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People, profits, and politics in the Eastern Cape chokka squid fishery: the socio-economics of an unstable resource

Author:

Frances Tessa Paterson

(PTRFRA010)

Supervisor:

A/Prof Anthony Leiman

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Student number	**PTRFRA010**
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Abstract

This study examines socio-economic issues confronting the chokka squid fishery in South Africa's Eastern Cape, particularly in the towns of St Francis Bay, Humansdorp and Jeffreys Bay. It examines the implications of two key issues challenging the industry: the volatility of chokka squid catches, and the government's recent proposal that, to further transformation, 25% of the sector's commercial rights should be reallocated to small-scale fishing co-operatives. It is argued that the socio-economic effects of catch volatility flow from the institutional structure of the fishery and the labour contracts in it, specifically the link between fishers' earnings and their catches. These are further linked to the local economy to which the fishery and its workers are closely tied. This thesis examines the ability of small-scale fishing co-operatives to participate efficiently in the sector and the potential impact of the proposed rights reallocation on the economic viability of existing firms. The primary data used was collected through personal communications with key sector participants. Possible solutions to the two issues examined are proposed. Alternative approaches to transformation and empowerment within the chokka sector are suggested.

TABLE OF CONTENTS

Plagiarism Declaration i

Acknowledgements ii

Abstract iii

Table of Figures vi

List of Tables vi

List of Abbreviations vii

1 Introduction 1

1.1 Background 1

1.2 Motivation 4

1.3 Focus area of the study 5

1.4 Ethics 6

2 Literature Review 6

2.1 The chokka squid sector 6

2.1.1 Biology of the chokka squid 6

2.1.2 Fisheries management and legislation in South Africa 7

2.2 Managing volatility in fisheries 9

2.2.1 The Gordon-Schaefer model 9

2.2.2 Total Allowable Effort 10

2.3 Property rights 11

3 Methodology 12

3.1 Data collection 13

3.1.1 Semi-structures interviews and field observations 13

3.2 Data analysis 14

3.3 Limitations in the data collection process 14

4 Results 14

4.1 The impact of the volatile nature of chokka squid 15
4.1.1 The impact of volatility on earnings and the local economy 16
4.2 Property rights in the chokka sector 20
5 Discussion 24
5.1 Reducing the impact of volatile stock levels 24
5.2 Identifying potential solutions to the rights reallocation proposal 26
6 Conclusion 28
Reference List 28
Appendix 33

Table of Figures

Figure 1: Annual chokka catch levels 2014-2019 2
Figure 2: Focus area of the study 5
Figure 3: Average monthly chokka harvests, 2014-2019 8
Figure 4: Humansdorp business categories 19

List of Tables

Table 1: South Africa's total fishery industry sales 2018 1
Table 2: Beach price for chokka squid (February 2021) 15
Table 3: Seasonal fluctuations in fishermen's' incomes 18
Table 4: Humansdorp and St Francis Bay employment statistics 22

List of Abbreviations

CPUE	Catch Per Unit Effort
DEAT	Department of Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries
FRAP	Fishing Rights Allocation Process
HACCP	Hazard Analysis and Critical Control Points
ITQ	Individual Transferable Quota
MLRA	Marine Living Resources Act
SSFP	Small Scale Fisheries Policy
TAC	Total Allowable Catch
TAE	Total Allowable Effort

1 Introduction

The local economy of the Humansdorp area in South Africa's Eastern Cape Province relies heavily on three sectors – light agriculture, tourism, and fishing. The fishing sector in this area is particularly risky, being based upon the harvest on a single species, chokka squid (*Loligo reynaudii*) whose catches are known for their volatility. This risk was accentuated when government recently proposed reallocating commercial rights within the fishery, increasing concerns regarding the fishery's future performance and viability. This thesis explores the impacts of volatile stock levels and the pending rights reallocation, both on the fishery and on the local economy to which it is linked.

1.1 Background

South Africa's fishing industry is relatively small, contributing around R6 billion to the economy annually and employing more than 43 000 people (Statistics South Africa, 2018; Sink *et al.*, 2019). Despite its small size, it is locally important along the western and southern coasts. Hake and small pelagic fish dominate the industry, collectively contributing over 50% of total industry sales (Statistics South Africa, 2018). However, the focus of this study is the squid sector.

Table 1: *South Africa's total fishery industry sales 2018*

Fishery	**2018**	
	R'000	**% contribution**
Anchovy	1 651 001	28,3
Hake	1 225 211	21,0
Kingklip	77 296	1,3
Lobster	573 267	9,8
Pilchard/sardine	301 989	5,2
Squid	1 054 878	18,1
Tuna	127 491	2,2
Other	824 649	14,1
Total	**5 835 782**	**100,0**

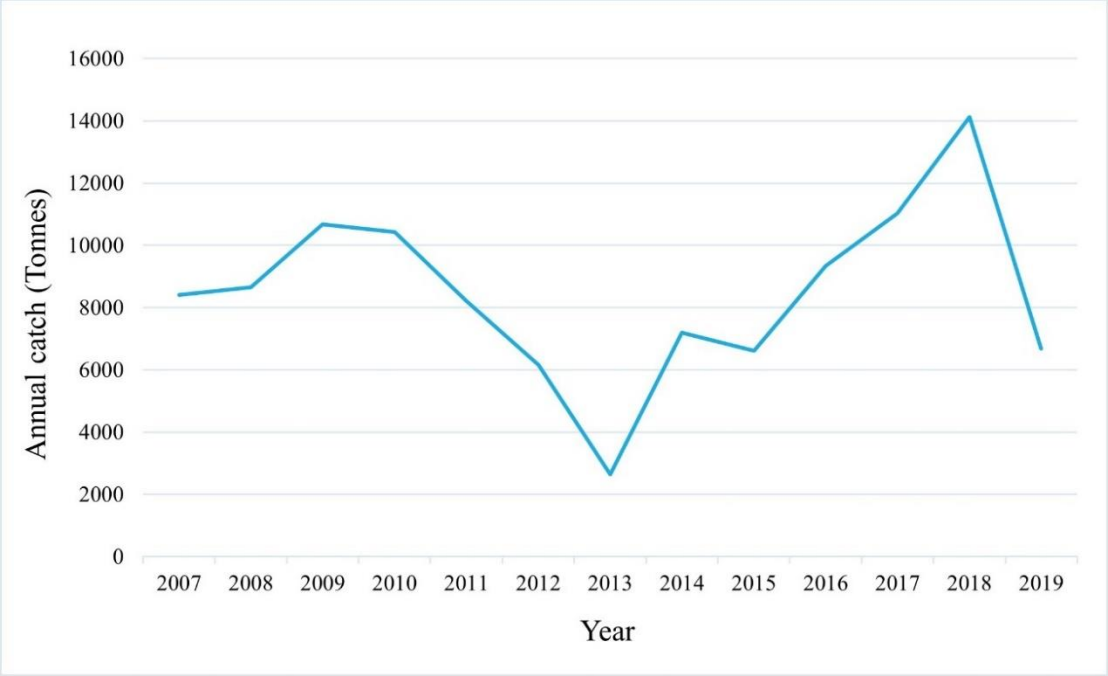
Source: Statistics South Africa (2018)

Despite being a relatively new component in South Africa's commercial fisheries, the squid sector now contributes 18%, more than R1 billion, to total fishing industry sales, see Table 1 above (Statistics South Africa, 2018). It has a strong export focus, making it a source of foreign income. It is estimated that more than 98% of South African chokka is exported, largely to the Euro zone, particularly Spain and Italy (Cochrane, Oliver and Sauer, 2014).

Although chokka squid are found all along the South African coastline, the fishery is largely located in the inshore region of the country's south-east coast, where chokka aggregate to breed. It operates from two centres: one in Port Elizabeth and the other in St Francis Bay. This study focuses on the chokka fishery in St Francis Bay.

Changes in the squid biomass are difficult to predict. They have a relatively short life span of 18 to 24 months and recruitment is unstable, being highly sensitive to natural environmental factors (Augustyn, Lipiński and Sauer, 1992). As a result, the resource cannot be effectively managed by controlling the annual total allowable catch (TAC) – rather, it is managed by restricting total allowable effort (TAE) (DEFF, 2020). There are two key effort restrictions currently in use: limitations to man days at sea, and seasonal closures. Despite these management policies, chokka catch levels vary greatly over time, both within and between seasons, see Figure 1 below.

Figure 1: *Annual chokka catch levels 2014-2019*



Source: DEFF catch data (2020)

The chokka sector in the Eastern Cape began in the mid-1980s. Prior to this, South African chokka squid catches were largely trawled bycatch harvested by foreign fleets. The sector has since evolved into an international commercial fishery. Its evolution was driven largely by demand from Italy and Spain for high quality, freshly frozen South African squid. The fishery has progressed from using small, decked boats for day trips, to using specialized chokka vessels that can remain at sea for up to 25 days (G. Lightfoot, pers.comm, September 2020). These vessels are equipped with on-board flash freezers and can support a crew of up to 30 men. Since 2001, the number of commercial companies has fallen from 128 enterprises with 138 dedicated squid vessels, to 79 commercial companies with 123 vessels. Despite the takeover of some firms by others, the industry remains comparatively unconcentrated, and the five largest firms only own 20% of the sector's operating vessels (SASMIA, 2019).

Two institutional features of the fishery are central to this study. The first of these is that fishers' incomes are directly linked to their personal catches. Fishermen are paid for their personal catches, currently earning a flat rate of R12 per kilogram of chokka harvested, though this does vary slightly. Catches fluctuate seasonally, with variations in stocks and water conditions. They are also affected by the sector's management policy, which closes the fishery (and therefore fishers' incomes) for four months each year. The resulting income fluctuation affects the households of chokka fishers directly, and also permeates through to the local economy.

The second is that the Department of Environment, Forestry and Fisheries (DEFF) allocates all long-term rights in the fishery. These rights are ostensibly non-tradable, and the coming (2021) round of allocations will be for 15 years. In March 2019, the DEFF proposed that 25% of the sector's TAE would be allocated to small-scale community co-operatives. DEFF officials argued that reallocating commercial fishing rights to small-scale fishers in the traditional linefish, squid and abalone fishing sectors would "transform" the country's fishing industry (DEFF, 2020b). The policy is proving controversial, concerns being raised over its consequences for employment and export earnings (A. Smith, pers.comm, October 2020).

In an area such as Humansdorp, where the local economy has a narrow industrial base, any factors that affects the performance of one of the key industries affects more than just its firms and workers, it affects everyone linked to them. This is particularly the case of the chokka sector, where landings drive earnings. Any factors that impact its performance (such as catch collapses, reallocation of rights, or changes in prices) affect not only the profits of those who have invested in vessels, but also the livelihoods of workers and the economic viability of

linked enterprises in the area. Current debates surrounding rights reallocations in the sector make the analysis of factors driving the fishery's performance particularly relevant.

1.2 Motivation

The chokka fishery is complex. The primary problem facing the fishery is the volatility of the stock. The chokka sector is based upon the harvest of a single, short-lived, and high value resource. Entry into the fishery requires significant capital expenditure and unstable harvests make it a high-risk investment. These risks are compounded by unstable exchange rates and prices. Some firms spread these risks by operating in other fisheries, others by vertically integrating their operations along the export value chain. Companies attribute more than 60% of vessel operating costs to labour (Mthembu, 2019) and they further spread risks by linking wage payments to fishers' catches. As a result, fishers experience income uncertainty throughout the year. By determining fishermen's incomes and therefore household expenditures, catch fluctuations also impact local businesses and the local economy as a whole.

A second concern currently facing the chokka fishery is the validity and reliability of property rights. As with all marine species, a squid is not owned until it has been harvested. The predominant property right in fisheries is the permit that allows a vessel owner to harvest fish. In South Africa, fishing rights are not officially tradable (they are not classified as individual transferable quotas, or ITQs), but they are inherently valuable.

As the Gordon-Schaefer model shows, open access leads to the dissipation of rents (Gordon, 1954). Moreover, if harvest costs are independent of abundance, a resource can be fished to commercial extinction (Clark, 2006). An example of this is a fish species, such as salmon, that migrate along a fixed route. An entire age cohort can be harvested at a fixed, low costs as they migrate along this route to spawn (Kulmala, Laukkanen and Michielsens, 2008). Fishing into chokka breeding aggregations keeps costs low but poses similar risks. The only way to ensure resource sustainability in such a fishery is to limit access and to guarantee a period for secure breeding.

Chokka are a high-value species, regulated by restricting access and by allocating long-term commercial rights and annual harvesting permits (Department of Environmental Affairs and Tourism (DEAT), 2005). Current proposals to reallocate a proportion of commercial rights to small-scale co-operatives highlight the need to examine the implications of rights allocations in the chokka sector. The key question that arises is whether rights can be given to community

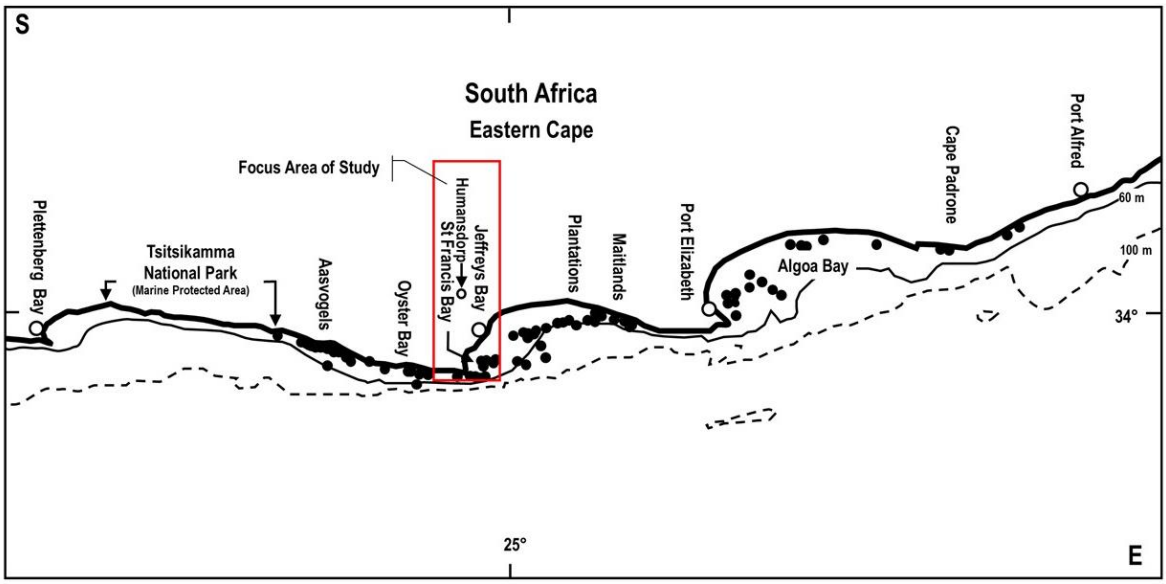
co-operatives without negatively impacting the viability of companies; reducing foreign exchange inflows; threatening the incomes of current workers; and creating unrealisable expectations amongst community members.

These problems can be condensed into two themes – volatility, and rights. This thesis examines the causes of these problems and their impact on the performance of the fishery, its employees, and the health of the local economy in which it operates. It examines current industry debates in the light of recent scientific research, industry insights and existing literature. It also evaluates potential solutions that could mitigate these issues.

1.3 Focus area of the study

The study is located in the greater Humansdorp area in the Kouga municipality of South Africa's Eastern Cape Province. The chokka squid sector dominates the province's commercial fisheries sector (Hara *et al.*, 2008) and directly employs approximately 3 000 people (WWF-SA, 2016). The fishery has two major centres: one in Port Elizabeth and the other in St Francis Bay and the nearby centres of Humansdorp and Jeffreys Bay. This study focuses on the chokka fishery operating in the latter area. Figure 2 indicates the area of this study and the coastline along which chokka squid are predominantly found.

Figure 2: *Focus area of the study*



Note: the red demarcation shows the focus area of the study, and the black dots indicate the main breeding aggregations and harvest grounds of chokka.

Source: Cochrane, Oliver & Sauer (2014)

The population of St Francis Bay and Humansdorp is approximately 25 000, most of whom are isiXhosa and Afrikaans speaking (Statistics South Africa, 2019a, 2019b). Most household have monthly incomes that range between R9 000 and R38 000 (Statistics South Africa, 2019a, 2019b). There are three main economic activities in the area – light agriculture, tourism, and fishing. Tourism drives the economy of Jeffreys Bay, one of the world's top surf destinations. St Francis Bay is also a popular local tourism destination and is home to many commercial chokka fishing companies. Although Humansdorp is a centre of light industry and dairy farming, a large portion of the town's inhabitants are fishers, and many of its businesses have linkages to the chokka sector.

1.4 Ethics

This study has received ethical clearance by the University of Cape Town's Commerce Faculty Ethics Research Committee, to which a research proposal and interview questionnaire was sent. A copy of the ethical approval letter and the questionnaire is attached in the appendix.

2 Literature Review

2.1 The chokka squid sector

Since many of the economic problems in the chokka sector stem from the volatility of the squid harvest, it is important that the factors driving this be clearly understood. This section discusses these in detail.

2.1.1 Biology of the chokka squid

There is a large body of literature related to the chokka squid in South Africa and its environment (Roberts and Sauer, 1994; Cochrane, Oliver and Sauer, 2014b), life cycle (Sauer, 1995; Lipinski *et al.*, 2016) and stock levels (Lipinski and Soule, 2007). In short, chokka squid, or *Loligo reynaudii*, are a cephalopod marine animal abundant in the warmer, well-oxygenated waters of the St Francis Bay coastline in the Eastern Cape. Chokka squid have a relatively short life span of approximately 18 months. The breeding habits and stock levels are highly dependent on and sensitive to natural environmental factors such as seawater temperature, upwelling and storms (Roberts and Sauer, 1994). Other environmental factors such as ocean salinity, thermoclines and weather patterns such as El Niño or La Nina also influence chokka breeding habits (G. Lightfoot, pers.comm, September 2020). Although chokka spawn

throughout the year, most spawning activity is concentrated in the spring and early summer, in the warm inshore waters of the Eastern Cape coastline (Roberts and Sauer, 1994). Chokka form spawning aggregations, laying mats of fertilized eggs along the seabed. Fishers target these spawning aggregations, using large lights to attract and harvest chokka at night. During this period, catch per unit effort (CPUE) is at its highest, and harvests are at their greatest, declining rapidly throughout the rest of the year (Roberts and Sauer, 1994; Sauer, 1995). The sector's original closed season was accordingly set for a month in the early summer. Spawning is not restricted to early summer, however, and an additional three-month autumn closure has been in place since 2014 (DEFF, 2020).

The short life span and sensitivity of stock levels to environmental factors means that squid catches fluctuate considerably across seasons. Catch levels can vary between 14 000 tons in a good season and 2 000 tons in a poor season (DEFF, 2020). Chokka are harvested using hand-lined jigs, a non-invasive and environmentally friendly method. Jigging is labour-intensive, has little impact on the environment and almost no bycatch (SASSI, 2020). Due to this harvest method, the commitment to closed seasons by the DEFF and the industry, and their continuing relative abundance, chokka squid are classified by SASSI as a sustainable marine resource (SASSI, 2020). The fishery is also busy with a Fisheries Improvement Project as a precursor to potentially applying for MSC certification in the future (Marine Stewardship Council, 2020).

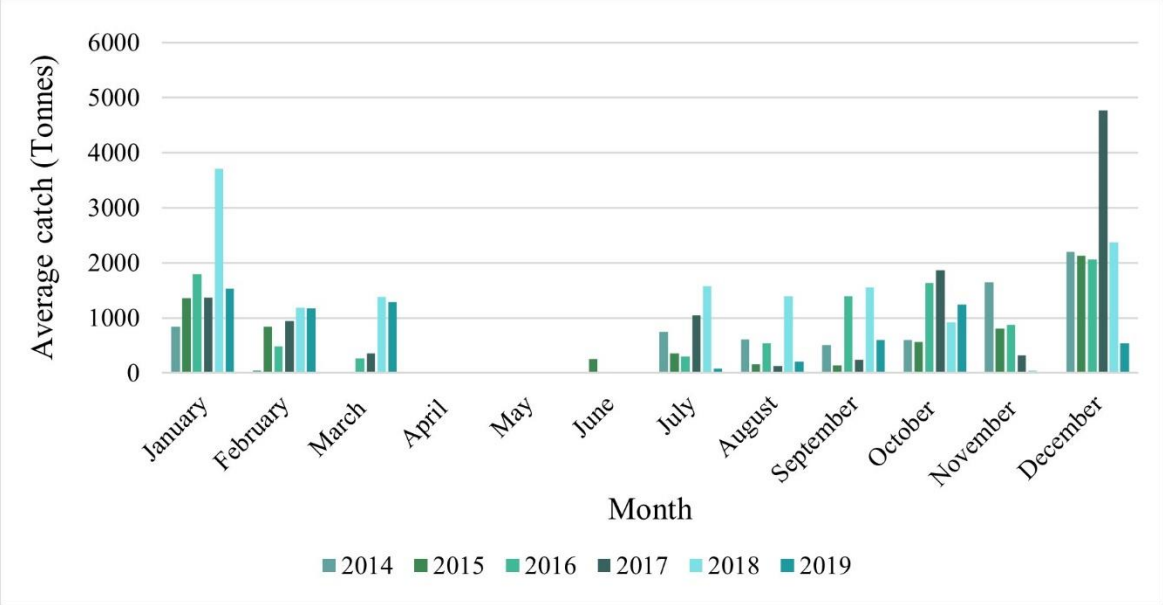
2.1.2 Fisheries management and legislation in South Africa

South Africa's marine fisheries are governed by the Marine Living Resources Act (MLRA) No. 18 of 1998 (South African Government, 1998). The MLRA is a national framework identifying, amongst others, regulatory forums; interest groups; determining total catch levels; allocation of rights for both local and commercial fishing; and vessel requirements (South African Government, 1998). Specific regulatory frameworks exist for individual sectors within the country's fisheries industry.

In 2005, the Department of Environmental Affairs and Tourism (now DEFF) issued a policy that outlined the specific requirements for the chokka squid sector, including the number of commercial rights-holders, permits, fishing seasons and vessel requirements (Department of Environmental Affairs and Tourism (DEAT), 2005). The 2005 policy document stipulated that commercial rights were to be allocated to no more than 128 commercial rights holders, with a maximum of 2 400 individual crew permits and 145 vessels. Currently, there are 79 commercial rights holders operating in the chokka sector, with 2 443 permit holders, or crew members,

working on 123 vessels (SASMIA, 2020). Control is effected by restricting TAE, which places regulations on the number of fishermen, or individual permit holders, operating in the sector, as well as the enforcement of closed seasons. There are currently two closed seasons, one three-month period from April to June, and a one-month period from mid-October to mid-November (DEFF, 2020). The annual season in the chokka sector runs from July to March, with the largest volume of chokka being harvested during December. The variability of catches can be seen in Figure 3 below. Note the closure from April to June, and that catches in October and November include periods of closure.

Figure 3: *Average monthly chokka harvests, 2014-2019*



Source: Author's own compiled using data obtained from DEFF (2020)

Within the context of South African fisheries management, the chokka sector provides several unique regulatory challenges that do not arise in other fisheries sectors. As the sector expanded in the mid-1980s, capital expenditure on equipment and vessels increased and the employment opportunities and foreign capital gained from export highlighted the importance of regulating the sector and ensuring its continued sustainability. The unique and complex characteristics of the species have made managing and regulating the sector more complex than other fisheries sectors. Augustyn *et al.*, (1992) highlight three difficulties in the sector. Firstly, the life cycle and population age structures of the chokka squid were not fully understood (Augustyn, Lipiński and Sauer, 1992). Secondly, the sensitivity of chokka breeding and stock levels to

natural environmental factors make stock predictions difficult (Augustyn *et al.*, 1992). Thirdly, Augustyn *et al.*, (1992) argue that the short life span of chokka make it difficult to implement or adjust long-term management policies.

Despite these challenges, the application of effort restrictions and the management policies have preserved the resource, albeit vulnerable to significant fluctuations. The next section discusses these effort restrictions and management policies applied in the South African squid sector.

2.2 Managing volatility in fisheries

In order to manage fisheries effectively, policy planners and scientists have developed several useful tools, such as bioeconomic models, that forecast both the economic viability and biomass of fisheries. However, bioeconomic models, particularly surplus production models, are difficult to apply to unpredictable, short-lived species such as the chokka squid. The challenges highlighted by Augustyn *et al.*, (1992) in the previous section indicate the difficulties of effectively managing the volatile chokka squid sector. Despite this, some of the general lessons of the Gordon-Schaefer model are informative for policy purposes.

2.2.1 The Gordon-Schaefer model

The Gordon-Schaefer model is a well-known bioeconomic fisheries model that is based on harvest prices, the cost of effort, and stock biomass. It combines two models, both developed in the mid-1950s – the Gordon model and the Schaefer model. It is widely used in modelling fisheries management, as it is a simple model that effectively predicts the outcomes in many fisheries.

From a naïve policy maker's perspective, the appeal of the Schaefer model (Schaefer 1954), lies in its ability focus on the maximum sustainable yield of a specific fishery, a notion that appeal intuitively, despite its limitations. One of the basic assumptions of the Schaefer model is full information regarding the biomass of the fish species (Garcia, Sparre and Csirke, 1989). However, the unpredictability of the chokka stock levels and a lack of understanding regarding the biomass of the species (see Augustyn *et al.*, 1992) and the seasonal oscillations of chokka squid, mean that Schaefer model estimates may be inaccurate management tools. Furthermore, there are simply too many exogenous shocks that affect the biomass of chokka squid, many of them unpredictable, for accurate predictions regarding effort levels or yield to be gained from the Schaefer model.

The Gordon model highlights the relationship between a renewable fish species and its harvesting method. The assumptions of the Gordon model reflect the characteristics of demersal fish such as cod, but can also be applied to fish species that migrate over large distances (Gordon, 1954). The main result of the Gordon model is that in an unregulated, open access fishery, effort will increase until rents are eliminated and overfishing threatens the existence of the fishery (Clark, 2006). Despite the Gordon model being designed to predict outcomes for stable, long-lived fish species, its main result still applies to the South African chokka squid fishery. While Gordon (1954) emphasised the importance of reducing effort in order to prevent overexploitation, no detailed potential solutions are provided. Clark (2006) proposed two limits on effort – the implementation of closed seasons, and the granting of exclusive fishing rights by government. These are precisely what the South African squid fishery has adopted to prevent overexploitation.

While the Gordon-Schaefer model as a whole can be applied in the modelling and prediction of many fisheries, its applicability for short-lived and unpredictable species such as chokka squid is less successful. Despite this, there is still an important result of the model that can be applied in the empirical understanding of management in the chokka fishery. The key message is that effort control is the most reliable management tool that can be used to ensure sustainability and avoid overexploitation in the chokka sector. In order to do so, the South African chokka squid fishery uses total allowable effort (TAE) to manage the chokka sector, which encompasses the two limits to effort proposed by Clark (2006).

2.2.2 Total Allowable Effort

One of the key objectives of the chokka sector is to ensure that effort levels are regulated so as to "secure the greatest catch on average, in the longer term, without exposing the resource to the threat of reduction to levels at which future recruitment success may be impaired or catch rates drop below economically viable levels" (DEFF, 2020a). In many fisheries, harvest is a function of the species' catchability coefficient, effort, and stock abundance. If the biomass of a fish species declines, so does the harvest and in turn, profitability. As a result, effort declines too. The outcome is that such a fishery will become commercially unviable long before the species is threatened. However, in a fishery where the species migrates along certain fixed routes or forms breeding aggregations (such as chokka squid), catchability is independent of biomass and the species can easily be over-harvested before it becomes clear that the species is threatened. For this reason, such species need seasonal closures and effort restrictions.

The TAE management policies in the chokka sector focus on the enforcement of closed seasons, man days at sea, and limitations on the number of vessels and individual fishing permits. Currently, the effort limit is 295 000-man days per annum. With 2 443 permit holders, this gives an average of 120 days per year at sea per fisherman. The average duration of a fishing trip is approximately 18 to 25 sea days and fishermen usually go on 6 trips per year. The gazetted closed seasons, which allow the squid to spawn undisturbed, are from 19 October to 23 November (in the height of spawning season) and since 2014, from April to June each year (DEFF, 2020a). The chokka sector participants have supported these closures, as they protect stock levels.

The variability and sensitivity of the chokka stock levels make its management challenging. However, the use of TAE and closed seasons has proven successful, albeit the stock remains vulnerable to natural environmental factors. Without these management tools, Augustyn *et al.*, (1992) estimate that chokka stock levels in South Africa would have been quickly overexploited. Despite the success of these management policies, catch levels remain uncertain, and their fluctuations have wider socio-economic impacts in the area. These will be further discussed in Chapter Five.

2.3 Property rights

Property rights determine the use of a resource. The strength of a property right depends on the regulatory and social institutions that underpin its enforcement (Alchian, 1989). There are many studies that analyse in detail the role of property rights in fisheries (see for example Ostrom and Schlager, 1992; Jentoft, 2004; Ostrom, 2008). Gordon (1954) argues that the problems of overexploitation and inefficiencies within fisheries exist due to a lack of property rights. In over-exploited open access fisheries, the establishment and enforcement of property rights have helped stock levels to recover. Anderson and Leal (1995) developed this, pointing out that establishing secure property rights creates an incentive to conserve stock levels.

While many studies argue that property rights promote the sustainable use of natural resources (Jentoft, 2004; Arnason, 2007, 2012; Ojanen *et al.*, 2017), property rights alone are insufficient to bring about socially and economically optimal outcomes in fisheries management. Some studies go further and suggest that introducing property rights can be damaging. These range from concerns regarding income distribution and the concentration of market power where rights such as ITQs are tradable (Copes, 1986), to social disruption and the negative impact on local communities, as highlighted by Appleby *et al.*, (2018) and the failure of property rights

to recognize broader policy and socio-economic issues (Wyman, 2008). There are many debates on property rights in fisheries management, but it is clear that changing the structure of property rights in a fishery can have socio-economic consequences, and these need to be considered.

Rights play an important regulatory role in South Africa's chokka squid sector. The 2005 policy document outlined the allocation of commercial rights in the fishery. Long term (eight year) rights were issued for the first time in 2005, and again in 2013. The 2021 rights issue will be for 15 years. According to the 2005 policy, individual permits are to be allocated annually for crew members (DEAT, 2005). These individual permits are fishing rights granted for crew members, and commercial rights holders apply for a certain number of permits per vessel. Transformation played an important role in earlier rounds of the Fishing Rights Allocation Process (FRAP) and the sector has gone from effectively zero black ownership in 1994 to over 60% black ownership in 2013 when the last rights allocation was made (Mthembu, 2019).

In the past, the squid sector FRAP remained relatively stable, thereby guaranteeing commercial rights holders and their applications for annual individual permits to be renewed. However, this no longer seems to be the case, and the upcoming FRAP and potential reallocation of rights is a significant cause of concern.

A review of the literature related to managing volatile stock levels and the use of property rights in fisheries management has highlighted the importance of evaluating the socio-economic impact of these two factors on the performance of the chokka squid fishery. Chapter Three discusses the methodology applied in this thesis.

3 Methodology

This thesis examines the problems posed by stock level volatility and insecure property rights, and their impact on the performance of the chokka squid fishery, its employees, and the health of the local economy. It does so by using a combination of qualitative and quantitative research in order to provide an in-depth description and observations of the chokka fishery in the greater Humansdorp area. This chapter discusses the data collection methods applied in the study as well as the data analysis procedure followed. It concludes with a brief discussion on the challenges experienced during the data gathering process.

3.1 Data collection

The qualitative data gathered in this study was drawn from personal interviews with sector participants and *in situ* observations at the port in St Francis Bay from which the fishery operates. Semi-structured interviews were conducted with business owners in the central business district of Humansdorp. More details can be found in the Appendix. In situ observations were made by spending time in the Humansdorp town centre and speaking to locals. Observations were also made at the port in St Francis Bay, on the operations of chokka boats preparing to depart, and the operations of food and equipment suppliers in the port. These provided insight into the personal perspective and lived experiences of the people who work in the chokka sector and live in the nearby towns.

3.1.1 Semi-structures interviews and field observations

Semi-structured interviews were conducted with a wide range of participants in the chokka sector, including commercial companies, equipment specialists and business owners in the towns of St Francis Bay, Humansdorp and Jeffreys Bay. Due to time and budget constraints, only a sample of stakeholders in the chokka sector could be interviewed. Approximately 30% of local business and key industry participants in the focus area were surveyed. Survey details and calculations can be found in the Appendix.

The semi-structured interviews conducted with business owners provided insights into the history of the chokka sector, personal experiences of business owners in the chokka industry, and insights into the impact of the fluctuating catches on the local economy. Interviews were also conducted with commercial rights owners and the fishing companies that operate from the harbour in St Francis Bay. These interviews provided in-depth insights into the operation of the industry and a corporate perspective of the challenges and issues currently facing the sector. Unfortunately, due to the COVID-19 pandemic and the timing of the data collection procedure, personal interviews could not be conducted with fishermen. However, this study is a companion to a dissertation by Mthembu (2019) which entailed extensive interviews with fishermen themselves. Collectively, these two sets of interviews have given insights into the workings of the chokka sector and the challenges it faces from a wide range of perspectives.

3.2 Data analysis

The data obtained for this study was analysed using Microsoft Excel, using heuristic tools such as graphs to illustrate trends in catch levels and tabulating results obtained from secondary datasets. Many observations, personal interviews and the stories told by interviewees were difficult to translate into a dataset but were transcribed and categorized according to themes. A combination of quantitative and qualitative information was collected, and supporting data were used to provide further evidence for normative opinions. Quantitative data regarding incomes and catch levels were sourced from SASMIA and DEFF databases. Due to the nature of the COVID-19 pandemic throughout the research period, no original quantitative data on incomes or catch levels could be obtained.

3.3 Limitations in the data collection process

Due to the global COVID-19 pandemic and travel restrictions imposed from March 2020, the duration of the data-gathering and field work period was significantly shorter than initially intended. The pandemic also made the interview process difficult; several pre-arranged interviewees were unable to participate for health reasons, despite all interviews taking place outdoors and with strict adherence to social distancing and sanitizing. Another limitation encountered during the data-gathering process was local research fatigue, as researchers from Nelson Mandela University had recently been through the area.

The qualitative data gathered revealed several trends that were corroborated by quantitative data. The methodology applied in the study has resulted in a clearer understanding of the problems of volatility and rights that the chokka sector faces. Chapter Four examines these findings in detail.

4 Results

Using the observations and results obtained from the data gathering and interview processes, Chapter Four unpacks the two issues of volatile stock levels and property rights in the chokka fishery. It closely examines the impacts that these two issues have on the performance of the chokka sector, its economic viability, employment and earnings, and effective participation by small-scale co-operatives. It also determines the impact of these issues on the local economy of the greater Humansdorp area.

4.1 The impact of the volatile nature of chokka squid

The volatility of chokka catches, together with market uncertainty, make participation in the South African squid fishery a high-risk operation. In order to participate in the sector and profit from the export demand for high-quality South African chokka, significant capital investments are needed. Chokka vessels require specialized on-board flash-freezers to ensure the quality standards required for international export. The prices of new vessels range between R6 million for smaller boats and R18 – R20 million for larger, 30-man vessels (A. Smith, pers.comm, October 2020).

In order to export squid to the Euro zone, strict HACCP[1] compliance and a full chain of custody documentation are required. The performance of the fishery relies heavily on export markets and it is vulnerable to exchange rate fluctuations. A key determinant in profitability for the fishery is the beach price of chokka, see Table 2. The beach price is the value of landed chokka, based on their size, and it is driven by export prices. It is heavily influenced by the exchange rate, and the recent strengthening of the rand has decreased the beach prices for chokka in South Africa.

Table 2: *Beach price for chokka squid (February 2021)*

Chokka size	Current SA beach price
S (14-8cm)	R65 – R75 /kg
M (18-25cm)	R80 – R90 /kg
L (25-30cm)	R95 – R105 /kg
XL (>30cm)	R95 – R105 /kg

Source: FAO (2020) and SASMIA (2021)

In December 2020, the import price for average size chokka squid to the Euro zone was USD 9.15, or R146 per kilogram (FAO, 2020a). South Africa is a relatively small contributor to a large global sector, competing for international demand against countries such as Morocco and the Falkland Islands (FAO, 2020b). South African squid is known for its quality, and the

[1] HACCP (Hazard Analysis Critical Control Point) is an international method used to manage food safety risk, ensure quality, and certify food products for international imports and exports.

sector's ability to compete internationally relies on the continued supply of high quality, freshly frozen chokka.

In order to mitigate the risk of operating in a sector known for its instability, commercial companies opt for a few strategies. Some of the larger commercial enterprises in the chokka sector operate in several other fisheries. This diversifies their risk, as one fishery cross-subsidizes another and makes it easier for the firm to survive a bad chokka season. Other companies operate solely within the chokka sector but minimize their risks by controlling as much of the value chain as possible. Owning sophisticated cold storage facilities and building up a stock of frozen chokka allows them to enter into long-term supply contracts, permitting them to continue exporting during seasonal closures and through bad seasons. Some of the smaller companies reduce market risk by selling their catch on contract to large companies. A number of companies however still sell 'from the beach' to larger firms looking to fill pallets for export. Observations suggest that these are the firms most vulnerable to fluctuating harvests.

The commercial fishery as a whole reduces its exposure to catch fluctuations by paying fishers according to their personal landings. Interviews suggested that vessel owners did not see risk spreading as the main rationale for linking earnings to catches. Rather, the main reason given was to incentivise the crew. The chokka sector only operates for a short period throughout the year, and companies rely on the individual harvest of each chokka fisherman for their profitability. Thus, from an industry perspective, the harder fishermen work, the more both the fishermen and the companies earn. A more detailed examination, however, indicates the significance of risk diversification. Interviewee results suggested that, if crews had been paid a standard monthly wage that was unlinked to catch levels, a bad season could bankrupt a commercial chokka company.

4.1.1 The impact of volatility on earnings and the local economy

In the greater Humansdorp area, the narrow industrial base means that many enterprises are linked. Inter-industry linkages describe how an action or change in one sector leads to a reaction or change in another. Many studies have examined and modelled in detail the linkages between marine resources and the health of the local economy in which the fisheries operate (see for example Butcher *et al.*, 1981; Briggs, Townsend and Wilson, 1982; Arita *et al.*, 2013; Seung, 2017). In 2018, the chokka sector alone generated more than R1 billion in total sales and its contribution to the local economy is indisputable (Statistics South Africa, 2018). More than

half of the chokka sector's employees live in and around the towns of Humansdorp, and their earnings contribute to the performance of local businesses.

Many business owners interviewed in Humansdorp and St Francis Bay reported that they could clearly tell whether it was a good or bad chokka season, based on sales. This 'ripple effect' and the link between the performance of the chokka sector and the health of the local economy is an example of an inter-industry linkage. The original intent of this study was to assess the effects of shocks to the squid catch on the local economy by modelling the backward and forward inter-industry linkages, but time constraints and travel limitations caused by COVID-19 prevented this. Instead, only a relatively simple analysis of the linkages between the fishery and the greater Humansdorp area can be examined, based on *in situ* observations and interviews conducted with local businesses. More details on these observations and methods can be found in the appendix.

Harvesting chokka requires considerable amounts of imported specialized gear, including generators, on-board lighting, and flash freezers (G. Lightfoot, pers.comm, September 2020). Chokka vessels are manufactured in South Africa, and installation of such gear, as well as large repairs to boats is usually done in Port Elizabeth. However, inputs such as fuel, jigging equipment and food for crews are often purchased from bulk wholesalers in Humansdorp and St Francis Bay. For example, during a good season, even though TAE is fixed for the year, an increase in chokka catch levels prompts more intense fishing and faster vessel turn-around times. This leads to an increase in demand for jigging equipment and food for crews. This increased demand stimulates production and sales in these industries. At the same time, a good season also increases the earnings of crew, further stimulating expenditure in and around Humansdorp.

The catch-based earnings of fishermen drive many of these effects. Based on basic income data derived from DEFF (2020) catch levels, the monthly wages of chokka fishermen can fluctuate significantly from one season to another. Table 3 shows the effect of the 2019 decline in catches. It shows total catches over two 62-day periods, Period A and Period B. This calculation illustrates the effects of a catch decline on the earnings of a representative fisherman working during the two major fishing months in a season – December and January. The catch difference between these two periods was more than 4 000 tons of chokka. Using the current wage of R12 per kilogram of chokka and assuming 2 443 fishermen, this results in a two-month income difference of almost R20 000 between the two periods for the average fisherman.

Table 3: *Seasonal fluctuations in fishermen's' incomes*

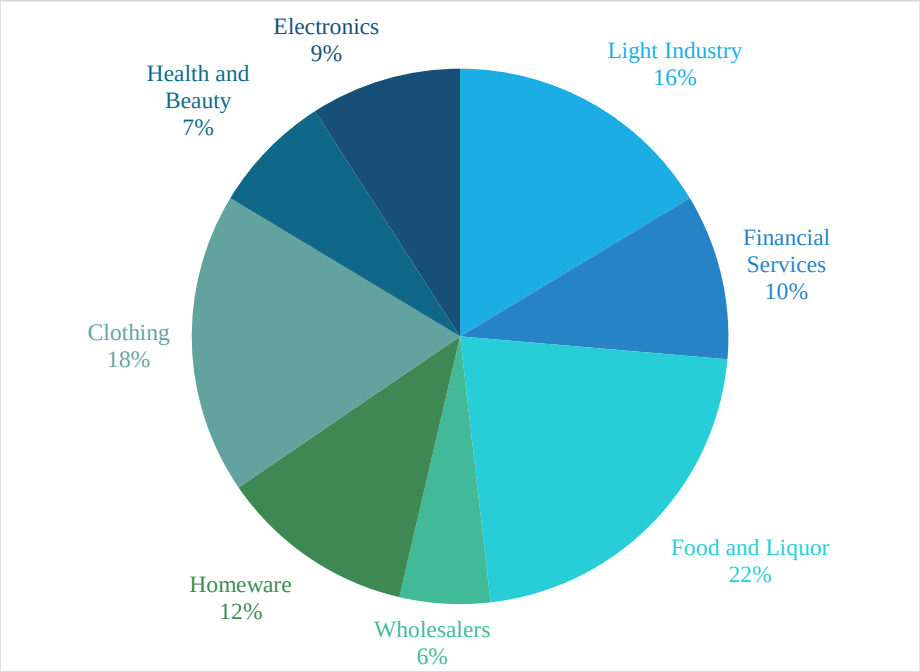
		Average catch (tonnes)	Average income per fisher for the month	Year-on-year difference
Period A	December 2017	2 372	R11 600	
	January 2018	3 709	R18 200	
Period B	December 2018	543	R2 600	**-R9 000**
	January 2019	1 534	R7 500	**-R10 700**

Source: Author's own based on calculations derived from DEFF (2020) data

Table 3 shows how readily the incomes of chokka fishermen fluctuate, and the implications for local businesses in the area can be inferred. In an average year where 9 000 tons are landed by 2 443 fishermen at R12/kg, the average income of a fisher will be approximately R46 000, which equates to an average of R5 700 a month for the eight months in which the chokka season operates. The majority of this is concentrated into the December/January peak harvesting period. Thus, a R20 000 difference in income, as calculated in Table 3, has a significant impact on household earnings and expenditure.

An earnings decrease of R20 000 for two months over the busiest time of the year for chokka fishermen impacts the consumption and expenditure behaviour of them and their families, which, in turn, impacts the local businesses in town. Interview results indicate that, despite local business owners being unable to distinguish between chokka fishermen and other customers, there is a decrease in activity and 'customers through the door' in a bad season. Businesses however also benefit from good seasons, and interview results indicate a definite increase in purchasing of products such as electronics, clothing, and homeware during the peak months. These three categories together comprise approximately 40% of the local businesses in Humansdorp, see Figure 4. More details on the business categories and figure calculations can be found in the Appendix.

Figure 4: *Humansdorp business categories*



Source: Author's own

Indebtedness is an area of particular concern. One of the business categories that report an increase in clients during bad seasons and closed seasons, is the financial services sector in Humansdorp. There are several large money lending and cash loan businesses in town. Income uncertainty resulting from a volatile stock and seasonal closures often leaves chokka fishermen with no alternative but to borrow money. Although interest rates have a legal ceiling (SAICA, 2019), money lenders add additional charges such as 'administration fees' that significantly increase the costs of borrowing. This often results in chokka fishermen entering into a debt cycle that is difficult to break due to the uncertainty of their future potential income. A debt councillor interviewed in Humansdorp described a general mistrust of banks as savings institutions, and a lack of 'financial sophistication' in the community. Interview results with businesses suggested that many chokka sector employees tend to 'spend big' during the December and January months, when fishers and skippers earn the majority of the season's income. Interviews with debt councillors and local retailers confirmed that, instead of saving a portion of incomes for the coming closed seasons, or repaying debts, many chokka sector employees prefer to spend.

It is clear that the linkage of earnings to catches means that catch fluctuations, together with the long seasonal closures, affect fisher earnings and has a destabilising effect on the local economy. Finding a solution is difficult, though Chapter Five discusses potential mitigatory measures.

In 2021, the eight-year commercial squid fishing rights issued in 2013 will be replaced by new 15-year rights. Although TAE is not expected to change, DEFF has proposed a 25% reallocation of rights from commercial companies currently invested in the fishery, to small-scale multi-species community co-operatives. This adds a further element of instability to the chokka fishery, which is discussed in the section below.

4.2 Property rights in the chokka sector

One of the major issues currently facing the chokka sector is the validity and reliability of property rights in light of the potential reallocation of commercial rights. In 2012, the South African government released the Small-Scale Fisheries Policy (SSFP) that aimed to transform the country's fisheries industry by recognising small-scale fishers and communities that had historically been excluded from legislation. It defined small-scale fishers as those who "make a living from marine resources using little or no technology [and] could be involved in the sale, barter or other commercial activity involving these resources" (Masifundise Development

Trust and PLAAS, 2014). The policy controversially shifted rights from individual small-scale fishers to community co-operatives. The recipient co-operatives needed to meet clear criteria, including proof of historical involvement in small-scale harvesting of a marine resource; having 10 years of direct involvement in the small-scale fisheries sector; and having no other forms of income or employment (Masifundise Development Trust and PLAAS, 2014).

The policy proposed that the community co-operatives would receive a multi-species basket of rights. These include high value species such as rock lobster, prawns, crab, abalone and species "traditionally harvested by small scale fishers" (South African Government, 2012). The most recent policy also includes squid (DEFF, 2019). Squid was not included in the original policy proposal, and there is little evidence that it was ever traditionally harvested by communities. The current proposal is to allocate 25% of TAE to small-scale fishers (DEFF, 2019). Currently, the commercial sector has been allocated 295 000 person days per season. The proposal by government thus implies that 73 750 of the person days will be reallocated to small-scale co-operatives (DEFF, 2019).

The question now arises as to whether rights can be given to community co-operatives without negatively impacting the viability of companies; reducing the flow of foreign income into the country; threatening the incomes of current workers; and creating unrealistic expectations amongst community members.

There is a lack of clarity regarding the details of the TAE reallocation. The most likely scenario, based on the draft policy, is that the commercial sector will have to reduce effort by 25%. This implies that the current 2 443 individual permit holders under the commercial rights holders will not lose their permits, but that their effort levels and subsequent days at sea will have to reduce. Currently, the sector is allowed to operate at sea for 238 days per year, and each individual permit holder is allowed to be at sea for 120 of those 238 days. Removing 25% of the days at sea means that individual fishermen will only be allowed to fish for 90 days, instead of 120. A reduction in working days will have a significant negative unintended consequence on the potential incomes of commercial chokka fishermen.

Another possible outcome of the reallocation is that 25% of current commercial fishermen may lose their jobs and will either have to join co-operatives or find alternative employment outside of the chokka sector. Table 4 below illustrates the employment statistics for Humansdorp and St Francis Bay, and the approximate number of fishermen living in the towns.

Table 4: *Humansdorp and St Francis Bay employment statistics*

	Humansdorp	St Francis Bay
Total population	20 123	4 933
Working age population	12 000	3 305
Unemployed individuals	2 580	710
Employed individuals	9 420	2 595
Approximate number of fishermen living in the town	1 000	300
Average fisher household size	6	4

Source: Statistics South Africa (2019) and Mthembu (2019)

From Table 4, it can be estimated that, if 25% of fishermen in Humansdorp and St Francis Bay lose their jobs, the number of unemployed individuals in the area may increase by 10%.

The effort reduction will also have a negative impact on the viability of commercial companies. Reducing the number of operational days produces an inevitable "excess of fishing capacity" (Clark, 2006). Chokka vessels will only be used for a brief period during the season and be inoperative for the rest of the year. These vessels are highly specialized, and thus cannot be repurposed for use in other fisheries. The costs of maintaining idle vessels would be a financial drain for commercial companies. Furthermore, average fixed costs within the fishery (such as licensing and harbour fees) would rise as output declined. These types of fixed costs remain unchanged, irrespective of whether or not companies are harvesting chokka. A 25% reduction in effort thus has the potential to negatively impact the profitability of commercial companies, which has consequences for salaries and employment opportunities in the fishery.

The proposed reallocation of rights may also negatively impact the ability of the sector to export high quality South African chokka to the Euro zone. In order to benefit financially from the reallocation of rights in the chokka sector, small-scale rights holders will either need to secure investment to fund the initial capital costs of purchasing specialized chokka vessels or will need to enter into catch agreements with existing firms. Small-scale fishers will be granted a multi-species quota, which means that they are likely to use boats designed for day trips. Presumably, these boats will be vessels that are used for handline or harvesting rock lobster, as the majority of small-scale fishers use these types of boats. These vessels are not designed to harvest chokka, and they lack the on-board flash freezers that are needed. Compared to

commercial chokka boats, the use of other vessels significantly reduces the volume of catch and the duration of trips.

Profitably exporting chokka to the Euro zone requires specialized squid vessels. There are two primary reasons for this. Firstly, they can stay at sea longer, and so average operating costs are lower. Secondly, the on-board flash freezers make it easier to maintain the strict quality and HACCP requirements for squid exports to international markets. Chokka should be flash frozen within four hours of being caught, and this cannot be done from a vessel not specifically designed for chokka harvesting. Chokka harvested from normal linefish vessels can only be sold into the local consumer market where it competes against cheap imported trawled Patagonian squid. Chokka harvested in this manner will not obtain the same prices that commercial companies receive for export-grade chokka. Unless co-operatives can enter into agreements to access squid vessels from current operators, or find the necessary funding to purchase chokka boats, the proposed rights reallocation seems likely to restrict chokka exports and the inflow of foreign income that the sector brings to the country.

Unfortunately, the proposed rights reallocation may create unrealisable expectations amongst community members. Interviews reveal many fishermen believe that, if they were granted individual rights, they stand to gain a greater share of the wealth generated by the commercial companies (Mthembu, 2019). Understandably, fishermen risk their lives harvesting chokka in return for wages that are on average just above the national minimum wage. The questions arise as to whether co-operatives will be able to participate in the fishery in an efficient way that allows them to gain a share of the wealth, and whether the commercial fishermen who remain will be better off in any way.

Another factor to consider is that the majority of small-scale co-operatives are located outside of chokka breeding aggregation areas. The volumes harvested from fishing into breeding aggregations is what translates into profitability. Most small-scale fishing co-operatives are found further along the coast of the Eastern Cape (in the Transkei area) and in KwaZulu-Natal. Allocating rights to harvest squid in areas where squid do not breed leads to rent squandering and hinders the economic viability of the fishery.

Apart from financing and geographic challenges, another important concern with the reallocation of rights to small-scale co-operatives is the risk that they could become paper quota holders. If entry requirements of the chokka sector are unachievable for small-scale fishers who lack the necessary funding and sector knowledge, they may become paper quota holders. Paper

quota holders are defined as "new entrants who sell their access right to an established company to harvest [and] process the allocation in return for cash payments" (Isaacs, 2006). An example of a South African fisheries sector where this is a persisting issue is the small pelagic sector, particularly the sardine fishery (see Hara *et al.*, 2014).

In summary, the proposed rights reallocation seems to have ignored the impact of its implementation on the sector and its participants, as well as the risks for small-scale co-operatives. It is difficult to know what alternative policies or proposals the DEFF has considered to improve the welfare of fishers and empower communities. Chapter Five discusses possible alternatives to the current structure of the proposed rights reallocation.

5 Discussion

Chapter Five examines several possible solutions to the problems facing South Africa's chokka squid fishery. It discusses potential solutions to reduce the impact of the volatile stock levels on the local community and economy, as well as possible alternative policy strategies that the DEFF could consider in place of the current proposal to reallocate 25% of the sector's TAE.

5.1 Reducing the impact of volatile stock levels

There is nothing that can be done to reduce the volatility of chokka squid stock levels. Currently, research is being conducted into improving stock predictions, but this work is still in early stages (Roberts *et al.*, special edition forthcoming). As discussed in Chapter Four, volatile stock levels directly impact the incomes of chokka fishermen as they are paid on a per catch basis. In an area such as Humansdorp, the performance of the chokka sector has an impact on economically linked enterprises.

The income uncertainty and income fluctuations of chokka fishermen impose a burden on them and the local economy. Squid sector managers interviewed recognise the financial burden that this uncertainty places on their employees, and some have proposed measures to address this issue. Several companies have suggested income smoothing, offering their crew a consistent average monthly income. This average income implies that fishermen will still gain from a good season, but the income would be smoothed so that the difference between a December wage and an April wage would be less extreme. However, this proposal was not well-received by crews, as the appeal of immediate windfall incomes from a good December catch seemed to outweigh that of a smoothed income. One fishing company pays out a 'bonus' or 'thirteenth

cheque' to chokka fishermen and skippers immediately before the season ends – prior to the longer closed season in April and June – to provide their employees with some form of income during this time.

Currently, the majority of companies employ chokka fishermen on a contractual basis. There is a sector-wide statutory minimum wage that fishermen earn if catch levels are below a certain minimum amount (Mthembu, 2019). Even so, fishermen are not eligible to earning this minimum wage unless they are actually at sea. Furthermore, if a crew member is absent when the vessel is scheduled to leave, a replacement is simply contracted to fill their place on board.

Closed seasons, while difficult for crew, are an important and necessary aspect of TAE and ensuring the sustainable harvest of chokka. Interviews with sector participants note that fishermen are free to find alternative employment during closed seasons, but this is not always possible, due to the narrow industrial base and limited employment opportunities in the area. Interview results have also revealed that while there are many companies that aim to offer support during closed seasons where possible, there are other companies that ignore the burden that the complex nature of the chokka sector places on their employees. Discussions with industry participants revealed that labour practices are not consistent throughout the sector. Larger companies with established human resources departments seem to offer fishermen better contracts and employment benefits, while some smaller firms tend to adhere to less formal practices. The extension of standard sector-wide labour practices could assist in creating more favourable employment conditions for all chokka fishermen. Companies could also investigate the possibilities of remunerating dedicated employees that have been working for a firm for a long time with payment benefits or bonus payments during closed seasons.

It is undeniably difficult to reduce the impact of stock volatility on incomes and the local economy. While the enforcement of industry-wide employment and contractual improvements may assist in reducing some of the income uncertainty in the sector, the responsibility does not lie solely with commercial companies. A mutual agreement needs to be reached between commercial companies and their crews. The potential solutions mentioned above originate from discussions with industry participants and observations made throughout this study, and further research and analysis into the viability of these suggestions is required.

5.2 Identifying potential solutions to the rights reallocation proposal

DEFF has proposed a 25% reallocation of TAE in the chokka squid fishery in an attempt to transform the sector and empower small-scale fishing co-operatives. As highlighted in Chapter Four, the consequences of this proposal for the sector, its employees and small-scale fishers may not have been fully considered by DEFF. There is no doubt that squid fishers face relatively low and unstable incomes, but it is unclear as to how they will benefit from this proposal. One possibility is that DEFF regarded the multi-species quota of the co-operatives as a means to stabilize fishermen's incomes during closed periods and bad seasons, but the size of the allocation (25%) is such that specialized vessels are needed to harvest chokka in a way that benefits small-scale fishermen. This allocation is equivalent to the collective effort of the five largest companies currently operating in the sector.

A key dynamic that comes to light in the fishery is that neither fishermen nor companies can succeed without the other. Companies provide the capital and chokka fishermen provide the labour. In a high-risk fishery such as the chokka sector, the risk is distributed between the investors (the companies) and the fishermen. Many argue that the chokka fishermen carry a greater burden as they risk their lives harvesting chokka at sea. A potential area to explore is the effect on incomes if the flat rate of R12/kg that fishermen earned fluctuated with the beach price, albeit within a certain marginal upper and lower limit. Thus, when export prices are favourable, fishermen stand to gain from the increased profitability. If export prices are unfavourable, the rate could remain at R12/kg, thus not changing the current labour costs of companies during unfavourable times. From a financial standpoint, this can be justified as the cost base will change with performance, thus not financially impacting companies during bad seasons. Further investigation into the viability of this suggestion, from a company perspective, is however needed.

One tempting possibility to consider is the introduction of individual permits for chokka fishermen, both commercial and small-scale. This, however, would destroy the fishery. The chokka sector is capital intensive, and the driver to investment is profitability. Crew provide labour to the owners of capital (the vessel owners and the commercial companies) and are relatively free to move between employers between seasons. If individual rights are given to fishermen who do not have capital investment, the risk of them becoming paper quota holders increases exponentially. Individual permit holders will, instead of fishing themselves, rent their permits to the highest bidders. Commercial companies will be left with no choice but to rent a

permit from an individual fisherman and will face increased competition for harvesting rights from other firms who may try to enter into the fishery, as regulatory controls and long-term commercial rights will become irrelevant. This will not only lead to the squandering and dissipation of rents in the fishery but will also threaten the sustainability of chokka. In such a situation, the commercial fishery will also no longer be able to export chokka, nor profit from participation. The livelihoods of thousands of people and enterprises linked to the fishery will be jeopardised. Unfortunately, the end result of such an allocation would be the collapse of the commercial fishery.

An interesting alternative is to grant co-operatives commercial rights. In order to succeed however, they will need assistance and access to capital. Ideally, this would come from existing commercial rights holders, but this is difficult to propose when the granting of rights to one group implies that the other may no longer participate in the fishery. At a reduced TAE reallocation, it could succeed, given that the TAE of existing rights holders remains relatively unchanged and that existing crew do not lose too many permits. It is important to note, however, that this is not in line with the DEFF's small-scale policy, and the risk of a small-scale co-operative becoming a paper quota holder, if given commercial squid rights, remains high. This, as previously mentioned, increases inefficiency in the fishery, and leads to the squandering of rents.

The difficulties of small-scale fishing co-operatives being able to financially gain and profit from the current reallocation without either becoming paper quota holders or affecting the performance of the sector must be considered and alternative possibilities must be identified. While successful participation by small-scale fishers in the chokka sector is not impossible, the bureaucratic difficulties and economic inefficiencies that may result need to be accounted for. Reallocating 25% of the TAE – the equivalent to that of the five largest commercial companies in the sector – will undoubtedly have negative consequences for profitability, export, and incomes in the commercial fishery. In order for small-scale co-operatives to participate in the sector, the proposed TAE will have to be lowered. Government needs to acknowledge and account for the complexities of the squid fishery and the significant capital costs required to participate in a profitable manner. By significantly reducing the TAE reallocation, government could empower small-scale fishermen to harvest chokka on a subsistence basis that does not affect the commercial fishery. These small harvests can be sold locally, as bait or to local restaurants, as a form of income for small-scale fishers. Closed seasons must still apply to all sector participants, so as not to disturb the breeding aggregations and future stock levels of

chokka squid. It must be understood by all sector participants that regulating effort limits is in their best interest, as it ensures the ability for harvest (albeit uncertain) and income in the coming seasons.

Chapter Five has discussed possible solutions to some of the issues facing the chokka sector. The discussion highlighted the need for cooperation between commercial companies and chokka fishermen, in finding a solution to income uncertainty that is mutually beneficial. It also emphasised the need for further research prior to the implementation of the proposed rights reallocation, and the potential for alternative solutions that could bring about empowerment and further transformation in the sector – both for commercial fishermen and small-scale fishermen.

6 Conclusion

South Africa's chokka squid fishery is a small yet valuable fishery. This study focused on the chokka sector operating in and around the towns of Humansdorp, Jeffreys Bay and St Francis Bay. This thesis identified two issues facing the chokka sector – volatility, and property rights. It examined the causes of these two issues and their impact on the performance of the fishery, its employees, and the health of the local economy to which it is linked. Despite the use of TAE and closed seasons to manage the fishery, the inevitable volatility of chokka stock levels have an impact on the incomes of its employees and the local businesses in the greater Humansdorp area. Before it is implemented, the proposal by government to reallocate commercial rights in the fishery undeniably requires further research into the effect of this reallocation on the economic viability of the fishery and the ability of small-scale co-operatives to participate efficiently.

While there are no straightforward answers, this thesis has proposed possible solutions that could mitigate these two issues. The issue of income uncertainty requires inputs from both commercial companies and fishermen, for both rely upon each other for successful participation in the chokka sector. An analysis of the potential impact of the proposed rights reallocation has highlighted the possibility for alternative means in which empowerment and transformation can be achieved for both commercial fishermen and small-scale fishermen in the chokka sector.

This study forms part of a wider accompanying body of literature that focuses on the chokka squid sector in the Eastern Cape province of South Africa. It serves to shed light on some of

the issues in the fishery and proposes several solutions, in the hope that it sparks some debate and potential consideration. Areas for further research include an analysis into the economic linkages of the sector, and more research is needed into the reality of the rights reallocation and what it will entail, both from a commercial and a small-scale perspective.

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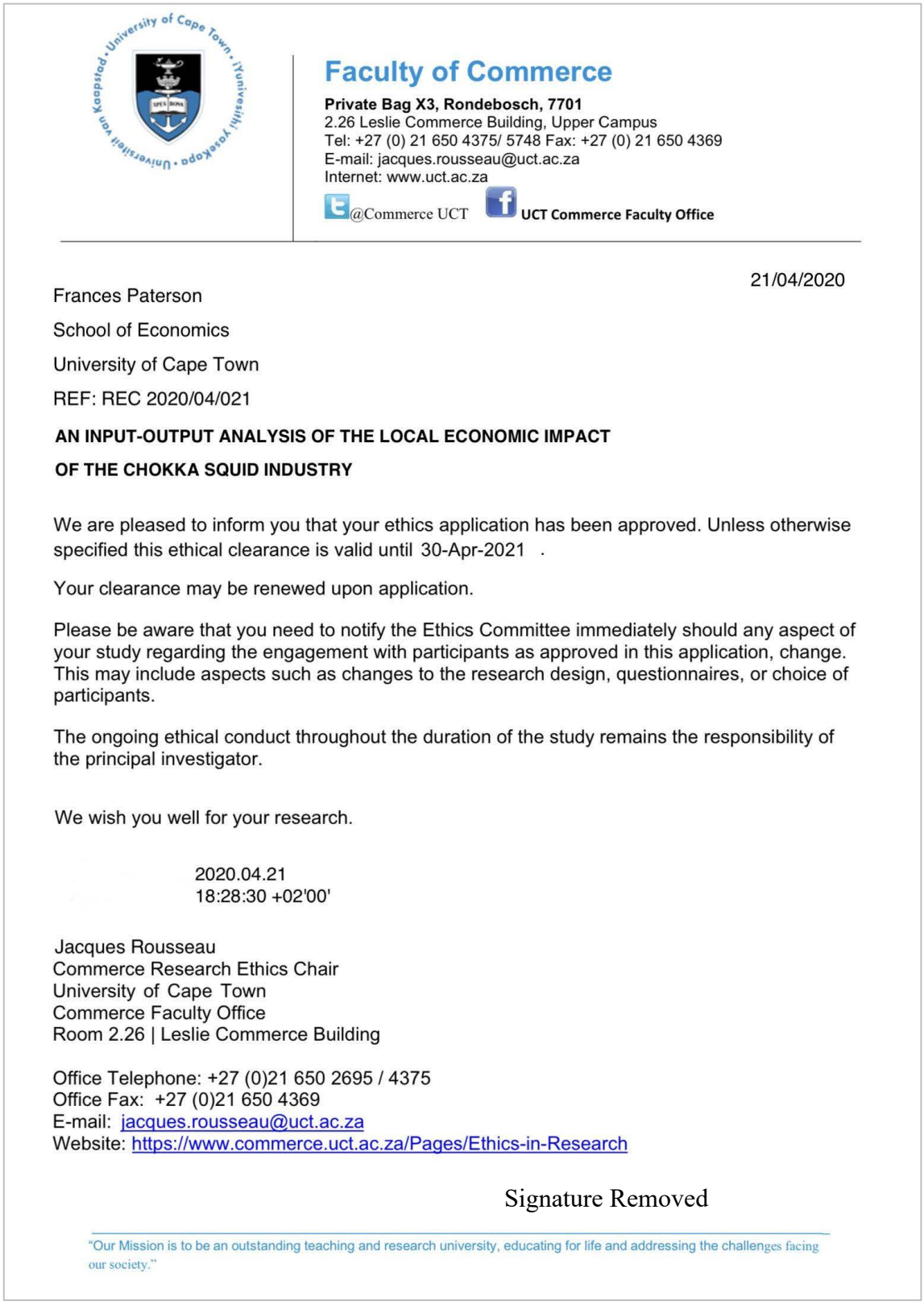
Appendix

Ethical clearance and approval letter:



Faculty of Commerce

Private Bag X3, Rondebosch, 7701
2.26 Leslie Commerce Building, Upper Campus
Tel: +27 (0) 21 650 4375/ 5748 Fax: +27 (0) 21 650 4369
E-mail: jacques.rousseau@uct.ac.za
Internet: www.uct.ac.za
@Commerce UCT **UCT Commerce Faculty Office**

21/04/2020

Frances Paterson

School of Economics

University of Cape Town

REF: REC 2020/04/021

AN INPUT-OUTPUT ANALYSIS OF THE LOCAL ECONOMIC IMPACT OF THE CHOKKA SQUID INDUSTRY

We are pleased to inform you that your ethics application has been approved. Unless otherwise specified this ethical clearance is valid until 30-Apr-2021 .

Your clearance may be renewed upon application.

Please be aware that you need to notify the Ethics Committee immediately should any aspect of your study regarding the engagement with participants as approved in this application, change. This may include aspects such as changes to the research design, questionnaires, or choice of participants.

The ongoing ethical conduct throughout the duration of the study remains the responsibility of the principal investigator.

We wish you well for your research.

2020.04.21
18:28:30 +02'00'

Jacques Rousseau
Commerce Research Ethics Chair
University of Cape Town
Commerce Faculty Office
Room 2.26 | Leslie Commerce Building

Office Telephone: +27 (0)21 650 2695 / 4375
Office Fax: +27 (0)21 650 4369
E-mail: jacques.rousseau@uct.ac.za
Website: https://www.commerce.uct.ac.za/Pages/Ethics-in-Research

Signature Removed

"Our Mission is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society."

Interviewee letter:

Dear Interviewee,

My name is Frances Paterson. I am a final year Master's student in economics at the University of Cape Town. I am doing research for the Environmental Economics Policy Research Unit as part of the Solstice Squid project.

I am studying the links between the Chokka squid and the local economies in Humansdorp, Jeffreys Bay and St Francis Bay. My research has been approved by the UCT Ethics Committee (find attached a copy of the approval letter).

I would like to ask you a few questions about the connections between your business and the Chokka industry. It will take only a few minutes of your time and no personal information is required. You may end the interview at any stage, and you do not need to answer any questions that you are unwilling to.

Please let me know if you have any further questions.

You can contact me (Frances) regarding any queries related to my research at 084 512 3144, or by email at PTRFRA010@myuct.ac.za

My supervisor, Professor Tony Leiman, can be contacted at 060 820 1754 or 021 689 2372, or by email at tony.leiman@uct.ac.za

Interviewee consent form:

INTERVIEWEE CONSENT FORM

Owner name (for administration use only, **not** to be used in research or quoted unless specified): _____

_____

Business name (for administration use only, **not** to be used in research or quoted unless specified): _____

_____

Business type: _____

_____

_____

I (insert name here) _____
give permission and consent for my interview to be sound recorded and written down, and for the answers that I provide to be used in this study regarding the impact of Chokka squid on the local economy and businesses in the area.

Interviewee signature: _____

Date: _____

Interview questions:

INTERVIEW QUESTIONS

1. **What type of business do you own and what do you specialise in?**

_____

_____

_____

2. **What proportion of your business activities involve local residents?**

_____

_____

_____

3. **What proportion of your business involves local people (in your town or in your area) in the following sectors and how much involves visitors from out of your area?**

local fishing	local farming	local tourism	local other
outside fishing	outside farming	outside tourism	outside other

If other, who: _____

_____

_____

4. **Do you do a lot of business with chokka fishermen and fishing companies?**

_____

_____

_____

5. **How many of your customers do you think are chokka fishermen or the families of chokka fishermen?**

6. **Can you tell (without asking) whether it has been a good or a bad chokka season from how your business performs?**

7. **Does closing the chokka fishery (closed seasons) affect your business in any way?**

8. **Does your business benefit when there is a good fishing season in the squid fishery?**

9. **Do you think your business is affected by the chokka industry or rather by other sectors such as farming and tourism?**

10. **Where do you spend most of your money?**

in my town	in the surrounding towns	in Port Elizabeth or further away

Humansdorp: local business analysis

Video footage of the town and manual counting while on location was used to ensure that each business in Humansdorp was counted. Below is a list of each of the formal businesses in Humansdorp, categorized into the eight business categories identified in the town.

Financial Services	**Food and Liquor**	**Wholesalers**	**Homeware**	**Clothing**	**Health and Beauty**	**Electronics**	**Light Industry**
African Bank	Shoprite	Humansdorp Fruit & Veg	Home Express	Bradlow's	Spec Savers	Kouga Cellular	Container Hire
ABSA	Lucky's	Lucky's Wholesalers	Russels	Ackermans	Marty's Salon	Cell Tablet Repair	Auto Towing
FNB	Humansdorp Supermarket	First Choice Dairy	Lewis	PEP	Backstage Salon	Lucky's Cellular	BuCo
Nedbank	Cheap Cheap Supermarket	Farouk's	OK Furniture	Jet	Oos Kaap Apteek	MTN	Midas
Standard Bank	Unity Supermarket	Food Man	Radio & TV	Express Store	Pharmacy	Future Cell and Sound	Autozone
Afri-Loan	African Supermarket	Hosana Wholesalers	Appliance Repairs	Mad Price	Missa's Hair Salon	Ahmad Cellular	Pro Glass & Aluminium
Ritefin	Spar	6%	One Price	VJ's Superstore	Arthur's	Pakcha	PG Glass
CDS	Courspur Supermarket		Humies Bargains	Mr Price Clothing	7%	Star Electronics	Auto Radiators
Debt Info	LiquorShop		Cheap Dream	Markham's		Break iFix Repairs	Genro Workshops
Neofin Loans	Rex Café		Ozzie's	Takkie Town		9%	Sport & Boat
10%	Grand Liquors		Ons Winkel	Toure's Clothing			Engen
	Tops		Paramount Upholsters	Funky Store			Mazda
	Wimpy		12%	Wayde Fashion			Toyota
	KFC			Nicky's Fashion			Isuzu
	African Pot Takeways			Monique's			Ko-Op
	Grill & Company			Jumbo			Cleaning Warehouses
	Sgt Pepperoni's			Dunn's			16%
	JWC Fish Supplies			18%			
	Mighty Bites Café						
	Blue Bottle Liquors						
	Humansdorp Slaghuis						
	Sebastian's Slaguis						
	22%						

Semi-structured interviews were based on a casual discussion, with the interview questions (as in the Appendix) acting as a framework for the discussions. In each of the business categories,

a selected sample of business owners were interviewed. Hesitance due to the COVID-19 pandemic and difficulties with in-person discussions led to fewer businesses being interviewed than would have been preferred, but sound evidence was collected through those that were conducted, combined with observations of the operations of the chokka industry and other studies such as Mthembu (2019).

Summary of results of semi-structured interviews and *in situ* observations:

Question	Responses				
What proportion of your business activities include local residents?	The majority of respondent's reported that business was conducted with local residents within the Humansdorp town area.				
What proportion of your business involves local people in the following sectors and how much involves visitors from out of your area?	Local fishing	Local farming	Local tourism	Local other	
	Outside fishing	Outside farming	Outside tourism	Outside other	
Do you do a lot of business with chokka fishermen and fishing companies?	Yes	Some	None		
How many of your customers do you think are chokka fishermen or the families of chokka fishermen?	All	Many	Some	None	Can't tell
Can you tell (without asking) if it has been a good or a bad chokka season?	Yes	No			
Does closing the chokka fishery (closed seasons) affect your business in any way?	Yes	No			
Does your business benefit when there is a good fishing season in the squid fishery?	Yes	No			
Do you think your business is affected by the chokka fishery or other sectors such as farming and tourism?	Fishing	Farming	Tourism		