, the inclusion of non-fishers in beneficiary lists and the inefficiency by DEFF that has set livelihoods further back (https://www.masifundise.org/)

Overall, few fishers in this study felt negatively towards many of the different fishing policies assessed. However, small scale fishers have provided notable negative associations with fishing policies categorised in the study as it has often operated with a drawback in the communities. Despite these challenges communities continue to rely on fisheries as a source of food and livelihoods (Macdonald 2019). The roll out of the formal fishing rights allocation process to SSF provides hope for the fishing communities in the Western Cape. Genuine co-management is a critical policy that was expressed as a concern by users in this study and requires the efforts by the government to adapt the strategy to grant fishers more responsibility in allocating rights, identifying, and excluding corrupt members and deciding the management structure which suits the community.

Moreover, DEFF has announced income from recreational fishing licences amounting to ZAR 18 million in 2013 and ZAR32,6 billion economic contribution from recreational angling participation (Potts, Saayman et al. 2022). This is a significant amount to improve the enforcement, monitoring, compliance, and overall socio-ecological management of recreational fishing especially when the annual catch includes that of high value species.

Furthermore, monitoring on commercial vessels is not a topic that has been widely commented on by the fishers in this study although there have been suggestions on the importance of stricter measures to place on bigger vessels, accompanied with the majority view that fishing off the Southern African coast reduces fish stock available for penguins.

Total applied effort is the quantity of fishing vessels which includes the type, size and engine power thereof or the fishing method applied that requires fishing vessel licenses or fishing permits that may warrant the removal of individual or groups of species or the maximum number of persons on board a fishing vessel requiring fishing licences or permits to fish individual or groups of species this concept has not been included in the categories assessed for the fisher survey.

4.12   Researchers and policy makers

Researchers and policy makers were generally mixed in their optimism regarding reversing the downward trend in the population. Many expressed similar opinions that any action would be better than not acting at all. The barriers to achieving success with African penguin conservation have been identified by informants and the most frequent emergent themes are discussed. Most of the concerns listed had interlinking relationships with one another.

Overfishing, food availability and habitat destruction were among the most significant challenges displayed by participants. The African Penguin Biodiversity Management Plan 2022 as well as the partial period of fishing closures around key penguin breeding colonies

have been announced. Key outcomes in the AP-BMP intend to have the population of African penguins slowed and at best reversed. The partial fishery closures are only until the 14th of July 2023 and a permanent decision regarding the state of closures will be made once an Independent International Science Panel will be instated. Public commentary from the research community has pointed to the lack of precautionary measures put in place in the interim of critical discussions undertaken by NGOs and the small pelagic fishing industry that could likely have resulted in positive penguin breeding efforts for 2022 (WWF 2022). Future concerns regarding the announcement pertain to the transparency on the selection of panel members, the rapid appointment of the panel and a precautionary approach to be constituted if the time of partial fishing closures precedes the final decision and lastly an ecosystem approach to fisheries must be taken into consideration with the final output to account for marine life and species interactions as well as livelihoods and wellbeing of resource users dependant on the ocean. Moreover, future priorities should consider the availability of forage fish at all life cycles of the African penguin to alleviate the effects of climate change.

Habitat destruction was listed as a key challenge to African penguin conservation, for the topics discussed in this study this definition encompasses a wide range of factors such a nest suitability, the reinforcement of colonies against catastrophic weather conditions, oil spills, predation, disturbance at sea by shipping activities and the prevention of road accidents experienced at the mainland colonies. This concern therefore spilled into other concerns listed by participants.

An ecosystem-based approach is the overarching approach that is fundamental in ocean planning and governance, though hindrance in achieving this approach lies in the complexities of natural ecosystems as well as the institutional and legal systems that are customary for the management of those resources. Langlet et al, 2018 puts forward that considerable work in implementing the approach can be done even when the necessities of

the system are far from perfect. A clear challenge identified by informants in the study is the lack of clear coordination between mandates pertaining to biodiversity and fisheries management by government, this is critical given the c10, 4000 breeding pairs of African penguins in the wild and the role as bioindicators in the marine environment reflecting a depleting fish stock. Harmonisation between the mandates is required to better manage a shared resource that includes the disclosure of information between government departments.

Many respondents pointed to the importance of Marine Protected Areas as an existing strategy and the need to expand more as an additional and future policy. Long term international Ocean Economy and Sustainability Goals of the United Nations is to identify areas of priority and expand ocean protection to 10%. Still, facilitating the involvement of local and indigenous communities into marine protected area planning and implementation is a key determinant of its success. A call to reinforce stricter measures and compliance with fishing laws and policy in ensuring the success of existing MPA's has been a recurring theme in this study as Illegal fishing is cited by FAO as one of the greatest threats to marine ecosystems (De Coning and Witbooi 2015). More capacity and training of coastal law enforcement is a popular theme that emerges in literature as well as more cooperation with the South African Police Service as the authority of fishery control officers are limited. However, the call for more stringent enforcement and laws will ultimately affect vulnerable groups like small- scale fishers excluded from traditional fishing rights due to the instances of illegal fishing in coastal communities that are at times driven in response to the disproportionate allocation of fishing rights, more stringent outcomes of law enforcement are not appropriate solution to this situation and has the potential to create conflict around human rights issues. There is a requirement from the government to aid and facilitate in the co-management processes in fishing communities and to ensure fair and equitable access to fishing rights as well as a potential for community members to work with law enforcement to

identify potential persons involved in crime. However, illegal fishing laws and policies should be developed at a legislative and policy level and the tools offered by a criminal law approach can accompany and reinforce existing methods (De Coning and Witbooi 2015).

The concept analysis has highlighted important insights perceived by mostly knowledge producers of African penguin research; key concepts were brought forward by this group that would aid in development of African penguin management and conservation. There is a consensus on the importance of facilitating co-ordinated action among stakeholders and the time in which these decisions are made with respect to the vulnerable predicament facing the African penguin species.

There is awareness among participants regarding the disorderly state and the lack of intervention at a government level and the value in discerning roles and responsibilities of the various stakeholders.

4.13   Limitations

The specialist stakeholder group of researchers, policymakers and fishers presented the greatest challenges for gathering survey responses. Initially, the strategy was to contact researchers, policymakers, and pelagic fishing associations through email but due to the low response rate, snowball sampling was implemented which justified the difficulties experienced in recruiting participants.

Budget and time constraints as well as safety concerns prevented travelling to extended regions in South Africa and gathering responses from a wider range of stakeholders.

5.   CONCLUSIONS

Many stakeholders lacked sufficient knowledge on African penguin conservation, but fishers and those within 5km from penguin colonies had good knowledge. Positive attitudes towards African penguins were linked to good knowledge, but some attitudes may be influenced by specific conflicts with managing authorities or disputes over user rights and access.

Overall, Fishers generally had positive attitudes towards African penguins, but had negative attitudes towards conservation laws and policies, which they felt put them at a disadvantage. Fishing strategies and policies were mostly seen as valuable conservation measures, but fishers felt that some measures were not adequately enforced. Small- scale fishers felt the most negatively impacted by most of the fishing measures and their main challenge was that they were not part of the participatory and decision-making process that informed their livelihoods.

Based on the study, it was found that the specialist researcher and policymaker survey was largely composed of research participants, with policy makers making up a small proportion of the total participants. While there were differences in opinion between research and policy stakeholders on the level of knowledge on the decline of the species, all stakeholders agreed that more action is needed to address the issue.

Despite some differences in optimism regarding reversing the downward trend, there were some common priorities identified by specialist stakeholders.

The findings highlight the need for targeted educational initiatives to address the knowledge gaps among stakeholders who lack sufficient knowledge about African penguin conservation. These initiatives should particularly focus on stakeholders who are not fishers or living within 5km from penguin colonies. The positive attitudes of fishers towards African penguins indicate a potential willingness to engage in conservation initiatives. This presents an opportunity for collaboration and partnership between fishers and conservation stakeholders.

However, the negative attitudes towards conservation laws and policies among fishers highlight a need for improved communication and engagement with fishers in the development and implementation of these measures. The perception that some conservation measures are not correctly enforced indicates a need for a higher standard of monitoring and enforcement to be implemented. Strengthening the enforcement of fishing regulations can help address many conservation issues and promote compliance. It is crucial to address the

specific concerns of small -scale fishers and include them in participatory processes. Ensuring their active involvement in decision-making and considering their livelihoods in conservation planning can contribute to more equitable and sustainable solutions.

The composition of the specialist researcher and policymaker survey being largely composed of research participants indicates a need for increased representation and participation of policy makers in future studies. Including a diverse range of stakeholders can facilitate effective decision-making. The difference in opinion between the two groups suggests a need for better communication and collaboration. However, despite the differences, it is

encouraging that all specialist stakeholders agreed on the need for more action. The identified priorities provide potential areas of focus for future policy and management decisions aimed at mitigating the impacts of human activities on the African penguin population.

The positive relationship between knowledge and positive attitudes towards African penguins suggests that improving knowledge can potentially lead to more favorable attitudes and support for conservation efforts. Therefore, efforts should be made to enhance knowledge among stakeholders to foster a greater appreciation and understanding of the importance of African penguin conservation.

6. RECOMMENDATIONS

It is recommended that policy regulation and conservation authorities prioritize the development of African penguin education initiatives aimed at engaging all stakeholders across South Africa. These initiatives should also target stakeholders, who may be located at greater distances from the African penguin colonies. This will ensure outreach programs encompasses raising awareness among a broader range of stakeholders and promoting greater community involvement. Investing in education and outreach programs can also promote sustainable practices and reduce the negative impact of human activities on the environment.

Based on the findings of this study, it is important to note that the study sample was not fully representative of the entire population. However, the findings from the sample still provide valuable insights that can inform policy and management decisions.

The composition of the fisher group mainly consisting of small-scale fishers highlights the importance of including a more comprehensive representation of stakeholders, specifically commercial fishers, in future studies. By incorporating a diverse range of stakeholders, including both small-scale and commercial fishers, a wider- ranging understanding of the perspectives within the fishing industry can be gained. This approach can have advantages for more effective decision-making and well-informed conservation strategies that address the needs and concerns of all fisher groups.

Considering that, it is recommended that the Department of Forestry, Fisheries and the Environment collaborate with other relevant organizations such as Cape Nature, SANParks, and the Robben Island Museum to develop and fund policies aimed at promoting education and participatory platforms with local communities. Additionally, funding should be allocated to these facilities to ensure that they have the necessary staff and resources to effectively carry out these measures.

While the findings of the study were not a direct result of the recommendations, findings from the research and policymakers survey provide unique insights to inform policy and management decisions aimed at protecting the African penguin population. It is suggested that the Department of Forestry, Fisheries and Environment work with conservation and veterinary professionals to identify and allocate funding for targeted research projects. This funding should also be used to employ and train personnel to assist with priority responses and initiatives.

Additionally, the Department of Forestry, Fisheries and Environment should foster multi-disciplinary collaborations among conservation professionals, commercial and small-scale fishery organizations, and NGOs. These collaborations can increase co-ordinated research action and management, ultimately helping to ensure the long-term survival of the African penguin population.

Furthermore, promoting the devolution of resource user rights and access by allocating resources to facilitate co-management within coastal communities can be beneficial. This can help to ensure that all stakeholders have a say in the management of coastal resources and can contribute to the conservation of the African penguin population.

Finally, it is important to facilitate working relationships between the public, government, NGOs, and private sectors. This can help to identify and address conflicts and perceived barriers to conserving wildlife like the African penguin. By working together, we can ensure that conservation efforts are effective, sustainable, and supported by all stakeholders.

References

1. Affairs, D. o. E. (2018). "DRAFT 2nd BIODIVERSITY MANAGEMENT PLAN FOR THE AFRICAN PENGUIN (Spheniscus demersus)."

2. Andrade, C., Menon, V., Ameen, S. and Kumar Praharaj, S. (2020). "Designing and conducting knowledge, attitude, and practice surveys in psychiatry:practical guidance." Indian Journal of Psychological Medicine, 42(5), pp.478-481.

3. Arias-Arévalo, P., et al. (2017). "Exploring intrinsic, instrumental, and relational values for sustainable management of social-ecological systems." Ecology and Society 22(4).

4. Ballouard, J.-M., et al. (2011). "Children prioritize virtual exotic biodiversity over local biodiversity." PloS one 6(8): e23152.

5. Barham, P.J., Underhill, L.G., Crawford, R.J. and Leshoro, T.M. (2007). "Differences in breeding success between African penguins (Spheniscus demersus) that were and were not oiled in the MV Treasure oil-spill in 2000." Emu-Austral Ornithology, 107(1), pp.7-13.

6. Bennett, N. J., et al. (2017). "Conservation social science: Understanding and integrating human dimensions to improve conservation." Biological Conservation 205: 93-108.

7. Berkes, F. (2017). Sacred ecology, Routledge.

8. Bhatia, S., et al. (2020). "Beyond conflict: exploring the spectrum of human–wildlife interactions and their underlying mechanisms." Oryx 54(5): 621-628.

9. Bonfadelli, H. (2002). "The Internet and knowledge gaps: A theoretical and empirical investigation." European Journal of communication 17(1): 65-84.

10. Borrini, G., et al. (2004). Indigenous and local communities and protected areas: Towards equity and enhanced conservation: Guidance on policy and practice for co-managed protected areas and community conserved areas, IUCN.

11. Burger, J. and M. Gochfeld (2001). Effects of chemicals and pollution on seabirds. Biology of marine birds, CRC press: 503-544.

12. Butterworth, D. (2020). "A Response to FISHERIES/2020/JUL/SWG-PEL/102."

13. Campbell, K. (2016). Factors influencing the foraging behaviour of African Penguins (Spheniscus demersus) provisioning chicks at Robben Island, South Africa, University of Cape Town.

14. Coetzee, J. and A. Badenhorst (2013). "Status and management of the South African small pelagic fishery—August 2013." Cape Town: Oceana Fishing Group.

15. Coetzee, J., et al. (2018). "A summary of the South African sardine (and anchovy) fishery."

16. Cooney, R. (2004). The precautionary principle in biodiversity conservation and natural resource management: an issues paper for policy-makers, researchers and practitioners, IUCN.

17. Cooper, J., 1978. Moult of the Black‑footed penguin. International Zoo Yearbook, 18(1), pp.22-27.

18. Correia, R. A., et al. (2016). "Familiarity breeds content: assessing bird species popularity with culturomics." PeerJ 4: e1728.

19. Crawford, R.J.M., Hemming, M., Kemper, J., Klages, N.T.W., Randall, R.M.,

Underhill, L.G., Venter, A.D., Ward, V.L. and Wolfaardt, A.C. (2006). "Molt of the African penguin, Spheniscus demersus, in relation to its breeding season and food availability." Acta Zoologica Sinica, 52, pp.444-447.

20. Crawford, R., et al. (2011). "Collapse of South Africa's penguins in the early 21st century." African Journal of Marine Science 33(1): 139-156.

21. Crawford, R., et al. (2017). "Tangled and drowned: a global review of penguin bycatch in fisheries." Endangered Species Research 34: 373-396.

22. Crawford, R., et al. (1995). "Trends of African penguin Spheniscus demersus populations in the 20th century." South African Journal of Marine Science 16(1): 101-118.

23. Crawford, R. J. (2007). "Food, fishing and seabirds in the Benguela upwelling system." Journal of Ornithology 148(2): 253-260.

24. Crawford, R. J., et al. (2007). "An altered carrying capacity of the Benguela upwelling ecosystem for African penguins (Spheniscus demersus)." iceS Journal of marine Science 64(3): 570-576.

25. DEA (2018). "Biodiversity Management Plan for the African penguin Spheniscus demersus." Government Gazette 580.

26. DEFF (Department of Environment, F. a. F. (2020). "Status of the South African marine fishery resources 2020." Cape Town: DE

27. De Coning, E. and E. Witbooi (2015). "Towards a new'fisheries crime'paradigm: South Africa as an illustrative example." Marine Policy 60: 208-215.

28. Driver, A., et al. (2012). "National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems."

29. Durant, J. M., et al. (2009). "Pros and cons of using seabirds as ecological indicators." Climate Research 39(2): 115-129.

30. Duffy, R., Massé, F., Smidt, E., Marijnen, E., Büscher, B., Verweijen, J., Ramutsindela, M., Simlai, T., Joanny, L. and Lunstrum, E., 2019. Why we must question the militarisation of conservation. Biological conservation, 232, pp.66-73.

31. Espinaze, M. P., et al. (2019). "Parasite diversity associated with African penguins (Spheniscus demersus) and the effect of host and environmental factors." Parasitology 146(6): 791-804.

32. Ferranti, F., Turnhout, E., Beunen, R. and Behagel, J.H., 2014. Shifting nature conservation approaches in Natura 2000 and the implications for the roles of stakeholders. Journal of Environmental Planning and Management, 57(11), pp.1642-1657.

33. Frost, P., et al. (1976). "Behavioural adaptations of the Jackass Penguin, Spheniscus demersus to a hot, arid environment." Journal of Zoology 179(2): 165-187.

34. Furness, R. W. (1993). Birds as monitors of pollutants. Birds as monitors of environmental change, Springer: 86-143.

35. Furness, R. W., and K. Camphuysen (1997). "Seabirds as monitors of the marine environment." iceS Journal of marine Science 54(4): 726-737.

36. Genovart, M., et al. (2013). "Holding up a mirror to the society: Children recognize exotic species much more than local ones." Biological Conservation 159: 484-489.

37. Griffiths, M. H. and S. J. Lamberth (2002). "Evaluating the marine recreational fishery in South Africa." Recreational fisheries: ecological, economic and social

evaluation: 227-251.

38. Hagen, C., Sherley, R.B., Steinfurth, A., Pichegru, L., Robinson, K.J., Jarre, A., Crawford, R.J., Winker, H., Altwegg, R., van der Merwe11, L. and McInnes, A., Annex 2: An evaluation of the evidence of the impact of fishing closures around breeding colonies of African Penguins

39. Hall, G. B. and C. Close (2007). "Local knowledge assessment for a small-scale fishery using geographic information systems." Fisheries Research 83(1): 11-22.

40. Harris, M. and S. Wanless (1997). "The effect of removing large numbers of gulls Larus spp. on an island population of oystercatchers Haematopus ostralegus: implications for management." Biological Conservation 82(2): 167-171.

41. Holcombe, L. (2015). "Penguin politics: human dynamics in the African penguin conservation debate." Tropical Resources 34: 72-78.

42. Holness, S. D., et al. (2022). "Using systematic conservation planning to align priority areas for biodiversity and nature-based activities in marine spatial planning: A real-world application in contested marine space." Biological Conservation 271: 109574.

43. Home, R., et al. (2009). "Selection criteria for flagship species by conservation organizations." Environmental Conservation 36(2): 139-148.

44. Hooykaas, M. J., et al. (2019). "Identification skills in biodiversity professionals and laypeople: A gap in species literacy." Biological Conservation 238: 108202.

45. Huxham, M., et al. (2006). "Factors influencing primary school children's knowledge of wildlife." Journal of Biological Education 41(1): 9-12.

46. International, B. (2018). "Spheniscus demersus." The IUCN Red List of Threatened Species 2018.

47. IUCN. 2022. The IUCN Red List of Threatened Species. Version 2022-2. https://www.iucnredlist.org. Accessed on [18 July].

48. International, B. (2021). "Species factsheet: Spheniscus demersus."

49. Johannes, R. E. (1993). "Integrating traditional ecological knowledge and management with environmental impact assessment." Traditional ecological knowledge: concepts and cases 1: 33-39

50. Johnson, R., et al. (2006). "Seabird predation by white shark, Carcharodon carcharias, and Cape fur seal, Arctocephalus pusillus pusillus, at Dyer Island." South African Journal of Wildlife Research-24-month delayed open access 36(1): 23-32.

51. Kemper, J., Roux, J.P., Bartlett, P.A., Chesselet, Y.J., James, J.A.C., Jones, R., Wepener, S. and Molloy, F.J., 2001. Recent population trends of African penguins Spheniscus demersus in Namibia. African Journal of Marine Science, 23, pp.429-434.

52. Kemper, J. (2006). Heading Towards Extinction? Demography of the African Penguin in Namibia, Citeseer.

53. King, M. D., et al. (2020). "Effects of petroleum exposure on birds: a review." Science of The Total Environment: 142834.

54. Lei, B.R., Green, J.A. and Pichegru, L., 2014. Extreme microclimate conditions in artificial nests for Endangered African Penguins. Bird Conservation International, 24(2), pp.201-213.

55. Macdonald, M. (2019). The contribution of small-scale fisheries to the community food security of one South African coastal community, Faculty of Science.

56. Makhado, A. B., et al. (2013). "An assessment of the impact of predation by Cape fur

    seals Arctocephalus pusillus pusillus on seabirds at Dyer Island, South Africa."
    Ostrich 84(3): 191-198.

57. McInnes, A., et al. (2020). "Benguela Current Forage Fish Workshop."

58. McInnes, A.M., McGeorge, C., Ginsberg, S., Pichegru, L. and Pistorius, P.A., 2017.
    Group foraging increases foraging efficiency in a piscivorous diver, the African
    penguin. Royal Society open science, 4(9), p.170918.

59. Miller, R. J. (2020). "The effects of anthropogenic disturbance upon African penguin
    colonies."

60. Mkono, M., 2019. Neo-colonialism and greed: Africans' views on trophy hunting in
    social media. Journal of Sustainable Tourism, 27(5), pp.689-704.

61. Molini, U., et al. (2020). "Avian influenza H5N8 outbreak in African penguins
    (Spheniscus demersus), Namibia, 2019." Journal of Wildlife Diseases 56(1): 214-218.

62. Montevecchi, W. A. (1993). "Birds as indicators of change in marine prey stocks."
    Birds as monitors of environmental change: 217-266.

63. Nel, D. C., et al. (2003). "The conservation status and impact of oiling on the African
    Penguin." The Rehabilitation of Oiled African Penguins: A Conservation Success
    Story'.(Eds DC Nel and PA Whittington.) pp: 1-7.

64. Nel, D. C. and P. Whittington (2003). Rehabilitation of oiled African Penguins: a
    conservation success story, BirdLife South Africa.

65. Ojemaye, C.Y. and Petrik, L., 2019. Occurrences, levels and risk assessment studies
    of emerging pollutants (pharmaceuticals, perfluoroalkyl and endocrine disrupting
    compounds) in fish samples from Kalk Bay harbour, South Africa. Environmental
    pollution, 252, pp.562-572.

66. Padua, S. M. (1994). "Conservation awareness through an environmental education
    programme in the Atlantic forest of Brazil." Environmental Conservation 21(2):
    145-151.

67. Parsons, N. J., et al. (2016). "Health evaluation of African penguins (Spheniscus
    demersus) in southern Africa." Onderstepoort Journal of Veterinary Research 83(1):
    1-13

68. Petersen, S.L., et al. (2006). "Is food availability limiting African Penguins
    Spheniscus demersus at Boulders? A comparison of foraging effort at mainland and
    island colonies." Ibis 148(1): 14-26.

69. Petersen, S. L. (2008). "Understanding and mitigating vulnerable bycatch in southern
    African longline and trawl fisheries."

70. Pita, C., et al. (2020). "Fisher's perceptions about a marine protected area over time."
    Aquaculture and Fisheries 5(5): 273-281.

71. Pichegru, L. (2013). "Increasing breeding success of an Endangered penguin: artificial
    nests or culling predatory gulls?" Bird Conservation International 23(3): 296-308.

72. Pichegru, L., et al. (2016). "African Penguin tolerance to humans depends on
    historical exposure at colony level." Bird Conservation International 26(3): 307-322.

73. Pichegru, L., et al. (2017). "Avoidance of seismic survey activities by penguins."
    Scientific Reports 7(1): 1-8.

74. Pimid, M., et al. (2022). "Understanding Social Dimensions in Wildlife Conservation:
    Multiple Stakeholder Views." Animals 12(7): 811.

75. Plummer, R. and D. Armitage (2007). "A resilience-based framework for evaluating
    adaptive co-management: linking ecology, economics and society in a complex

world." Ecological economics 61(1): 62-74.

76. Potts, W. M., et al. (2022). "Understanding the economic activity generated by recreational fishing in South Africa provides insights on the role of recreational fisheries for social development." Fisheries Management and Ecology 29(1): 29-43

77. Ragaller, S. and A. Jarre (2015). Human dimensions of stony point penguin colony management. Research Report, SA Research Chair in Marine Ecology and Fisheries, University of Cape Town.

78. Rand, R. (1950). "Birds of the guano islands." Farming in South Africa 25(294): 297-301.

79. Reusch, K., et al. (2020). "Foraging movements of breeding Kelp Gulls in South Africa." Movement ecology 8(1): 1-12.

80. Roberts, L. C., et al. (2023). "Descriptive Epidemiology of and Response to the High Pathogenicity Avian Influenza (H5N8) Epidemic in South African Coastal Seabirds, 2018." Transboundary and Emerging Diseases 2023.

81. Robinson, W. M. L. (2013). "Modelling the impact of the South African small pelagic fishery on African penguin dynamics." University of Cape Town.

82. Roy, C., et al. (2007). "Abrupt environmental shift associated with changes in the distribution of Cape anchovy Engraulis encrasicolus spawners in the southern Benguela." African Journal of Marine Science 29(3): 309-319.

83. Schuetz, J., et al. (2015). "Searching for backyard birds in virtual worlds: internet queries mirror real species distributions." Biodiversity and Conservation 24(5): 1147-1154.

84. Scheun, J., et al. (2021). "Urofaecal glucocorticoid metabolite concentrations in African penguin (Spheniscus demersus) chick populations experiencing different levels of human disturbance." Conservation Physiology 9(1): coab078.

85. Seddon, P., et al. (2008). "Effects of human disturbance on penguins: the need for site-and species-specific visitor management guidelines." Marine wildlife and tourism management: Insights from the natural and social sciences: 163-181.

86. Singh, D. M. P. and M. O. Mashiyane (2020). "'National Environmental Management Act, 1998 (Act No. 107 of 1998) National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of."

87. Shelton, P., et al. (1984). "Distribution, population size and conservation of the Jackass Penguin Spheniscus demersus." South African Journal of Marine Science 2(1): 217-257.

88. Sherley, R.B., Barham, P.J., Barham, B.J., Crawford, R.J., Dyer, B.M., Leshoro, T.M., Makhado, A.B., Upfold, L. and Underhill, L.G. (2014). "Growth and decline of a penguin colony and the influence on nesting density and reproductive success." Population Ecology, 56(1), pp.119-128.

89. Sherley, R.B. and Winker, H. (2019). "Some observations on comparisons of fitting to the annual means and the observation-level data for the cases in MARAM/IWS/DEC19/Peng/P4 that support a positive effect of the island closures experiment on African penguins." Document MARAM/IWS/2019/PENG/WP3. 5pp.

90. Sherley, R. B., et al. (2020). "The conservation status and population decline of the African penguin deconstructed in space and time." Ecology and evolution 10(15): 8506-8516.

91. Sherley, R.B., Barham, B.J., Barham, P.J., Campbell, K.J., Crawford, R.J., Grigg, J.,

Horswill, C., McInnes, A., Morris, T.L., Pichegru, L. and Steinfurth, A. (2018). "Bayesian inference reveals positive but subtle effects of experimental fishery closures on marine predator demographics." Proceedings of the Royal Society B: Biological Sciences, 285(1871), p.20172443.

92. Sink, K. (2016). "The marine protected areas debate: implications for the proposed phakisa marine protected areas network." South African Journal of Science 112(9-10): 1-4.

93. Sowman, M. (2011a). "New perspectives in small-scale fisheries management: challenges and prospects for implementation in South Africa." African Journal of Marine Science 33(2): 297-311.

94. Sowman, M., et al. (2011b). "Marine protected area management in South Africa: new policies, old paradigms." Environmental Management 47(4): 573-583.

95. Sunde, J. and M. Isaacs (2008). "Marine conservation and coastal communities: who carries the costs? a study of marine protected areas and their impact on traditional small-scale fishing communities in South Africa."

96. Sunde, J. (2014). "Marine protected areas and small-scale fisheries in South Africa: promoting governance, participation, equity and benefit sharing, International Collective in Support of Fishworkers."

97. Stonehouse, B. (1967). "The general biology and thermal balances of penguins." In Advances in ecological research (Vol. 4, pp. 131-196). Academic Press.

98. Trathan, P. N., et al. (2015). "Pollution, habitat loss, fishing, and climate change as critical threats to penguins." Conservation Biology 29(1): 31-41.

99. Van Heezik, Y. and P. Seddon (1990). "Effect of human disturbance on beach groups of jackass penguins."

100. van Houdt, S., Brown, R.P., Wanger, T.C., Twine, W., Fynn, R., Uiseb, K., Cooney, R. and Traill, L.W. (2021). "Divergent views on trophy hunting in Africa, and what this may mean for research and policy." Conservation Letters, p.e12840.

101. Van Zyl, H. and J. Kinghorn (2018). "The economic value and contribution of the Simon's Town penguin colony." Independent Economic Researchers 23.

102. Vanstreels, R. E., et al. (2019). "Identification of land predators of African penguins Spheniscus demersus through post-mortem examination." Ostrich 90(4): 359-372.

103. Vanstreels, R. E. T., et al. (2020). "Seashell and debris ingestion by African penguins." Emu-Austral Ornithology 120(1): 90-96.

104. van Oostenbrugge, J. (2003). "Uncertainty in daily catch rate in the light fisheries around Ambon and the Lease Islands: Characterisation, causes and consequences." Wageningen University.

105. Vogler, D., Macey, S. and Sigouin, A. (2017). "Stakeholder analysis in environmental and conservation planning." Lessons in Conservation, 7(7), pp.5-16.

106. Vogler, D., et al. (2017). "Stakeholder analysis in environmental and conservation planning." Lessons in Conservation 7: 5-16.

107. Waller, L. (2011). "The African penguin Spheniscus demersus: conservation and management issues."

108. Wcisel, M. (2013). "The effects of white shark presence on the behaviour of Cape fur seals at Geyser Rock, Gansbaai, South Africa." University of Cape Town.

109. Wepener, V. and N. Degger (2012). "Status of marine pollution research in South

Africa (1960–present)." Marine pollution

Faculty of Humanities
Fakulteit Geesteswetenskappe
Lefapha la Bomotho

09 November 2020

Dear Miss T Lewis

Project Title:	Assessment of Stakeholder Views in the Conservation Strategies for the African Penguin
Researcher:	Miss T Lewis
Supervisor(s):	Dr REJ Burroughs Prof DA Abernethy
Department:	Production Animal Studies
Reference number:	14051177 (REC037-20)
Degree:	Masters

I have pleasure in informing you that the above application was **approved** by the Research Ethics Committee on 09 November 2020. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

[Type here]

Sincerely,

Prof Innocent Pikirayi
Deputy Dean: Postgraduate Studies and Research Ethics
Faculty of Humanities
UNIVERSITY OF
PRETORIA
e-mail:
PGHumanities@
up.ac.za

Stakeholder Assessment _ People Living Within 5km of a Colony

Page 1: Stakeholder Assessment: Consent

Conservation Strategies for the African Penguin: Stakeholder Assessment

Informed consent for participation in a research study

Dear participant

We are conducting a study to determine what people know and feel about the conservation status of the African penguin. It is part of a wider project exploring threats to African penguin health and conservation of the species. We need your views!

My name is Takdeera Lewis and I am a Masters student from the Centre for Veterinary Wildlife Diseases, Faculty of Veterinary Science, University of Pretoria. My project is being supervised by Professor Darrell Abernethy and Dr Richard Burroughs, both from the same Centre, and Dr Katta Ludynia from the South African Foundation for the Conservation of Coastal Birds (SANCCOB).

If you agree to partake in this study, you will complete a survey which will ask you a few questions about yourself and then seek your views on African penguin conservation. It will take approximately 20 minutes to complete and your responses will be treated in strictest confidence – all data will be recorded at group level with no identifying information about individuals involved. Online and postal responses are totally anonymous. If you email your questionnaire, the form will be downloaded and the email will be immediately deleted. No email addresses will be retained. Your participation is entirely voluntary and you can withdraw at any time.

As a thank you for participating in the survey, you will be eligible to participate in a draw for one of three vouchers, one for R500 and two for R250. At the end of the survey, you will be directed to a separate webpage for recording your name and contact details. If you complete a paper-based survey, you will given a separate list to record this information.

Results from the study will be used to assist policy makers, conservation authorities and

others involved in penguin conservation, to better understand what members of the public feel about the matter. Your opinion thus matters! The outcomes will form part of an MSc dissertation and will be published in a scientific journal.

We appreciate your help and look forward to your participation. Please note that, by continuing with the survey, you will be considered as giving consent.

If you have any queries, please do not hesitate to contact me at ltakdeera@gmail.com

Yours Sincerely

Takdeera Lewis

Page 2: Please tell us a little about yourself

1. What is your age?

○ 18 years or younger
○ 19 to 25 years
○ 26 to 50 years
○ Older than 50 years

2. What is your gender?

○ Male
○ Female
○ Other
○ Prefer not to say

3. What is your current or highest level of education?

○ Primary school
○ High (secondary) school
○ College/University
○ Prefer not to say

4. What is your **monthly** net income (in other words, how much is paid into your bank account or given to you each month)?

○ Less than R5 000

3 / 12

103

○ More than R5 000 but less than R10 000
○ More than R10 000 but less than R50 000
○ More than R50 000
○ Prefer not to say

5. How far do you live from wild penguin colonies?

○ Less than 100 metres
○ Between 101 and 500 metres
○ More than 500 metres
○ Between 500 metres and 5 kilometres

6. How long have you lived at your current address?

○ Less than 1 year
○ Between 1 and 5 years
○ More than 5 years
○ Prefer not to say

7. Were you aware of the presence of penguins before you moved to your current address?

○ Yes
○ No

8. To what extent were the presence of penguins a factor in you moving to your current address

○ No influence
○ Some influence
○ A major influence

9. How much do you value and appreciate the local penguin colony? Please choose the most appropriate option.

○ I love having the penguins close by
○ I tolerate the penguins
○ I dislike the penguins being so close to my property
○ I am neutral on the penguins

9.a. Please provide reasons for your answer (optional).

5 / 12

105

Page 3: Involvement with penguins

10. Do you work directly or indirectly with penguins on a full-time or part-time basis, or do you obtain an income from the sea e.g. fishing, boat charter?

○ Yes

○ No

If you answered Yes to this question, please note there will be additional questions for you in a separate survey. Thanks!

6 / 12

106

Page 4: Questions to assess knowledge and views

11. Please indicate if you agree or disagree with the following statements

	Agree	Disagree	Don't know
African penguins cannot fly	○	○	○
African penguins breed in Antarctica	○	○	○
African penguins used to be called "Jackass penguins" as their call sounded like a donkey	○	○	○
African penguins mate for life	○	○	○
African penguins nest in burrows or on the ground	○	○	○
Oil spills and predation by Cape fur seals threaten the penguin population	○	○	○
In Africa, African penguins occur only in South Africa	○	○	○
It is acceptable for people to closely approach African penguins as long as they do not try to touch them	○	○	○
African penguins have yellow spiky feathers on their heads	○	○	○
African penguins live for up to ten years	○	○	○
African penguins feed mainly on sardine and anchovy	○	○	○
During moult, African penguins replace only a few of their feathers at any one time	○	○	○
The breeding colonies at Stony Point and Boulders Beach are the only two mainland penguin colonies in South Africa	○	○	○
Only female birds sit on the eggs	○	○	○
The African penguin population has decreased significantly over the last 50 years	○	○	○

12. Please indicate your agreement or otherwise with the following statements in

107

regard to the penguins within 5km of your residence:

	Strongly Agree	Agree	Disagree	Strongly Disagree
The local penguin population is a valuable asset to my community	○	○	○	○
The local penguin population is a nuisance (e.g. due to them invading my property, creating a bad smell)	○	○	○	○
The local penguin population is a nuisance due to the visitors that wish to view the birds	○	○	○	○
The local penguin population has some negative impacts but I tolerate these as it is important to conserve them	○	○	○	○
The local penguin population negatively impacts me due to the restrictions imposed by conservation or government authorities	○	○	○	○
The local penguin population should be moved elsewhere	○	○	○	○
The local authorities listen to my concerns and opinions in regard to the local penguin population	○	○	○	○

13. Please answer the following questions about the availability of information on African penguin conservation. Please select all options that apply.

	Agree	Disagree
I am sufficiently informed about the conservation status of the African penguin	○	○
I have limited or no access to any relevant information	○	○
I can access relevant information from the internet	○	○
I can access relevant information from leaflets or brochures	○	○
I would like more relevant information	○	○

I have little interest in knowing any more about African Penguins	○	○

13.a. Please feel free to provide reasons for your answers or comment further (optional).

14. Please indicate if you agree or disagree with each the following statements. If you do not know, please indicate this

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Penguins and their habitat should be protected	○	○	○	○	○
Conservation laws and policies are based on sound science	○	○	○	○	○
The regulatory authorities are sensitive to my needs and values	○	○	○	○	○
Regulations to conserve penguins threaten the sustainability of the fishing industry	○	○	○	○	○
Conservation of African penguins is important to me	○	○	○	○	○
I do not mind being inconvenienced if it protects penguins	○	○	○	○	○
I am well informed about the conservation status of the African penguin	○	○	○	○	○
Marine Protected Areas (MPAs) play an important role in conserving the African Penguin.	○	○	○	○	○

9 / 12

109

14.a. Please feel free to provide reasons for your answers to comment further (optional)

15. Please tell us how you feel in regard to the conservation status of the African penguin. Please select all options that apply.

	Agree	Disagree
I am concerned about the conservation status of the African penguin	○	○
I might be concerned about the conservation status of the African penguin if I knew more	○	○
The African penguin population must be protected from further decline at all costs	○	○
I would be prepared to donate in order to conserve the African penguin population	○	○
There are greater conservation priorities in South Africa than the African penguin	○	○

15.a. Please feel free to provide reasons for your answers to comment further (optional)

110

Page 5: Final Comment

16. Please feel free to comment on any aspect of this survey or on African penguins and their conservation

11 / 12

111

Page 6: Final page

Thank you for completing this survey. Your participation will assist greatly in improving our understanding of how people feel about penguins.

Should you wish to participate in the raffle, please follow the link below to a separate webpage, which is completely separate to the survey and not linked to it in any way:

https://aber.onlinesurveys.ac.uk/stakeholder-survey-raffle

If you have completed a paper-based survey, you will be asked to record your contact details on a separate form.

Stakeholder Assessment _ People More than 5 km from a Colony

Page 1: Stakeholder Assessment: Consent

Conservation Strategies for the African Penguin: Stakeholder Assessment

Informed consent for participation in a research study

Dear participant

We are conducting a study to determine what people know and feel about the conservation status of the African penguin. It is part of a wider project exploring threats to African penguin health and conservation of the species. For more information on the project, please see https://africanpenguinhealth.co.za.

We need your views!

My name is Takdeera Lewis and I am a Masters student from the Centre for Veterinary Wildlife Diseases, Faculty of Veterinary Science, University of Pretoria. My project is being supervised by Professor Darrell Abernethy and Dr Richard Burroughs, both from the same Centre, and Dr Katta Ludynia from the South African Foundation for the Conservation of Coastal Birds (SANCCOB).

If you agree to partake in this study, you will complete a survey which will ask you a few questions about yourself and then seek your views on African penguin conservation. It will take approximately 20 minutes to complete and your responses will be treated in strictest confidence – all data will be recorded at group level with no identifying information about individuals involved. Online and postal responses are totally anonymous. If you email your questionnaire, the form will be downloaded and the email will be immediately deleted. No email addresses will be retained. Your participation is entirely voluntary and you can withdraw at any time.

As a thank you for participating in the survey, you will be eligible to participate in a draw for one of three vouchers, one for R500 and two for R250. At the end of the survey, you will be directed to a separate webpage for recording your name and contact details. If you complete a paper-based

survey, you will given a separate list to record this information

Results from the study will be used to assist policy makers, conservation authorities and others involved in penguin conservation, to better understand what members of the public feel about the matter. Your opinion thus matters! The outcomes will form part of an MSc dissertation and will be published in a scientific journal.

We appreciate your help and look forward to your participation.

If you have any queries, please do not hesitate to contact me at ltakdeera@gmail.com

Yours Sincerely

Ms Takdeera Lewis

Page 2: Please tell us a little about yourself

1. What is your age?

- ○ 18 years or younger
- ○ 19 to 25 years
- ○ 26 to 50 years
- ○ Older than 50 years

2. What is your gender?

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

3. What is your current or highest level of education?

- ○ Primary school
- ○ High (secondary) school
- ○ College/University
- ○ Prefer not to say

4. What is your **monthly** net income (in other words, how much is paid into your bank account or given to you each month)?

- ○ Less than R5 000

3 / 10

115

○ More than R5 000 but less than R10 000
○ More than R10 000 but less than R50 000
○ More than R50 000
○ Prefer not to say

5. How far do you live from wild African penguin colonies?

○ More than 5 km but less than 20 km
○ More than 20 km but less than 100 km
○ More than 100 km but in South Africa
○ I live outside South Africa

6. Have you seen African penguins at a zoo?

○ Yes
○ No
○ I do not know.

7. Have you seen wild African penguins?

○ Yes
○ No
○ I do not know

4 / 10

116

Page 3: Questions to assess knowledge and views

8. Please indicate if you agree or disagree with the following statements

	Agree	Disagree	Don't know
African penguins cannot fly	○	○	○
African penguins breed in Antarctica	○	○	○
African penguins used to be called "Jackass penguins" as their call sounded like a donkey	○	○	○
African penguins mate for life	○	○	○
African penguins nest in burrows or on the ground	○	○	○
Oil spills and predation by Cape fur seals threaten the penguin population	○	○	○
In Africa, African penguins occur only in South Africa	○	○	○
It is acceptable for people to closely approach African penguins as long as they do not try to touch them	○	○	○
African penguins have yellow spiky feathers on their heads	○	○	○
African penguins live for up to ten years	○	○	○
African penguins feed mainly on sardine and anchovy	○	○	○
During moult, African penguins replace only a few of their feathers at any one time	○	○	○
The breeding colonies at Stony Point and Boulders Beach are the only two mainland penguin colonies in South Africa	○	○	○
Only female birds sit on the eggs	○	○	○
The African penguin population has decreased significantly over the last 50 years	○	○	○

9. Please answer the following questions about the availability of information on

5 / 10

117

African penguin conservation. Please select all options that apply.

	Agree	Disagree
I am sufficiently informed about the conservation status of the African penguin	○	○
I have limited or no access to any relevant information	○	○
I can access relevant information from the internet	○	○
I can access relevant information from leaflets or brochures	○	○
I would like more relevant information	○	○
I have little interest in knowing any more about African Penguins	○	○

9.a.   Please feel free to provide reasons for your answers or comment further (optional).

10.   Please indicate if you agree or disagree with each the following statements. If you do not know, please indicate this

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Penguins and their habitat should be protected	○	○	○	○	○
Conservation laws and policies are based on sound science	○	○	○	○	○
The regulatory authorities are sensitive to my needs and values	○	○	○	○	○
Regulations to conserve penguins threaten the sustainability of the fishing industry	○	○	○	○	○

6 / 10

118

Conservation of African penguins is important to me	○	○	○	○	○
I do not mind being inconvenienced if it protects penguins	○	○	○	○	○
I am well informed about the conservation status of the African penguin	○	○	○	○	○
Marine Protected Areas (MPAs) play an important role in conserving the African Penguin.	○	○	○	○	○

10.a. Please feel free to provide reasons for your answers to comment further (optional)

11. Please tell us how you feel in regard to the conservation status of the African penguin. Please select all options that apply.

	Agree	Disagree
I am concerned about the conservation status of the African penguin	○	○
I might be concerned about the conservation status of the African penguin if I knew more	○	○
The African penguin population must be protected from further decline at all costs	○	○
I would be prepared to donate in order to conserve the African penguin population	○	○
There are greater conservation priorities in South Africa than the African penguin	○	○

11.a. Please feel free to provide reasons for your answers to comment further (optional)

Page 4: Final Comment

12. Please feel free to comment on any aspect of this survey or on African penguins and their conservation

Page 5: Final page

Thank you for completing this survey. Your participation will assist greatly in improving our understanding of how people feel about penguins.

Should you wish to participate in the raffle, please follow the link below to a separate webpage, which is completely separate to the survey and not linked to it in any way:

https://aber.onlinesurveys.ac.uk/stakeholder-survey-raffle

If you have completed a paper-based survey, you will be asked to record your contact details on a separate form.

10 / 10

122

Stakeholder Assessment _ Fishing Industry

Page 1: Stakeholder Assessment: Consent

Conservation Strategies for the African Penguin: Stakeholder Assessment

Informed consent for participation in a research study

Dear participant

We are conducting a study to determine what people know and feel about the conservation status of the African penguin. It is part of a wider project exploring threats to African penguin health and conservation of the species. For more information on the project, please see https://africanpenguinhealth.co.za.

We need your views!

My name is Takdeera Lewis and I am a Masters student from the Centre for Veterinary Wildlife Diseases, Faculty of Veterinary Science, University of Pretoria. My project is being supervised by Professor Darrell Abernethy and Dr Richard Burroughs, both from the same Centre, and Dr Katta Ludynia from the South African Foundation for the Conservation of Coastal Birds (SANCCOB).

If you agree to partake in this study, you will complete a survey which will ask you a few questions about yourself and then seek your views on African penguin conservation. It will take approximately 20 minutes to complete and your responses will be treated in strictest confidence – all data will be recorded at group level with no identifying information about individuals involved. Online and postal responses are totally anonymous. If you email your questionnaire, the form will be downloaded and the email will be immediately deleted. No email addresses will be retained. Your participation is entirely voluntary and you can withdraw at any time.

As a thank you for participating in the survey, you will be eligible to participate in a draw for one of three vouchers, one for R500 and two for R250. At the end of the survey, you will be directed to a separate webpage for recording your name and contact details. If you complete a paper-based

survey, you will given a separate list to record this information

Results from the study will be used to assist policy makers, conservation authorities and others involved in penguin conservation, to better understand what members of the public feel about the matter. Your opinion thus matters! The outcomes will form part of an MSc dissertation and will be published in a scientific journal.

We appreciate your help and look forward to your participation.

If you have any queries, please do not hesitate to contact me at ltakdeera@gmail.com

Yours Sincerely

Ms Takdeera Lewis

Page 2: Please tell us a little about yourself

1. What is your age?

- ○ 18 years or younger
- ○ 19 to 25 years
- ○ 26 to 50 years
- ○ Older than 50 years

2. What is your gender?

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

3. What is your current or highest level of education?

- ○ Primary school
- ○ High (secondary) school
- ○ College/University
- ○ Prefer not to say

4. What is your **monthly** net income (in other words, how much is paid into your bank account or given to you each month)?

- ○ Less than R5 000

3 / 10

125

- ○ More than R5 000 but less than R10 000
- ○ More than R10 000 but less than R50 000
- ○ More than R50 000
- ○ Prefer not to say

5. How far do you live from wild African penguin colonies?

- ○ More than 5 km but less than 20 km
- ○ More than 20 km but less than 100 km
- ○ More than 100 km but in South Africa
- ○ I live outside South Africa

6. Have you seen African penguins at a zoo?

- ○ Yes
- ○ No
- ○ I do not know.

7. Have you seen wild African penguins?

- ○ Yes
- ○ No
- ○ I do not know

- ☐ I work in the charter fishing boat sector
- ☐ I work on commercial purse seine fishing boats
- ☐ I work in the industry but have no direct contact with fishing boats or equipment

5 / 12

127

Page 3: Questions to assess knowledge and views

8. Please indicate if you agree or disagree with the following statements

	Agree	Disagree	Don't know
African penguins cannot fly	○	○	○
African penguins breed in Antarctica	○	○	○
African penguins used to be called "Jackass penguins" as their call sounded like a donkey	○	○	○
African penguins mate for life	○	○	○
African penguins nest in burrows or on the ground	○	○	○
Oil spills and predation by Cape fur seals threaten the penguin population	○	○	○
In Africa, African penguins occur only in South Africa	○	○	○
It is acceptable for people to closely approach African penguins as long as they do not try to touch them	○	○	○
African penguins have yellow spiky feathers on their heads	○	○	○
African penguins live for up to ten years	○	○	○
African penguins feed mainly on sardine and anchovy	○	○	○
During moult, African penguins replace only a few of their feathers at any one time	○	○	○
The breeding colonies at Stony Point and Boulders Beach are the only two mainland penguin colonies in South Africa	○	○	○
Only female birds sit on the eggs	○	○	○
The African penguin population has decreased significantly over the last 50 years	○	○	○

9. Please answer the following questions about the availability of information on

5 / 10

128

African penguin conservation. Please select all options that apply.

	Agree	Disagree
I am sufficiently informed about the conservation status of the African penguin	○	○
I have limited or no access to any relevant information	○	○
I can access relevant information from the internet	○	○
I can access relevant information from leaflets or brochures	○	○
I would like more relevant information	○	○
I have little interest in knowing any more about African Penguins	○	○

10.a. Please feel free to provide reasons for your answers or comment further (optional).

11. Fishermen might be impacted by conservation and management decisions. Please indicate your general attitude towards the following policies that might affect your fishing activity.

	My attitude to these issues is:				
	Positive (I believe it is a valuable and important measure)	Neutral (I do not have a positive or negative opinion on this measure)	Negative (I believe this measure is incorrect or wrongly implemented)	Don't know enough	Prefer not to say
Total allowable catch	○	○	○	○	○

Total allowable by-catch	○	○	○	○	○
Closed seasons	○	○	○	○	○
Issuing of permits	○	○	○	○	○
Area restrictions	○	○	○	○	○
Monitoring and/or record keeping	○	○	○	○	○

12. Please indicate if you agree or disagree with each the following statements. If you do not know, please indicate this

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Penguins and their habitat should be protected	○	○	○	○	○
Conservation laws and policies are based on sound science	○	○	○	○	○
The regulatory authorities are sensitive to my needs and values	○	○	○	○	○
Regulations to conserve penguins threaten the sustainability of the fishing industry	○	○	○	○	○
Conservation of African penguins is important to me	○	○	○	○	○
I do not mind being inconvenienced if it protects penguins	○	○	○	○	○

I am well informed about the conservation status of the African penguin	○	○	○	○	○
Marine Protected Areas (MPAs) play an important role in conserving the African Penguin.	○	○	○	○	○
The regulatory authorities are sensitive to my needs and values	○	○	○	○	○
Fishing off the southern African coast reduces the fish stock available for penguins	○	○	○	○	○
I would like to receive more information about the African penguin	○	○	○	○	○

12.a. Please feel free to provide reasons for your answers to comment further (optional)

13. Please tell us how you feel in regard to the conservation status of the African penguin. Please select all options that apply.

	Agree	Disagree
I am concerned about the conservation status of the African penguin	○	○
I might be concerned about the conservation status of the African penguin if I knew more	○	○
The African penguin population must be protected from further decline at all costs	○	○
I would be prepared to donate in order to conserve the African penguin population	○	○

There are greater conservation priorities in South Africa than the African penguin	○	○

13.a. Please feel free to provide reasons for your answers to comment further (optional)

Page 4: Final Comment

12. Please feel free to comment on any aspect of this survey or on African penguins and their conservation

9 / 10

133

Page 5: Final page

Thank you for completing this survey. Your participation will assist greatly in improving our understanding of how people feel about penguins.

Should you wish to participate in the raffle, please follow the link below to a separate webpage, which is completely separate to the survey and not linked to it in any way:

https://aber.onlinesurveys.ac.uk/stakeholder-survey-raffle

If you have completed a paper-based survey, you will be asked to record your contact details on a separate form.

10 / 10

134

Stakeholder Assessment _ Researchers

Page 1: Stakeholder Assessment: Consent

Conservation Strategies for the African Penguin: Stakeholder Assessment

Informed consent for participation in a research study

Dear participant

We are conducting a study to determine what people know and feel about the conservation status of the African penguin. It is part of a wider project exploring threats to African penguin health and conservation of the species. We need your views!

My name is Takdeera Lewis and I am a Masters student from the Centre for Veterinary Wildlife Diseases, Faculty of Veterinary Science, University of Pretoria. My project is being supervised by Professor Darrell Abernethy and Dr Richard Burroughs, both from the same Centre, and Dr Katta Ludynia from the South African Foundation for the Conservation of Coastal Birds (SANCCOB).

If you agree to partake in this study, you will complete a survey that will ask you a few questions about yourself and then seek your views on African penguin conservation. It will take 20 - 30 minutes to complete and your responses will be treated in strictest confidence – all data will be recorded at group level with no identifying information about individuals involved. Online and postal responses are totally anonymous. Your participation is entirely voluntary and you can withdraw at any time.

As a thank you for participating in the survey, you will be eligible to participate in a draw for one of three vouchers, one for R500 and two for R250. At the end of the survey, you will be directed to a separate webpage for recording your name and contact details. If you complete a paper-based survey, you will given a separate list to record this information

Results from the study will be used to assist policy makers, conservation authorities and others involved in penguin conservation, to better understand what members of the public feel about the matter. Your opinion thus matters! The outcomes will form part of an MSc dissertation and will be published in a scientific journal.

We appreciate your help and look forward to your participation. Please note that, by continuing with the survey, you will be considered as giving consent.

If you have any queries, please do not hesitate to contact me at ltakdeera@gmail.com

Yours Sincerely

Takdeera Lewis

1. Do you consent to pariticipate in the study

☐ Yes
☐ No

Page 2: Please tell us a little about yourself

2. What is your age?

- ○ 18 years or younger
- ○ 19 to 25 years
- ○ 26 to 50 years
- ○ Older than 50 years

3. What is your gender?

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

4. What is your highest level of education?

- ○ Primary school
- ○ High (secondary) school
- ○ College/University
- ○ Prefer not to say

5. What is your **monthly** net income (in other words, how much is paid into your bank account or given to you each month)?

- ○ Less than R5 000

3 / 11

137

○ More than R5 000 but less than R10 000

○ More than R10 000 but less than R50 000

○ More than R50 000

○ Prefer not to say

Page 3: Involvement with penguins

6. Please select the option that best describes your involvement with African penguins.

[   ]

7. How much contact do you have with penguins? Contact here is defined as observing or handling birds, working in/around a penguin colony or in a rehabilitation centre. Select one option that best applies to you

- ○ At least once per day
- ○ At least once per week
- ○ At least once per month
- ○ Less than once per month
- ○ No contact

5 / 11

139

Page 4: Assessment of views

8. Please indicate if you agree or disagree with each the following statements regarding the decline in the African penguin population. If you do not know, please indicate this.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Historical, human activities triggered the downward trend and it cannot be significantly altered.	○	○	○	○	○
Historical, human activities triggered the downward trend but current initiatives will make a significant, positive impact.	○	○	○	○	○
Reducing or changing prey availability is the single, greatest threat to the African penguin population.	○	○	○	○	○
Climate change is a major threat to survival of the African penguin	○	○	○	○	○
Conservation of African penguins is important to me	○	○	○	○	○
We have sufficient knowledge of why the population continues to decline.	○	○	○	○	○
More action is required to reverse the downward trend	○	○	○	○	○
Marine Protected Areas (MPAs) play an important role in conserving the African Penguin.	○	○	○	○	○
The BMP to increase the number of breeding pairs by >5% above the 2018 estimate is achievable.	○	○	○	○	○

6 / 11

140

8.a. Please feel free to provide reasons for your answers to comment further (optional)

9. How optimistic are you that the downward population trend in the African penguin population can be reversed?

☐ Highly Optimistic
☐ Slightly Optimistic
☐ Neither Optimistic or Pessimistic
☐ Slightly Pessimistic
☐ Highly Pessimistic

10. Please list any challenges you believe that threaten conservation of the African penguin population.

141

Page 5: Future Priorities

Please list any strategies, policies or interventions, under the headings below, that you believe will make a significant difference to enhancing conservation of the African penguin. For convenience, these have been grouped under different headings below.

11. Existing policies/strategies

12. Additional/future policies or strategies

13. Further research

14. Resources or development

142

© University of Pretoria

15. Political/Stakeholder roles and/or coordination

16. Other

17. Of all the interventions or strategies that you have indicated above, which are the most important two or three?

9 / 11

143

Page 6: Final Comment

18. Please feel free to comment on any aspect of this survey or on African penguins and their conservation

10 / 11

144

Table 1: Statements assessing knowledge of African penguins.

Statement	Answer (true or false)	Difficulty
African penguins cannot fly	True	Easy
African penguins breed in Antarctica	False	Easy
African penguins used to be called "Jackass penguins" as their call sounded like a donkey	True	Easy
African penguins' mate for life	True	Difficult
African penguins 'nest in burrows or on the ground	True	Easy
Oil spills and predation by Cape fur seals threaten the penguin population	True	Easy
In Africa, African penguins occur only in South Africa	False	Difficult
It is acceptable for people to closely approach African penguins as long as they do not try to touch them	False	Easy
African penguins have yellow spiky feathers on their head	False	Difficult
African penguins live for up to ten years	True	Difficult
African penguins feed mainly on sardine and anchovy	True	Easy
During moult, African penguins replace only a few of their feathers at any one time	False	Difficult
The breeding colonies at Stony Point and Boulders Beach are the only two mainland penguin colonies in South Africa	True	Difficult

Only female birds sit on the eggs	False	Difficult
The African penguin population has decreased significantly over the last 50 years	True	Easy

Table 2: Statements assessing the accessibility of information.

Statements	Agree	Disagree
I am sufficiently informed about the conservation status of the African penguin	○	○
I have limited or no access to any relevant information	○	○
I can access relevant information from the internet	○	○
I can access relevant information from leaflets or brochures	○	○
I would like more relevant information	○	○
I have little interest in knowing any more about African Penguins	○	○

Table 3: Statements assessing attitudes towards African penguin conservation.

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Penguins and their habitats should be protected	○	○	○	○	○
Conservation laws and policies are based on sound science	○	○	○	○	○

The regulatory authorities are sensitive to my needs and values	○	○	○	○	○
Regulations to conserve penguins threaten the sustainability of the fishing industry	○	○	○	○	○
Conservation of the African penguin is important to me	○	○	○	○	○
I do not mind being inconvenienced if it protects penguins	○	○	○	○	○
I am well informed about the conservation status of the African penguin	○	○	○	○	○
Marine protected areas play an important role in protecting the African penguin	○	○	○	○	○

Table 4: Statements assessing views towards African penguin conservation.

Statements	Agree	Disagree
I am concerned about the conservation status of the African penguin	○	○
I might be concerned about the conservation status of the African penguin if I knew more	○	○

The African penguin population must be protected from further decline at all costs	○	○
I would be prepared to donate in order to conserve the African penguin population	○	○
There are greater conservation priorities in South Africa than the African penguin	○	○

Table 5: Statements assessing residents' attitudes towards the local penguin population.

Attitude statement	Answer (Select one)
I love having penguins close by	○
I tolerate the penguins	○
I dislike the penguins being so close to my property	○

Table 6. Influence of the local penguin population.

Statement	Answer (Select one)
No influence	○
Some influence	○
A major influence	○

Table 7: Statements assessing attitudes of people living within 5km of colonies.

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
The local penguin population is a valuable asset to my community	○	○	○	○

The local penguin population is a nuisance (e.g., due to them invading my property, creating a bad smell)	○	○	○	○
The local penguin population is a nuisance due to the visitors that wish to view the birds	○	○	○	○
The local penguin population has some negative impacts, but I tolerate these as it is important to conserve them	○	○	○	○
The local penguin population negatively impacts me due to the restrictions imposed by conservation or government authorities	○	○	○	○
The local penguin population should be moved elsewhere	○	○	○	○
The local authorities listen to my concerns and opinions in regard to the local penguin population	○	○	○	○
The local penguin population is a valuable asset to my community	○	○	○	○

Table 8: Fishing measures.

Fishing measures	Positive (I believe it is a valuable and important measure)	Neutral (I do not have a positive or negative opinion on this measure)	Negative (I believe this measure is incorrect or wrongly implemented)	Don't know enough	Prefer not to say
Total allowable catch	O	O	O	O	O
Total allowable bycatch	O	O	O	O	O
Closed seasons	O	O	O	O	O
Issuing of permits	O	O	O	O	O
Area restrictions	O	O	O	O	O
Monitoring and record keeping	O	O	O	O	O

Table 9: Researcher and policymaker contact with penguins.

Statement	Answer (Select one)
At least once per day	O
At least once per week	O
At least once per month	O
Less than once per month	O
No contact	O

Table 10: Statements assessing the attitudes of researchers and policymakers.

Statements	Strongly Agree	Agree	Strongly Disagree	Disagree	Don't know
Historically, human activities triggered the downward trend, and it cannot be significantly altered.	○	○	○	○	○
Historically, human activities triggered the downward trend, but current initiatives will make a significant, positive impact.	○	○	○	○	○
Reducing or changing prey availability is the single, greatest threat to the African penguin population.	○	○	○	○	○
Climate change is a major threat to the survival of the African penguin	○	○	○	○	○
Conservation of African penguins is important to me	○	○	○	○	○
We have sufficient knowledge of why the population continues to decline.	○	○	○	○	○

More action is required to reverse the downward trend	○	○	○	○	○
Marine Protected Areas (MPAs) play an important role in conserving the African Penguin.	○	○	○	○	○
The BMP to increase the number of breeding pairs by >5% above the 2018 estimate is achievable.	○	○	○	○	○

Table 11: Statements evaluating the optimism of participants towards reversing the downward trend of APs.

Statement	Answer (Select one)
Highly optimistic	○
Slightly optimistic	○
Neither optimistic nor pessimistic	○
Slightly pessimistic	○
Highly pessimistic	○

Table 12: List of open-ended questions for researchers and policymakers.

Existing policies and strategies
Additional/ Future policies and strategies
Further research
Resources and development
Political/ Stakeholder roles and coordination

Most important two or three strategies

153