

# **The Social Profile and Impact of Illegal Fishing in the Tsitsikamma Marine Protected Area**

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***By***

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## ABSTRACT

Catching fish species with collapsed population status, some with critically endangered and vulnerable status, by illegal fishers within Marine Protected Areas (MPA's) undermines both the effectiveness of the MPA and also fisheries management. Reduced spill over into adjacent areas may negatively affect communities living in these areas.

The aim of this study was to determine the social profile of illegal fishers and the impact illegal fishing has on the Tsitsikamma Marine Protected Area. Spatial and temporal patterns of illegal fishing were obtained for the period from April 2004 to August 2015 and correlations between fishing practises and environmental conditions alongside social characteristics of illegal fishers were evaluated. Detailed data including fish and bait species caught as well as equipment used, environmental conditions under which illegal fishing takes place and the social profile of illegal fishers from a 12 month intensive study was used to answer questions not included in the previous 10 years data. Data comprised SANParks records for the 10 year period and during the 12 month intensive study data were obtained directly from illegal fishers in the field immediately after apprehension.

Research findings show that illegal fishers in the Tsitsikamma MPA are aware that they are breaking the law but that most are ignorant of the MLRA fishery regulations. This is reflected in the wide range of fishery transgressions. This study showed that Illegal fishers are mostly employed people and their main purpose for fishing illegally is for recreation. There is a severe lack of awareness regarding conservation and the importance and benefits of the MPA amongst illegal fishers which shows itself in their ignorance of fishery regulations and poor understanding of the purpose of MPA's. It has also become apparent by using environmental data at the time of arrest of illegal fishermen and looking at the questionnaire answered by illegal fishermen that illegal fishing can be predicted to take place at particular times and under certain environmental conditions.

It took a high amount of Ranger person-hours to arrest one illegal fisher however this was significantly reduced when acting on information from

informants. In the 12 month intensive study period 74% of illegal fishers apprehended were found guilty in Court.

Education of communities and illegal fishers in terms of the importance of the Tsitsikamma MPA is needed and alternative ways found to satisfy the recreational fishing needs of the illegal fishers.

## CHAPTER 1 – INTRODUCTION

### 1.1 Introduction:

The resilience of fish populations is systematically eroded by on-going fishing pressure thereby reducing their numbers and genetic diversity as well as degrading habitats and changing community structure (Attwood *et al.*, 1997). According to Gell & Roberts, (2002) research in reserves has shown the impact people have had in altering marine ecosystems by fishing. Ocean conservation, including making the world's fisheries sustainable, is unlikely to be achieved without marine protected areas. New reserves are declared around the globe every year. Day *et al.*, (2011) found that the broader public was very concerned regarding the health of our oceans and showed a strong motivation to support environmental protection in the sea similar to what most nations did in terrestrial areas over a hundred years ago. In a study done in the Table Mountain National Park MPA, Brill & Raemakers, (2013) found that levels of illegal fishing especially within the no-take zones is reported to have increased dramatically over the past decade. There are approximately 400 000 recreational shore-anglers in South Africa and it is estimated that the total effort in this sector is 3.2 million angler-days/year, with a total catch of 3000 tons/year (McGrath *et al.*, 1997). Recreational fishing in South Africa is seen as a contributing factor in reducing a number of important target species and research results from Canada, Australia and America show similar results.(Sink et al. 2019. South African National Biodiversity Assessment 2018. Technical Report Volume 4. Marine Realm. South African National biodiversity Institute, Pretoria, South Africa.

Two contrasting water masses, the warm Agulhas current and the cold Benguela current, have created South Africa's rich marine biodiversity (Branch & Branch, 2018). Four coastal biogeographic zones occur along the South African coastline, a subtropical Natal Bioregion, a warm-temperate Agulhas Bioregion, a cool-temperate South Western Cape Bioregion and a cool Namaqua Bioregion (Driver *et al.*, 2005). A rich ichthyofauna of 2200 species is supported within these four bioregions of which 13% are endemic to South Africa (Van Der Elst, 1993). At least 41 (36.6%) of the 112 species of sea breams that occur worldwide are

found in Southern African waters and 25 of these species are known to be endemic to the region (Smith & Smith, 2003).

An assessment of 17 of South Africa's most important line fish species in 1990 showed that populations of 12 of these species had collapsed and half of these collapsed stocks were of sea bream species (Sauer *et al.*, 2003b).

The Minister of Environmental Affairs and Tourism declared an emergency in the traditional linefishing sector in terms of a provision in the Marine Living Resources Act (1998) in the year 2000 (Griffiths, 2000). This was after scientific advice and gave the Minister extraordinary powers to regulate the fishery which led to a Linefish Management Protocol (LMP) being drafted which defined the procedures of monitoring, assessment and regulation, with the specific objective of rebuilding depleted stocks (Griffiths, 2000). The number of commercial linefish rights were subsequently reduced by 75% in 2003.

The distributional ranges of many slow growing sparids (Family Sparidae) fall within the Tsitsikamma MPA boundaries including poenskop (*Cymatoceps nasutus*), white musselcracker (*Sparodon durbanesis*), red roman (*Chrysoblephus laticeps*), janbruin (*Gymnocrotaphus curvidens*), bronze bream (*Pachymetopon grande*) and zebra (*Diplodus cervinus hottentotus*) (Cowley *et al.*, 2002). Many of the fish species found within the Tsitsikamma MPA are slow growing and therefore, large adult fish may contribute greatly to the viability of regional fisheries, producing larvae which can be distributed by ocean currents over an extensive area Tilney *et al.*, (1996). Brouwer & Buxton, (2002) found an average of 23-fold higher catch per unit effort (*cpue*) inside the Tsitsikamma MPA than on fishing grounds adjacent to the MPA and concluded that the Tsitsikamma MPA is an important source of carpenter larvae. Their study indicates that within 30 days larvae could be transported from the Tsitsikamma MPA to Algoa Bay. Buxton & Smale, (1989) carried out a comparative study of fish species in the Tsitsikamma MPA and at Cape Recife (exploited area) finding that the abundance, average size and maximum size of fish recorded were greater in the Tsitsikamma MPA than at Cape Recife. Exploitation by line and spear fishers was attributed to causing this difference, the results showing that marine reserves provide protection to exploited species. In a study by Burger,



(1990) on the frequency of species on reefs inside the Tsitsikamma MPA compared to those on reefs outside the Tsitsikamma MPA a marked difference was demonstrated. Red Steenbras (*Petrus ruepestris*), a key reef predator, was found to be nine times more abundant inside the Tsitsikamma MPA when compared to reefs outside the Tsitsikamma MPA. In addition, there was a scarcity of larger individuals of the same species outside the MPA. Burger, (1990) also found that when top reef predators are removed there may be indirect effects which allow other species to significantly increase their populations which negatively affects their co-existing species, for example, an increase in the density of *Boopsoidea inornata* (fransmadam) on exploited reefs outside the Tsitsikamma MPA was found, compared to a decreased density on unexploited reefs inside the MPA. According to Burger, (1990) a lower diversity of species and increased abundance of *Cremnochorites capensis* (cape triplefin) on exploited reefs outside the MPA could be as a result of the exploitation through overfishing of top reef predators such as *P. rupestris* (red steenbras). The removal of top reef predators and resultant negative consequences reinforces the vitally important role that the Tsitsikamma MPA plays in conserving reef ecosystems.

A study conducted by Halpern, (2003) in which 89 separate worldwide marine reserve evaluations were reviewed, showed that the abundance of protected animals increased within an MPA. There was a 59% increase in the diversity of fish species, an 80% increase in average body size and a 90% increase in biomass (Gell & Roberts, 2002; Halpern, 2003). In a study by Buxton, (1992) it was found that sustained catches of *Chrysoblephus laticeps* and *Chrysoblephus cristiceps* in heavily exploited areas along the eastern coast of South Africa could be the result of seeding from unexploited areas such as the Tsitsikamma MPA. According to Hanekom *et al.*, (1997) during scientific fishing surveys in the Tsitsikamma MPA it was found that there was a markedly higher CPUE inside compared to surveys done outside the Tsitsikamma MPA in exploited areas. This again indicates the protective role towards shore-angling species that the Tsitsikamma MPA plays. A study by Brouwer & Griffiths, (2005) on the life history and stock separation of *Argyrozona argyrozona* found that there are two separate populations of carpenter, one on the central Agulhas Bank where there

is no protection from exploitation and one in the Eastern Cape of which many occur in the Tsitsikamma MPA, giving protection to this spawner biomass stock from exploitation. According to Buxton, (1992) an increase in the proportion of *Chrysolephus laticeps* females in exploited populations to the east and west of the Tsitsikamma MPA was shown which can be attributed to the selective removal of the larger fish by the line-fishery. In a study by Burger, (1990) it was shown that the position of the Tsitsikamma MPA on the southern coast of Africa provides protection to fish species which represent the Agulhas Province littoral ichthyofauna ecosystem. Despite this and despite other current fisheries management strategies the South African line fishery is in a state of decline and unsustainable effort levels across all line fishing sectors need to be addressed (Brouwer & Buxton, 2002). Due to their wide range of benefits it has been recommended that 20 to 30% of each ecological system should be conserved to optimise the indirect benefits of MPA's (Ballantine, 1997).

The 3km stretch of coastline open at the time to fishing in the Tsitsikamma MPA was closed off after the declaration of the Linefish crisis in 2000, by the Minister of Environmental Affairs and Tourism (DEAT) (Cowley et al., 2002, Faasen & Watts., 2007). According to Sunde & Issacs, (2008) after this closure local community members from Covie, Coldstream, Storms River and Thornham as well as a small angling club called the Tsitsikamma Angling Forum, attempted to use political means to try and persuade the government to re-open a section of coastline for their limited exclusive rights. This campaign was initially approved by Marine and Coastal Management (MCM) and four small areas were potentially to be re-opened for local community members to make use of (Sunde & Isaacs, 2008). This was strongly resisted by the scientific community and non-government organisations such as the World Wildlife Fund (WWF). This included a "Statement of Concern" which was signed by 124 members of the marine science community in South Africa and was sent to the Minister of Environmental Affairs and Tourism (Sunde & Isaacs, 2008). The motivation for keeping the Tsitsikamma MPA (TMPA) a no-take zone was based on the following reasons;

- TMPA plays a very important role in the management and protection of many coastal fish species
- The resident nature and lack of dispersal by adults in some species make TMPA an important breeding ground (larger fish produce more eggs)
- The TMPA also protects certain life history stages in other species and provides temporary refuge for migratory species in transit (Tilney et al., 1996)

In 2007 the Minister of Environmental Affairs and Tourism considered a proposal to open the Tsitsikamma MPA for fishing but however decided to keep the status quo by not allowing any fishing in the MPA. It is crucial to note that this decision dealt with was a matter of recreational fishing and did not have an impact on food security (Van Schalkwyk, 2007; Minister of Environment and Tourism Media Statement). This decision was met with resistance from some community members which resulted in illegal fishing in the Tsitsikamma MPA continuing. In 2015 the National Government's Department of Environmental Affairs (DEA) opened four sections of the MPA for "experiential angling" and shortly afterwards reversed this decision after losing in court to a non-governmental organisation that challenged the legality of this action. A year later in December 2016 after a formal stakeholder consultation process, the DEA opened 20% of the MPA's coastline to angling. This decision ignored scientific evidence and significant public support to maintain the MPA's 'no-take status' (Lombard et al., 2020).

According to Goetz, (2005) intensive investigations into conceptually different strategies have occurred after the widespread failure of conventional management measures in the past. As an alternative, closing an area to exploitation with an ecosystem approach with reliance on natural processes to restore and sustain biodiversity and fisheries resources was suggested.

However, studies of MPA's rarely take into consideration the potential for non-compliance (Car, 2000; Kritzer, 2004). Illegal fishing not only impacts on resources within MPA's but also has negative impacts on the yield and availability of resources for compliant fishers in adjacent open access areas (Sethi, 2007). South Africa has the third longest coastline in Africa containing a

wide variety of coastal and offshore environments including a high level of ichthyofaunal endemics for which we have a responsibility to conserve (Dando, 2020).

Most anglers choose to ignore regulations due to inadequate enforcement effort and compliance with conventional management regulations has been poor (Brouwer *et al.*, 1997; Attwood & Farquhar, 1999).

The efficiency of linefishing over the course of the 20<sup>th</sup> century steadily increased due to a number of technical factors. These factors included the introduction of monofilament line (1950's), and cellular phones (1990's). Additional improvements were graphite rods and reels and chemically sharpened hooks with thinner, stronger and more transparent lines (Goetz, 2005).

Enforcement of the MPA regulations provides the link between the regulations and environmental and biotic protection. Poor enforcement or uncontrollable poaching leads to the failure of reserves to conserve valuable fish populations (Attwood *et al.*, 1997).

Wood, (2004) found that MPA's are largely failing to realize their potential as effective fisheries management tools. An understanding of the motives for non-compliance is thus crucial to successful MPA management, both in a fisheries and biodiversity conservation context. It was found that in the Table Mountain National Park MPA, illegal fishing may be much higher than experienced by rangers and managers in the field (Brill & Raemaekers, 2013). Additional factors contributing to illegal fishing in the Table Mountain National Park MPA include the weak sanctions on perpetrators, poor enforcement capacity and organization, and inefficient prosecution systems (Smith & Anderson, 2004).

According to Pomeroy *et al.*, (2005) challenges facing MPA's in meeting their objectives include understaffed management, insufficient financial, logistical and technical support, lack of scientific information and lack of institutional, decision-making and political support.

According to Attwood *et al.*, (1997) MPA's are far more effective compared to many traditional catch restrictions in the conservation of marine biodiversity. Failure of traditional management measures could lead to stock collapse and are the reason why MPA's can be seen as an insurance policy for fisheries (Attwood *et al.*, 1997). Slow growth rates, sex-change, barotraumas, strong inter-sector competition, challenges in achieving significant reduction in effort and the ineffectiveness of the current bag limits makes it important that additional "no take" MPA's should be considered to protect seabream species especially (Griffiths, 2000). According to Penney *et al.*, (1999) the conservation and management of endemic reef fish stocks can be achieved by maintaining a number of well situated and sufficiently large MPA's.

According to DeMartini, (1993) the overall contribution of multiple small closures will be less effective than that of one closure of equal total size, as one large MPA is more likely to hold viable populations of threatened species and a single large MPA will be logistically and operationally more easier to manage than several small MPA's of the same size (Attwood *et al.*, 1997). The total area covered by the Tsitsikamma MPA is approximately 35 000ha, while the total area covered by the terrestrial component is only approximately 29 000ha (Faasens and Watts, 2007) and as a result of the large area covered, the Park protects 11 per cent of South Africa's warm temperate southern coastal shoreline area (Sunde & Isaacs, 2008). There is a trend occurring in the designation of very large MPA's with an increasing number of sites larger than 150 000 square kilometres which include more than half the total MPA coverage worldwide. The management costs per unit area of ocean conservation are far less when conserving large areas and representing some of the best value per unit area (Day *et al.*, 2011).

In this project the spatial and temporal patterns of illegal fishing, correlations between these fishing practices including; details of fish and bait species caught, types of transgressions and equipment used; environmental conditions including; moon and tidal phase, wind and sea temperatures; as well as various social parameters of illegal fishers including their communities, ages, employment sector and reasons for fishing illegally in the Tsitsikamma MPA will

be examined. It is crucial for management to have an understanding of these patterns of non-compliance and its associated causes in order to combat illegal fishing.

## 1.2 Problem Statement

The Tsitsikamma Marine Protected Area was established in 1964 and was the first MPA to be proclaimed in Africa (Wood *et al.*, 2000; Sunde & Isaacs, 2008).

There is a 20-year target set by South Africa's National Protected Area Expansion Strategy (2008) for increasing the amount of inshore marine environment protected in no-take MPA's along the South African coast from the current 9% (334km) to 15% (568km) (Department of Environmental Affairs, 2016).

The main objectives of MPA's can be summarised as being:

- The protection of all marine life
- Facilitating fisheries management
- Reducing the amount of user conflict (Attwood & Lemm, 2003).

According to Faasens & Watts, (2007) the majority of local communities in Tsitsikamma supported the Park in the conservation of nature however native (people born in the area or their grandparents lived in the area before the proclamation of the Tsitsikamma MPA) and non-native (not born in Tsitsikamma and moved into the area for employment and other opportunities) showed highly significant differences of opinion regarding SANParks "no-take" legislation preventing fishing. In December 1994 the Tsitsikamma Angling Union (TAU) requested the opening up of the entire Tsitsikamma MPA or at least large parts of it for shore based angling by submitting a petition of 334 signatures to the National Parks Board (NPB) (Hanekom *et al.*, 1997). The NPB did not concede to the request and maintained the status quo by not opening up these areas for shore-based angling as requested.

SANParks Rangers were appointed as Fishery Control Officers (FCOs) and Environmental Management Inspectors (EMIs) and were responsible for the enforcement of the Marine Living Resources Act (1998) and the National Environmental Management: Protected Areas Act (2003). They undertake



regular patrols and observations along the coastline, as seen in Figure 1.1 below, to encourage compliance with the legislation.



**Figure 1.1: SANParks Field Ranger on observation in the Tsitsikamma MPA**

The aim of this study was to gain information on spatial and temporal patterns of illegal fishing as well as correlations between fishing practises and environmental conditions. In addition, a comprehensive social profile of illegal fishers was obtained. Among other aspects, these included their age, occupation, employment status and place of abode. All of this will assist SANParks in evaluating their management effectiveness and feed directly back into compliance strategies, as well as provide a platform for targeting educational and other community initiatives to reduce poaching. The knowledge gained will also provide a greater understanding of what drives illegal fishing.

In addition, this study documents the number, size and species of fish targeted by illegal fishing and helps to provide SANParks with a measure of the extent of the threat posed to endangered fish stocks by illegal fishing.

This work is an assessment prior to opening 20% of the shoreline in the Tsitsikamma MPA to fishing in 2016.

### **1.3 Research Aim and objectives**

To determine the social profile of illegal fishers and the impact they have on the Tsitsikamma Marine Protected Area and to obtain spatial and temporal patterns of illegal fishing for the period from April 2004 to August 2015. To evaluate correlations between fishing practises and environmental conditions and to measure various social characteristics including ages, racial demographics, gender, employment status and fisher motivations of illegal fishers apprehended in the Tsitsikamma MPA. To determine the species type, size and quantities of fish and bait species illegally collected to understand the impact of this on the MPA. To use more detailed data from the 12 month intensive study to answer questions not included in the previous 10 years monitoring.



## CHAPTER 2 – STUDY AREA, METHODS AND MATERIALS



**Figure 2.1: The study area showing the Tsitsikamma Marine Protected Area and a portion of the Garden Route National Park.**

### 2.1 The Study Area

The Tsitsikamma Section of the Garden Route National Park is located in the southern cape between the towns of Humansdorp in the east and Plettenberg Bay in the west. The Tsitsikamma MPA is Africa's oldest "no-take" MPA and was established on 4 December 1964 (Wood *et al.*, 2000, Sunde & Isaacs, 2008). The MPA is approximately 59km long and stretches from Groot River (east) (34 04'S, 24 12'É) to Groot River (west) (33 59'S, 23 34'E). In 1983 the seaward boundary east of the Bloukrantz River was extended from 900m offshore to 5.6 km offshore east of the Bloukrantz River (Hanekom *et al.*, 1997). The shoreline of the Park is rocky with ridges and interlaying gullies filled with sand and small boulders running parallel to the coast which extend into the subtidal region, rapidly reaching depths of over 20m (Hanekom *et al.*, 1997). There is turbulent

wave action and the exposed rocky intertidal zone generally has dense stands of red-bait (*Pyura stolonifera*), brown mussels (*Perna perno*), barnacles (*Octomeris angulosa* and *Chthamalus dentatus*) and calcereous algae (Hanekom *et al.*, 1997).

There are several communities within close proximity to the Tsitsikamma MPA including from west to east; Covey, Coldstream, Storms River, Thornham, Mandela Park, Sandrif, Koomansbos, Hermanuskraal, Robbehoek and Woodlands.

## 2.2 Research design and thesis structure

### Sanparks patrol data from May 2004 to April 2014:

Raw data from regular ranger patrols, including information on apprehended poachers, is maintained by the Park by way of patrol sheets and J534 fine books. This data were analysed in terms of the date and time when the illegal fishing occurred and correlated with tidal cycles, moon phase, wind speed and direction as well as sea temperature by means of chi-square tests and Spearman's rank correlations. Other data that were collected include where illegal fishing occurred whether on week days, weekends or public holidays. Limited data on the social parameters of illegal fishers obtained from J534 fine books was analysed. Trends across the ten-year data collection period were analysed and correlated between data sets.

### Intensive 12 month study (2014-2015):

An intensive 12 month study conducted between September 2014 and August 2015 was completed in which data were collected directly from illegal fishers when apprehended inside the Tsitsikamma MPA.

The purpose of this study was to answer questions that had not been answered in the 10 years monitoring period including social issues. In addition to a questionnaire (as listed below in 6.4) all fish species and bait species in their possession were identified, measured and counted. Every illegal fisher's fishing tackle including; fishing rod, thickness of line and size of hook were recorded and photographed. Litter and discarded fish species left on the rocks were recorded. All transgressions of relevant legislation were recorded including; undersize fish species and fish over the bag limit, bait species removed over the

bag limit and illegally removed and resisting arrest. Correlations between fishing practises and environmental conditions were investigated by using qualitative data through direct questioning of illegal fishermen.

The dates and time illegal fishing occurred were correlated with tidal cycles, moon phase, wind speed and direction as well as sea temperature by means of chi-square tests and Spearman's rank correlations. Other data in terms of whether illegal fishing occurred on week days, weekends or public holidays were also recorded in order to pick up patterns of preferred environmental conditions and dates/times illegal fishers access the Tsitsikamma MPA to fish. In a study by Gavin *et al.*, (2010) eight different methods were identified to study illegal natural resource use. These methods included; law enforcement records, indirect observation, self-reporting, direct observation, direct questioning, randomized response technique, forensics and modelling.

In order to assess conservation challenges posed by illegal resource use Gavin *et al.*, (2010) states four main questions that should be answered;- (1) what species is targeted and what harvesting techniques used (2) where does illegal resource use occur, (3) who is extracting illegal resources, and (4) why is illegal resource use occurring?

Information was obtained from Illegal fishers directly after their arrest in the field. Ranger patrols were carried out according to; - information received from informers, sea and weather conditions, moon phase and previous experience. Illegal fishermen were asked to answer questions in their home language in a non-aggressive, relaxed manner and with confidentiality according to the questionnaire below. Illegal fishers were not forced to answer the questions and it was done voluntarily in an open and transparent manner and respondents views were captured in their own words. Some of the questions were standard questions required for opening up an investigation docket. The answers provided gave an in-depth knowledge of illegal fishing in the MPA in terms of fishing practises and social drivers.

A total of 34 illegal fishers were interviewed in the field soon after their arrest for illegal fishing in the Tsitsikamma MPA. A questionnaire (Table 2.1) of 20

questions was administered, some semi-structured and others open ended. The questions asked were arranged in four categories similar to the study by Brill, (2012):

- i. Social information with questions about age, address (community) and why they fish in the no-take Tsitsikamma MPA. Their race and sex were also recorded.
- ii. Economic factors; - which employment sector they were in and where employed? This is important to show if the illegal fishermen do not have a source of income and rely solely on the sea for food.
- iii. Ecological variables; how many hours do they spend fishing illegally when they come to the Tsitsikamma MPA, why they choose the specific fishing spot where they were apprehended, what type of fish they were targeting, which fish species do they have in their possession, do they discard any fish species caught, which bait species are theirs and which type of bait do they use in the MPA, did they bring bait in from outside the MPA or collect it in the MPA, which access path they use to gain access into the National Park and MPA, how often they fish illegally in the MPA, which fish do they generally catch in terms of species, numbers and sizes and under which weather and sea conditions do they fish in the MPA.
- iv. Institutional issues; Are they aware of fishery regulations, for example size and bag limits, have they ever received any education as to the importance of the MPA and why they are fishing illegally in the MPA?

This survey is a combination of the use of SANParks law enforcement records, by observing the poaching first hand and direct questioning of the illegal resource user.

Brill, (2012) found that many of the respondents were quite willing to talk about their activities. Reasons for their responses were most likely because of ignorance of the law and/or disregard for the law and hoping to one day obtain legitimate rights for resource harvesting.

In a study by Eliason, (2004) in order to gain insight into the social world of wildlife violators qualitative data was obtained by allowing respondents to speak freely which gave the perspective of the violators.

Mann, (1994) used direct questioning of illegal gill and seine netters in the Lake St Lucia Reserve to obtain spatial data on several facets including;- where they were netting illegally, what type of fish and how much they were catching, why they fish with nets and how long they spend fishing.

**Table 2.1: Questionnaire for illegal fishers**

QUESTIONNAIRE
What is your name?
What is your date of birth and ID no?
Where do you live/address?
What time did you arrive at this fishing spot?
Why did you choose this specific spot?
What type of fish were you targeting?
Which fish species belong to you? (Record species and sizes)?
Were there any species caught that you threw back/discarded?
Which bait species are yours (Record type and quantities)?
Did you bring this bait in from outside or collect it in the MPA?
What time were you going to leave?
Which access path/route did you use to get into the MPA?
How often do you fish in the MPA?
Are you aware of fishery regulations, for example size and bag limits?
Which fish do you generally catch in terms of species, numbers and sizes?
How long do you generally fish for?

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When do you come and fish in the MPA and under what weather/sea conditions?
Have you ever received any education as to the importance of the MPA?
Which employment sector are you in/where are you employed?
Why are you fishing illegally in the MPA?

## CHAPTER 3 - ILLEGAL FISHING IN THE TSITSIKAMMA MPA

### 3.1 Introduction

According to Robinson, (1989) prior to the proclamation of the Tsitsikamma National Park (TNP) in 1964, this near pristine coastal area was under the jurisdiction of the Department of Forestry. Hanekom et al., (1997) stated that the Department of Forestry and neighbouring sawmills employed most of the local inhabitants. Entrance permits were purchased at a small fee from the local forestry offices by locals and visitors and they were allowed to fish and collect bait anywhere along the coast. According to Knobel, (1989) and Robinson, (1989) extensive negotiations took place between the National Parks Board (NPB) and the Department of Forestry Minister leading to the proclamation of the Tsitsikamma National Park in 1964. Shore-based angling was permitted to carry on throughout the Park for a further 11 years due to a prior agreement with the Department of Forestry, as well as socio-political pressure. A similar fishing permit system previously used by the Department of Forestry was used except that offshore angling was prohibited and the collection of bait was limited to certain sites. In 1975 the NPB limited shore-based angling to 15 sites along the western sector of the park and in 1978 despite a petition by local residents restricted fishing to a 3 km stretch of coast. This open area extended from the western sector of the Storms River Mouth Rest camp to the Waterfall and the collection of bait organisms was not allowed.

The Tsitsikamma Angling Union and NPB held negotiations during 1995 and 1996 and the NPB reduced the price of its annual entrance permit for Tsitsikamma residents from R135.00 to R10.00 however anglers were still unhappy with the situation. In the year 2000 the 3 km open section of coastline was closed to fishing after studies showed that it would not have a major impact on the subsistence of local communities (Hanekom *et al.*, 1997).





**Figure 3.1 Illegal fishers in the Tsitsikamma MPA (2014) unaware of SANParks Rangers observing them.**

Prior to 2004, in terms of compliance patrols Rangers did routine patrols to monitor illegal fishing in the Park and issued J534 fines for trespassing under the old National Parks Act which entailed a R200.00 rand fine. Compliance efforts by TNP were not exclusively focused on Law Enforcement with Field Rangers carrying out a variety of other tasks including infrastructure maintenance and tourism functions. As a result fishers stood a very small chance of being apprehended for fishing illegally in the Tsitsikamma MPA. This together with a relatively small fine was not a strong deterrent and illegal fishing throughout the Tsitsikamma MPA occurred mostly unhindered (Patterson, 2015, pers. com). From 2004 onwards greater efforts were made by SANParks to put an end to illegal fishing and penalties were increased. This coincided with resistance from illegal fishers and greater pressure being put on SANParks to open the Tsitsikamma MPA for fishing.

Exploitation along the Tsitsikamma coastline has been limited in the past as the shoreline was only accessible by traversing steep, narrow footpaths down the



180 m high coastal escarpment (Hanekom *et al.*, 1997). The TNP is largely unfenced and open access by nature. It is difficult to accurately gauge the extent of non-compliance with MPA regulations due to their clandestine nature (Le Quesne, 2008). In order to assist management in resolving the illegal fishing issue taking place in the Tsitsikamma MPA a greater understanding of this activity, the extent to which it is taking place and it's underlying drivers is needed (Smith *et al.*, 2015).

### 3.2 Methods

#### **Quantitative data:**

Data were obtained from SANParks official records of apprehensions of illegal fishers inside the Tsitsikamma MPA from May 2004 to August 2014 including details of fines, arrests and confiscations of illegally harvested resources. To complement this, data between September 2014 to August 2015 including detailed information obtained directly from illegal fishers when they were arrested in the field, were used.

A questionnaire answered by Illegal fishers was analysed quantitatively and qualitatively in order to gain insight into individual experiences and to understand the participant's point of view by obtaining their underlying reasons, opinions and motivations. Additional Information on the illegal collection of marine resources in the Tsitsikamma MPA was obtained by interviews with Field Rangers, SANParks Environmental Crime Investigation Service staff and previously apprehended illegal fishers. Due to sensitivities amongst certain communities regarding illegal fishing in the Tsitsikamma MPA pseudonyms were used in certain cases to protect identities.

Law enforcement patrols were carried out covertly with Field Rangers only being told by the Section Ranger at the beginning of the patrol where they would be deployed on observation or which areas would be covered by foot patrol. Information on patrols does in some cases get out and become known alerting illegal fishers to the fact that patrols are being carried out on that particular day. Field Rangers live in the same communities where the illegal fishers live sometimes having family members, friends or next door neighbours who fish illegally in the Tsitsikamma MPA. All Field Rangers have personal cell phones and

it is easy to send out a message giving details of patrols happening on the day. SANParks have several registered informers who are remunerated for providing information on illegal fishing in the Tsitsikamma MPA and these were also made use of in the 12 month intensive study period.

### **Qualitative Data**

Interviews of apprehended fishers took place by means of a questionnaire which was qualitatively analysed by collating, organizing and interpreting textual information.

To give insight into the degree of illegal harvesting of marine resources in the Table Mountain National Park MPA and to fill possible gaps in quantitative records, Brill (2012) used qualitative techniques by means of direct questioning through a harvesting survey on both poachers and park officials. The current lack of data on illegal activity occurring in many conservation and protected areas can be obtained by making use of a combination of different techniques to collect important data.

Individual experiences of the illegal fishers showed recurrent themes emerging from the questionnaire into phenomenon that are difficult to measure quantitatively. Short and long - term trends in illegal activities can be obtained by direct questioning (Gavin *et al.*, 2010).

### **Statistical Analyses**

A mixed method approach of qualitative and quantitative research techniques were used.

Patrolling activity was targeted to achieve maximum success in terms of apprehending illegal fishers. Patrolling was not random but based on factors such as information received from informers, previous experience and sea conditions.

Interviews of apprehended illegal fishers took place by means of a questionnaire which was analysed in a quantitative way in terms of certain questions, for example, age and type of employment.

### 3.3 Results

In the ten year period May 2004 to August 2014 a total of 218 illegal fishers were apprehended fishing illegally in the Tsitsikamma MPA (Table 3.1). In the intensive 12 month study period from September 2014 to August 2015 a total of 34 illegal fishers were arested for fishing inside the Tsitsikamma MPA.

**Table 3.1 Amount of apprehensions of illegal fishers in the TMPA, 2004 to 2015.**

YEAR	NUMBER OF APPREHENSIONS	NUMBER OF APPREHENSIONS AS A PERCENTAGE OF THE TOTAL
2004	41	16
2005	25	10
2006	20	8
2007	21	8
2008	15	6
2009	26	10
2010	18	7
2011	13	5
2012	18	7
2013	13	5
2014	22	9
2015	20	8
TOTAL	252	100.00

#### 3.3.1 Species caught

The data contained in Table 3.2 below is from fish confiscated from illegal fishers inside the Tsitsikamma MPA in the twelve-month intensive study period from September 2014 to August 2015. Thirty four illegal fishers were apprehended in the period and 18 (eighteen) species of fish were caught by the illegal fishers

and confiscated by SANParks officials (Table 3.3). Twelve illegal fishers resisted arrest and six of them evaded arrest which would have taken the total illegal fishers apprehended to forty for the period.



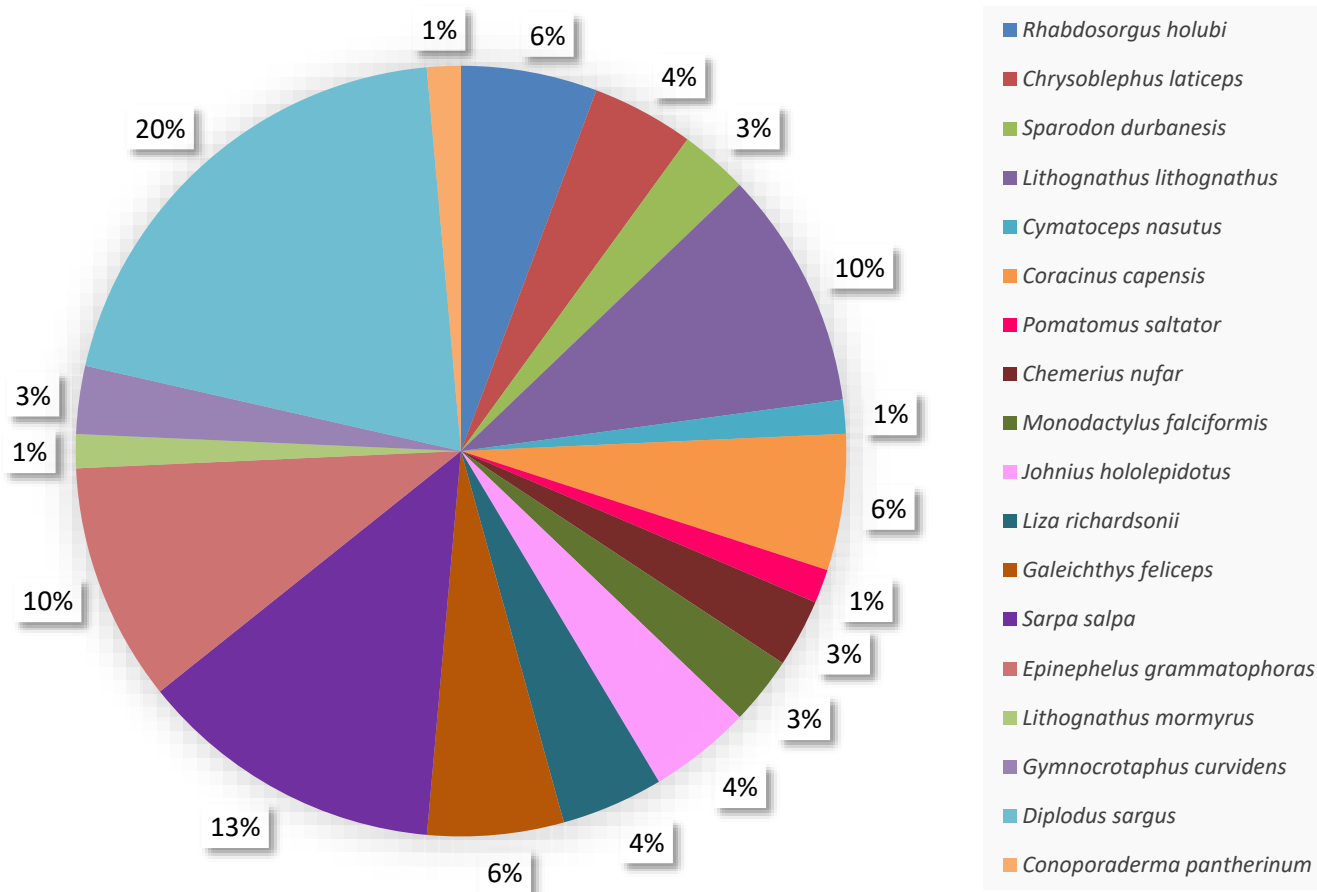
Figure 2.2 Confiscated fish during 2014 in the Tsitsikamma MPA.

Table 3.2 Fish species caught illegally during 12 months intensive survey from September 2014 to August 2015.

FINFISH	SCIENTIFIC NAME	NUMBER OF FISH	UNDER SIZE	OVER BAG LIMIT	% OF CATCH
Cape Stumpnose	<i>Rhabdosorgus holubi</i>	4	0	0	6
Red Roman	<i>Chrysolephus laticeps</i>	3	3	0	4

White Musselcracker	<i>Sparodon durbanesis</i>	2	2	0	3
White Steenbras	<i>Lithognathus lithognathus</i>	7	7	3	10
Poenskop	<i>Cymatoceps nasutus</i>	1	1	0	1
Galjoen	<i>Coracinus capensis</i>	4	1	1	6
Elf	<i>Pomatomus saltator</i>	1	0	0	1
Santer	<i>Chemerius nufar</i>	2	0	0	3
Cape Moonies	<i>Monodactylus falciformis</i>	2	0	0	3
Dusky Kob	<i>Argyrosomus japonicus</i>	3	3	1	4
Mullet	<i>Liza richardsonii</i>	3	0	0	4
Sea Barbel	<i>Galeichthys feliceps</i>	4	0	0	6
Strepie	<i>Sarpa salpa</i>	9	0	0	13
Rockcod	<i>Epinephelus grammatochoras</i>	7	0	0	10
Sand Steenbras	<i>Lithognathus mormyrus</i>	1	0	0	1
Jan Bruin	<i>Gymnocrotaphus curvidens</i>	2	0	0	3
Blacktail	<i>Diplodus capensis</i>	14	0	0	20
Puff adder shy shark	<i>Conoproraderma pantherinum</i>	1	0	0	1

## Percentage of species caught between 2014/2015



**Figure 3.3: Fish species caught illegally (as % of total) during 12 months from September 2014 to August 2015.**

The total fish found in possession of the illegal fishers which were apprehended was 70 fish and the five species with the highest prevalence among these were; blacktail at 14 fish (20%); strepie at nine fish (13%); white steenbras at seven fish (10%), rockcod at seven fish (10%) and cape stumpnose, galjoen and sea barbel all at four fish each (5%).

### 3.3.2 Undersize Fish species caught

A total of 19 fish (27%) were undersize and 14 of the 34 illegal fishers apprehended were in possession of undersize fish. Of significance is that all the red roman (three) caught were undersized as well as all the white musselcracker (two), white steenbras (seven), poenskop (one) and kob (three) caught were



undersized. There were four galjoen caught and (one) was undersized (Table 3.2).



**Figure 3.4 Undersize White Steenbras caught in TMPA in 2015.**

### **3.3.3 Species of fish over the bag limit**

Five (7%) of the fish caught (three species) were over the bag limit; three white steenbras (4%), one galjoen (1%) and one kob (1%).

In open fishing areas white steenbras have a daily bag limit of one, galjoen of two and kob of one per day.

Two of the illegal fishers were in possession of fish over the bag limits. One illegal fisher had two white steenbras over the bag limit and one had one galjoen and one kob over the bag limit.

In Table 3.3 below illegal fishing data is compared with other studies including fish species caught prior to year 2000 by locals and visitors in the 3 km open section in the Tsitsikamma MPA. Also showed in the table are fish species caught in scientific surveys in the same area and in the rest of the Tsitsikamma MPA. Some fish species caught by illegal fishers in the 12 month intensive study period showed similarities with this data especially blacktail, sand steenbras, cape stumpnose, white musselcracker and galjoen.

**Table 3.3: Shore angling catches in the Tsitsikamma MPA comparing recreational and scientific surveys with illegal fishing data (% of total fish in each case) (Hanekom *et al.*, 1997).**

SPECIES Common Name	Scientific Name	VISITOR % (1991 TO 1995)	LOCAL % (1991 TO 1995)	ILLEGAL FISHERMEN % (2014- 2015)	SCIENTIFIC SURVEY 1989-1991 (FISHING AREA)	SCIENTIFIC SURVEY 1989-1991 (REST OF PARK)
<b>CHONDRICHTHYES</b>						
Bronze whaler shark	<i>Carcharhinus brachyurus</i>	0.2	0.0	<b>0.0</b>	0.0	0.0
Blacktip Shark	<i>Carcharhinus limbatus</i>	0.3	0.0	<b>0.0</b>	0.0	0.0
Dusky Shark	<i>Carcharhinus obscurus</i>	0.4	0.0	<b>0.0</b>	0.0	0.0
Speareye, houndshark	<i>Mustelus spp.</i>	0.9	0.8	<b>0.0</b>	0.9	0,5
(Spotted) Gully Shark	<i>Triakis megalopterus</i>	0.9	0.0	<b>0.0</b>	0.0	0.3
Sharks (unidentified)		2.0	1.3	<b>0.0</b>	0.0	0.0
Shyshark	<i>Haploblepharus spp.</i>	2.0	0.3	<b>1.42 (1)</b>	5.5	3.7
Striped Dogfish	<i>Poroderma africanum</i>	0.4	0.7	<b>0.0</b>	0.0	2.2
Leopard Shark	<i>Poroderma pantherinum</i>	0.3	0.0	<b>0.0</b>	1.8	2.5
(Spotted) ragged tooth shark	<i>Charcharias taurus</i>	0.1	0.0	<b>0.0</b>	0.0	0.0
(Thornback) skate	<i>Raja clavata</i>	0.1	0.0	<b>0.0</b>	0.1	0.0



(Lesser) sandshark	<i>Acroteriobatus annulatus</i>	2.9	0.4	<b>0.0</b>	0.0	2.0
	<i>Myliobatis aquila</i>	0.0	0.0	<b>0.0</b>	0.0	0.5
<b>OSTEICHTHYES</b>						
	<i>Conger wilsoni</i>	0.0	0.0	<b>0.0</b>	0.9	0.0
(Sea) Barbel	<i>Galeichthys feliceps</i>	4.1	0.8	<b>5.71 (4)</b>	1.8	2.2
Rockcod	<i>Epinephelus</i>	0.8	0.2	<b>10.00 (7)</b>	0.0	0.0
Yellowbelly Rockcod	<i>Epinephelus marginatus</i>	0.0	0.0	<b>0.0</b>	0.0	1.3
Koester	<i>Acanthistius sebastoides</i>	0.0	0.0	<b>0.0</b>	0.0	0.2
Elf	<i>Pomatomus saltatrix</i>	4.8	10.4	<b>1.42 (1)</b>	5.5	2.4
Spotted Grunter	<i>Pomadasys commersonnii</i>	0.3	0.0	<b>0.0</b>	0.0	0.0
Piggy (gorrie)	<i>Pomadasys olivaceus</i>	0.1	0.0	<b>0.0</b>	0.0	0.0
Cape Lady (Fransmadam)	<i>Boopsoidea inornata</i>	1.7	21.8	<b>0.0</b>	2.8	3.5
Santer	<i>Cheimerius nufar</i>	0.4	0.1	<b>2.85 (2)</b>	0.0	13.3
Dageraad	<i>Chrysolephus cristiceps</i>	0.2	0.0	<b>0.0</b>	0.0	0.0
Red Roman	<i>Chrysolephus laticeps</i>	1.9	2.3	<b>4.28 (3)</b>	0.0	1.8
Poenskop	<i>Cymatoceps nasutus</i>	0.4	0.2	<b>1.42 (1)</b>	0.0	1.7

Zebra	<i>Diplodus cervinus hottentotus</i>	1.0	0.3	<b>0.0</b>	0.0	5.0
Moony	<i>Monodactylus falciformis</i>	0.0	0.0	<b>2.85 (2)</b>	0.0	0.0
Blacktail	<i>Diplodus sargus capensis</i>	6.7	5.0	<b>20.00 (14)</b>	12.7	20.0
Jan Bruin	<i>Gymnocrotaphus curvidens</i>	0.4	1.4	<b>2.85 (2)</b>	0.0	0.0
White Steenbras	<i>Lithognathus lithognathus</i>	4.1	3.6	<b>10.00 (7)</b>	0.9	2.0
Sand Steenbras	<i>Lithognathus mormyrus</i>	3.3	0.3	<b>1.42 (1)</b>	0.9	2.0
Hottentot/Bronze Bream	<i>Pachymetopon grande</i>	1.3	2.0	<b>0.0</b>	0.0	8.7
Red Steenbras	<i>Petrus rupestris</i>	0.3	0.0	<b>0.0</b>	0.0	1.2
Cape Stumpnose	<i>Rhabdosorgus holubi</i>	4.5	0.8	<b>5.71 (4)</b>	8.3	3.4
Strepie	<i>Sarpa salpa</i>	22.6	36.7	<b>12.85 (9)</b>	39.2	5.7
White Musselcracker	<i>Sparodon durbanesis</i>	2.5	1.7	<b>2.85 (2)</b>	0.9	1.7
Steentjie	<i>Spondylisoma emarginatum</i>	0.5	2.9	<b>0.0</b>	0.0	1.0
Galjoen	<i>Dichistius capensis</i>	3.9	2.8	<b>5.71 (4)</b>	3.7	6.2
Banded Galjoen	<i>Dichistius multifasciatus</i>	0.1	0.0	<b>0.0</b>	0.0	0.0
Stonebream	<i>Neoscorpis lithophilus</i>	0.0	0.1	<b>0.0</b>	0.0	0.5

Kob	<i>Johnius hololepidotus</i>	0.0	0.0	<b>0.0</b>	0.0	0.0
Dusky Kob	<i>Argyrosomus japonicas</i>	0.7	0.0	<b>4.28 (3)</b>	0.0	0.8
Geelbek	<i>Atractoscion aequidens</i>	0.0	0.0	<b>0.0</b>	0.0	2.4
Southern Mullet	<i>Chelon richardsonii</i>	1.1	0.1	<b>4.28 (3)</b>	14.5	0.2
Klipvis	<i>Clinus spp.</i>	1.8	1.3	<b>0.0</b>	0.0	0.2
Blaasop/Puffer	<i>Amblyrhynchotes honckenii</i>	19.6	1.6	<b>0.0</b>	0.0	0.8
Fish unidentified		0.6	0.0	<b>0.0</b>	0.0	0.8

### 3.3.4 Discarded fish species and litter

Only four of the 34 illegal fishers questioned said that they discard unwanted fish and mentioned sea barbel and blaasopies as the fish they discarded.

Where fishers were apprehended on the rocks whilst fishing there was in all cases litter in and around the rocks including; fishing line, plastic and paper litters. Other fish species including klipfish and shy shark were also found.



**Figure 3.5 Common scenes on the rocks. Fish and litter discarded by illegal fishers in Tsitsikamma MPA.**

### **3.3.5 Bait species and Alikreukel illegally removed**

Four bait species were identified (Table 1.4) below. Eleven illegal fishers were in possession of alikreukel (*Turbo sarmaticus*), four had alikreukel over the bag limit and five had undersize ones. The bag limit for alikreukel is five per person per day with a minimum size of 63.5mm in diameter.

Fifteen illegal fishers were found in possession of red bait. Twelve illegal fishers were found in possession of musselworm of which 9 exceeded the bag limit. The bag limit in open areas for musselworm is 10 per person per day.

Twenty-five illegal fishers were in possession of illegal bait implements “wurm pikke”. The MLRA states that any sea worm including mussel worm can only be removed by means of hand or suction pump. The illegal fishers in the Tsitsikamma MPA use these illegal bait implements referred to as “wurm pikke” to chop off mussels growing in mussel beds on rocks to find the mussel worm located beneath the mussel. One illegal fisher was found in possession of pilchards and one with 500g of white mussel.

**Table 3.4 Bait species confiscated in the 12 month period September 2014 to August 2015.**

BAIT	SCIENTIFIC NAME	NUMBER	UNDERSIZE	OVER BAG LIMIT
Alikreukel	<i>Turbo sarmaticus</i>	74	32	40
Polychaete worm	<i>Pseudonereis variagata</i>	200	No size	148
Octopus	<i>Octopus vulgaris</i>	2	0	0
Venus Ear	<i>Haliotis spadicea</i>	1	0	0
Red Bait	<i>Pyura stolonifera</i>	6,35kg	0	0

### 3.3.6 Equipment Used

Fishing rods ranged from 12ft to 14ft (3.7m to 4.3m) and one fishing rod was a three piece (Table 1.5). Fishing line ranged from 10kg to 35kg (nylon) with an average breaking strain of 19kg. Twenty-four illegal fishers had Penn Reels (multiplier reels), one fisher had two Penn reels. Three of the fishers were in possession of two reels. Most of the illegal fishers had a variety of hooks. Hook sizes ranged from a no.1 to a 9/0.

**Table 3.5 Fishing equipment confiscated in the 12 month period September 2014 to August 2015.**

ILLEGAL FISHER NO.	FISHING ROD LENGTH	FISHING LINE THICKNESS	REEL TYPE	HOOK SIZES
No.1	3.5m	15kg	Silstar (Silver) and a Penn Jigmaster 500	1/0, 3/0, 5/0, no.1, no.2.
No.2	3.5m	20kg	Penn no.49 Super Mariner	4/0
No.3	3.8m	20kg	Penn no.49 (Deep sea reel)	1/0, 2/0, 3/0, no.10

No.4	3.8m	25kg	Penn no.49 Super Mariner	1/0,no.10
No.5	14ft	18kg	Silver and black (Swart fire wolf)	No.8, no.10, 1/0, 2/0 and 4/0
No.6	14ft	20kg	Penn 49 (Deep sea reel)	1/0 and 3/0
No.7	14ft	20kg	Penn 49	2/0 and 7/0
No.8	14ft	20kg	Speed Master, Penn Jigmaster 8500, Okuma	1/0, 2/0, 3/0, no.10
No.9	Surf Special, 3.5m rod	15kg	Topaz Strike Power Reel	1/0, 4/0, no.10
No.10	Sea Link surf sea line, 4.1m	17kg	Imperial	No.2, 3/0, 5/0
No.11	4.0m 2 piece	20kg	Penn 500 Jigmaster	No.4, 1/0, 2/0, 4/0
No.12	14ft, 2 piece	15kg	Penn 49 Longbeach no.58	3/0, 4/0
No.13	Black Okuma, 4.2m	15kg	Penn no.49 Deep Sea	2/0, 3/0,4/0, 6/0, no.10
No.14	Brown, 4.75m	12kg	Penn Jigmaster	1/0, 3/0, 4/0, no.10
No.15	4.2m	20kg	Penn 49 Super Mariner	4/0, 8/0, 10/0
No.16	4.0m	17kg	Shimano black reel	5/0 and 6/0
No.17	Yellow and black, 3.8M	20kg	Penn 49 Deep Sea Reel	5/0, 8/0, 10/0, 3/0,

No.18	3.8m	20kg	Hand Line	3/0, 4/0, 5/0, no.10
No.19			None - taking turns with others	
No.20	3.8m	20kg	Shimano 521 reel	8/0, 1/0, 5/0, 4/0, 9/0, , no.8
No.21	13ft	18kg	Penn Jigmaster 500	2/0, 4/0
No.22	4.0m; 2piece	15kg	Penn no.49, Super Mariner	4/0, 6/0, 8/0, 1/0, 3/0, no.8
No.23	13ft	20kg	Shimano reel	2/0, 8/0, 5/0, 3/0, no.2 hooks, no.8 hooks
No.24	12ft	19kg	Penn 49 Super Mariner	4/0, 6/0, 8/0, 1/0, 3/0,
No.25	14ft	35kg	Penn 49 Jigmaster	5/0,2/0, no. 8 strepie hooks
No.26	14ft	15kg	Penn 49 black	2/0, 8/0, 5/0, 3/0, no.2 hooks, no.8 hooks, no.10 hooks, 1/0 hooks.
No.27	Black with light handle	10kg	Penn 49 Jigmaster	2/0, 3/0, 5/0, 4/0, 6/0no.1, no.4, no.8 hooks
No.28	Fold up 3 piece	30kg	Shimano	3/0, 5/0, 6/0, 9/0
No.29	3.5m	18kg	Penn 500 Jigmaster	3/0, 6/0

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No.30	3.5m	18kg	Penn 500 Jigmaster	1/0, 2/0, no.10
No.31	3.5m	18kg	Penn 500 Jigmaster	1/0, 3/0, 6/0
No.32	3.5m	20kg	Daiwa Sealine SL505H	No.2, 1/0, 3/0, 5/0, 6/0
No.33	3.7m	18kg	Penn 49 Super Mariner	No.1, 1/0, 3/0
No.34	3.4m	20kg	Penn 49 Deep Sea Reel. Penn No.67 Longbeach	No1, no.4, no.6, 1/0





Figure 3.6 Confiscated fishing equipment in the Tsitsikamma MPA.

### 3.3.7 Illegal fisher transgressions

The 34 illegal fishers all contravened the Marine Living Resources Act (MLRA) and the National Environmental Management Protected Areas Act (NEM:PAA) regulations for fishing in the MPA and illegal entry (Table 1.7). Under the MLRA there were also the following transgressions: 14 illegal fishers were in possession of undersize fish, two were in possession of fish over the bag limit, 11 were in possession of alikreukel with four being in possession over the bag limit and five undersize. 15 illegal fishers were in possession of redbait, 12 were in possession of mussel-worm with nine in possession over the bag limit. 25 of the illegal fishers were in possession of illegal bait implements, namely “wurm pikke”.

Twelve illegal fishers initially resisted arrest and had to be subdued. Six illegal fishers resisted arrest and escaped with. One of them threatened Field Rangers with a knife.

**Table 3.6: Percentage of each transgression**

TRANSGRESSION	PERCENTAGE OF THE 34 ILLEGAL FISHERS APPREHENDED
ILLEGAL FISHING	100

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ILLEGAL ENTRY	100
UNDERSIZE FISH	41
FISH OVER THE BAG LIMIT	6
TOTAL NUMBER OF ILLEGAL FISHERMEN WHO CAUGHT AND WERE IN POSSESSION OF FISH	56
IN POSSESSION OF ALIKREUKAL	32
OVER BAG LIMIT ALIKREUKAL	12
UNDERSIZE ALIKREUKAL	15
IN POSSESSION OF RED BAIT	44
IN POSSESSION OF MUSSELWORM	35
MUSSELWORM OVER BAG LIMIT	27
IN POSSESSION OF ILLEGAL BAIT IMPLEMENTS	74
RESISTED ARREST	30

In answers to the questionnaire that the 34 illegal fishers answered, in terms of time spent fishing in the MPA 26 (82%) of illegal fishers spent from five hours to eight hours fishing (Table 1.8). In terms of fish species targeted 17 (50%) of illegal fishers say they will take any fish that bites, however six (18%) target red roman, eight (24%) galjoen, two (6%) blacktail, four (12%) strepies, two kob (6%) and one illegal fisher each indicated that they target jan bruin, zebra, elf, white steenbras and cape stumpnose.

In terms of bait collection 31 (91%) of illegal fishers said that they collect bait inside the MPA. Twenty two (65%) of illegal fishers fish in the MPA from between once a week to once month.

**Table 3.7: Information obtained through questionnaire directly from illegal fishers after apprehension (September 2014 to August 2015).**

<b>TIME NORMALLY SPENT FISHING ILLEGALLY IN MPA (APPROX)</b>	<b>NO. OF ILLEGAL FISHERMEN</b>	<b>FISH SPECIES TARGETED</b>	<b>NO. OF ILLEGAL FISHERMEN</b>	<b>DID YOU COLLECT BAIT IN MPA</b>	<b>NO. OF ILLEGAL FISHERMEN</b>	<b>HOW OFTEN DO YOU FISH ILLEGALLY IN MPA</b>	<b>NO. OF ILLEGAL FISHERMEN</b>
1hr	0	any fish that bites	17	Yes	31	Everyday	0
						Almost everyday	1
2hrs	0	red roman	6	No	<u>3</u>	Twice a week	<u>1</u>
3hrs	1	galjoen	8			Once a week	<u>2</u>
4hrs	2					Twice a month	<u>8</u>
		strepies	4			Three times a month	<u>1</u>
5hrs	12	blacktail	2			Once a month	<u>11</u>
		kob	2			Once every two months	<u>2</u>
6hrs	6	jan Bruin	1			Once every few months	7
7hrs	0	bontrok	1			Once a year	1
8hrs	8	elf	1				
9hrs	3	white steenbras	1				
10hrs	0	cape stumpnose	1				

11hrs	2						
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A total of 84 patrols in the 12 month intensive study were carried out in the Tsitsikamma MPA specifically to locate illegal fishers leading to 34 arrests in the field (Table 1.8). Man-hours included the amount of hours per Ranger it took to arrest one illegal fisher which amounted to 68 hours per Ranger. Of the 34 arrests, 13 were after following up on information from informers and subsequently their man-hours per arrest were significantly lower at nine hours per Ranger. Most patrols (68%) were carried out on weekends (Friday to Sunday) and public holidays when illegal fishing activity was known to be high. 30 (88%) of illegal fishers were apprehended in the weekend period from Friday to Sunday.

**Table 3.8 Catch per unit effort for 12 month intensive study (September 2014 to August 2015)**

<b>Illegal fisherman</b>	<b>No. of fish</b>	<b>Angler-Hours fished</b>	<b>CPUE</b>
34	70	129	0.54
<b>Illegal fisherman</b>	<b>No. of fish</b>	<b>Angler-Hours fished if Rangers had not arrested illegal fishermen</b>	<b>CPUE</b>
34	119	220	0.54
<b>Total fishing outings per year</b>	<b>Total angler-hours (illegal angler effort)</b>	<b>Total amount of fish estimated to be caught per year</b>	
629	3910hrs	2122	

A total of 70 fish were caught in the 12 month intensive study period by the 34 illegal fishermen in 129 angler-hours which equalled a cpue of 0.54. Rangers

lessened some illegal fisher's planned fishing trip by arresting them which brought down the projected angler-hours from 220 to 129 thereby reducing the catch by 41%. Data was projected from information given by illegal fishermen in the questionnaire to work out total fishing outings per year (629), total angler-hours (illegal angler effort) (3910hrs) and total amount of fish estimated to be caught per year (2122).

**Table 3.9 Amount of Ranger patrols carried out from September 2014 to August 2015 including man-hours per arrest.**

<b>Number patrols carried out</b>	<b>Total arrests</b>	<b>Field Ranger man-hours</b>	<b>Man-hours per arrest</b>	<b>Arrests from informer information</b>	<b>Man-hours per arrest</b>	<b>Weekend and public holiday patrols</b>	<b>Weekday patrols</b>
84	34	2318	68	13	9	57	27

Out of the 34 illegal fishers apprehended in the 12 month period 25 (74%) were found guilty in Court (Table 1.9). All of them received sentences apart from one who was cautioned. Nine of the 34 cases were withdrawn by the Public Prosecutor.

The average fine value per person convicted and fined was R1587.00 and the average alternate days of imprisonment was 146 days.

**Table 3.9 Court results for 34 apprehensions in the 12 month period.**

<b>ILLEGAL FISHERMEN</b>	
<b>No.1</b>	[Case S230/15] 7/6/16 - R1500 or 150 days imprisonment.
<b>No.2</b>	[Case S230/15] 7/6/16 – 150 days on top of his current sentence of 5 years.

<b>No.3</b>	Case S170/14]24/3/20 - Withdrawn DPP decision [ not reinstated]
<b>No.4</b>	Case S170/14]24/3/20 - Withdrawn DPP decision [ not reinstated]
<b>No.5</b>	Case S170/14]24/3/20 - Withdrawn DPP decision [ not reinstated]
<b>No.6</b>	[Case S209/15] 29/3/16 – R1500 or 150 days imprisonment
<b>No.7</b>	[Case S209/15] 29/3/16 – R1500 or 150 days imprisonment
<b>No.8</b>	[Case S209/15] 29/3/16 – R1500 or 150 days imprisonment
<b>No.9</b>	Case S209/15] 29/3/16 – Count 1: (sec 46(1)Act57/03 – without permission on premises)R1000/100 days imprisonment  Count 2: (Sec 13(1) Act 18/98 Fishing without permit) R1000/100 days imprisonment
<b>No.10</b>	[Case 198/15] 12/4/15 – 2 counts (Sec 13(1) & Sec 46) R1500/150 days imprisonment
<b>No.11</b>	[Case 198/15] 12/4/15 – 2 counts (Sec 13(1) & Sec 46) R1500/150 days imprisonment
<b>No.12</b>	[Case 198/15] 12/4/15 – 2 counts (Sec 13(1) & Sec 46) R1500/150 days imprisonment
<b>No.13</b>	Case S 211/14] 24/2/15 – Withdrawn DPP instruction [not reinstated]
<b>No.14</b>	Case S 211/14] 24/2/15 – Withdrawn DPP instruction [not reinstated]
<b>No.15</b>	Case S 211/14] 24/2/15 – Withdrawn DPP instruction [not reinstated]
<b>No.16</b>	Case S66/16] 12/7/16 -Count 1: Sec 13(1), R1000/100 days imprisonment. Count 2:Sec 46(1) R1000/100 days imprisonment

<b>No.17</b>	Case S66/16] 12/7/16 -Count 1: Sec 13(1), R1000/100 days imprisonment. Count 2:Sec 46(1) R1000/100 days imprisonment
<b>No.18</b>	Case S66/16] 12/7/16 -Count 1: Sec 13(1), R1000/100 days imprisonment. Count 2:Sec 46(1) R1000/100 days imprisonment
<b>No.19</b>	[Case S 210/15]12/7/16 - R1500/150 days imprisonment
<b>No.20</b>	[Case S65/16] 7/6/16 – R1500/150 days imprisonment
<b>No.21</b>	[Case 68/16] 2/8/16 – R2500/100 days imprisonment
<b>No.22</b>	[Case 68/16] 2/8/16 – R1500/150 days imprisonment
<b>No.23</b>	[Case S199/15] 5/4/16 – R1000/100 days imprisonment
<b>No.24</b>	[Case S199/15] 2/8/16 - R1500/100 days imprisonment
<b>No.25</b>	Case S183/15] 1/12/15 – Cautioned and discharged
<b>No.26</b>	[Case S182/15] 26/1/16 – R1000/100 days imprisonment
<b>No.27</b>	[Case S182/15] 26/1/16 – R1500/150 days imprisonment
<b>No.28</b>	[Case S182/15] 26/1/16 – R1000/100 days imprisonment
<b>No.29</b>	[Case S211/15] 5/4/16 – R1500/50 days imprisonment
<b>No.30</b>	[Case S208/15] 29/3/16 - 2 Counts – Count 1(Permit)R1000/100 days imprisonment, Count 2(Without permission in park)R1000/100 days imprisonment
<b>No.-31</b>	[Case S208/15] 29/3/16 R1500/150days imprisonment
<b>No.32</b>	Case 36/08/2015– Withdrawn DPP instruction [not reinstated]
<b>No.33</b>	Case 36/08/2015– Withdrawn DPP instruction [not reinstated]
<b>No.34</b>	Case 36/08/2015– Withdrawn DPP instruction [not reinstated]



### 3.4 Discussion

Field Rangers not only carry out marine law enforcement in the Tsitsikamma Section of the Garden Route National Park but are also required to perform other tasks including terrestrial law enforcement in the forests and mountains, safety and security in the main tourist areas, routine maintenance of infrastructure and hiking trails, tourism related activities and many other *ad hoc* tasks.

International trends in poaching activities indicate poaching is not a problem only in South Africa. In a study on the illegal bush meat hunting outside the Serengeti National Park, Tanzania, in an act of intimidation illegal hunters burnt down a house belonging to the leader of the Natural Resource Committee in a project village (Holmern *et al.*, 2007). As a result of more enforcement related threats from illegal hunters against members of the Village Game Scouts this led to increased inter-village and intra-village conflict. Holmern *et al.*, (2007) further stated that Village Game Scouts faced difficulties when trying to place illegal hunters under arrest partly due to often being outnumbered and also not carrying firearms. In a study of poaching in the Serengeti National Park, Tanzania, it was found that if law enforcement patrol regularity is lessened or stopped then there is a drastic increase in the poaching of wild animals and that anti-poaching is effective for the protection of the species of interest if there are sufficient resources for a professional national park service (Hilborn *et al.*, 2006). Non-compliance with MPA regulations has been reported from all over the world including; Europe, North America, South America, Africa, Asia and Australia and intertidal, coastal and offshore locations (Gribble & Robertson, 1998; Wallace, 1999).

The illegal fishers in the Tsitsikamma MPA were on approach generally non-cooperative and some showed highly aggressive behaviour in order to attempt to intimidate SANParks conservation staff. The coastal terrain has many gullies, rocky outcrops and coastal forest coming close to the sea. Illegal fishers also kept a lookout for Field Rangers patrolling the area and if sighted they would immediately reel in their lines and disappear into the many gullies and thickly wooded kloofs found along the Tsitsikamma coastline.



Some of the illegal fishers had just started to fish when they were apprehended so the fish caught could be an under representation of fish that would have been caught had they not been apprehended. The total catch found in possession of illegal fishers that were apprehended in the 12 month intensive study period was 70 fish. In a study in the Tsitsikamma MPA by baited remote underwater video systems Dando, (2020) found blacktail, cape stumpnose, red roman, Jan Bruin, strepie and sea barbel were all significantly associated with Tsitsikamma and these species also being among those caught by illegal fishers.

According to Hanekom *et al.*, (1997) in a study done in the Tsitsikamma MPA from 1991 to 1995 in the open fishing area where visitor and local fishers were asked to fill out catch cards, the five highest percentage of species caught by visitors were strepie (22.6%), blaasop/puffer (19.6%), blacktail (6.7%), elf (4.8%), cape stumpnose (4.5%) and locals highest numbers of species caught was strepie (36.7%), fransmadam (21.8%), elf (10.4%), blacktail (5%) and white steenbras (3.6%). Similar species were found in the 12 month intensive study period including blacktail (20%), strepie (12.9%), white steenbras (10%) and cape stumpnose (5.7%). Murray, (2006) in a study on illegal fishing in the Tsitsikamma MPA over an 8 month period by aerial surveys and collecting evidence off rocks at known illegal fishing places found that fish species identified from scales at known illegal fishing places included santer (*C nufar*), red roman (*C. laticeps*), poenskop (*C nasutus*) and blacktail (*D. capensis*).

In a study by Brill, (2012) of fish confiscations by SANParks Rangers in the Table Mountain National Park MPA over a 10 year period 14 fish species were recorded compared to the 18 fish species recorded in the 12 month intensive study period in the Tsitsikamma MPA.

In a scientific shore angling fishing survey in the Tsitsikamma MPA between 1989 to 1991 in both the open fishing area and the closed MPA the five highest percentage of species in the open area was strepie (39%), southern mullet (14.5%), blacktail (12.7%), cape stumpnose (8.3%) and elf (5.5%). In the closed fishing area blacktail (20%), santer (13.3%), hottentot (8.7%), galjoen (6.2%) and strepie at (5.7%) were caught (Hanekom *et al.*, 1997).

The high percentage of blacktail (20.00%) of the catch recorded compared similarly to the scientific shore survey in the closed areas of the Tsitsikamma MPA between 1989 to 1991 where blacktail were recorded also at (20%). strepies at (12.85%) compared to (5.7%) , white steenbras at 7 fish (10.00%) compared to 2%, rockcod at (10.00%) compared to 0.00%, cape stumpnose, galjoen and barbel all at 4 fish each (5.71%) compared to 3.4%, 6.2% and 2.2% respectively.

Strepies are caught by illegal fishers to use as bait. According to Hanekom *et al.*, (1997) species most frequently caught by both Visitors and Locals was the *S. salpa* comprising 22.6% and 36.7% respectively. The small hook size and pilchard bait used by many anglers in the area would tend to target these smaller species. *Sarpa salpa* and *B. inornata* comprised 47% and 18% of the suprabenthic fish counted in both subtidal gullies and on shallow coralline in the Tsitsikamma MPA dominated reefs (Burger, 1990).

White steenbras were caught by four different fishers, three were caught in estuaries and 4 in sandy areas in the periods, May, July and November. Adult white steenbras and dusky kob migrate. An MPA objective is to protect these species whilst they're there but the catching of undersize fish by poachers negates the purpose of the MPA. White steenbras and dusky kob are collapsed species with white steenbras being classified as Endangered and dusky kob as Vulnerable (Mann BQ 2013) and are meant to be protected by the MPA (Smith, 2017, pers. com). All the white steenbras caught were under the size limit showing that even in the MPA there is a lower abundance of large adults. In a study on the shore angling fishery between Plettenberg Bay and Grootbank close to the western border of the Tsitsikamma MPA, King, (2005) found that 61% of the white steenbras caught by shore anglers were below the legal size limit as well as for other protected fish species including galjoen (44% undersize) and zebra (56% undersize).

Lamberth & Joubert, (2014) used five conservation criteria, including; abundance, level of knowledge, endemism, relative exploitation throughout range and vulnerable life history characteristics, to rank fish species in order of importance, along the South African coastline, for research and urgent

management action. The top ranked 30 fish species needing conservation management action for recreational shore fishing included 10 of the fish species (elf, strepie, galjoen, blacktail, white steenbras, mullet, cape stumpnose, white musselcracker, sand steenbras and sea barbel) caught by illegal fishers in the Tsitsikamma MPA in the 12 month intensive study period. For combined sectors including; recreational shore, boat and spearfishing as well as commercial boat and net fishing 8 of the fish species caught by illegal fishers in the Tsitsikamma MPA were ranked in the top 30 fish species requiring conservation management action including; strepie, blacktail, white steenbras, mullet, red roman, white musselcracker, cape stumpnose and santer (Lamberth & Joubert, 2014). The IUCN Red List status lists Galjoen as being (Near Threatened (2016), Elf (Vulnerable 2019), Dusky Kob (Critically Endangered 2019), Roman (Near Threatened 2009), Poenskop (Vulnerable 2009), White Steenbras (Endangered 2009) and White Musselcracker (Near Threatened 2009) (Sink et al., 2019).

The species that were over the bag limit were white steenbras, galjoen and kob with white steenbras and kob having collapsed fish stocks.

Discarded fish species and litter, besides visual pollution to paying hikers, causes environmental damage as discarded fishing line gets into organisms growing on rocks later dislodging these, plastic and other litter lands up in the sea and is often digested by marine species (Smith, 2017, pers.com). In a study by Murray, (2006) on illegal fishing effort in the Tsitsikamma MPA at identified popular illegal fishing sites a number of discarded dead sharks were found, fishing line was the most common litter found along with empty packets, bait-thread reels and hooks. Hanekom *et al.*, (1997) found that discarded bait and plastic bags left by anglers in the Tsitsikamma MPA probably adversely affected the wilderness experience of hikers along the Otter Trail which generates income for the Park.

In a study by Brill, (2012) of confiscations in the Table Mountain National Park MPA, four bait species were recorded over a 10 year period (wonder worm (*Marphysa spp*), white bait species (*Galaxidae spp*), mussel worm (*Pseudonereis variegata*) and red bait (*Pyura stolonifera*). Twenty five of the illegal fishers (74% of total illegal fishers apprehended) had illegal bait implements “wurmpikke” in their possession. These “wurmpikke” cause significant environmental damage

as they are used to chop mussels off mussel beds on rocks to get to the musselworm underneath the mussels. In the questionnaire twenty of the illegal fishers said that they collected musselworm in the MPA. However some of them may have been cautious to admit to this as it is illegal to use "wurmpikke" and the total is most likely higher.

Only two illegal fishers, (6%) of the fishers apprehended were found in possession of bait (pilchards) which they had purchased, indicating that most of the illegal fishers collect bait illegally in the MPA. One illegal fisher was found in possession of white mussel that is not found in the MPA but the fisher said that he collected it outside the MPA at Keurbooms beach near Plettenberg Bay. Two illegal fishers were found in possession of Octopus and 11 fishers were found in possession of alikreukel but these are not normally used as bait but taken for food. The intertidal community structure can be altered by human exploitation which is a form of predation (De Boer *et al*, 2002).

All the fishers had long fishing rods ranging from 3.5 to 4.2m and most of the fishers had Penn reels (71%) in their possession. This indicates that they are experienced shore anglers with sufficient skill to operate multiplier reels in the challenging rocky coastline waters of the Tsitsikamma. The fishermen used heavy lines showing that they were not interested in the challenge of catching fish on light tackle, they want to hook the fish and remove them (Smith, 2018, pers. com). Hook size 1/0 to 10/0. 1/0, 2/0, 3/0 were the most common hooks and can catch fish such as strepie and blacktail and also large fish like red roman and galjoen.

Besides illegal fishing and trespassing the illegal fishers also transgress the MLRA legislation by breaking general fishery laws including; catching undersize fish, fish over the bag limit, collect alikreukel including alikreukel over the bag limit and undersize alikreukel, collecting redbait, musselworm and musselworm over the bag limit, use illegal bait implements to remove musselworm as well as resisting arrest. Brouwer *et al*, (1997) conducted 4 490 interviews with anglers along the South African coastline and obtained information of catch-and-effort from 9 523 anglers. It was found that many anglers had little knowledge of the regulations or complied with the regulations. Sauer *et al.*, (1997) in a study on

the South African boat-based line fishery found that a high percentage of commercial and recreational fishers did not know or adhere to fishery regulations and 22% to 58% of recreational fishers admitted to selling their catches.

More notable transgressions include catching and being in possession of undersize fish (41%), removing and being in possession of red bait (44%) and musselworm (35%), possession of illegal bait implements “wurmpikke” (74%) and resisting arrest (30%). In a study by Nel *et al.*, (2013) on bait collectors in Langebaan Lagoon a distinct lack of adherence to the bag limits reflects a disregard for conservation measures. Illegal fishers have also been involved in other non-environmental crimes inside the Tsitsikamma National Park (Patterson, 2019, pers. com).

In the ten year period from 2004 to 2014 there were similar incidences of Field Rangers being verbally and physically threatened by illegal fishers. Nortier, (2017, pers. com) said that in the Table Mountain National Park MPA approximately 20% of abalone poachers resisted arrest. According to Patterson, (2015, pers. com) there appears to be a perception amongst illegal fishers in Tsitsikamma that they are above the law which is probably contributed to by certain local politicians commiserating with and supporting illegal fishers while vilifying SANParks conservation staff.

Most of the illegal fishers spent between five to eight hours fishing. Once they enter the Marine Protected Area they first collect bait from the rocks. If there is a large sea swell present then it takes longer to collect bait and they will sometimes collect bait for a second time especially if the sea calms down while they are fishing (Daniels, 2019, pers. com). If fish are not biting or the swell picks up they will leave and if they are biting they will stay longer. Illegal fishers have put in effort to get to the MPA in terms of walking long distances and want to enjoy the experience of fishing and do not want to leave so soon. A small number of illegal fishers set snares for animals in the terrestrial area bordering the MPA which also increases their time spent illegally in the National Park (Daniels, 2019, pers. com).

Half of the illegal fishers questioned said that they do not target any particular fish species and will catch anything that bites whilst the other half said they do target specific fish species, the two most popular being galjoen and red roman. According to Smith, (2017, pers. com) galjoen and red roman are the two most targeted fish species in the Tsitsikamma MPA due to the protection these fish have had in the MPA which increased their numbers.

Almost all of the illegal fishers said they collect bait inside the MPA mostly being polychaete worm (mussel worm) and red bait. A large percentage of the illegal fishers were in possession of illegal bait implements referred to as “wurmpikke” which are used to collect mussel worm. Extensive damage is caused to mussel beds by using these implements. Illegal fishers sometimes collect extra red bait and then take it home and bury it which makes it smell strongly, increasing its value as bait and then use it at a later date (Daniels, 2019, pers. com).

Most of the illegal fishers fish from between once a week to once a month according to when they have time off from work and have the time. The illegal fishers fish when they have time off from work and when they feel like fishing (Daniels, 2019, pers. com).

The cpue of 0.54 was similar to a study by Hanekom *et al.*, (1997) which found the cpue of local anglers fishing in the 3 km section of coastline within the Tsitsikamma MPA which was open to fishing at the time from 1991 – 1994 as being at 0.55. Information from illegal fishermen was further projected to work out the total fishing outings per year, total angler hours per year (illegal angler effort) and total amount of fish estimated to be caught per year. This could be an under-estimation as not all the illegal fishermen who fished during the 12 month intensive study period were apprehended. Ranger patrols are effective in decreasing the angler-hours of illegal fishermen thereby decreasing the number of fish caught and removed from the MPA. The estimated total amount of fish caught per year is high and damaging to the fish stocks negating the purpose of the MPA.

It took a high amount of ranger man-hours to arrest illegal fishers (68 hours man-hours per ranger for one illegal fisher) by patrolling and doing observations at

known popular illegal fishing sites. However, acting on information provided by informants cut down the man-hours per arrest to 9 man-hours per arrest and 38% of the illegal fishers were apprehended with information provided by the informants. It would therefore be important to recruit more registered informers and casual informers in order to increase the success rate in apprehending illegal fishers. Most illegal fishers were apprehended during the weekend period from Friday to Saturday when they had time off from their work.

Resistance was often experienced by SANParks law enforcement officials from certain local SAPS officials personally not regarding environmental crimes as a priority leading to challenges in the opening of cases and ensuring they reached the Court roll (Paterson, 2017, pers.com).

Constant communication with SAPS and DOJ officials is necessary to ensure that no cases are withdrawn as well as to create a better understanding of the importance of environmental legislation.



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## CHAPTER 4: RELATIONSHIPS BETWEEN FISHING PRACTISES AND ENVIRONMENTAL CONDITIONS

### 4.1 Introduction

In a study by Hanekom *et al.*, (1989), 62 major sea temperature declines (> 3 degrees over 48 hours) were recorded in daily sea surface temperatures in the Tsitsikamma MPA over a seven-year study period and 81% (50) of these occurred between the months of November and April. In 67 – 79 per cent of the instances where easterly winds blew, decreases between 2.5 to 2.1 degrees in sea temperatures were recorded between the first and second day of wind at the surface and at 12m. Sea temperatures levelled off between 12 and 9 degrees C when easterly winds carried on blowing strongly. When easterly winds ceased blowing, temperature increases at the surface and 12 m depth were recorded between the first and second day of the start of westerly (NW-SW) winds.

According to Hanekom *et al.*, (1989), significant differences between angling catches in 1983 and 1984 off Storms River in the Tsitsikamma MPA were that the catch rate of elf (*P. saltratrix*) during summer 1983 (warm sea temperatures) was much higher than in summer 1984 when sea temperatures were cooler. No Fransdam (*B. inornata*) were caught during the cooler summer of 1984. A cold-water ridge is formed by strong easterly winds during summer and as Tsitsikamma is closer than most of the South African coastline to the shelf break it is likely supplemented by a surplus of available sustenance thereby supporting larger and more diverse community structures (Dando, 2020).

Easterly winds blow regularly in summer while westerly winds dominate throughout the year. These easterly winds cause upwelling by moving the warmer surface waters offshore allowing the cooler water from deeper down to reach the surface at the coast. This cold water brought to the surface can have serious effects on a wide range of fish species (Schumann *et al.*, 1987). Sudden changes in temperature of 10 degrees and more due to upwelling can be experienced which can have dramatic effects on fishes including by driving fish inshore.

De Boer *et al.*, (2002), in a study on human exploitation of the intertidal area at Inhaca Island, Mozambique, found that human activities clearly correspond to



the period with lowest tides which is when there is the highest prey abundance. During spring tides the intertidal area was accessed exactly during the period of lowest water and during neap tides the intertidal area was visited earlier or ended later. Environmental conditions also influenced the efficiency of collecting as strong, mostly southerly winds caused waves in the channel on certain days which forced humans to leave and look for other intertidal areas that were not so productive.

The objectives for this chapter were to gain an understanding of which environmental conditions illegal fishers take note of and which of these conditions encourage them to fish illegally in the Tsitsikamma MPA. By understanding these environmental factors it will make it easier for managers to plan more effective patrols in terms of success in apprehending illegal fishers.

## **4.2 Methods**

The date and time illegal fishing occurred in Tsitsikamma was correlated with tidal cycles, moon phase, wind speed and direction as well as sea temperature. Chi-square tests and Spearman's rank correlations were used to correlate illegal fishers arrests with water temperature, wind gust speed and wind direction data using Microsoft Excel to examine any significant linkages for the preferred fishing conditions.

Data were obtained from SANParks official records of apprehensions of illegal fishers inside the Tsitsikamma MPA from May 2004 to August 2014. Data between September 2014 to August 2015 with detailed information were obtained directly in the form of a questionnaire from illegal fishers when they were arrested in the field. Data on weather and sea conditions including sea temperatures, wind gust speeds and wind gust direction for each apprehension in the 10 year and 12 month intensive study period was obtained from the SA Weather Service. Data was analysed to obtain averages of conditions at the time of arrests.

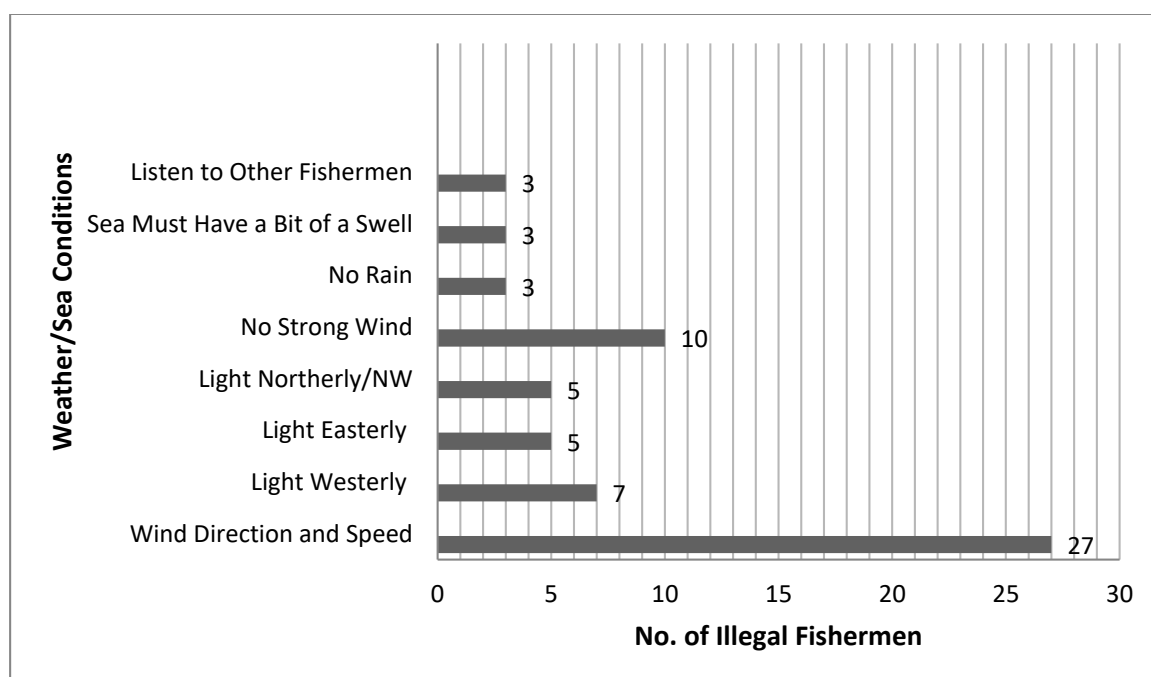
A questionnaire answered by Illegal fishers was analysed quantitatively and qualitatively to gain insight into individual experiences and to understand the participant's point of view by obtaining their underlying reasons, opinions and motivations. Additional Information on the illegal collection of marine resources

in the Tsitsikamma MPA was obtained by interviews with Field Rangers, SANParks Environmental Crime Investigation Service staff and Managers.

### 4.3 Results

When answering the questionnaire 27 (79%) of the illegal fishers answered that they look at wind direction and speed before they decide to go fishing. Seven (21%) had a preference for light westerly wind, 5 (15%) for light easterly wind and 5 (15%) for light northerly/north westerly winds. 10 (29%) of illegal fishers specifically said that they do not like strong wind and will not come to fish and 3 (9%) will not come if there is any rain (Figure 4.1).

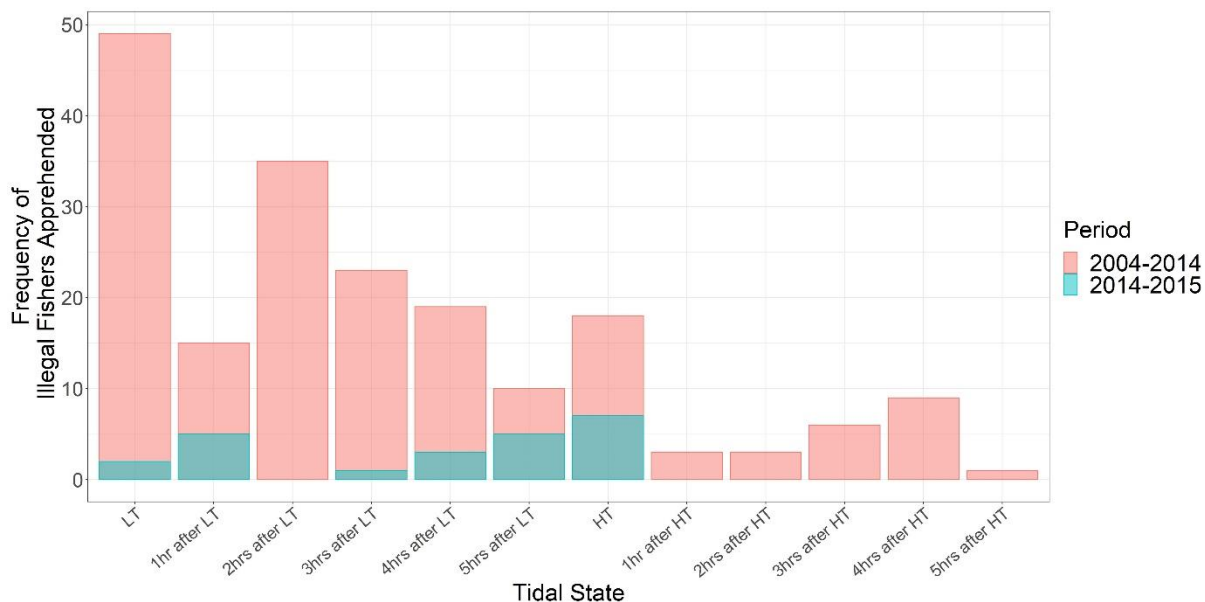
Some of the illegal fishers also mentioned they look at the Tsitsikamma mountains and if the mountains are clear with a bluish tinge then the sea is good for fishing, whereas if there is a haziness or mist around the mountains and wind swirling then conditions for fishing are not good.



**Figure 4.1: Illegal fishers preferences for environmental conditions (12 month intensive study period).**

Many illegal fishers in the 2004 to 2014 period were apprehended at low tide, 50 (25%) and 106, (53%), were apprehended with incoming tide up until high

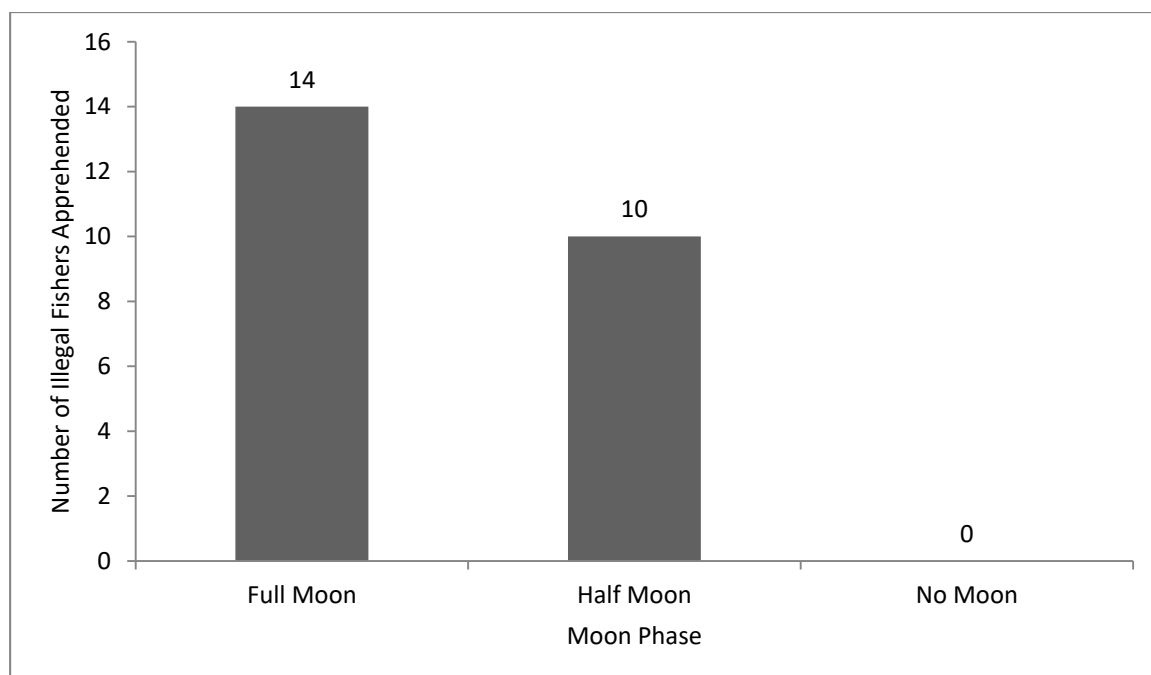
tide. Forty-three, (22%) illegal fishers were apprehended fishing on an outgoing tide (Figure 4.2).



**Figure 4.2: Tidal cycle when illegal fishers were apprehended (2004 to 2014 and 12-month intensive study period).**

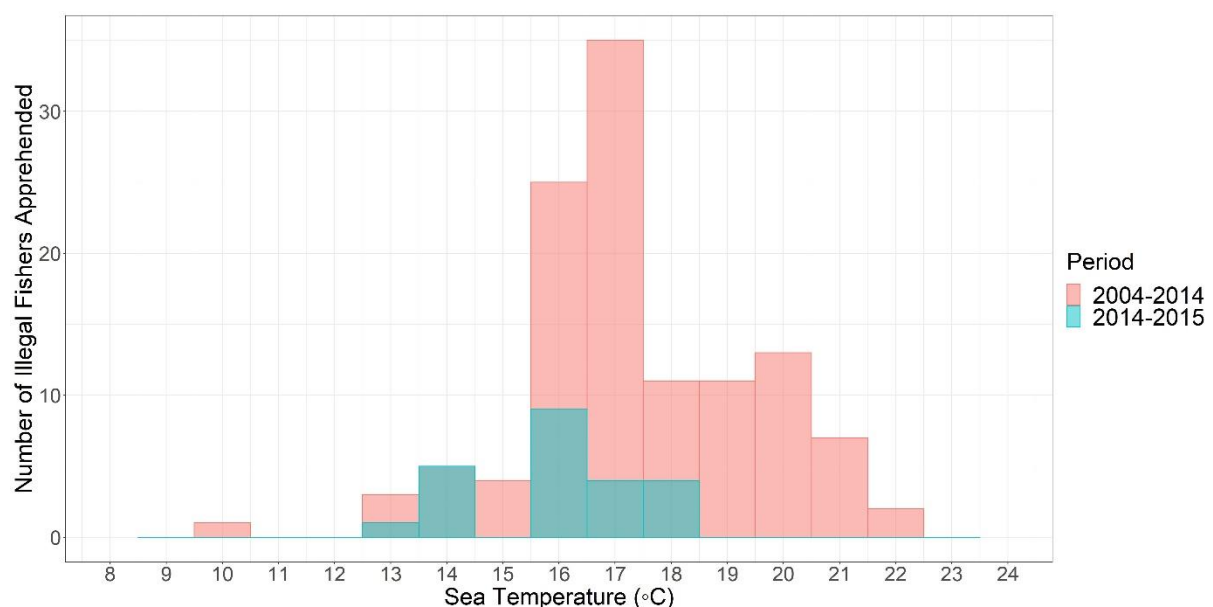
In the 12 month intensive study period five (15%) of illegal fishers were apprehended at low tide while 27 (79%) were apprehended with incoming tide. Only 2 (6%) were apprehended with outgoing tide (Figure 4.2).

Fifty eight percent, 58%, of illegal fishers apprehended at night were fishing when it was full moon, 42% at half and none at the new moon period. No illegal fishers were apprehended at night during the 12-month intensive study period (Figure 4.3).



**Figure 4.3: Moon phase when illegal fishers were apprehended at night (2004 to 2014).**

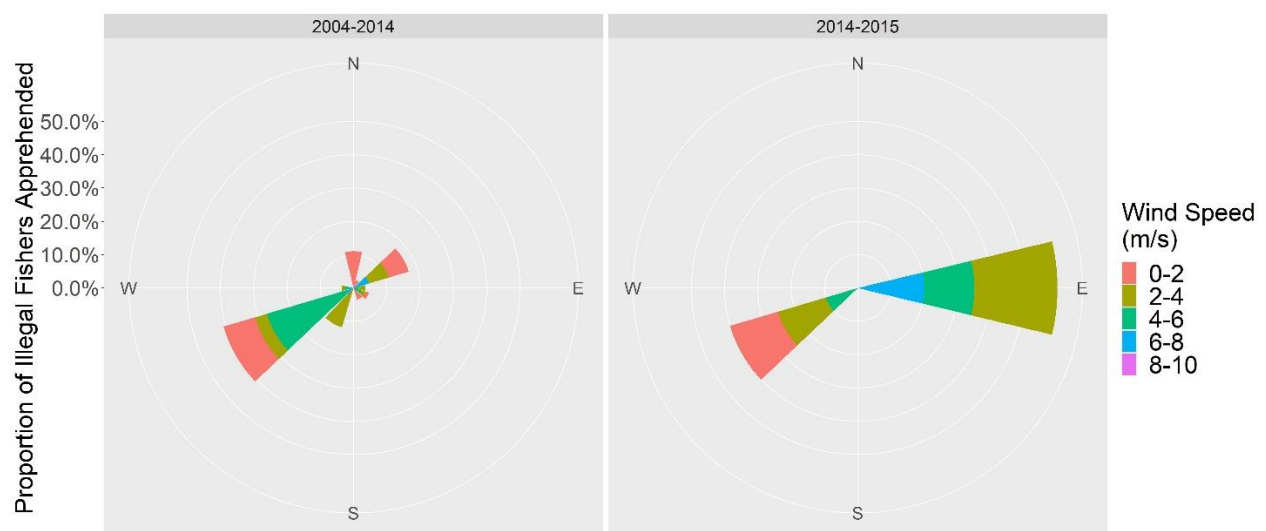
In terms of apprehensions of illegal fishers between 2004 and 2014 sea temperatures ranged from 10 degrees to 22 degrees Celsius. The highest number of illegal fishers apprehended (26%) was at 17 degrees and most apprehensions occurred with sea temperatures between 15 to 20 degrees (86%) (Figure 4.4).



**Figure 4.4: Sea Temperatures when illegal fishers were apprehended.**

For the 12-month period in terms of apprehensions sea temperatures ranged from 13 degrees to 18 degrees. The highest number of illegal fishers apprehended was at 16 degrees (35%). Most of the illegal fishers (76%) were apprehended with sea temperatures from 16 to 18 degrees (Figure 4.4).

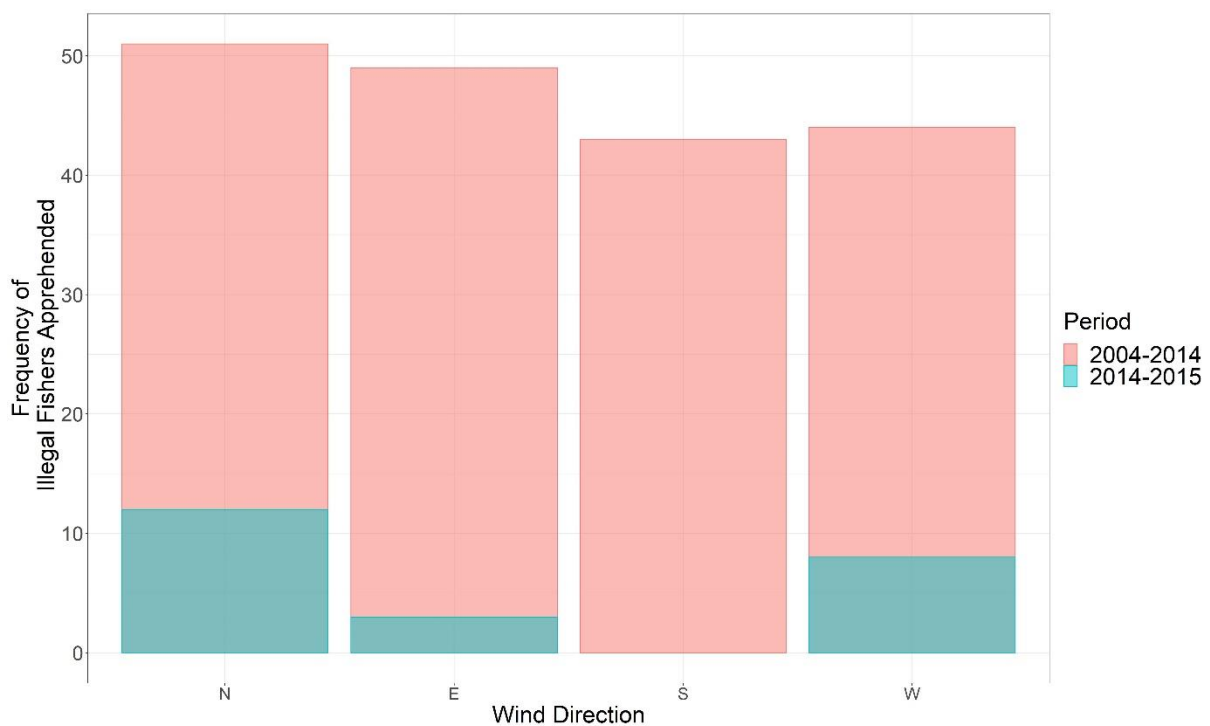
Illegal fishers in the 10-year period were apprehended with wind speed gusts from 0 to 6.9 meters per second with an average wind speed gust of 3.39 metres per second. In the 12-month period illegal fishers were apprehended with wind speed gusts from 0 to 7.0 metres per second with an average wind speed gust of 2.55 metres per second (Figure 4.5).



**Figure 4.5: Wind gust speed (m/s) when illegal fishers were apprehended (2004 to 2014 and 12-month intensive study period).**

In the ten-year period, 27% of illegal fishers were apprehended on northerly winds, 26% on easterly to south easterly wind, 23% on southerly winds and 24% from south-west to westerly winds (Figure 4.5; Figure 4.6).

In the 12-month intensive study period, 52% of illegal fishers were apprehended with a northerly wind blowing, 13% with an easterly wind and 35% with westerly or south westerly winds (Figure 4.5; Figure 4.6).



**Figure 4.6: Wind direction when illegal fishers were apprehended 2004 to 2014 and 12-month intensive study period. (N:316-45, E:46-135, S:136-225, W:226-315).**

In table 4.1 sea temperature and wind gust speed were further analysed by using Spearman's rank correlation tests to compare the apprehension counts with typical prevailing conditions during that month. The frequency of apprehensions did not significantly correlate to values of water temperature ( $p=0.68$ ), wind speed ( $p=0.34$ ). The moon phase ( $p=0.22$ ), tidal phase ( $p=0.24$ ) and wind direction ( $p=0.20$ ) also had non-significant effects on the frequency of apprehensions.

**Table 4.1: Results of a) chi-square tests and b) Spearman's rank correlations used to test the relationship between the frequency of illegal fisher apprehensions and environmental variables.**

a)	<b>Variable</b>	<b>X-squared</b>	<b>df</b>	<b>p-value</b>
	Moon Phase	3	2	0.2231
	Tidal Phase	24	20	0.2424
	Wind Direction	6	4	0.1991
b)	<b>Variable</b>	<b>S</b>	<b>rho</b>	<b>p-value</b>
	Sea Temperature	190.09	-0.15	0.675
	Wind Speed	80.101	-43	0.335

#### 4.4 Discussion:

According to Mann, (1994) in a study of illegal gill and seine netters at Lake St Lucia, time spent netting depended on the wind, salinity of water which affected fish abundance and the season relating to the amount of fresh water in the estuary . Brill, (2012) found that the two most important factors abalone poachers in the Table Mountain National Park MPA look at is resource abundance and accessibility. Other factors they take into account before poaching include sea currents, wave action and sea conditions.

In the questionnaire most of the illegal fishers mentioned that wind direction and speed were the crucial factors when planning to poach. This was borne out by the results which showed that illegal fishers avoid strong winds and favour light northerly winds which often also create the bluish tinge around the mountain tops.

Just over 78% of illegal fishers in the ten year period and 94% of illegal fishers in the 12 month period were apprehended in the low tide period and incoming tide through to the high tide period. In the 12 month intensive study period 31 (91%) of illegal fishers indicated that they remove bait illegally at low tide and then fish with the incoming tide and this would explain why most were apprehended in this period. Another factor is that due to the nature of the rugged rocky coastline when the tide is pushing in and getting towards high tide there is less space to stand on the rocks and fish and it also becomes more dangerous with risk of being swept from the rocks. The illegal fishers often fish in the same gullies where they have collected bait by dislodging mussels on the rocks and fish are attracted by this. Most of the illegal fishers apprehended in the 12 month intensive study period (85%) in Table 1.8 (chapter 3) indicated they spend a maximum of 8 hrs or less in the MPA which includes time spent walking down the steep contours to the sea and climbing back out again after fishing. They therefore plan on arriving at the sea at low tide or as close as possible to low tide.

In the 12 month period no illegal fishers were apprehended at night although many night time observations of access routes to the coastline were carried out as well as information sought from informers regarding night fishing. One illegal fisher was apprehended at Elands River Mouth shortly before nightfall and was



planning to fish until later that night and this was during full moon period. Two illegal fishers were apprehended at sunrise after having spent the night fishing at Bloukrantz River Mouth.

In the ten year period most illegal fishers apprehended at night were either apprehended during full moon (58%) or half moon (42%) periods. Due to the rugged nature of the coastline in the Tsitsikamma MPA it is mostly only possible to fish at night in river mouths or at Jaftaskraal in the eastern section of the Park which is a protected cove. The one illegal fisher in the 12 month intensive study apprehended shortly before nightfall was fishing in a river mouth. According to Daniels (2017, pers. com) fishers in Tsitsikamma like full moon as there is more visibility for collecting bait and the fish bite heavily on musselworm in full moon. According to Jacobs (2019, pers. com) illegal fishers take advantage of full moon as they have enough visibility not to have to use torches and so stand less chance of being apprehended by SANParks Rangers.

In the ten year period in terms of apprehensions of illegal fishers sea temperatures ranged from 10 degrees to 22 degrees Celsius. The highest number of illegal fishers apprehended (26%) was at 17 degrees and most apprehensions occurred with sea temperatures between 15 to 20 degrees (86%). With drops in sea temperatures illegal fishers fish in the river mouths at night where the water is warmer and fish congregate.

For the 12 month period in terms of apprehensions sea temperatures ranged from 13 degrees to 18 degrees. The highest number of illegal fishers apprehended was at 16 degrees (35%). Most of the illegal fishers (76%) were apprehended with sea temperatures from 16 to 18 degrees which corresponds to northerly and westerly winds. Sea temperatures are strongly linked to wind direction and the type of fish caught. No significant difference from the null hypothesis was seen though when considering water temperature and the times of apprehended fishers even though wind direction can have a profound effect on sea surface temperature.

According to Schumann *et al.*, (1982) within hours of a suitable strong wind blowing large thermocline displacements can occur and can take several days to

dissipate. According to Beckley, (1983) warm surface water was moved back towards the coast causing a relaxation of upwelling and increasing sea surface temperatures when south westerly winds blew combined with the passing of coastal low pressure systems.

Illegal fishers in the 10 year and 12 month period were apprehended with wind gust speeds from 0 to 7.0 m/s and with average speeds of 2.6 m/s and 3.4 m/s respectively. According to the questionnaire the majority of illegal fishers do look at weather conditions including wind direction and wind speed before coming to fish illegally in the MPA and a significant number specifically indicated that they do not fish if there are strong winds. Brill, (2012) found that small-scale fishers from the West Coast Rock Lobster and Rastafarian communities planned their collection activities in the Table Mountain National Park MPA around seasonal parameters such as time of day and weather conditions. What is important to them is the strength and direction of the wind. According to Jacobs, (2017, pers. com) if the wind is blowing strongly you can't feel if a fish is biting on your hook.

The varied nature of the Tsitsikamma coastline, along with deep water areas particularly along the eastern section of the MPA makes wind direction and speed important when catching fish. To the east of Storms River mouth the water is deeper and east/south easterly winds which blow mostly in summer and bring cold water are preferable which allow deep water fish such as red roman to be caught and kob in the river mouths at night (Jacobs, pers. com. 2019). In the 12 month intensive study all the roman caught were in the eastern sector of the MPA in the summer months and with associated easterly winds.

To the west of Storms River Mouth the water is shallower and fresh south westerly winds are preferable which bring in warmer water and fish like galjoen, blacktail and hottentot (Jacobs, 2019, pers. com). All the galjoen caught in the 12 month intensive study period were caught in the western sector of the MPA in the winter months when south westerly winds were blowing. Chi-square tests and Spearman's rank correlations did not find any significant correlations between the frequency of apprehensions and water temperature, wind speed, moon phase, tidal phase and wind direction.

Wind direction also has relevance in terms of casting direction. A northerly wind enables fishers to cast deeper whereas strong easterly or westerly winds cause a fishing line to get snagged on rocks (Daniels 2019, pers. com). A northerly wind is also warmer and tends to make the sea calmer with a smoother appearance making fishing conditions easier. Illegal fishers are recently also favouring easterly winds which relates to the species of fish they are targeting which come into shallower areas and bite in colder waters.

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## CHAPTER 5: SOCIAL PROFILE OF ILLEGAL FISHERS

### 5.1 Introduction

In a study done by Faasen & Watts, (2007) in the case of the Tsitsikamma MPA, local communities believe they have traditional rights to access fishery resources in the MPA and regard being excluded as an infringement of these rights. Fishing has been for both cultural and subsistence purposes for the coloured community of Tsitsikamma and they consider themselves as traditional but recreational fishers. In a study by Mann, (1994) in estimating the extent of illegal fish harvesting in the Lake St Lucia Game Reserve, it was found that people living in rural areas adjacent to the lake have carried on poaching fish and prawns by the use of gill and seine nets. Compliance efforts by the Natal Parks Board led to regular arrests and the seizure of thousands of meters of net causing local inhabitants of the tribal areas adjoining the lake to regard the NPB as the enemy. According to Brill (2012), Park officials are concerned that many of the marine resources in the Table Mountain National Park MPA have been heavily overexploited and that some populations may be heading for collapse.

Several protest marches were organised by the Tsitsikamma Angling Forum between 2005 and 2015 against the Park's no-take policy and to demand access to fish in the Park (Patterson, 2015, pers. com). On the 8<sup>th</sup> September 2007 a protest march took place of approximately 70 illegal fishers during which they entered the MPA illegally and fished in the Ngubu hut/Skilderkrans area for several hours.

Even in remote areas of ocean there will be resistance to MPA's by commercial companies or individuals who will oppose management whether it affects them to a large extent or not (Day *et al.*, 2011). In a study by Wood, (2004) on MPA's in the Seychelles, it was found that only 57% of non-poachers and 27% of poachers indicated that they were benefiting from MPA's. It was concluded that it was important that fishers be educated as to the benefits of MPA's, for example of the most tangible benefit which is spill over. It was further found that there was a lower skill level of poachers (8%) compared to non-poachers (27%) that were educated to above secondary level negatively impacting on their ability to earn other income indicating that poaching is motivated by

economics. In order to ensure success in the management of existing MPA's in the Seychelles management will need to create a trusting relationship between themselves and resource users (Wood, 2004).

But trust alone without enforcement is unlikely to be successful in reducing poaching. For example; in a study of surveillance and poaching off the Great Barrier Reef Marine Park, Davis *et al.*, (2004) found that with increased law enforcement patrols and observations, the amount of fish poaching incidents were reduced.

The Queensland Parks Wildlife Service not only performed law enforcement operations (Davis *et al.*, 2004). Their other job responsibilities included engaging with indigenous groups, environmental education programmes and communication with non-governmental stakeholders, dealing with wildlife strandings, ensuring camping regulation compliance, the cleaning and maintenance of public facilities and controlled burns on the islands (Davis *et al.*, 2004). It seems to be a common mistake that nature conservation authorities all over the world make in trying to complete many general duties and not having a certain staff component that focus only on enforcement. Recommendations to increase anti-poaching effectiveness at the Great Barrier Reef Marine Park were; to increase surveillance effort in the no take areas, to expand current environmental education and public awareness campaigns and to increase budget allocations for enforcement operations in the no take areas (Davis *et al.*, 2004).

## 5.2 Methods

Limited social data including age, gender, residence and employment sector of illegal fishers was contained in Park records of illegal fishing from 2004 to August 2014 of 218 illegal fishers that were apprehended. More detailed social data on illegal fishers was gathered in the intensive study period from September 2014 to August 2015 when 34 illegal fishers were apprehended for fishing illegally in the Tsitsikamma MPA. After the illegal fishers were apprehended and placed under arrest and any fish and bait species as well as equipment in their possession recorded they were requested to voluntarily answer questions according to the questionnaire.

### 5.3 Results

Data from the period 2004 until August 2014 (table 5.1) showed that most illegal fishers came from Woodlands (20%), Mandela Park (18%), Thornham (17%), Storms River West (8%) and Coldstream (8%). During the 12 month intensive study period the communities where most of the illegal fishers came from Woodlands and Coldstream (both 24%), Mandela Park (18%), Sandrif (12%) and Hermanuskraal (9%).

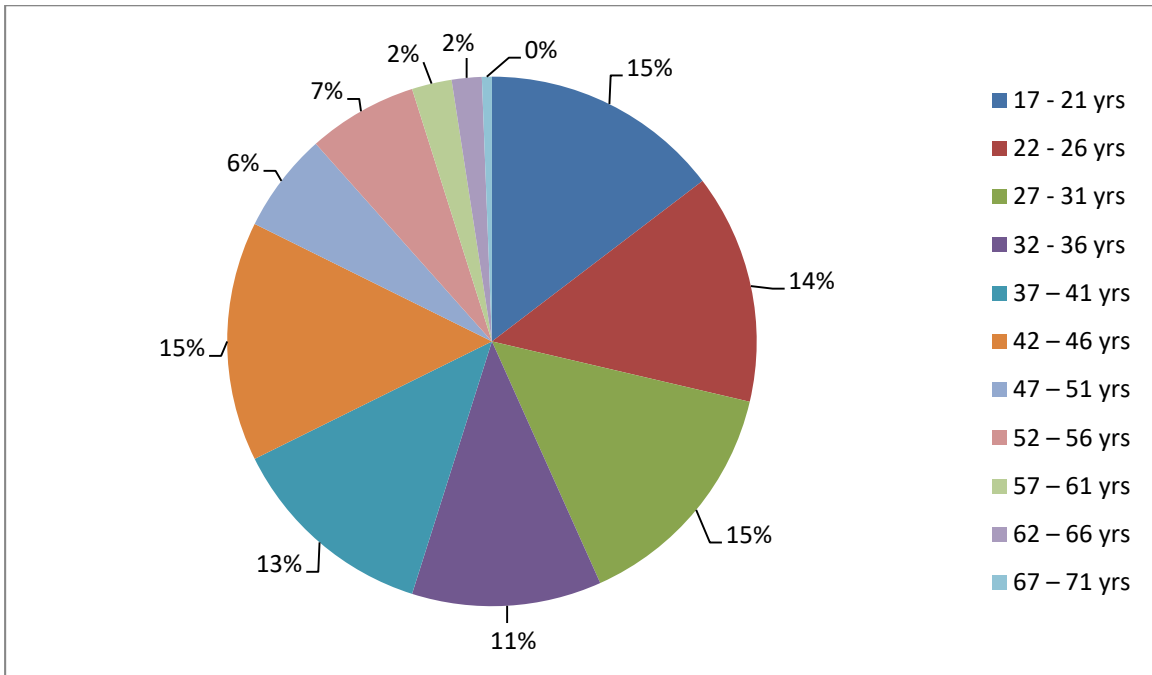
**Table 5.1 Communities in which apprehended illegal fishers resided.**

<b>COMMUNITIES IN WHICH ILLEGAL FISHERS RESIDE (arranged from west to east)</b>	<b>NUMBER OF ILLEGAL FISHERS APPREHENDED (2004 TO 2014)</b>	<b>NUMBER OF ILLEGAL FISHERS APPREHENDED (2014 to 2015)</b>
Mosselbay	1	0
George	1	0
Knysna	4	0
Plettenberg Bay	5	0
Craggs	3	0
Natures Valley	1	0
Coldstream	17 (8%)	8 (24%)
Witelsbos	1	0
Lottering	1	0
Storms River West	18 (8%)	2 (6%)
Storms River	2	0
Thornham	38 (17%)	0
Mandela Park	40 (18%)	6 (18%)
Bluelillies Bush	1	0
Gradita	1	0

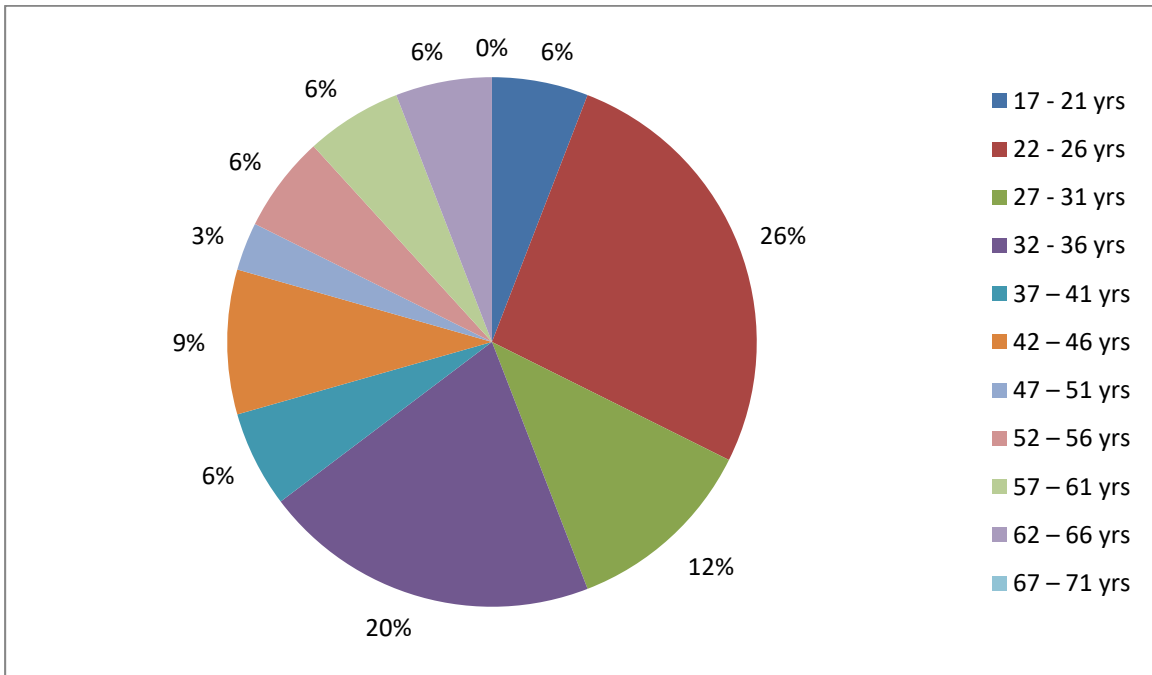
Sandrif	7	4 (12%)
Koomansbos	3	0
Hermanuskraal	6	3 (9%)
Robbehoek	4	2 (6%)
Oubos	1	1 (3%)
Woodlands	44 (20%)	8 (24%)
Kareedouw	4	0
Clarkson	2	0
St Francis	2	0
Jeffreys Bay	3	0
Port Elizabeth	5	0
Vereeniging	1	0
China	1	0
Spain	1	0

In the period 2004 until August 2014 the three highest percentages (15% each) of illegal fishers were the age groups (17 to 21yrs), (27 to 31yrs) and (42 to 46 yrs) with 83% of illegal fishers being below 47yrs. Older age groups accounted for the remaining 17% of illegal fishers (Figure 5.1).

In the 12 month intensive study the three highest percentages of illegal fishers were the age groups (22 to 26 yrs), (32 to 36 yrs) and (27 to 31 yrs), in order of frequency. Most (79%) of illegal fishers being below 47 yrs. Older age groups accounted for the remaining 21% of illegal fishers (Figure 5.2).



**Figure 5.1** Ages of illegal fishers in the period 2004 to August 2014.



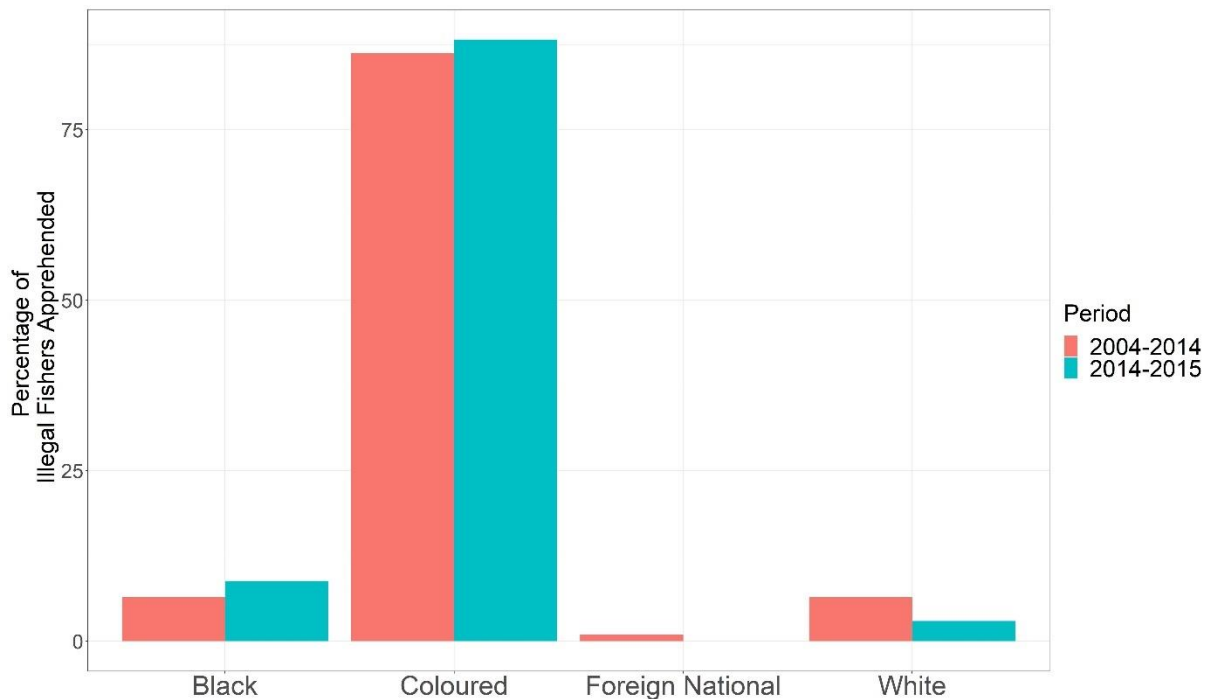
**Figure 5.2:** Ages of illegal fishers in the 12 month intensive study.

In the period 2004 to August 2014 demographics of illegal fishers apprehended was 83% coloured, 10% black, 6% white and 1% foreign nationals (Figure 5.3). The only female apprehended was a Chinese foreign national who was

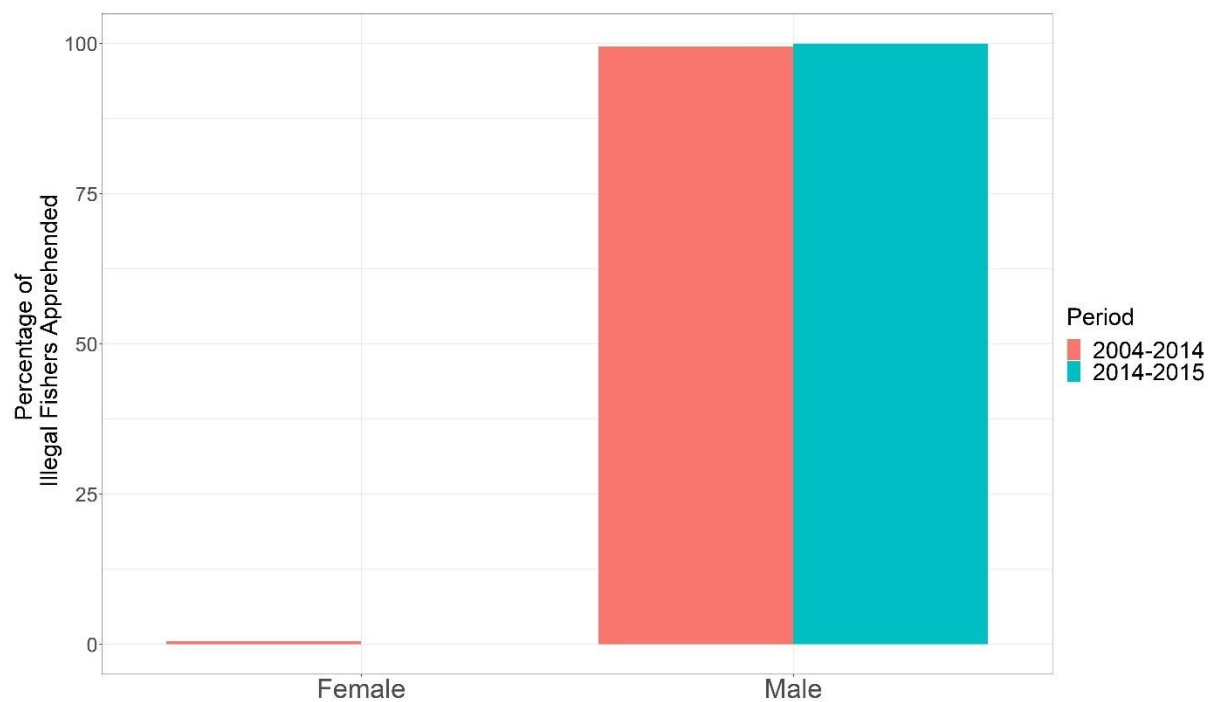


apprehended in the main tourist rest camp area in front of the chalet where she was staying (Figure 5.4).

In the 12-month study from September 2014 to August 2015 the demographics of illegal fishers apprehended was 88% coloured, 9% black and 3% white. No females were apprehended during this time period (Figure 5.3 and 5.4).



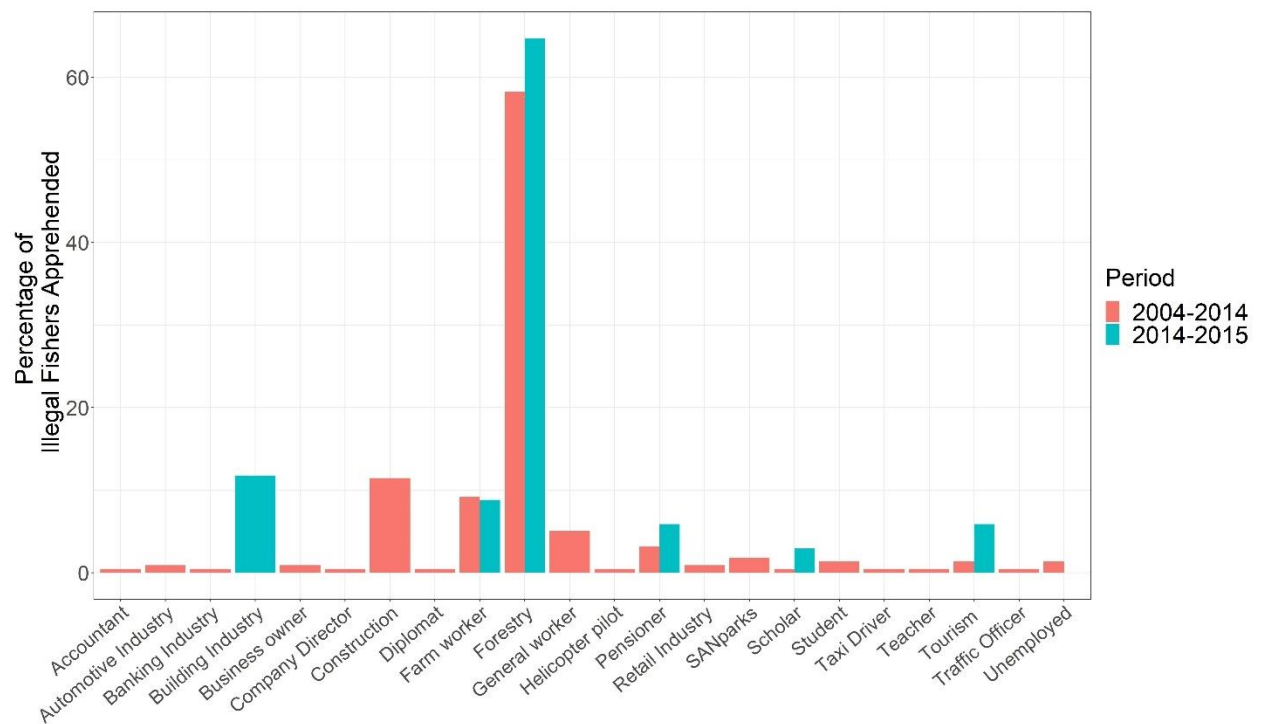
**Figure 5.3: Racial demographics of illegal fishers 2004 to 2014 compared to September 2014 to August 2015.**



**Figure 5.4: Gender of illegal fishers apprehended 2004 to 2014 compared to September 2014 to August 2015.**

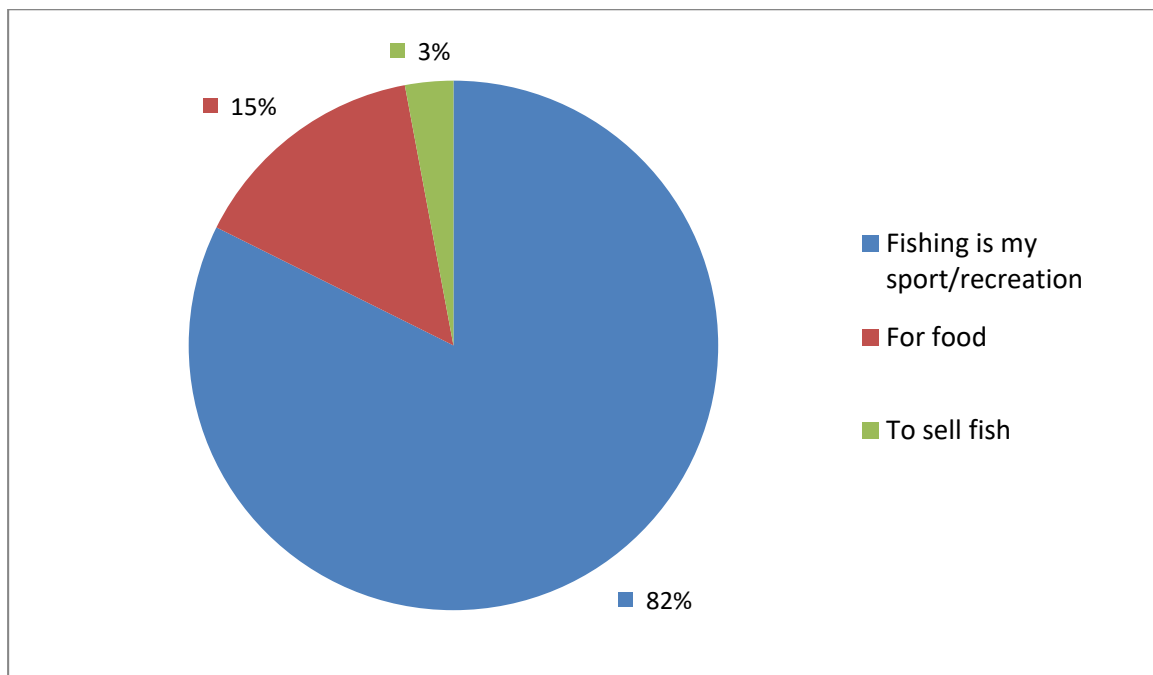
Information regarding the employment sector of illegal fishers from the period from 2004 to August 2014 was obtained. Of those apprehended the top five employment sectors were; 58% employed in the Forestry industry, 12% in the building industry, 9% were farmworkers, 5% general workers and 3% pensioners. Unemployment was recorded as 1% (Figure 5.5).

In the 12 month intensive study period the top five employment sectors were Forestry (68%), building industry (12%), Farm worker (9%), and pensioner (6%). Unemployment was recorded as 0%. The pensioners apprehended also indicated that they were employed part time and earning an income besides their pension (Figure 5.5).



**Figure 5.5: Employment sector of illegal fishers apprehended in 2004 to 2014 and fishers September 2014 to August 2015.**

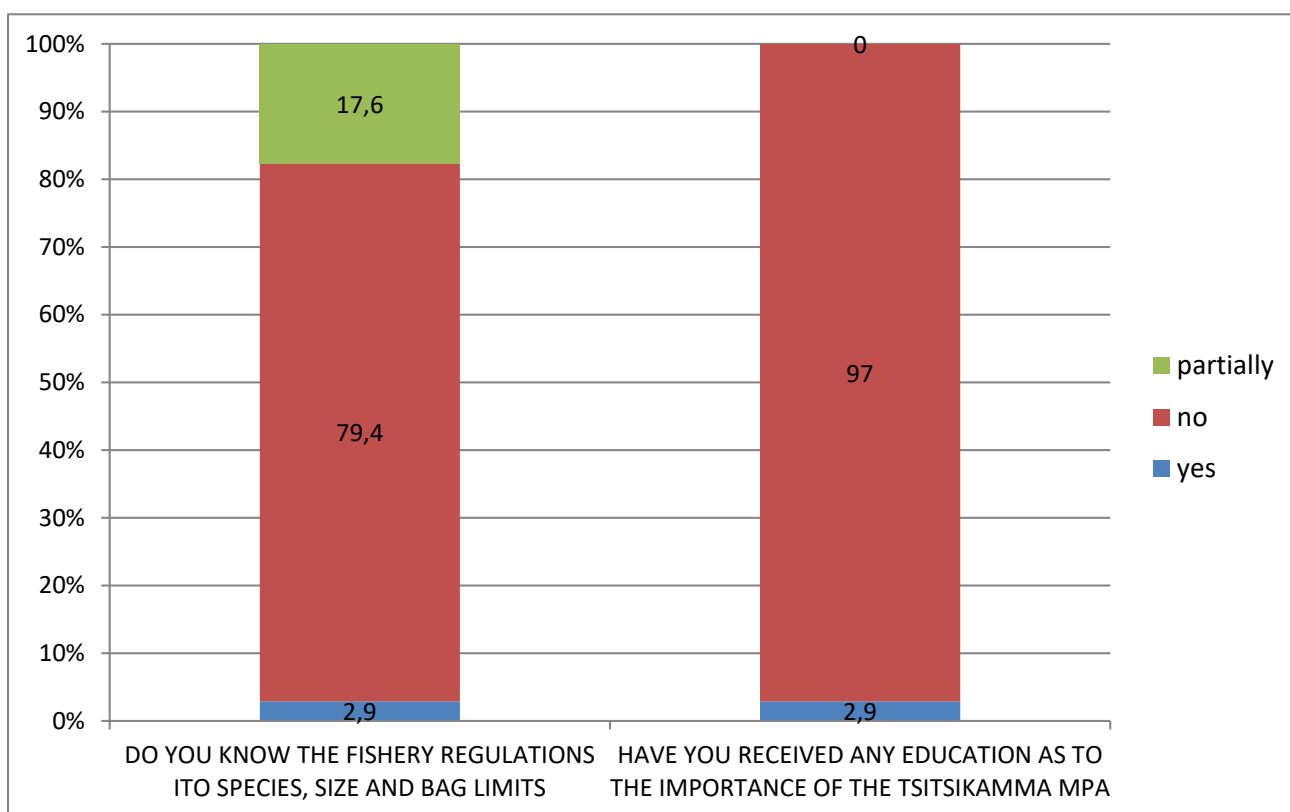
Just over 82% of illegal fishers apprehended in the 12-month intensive study said that their reasons for fishing in the MPA were for sport and recreation and that during the week they worked and so wanted to relax on a weekend, 15% indicated they caught for food and 3% to sell the fish they caught (Figure 5.6).



**Figure 5.6: Reason for fishing in the MPA.**

In the 12 month study period twenty seven (79%) of the illegal fishers claimed that they do not know the regulations and 6 (18%) said they partially know the regulations with only 1 (3%) indicating he knew the regulations (Figure 5.7).

Thirty three (97%) of the illegal fishers answered that they had received no education with regards to the importance and benefits of the Tsitsikamma MPA (Figure 5.7).



**Figure 5.7: Illegal fishers knowledge of MLRA fishery regulations, education and number of repeat offenders.**

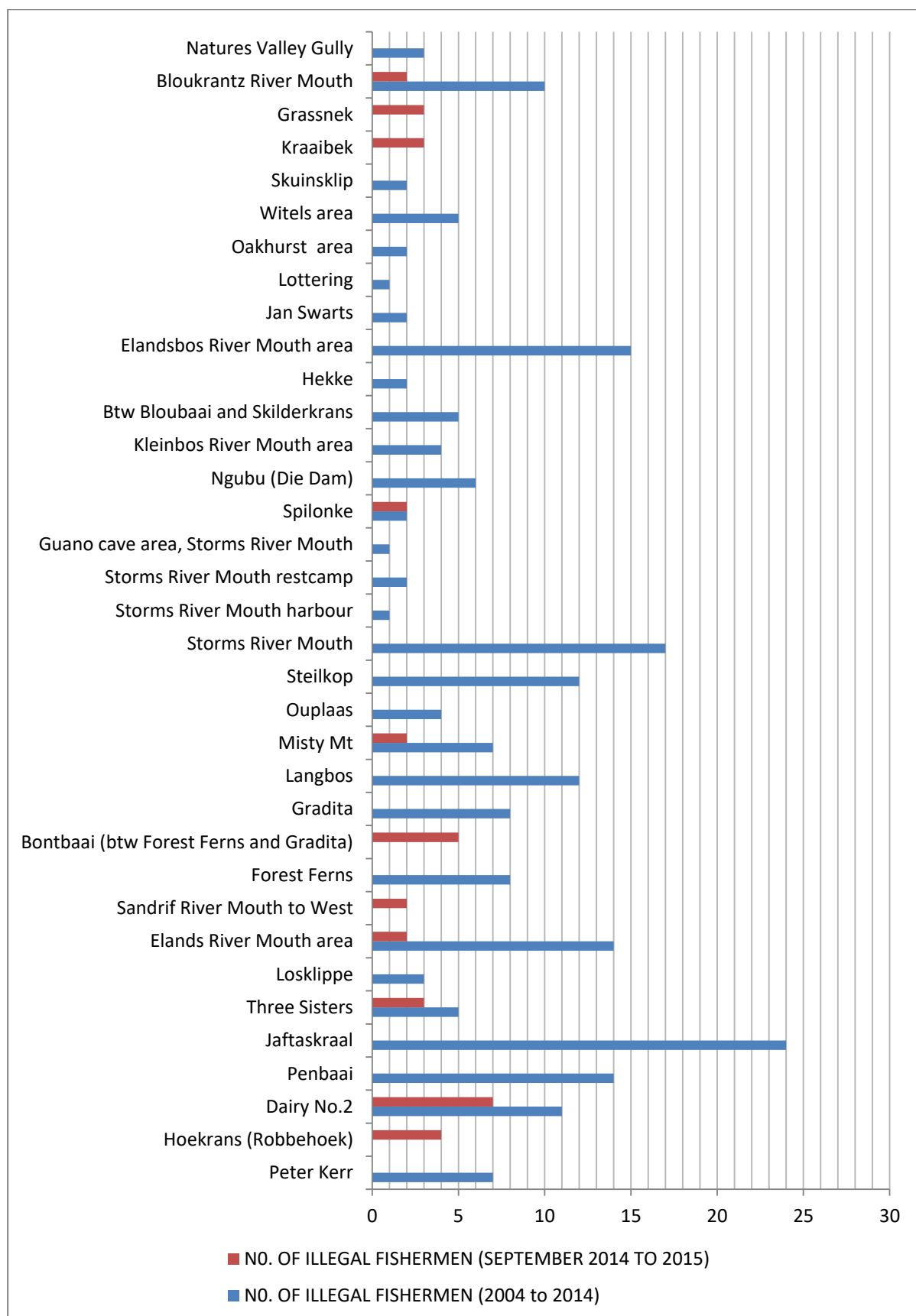
Thirteen (38%) of the illegal fishers apprehended in the 12 month period had been apprehended in the previous 10 years fishing in the Tsitsikamma MPA. One illegal fisher was apprehended twice in the 12 month period (Table 5.2).

**Table: 5.2 Number of illegal fishers who are repeat offenders (percentage of total shown in brackets).**

Repeat offenders caught previously	No. of repeat illegal fishers caught in 2014/2015 period	No. of repeat illegal fishers caught in 2004 to 2014 period
Yes	13 (38%)	47 (22%)
No	21 (62%)	171 (78%)

In the 2004 to August 2014 period most illegal fishing took place at Jaftaskraal (12%), Storms River Mouth (8%), Elandsbos River Mouth area (7%), Penbaai (7%), Elandsriver Mouth area (7%), Langbos and Steilkop at (6%), Dairy no.2 at (5%) and Bloukrantz River Mouth (5%). (Figure 5.8).

In the 12 month intensive study from September 2014 to August 2015 most illegal fishing took place at Dairy no.2 (21%), Hoekrans (Robbehoek) (12%), Three Sisters, Kraaibek and Grassnek at (9%), Elands River mouth area, Sandrif River Mouth to west, Misty Mt, Spilonke and Bloukrantz River Mouth at (6%) each (Figures 5.8 and 5.9).



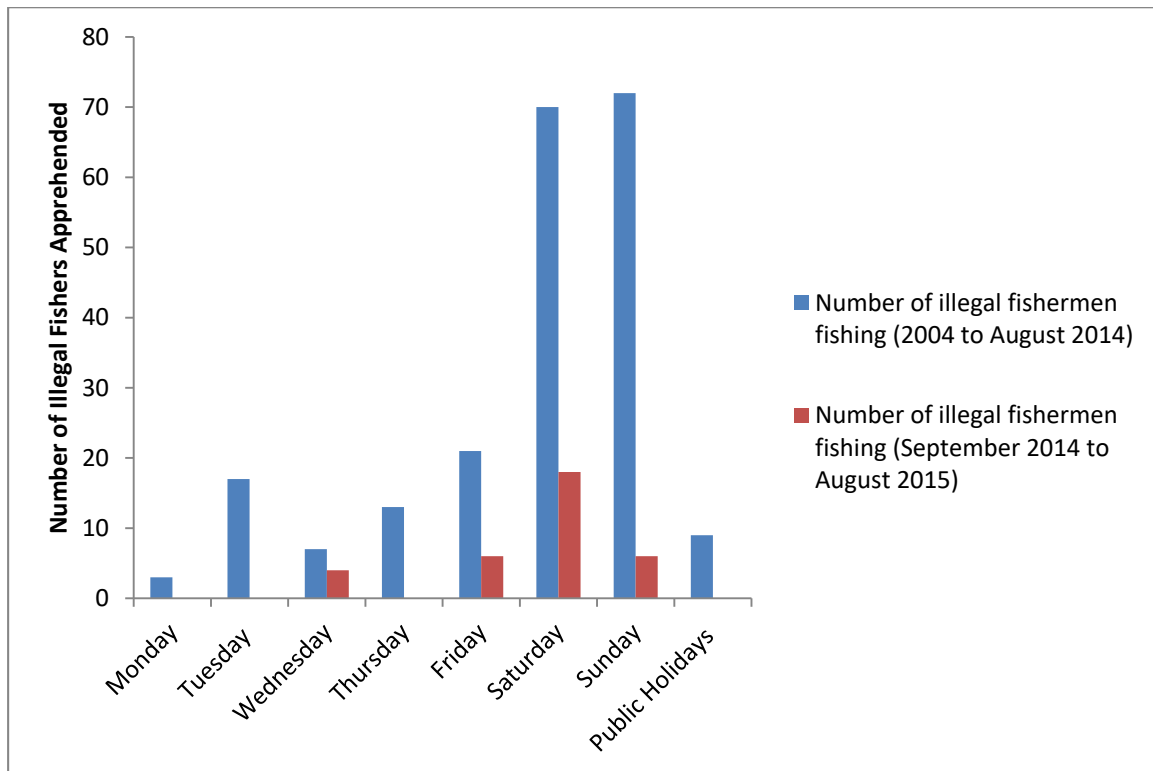
**Figure 5.8: Illegal fishing areas in the Tsitsikamma MPA (in both the 10 year and 12 month period studies).**



**Figure 5.9 Red dots indicating points where illegal fishers were apprehended inside the Tsitsikamma MPA in the 12 month intensive period.**

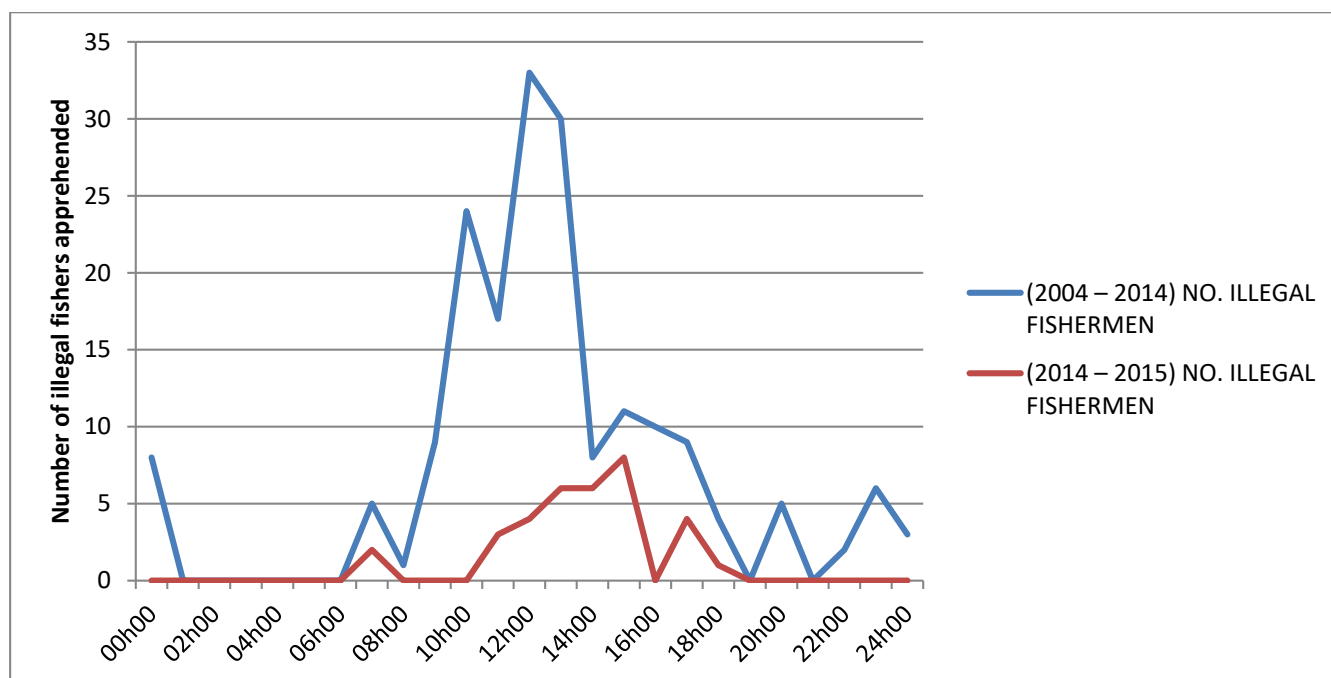
Just over 81% of illegal fishers apprehended in the 2004 to August 2014 period were fishing over the weekend (Friday afternoon to Sunday) and public holidays. In the 12 month intensive study 88% of illegal fishers were apprehended over the weekend (Friday afternoon to Sunday) (Figure 5.10).





**Figure 5.10: Days of the week illegal fishers apprehended.**

In the period 2004 to August 2014, 82% of illegal fishers were apprehended between 09h00 and 17h00. Similarly, In the 12 month intensive study 92% of illegal fishers were apprehended between 11h00 and 17h00 (Figure 5.11).



**Figure 5.11: Time of day illegal fishers apprehended.**

One (3%) illegal fisher indicated that he fishes almost every day in the MPA, one (3%) twice a week and two (6%) once a week. Nine (27%) illegal fishers indicated they poach twice a month, eleven (32%) of illegal fishers answered that they fish once a month in the MPA, nine (27%) once every few months and one (3%) once every a year (Table 5.3).

Most of the illegal fishers (50%) said that they spend half day fishing in the MPA and this includes collecting bait. Almost 15% indicated they spend approximately 8 hours in the Park fishing whilst 15% said they spend a whole day fishing illegally in the Park (Table 5.4).

**Table: 5.3 Regularity of illegal fishers fishing in the MPA**

HOW OFTEN DO YOU FISH IN MPA?	NO OF ILLEGAL FISHERS
Everyday	0
Almost everyday	1 (3%)
Twice a week	1 (3%)
Once a week	2 (6%)

Twice a month	9 (27%)
Once a month	11 (32%)
Once every few months	9 (27%)
Once a year	1 (3%)

**Table 5.4 Time spent fishing in the MPA**

TIME NORMALLY SPENT FISHING IN MPA APPROXIMATELY	NO OF ILLEGAL FISHERS
1hr	none
2hr	none
3hr	1 (3%)
4hr	2 (6%)
5hr	2 (6%)
Half a day	17 (50%)
8hr	5 (15%)
Whole day	5 (15%)
Didn't know	2 (6%)

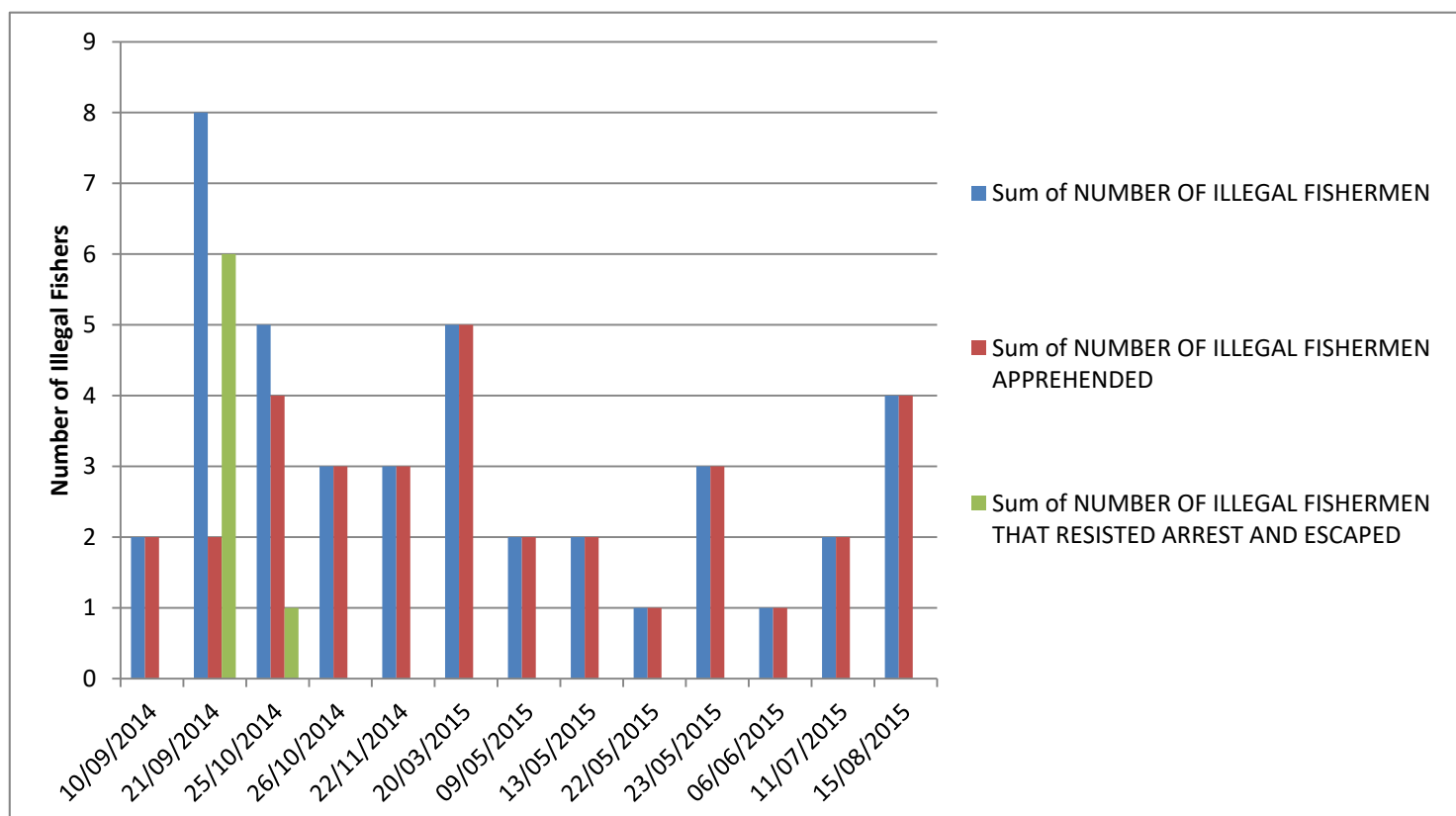
The proximity of apprehended illegal fishers to the most highly utilized access paths is shown in Table 5.4. Twenty one (62%) of illegal fishers were apprehended fishing within 1 km from where they entered the Park. Ten (29%) illegal fishers were caught within 2 km of where they entered and three (9%) within 3 km of where they entered the Park.

**Table 5.5 Access paths used by illegal fishers to get to fishing areas in the Tsitsikamma MPA.**

ACCESS PATH	APPROX DISTANCE FROM PLACE CAUGHT FISHING	NO. OF ILLEGAL FISHERS
Sandrif river mouth	within 1km	2
Dairy No.2	within 1km	6
Hoekrans	within 1km	4
Kraaibek	within 1km	3

Koppies (Robbehoek)	within 2km	3
Forest Ferns	Within 2km	5
Misty Mountain	Within 1km	2
Ngubu Hut	Within 2km	2
Elands River cliff path	Within 1km	1
Grassnek	Within 3km	3
Grootkrans west of Elands River	Within 1km	1
Bloukrants River Mouth	Within 1km	2

Out of a total of 34 illegal fishers apprehended in the 12 month period the largest group of illegal fishers encountered was of 8 persons and the smallest was of a person fishing alone. The average group of illegal fishers was 3 persons. In the 12-month period a total of 12 (29%) of illegal fishers resisted arrest with



6 of these being apprehended and 6 managing to get away. No clear trend over the year can be seen (Figure 5.12).

**Figure 5.12: Number of illegal fishers resisting arrest and those escaped in each group of apprehended in the 12 month study period 2014/2015**

Out of the 34 illegal fishers apprehended in the 12 month period, 8 (24%) had non-environmental criminal records with a range of offences including amongst others; common assault, grievous bodily harm assault, robbery, housebreaking, contravention of the arms and ammunition act and possession and use of dangerous-dependence-producing drugs.

#### **5.4 Discussion:**

During the 12 month intensive study the three communities where most illegal fishers came from were Woodlands, Coldstream and Mandela Park which were the same communities that recorded the most illegal fishers for the 2004 to 2014 period. It is therefore clear that there is an enduring culture of non-compliance with regards to environmental legislation within these specific communities which has persisted over decades. In the 12 month intensive study all the communities from where illegal fishers came from are Tsitsikamma communities whereas in the period 2004 to August 2014 approximately 85% of the illegal fishers came from Tsitsikamma and the rest were from areas outside of Tsitsikamma. This confirms the fact that poaching in the Tsitsikamma MPA is a very local, as opposed to a national or international issue.

With regards to ages of illegal fishers recorded in the period 2004 to August 2014 the majority of illegal fishers were under the age of 47 years which was similar to the 12 month intensive study. Older age groups accounted for a small percentage of illegal fishers. The distance to walk, very steep terrain and challenging fishing conditions could be the reason for only a small percentage of the older age group fishing illegally in the MPA. Many locals who used to fish in the MPA before it was closed to fishing reminisce about days gone by however most if not all those people have passed away or are too old to walk the long distance, steep hills and fish the rugged coastline. A man of twenty years old in 1964 when the MPA was proclaimed would be 71 years old in 2015 and only a very small percentage of illegal fishers over the age of 60 years were

apprehended in the study period. This could indicate that illegal fishing is being passed down from older to younger men in these communities. Jacobs (2019, pers. com) said that particularly in the Storms River and Coldstream communities there were very few younger illegal fishers under the age of thirty years who were interested in fishing. Some of the illegal fishers paths down to the sea in the western sector of the MPA have become overgrown by vegetation due to not being used anymore (Peterson, 2017, pers. com). Law enforcement data seems to confirm this as a relatively low number of apprehensions took place in the western sector of the MPA despite frequent patrols.

The majority of illegal fishers in both the 10yrs data (83%) and the 12 month study (88%) were coloured with black and whites only accounting for relatively small percentages.

In a study by Faasens & Watts (2007), on local community reaction to the “no-take” policy on fishing in the Tsitsikamma MPA, all black respondents disagreed strongly with the local coloured populations feeling that only those whose parents and grandparents fished in the area before it was declared a national park should be allowed to fish in the park. The black respondents were in favour of all people being allowed to fish in the Tsitsikamma MPA.

Coloured respondents regard black and white ethnicities as recent immigrants to Tsitsikamma who have no traditional rights (Faasens & Watts, 2007). No women illegal fishers were apprehended in the MPA besides one foreign national apprehended in the main tourist restcamp in front of her accommodation unit and she was in all likelihood ignorant of the environmental legislation including that the area is a no-take MPA.

There is a big commercial forestry industry in Tsitsikamma which is the reason most of the illegal fishers apprehended in the 10yr period (58%) as well as the 12 month period (67%) were employed in this sector. Only 1% was recorded as unemployed in the 10 year study and none recorded as unemployed in the 12 month study.

The biggest motivation for fishing in the MPA (82%) was recorded as being for sport and recreation. In a study regarding motivations of outdoor anglers Knopf *et al.*, (1973), put forward that anglers were strongly motivated by four main factors; temporary escape, achievement, exploration, and the experience of natural surroundings. The 15% of illegal fishers that said they fished for food were employed people and had expensive fishing gear and tackle as well as cell phones and expensive cool drinks in their possession. It appears that they are under the impression that they will garner more sympathy from law enforcement with regards to lesser fine amounts or penalties if they say they are hungry and are fishing for food. The pensioners apprehended also indicated that they worked on a part time basis. Fedler & Ditton, (1994) found that the motivation of relaxing and getting away from daily routines was very important. Being in a natural environment and being able to experience natural surroundings was found to be from moderate to very high. It was also found that generally anglers wanted to get away from other people during their fishing experiences and that most angling groups placed a relatively low importance on catching fish to eat. A strong motivation for Illegal fishers in Tsitsikamma was also to get away from the daily grind of work and to relax in natural surroundings. In a study by Eliason, (2004) looking at motivations and rationalizations of a 113 poachers apprehended for a variety of illegal hunting and fishing offences in Kentucky, USA, it was found that poaching was not carried out for purposes of obtaining food and that most transgressors were relatively well off financially. The most important motivations were found to be recreational satisfactions, trophies and money and ignorance/forgetfulness/carelessness.

According to Hanekom *et al.*, (1997), it would be ecologically preferable to close the Tsitsikamma MPA and that this would not have a significant impact on the subsistence of local communities. It was found that catch restrictions in terms of minimum sizes and bag limits did not appear to protect shore-angling species and the number of anglers on the South African coastline was increasing annually. As in this study, Hanekom *et al.*, (1997), also found no evidence of subsistence fishers in the Tsitsikamma, as opposed to some studies of other areas of South Africa. Mann, (1994) found that 64% of illegal gill netters in Lake

St Lucia were unemployed and netted for fish mainly for subsistence purposes although surplus fish were sold locally. Illegal seine netters in Lake St Lucia harvested mainly prawns which were sold in areas away from the rural community at high profit. Mann, (1994) further noted that gill and seine netting are not traditional fishing methods. Faasen and Watts, (2007) also mentions certain communities in Tsitsikamma with economic hardships, based on information from the local police, community leaders and various officials. According to Attwood, (2006) from an ecological perspective it would be counterproductive to allow any form of linefishing in the Tsitsikamma MPA and furthermore few people in this area qualify as true subsistence fishers as opposed to the Transkei coastline where there is extreme poverty and a demonstrable history of dependence on marine resources. King, (2005) in a survey of the recreational lineshore fishery between Plettenberg Bay and Grootbank located on the western border of the Tsitsikamma MPA found that only six out of 1 189 anglers interviewed during the study fished for their livelihood and were considered as true subsistence fishers.

Only a very small percentage of illegal fishers in the ten year period were found to be unemployed at the time of being apprehended and none were found to be unemployed in the 12 month study, their main reason for fishing was recreational with modern fishing equipment and tackle being used. Wherever communities, whether low income or high income, border on protected areas there are tensions between the demands for access and resource use versus the needs of resource conservation and management (Brill, 2012). For long-term sustainable use and conservation of marine ecosystems well planned, constructive communication exchanges will need to take place to set the groundwork for the establishment of multiple use MPA's including no-take zones (Agardy *et al.*, 2003).

Every MPA is unique having being designed to meet the specific conservation needs of the place where it is established, covering a wide variety of MPA goals and objectives (Agardy *et al.*, 2003). Protected areas are being recast as methods to bring about income generation and for social planning which compromises



their effectiveness as tools for the conservation of wild biodiversity (Locke *et al.*, 2005).

The absence of alternative fishing sites has increased locals people's wish to fish in the park (Faasen & Watts, 2007). Several of the illegal fishers mentioned that they don't have transport to fish outside the MPA at Nature's Valley or Oubos which is located just outside the MPA on the western and eastern borders respectively. Two of the illegal fishers mentioned that the fish bite better inside the MPA than outside the MPA. According to Peterson, (2017, pers. com) MTO Forestry company, which is the biggest employer in the Tsitsikamma, as per discussion and agreement with the workers labour union provides a vehicle once a month on a weekend to take their staff that want to fish to areas outside the MPA and staff do make use of this opportunity.

Most of the illegal fishers said they do not know any of the MLRA fishery regulations with regards to fish measurements with only one saying he knew the regulations. This cannot however be taken at face value as poachers may perceive it to be in their best interests to claim ignorance believing it could result in a smaller fine or less harsher penalty. Smith (2005), in a study of assessment of Plettenberg Bay nearshore line fisheries found that a high percentage of fishers did not know the regulations (recreational 64%, charter 53%, commercial 42%) and that only 27% of fishers had ever had their catch inspected and that most had only been inspected on one occasion.

Besides illegal entry and fishing illegally in the MPA the illegal fishers show ignorance and lack of care regarding the other fishery regulations. This was shown in the number of other transgressions which occurred, as discussed in the previous chapter. Smith, (2005) states that with regards to the high degree of non-compliance of fishers in Plettenberg Bay the following needs to be addressed; the illegal selling of fish by recreational users, the keeping of undersized fish, specifically geelbek and kob, commercial operators with hake handline permits illegally targeting traditional linefish and sharks, using mammal blood to chum for sharks, recreational fishers selling hake and shark under commercial vessel names and fishing illegally inside the Tsitsikamma MPA. According to Attwood & Farquhar, (1999) the attitude of anglers themselves is

a problem in itself as a high percentage of anglers admit to transgressing certain regulations and an even larger percentage do not adequately know the regulations. KwaZulu Natal had the highest compliance inspection rate by officials which according to Brouwer *et al.*, (1997) is the reason why anglers in KwaZulu Natal had the best knowledge of the regulations and fewer anglers admitted disobeying regulations compared to the other provinces. Studies have shown that when law enforcement do regular patrols and compliance inspections it not only educates resources users on applicable environmental legislation but brings down the amount of poaching incidents which is the reason conservation authorities need to put a lot of focus and effort into this (Brouwer *et al.*, 1997).

Only one of the illegal fishers apprehended in the 12 month study said he had received any education with regards to the importance and benefits of the Tsitsikamma MPA. According to Faasen & Watts, (2007) due to the lack of communication by the park and the poor relationship between the park and local people in Tsitsikamma there is a lack appreciation on the usefulness of the park. This shows in the amount of illegal fishing taking place and lack of respect and understanding of the fishery regulations. At the time of writing there was a People and Conservation department at the Tsitsikamma section of the GRNP whose main purpose was to increase awareness and knowledge about conservation and the benefits and importance of the Tsitsikamma National Park and MPA. Limited success has been obtained and a new approach in environmental education and interpretation is needed to alter this negative mind-set as illegal fishing is one of the biggest and most long standing threats facing the Park.

An effort also needs to be made to educate school children in the communities where the illegal fishers come from with well thought out and sustained programmes as they could have a positive influence on their family and friends and will be the community leaders of the future. Wood, (2004) found that most poachers in MPA's in the Seychelles had a low level of education. Smith, (2005) in addressing the issue of ignorance and non-compliance amongst fishers in the Plettenberg Bay area stated that anglers should be educated on specific fishery

regulations, why the regulations were drawn up and the purpose the regulations have in protecting fish stocks.

A high percentage (38%) of illegal fishers apprehended in the 12 month period had been apprehended for illegal fishing previously in the Tsitsikamma MPA and one of the illegal fishers was apprehended twice in the 12 month period indicating that being arrested is not a strong deterrent. Penalties for illegal fishing will need to be made harsher in order to act as a deterrent against poaching. Twenty one percent of illegal fishers in the 10 year period were repeat offenders and it was suspected that the percentage could be higher. According to Carl Nortier, (2015, pers. com) in the Table Mountain National Park MPA approximately 50% of abalone poachers apprehended are repeat offenders.

The fishing areas where the most amount of illegal fishers were apprehended; Jaftaskraal in the 10 year study and Dairy No. 2 in the 12 month study are closest to the community of Woodlands where the highest percentage of illegal fishers come from. Jaftaskraal is a sheltered cove where it is also possible to fish at night and Dairy No.2 is a wide deep gully open to the sea and only suitable for day time fishing. The river mouths of; Elands River, Storms River, Elandsbos River and Bloukrantz River Mouth were also popular illegal fishing areas in the 10 year period as they could be fished at night. Langbos and Steilkop were also popular fishing areas in the 10yr period and these are the closest fishing areas from two large communities in Tsitsikamma, Thornham and Mandela Park.

Most of the illegal fishers in both the 10yr and 12 month period were apprehended on weekends or public holidays which relates to the illegal fishers being employed and only getting time off to fish during these periods. It also shows that if conditions are good for fishing in the week then some illegal fishers will go fish in late afternoon straight after they get off work or at night in the river mouths. In a study on illegal fishing in the Tsitsikamma MPA over an 8<sup>th</sup> month period by aerial surveys and collecting evidence off rocks at known illegal fishing places Murray, (2006) found that most anglers observed in the MPA during aerial surveys were seen on public holidays and weekends suggesting that it is a recreational rather than subsistence activity. Similarly most evidence of illegal fishing was found over weekend periods than weekdays. During aerial

surveys conducted over the Tsitsikamma MPA between December 2008 and November 2009 a total of 32 illegal fishers were observed and the majority of the illegal fishers were observed during weekends or public holidays (Smith *et al.*, 2015).

In both the ten year and 12 month period most illegal fishers were apprehended between 09h00 and 17h00. The illegal fishers prefer day time fishing as they can collect bait as well as see where they are casting. The rough nature of the Tsitsikamma coastline also makes it unsafe to fish at night from the rocks. The small percentage of illegal fishers apprehended at night come into the MPA with bait and fish in protected areas, mainly river mouths and the cove at Jaftaskraal.

Once a month was the most frequent time illegal fishers fished in the MPA with a lesser number saying they fish either more regularly or less regularly. One illegal fisher said that he fished almost every day and this particular illegal fisher has his own vehicle to access different areas and likes to fish in the river mouths where it is protected from the elements.

Most of the illegal fishers said that they spend from half a day to a day fishing in the MPA and this time includes collecting bait in the rocks. When managers are planning law enforcement patrols this needs to be taken into account as Rangers will have a far higher success rate in apprehending illegal fishers by working during the low tide and incoming tide period when the intertidal area is exposed for bait collecting

The majority of the illegal fishers were apprehended fishing within 1km from where they entered the park which could possibly indicate that they plan carefully beforehand which fishing area they will use.

The Tsitsikamma MPA located within the Garden Route provides one of the few true sanctuaries as the Garden Route itself is largely over-utilised and over-developed and it would be difficult to move MPA's as it would be difficult to move the terrestrial part of MPA's (Attwood, 2006).

A high percentage of illegal fishers resisted arrest and some managed to get away. SANParks Field Rangers are often outnumbered by illegal fishers which makes arrests difficult and puts Field Rangers safety in danger.

There is a high rate of criminality amongst illegal fishers many with criminal records indicating the need for Rangers need to be trained and adequately equipped to deal with them.

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## CHAPTER 6: CONCLUSIONS/ RECOMMENDATIONS

The catching of undersize fish, exceeding the bag limits of and targeting species with collapsed populations by illegal fishers in the Tsitsikamma Marine Protected Area is negatively affecting the effectiveness and purposes of the MPA. The total amount of fish estimated to be caught in the MPA by illegal fishermen per year is high with resultant negative consequences to fishery management. The associated illegal collection of bait species in the MPA and environmentally damaging harvesting methods is further damaging the integrity of the MPA. Illegal fishers fishing in the Tsitsikamma MPA are experienced anglers using good quality fishing equipment.

Illegal fishers transgress a range of environmental laws besides fishing in the MPA including; illegal entry, trespassing, catching undersize fish, catching fish species over the bag limit, collecting bait species including over bag limits and undersize, using illegal methods to collect bait species as well as resisting arrest and non-co-operative behaviour towards SANParks Rangers.

It took a large amount of time to apprehend illegal fishers however this time was drastically reduced when acting on information received from informers. A dedicated law enforcement team needs to be created that focuses only on environmental and fishery compliance and not given other non-enforcement related tasks. This will improve the apprehension success rate significantly. Although most of the illegal fishers apprehended in the 12 month period were found guilty in Court and sentenced there were some cases that were withdrawn by the Public Prosecutor and more effort needs to be put in to educate SAPS and DOJ on the importance of environmental legislation in order to get more support and prevent poor communication.

Most illegal fishers take into account wind direction and speed which also effects sea temperature before coming to fish illegally in the MPA. Night fishing is mostly at full moon and some at half-moon with none recorded with no moon. Most illegal fishers arrive at the MPA with low tide and first collect bait in the intertidal area and then fish with the incoming tide. These environmental factors must be taken into account when planning law enforcement patrols.

Managers need to study sea and weather conditions and predictions when planning law enforcement observations and patrols. Patrols and observations need to coincide with the low tide to incoming tide period. During periods of strong winds patrols should not be carried out and in terms of wind direction northerly and easterly winds are favoured by illegal fishers. With cold sea temperatures of below 15 degrees brought on by easterly winds observations and patrols need to be concentrated at river mouths and sheltered coves. Night time fishing is mostly concentrated in river mouths and sheltered coves with known access paths under full to half-moon conditions and there is often an increase in night time fishing when easterly winds have caused a significant drop in sea temperatures and fish are aggregating in the river mouths and coves.

Social characteristics recorded in the study showed that most illegal fishers are males from the coloured population group and the majority of illegal fishers fall within the age group from late teens to late thirties with the steep terrain and rugged coastline discouraging older persons. Illegal fishers apprehended in the Tsitsikamma MPA are employed people and it is clear that their biggest motivation for fishing is for sport and recreation and not for food. Most apprehensions took place on weekends and public holidays when illegal fishers were off from work.

The majority of the illegal fishers are ignorant towards fishery regulations which shows in the high rate of non-compliance to a range of regulations. There is also a concerning lack of awareness of the importance and role of the Tsitsikamma MPA amongst illegal fishers.

Generally there is a high degree of aggressiveness amongst illegal fishers towards SANParks Rangers which results in a lack of co-operation and resisting arrest.

A team of field rangers led by a competent, passionate and motivated Section Ranger needs to be created whose job description is focused on environmental and fishery compliance and not any other ad hoc tasks. This will increase the skill level of rangers and effectiveness of law enforcement in the MPA with resultant positive results and a higher standard of conservation.

Challenges were often experienced by SANParks law enforcement officials with certain SAPS officials appearing ignorant of environmental crimes and not regarding the crimes as important leading to cases being withdrawn. Constant communication with SAPS and DOJ officials is needed to ensure no cases are withdrawn as well as to create a better understanding by them of the importance of environmental legislation. Environmental legislation training should be made a requirement for prosecuting or adjudicating a fisheries crime.

Environmental education has been lacking and a well-planned and concerted education programme needs to be actioned with the aim of explaining the importance and benefits of the Tsitsikamma MPA to school children, illegal fishers and other Park user groups including SANParks staff.

The main reason for illegal fishing in the Tsitsikamma MPA is not for food but for recreation. SANParks needs to consider providing alternatives for illegal fishers to satisfy their recreational needs for example by expanding on the once a month initiative of local employers providing transport to their employees to take them to unprotected fishing areas outside the Tsitsikamma MPA on weekends. This would relieve pressure on the MPA and encourage goodwill amongst communities neighbouring the Park.

This study used historical law enforcement data as well as data obtained directly from illegal fishers in the field to give an accurate assessment of the state of illegal fishing in the Tsitsikamma MPA. It suggests ways for park management to decrease and limit the current rate of illegal fishing in the Tsitsikamma MPA.



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