Universidade do Algarve

A Value Chain Analysis of Tuna Industry in Ghana

By Elizabeth Drury O'Neill
A45591

A thesis submitted to the University of the Algarve in partial fulfilment of the degree
MASTERS OF SCIENCE IN MARINE BIOLOGY

Supervisor: Margarida Castro

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Declaration:

'A Value Chain Analysis of the Tuna Industry in Ghana'

I declare that I have personally undertaken this original unpublished study herein submitted. Other sources of information are properly cited in the text and a list of references is included.

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Elizabeth Drury O'Neill (Student)

This is an unpublished M.Sc. thesis and is not prepared for further distribution.

To my parents

In special dedication to my mother Meg,
my ultimate supporter

List of Acronyms

ACP: Atlantic Caribbean Pacific

AIS: Automatic Identification System

BRC: The British Retail Consortium

CBI: Centre for the Promotion of Imports from developing countries

CF: Conversion Factor

CIF: Cost Insurance Freight

CEPS: Customs, Excise and Preventive Service

DWF: Distant Water Fleet

EC: European Commission

EEZ: Exclusive Economic Zone

EFIC: European Food Inspection Services

EMOFA: European Market Observatory for Fisheries and Aquaculture

FAD: Fish Aggregating Device

FAO: Food and Agriculture Organization.

FC: Fisheries Commission

FFA: Pacific Islands Forum Fisheries Agency

FOB: Free On Board

GG: Gilled and Gutted

GIPC: Ghana Investment Promotion Council

GPHA: Ghana Ports and Harbour Authority

GNAFF: Ghana National Association of Farmers and Fishermen

GDP: Gross Domestic Product

GTA: Ghana Tuna Association

HS: Harmonized System

ICCAT: International Commission for the Conservation of Atlantic Tunas

IFS: International Food Standards

IUU: Illegal, Underreported and Unregulated Fishing

IW:LEARN: International Waters Learning Exchange and Resource Network

LOA: Length Over All

MRAG: Marine Resource Assessment Group

MCS: Monitoring Control and Surveillance

MFRD: Marine Fisheries Research Division

MoFAD: Ministry of Fisheries and Aquaculture Development

MoTI: Ministry of Trade and Industry

MT: Metric Tons

NFAG: National Fisheries Association of Ghana

NOAA: National Oceanic and Atmospheric Administration

OECD: Organization for Economic Co-operation and Development

OPRT: Organization of the Promotion of Sustainable Tuna Fisheries

PFC: Pioneer Food Cannery

RCA: Revealed Comparative Advantage

SD: Standard Deviation

SGS: Société Générale de Surveillance

SPC: Secretariat of the Pacific Community

TTV: Tema Tuna Ventures

USDA: United States Department of Agriculture

VAT: Value Added Tax

VCA: Value Chain Analysis

VHF: Very High Frequency

VMS: Vessel Monitoring System

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Resumo

O atum em lata passou por uma longa viagem até chegar às prateleiras dos supermercados. Uma elevada proporção das latas de atum compradas na União Europeia provêem da África Ocidental, uma região em vias de desenvolvimento com elevada dependência da pesca. É expectável que a crescente procura de atum resultará na expansão da pesca destas espécies, uma das últimas indústrias de processamento ainda baseadas na África Ocidental. O atum é o produto mais importante das exportações de produtos da pesca provenientes do Gana, um país situado na costa Ocidental de África. O objectivo desta tese é compreender como funciona esta indústria global em termos de procedimentos, práticas, governança e finanças. Foram examinados os aspectos socioeconómicos com particular relevância para um país em desenvolvimento, utilizando a metodologia da Análise da Cadeia de Valor (ACV). A ACV é uma ferramenta utilizada para compreender como diferentes companhias e organizações participam em processos económicos locais e quais os seus impactos a nível global. Esta análise tem o potencial de permitir compreender a cadeia de transformação de um produto e o valor económico de cada um dos elos desta cadeia, neste caso desde a captura do atim até ao consumidor, permitindo identificar oportunidades para melhorias de eficiência. Os dados foram obtidos através de entrevistas e questionários aplicados no Gana e através da consulta de bases de dados da indústria e do governo do Gana. Concluiu-se que a indústria associada ao comércio de atum funciona sob grande influência de grandes multinacionais e opera em parte na ausência de legislação apropriada. A governança aplicada nas etapas da cadeia de valor está bem definida, no entanto a implementação é fraca ou inexistente. O processamento, igualmente dominado pelas multinacionais, permite o exercício de algum controlo sobre os produtos e a sua venda mas apesar disso, os elos de maior valor ocorrem na fase do retalho. A dinâmica socioeconómica associada à cadeia de valor inclui aspectos negativos como falta de comunicação entre o sector público e privado, desequilíbrios de poder entre os produtores, papel pouco importante das mulheres e situação precária dos trabalhadores das indústrias. Este trabalho produziu informação valiosa sobre os componentes de uma indústria pesada de custos igualmente elevados, a operar num país em desenvolvimento, em que a pesca ilegal é muitas vezes tacitamente ignorada. São claramente identificados os subsectores que merecem atenção e financiamento. Esta cadeia de valor pode ser utilizada para compreender a complexidade financeira e a dinâmica da pesca industrial de atum no Gana.

Palavras-chave: região em desenvolvimento, produtos de atum, pescas industriais importantes, Análise da Cadeia de Valor, companhias multinacionais, governança, pesca ilegal, complexidade financeira, dinâmica da vida real.

Abstract

Every can of tuna purchased by the consumer has taken a long journey before reaching the supermarket shelves. For each can bought there is a lengthy process from sea to shelf. A large proportion of the tuna cans purchased in the European Union come all the way from West Africa; a developing region with a high dependency on fisheries. Amidst an ever-increasing demand for tuna products the global tuna fisheries are set to continue expanding, apparently one of the last natural resource based industries fit to do so in West Africa. Tuna is the biggest fisheries export and dominates the fisheries sector in Ghana, a country situated in West Africa. This thesis aims to understand how this globally important industrial fisheries functions in terms of procedures, practices, Governance and finance. Socioeconomic influences, in the setting of a developing country, were also examined. For these purposes a Value Chain Analysis was employed. A Value Chain Analysis is a tool commonly used to understand how different companies and organizations participate in a domestic policy environment, which directs conclusion in the global economy. This analysis has the potential to allow researchers to fully understand a commodity chain and hence identify realistic opportunities for consequential improvements. Interviews and questionnaires were employed in-field Ghana along with secondary data collection techniques. It was found that the fisheries functions at the production level under influences from large multinational companies and tends to operate with a certain degree of lawlessness. Governance over the value chain is well defined, however implementation is poor or non-existent. The processors, whom are also dominated by multinationals, exert some control over the producers and their sales, however the high value links which are highlighted occur at the retail stage. Socioeconomic dynamics acting in the chain included the lack of communication between the public and private sector, power imbalances amongst players at production, the role of local businesswomen as actors in the chain and the general characteristics of the workers in the industry. Value addition and upgrading are needed the most in Governance over the chain, especially within Monitoring, Control and Surveillance. The results of the study provide a wealth of material about the components of a cost-heavy fishing industry in a developing country; an industry on which many eyes have recently turned due to illegal fishing activities. It highlights clearly where funding and future focus are needed. This value chain can be used as a guide for those that need to comprehend the financial complexities and real life dynamics of the Ghanaian tuna fishing industry today.

Keywords: Developing Region, Tuna Products, Important Industrial Fisheries, Socioeconomic Influences, Value Chain Analysis, Multinational Companies, Governance, Illegal Fishing Activities, Financial Complexities, Real Life Dynamics.

Contents Pages

Chapter 1.

1.1 Introduction

The Marine Sector can bring huge amounts of revenue to a nation and can facilitate economic development in many ways. In the last decades both marine shipping and the marine capture industry have seen great expansion; fleet sizes, trading volumes and fishing capacities have all grown (Bravo, 2013). Fishing in particular has become more industrialized and today the industrial fishing fleet lands over 80% of the total sea catch volume (IndustrialFishing, 2013). In the Industrial fishing sector harvesting activities become capital intensive and the landed species are more export or retail orientated rather than for direct consumption. Advantages include greater foreign exchange earnings for Governments, the creation of paid employment and the increased availability of fish products in the global market (IndustrialFishing, 2013). The tuna capture fisheries became an import world asset with the development of industrial fishing. The fisheries went industrial as the demand for canned tuna grew in the 1940's and 50's (FAO, 2010[2]). DWFs (Distant Water Fleet) from Europe, the USA and Asia began to spread through the world's oceans on the hunt for tuna to meet the demands of the growing industry (FAO 2010[2]; 2013[1]). Once a low-cost substitute for sardines in a can, tuna now is a highly valued food commodity (FAO, 2010[1]). On the 5th of January this year in Japan a single Pacific Bluefin Tuna *Thunnus orientalis* sold for 1.7 million US dollars (BBC World News, 2013). The industrial tuna fleet is hence a very mobile mechanized fleet and its catch is intensively traded worldwide.

The fishing industry in West Africa must be recognized as crucial in the positive economic and social development in these countries (Bartels *et al,* 2007). West Africa is defined by the UN as a sub region consisting of 16 countries that run along the western coastline of continental Africa (See Image 1.1). This region is pinpointed in fisheries science due to the ever-growing movement of foreign fishing fleets in the area and the increased volume of seafood exports. Marine fish offer an undeniably important protein source to the region, they eat more seafood than any other Africa region, but there has been a noticeable drop in landings of local fisheries in recent times (MRAG, 2008). The fishing industry provides the main solutions to debt repayment and revenue creation in the form of fish exportation and fish licensing agreements and partnerships with overseas fisheries (Bartels *et al,* 2007). West Africa was one of the first areas to be exploited by the newly industrialized European and Asian tuna fishing fleets in the early seventies. Tuna production and processing

sites began to be located in the region during the same time period with input from foreign investors. National tuna fishing fleets were developed, also with the help of foreign ventures, as different countries in West Africa received their independence from their former colonists. The tuna fisheries is said to be the only fisheries resource in West Africa that can be expanded and developed to a greater potential (Falaye, 2008), this makes any decisions or plans made now or in the near future crucially important. The tuna industry in West Africa is highly export orientated and so tuna is not a vital food commodity to the local populations themselves, however it provides a vital source of foreign exchange earnings, employment and trade opportunities. There are three tuna processing sites in West Africa today and many countries posses domestically flagged industrial tuna fleets i.e. Cote D'Ivoire, Ghana and Senegal (FAO, 2010[2]).

Image 1.1: A Map of West Africa, Ghana can be seen along the Gulf of Guinea beside its neighbouring countries Togo and Cote D'Ivoire. Source: < http://cabinetoffreshwatercuriosities.com/tag/west-africa/>

In 2008 40% of the maximum sustainable catch for the East Atlantic tuna was in Ghanaian waters. The Ghanaian tuna baitboat fleet is the largest in the East Atlantic, in 1991 it accounted for 61% of all the Skipjack tuna caught in that sector (Bortier-Verstraaten, 2002; Falaye, 2008; Mensah, 2010). According to the Bank of Ghana in 2008 Ghana is, in reality, the fourth largest

producer of tuna in the world (Asiama *et al,* 2008). Local Ghanaians have been catching tuna artisanally for hundreds of years with the use of traditional canoes, hand lines and gill nets, but the commercial industry didn't begin till 1959 just after independence (Bortier-Verstraaten, 2002). This venture started through the collaboration of the Ghanaian Government with Star Kist International (USA) in order to conduct a survey on tuna stocks in the Gulf of Guinea (Mensah, 2010). It was established that there was significant tuna resource to begin an economically profitable capture industry (Mensah, 2010; Kwadjosse, 2009). The industry didn't really take off until the 70's and 80's while at the same time infrastructure, docks and processing facilities were built which put the harbour of Tema at the forefront of tuna production for the whole East Atlantic (Hammond, 1977). Today canned tuna is Ghana's most important non-traditional export and the production of the industry has increased over 100% since the late 80's (Bortier-Verstraaten, 2002).

1.1.1 Problem Statement

Industrialized fishing such as tuna fishing is usually dominated by a small number of foreign corporations so fishing control will be concentrated amongst them and hence also the benefits (Kent, 1986). These benefits, linked directly and indirectly to industrial fishing, are normally inaccessible to developing populations. This economic marginalization is clearly seen in fishery-dependent developing countries, Ghana is an example of this type of country. The new increased fishing capacities, advanced technologies and larger modernized fleets may lead to greater wealth and substantial benefits for national economies and investors. However, industrial fishing, so far, has only deepened the imbalance between world catch and consumption (Kent, 1986). Asymmetries in capabilities maintain asymmetries in benefits.

The global tuna fishery today is a multi billion dollar business and, as a result, the simultaneous focus of many large-scale industrial fishing exploits and conservation efforts. It takes place in developed and developing countries EEZs (Exclusive Economic Zone), thus there is a difference in the ability to implement fishing legislation for the protection of tuna stocks. West Africa is an example of a developing region with major tuna stocks and the presence of large industrial tuna fleets. By understanding, intricately, how a tuna fisheries works and who is really in control, the ability for legislation to directly target the illegalities is made possible. Knowing where exactly the lack of ability to implement regulations exists allows policies to be more efficient and relevant. It can also highlight the dependency of regions on fishing industries and promote the more even spread of revenue where it is needed most.

1.1.2 Overall Research Question

How does a globally import industrial fisheries function in terms of procedures and practices, governance and finance and what kind of *socioeconomic influences can it have on a developing country?

**Socioeconomics: The Social Science that studies how economic activity affects social processes. Social processes consist of interactions between individuals and groups that include co-operation and conflict, social differentiation and integration, development, arrest and decay (Gillin, Gillin & Ginsberg, 2012).*

1.1.3 Research Aims

1. To describe the Ghanaian tuna industry and look at the revenue flow from production to export and retail.

2. To identify the links with the highest values and establish those with the most control over the industry in Ghana.

3. To understand the socioeconomic dynamics affecting the Ghanaian tuna fisheries.

4. To discern how Governance works within the Ghanaian tuna industry.

5. To investigate where value addition and upgrading are needed the most to promote economic stability.

1.1.4 Format of the Thesis

The thesis is split into five chapters. Chapter One is the introduction to the theme, the study question, the problem statement and the aims. Chapter Two consists of a small chapter on the concept of the value chain and the Value Chain Analysis. Chapter Three is the methodology; research methods, data manipulation, statistical analysis and financial calculations are all described here in detail. Chapter Four is the value chain; it contains a value chain map and a description of the value chain from fishing to retail. This chapter also has extra information on Governance, important actors, unofficial dynamics and revenue distribution. The final chapter, Chapter Five, holds the discussion, the limitations, the recommendations and the conclusion. The discussion tries to follow the value chain from production through processing to export and finally looks at the governance and illegality issues. In the appendix are images, tables and graphs that supplement a better understanding of the Ghanaian tuna value chain.

Chapter 2.

2.1 Theory

A Value Chain can be considered the linkage of all steps in production, processing and distribution of a product together, allowing the evaluation of each step in relation to the previous and succeeding steps (Russel & Hanoomanjee, 2012). The value chain isn't necessarily straight, it has vertical relationships as the product moves through different processing stages and it has various horizontal relationships as the product passes to multiple markets (Hempel, 2010). An important concept is that no matter its direction, all decisions made at one step have consequences thereafter (Hempel, 2010). Upstream activities produce inputs for the core activities in a chain i.e. equipment supplies and research organizations. Downstream activities on the other hand deal with the products from the core activities i.e. harvesting, processing and shipping (Hempel, 2010). People who take part in the value chain are called players or actors, each actor or group of actors, perform a unique role in the value chain (NiMble, 2005). The international and national enabling environments of the value chain include legislation, laws, trade agreements, policies and infrastructures. These environments allow the product to move through the value chain (Hellin and Meijer, 2006). Institutions, associations and businesses that assist a value chain and increase its efficiency are known as supporting organisations (Hellin and Meijer, 2006).

The concept of a Value Chain first came into existence with Michael Porter in 1985 in his book *'Competitive Advantage: Creating and Sustaining Superior Performance',* he identifies 5 main links in a general Value Chain (Porter, 1985):

1. Inbound logistics: the receiving and storing of raw materials and their distribution to manufacturers/primary processing

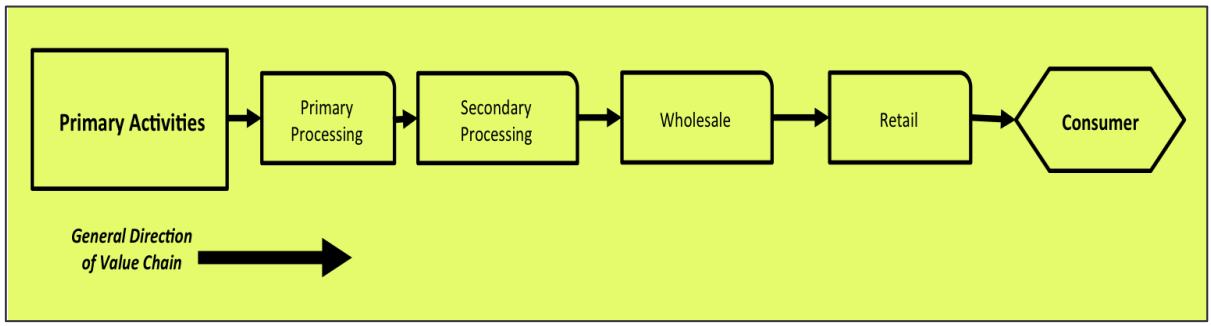
2. Operations: the process of transforming inputs into finished products and services, primary & secondary processing

3. Outbound logistics: the warehousing and distribution of finished goods

4. Marketing and sales: the identification of customer needs and the generation of sales

5. Service: the support of customers after the products and services are sold to them

Value chains can be mapped and analyzed further using a Value Chain Analysis (VCA). Scheme 2.1 is an example of a value chain map and therefore a VCA. It is a simplified map that shows the usual activities taking place along a commodity chain. A VCA provides a systematic and analytical tool to understand the processes at work in an industry or system and highlight the costs at each stage of the system or chain (Russel & Hanoomanjee, 2012). A detailed understanding of an industry can be gained from an economically directed study such as the VCA. Constraints and major issues can be uncovered and a general overview of the revenue flow from production to retail can be identified. The VCA can be applied descriptively where the purpose is to characterize a process from start to finish and allocate cost proportions or as a model in more analytical studies (Porter, 1985). It is ultimately a diagnostic tool that can help design projects and programs to provide support for a value chain. The aim is in achieving a certain development outcome, this can be purely business related, like reducing processing costs in a company or it can be for social development, for example identifying where value addition is needed in a developing region's agricultural value chain.



Scheme 2.1: Simple value chain map showing the general stages of the chain and the direction the product takes. Source: This study.

A VCA can be qualitative through the use of interviews, desk reviews, participant observation and group discussions (M4P, 2008). Qualitative VCA's aim to characterize a process from start to finish. A VCA can also be used quantitatively if the researcher works with the data or carries out calculations along the chain (M4P, 2008). This type of analysis can be done with the use of questionnaires, surveys and statistical tests. Eventually the VCA can be used as an analytical model, however the scope of the VCA depends on the time and the data available. A VCA should really start out quantitatively to allow a good understanding of the industry or business to be grasped (M4P, 2008). A combination is recommended if time and funds permit, the qualitative side will let researchers understand the real-world complexity of the industry and any unofficial dynamics going on. While the qualitative approach allows the identification of weak links, high value links and big players.

The VCA can easily be applied to a fishing industry and has been done so in many cases already (Antwi-Asare and Abbey, 2011; Hempel, 2010; Mkama *et al*, 2010, Nyeko, 2004). All the studies are relatively recent suggesting this method is quite a new phenomenon in fisheries science. The VCA can be used to look at multiple aspects of the marine sector and fisheries, both artisanal and industrial, and aquaculture (Russel and Hanoomanjee, 2012). One species or multiple species can be followed through the commodity chain, a single village, a whole region or an entire country can be used as the framework. The VCA is now popularly used in fisheries value chains in developing countries to study value addition. Value addition is an important concept as it promotes better profit, more stable market conditions, job opportunities, product diversification and greater economic benefits where they are most needed (Russel and Hanoomanjee, 2012). VCAs have the potential to allow researchers to fully understand a commodity chain and hence identify realistic opportunities for consequential income or profit increases.

When the value chain is mapped certain aspects of it can be further analyzed; one of these is the spread of revenue through the chain. Looking at prices and costs can show researches how much actors earn, spend and sometimes lose in their businesses. Studying the finances at each step in the value chain allows a picture to be created of where the earnings, losses and costs are distributed. Some important concepts in understanding revenue distribution studies include the total cost, the purchase price the selling price, the profit, the margin and the added cost.

•The total cost is the production or processing costs that a company will spend producing their commodity.

•The purchase price is what the company pays for the product that they will process, trade or retail. For producers the purchase price is equal to the total cost as they do not buy the raw product but harvest it.

•The selling price is how much the company sells their product for to the next link in the value chain.

•The profit is the difference between the price the company sells their product for and the cost it took them to produce it. Profit= Selling Price- Total Cost.

•The margin is the portion or percentage of the final selling price that is profit, a high margin reflects high profitability. Margin= Selling Price - Purchase Price.

•Added cost is how much it cost a company to buy or produce a product. It reflects the effort of chain actors to add value to the final product. Added Cost= Total Cost- Purchasing Price.

(Chuong, 2011)

Chapter 3.

3.1 Methodology

3.1.1 Outline

The value chain was used as the framework upon which data collection was based. The data targeted for collection aimed to fill in the commodity chain at each step. The industrial tuna value chain takes place domestically in Ghana mainly in Tema, Greater Accra Region. All the tuna vessels land their catches in the Tema Fishing Harbour and all the tuna companies and processors are located in this area. The Ministerial offices that are directly in charge of the tuna activities are also in Tema. Down the coastline towards Cote D'Ivoire is the port of Sekondi-Takoradi where imports of tuna can be made. In the capital Accra all the Ministries and Governmental offices are located as well as international organizations like the FAO. A map of the Ghanaian coastline where the domestic value chain takes place can be found in the appendix (Image 1.A).

In total 31 companies, organizations and ministries were visited in Ghana over a three-month period. Interviews were carried out with willing participants (25+) and questionnaires were completed where possible (23). Data was requested when appropriate which included tuna landings, company accounts and tuna prices. In table 1.A in the appendix a list of all the organizations, ministries and companies that the principal researcher visited can be found.

3.1.2 Data Collection

The value chain was compiled using both primary and secondary data collection techniques. Primary techniques were carried out in the form of in-depth interviews, questionnaires and observations A thorough desk review of the current literature acted as a secondary collection method along with the data requests to the organizations and bodies. The results are comprised of only information picked up in field.

Questionnaires and Interviews

An example of a questionnaire used for the tuna fishing companies can be located in the appendix. The questionnaire was split into six sections; 1. General Tone, 2. Fishing and Processing Activities, 3. Rules and Regulations, 4. Links and Actors, 5. Upgrading and

Improvements and 6. Revenue flow. Empirical data was also requested from the appropriate respondents, an example of a request to a tuna company can be seen at the end of the questionnaire in the appendix. There were three categories of respondents; Governmental (5), Private (15) and Non-Governmental (3). The questions were designed as close-ended questions with importance scales and various choices. Soon after beginning the research the questionnaire had to be redesigned so more open-ended questions could be included. A sample size of at least fifty respondents, evenly spread through each category was initially planned, but once in the field it was found that this was not practical for logistical reasons. Analysis then became difficult as there was such a small sample number and the data was now mixed (nominal and ordinal). At this point the questionnaire results were nominated as secondary data and used only as a support to the value chain. The analysis was done by designating each answer with a letter and so making it a category. The open-ended answers were analysed by calculating the percentage of answers in each category. Means and sample standard deviations (SD) were calculated for the importance scales to understand the spread of the data and hence if answers were uniform or not, the percentage frequency for each answer category was also calculated.

Interviews were designed individually before each meeting so the optimum amount of information could be obtained from the individual without causing difficulty or taking excessive time. They were drawn-up as assistance to the questionnaire or in place of the questionnaire when it could not be taken, as a way to get extra information and personal stories. More than often each meeting would start out as an interview until the respondent felt comfortable enough to answer the questionnaire. Questions in the interview included: Could you describe the Ghanaian tuna value chain? How long have you been in the industry? How did you get into the industry? How has it changed since then? What do you think about the current EU ban issue? What do you think about the tuna stock health here? Are you making fewer landings than before?

Questions changed tremendously depending on who was the interviewee. If an inappropriate question was asked the interview could end prematurely without a questionnaire or data. Normally only general questions were asked to try and prompt the individual into talking about themselves and their place in the value chain.

Empirical Data

The following data was collected to try and put together a quantitative side to the value chain. All the data given by the tuna companies and processors of costs and prices are from 2012 or the first quarter of 2013.

From Tuna Companies:

-Sales prices of each tuna species to processors.

-Sales prices of each tuna species as bulk export per month.

-Sales prices of each tuna species to local market per month.

-Tonnes of each species of tuna landed per trip.

-Tonnes of each species that go to the processors per trip.

-Tonnes of each species that are exported as bulk per trip.

-Tonnes of each species that go to the local market per trip.

-Cost of Fishing: cost per trip divided between all of the different categories i.e. Ghanaian salaries, Korean Salaries, Provisions, Oil, Fuel, Spare parts, Certifications, Harbour bills.

-General accounts of running a tuna company.

From the Processors:

-Purchase Price of tuna from the companies per ton.

-Annual sales records.

-Accounts summary for one working year.

-Production Cost: the different costs that go into making a tuna product i.e. packaging, ingredients, utilities, salaries, labeling.

-Sales Price of tuna to the Ghanaian or foreign retailers.

From the Government:

-Tuna landings records, for different species and by the different type of vessels.

-Tuna imports and exports, in weights and values

-List of active tuna vessels and information about them (Lengths, tonnages, year built)

The aim of analysing this type of data was to show how the tuna and the revenue move through value chain in the units of US Dollars and Metric Tons (MT) of tuna live weight. US Dollars were chosen as it is a universally accepted currency for trade all around the world. MT of tuna product were converted to live weight so that the units would be the same from landing to export. In this way a more accurate description of tuna quantity could be made at each step in the value chain. All currency conversions were done with exchange rates from "United States dollar (USD) and Ghanaian Cedi (GHS) Exchange Rate History" at 'freecurrencyrates.com' or 'xrates.com'. All data treatment was carried out in Excel 2010 for Mac; data files were compiled here also from the empirical data offered in interviews or in hardcopy form.

3.1.3. Statistical Analysis

All the empirical data used for the statistical tests was continuous ratio type. The graphs of the data were finalized for presentation in Excel 2010. Simple line graphs were put together to visualize trends in the data over the time period. Monthly and annual data were summarized to show different patterns. The annual data often depicted a clearer trend over a longer time period and for this reason was graphed in conjunction with the monthly, more detailed, data. Descriptive statistics were added when appropriate to show the spread and variability in the dataset from the average values; Means and SDs were inserted. For the data on prices, MT and values (US$) population SDs were computed; all the information was represented in the data and only these datasets were of interest.

Simple statistical correlations were carried out in R to analyse the empirical data. The 'R-Project' or R programme is part of the GNU project developed for free sharing software (R, 2008). All the variables were tested for normality using Normal Probability plots in conjunction with the Shapiro Wilk Test. To back up any uncertainties the 'Shapiro.test' function was employed. This type of normality test works well for both small sample sizes (<50) and large sizes, up to 2,000 (Laerd Statistics, 2013). The sample sizes in the empirical data ranged from under 50 to over 1,500, for this reason the Shaprio Wilk test was chosen.

The statistical significance of correlation between variables (with approximately normal distribution) was evaluated through the p-value of the Pearson's Product Moment Correlation. When the variables were not normally distributed and did not appear to have a linear relationship a Kendall Tau-B Rank Correlation was used. This test was chosen because it is less sensitive to tied pairs than Spearman's Rank Correlation Test (R-tutorial, 2013). The

test statistic 'Tau' can be interpreted that same as the Pearson's statistic, the only difference being the changes are not linear. Statistical significance was taken with p-value <0.0025 (Two tailed test, α=0.05)

3.1.4 Conversion Factors

In fisheries, conversion factors are used to convert the weight of a fish at one stage in the production chain or commodity chain to its weight at another stage (FAO, 2013[1]). There are two types of conversion factors used today in fisheries statistics, one to convert landed weight to live weight and the other to convert product weight to live weight (FAO; 2013[1], 1986). This study is not interested in specific weights of tuna when caught at sea but in the movement of the tuna in large quantities through the commodity chain and the associated prices. Accordingly, the second type was used with the conversion factors available for tuna products. The factors were applied to the tuna product weight files. They included 20 conversion factors for all different types of tuna products; heads, eggs, loins, fillets, bellies, tails, cans, frozen bulk, fresh bulk, chilled bulk. They were collected from all available publications and reports online, Table 3.1 is a summary of all the sources used.

Conversion Factor Sources		
Source	***Publication***	***Title***
Cunningham, Restrepo and De la Serna, 2002	Collective Volume of Scientific Papers. ICCAT, 54(2): 527-530	Updated Estimates of Conversion Factors for Bluefin Tuna from Product Weight to Live Weight.
EMOFA, 2012	Metadata 2 - Data management, Annex 8.	Conversion factors by CN-8 codes from 2007 to 2012.
USDA, 1992	National Agricultural Statistics Service, Agricultural Handbook No. 697.	Weights, Measures, and Conversion Factors for Agricultural Commodities and Their Products.
FAO, 1990-2013	Coordinated Working Party on Fisheries Statistics	Handbook of Fishery Statistical Standards.
FAO, 1980	Fisheries Circular No.725, p. 217	Quantity conversion factors: Atlantic fish species - landed or product weight to live weight.
FAO, 2000	Fisheries Circular No. 847 Rev. 1, p. 176	Conversion Factors from Landed to Nominal Weight.

Table 3.1: A summary of the conversion factor sources that were used in this study; the reference, the publication and the title.

All the conversion factors were compiled into a spreadsheet for comparison. There were six conversion factors in the literature for canned tuna; for Skipjack, Yellowfin or any species of tuna. All six were used to make an average conversion factor (general factor) for the collected data; 1.95 (SD=0.256, 95% CI= 1.7416- 2.1517). Instead of just picking the most common conversion factor mentioned the research wanted to include all available data currently used. The CEPS dataset didn't always mention the species of tuna in the product so the general factor was applied to all values. The minimum and the maximum factors were applied to the product weights to see the different live weights given by using either the smallest, the average or the largest conversion factor. The difference from the average was then converted into percentage for clarity and understanding. The percentages were added to the results when appropriate to show the discrepancies. There were no available conversion factors for pouches online, in the literature or with the tuna processors themselves. The Ghanaian processors did not have specific conversion factors for any of their products, pouches or cans. The same conversion factor for cans was therefore used for the tuna pouches. The main brand that produces in Ghana (John West) regrettably could not provide this study with well-sourced conversion data. John West also advised that this type of information is considered confidential, therefore tuna processors are hesitant to give it out.

For tuna loins, tuna tail, tuna tail meat, tuna head, tuna belly meat and tuna eggs the conversions factors calculated by Cunningham, Restrepo and De la Serna (2002) for Bluefin tuna were used as there was none other applicable. The Bluefin tuna sampled in this study were between 68Kg and 193Kg GG (Gilled and Gutted) and were from aquaculture farms. The tuna products in our dataset may come from both the wild or aquaculture, again this is not mentioned by customs or as expected, from tuna retailers. Resultantly the best option was used which was to work with the only data available, that for the Bluefin tuna.

In this study quantities of frozen tuna, chilled tuna and fresh tuna were treated as the live weight (also known as Round Weight) of the tuna. All of the tuna is put into frozen storage when caught in Ghana (minimum -9°C) and will arrive to processing or trade in this condition.

3.1.5 Treated files

The file from Ghana Customs, Excise and Preventive Services (CEPS) contained all the monthly exports and imports of tuna products in Ghana from 2004 to March 2013. The net kilograms of the product weight, the type of product (can, fillet, whole), the CIF ('Cost

Insurance Freight') in Ghanaian Cedis and the FOB ('Free on Board') in Ghanaian Cedis were all supplied in the file. FOB is the selling price of the product not including the cost of shipping or insurance while the CIF is the price with them. The FOB was used in this study as it wasn't known if the Ghanaians were paying the CIF or not; freight and insurance can be paid by either the exporter or the importer depending on the trade agreement. Ghanaian Cedis were converted to US Dollars, the Kg of the products were converted to metric tons and finally the metric tons were transformed to the tons of tuna live weight. This was done using the conversion factors. The dataset supplied the relevant foreign exchange rate according to the time the product passed through the customs inspection points.

The different types of products in the CEPS file were able to be separated from each other by applying a filter to the dataset, tons and prices of bulk tuna, fillet tuna or canned tuna could be extracted. In this way the amount of different export types and the worth was calculated. The amount of tuna that was traded into the local market on an annual basis was estimated as the difference between the tuna landed and the tuna products exported i.e. the tuna that stayed in the country. The data on the landed tuna was from the file provided by the MFRD (Marine Fisheries Research Division). The MT and product value of the tuna sold by PFC, the Pioneer Food Cannery to Ghanaian supermarkets and shops was worked out from the CEPS data also. As PFC is situated in the freezone enclave any products they sell to Ghanaian retailers are treated as import into Ghana and taxed accordingly. Hence, the import dataset was filtered to show only products originating in Ghana. Myroc Food Processing exports 100% of their products and supplies no tuna products to Ghanaian retailers, therefore any Ghanaian tuna products are produced by PFC. The total tuna exported from both Myroc and PFC was calculated by adding the PFC imports to the product exports out of Ghana; bulk tuna was filtered from the data as they only export products.

The other file that had to be treated quite extensively was the production costs given to the study by Myroc. They gave this study a summary of the costs of making the individual cans and pouches in their range. The product net weights were given in grammes so these were converted to live weights. Table 3.2 is an example of some of the cost categories that go into making Myroc products. The cost per MT of live weight for each category was calculated with the conversion factors. By averaging all of the products a mean price of production for each category was retrieved. In these accounts were also the numbers of cartons that were exported and their unit prices for 2012. The converted weights were used to get an average live weight of tuna that was exported from Myroc, the unit prices were summed to give an export value.

Product Cost Analysis Summary: Myroc	
Products	Can, Pouch
Volumes (Grams)	200, 400, 800, 1705, 1880, 1400, 3100
Cost Structure Per Case	Fish cost, Ingredients, Direct Labour, Production Overheads
Packaging Cost	Cartons & Fitments, Cans & Ends, Pouches, Labels/Stickers, Tapes Glue, Total packaging
Totals	Direct Production Costs, Finance Cost, General & Administrative Expenses

Table 3.2: A synopsis of the production cost analysis Myroc supplied this study with; the categories to which costs are allocated are shown.

Tuna production data

The tuna landings at Tema, were taken from the file given to the study by MFRD, they did not need to be treated. The financial information about the companies was supplied by some of the companies themselves and then summarized by this study. Percentage values of each cost component were added to the results tables so a clearer idea of where the revenue is could be grasped. Six out of the ten fishing companies supplied this study with their annual 2012 average landings and total income from sales. The three largest companies were unable to partake in this study. An average of six trips a year where made by the companies so when the annual landing information was not offered the average trip tonnages and sales price were extrapolated accordingly. When total incomes were not given they were calculated using the average prices per MT to the local market, processors or to bulk export.

Price Data

The average price per MT sold to the local market was determined by averaging the 2012 monthly prices from one of the fishing companies. The monthly 2012 prices per MT for the different species (Skipjack, Black Skipjack and Yellowfin) and converted into US Dollars (1.82 Ghana Cedi= 1 US Dollar). Another company offered its monthly tuna prices from 2006 till 2012 to bulk export so an average price for 2012 was calculated from this. The mean price the processors paid for 2012 was averaged from the prices that PFC officially offered the tuna companies each month.

Retail Data

The average estimated retail prices of tuna products were computed for different categories; the Ghanaian produced tuna cans sold in Ghana, the Ghanaian cans sold on the foreign market and the imported tuna cans sold in Ghana. As many products as possible were chosen for each category to get the most accurate price per MT. Ninety-five Ghanaian produced tuna cans were viewed in European supermarkets, either online or directly in store. Nineteen Ghanaian produced tuna cans were reviewed in the stores and supermarkets around Tema and Accra. Twenty-two imported tuna cans were surveyed in store in Ghana. Pouched products were not included in the revenue analysis as they were processed further outside Ghana and these costs were unknown. Also, the majority of the products were canned in the local stores. Pouched products were only located in the large modern super market Shoprite in Accra Mall. The net weights were converted to live weights with the conversion factors and alongside the unit prices were used to calculate the price per MT of live weight. The average price per MT for each type of product was used as a rough estimate for the comparison of retail prices between the Ghanaian tuna products abroad, Ghanaian tuna products in Ghana and imported foreign tuna.

Revenue Distribution Calculations

Total costs for fishing are actual values taken from the accounts of a company with both a purse seiner (Length Over All LOA: 60m) and a Baitboat (LOA: 54.9m). The cost of fishing in US Dollars per MT was worked out by using the average baitboat and purse seiner tonnages that companies have been landing over the past year (2012-2013). A minimum average of 170MT and a maximum average of 300MT have been landed by the baitboats of contributing companies (7). The minimum average landed by purse seiners was 400MT with a maximum if 600MT (3 companies). Minimum and maximum fishing costs were added in using the smallest and largest tons landed that were quoted by the companies, this gives an idea of how costs change per trip.

Average selling prices of the companies to the Ghanaian processors and as bulk export were calculated from the monthly prices as mentioned earlier in 'Price Data'. The presumption is made that Myroc will pay similar prices as PFC, this was also suggested in interviews. As only three companies admitted to exporting their tuna to foreign processors these prices are the best indicators of what they would charge. They can change according to the customer but

no other companies provided bulk export prices. The values calculated for each step in production (Production Costs, Selling Prices and Profits) are presented with the maximum and minimum values from the calculations so the image of the revenue distribution is as clear as possible. The minimum and maximum values are the minimum and maximum prices quoted to this study for each customer.

Total processing costs for Myroc and PFC were calculated using the Myroc accounts and including the average price per MT paid for tuna to the companies. In this way PFC was able to be included as the accounts are actual values from the Myroc processing plant. The cost that Myroc paid per MT for tuna was recorded in the moment the accounts were compiled, therefore to have a more general idea of the processing costs over the entire year the average price paid by PFC was added. The maximum and minimum total costs for processing were calculated by applying the smallest and largest conversion factors to the myroc accounts in conjunction with the most and least expensive tuna purchase price. In this way the more cost heavy and least cost heavy production prices could be identified.

The purchasing price of the retailers was calculated by analysing the CEPS files. The MT of products sold to export for 2012 were filtered from the dataset, each product unit weight was divided into its metric tons of live weight. In this way the price per MT of live weight was given for each exported tuna unit. The maximum and minimum conversion factors were applied and the price per MT was calculated for them also. An average of the tuna price sold to export was then calculated from the 2012 data. The purchasing price by the Ghanaian retailers was calculated in the same way and similar results were issued, hence the average was taken as a representative of the price data. Selling prices were calculated as stated earlier in the retail data description.

The revenue distribution through the margin was worked out for a typical sized tuna can (180g net weight). The absolute values for each of the pathways at retail were averaged to get just one price per MT for production, processing and retail. The conversion factor for live weight was removed from the values and the price per 180g of product weight was computed.

Chapter 4. Results

4.1 Current Climate

This short section introduces current aspects of the Ghanaian tuna sector and presents the general views of stakeholders and civil workers today.

At the start of the study period, in mid March 2013, the European Union (EU) were reported to have banned or at least recommended the refusal of all processed and bulk tuna products being imported from Ghana (Joy Online Ghana, 2013; Undercurrent News Ghana, 2013[1,2]). It is unclear if there was a full ban occurring or that the EU had advised their retailers and wholesalers not to receive tuna products from Ghana. The EU also identified other countries in West Africa, such as Senegal, Cote D'Ivoire and Cape Verde, from which tuna exports were controversial. The reason for the confusion over the Ghanaian and West African tuna products was the illegalities in the tuna fleets' fishing activities. The EU has strict regulations against illegal, unreported and unregulated fishing (IUU) regarding seafood products. Ghana and other West African countries export tuna products to this market, the EU is Ghana's largest tuna market. IUU had been reported just before the start of the study in January 2013. The tuna company Panofi had been illegally fishing with its purse seiner the F/V Panofi Discoverer, accompanied by its two Reefers, inside the EEZ of Liberia. The Liberian authorities became aware and detected the fishing activities as well as illegal transhipment activities. They fined the company 500,000 US $ for the three vessels. It is not clear whether it was this incident that brought the attention of the EU to Ghana or other related IUU activities within the fleet.

As a result of the IUU issue multiple meetings and committees were set up between stakeholders and Governmental members to try and bring light to the EU's allegations. Myroc, the tuna processing plant, ceased production for at least three months over the study period. Containers of bulk export where sent back from the EU to the companies (e.g. Spain) while some EU countries, such as Portugal, still received Ghanaian tuna products. On the seventh of August 2013 it was reported that the Ghanaian tuna fishing companies will have to pay a 3.1 million US Dollar fine for IUU (Daily Graphic, 2013).

There was an on-going awareness amongst the people with whom this study contacted that the industry is significant for the country. When asked how important they thought the

Ghanaian tuna industry was over 95% of questionnaire respondents decided it was seven out of ten and above on the importance scale, where one was unimportant (Mean score= 8.61, SD= 1.64, n=23). Therefore the general feeling amongst the stakeholders and the Government is that the tuna business is important for Ghana as a country and for it's economy; it provides jobs, GDP (Gross Domestic Product) and fish for the local market.

4.2 The Value Chain

4.2.1 An Introduction

A general map of the tuna pathways through the Ghanaian tuna industry is displayed in scheme 4.2. The path of the tuna and its direction can be seen in the black arrows. There are two value chains evident, the export orientated value chain and the local value chain. The longest value chain is the local market chain; for the purpose of the map this chain was shortened. There can be many more steps in the actual local value chain as the tuna is smoked, cut into many different pieces and traded between countless market women.

All the industrial tuna fishing activities are launched from Tema by baitboats (pole and liners) and purse seiners. At least 3,000 people are employed directly by the industrial tuna fisheries (ships crew, tuna company staff, cold store staff, processors staff and company customers). There can be other workers employed by the industry like the stevedores for sorting the tuna and workers for fixing the vessels, but they are not included in this estimate. Most tuna imported is landed at Tema though some may enter the country through the port at Sekondi-Takoradi; from the port it heads to the retail stage throughout Ghana.

The Value Chain Map (scheme 4.2.) indicates that the tuna moves from landing through the cold stores to the 'Big Mammies' (the entrepreneurial women in the local market) and the Ghanaian Processors (PFC and Myroc). It can either be directly exported as bulk tuna to foreign processors or retailers. This study does not follow the bulk tuna further than its' export stage. From the 'Big Mammies' it will go to different 'Fish Mammies' (local market women) for processing and trade before it ends up in the Ghanaian local market. PFC and Myroc will export it and sell it to Ghanaian or foreign retailers. Consequently, Ghanaian tuna products will end up on the foreign market all across the world or either back in Ghana after further processing.

Please see the second PDF on the CD which includes this Scheme

4.2.2 Step One

The Fleet

According to Ghanaian sources, Governmental and private, there are currently 37 active tuna fishing vessels, 19 baitboats and 16 purse seiners (as of April 2013). They vary from between 44 meters in length to 94 meters overall. 34 of these are Ghanaian flagged and fish directly from Tema, three of the vessels are from Belize but fish under an agreement with the company TTV (Tema Tuna Ventures). The Government of Belize and TTV have an access agreement, three tuna vessels from Belize can fish in Ghanaian EEZ and, in return, four TTV vessels will fish in Belizean EEZ. Belize pays TTV a small fee which helps them to gain access to Ghanaian fishing grounds. The Ghanaian company pays a fee to the Government of Belize to capture tuna in their EEZ. There are no official Governmental access agreements between Ghana and any other country that allows foreign fleets to fish for tuna in Ghanaian EEZ. The majority of the baitboats and purse seiners were built 30 or more years ago, many in Asia, some vessel models are not produced today. In the appendix table 2.A shows a description of the Ghanaian fleet; vessel and company names, tonnages, lengths and the years they were built. The fleet is continuously maintained with spare parts and refurbishment. They land the tuna in the Tema Fishing Harbour, they are obliged to do this unless decided otherwise with permission and supervision by the Fisheries Commission. Panofi own two carriers or reefers, which they use to directly export bulk frozen tuna.

The Crew

The Ghanaian Law states that at least 75% of the crew on the industrial vessels, the tuna vessels included, need to be Ghanaian citizens. The Ghanaians are the fishermen and, on a few, of the vessels they act as the 2nd Officers and 2nd Engineers. These Officers and Engineers are normally from the Regional Maritime University just outside of Tema. According to the interviews and questionnaires carried out by this study the Ghanaian crew can be employed either on a long-term contract, short-term contract (2-3 months) or by trip. It depends on the company in question. The Ghanaian tuna fishermen are usually from a traditional fishing family, but almost 40% of the questionnaire respondents agreed that they are mainly employed for their aptitude and skill, not through family inheritance or connection. The vessel owners will employ fishermen by normally inviting them for an interview. There is a certain location in the Tema Fishing Harbour where fishermen congregate and companies

can locate them here. Some companies referred to this as a 'labour pool' where there are always available fishermen. More than often, personnel in the companies may know some of the fishermen from previous tuna trips or employment. Certain fishermen can develop a reputation with the companies for being good workers or well skilled. All the fishermen have record books where they report all their experience; the tuna companies check these books during the meetings or interviews. If they do not have the qualifications or exact experience for catching tuna some companies will train them on the job. The Captain or Chief Officer will evaluate them after their first trip and advise the administrators. The fishermen usually need to be skilled in other activities on board such as metal work, net repair and carpentry. 52% of the questionnaire respondents concurred that the fishermen will not leave the tuna fishing industry till old age or retirement. Tuna fishing can be very strenuous, one of the companies suggests that fishermen retire at 50 for their health but fishermen tend to keep working until they are unable. Their positions can be filled very quickly filled by younger and more able fishermen. Companies admitted that the fishermen move between vessels and other companies, often attracted by better salary offers or other benefits. The fishermen customarily receive between 100 and 200 US Dollars per month or per trip (as of the 1st quarter 2013). This is the basic pay; on top of this they may receive a fishing bonus if break-even tonnage is exceeded. Bonuses are usually paid per metric ton above the break-even point, one of the companies pays the fishermen five US Dollars per metric ton. The fishing bonuses can fluctuate; a good tonnage can typically give a fisherman between 300 and 500 US Dollars depending on the company. The Ghanaian officers can earn up to 620 US Dollars bonus in one of the companies. Where on a contract the crew receive about 100 US Dollars after each trip as a landing allowance, the 2nd Officers and engineers can receive up to 300 US Dollars. If the Ghanaian crew help with the unloading of the tuna they will receive an incentive per metric ton of the catch (cargo work allowance), one company offers five US Dollars per ton they unload. All the Ghanaians are paid in Ghanaian Cedis and not in US Dollars.

The foreign nationals as crew are from Korea and occasionally China. They are always the Captains, Chief Officers, 1st Engineers, Bosans (on the Purse Seiners) and on the majority of the boats, the 2nd Officers and 2nd Engineers. These crew members make all decisions when at sea; where to fish, when to fish and when to turn back. Korea is a country with experience in large-scale industrial tuna fishing so there are available Captains and Officers skilled and trained to specifically operate tuna vessels. This is not the case for Ghana. There are Ghanaian Captains but none that have experience in tuna fishing. The tuna companies will have an agent working for them in Korea and China who will take care of

employment and logistics for the expatriates, some companies may even use the same agent. There are Korean and/or Chinese expatriates in the offices and cold stores as well as on the vessels. Over 40% of people surveyed did not know how the expatriates are employed, 8% of respondents were aware of the agents abroad. One Chinese accountant who was interviewed used to work as a rice farmer before being connected by a friend in the tuna business. Companies revealed that the Korean or Chinese workers were a tight nit community and stayed together in Tema, communicating often and connecting friends and family back home with the industry. It is this frequent interaction that allows the vessels to work together at sea. How long Koreans/Chinese stay in Tema is dependent mainly on the financial income. If landings start to drop some can leave their contracts to look for a better-paid profession. This happened to the tuna company Gafko, the Korean investor pulled out and returned to Korea in the late nineties as the company stopped breaking-even.

Korean crew get paid in US Dollars and at higher rates than the Ghanaians. They receive a baseline salary of between 1,000 and 5,000 US Dollars per month, depending on their rank. According to the account of one company Captains can earn up to 5,000 US Dollars per month, followed by the Chief engineer with as much as 4,000 a month. The Chief Officer, 2nd Engineer, 2nd Officer and Bosan earn between 1,000 and 2,000 US$ on a monthly basis. Fishing bonuses can be quite high for the expatriates. One tuna company's accounts showed that, per ton landed over break-even, Captains earn 50 US Dollars, Chief Engineers 30 US Dollars and Chief Officers, 2nd Engineers, 2nd Officers and Bosans 15 US Dollars. Koreans, on a good fishing trip can earn in and around 10,000 US Dollars, conditional on their position. Landing allowances for Captains after each trip can be 1,000 US Dollars followed by 500 Dollars for Chief Engineers, the rest of the Korean crew receive about 300 Dollars. A summary of all the salaries as of late 2012-early 2013 can be seen in table 4.3.

Crew Salary Ranges per Trip/Month (US $)			
Crew Member	**Baseline Salary**	**Fishing Bonus per MT**	**Landing Allowance**
Captain	2,000-5,000	50	± 1,000
Chief Engineer	1,500-4,000	30	± 500
Chief Officer	1,300-2,000	15	± 300
2nd Engineer	1,000-2,000	15	± 300
2nd Officer	1,000-2,000	15	± 300
Bosan (PS)	1,000-2,000	15	± 300
Fishermen	100-200	5	± 100

Table 4.3: A Summary of the crew salaries on board a Ghanaian tuna vessel. The baseline salaries, the fishing bonuses and the landing allowances are shown in this table. The fishing bonus is per ton of tuna landed while the baseline and the landing allowance are per trip, or sometimes per month. All values are in US Dollars (April 2013).

Industrial Tuna Fishing Companies

In the industrial tuna fishing sector there are ten tuna fishing companies that are currently active in Ghana, according to this study's research there. This investigation was in direct contact with all of the companies, with the accountants, directors and operational managers. The companies are as follows:

- Afko Fisherieis Co. LTD.
- Agnespark Fisheries LTD.
- Clear Skies Fishing Co. LTD.
- G-L Fisheries LTD.
- Panofi Co. LTD.
- World marine Co. LTD.
- D-H Fisheries, Co., LTD.
- Rico Fisheries LTD.
- Trust Allied LTD.
- TTV LTD. (Tema Tuna Ventures)

Each company was set up as a joint venture with a Ghanaian and Korean counterpart, and one with a Ghanaian, Korean and French counterpart. Only one company, Clear Skies, is entirely a Ghanaian enterprise. All ten companies interact at the meetings of the Ghana Tuna Association (GTA), they meet to discuss sustainability, current regulations and the long-term

future of the industry. Seven respondents referred to the association as a place of interaction during the questionnaires.

Currently the biggest companies are Panofi and TTV, followed by Clear Skies. There is a strong competition between Panofi and TTV to emerge as the leading tuna fishing company. TTV was, in the past, the largest company. Each of these companies is linked or will be linked to a cannery. TTV is a sister company of PFC both of which are part of MW Brands. This large seafood company produces the brands John West, Petite Navire, Mareblu and Parmentier. The MW Company itself is owned by Thai Union Group/ Thai Union Frozen Products from Thailand, whom specializes in all types of seafood products around the world. Panofi is soon to be the sister company of a large new cannery called Cosmos which will be opening in Tema within the next couple of years. This cannery is being built on the site of the old cannery, Gafco, which went under in 2007, apparently due to the lack of tuna landings in Tema. Gafco also had a sister tuna company which was partly owned by the present day director of Panofi. Clearskies is the sister company of Myroc, both of which have no Korean ownership involved. None of the other companies are linked to the processors.

Table 4.4 shows what is involved for a company to run one purse seiner for an entire year. It was contributed by a tuna company and covers the 2012 accounts. By examining the percentage contribution each expenditure category makes to the annual costs, the huge allowance needed for oil and fuel stands out. It contributed almost 50% to the entire annual expenditures for this company in 2012. Fishing gear is the next largest contributor to the costs, the rest of the 17 other categories represent only 25% of the budget. Other companies who contributed their accounts showed that for one purse seiner over ten million US Dollars can be spent per annum. The three largest companies have up to seven purse seiners each, this highlights the heavy financing involved in tuna production.

Annual Purse Seiner Running Costs 2012		
Expenditure	**Cost (US $)**	**%**
Oil/Fuel	3,779,600	48.7%
Fishing Gear	2,016,900	26%
Provision Fees	600,000	7.7%
Salaries	541,267.96	6.9%
Docking	200,000	2.6%
Full Catching Allowance	200,000	2.6%
Fishing Bonus	150,000	1.9%
Landing allowance	76,000	1%
Administrative overhead	60,000	0.8%
Ship Certificates/Licenses	49,800	0.6%
Insurance	44,402	0.6%
Air tickets	28,333	0.4%
Medical expenses	20,000	0.3%
Cargo Work	14,560	0.2%
Logistics	11,000	0.1%
Agency fee for expats	10,000	0.1%
Engine spare parts	10,000	0.1%
Cargo Work Allowance	10,000	0.1%
Harbour Bills	4,430	0.1%
Grand total	***7,766,292.96***	***100%***

Table 4.4: An example of the costs of running a tuna purse seiner during 2012, supplied by one of the tuna companies. These accounts include non-fishing related activities also. All values are in US Dollars (April, 2013).

Fishing Activities

Tuna production takes place all year round, however the peak period when the best landings are made is between February and June. During the off-peak period tuna vessels can land as little as 10% of their net tonnage. Depending on the type of vessel, the fleets spend between 30 and 45 days at sea locating and fishing the tuna. They usually have to turn back because of the cost of fuel consumption. An average of six trips a year is made by the companies per vessel, though some can make up to eight. The turn-around period can be anywhere between ten days and one month, depending if the vessel needs repairs or not. The longer the turn-around period the more the profit per trip is reduced, one of the major aims of the tuna companies is to have a short turn around period. Bamboo FADs (Fish Aggregating Device) are used by both types of vessels. Images of these are located in the appendix (image 2.A and 3.A). In 2011 there was 1,500 FADs being used by the Ghanaian industrial tuna fleet. Vessels can fish together at sea, there is more than often communication between baitboats and purse seiners. It usually occurs when there is a large aggregation of tuna and fish surrounding a FAD. Baitboats have a limited capacity, when they attract more than enough tuna for their catch or if they want help with fishing they will communicate with a purse seiner. The purse seiner can easily surround the entire school of tuna and capture it. They use smaller boats (two) which they launch into the water to pull the nets together, these are operated by skilled Bosans. The catch is usually divided at sea, the purse seiner will pass a certain tonnage of tuna to the baitboat. This is decided between the captains. Normally, if the majority of the tuna are small the purse seiners will give more to the baitboats, however, if the tuna are bigger they will take the larger tonnage. Apparently this is due to the requirement by the Ghanaian processors for larger sized tuna. Many of the purse seiners are linked to the processors so will need to land tuna of greater sizes. When the large purse seine is still in the water with the tuna inside a smaller purse seine will be used to scoop the tuna directly out of the water to pass to the baitboat. A metal tray is usually mounted between the two vessels and the tuna are slid over on this. An image of this process taking place can be seen in the appendix in image 4.A.

Tuna fishing is a cost heavy production, table 4.5 is the trip-based accounts of a tuna company in 2012. The costs shown are the minimum needed to run either type of vessel per trip. Once vessels are docked in Tema there are many other types of costs involved in the fisheries.

Production Costs Per Trip 2012 US$				
Expenditure	**Costs Purse-Seine US$**	**%**	**Costs Baitboat US$**	**%**
Vessel Fuel & Lubricant	289,685.6	80.9%	195,109.9	69.1%
Salaries	30,607.66	6.3%	40,123.66	9.0%
Vessel Parts Supplies	8,791.2	2.5%	24,725.3	8.8%
Fishing Bonus	7,967.0	2.2%	14,835.2	5.3%
Crew Food & Provisions	8,428.6	2.4%	10,912.1	3.9%
Preservative Materials	5,604.4	1.6%	2,442.3	0.9%
Docking Expenses (Certification)	4,890.1	1.4%	4,065.9	1.4%
Port Dues	4,922.5	1.4%	2,318.7	0.8%
Fishing License	3,281.3	0.9%	1,137.9	0.4%
Oxygen & Gases	1,005.5	0.3%	802.2	0.3%
Cleaning & Sanitation	714.3	0.2%	522.0	0.2%
Grand total	**357,931.18**	**100%**	**282,159.88**	**100%**

Table 4.5: The trip costs of a baitboat and a purse seiner of one of the tuna companies for 2012. Only fishing related activates are included for these accounts. The values are in US Dollars (April 2013).

In the production of tuna fuels, oils and lubricants constitute 60-80% of the trip costs. The costs of fuel for a trip can decide the profit margin. In table 4.5 it can be seen that running a purse seiner is more cost heavy as more fuel is needed. However, more of the trip budget is spent on salaries, spare parts, bonuses and crew supplies for the baitboat. After the fuel expenditure the next major cost for both vessels is either salaries or spare parts, depending on the trip. Salaries can represent a big portion of the production costs when a break-even tonnage or a full net tonnage is landed. If the vessel is old then spare parts can be more expensive, the example in table 4.5 indicates that the baitboat needed much more repairs than the purse seiner.

Landings

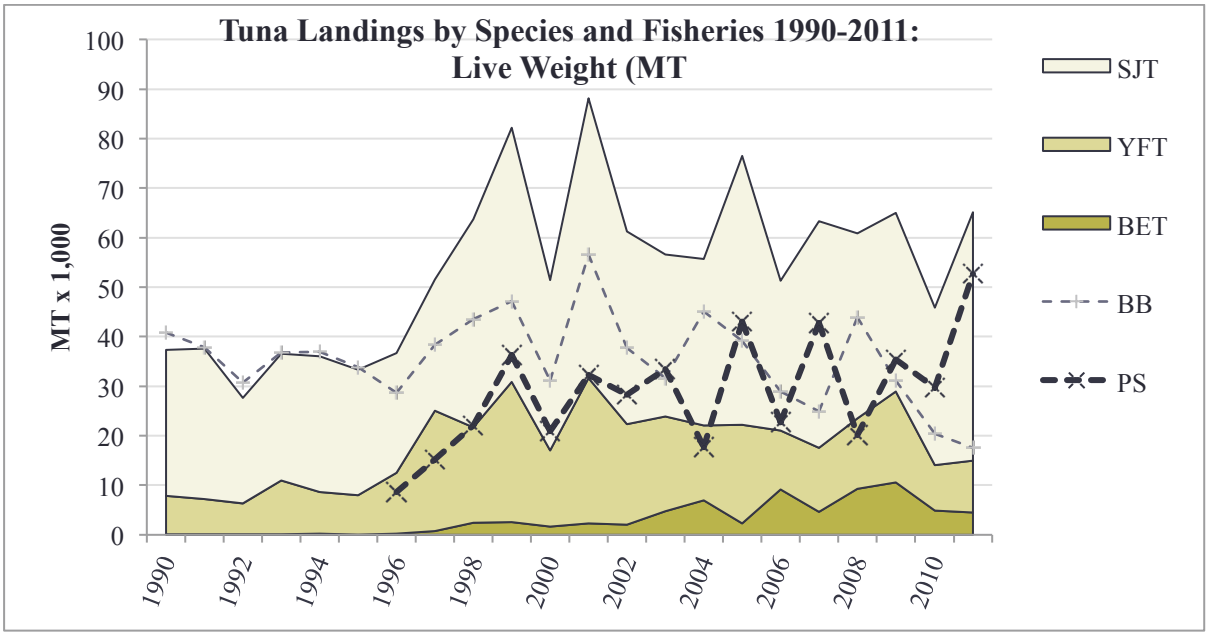
Landing the catch at Tema involves many different stakeholders and authorities. The main presence felt at the landing site is that of Ghana Standards Authority (GSA). Before a ship can offload any tuna the entire vessel needs to be inspected and then a discharge permit issued.

Also at the landing site to carry out other types of inspections and grant the needed permits are CEPS, Immigration and the Fisheries Commission (FC). The FC need to issue a catch certificate for the tuna, receive the logbooks (where vessel positions should be recorded) and produce a VMS (Vessel Monitoring System) report for the trip. All this documentation needs to accompany the tuna to the next step in the value chain. The tuna companies will always have representatives at the landings and when appropriate, a representative from either Myroc or PFC will be present. The tuna will usually be sorted at the landing site into scaws (large metal boxes which take approximately 225 to 227 Kg of tuna). An image of the discharging process and the empty scaws from a cold store in Tema can be seen in the appendix in images 5.A and 6.A. Hired stevedores normally carry out the sorting task at the harbour. They will come from an association of stevedores through which they can be hired. After one trip in 2013 a company spent 2,200 US Dollars in stevedore charges for sorting the catch of a baitboat and 3,500 US$ for their purse seiner. Sorting is done according to the lengths of the tuna and will be done by eye. In the cold stores they are sorted into species and size categories and the scaws are weighed. According to these measurements the companies are paid by the processors and the market women. If there is a space issue at the port side, which can often happen in Tema, then tuna won't be sorted until it reaches the cold stores.

There is an inconsistency in the tuna catch data for Ghana. This study analysed the tonnages of tuna landings from eight different sources, seven from Ghanaian governmental data and one from the FAO. The biggest deviation is the CEPS file, its reported landings are up to ten fold greater than all the other sources. After 2006 CEPS did not receive any data on the landings of Ghanaian tuna. An example of these differences can be seen in the appendix in graph 1.A. It is hard to make an accurate description of tuna landings in Ghana over a period of time or describe with veracity this part of the value chain.

The companies describe their catch over recent years as being comprised of between 65% and 90% Skipjack, 10-25% Yellowfin and the occasional tons of Black Skipjack. Graph 4.1 shows the tonnages of the three major species landed from 1990 till 2012 and the quantity caught by each of the fisheries; baitboats and purse seiners. The data from the MFRD was used to create this graph as it included the most information. Skipjack represents the largest quantity of tuna caught while the catches of Yellowfin and Bigeye have only been growing since the early nineties and late nineties respectively. Purse Seiners appeared as a fishery in 1996, previously baitboats were the only type of tuna fisheries. The baitboat fleet was the major tuna lander at least until the start of the 21st century. After this point a fluctuation between the landings of the fleets started to occur, from 2008 onwards the tonnages of the

purse seiners overtook that of the baitboats. It seems that in recent times the purse seiner fleet landed the majority of the tuna, their landings have been increasing moderately according to the correlation test (p=0.016, R=0.590). Baitboat catches, on the other hand, do not show any statistically significant increases or decreases over time. Bigeye tuna landings increase with respect to time (p-value = 0.0018, R=0.717), Yellowfin and Skipjack landings don't increase or decrease significantly. Nonetheless, Skipjack landings do increase decidedly as more purse seiner landings are made (p-value = 0.0009, R=0.744). None of the other species show any significant responses with respect to the purse seiner or baitboat tonnages. General landings when correlated with time show a significantly firm increase (p-value = 1.392e-06, R =0.783).



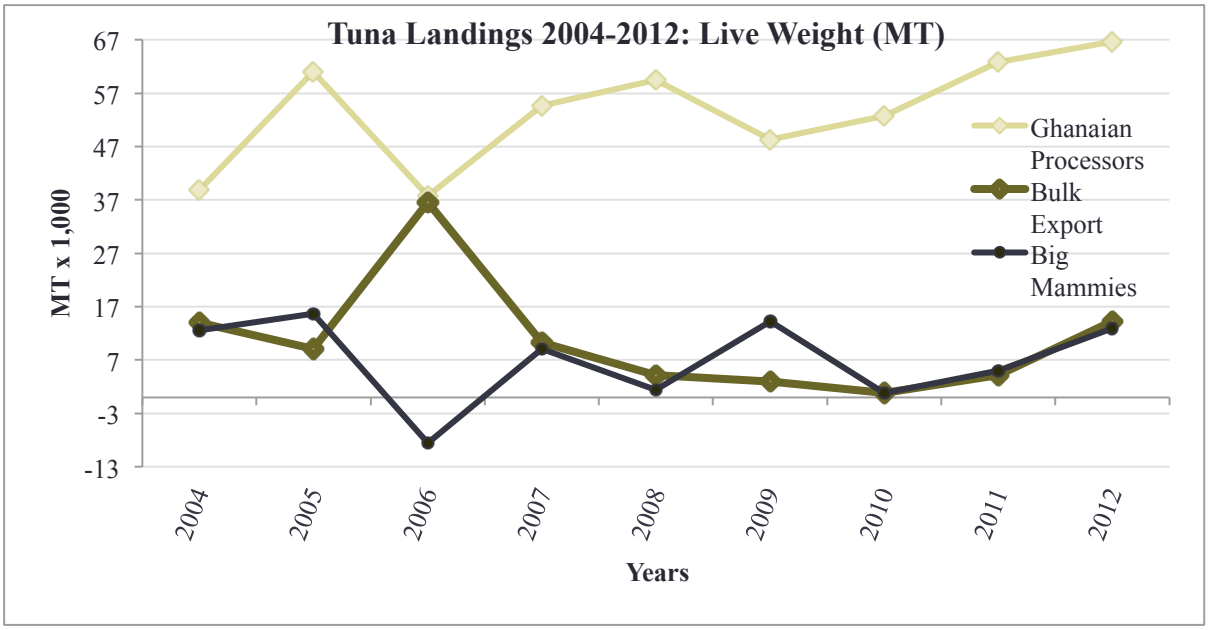
Graph 4.1: The landings in MT of tuna live weight per species; BET= Bigeye Tuna, SJT= Skipjack Tuna and YFT= Yellowfin Tuna. The landings are also shown per fisheries; BB= Baitboats and PS= Purse Seiners. The average MT landed since 1990 was 55,086.59 (SD: 18,593.61). n=27.

Table 4.6 shows the average tonnage that six of the tuna companies landed in 2012 and the value they were sold for in US Dollars. This indicates that six out of the ten companies landed just fifteen thousand tons of tuna in 2012, according to the Ministry of Fisheries and Aquaculture Development (MoFAD) 90,000MT were landed in total. This suggests that the three biggest companies (which are not included in the table), plus one other, landed the remaining 75,000 tons.

Company Sales 2012		
Company	**MT**	**US $**
1	3,020	7,328,373
2	1,898	3,415,356
3	1,873	3,308,286
4	1,620	2,987,550
5	3,600	6,617,520
6	3,300	6,055,005
Total	***15,311***	***29,712,090***

Table 4.6: The MT and value in US Dollars quoted to this study, or estimated from monthly quotes, of the tuna six of the companies landed and sold during 2012.

Tuna companies have three sales channels for their tuna once it's landed; sell it to the local market (Big Mammies); sell it to the local processors in Ghana or export it as bulk tuna to foreign processors. Whom they sell it to depends on the processing company (both PFC and Myroc have sister tuna companies), the price offered, pre-financing deals, foreign exchange and storage space. Graph 4.2 shows the annual amount of tuna that entered each pathway over a nine-year period. The graph indicates that when the tuna going to the processors and Big Mammies was low the tuna exported as bulk was higher (2006). The peak in the landings that went to the processors happened in 2005 followed the next year by the maximum drop in the supply. The supply of tuna to the Ghanaian processors seems to have increased slightly in the last two years, as this supply increased the bulk export decreased. The tuna going to the Ghanaian processors since 2004 however has not increased statistically significant (p-value = 0.072, R= 0.625). Over the time period there were no significant increase in the landings that went to the Big Mammies and to bulk export with respect to time (Bulk landings over time: p-value = 0.298, R= -0.391; Big Mammies' landings over time: p-value = 0.918, R= -0.040). There are no statistically significant interactions between the landing paths themselves. When the average conversion factor for cans and pouches is used on export files there is more exports than landings reported in 2006. This results in a negative value of tuna that went to the Big Mammies.



Graph 4.2: The quantity in the tuna paths over the last nine years in Ghana. The landings to the Big Mammies/ local market showed a max divergence from the mean conversion factor of +22.39% and -10.54 %. Ghanaian processor's landings showed a divergence of -21.6% to +9.7%. Bulk Export did not need a conversion factor to be applied. n=9.

The total quantity of tuna landed between 2004 and 2012, and how much goes where, is summarized from the CEPS files and MFRD landings data in table 4.7. Three values of landings for each pathway are given to highlight the change in MT caused by using the smallest, average and largest can conversion factors. As a result of using the factors the MT that goes to the Big Mammies and enters the local value chain changed quite dramatically. Nevertheless, the percentage of tuna that went to each destination over the last nine years did not change greatly. The Ghanaian processors, by far, received the most tuna. Between 60 and 82% of all the landings since 2004 has been purchased by them. The Big Mammies and foreign customers didn't receive more than 30% of the landings between them. On average they received just 24% (159,689.4 MT) of the Ghanaian tuna between 2004 and 2012.

Landings 2004-2012: Live Weight (MT)						
Destination	**Live Weight A (MT)**	**%**	**Live Weight B (MT)**	**%**	**Live Weight C (MT)**	**%**
Ghanaian Processors	482,409.95	76	395,366.8	60	547,401.51	82
Bulk Export	96,475.53	15	96,475.53	15	96,475.53	15
Big Mammies	63,213.87	9	163,339.48	25	25,045.33	3
Total	***633,736.16***	***100***	***655,181.81***	***100***	***668,922.37***	***100***

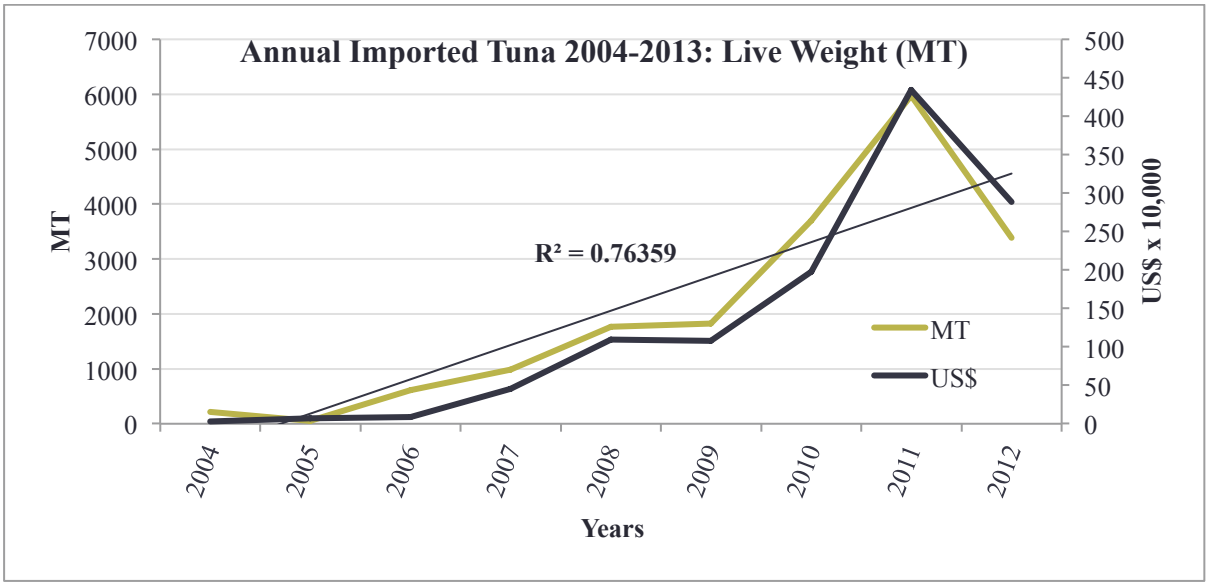
Table 4.7: The destination of the tuna landings and the estimated tonnage received according to the CEPS and MFRD files. Live Weight A: when the average CF is used, B is when the smallest CF is used and C is when the largest CF is applied. The percentage of tuna as well as the MT of the different possible live weights gone to each path over the nine years can be seen.

Imports

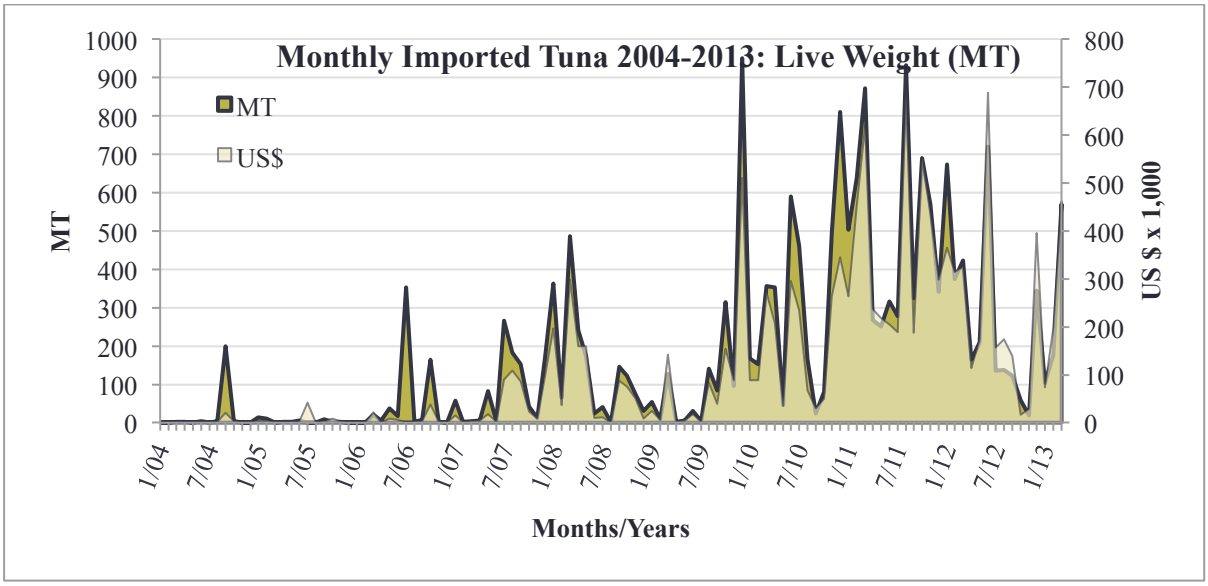
Imports of tuna enter the Ghanaian tuna value chain from the port at Tema or through the port of Sekondi-Takoradi. The majority of imports arrive already processed as canned tuna chunks, tuna flakes, tuna steaks and shredded tuna and occasionally frozen whole tuna enters the value chain. All the imports pass the Ghanaian CEPS officers who will input information into their electronic system. The tuna products entering Ghana from abroad have an import duty tax of 5%, this is established from their HS (Harmonized System) code. The Monitoring, Control and Surveillance (MCS) Division in Tema and Sekondi-Takoradi are responsible for monitoring all fish imports, including tuna, into Ghana.

According to the CEPS files, which were created at the ports between 2004 and 2013, the importation of tuna goods into Ghana has been increasing over time (graphs 4.3 and 4.4). Annual trends show a strong linear increase in both MT and value with time (p-value = 0.002, R =0.873; p-value = 0.0017, R=0.881). According to the R^2 value over 76% of the total variation in tons annually imported into Ghana can be explained by the linear relationship with time (R^2 = 0.76359). This suggests that time is a good predictor of tuna imported per annum into Ghana. The monthly imports (MT) changed sharply over the time period according to graph 4.4, but they correlate positively with time (p-value = 4.441e-16, R_{tau}=0.523). The value of the imports also correlate with time and with a slightly stronger relationship (p-value =< 2.2e-16, R_{tau}=0.588). The monthly and annual value of the tuna increases and decreases with the amount of tuna statistically significantly (p-value =< 2.2e-16, R_{tau}=0.836; p-value = 5.043e-06, R=0.978). In 2004 as little as 200 MT was imported over the entire year. However monthly exports started to rise and fall by late 2006. Almost 1,000 MT of tuna was imported during December 2009 alone. The annual trends show a peak in

import in 2011. The standard deviations of the data indicate the monthly and annual values as well as the monthly MT of import are very widely spread.



Graph 4.3: The annual MT and value in US Dollars of tuna imported into Ghana since 2004. The value is the price the Ghanaians have paid for the products as quoted to customs. The greatest annual divergence from the mean conversion factor = (-13.4%, +3.41). Mean MT: 2,058.64, SD: 1,845.41. Average value of imports= 1,336,192.994 US$ (SD= 1,400,843.08).n=9.



Graph 4.4: The monthly imports in MT and US Dollars of tuna into Ghana. US Dollars are the prices paid by the Ghanaian importers and quoted to customs. There is -25.8% to +6.6% maximum deviation from the average conversion factor once applied. The mean MT imported was 174.574, the SD was 229.98. The mean value of imports per month was 114,946.81, SD: 159982.51. n=111.

The tuna products come from all over the world into Ghana. Figure 4.1 represents the countries who contributed the majority of tuna imports over the time period (2004-2013). Thailand and Morocco clearly take the lead representing 55% of the imports between them.

The 'Others' category includes countries that imported under 85 metric tons over the nine years. In total, between 2004 and the start of 2013, 19,377.45 MT (-11.6% +3.05%) of imported tuna was registered by CEPS with a total value of approximately 12,759,019.43 US Dollars.

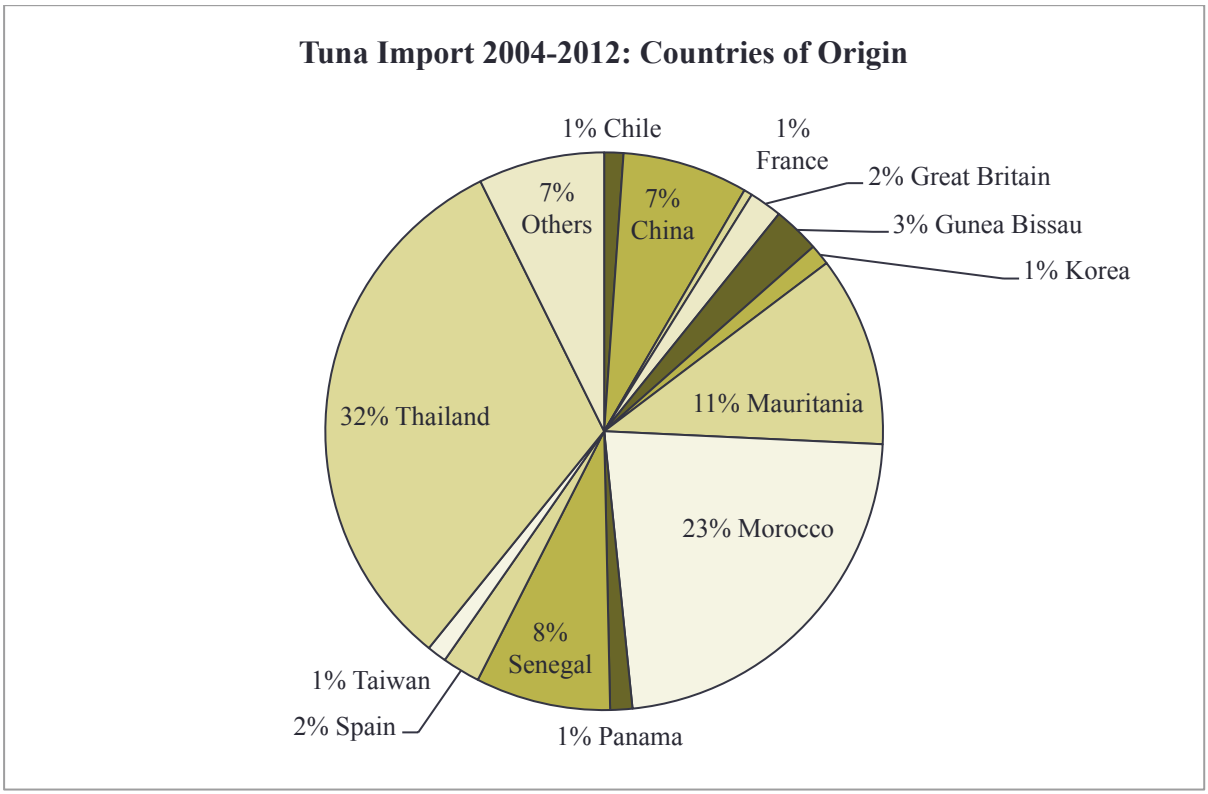


Figure 4.1: The origins of the tuna imports into Ghana between 2004 and 2012, Thailand dominates the import trade while Morocco holds the runner up position. 'Others' are countries that imported under 85 MT over the nine years.

4.2.3 Step Two

The Cold Stores

Before being processed, traded or exported as bulk product the tuna passes through cold stores. It emerged that only one company, Panofi, skips this step and directly export the Bulk tuna. The tuna after being sorted in the scaws will be brought on the back of a truck to one of five cold stores that are currently being used in Tema. PFC have their own cold store that is adjacent to their factory, they also are renting another cold store close by. Afko has their own cold store where all their tuna will be taken to before being traded. Mankoadze is the largest cold store and is not owned by a processing company or a fishing company. Myroc has a

coldstore also at the factory. According to investigations these are the only five cold stores active at the start of 2013.

At the cold stores the tuna are sorted according to species and weights. It costs companies 18 US Dollars per MT to weigh the tuna at Mankoadze, this is usually done while they are still in the scaws. If storage of the tuna is required at the coldstore it will cost another 18 US Dollars per MT of tuna. It is here at the different coldstores that the company's registered customers will come to receive their tuna, barter for prices and meet with their own customers.

4.2.4 Step Three

Processors

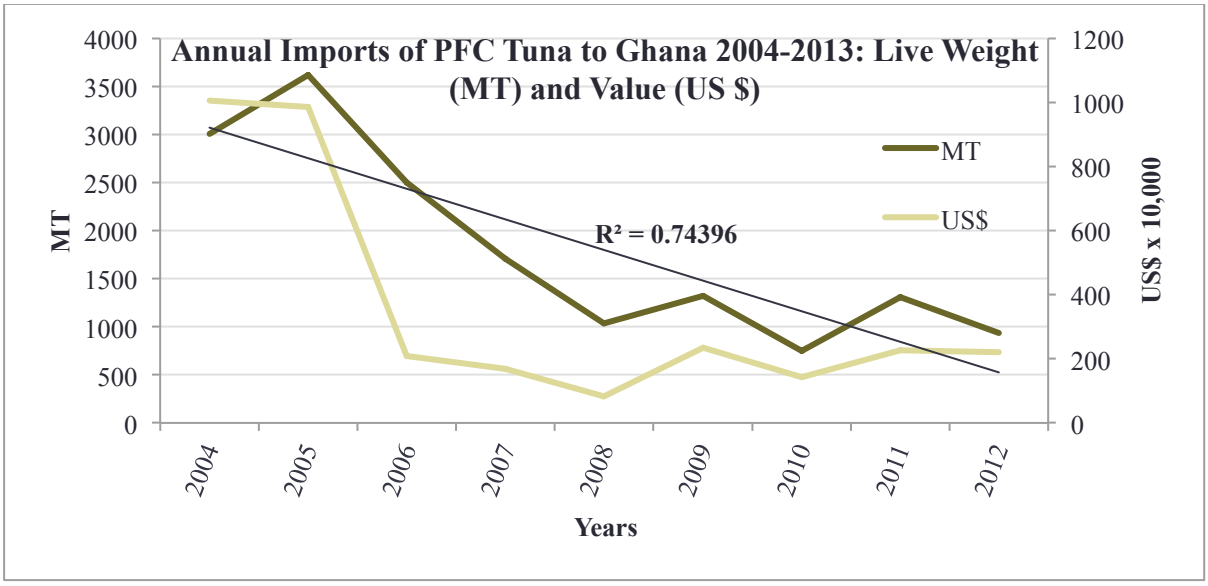
As of late there are two tuna processing plants in Ghana, Pioneer Food Cannery (PFC) and Myroc Food Processing Company Limited. Myroc began production in 2002 while PFC much earlier in 1972. PFC are the biggest processors with the capacity of processing 240 MT of tuna live weight a day. Myroc has a capacity of only 90 MT. In reality, during the first quarter of 2013 PFC has been producing approximately 200 tons a day and Myroc 40 tons a day. Myroc has experienced a decrease in production in the last four years, in 2005 they were producing 80 tons a day, close to their capacity. In 2012 Myroc produced only 12-13% of the exported processed tuna products; PFC exported the remaining 87-88%.

PFC currently employs 1,500 workers and Myroc 960. As both export to the EU they have to comply with stringent European food safety laws. These include regulations from the EFIC (European Food Inspection Services), the BRC (British Retail Consortium) and IFS (International Food Standards). According to the Operations Managers at both processing plants, GSA acts as a local extension of the EU regulating bodies. GSA will inspect the plants to see that standards are high and in turn the EU authorities will audit GSA. This will usually happen every two to three years, the auditors will inspect the processors, the vessels and go through GSA records.

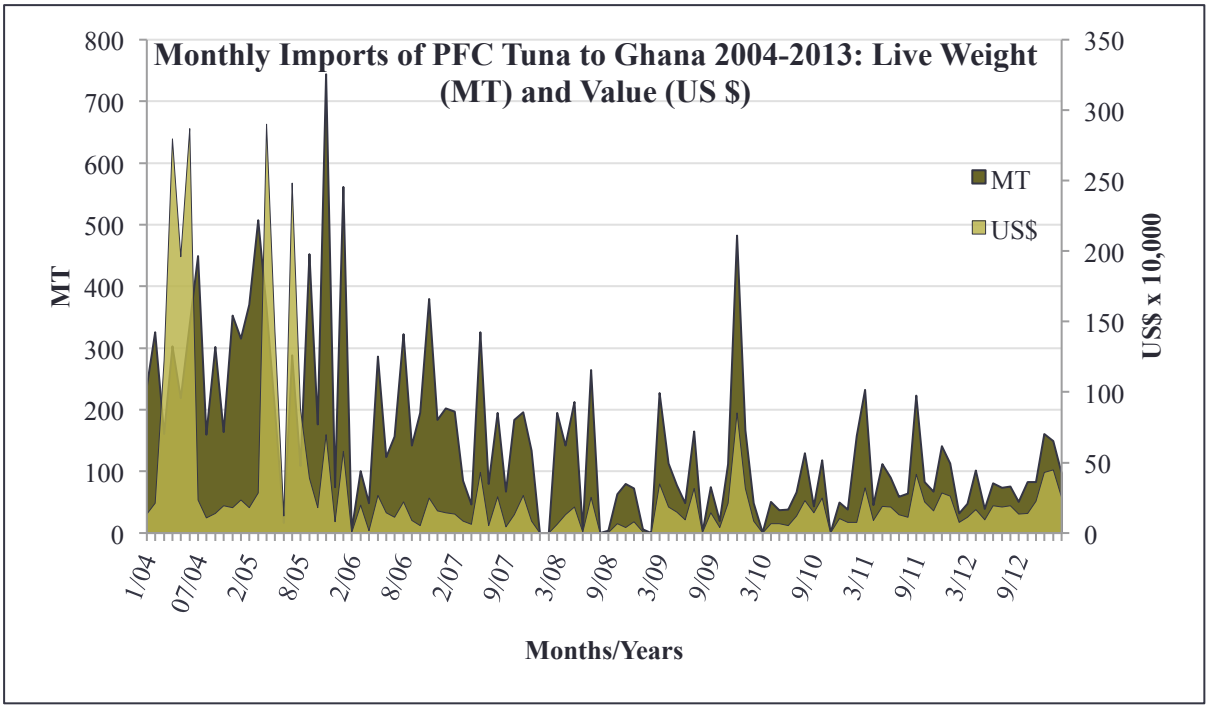
PFC process Skipjack, Yellowfin and Bigeye tuna, they do not process Black Skipjack or Bonito. Myroc only process Skipjack and Yellowfin tuna, both processors are restricted to using only larger size classes because of the EU requirements. Size classes are as follows: Yellowfin greater than 10Kg, Yellowfin 10Kg and under, Bigeye greater than 10Kg, Bigeye

10Kg and under, Skipjack above 3.4Kg, Skipjack above 1.8Kg, Skipjack below 1.8Kg and Skipjack below 1.5Kg.

Both processing plants are located in the Ghanaian freezone enclave. Myroc do not process any tuna for the local market and will export 100% of their products to the EU. PFC said they send approximately 3% of yearly productions to be sold in Ghana. The main brand that they import into Ghana is Starkist tuna. Graphs 4.5 and 4.6 visualize the quantity of tuna products that are sent to the Ghanaian market by PFC on a monthly and yearly basis. Annual trends show significantly decreased imports from PFC to Ghana between 2004 and 2012 (p-value = 0.003, R= -0.8625287), monthly data does not give any significant correlations. This annual decrease in tons can be predicted by time, 74.396% of the variation in the quantity of tuna can be estimated from the inverse linear relationship with time. MT and value correlate closely by month and by year (p-value =< 2.2e-16, R_{tau}=0.598; p-value = 0.0029, R=0.861). However, there are inconsistencies for part of 2004 and 2005. During these years it seems that on three occasions the tuna was worth more than the rest of the time period. The monthly values show a huge range in their distribution, indicating that they changed immensely from 2004 to 2012 (Mean= 302,658.059, SD= 550,117.91). In total, over the period PFC has sold 16,507.29 MT (-25.4% +6.9%) valued at 33,595,044.5 US Dollars to the Ghanaian market.



Graph 4.5: Annual Imports of tuna products from PFC into Ghana. The maximum divergence from the data when the average conversion factor is applied is -26.15% to +32.8%. The mean annual import to Ghana was 1,799.824 MT (SD: 953.17). Mean value of imported tuna: 3,641,914.368$, SD: 3,410,583.99. n=9.



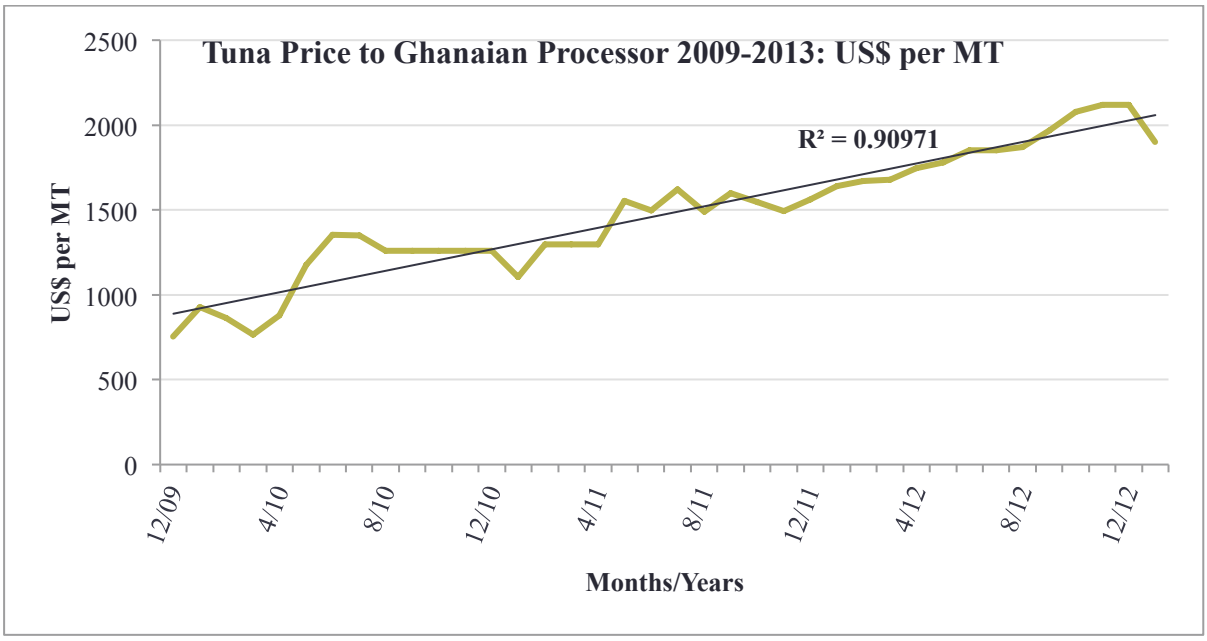
Graph 4.6: The monthly imports of tuna from PFC into Ghana, in MT and in value (US$). The maximum deviation from the dataset when the average canned conversion factor is used: -26.15% +18.2%. Mean MT per month= 148.7143216, SD= 136.43. Mean value paid by Ghanaian retailers per month= 302,658.059, SD= 550,117.91. n=111.

Prices to be paid by Myroc and PFC are put forward on a monthly basis by the processors themselves and also by a pricing committee. This committee consists of representatives from the various companies, the processors, the FC, GTA and a chairman. Yellowfin is worth more to the processors as it is usually larger and produces a better yield per can of tuna. Skipjack is the cheaper tuna as the sizes landed are usually smaller than the other species. Currently the Chairman of the pricing committee is Mr Paul Bannerman, the director of MFRD. The committee looks at the current prices of tuna per MT in the Seychelles, in Vigo and Abidjan, whom also are major tuna producing ports. There will then be a consultation and discussion over an appropriate price for the Ghanaian tuna. Graph 4.7 shows the monthly prices offered by PFC to the tuna companies per MT for the category of Skipjack +1.8Kg. They have been increasing very significantly since the end of 2009 (p-value =< 2.2e-16, R= 0.953).

This category is used as the reference to decide the prices of the other tuna species. The price data shows a small standard deviation so the data does not vary greatly from the mean price over the period (Mean price: 1,473.87, SD: 361.61).

According to Mr Bannerman the committee tries to delegate a fair price for the tuna companies to encourage them to sell the tuna in Ghana. If the prices are higher in other foreign tuna processing companies, like in Abidjan, the companies will land the tuna and then export it directly as bulk. Mr Bannerman also added that the committee will make deals with

the companies to try and get them to fill the quotas of Myroc and PFC. Permission is needed from the FC to export bulk tuna, the committee will offer the companies to first fill the quotas of the Ghanaian processors and then they can bulk export the rest from Ghana. According to over 65% of the questionnaires these prices change quite often. The reasons given were the world stock market and foreign exchange rates, the seasonality of tuna fishing, the buyers and international pricing and ultimately the trip costs (i.e. fuel and gas).



Graph 4.7: This series represents the SJ +1.8 category (Skipjack over 1.8 Kg), which is what the pricing committee uses to give guide monthly prices to the processors. Mean price: 1,473.87, SD: 361.61(units= US$/MT), n=27.

Myroc contributed their production costs and 2012 account summary to this study. The average costs of each category were converted to average price per MT and are displayed in table 4.8. It emerges here that the price of the raw material greatly outweighs all the other costs. The direct labour costs are relatively little, in fact packing costs more than the salaries. As the cost of labour is so high in the EU the tuna brands want all the packaging and labelling done in Ghana, the products are exported as 'shelf ready'. For the categories mentioned in table 4.8, it costs Myroc a rough average of 2,898.80 US$ to process one MT of tuna live weight. In 2012 the annual production costs for Myroc reached 22,679,528 US$ and they sold their products for 21,699,805.47 US$. This indicates they were at a loss of 979,722.53 US$ for 2012.

Production Cost Analysis for Myroc 2012		
Cost Components	**Cost per MT (US $)**	**%**
Tuna Cost	2168.31	75
Packaging Costs	312.77	11
Production Overhead Costs	204.98	7
General and Administrative Costs	164.24	6
Direct Labour Costs	34.92	.12
Ingredient Costs	1.65	.05
Total	***2,898.80* (-6.25% + 35.42%)**	***100***

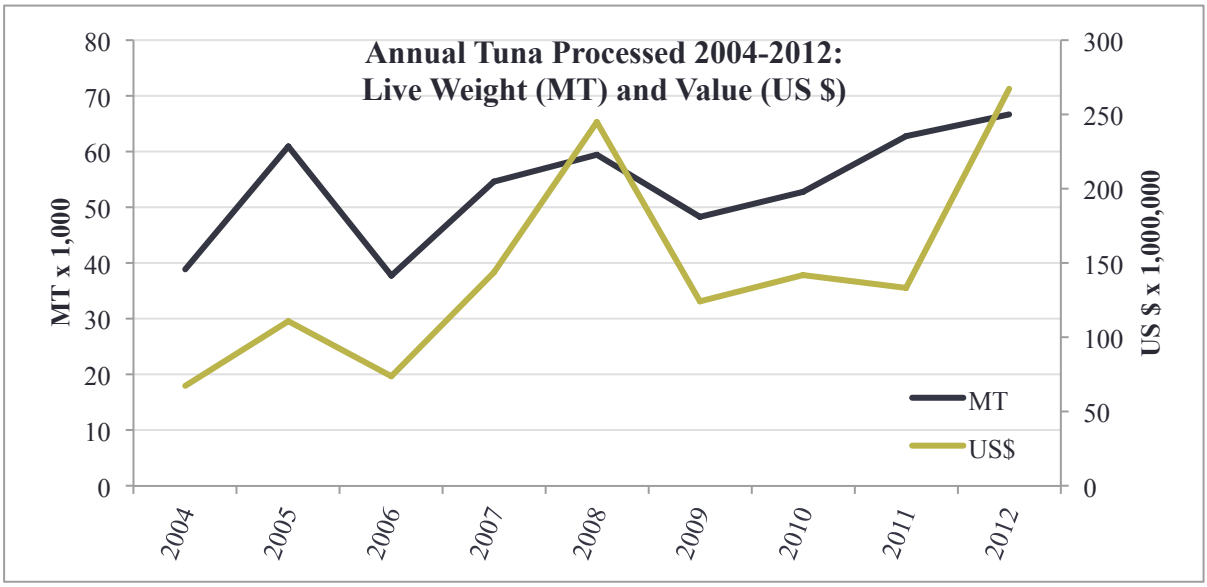
Table 4.8: A summary of the main production costs for Myroc duirng 2012, they were donated by the Accountant at Myroc and then converted into US Dollars per live weight by this study. The percentage discrepancy caused by the different CFs are shown for the total cost. Packaging Costs include cartons, cans, can ends, pouches, labels, stickers and glue. Tuna Costs do not include the offals. The Ingredient Costs include oils, gums, water or salt.

The main bulk of the workers that are on the factory floor and carry out the processing are required to have at least a Basic Education Certificate (BEC). The different aspects of the work they can usually learn on the job, but they need to be able to read the notices and regulations or sign and write in certain forms. These type of workers are usually women, 65% of PFC is comprised of women workers and in Myroc all of the tuna cleaners are women. The factory floor where these women work is open 24 hours a day. The women will work in six to eight hour shifts all through the clock. According to a Governmental Fisheries Officer, whom visited PFC, the factory floor is at very high temperature from the steam for tuna cleaning. Most workers will continue to work in the factories until retirement. There is a very low turn over rate among these employees; PFC has had some of the same workers for up to 20 years. Myroc has been open eleven years and nearly all the same workers are present since the start. Candidates interested in working with these companies usually have to apply through human resources and complete an interview and a medical. Both operations managers admitted that some candidates might get to this stage through a connection, somebody already working at the plant. But even so they are required to have some sort of specialization.

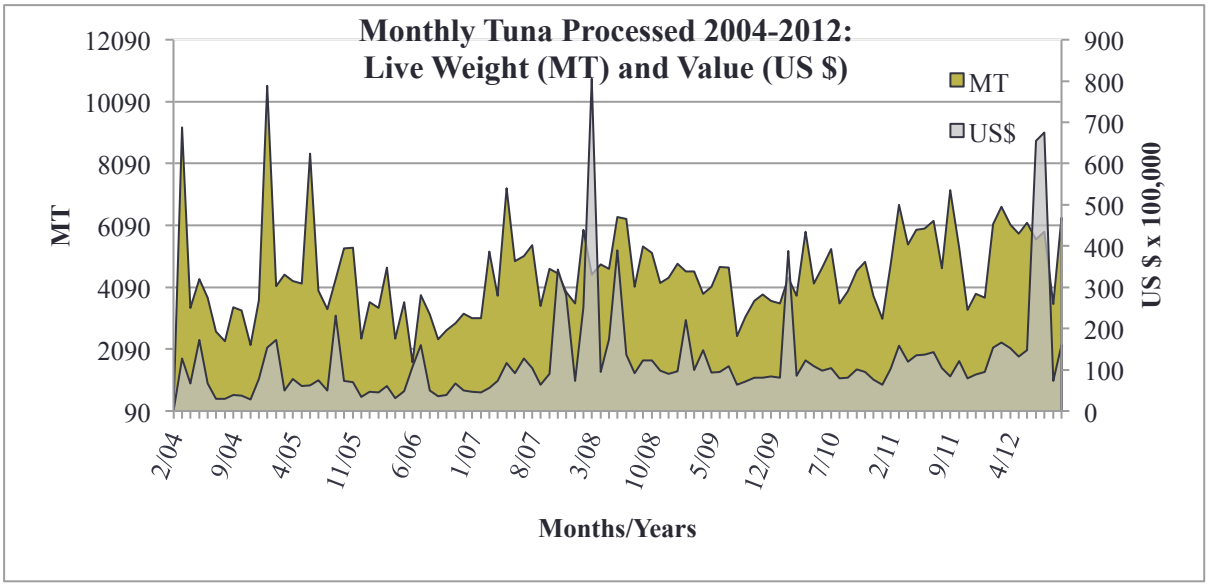
Graphs 4.8 and 4.9 show the annual and monthly tuna in MT of live weight and value in US$ that Myroc and PFC processed since 2004. The annual tuna in MT is not changing over time statistically significantly and neither is the value (MT: p-value = 0.072, r= 0.625; Value: p-value = 0.0617, R= 0.643). However they do show a strong significant linear relationship between each other (p-value = 0.013, R= 0.782). According to graph 4.9 the

amount of tuna processed by PFC and Myroc on a monthly basis suffered greater drops and peaks in production in the earlier years. There is a positive correlation between MT and time (p-value = 0.0008, R=0.316). This correlation exists with value over time also (p-value = 0.008, R=0.253). The value of the tuna sold by the two factories does not seem to correlate very strongly with the amount of tuna processed, there is however a positive monotonic relationship between them (p-value = 1.998e-15, R_{tau}=0.513). The relationship seems weakest when there was a peak in production in 2007 but no peak in prices. The value of the tuna sold by the processors looks highest in March 2008 when there is no actual peak in the MT of processed tuna. The standard deviations of the mean MTs and values do not show huge variation within the data. They indicate a narrower distribution than the data for other tuna paths i.e. PFC imports into Ghana. Perhaps a more steady supply reached the Ghanaian processors per month or annum.

To summarize, the total tuna gone through the processors in Tema from 2004 till the start of 2013 amounts to 509,216.04 MT (-22.3% +7.5%) with a net worth (selling price) of about 1,338,156,804 US Dollars.



Graph 4.8: The annual value and MT that went through the Ghanaian processors since 2004. The US$ is the selling price to the next stage in the value chain. The Ghanaian processors landings show a divergence of -21.6% +9.7% according to the applied conversion factors. Mean MT processed per year= 53,601.11, SD of the mean= 8,612.05. Mean US Dollars paid per year by the importers of Ghanaian tuna: 145,225,994.6 US$ (SD= 64,515,373.9). n=9.



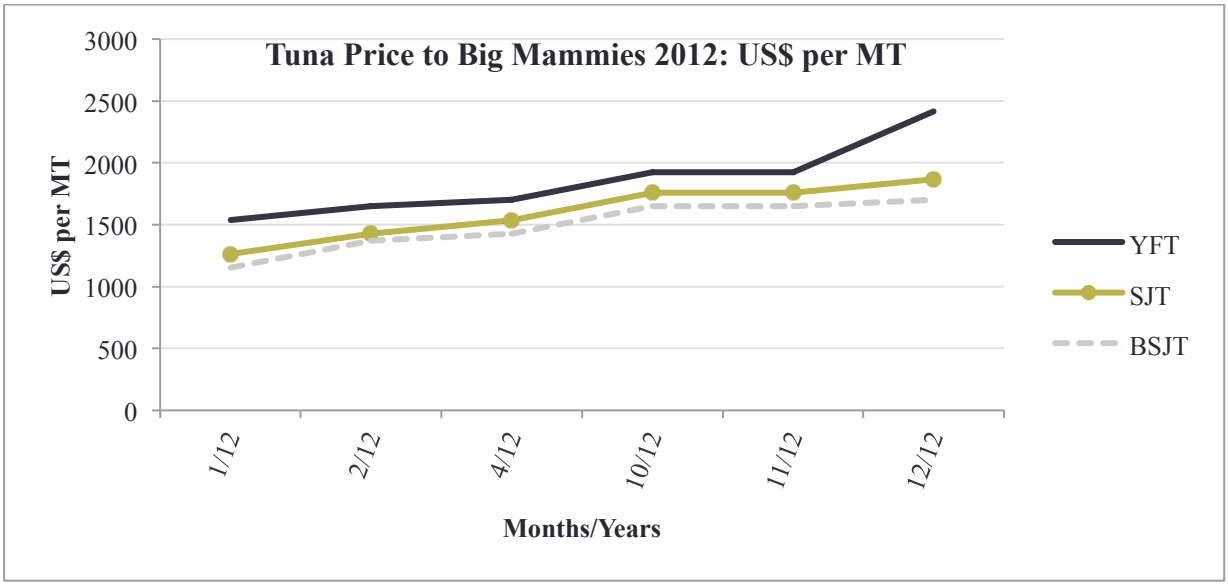
Graph 4.9: Monthly values and quantities of tuna being processed by PFC and Myroc over a nine year period. The max divergence from the average conversion factor throughout the dataset is -21.6% and +9.7%. Mean MT processed per month: 4,629.24, SD: 1,908.69. The mean US Dollars received by the processors on a monthly basis was 12,165,061.85$, SD: 11,912,030.79. n=110.

Big Mammies

Each company will have registered Ghanaian customers that sell the tuna to the local market. These customers are usually women and are known locally as the 'Big Mammies'. Companies can have over fourteen regular Big Mammies to which they can sell their fish. Big Mammies usually get into the tuna fishing industry at a young age through female inheritance, their husbands or other family members often have nothing to do with fisheries at all. They can come from all over Ghana, they will travel to Tema to the cold stores every month or less often depending on the tuna landings. Many of them are businesswomen with other ventures who have done well and or have large bank loans. They are of great importance to the tuna companies as they will pre-finance most trips. All transactions take place in Ghanaian Cedis. On many occasions the companies can sell between 50 and 100% of the landings to the Big Mammies. The Big Mammies sometimes offer better prices than the processors due to the demand for tuna in the local market or as they pre-financed a huge section of the trip. In other circumstances companies are in need of Ghanaian currency to pay salaries or certain ship supplies. Another reason that occurred during the study period was the advised ban on Ghanaian tuna import into Europe. Since it occurred some of the tuna companies had no choice but to sell 100% of their catch to the local market. The prices Big Mammies pay are therefore very dependent on the situation of the company and the tuna landings. 40% of

respondents agreed prices changed according to the supply and demand of the local Ghanaian market and another 40% said it was the seasonality of the fishing activities.

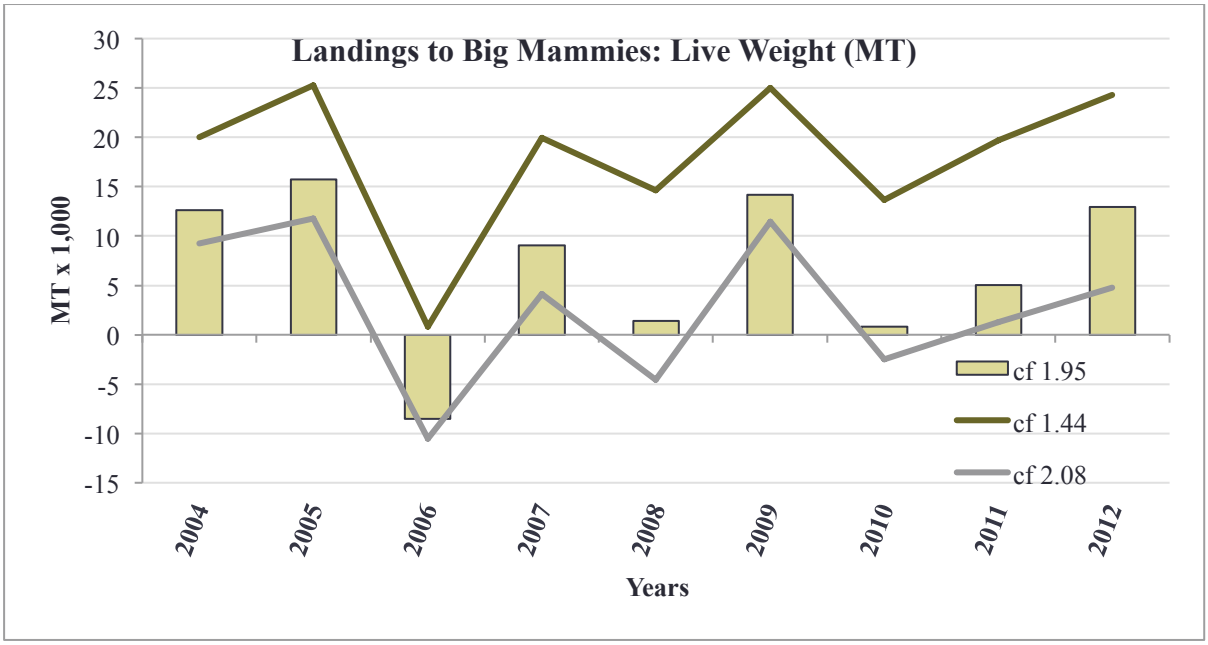
Graph 4.10 shows the prices the Big Mammies paid for Skipjack, Black Skipjack and Yellowfin tuna to one of the companies per trip in 2012. Yellowfin tuna prices have increased the most, from close to 1,500 US Dollars to almost 2,500 US Dollars in one year, a one thousand dollar increase. The Black Skipjack were the cheapest per MT. All three species advanced in price over the year 2012 and all do so linearly with statistical significance (Yellowfin p-value = 0.008, R=0.927; Skipjack p-value = 0.0008, R= 0.976; Black Skipjack p-value = 0.003, R =0.953). The mean price out of all the species during the period was 1,651.40US$, the standard deviation is small indicating the data points are close to the mean (SD= 288), there can be more certainty that the mean prices for 2012 are captured. The one Big Mammie, with whom this study had direct contact, received her tuna from one of the largest companies, TTV (with same owner as John West). She takes bank loans to contribute to the running of the TTV vessels. During the first quarter of 2013 she did not make more than 300 Ghanaian Cedi profit on selling her tuna (approx. 154.6US$).



Graph 4.10: The monthly prices per MT that Big Mammies paid per species over 2012. The Average Yellowfin tuna price per MT during 2012 was 1,858.97$, the SD was 313.56$. The Skipjack tuna prices showed an average of 1,386.447, a SD of 597.48. The Black Skipjack category shows a 2012 mean price of 1,492.634$, a SD of 212.565. n= 6.

The sum of the total tuna received by the Big Mammies in the past nine years fluctuates greatly depending on which can conversion factor is used in the dataset (minimum and maximum total; 25,045.3 and 163,339.5 MT). The differences in the annual data are much smaller, the tons of tuna that go to the mammies per year can increase a maximum of 22.39%

and decrease a maximum of 10.54%. From graph 4.11 the average tons that are traded by the Big Mammies can be seen, all three conversion factors were applied to the data. The annual amount the Big Mammies received changed quite dramatically over the past nine years. In 2006, 2008 and 2010 the Big Mammies experienced drops in their tuna supply. There was no statistically significant increase or decrease in landings over the years (p-value = 0.9176, R= -0.04). The mean (7,023.763MT) and the SD (7,559.0855MT) for this data demonstrates a high variability in the dataset, which can be seen in the graph, it also may show that more than nine years data is needed to accurately analyse the landings.

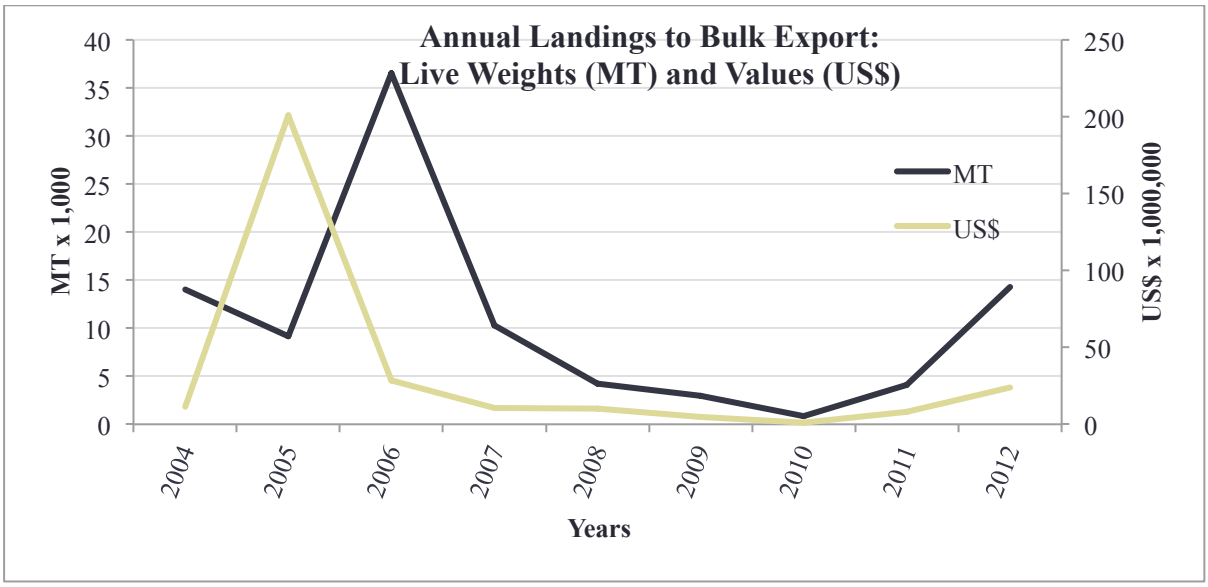


Graph 4.11: The landings in MT that went to the Big Mammies per year. The data with each of the three conversion factors is pictured here to actually visualize the percentage differences. 1.95 is the average CF (Conversion Factor) 1.44 this minimum and CF 2.08 is the maximum. The biggest divergence from the mean factor is +22.39% and -10.54 %, these changes can occur when the different conversion factors are used. The mean tonnage than went to the Big Mammies annually, according to the average conversion factor, was 7,023.763 MT, the SD was 7,559.086 MT. n=9.

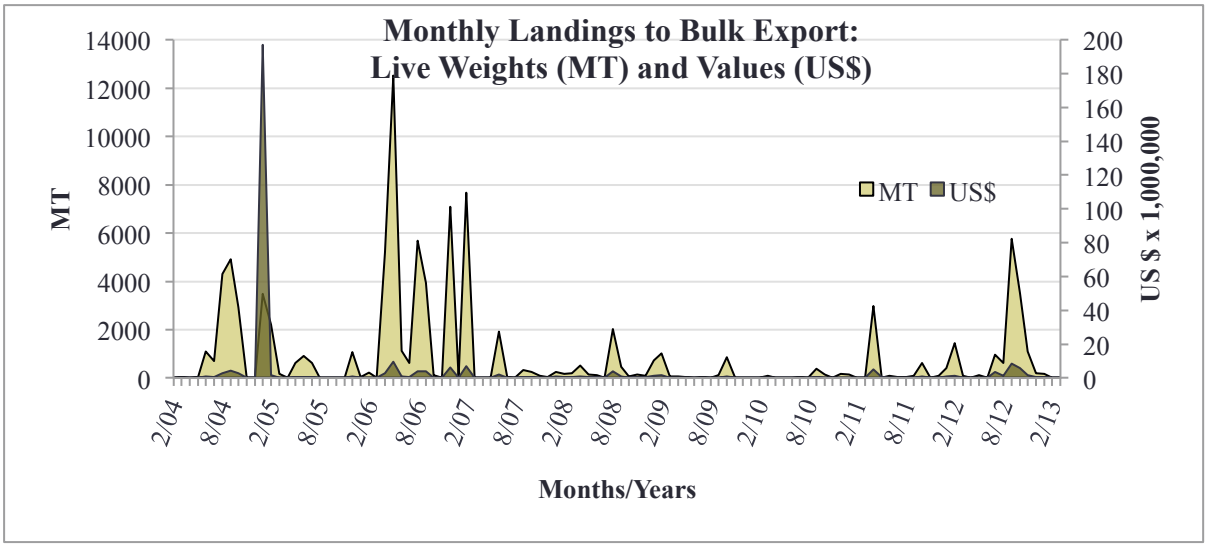
Non-Ghanaian Customers

The non-Ghanaian customers that buy the bulk tuna from Ghana are found worldwide. One company who bulk exports sends their tuna to Thailand, Ecuador, Portugal, Spain and France. This company is not qualified to sell to PFC, they do not meet certain standards. Companies can quite frequently bulk export to Cote D'Ivoire. The port of Abidjan has tuna processing plants just like Ghana and can sometimes offer better prices per MT. As Cote D'Ivoire is a neighbouring country, shipping costs will be low, this makes the processors in Abidjan big competitors for PFC and Myroc. Graphs 4.12 and 4.13 represent the monthly and annual MT

and value of the tuna that has been sold as bulk from Ghana since 2004. Neither MT nor value show statistical increases or decreases over the time period. In late 2004 the value of the selling prices peak much higher than the actual MT sold. In 2006 the most bulk tuna was sold to export, however this changed quite rapidly from month to month and is followed by a rapid fall in imports the next years. Values peak independent of MT in late 2004, for the rest of the time however they correlate positively with the quantity, both per month and annum (p-value= < 2.2e-16, R_{tau}= 0.857; p-value = 0.002, R_{tau} = 0.778). There are significant spikes and dips during 2006, one month over 12,000 MT was sold but the next month this dropped to less than 2,000 MT. From 2007 till late 2012 there were few bulk exports, nothing reaching close to 4,000 MT. In fact for most of these years there was no export over 2,000 MT. The values in US Dollars exported as bulk (Annual: Mean=33,300,284.26, SD= 59,885,852.2; Monthly: Mean=2,729,954.298, SD= 18,694,733.96) from the data graphed below, indicate highly skewed data; the monthly MT exported data is also highly variable about the mean (Mean= 878.58MT, SD= 1,909.9MT).

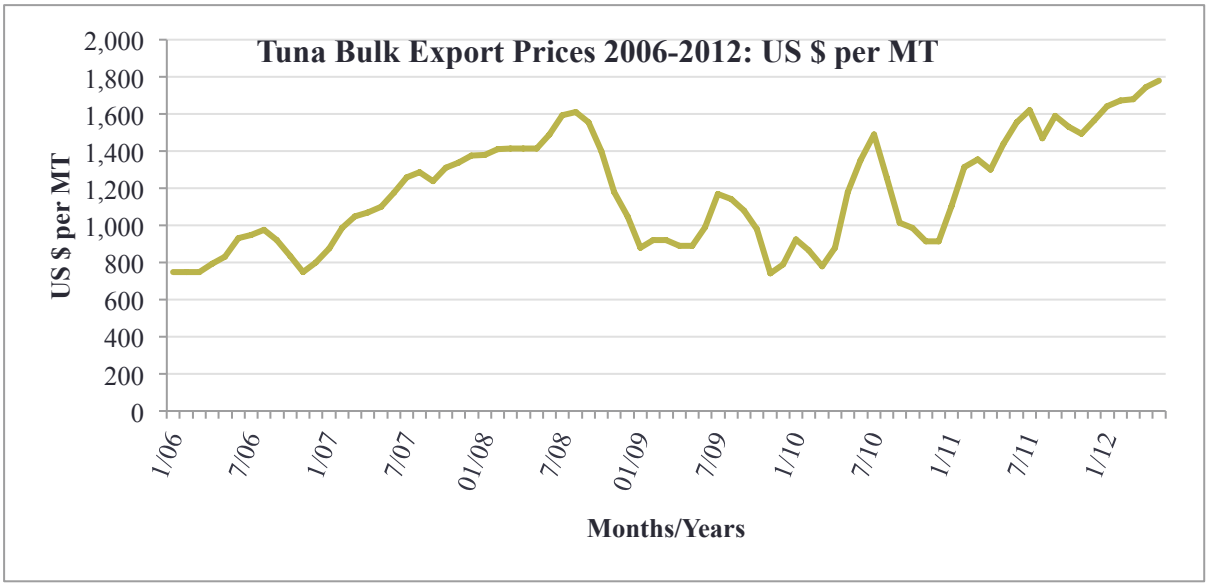


Graph 4.12: The annual data of metric tons exported as bulk tuna, there was an average export of 10,719.504 MT with a SD of 10,203.843. The mean value of the exports was 33,300,284.26$ with a SD of 59,885,852.2$. n=9.



Graph 4.13: The bulk tuna export from Ghana in MT and in value since 2004. The monthly bulk export in MT has a mean of 878.58 and a standard deviation of 1,909.9. The average monthly value received by the exporting tuna companies was 2,729,954.298$, SD: 18,694,733.96 .n=111.

One company offered this study their monthly average prices per MT for which they sold their tuna to export, these are represented in graph 4.14. The mean price over the period was 1,179$ while the standard deviation was 297.789. It is clear the tuna prices have been increasing over time, this increase is statistically significant (p-value = 5.307e-07, R =0.535). They peaked in late summer 2008 and then decreased rapidly after this, with some fluctuations, to a minimum at the start of 2010. From here they have again increased, though not linearly. The prices experienced another great peak in late 2010 followed by a drop a couple of months later. From this point they have been increasing without any great changes.



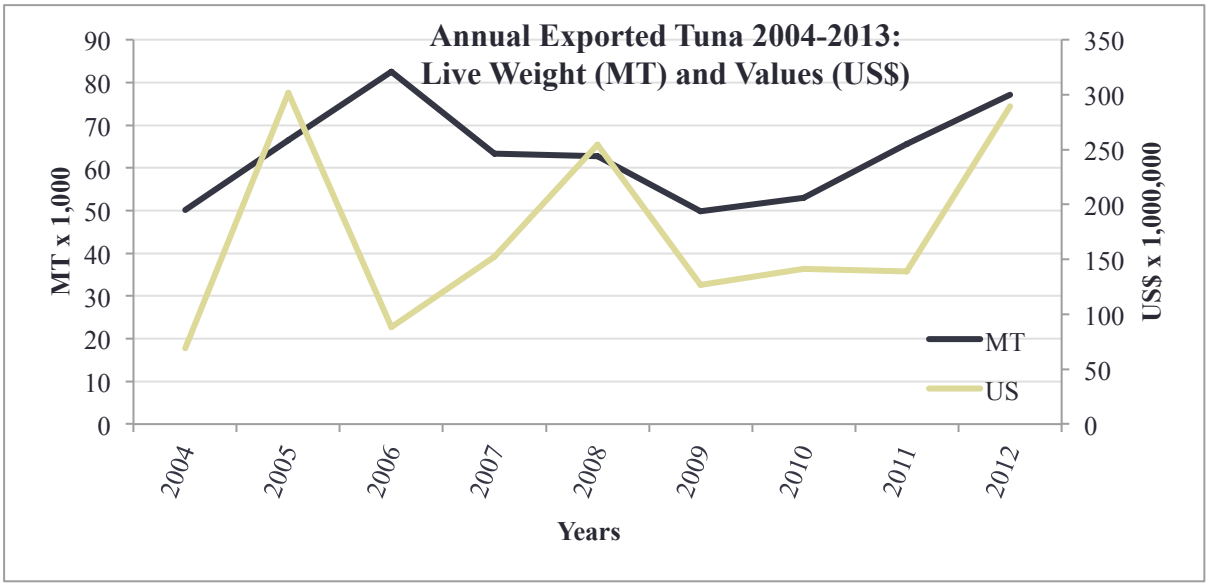
Graph 4.14: The price per MT of tuna is shown for bulk export from 2006 till 2012, prices were donated by a tuna company. Mean price over the time period: 1,179.4675 US$, SD of the data: 295.85.

4.2.5 Step Four

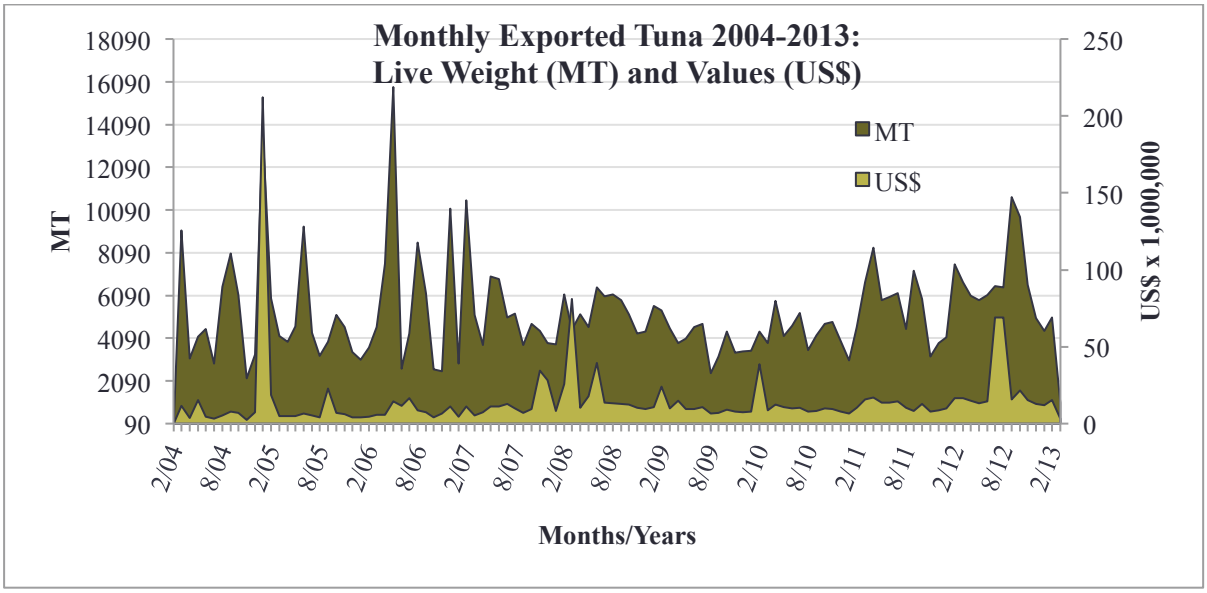
Export

The tuna products once ready at Myroc and PFC are taken directly into containers and onto ships in the Tema Harbour facility. The container spaces on the ships must be booked well in advance due to the busy nature of Tema Port. PFC said they book their container space usually two weeks in advance. Normally days before the cargo ship even reaches Tema all the spaces are taken. The processors can produce product ready for export within 48 hours, PFC said they can even do it in 24 hours if really necessary.

In graphs 4.15 and 4.16 are displayed the monthly and annual Ghanaian tuna exports registered with CEPS over a nine-year period. The bulk export was also included to be able to see an overall picture of the tuna leaving Ghana overtime. The selling prices (US$) visualized show a noticeable disparity from the exports throughout much of the nine years. The monthly values and tons show a positive correlation (p-value = 8.776e-05, R= 0.365) while the annual trends show none at all. For example in early 2006 there is a huge quantity of tuna exported, however its value does not peak at all. The value and weight of tuna exports do not show a clear increase or decrease over time, the monthly MT exported fluctuates around 5,000 MT. Since 2004 till March 2013 Ghana has exported 574,748.83 MT (-18.4% +6.2%) of tuna live weight at a value of 1,604,991,709.3 US Dollars (FOB).



Graph 4.15: A general view of the MT of tuna exported and their value over the last nine years The maximum deviation from the average live weight exported for the annual data is -22.4% to +10.54%. The annual MT exported from 2004 to 2012 has an average of 63,402.61144 MT per year and shows an SD of 10,744.53. Annual average value of exports over the period= 173616202.7$, SD= 81,268,526.6.



Graph 4.16: Monthly export in MT and value from Ghana since 2004. The monthly data shows a deviation according to the conversion factors of -21.36% and +9.7% from the average live weight. Mean MT exported= 5,283.337, SD=2,335.781. Mean US Dollars of export per months was 14,482,915.37, SD= 22,480,828.35.

Fish Mammies

In the local value chain once the Big Mammies have received their tuna another group of women will normally buy it from them who will process it. These women are referred to as Fish Mammies, there are two types; Grade one and Grade two. Grade one Fish Mammies will buy tuna in small quantities, between one and ten individual tuna, while Grade two Mammies

will buy in bulk, up to 50 tuna. They can buy the tuna for ten US Dollars per individual for the smaller sizes and for more than 65 US Dollars for a big tuna. The tuna in the local market is usually smoked before being sold on to consumers. The smoking process takes place in traditional wood burning ovens. An image of the process can be found in the appendix in image 7.A. These ovens are not very efficient and can use large amounts of wood, which is usually collected from the surrounding habitat. However a huge amount of the local fish products eaten in Ghana are processed via smoking. Once the tuna is smoked it can be sold on to the next group of Fish Mammies or sometimes the smokers will retail it themselves. The tuna can pass through many Fish Mammies before being sold to the consumer. The sales between the Mammies normally takes place through credits, the buyer is given a certain amount of weeks or months to pay the bill which will have added interest.

4.2.6 Step Five

Retail

The tuna in the local chain, when it reaches the retail stage, will usually be broken up into small pieces. At the start of 2013 these pieces were being sold for between 55c and two US Dollars depending on size (1-5Kg). This type of smoked tuna is not sold in conventional type supermarkets. It will be retailed either on small stalls near the road or in stalls located in a local market. When asked how popular smoked tuna is to eat in Ghana 100% of the questionnaire respondents answered between 7 and 10 on the popularity scale, 1 being unpopular (Mean=9.05, SD= 1.13).

The Ghanaian products produced by Myroc and PFC will end up mainly as cans in supermarkets in Europe. Recently John West has introduced tuna salad pouches; these contain a mixture of tuna and other additives such as herbs and vegetables. The pouches are not made in Ghana, instead the Ghanaian tuna is exported to Europe in larger pouches as fillets and loins to be further processed. The canned products are the main Ghanaian export, in the past nine years, depending on the conversion factor, between 68 and 75% of all tuna exports were canned.

The exported cans range between 80g and 640g (net weights) with the larger sizes destined for catering and restaurants. The prices per unit for canned tuna were between two and ten dollars per unit, the average of 95 sampled cans was 4.67 US$ (SD= 3.26 US$). When converted to price per MT of tuna live weight with all three conversion factors they were sold from 5,500 US Dollars to 27,000 US Dollars. The average price was 9,604.90 US$ per MT

(SD=2,875.24) with the average conversion factor. The processors also produce pouches of up to 3Kg (net weight) of large tuna pieces, fillets or loins for catering and restaurant use abroad. Their selling prices were not obtained by this research.

The canned products samples that were imported into Ghana from PFC were sold at between 1.55 and 2.60 US$ per unit (160-190g net weight). Their prices per MT ranged from 4,600 to 14,00 US$ (19 samples) conditional of the conversion factors. With the average conversion factor applied the mean price per MT was 6,451.18 US$ (SD= 1,563).

Imported tuna sold in Ghana was sampled in the form of cans, 22 cans were examined. The majority were from Asia, mainly Thailand, and the remainder were from Columbia, Peru and the USA. The can types were between 85 and 425g and cost from 1.60 to 5.70 US$ a unit. Prices per MT of live weight ranged from 2,600 to 22,000 US$, again depending on the conversion factor. The average price per MT was 8,419.5 US Dollars (SD= 5,302).

According to the average prices of the canned products sold in Ghana and abroad the cheapest tuna product was the Ghanaian tuna sold in Ghana, the Ghanaian tuna sold abroad was the most expensive. The imported tuna equated to be more expensive than the Ghanaian tuna sold in the shops there.

Canned tuna appeared not to be very popular for consumption in Ghana, 65% of the questionnaire respondents gave it a five and under (1 being unpopular) on the popularity scale (Mean= 4.09, SD= 3.05). It was determined as too expensive for most Ghanaians. Some said that it was much cheaper to buy smoked tuna in the local market place. Canned tuna is treated as more of a delicacy in Ghana than an everyday food supply.

4.3 Governance of the Value Chain

The Governance of the value chain is held by a combination of National and International Enabling Environments and Supporting Organizations. Table 4.9 is a summary of all the different bodies involved in the Governance of the tuna value chain. The roles of the main organizations are explained further in this section.

Enabling Environments and Supporting Organizations
National Enabling Environment
Freezone Enclave
Fisheries Commission Fishing Licenses & Safety Certificates
Ghana Fisheries Act 625 2002
Ghana LI 1968 2010
GSA Permits
National Supporting Organizations
MoFAD [FC: MFRD&MCS]
GSA
GTA
GPHA
GIPC
CEPS
GNAFF
NFAG
MOTI
International Enabling Environment
ACP-EU Preferential Trade Agreement
ICCAT License
EU Certifications (Quality, Safety & Standard)
International Food Safety Certifications
International Supporting Organizations
ICCAT
European Parliament
FAO

Table 4.9: National Enabling Environments and Supporting Organizations and International Enabling Environments and Supporting Organizations. ICCAT: Inernational Commission for the Conservation of Atlantic Tuna, ACP: Atlantic Caribbean Pacific, EU: European Union, MoFAD: Ministry of Fisheries and Aquaculture Development, FC: Fisheries Commission, MFRD: Marine Fisheries Research Division, MCS: Monitoring Control and Surveillance, GSA: Ghana standards Authority, GTA: Ghana Tuna Association, GPHA: Ghana Ports and Harbour Authority, GIPC: Ghana Investment Promotion Council, CEPS: Customs, Excise and Preventive Service, GNAFF: Ghana National Asociation of Farmers and Fishermen, NFAG: National Fisheries Association Ghana, MoTI: Ministry of Trade and Industry, FAO: Food and Agriculture Organization.

4.3.1 National

Ministry of Fisheries and Aquaculture MoFAD

The national organization that regulates and controls the Ghanaian tuna value chain is primarily MoFAD. Under this ministry exists the Fisheries Commission (FC) which controls the MFRD and the MCS department. All tuna licensing, certificates and reports are dealt with by the MFRD and MCS in Tema. The MoFAD offices are located in Accra and are headed by the Minister of Fisheries, Mr. Samuel Quaatey. In terms of data, they just receive summaries; their research divisions will collect the raw data, treat and compile it for them. This ministry had little information on the tuna fisheries, only an annual summary of the industrial landings and values for 2011 and 2012. Methods of collection and detailed information of the tuna data was not known in this department. They received all their tuna data from the MFRD in Tema.

Marine Fisheries Research Division MFRD and Marine Control and Surveillance MCS

The MFRD is headed by Mr. Paul Bannerman and is responsible for collecting data and records for the entire industrial tuna fleet. The regulations are meant to be implemented by MoFAD. MRFD will issue a catch certificate after each trip that goes with the landings to show their country of origin. This is as a result of a law made by the EU in response to IUU and recommendations by made by ICCAT. According to the Director of MFRD it is ICCAT that have the main control over them. They compile vast reports for ICCAT each year. MFRD will review the logbooks from each tuna trip as required by ICCAT. In the annual report made to ICCAT logbook histories for the year must be included. Any quantitative information about the tuna that goes to the Big Mammies is unknown to the MFRD.

The MCS is located in the same building and is in charge of the VMS, which is extremely important for the tuna industrial fleet. A VMS certificate is required by Ghana, to be issued with each landing to indicate where the tuna was caught and make it traceable. The logbooks are supposed to back up the VMS data. The VMS is part of an ICCAT-VMS network in which a transmitter is installed on each vessel, a satellite receives information on the position and speed of the vessels and relays it to the MCS in Tema. In turn this data can be sent on to the MCS of other countries, according to Mr. Bannerman the UK have a VMS receiver so they can see the Ghanaian tuna fleet. The MCS posses only one VMS, which is

only in the Tema branch and only for the tuna ships. The VMS was apparently supplied by ICCAT in November 2012. Before this period Ghana had a contract since 2005 with a private firm from the UK, 'Blue Fingers', to supply a VMS to control the tuna fleet.

The MCS are in contact with the Ghanaian Navy as it is one of their duties to join them at certain times for sea patrols. It is also in their power to ask for Naval assistance if they suspect IUU to be occurring. Tuna observers are sent out on the vessels from time to time by the MCS. They are required by ICCAT to be there during a two month period in winter when FADs are banned, during the rest of the year they are placed on purse seiners only at random. The tuna observers are usually Marine Science students or graduates, the vessel owners are required to pay them. One of the Professors at the University of Ghana that contributed to this report supplied observers to the MCS.

Each MCS department have an AIS (Automatic Identification System) satellite, or are meant to, which allows them to identify importing vessels in the vicinity. They are able to distinguish which type of vessels they are and even what they could be carrying. In conjunction with websites such as marinetraffic.com and vesseltracker.com the MCS officers can confirm if there are seafood products on board. In this case they will be present in the port to receive a permit for the bulk products. However officers in the Sekondi-Takoradi MCS have never worked with these permits before.

MFRD, MCS and Customs (CEPS) are required to monitor any of the transhipment activities carried out by Panofi. According to the MCS it will take place on anchorage outside of the Tema harbour.

Legislation

The Fisheries Act 625 from 2002 and the Fisheries Regulation L.I. 1968 from 2010 are the major pieces of legislation that govern both the tuna fleet. The FC, and therefore the MFRD and MCS, were established to implement this legislation. The Act includes all policies related to inland, freshwater and marine fisheries as well as aquaculture. The L.I. was drawn up to enforce the Act and includes measures for conservation as well as plans for development in the Ghanaian fisheries and aquaculture. The Act and the L.I. include regulations for the tuna fleet that try to ensure Ghana maintains some type of share in the fisheries yet that also attract foreign investors who can take care of the heavy financing. 40% of the questionnaire respondents said the Act and the L.I. are the main rules that govern their role in the tuna industry, following this was international legislation. 35% of the questionnaire respondents

said that the ICCAT recommendations and the EU regulations were the most important in the tuna industry.

Ghana Standards Authority GSA

GSA is very present in the industrial tuna industry at the production and processing stages. Permits and certificates need to be received from the GSA before tuna can move through the value chain to be exported or to be sold in Ghana. They control all aspects of hygiene and quality standards, both on board the vessels and in the processing plants. Hygiene and sanitation on board is investigated by reviewing all cabins, toilets, kitchens and meeting areas. Cleaning records should be kept for the entirety of the trip and these are read by GSA to check they are up to standard. Medical records are also inspected as it is important to know about how the patient was isolated and treated. The tuna holds are thoroughly inspected for any damages or liabilities, they need to be made of a very durable material as they are constantly disinfected and washed. The tuna is frozen to minus nine degrees Celsius and this is maintained for the entire trip. The holds are extremely important to maintain as they come in direct contact with the tuna. GSA has temperature monitors in each hold and at docking temperature profiles for the trip will be measured randomly. GSA asks for health and safety to be upheld on vessels but they do not regulate it. Anything that could jeopardize the product they endeavour to make recommendations to prevent it. According to the Head of Fish Control at GSA the EU are extremely difficult to appease in regards to sanitary and hygiene standards. The GSA incorporates EU regulation into their policies as a huge amount of the tuna goes to the EU. Before a vessel leaves for a trip the GSA will inspect again and issue another certificate. In the questionnaires stakeholders revealed that to export to the EU is a difficult procedure because of the standards required, the USA has much lower standards but the market is more closed towards Ghana. Not all companies will pass their checks and so they will not be able to supply the processors in Ghana. GSA are commended by some of the industrial tuna stakeholders for the strict and thorough investigations they make.

Ghana Customs Excise and Preventive Service CEPS

CEPS have quite an amount of data on tuna imports and exports. They monitor the flow of tuna in and out of Ghana, where it comes from and where it is going to. They control all the Ghanaian borders; land, sea and air. Officers at their checkpoints register the tuna products on

a computer programme as they pass in or out of, or sometimes through, Ghana. Once registered electronically CEPS offices all over Ghana can observe the imports or exports that have just arrived into or left the country. The Harmonized System (HS) code, which all commodity imports have, allows the customs officer to apply the correct VAT (Value Added Tax). Customs work quite closely with the FC and its sectors assisting them mainly in Tema port with the activities there.

Ministry of Trade and Industry MoTI

The Ministry of Trade and Industry (MoTI) is meant to hold all the traceability reports for the export orientated tuna value chain, they have a traceability committee whom presides over this. Any traceability information on the tuna exports was unavailable for this research. Other than this they do not have any other data for the Ghanaian traded tuna products.

Ghana Investment Promotion Centre GIPC

It is here the tuna fishing business will start officially. To set up a tuna fishing company as a joint venture each investor needs to register 10,000 US$ worth of equity at the Ghana Investment Promotion Centre, it must remain divided as at least 50% Ghanaian throughout the venture. This requirement is according to Ghanaian law, the Fisheries Act 625 from 2002. The accounts will be audited on occasions to reconfirm that Ghana always has at least a 50% share in the business ownership. The operational costs, however, can be paid for by the foreign counterpart, which is usually Korean.

Ghana Ports and Harbour Authority GPHA

GPHA are in control of the tuna vessel movements and activities whilst inside the Tema Fishing Harbour. In the Tema office, located on the pier of the fishing harbour, they have records of tuna vessel calls made per annum and operational statistics on fish export and import, which includes tuna landings. As the tuna fleet is quite large the GPHA will be in contact with them frequently for piloting, docking, offloading and berthing activities. Officers from the GPHA will work with the crew and staff from the tuna ventures closely once a vessel enters the fishing harbour. They will make their own reports of the landings, usually interns at the authority will do this during discharge.

The Freezone Enclave

The Tema freezone enclave was created to aid economic development in Ghana, there are two others which are located in Accra and Sekondi-Takoradi. Tuna products that are not consumed in Ghana can be exported free of duty tax, a maximum of 30% of produce can go to the Ghanaian national market. The products that are sold to Ghanaian businesses are treated as imports and taxed accordingly.

Non-Governmental Organizations

The Ghana Tuna Association is made up of representatives from all ten fishing companies. Over 40% of questionnaire respondents said this is the main place where companies will interact and discuss the tuna industry and business. Currently the head of the GTA is the director of Panofi Company.

The Ghana National Association of Farmers and Fishermen (GNAFF) and the National Fisheries Association of Ghana (NFAG) are bodies that represent organizations from the agriculture and fisheries sector, both private (tuna companies) and public. They provide support to fisheries by giving stakeholders a chance to voice opinions and upsets as well as helping campaign for needed resources. They can also help Ministries by providing data that the Governments need, i.e. registered fishermen in a certain area. According to the ex-President of GNAFF the majority of those who make the laws are associated with the industrial sector, the artisanal fishermen are not informed about the legislation making. The industrial stakeholders outnumber them in the process.

4.3.2 International

International Commission for the Conservation of Atlantic Tuna ICCAT

As Ghana is a member of ICCAT it must follow all their recommendations. They require each vessel to buy an ICCAT license from them every two years. In 2012 it costs 15,000 US$ for the purse seiner of one of the companies. Every two years there is an international meeting at which the recommendations are discussed and new ones are made. Recommendations include: the prohibition of FADs during certain months, using catch certificates, having tuna observers, increased standards of port inspections and using trade restrictions. The head of the MRFD and the MCS said the ICCAT recommendations have some control over the tuna industry. The FC will enforce the regulations on the individual companies and ICCAT will

apply the recommendations to Ghana as a country. If Ghana carries out illegalities then ICCAT will attend to them. Since 1996 ICCAT began to require import bans on non member tuna (Francis, 2007), eventually forcing Ghana, for the sake of their market, to become a member.

The European Union

Many aspects of the EU legislations affect the Ghanaian tuna industry and trade between them. In the interviews many people said that trying to keep up with the EU's health and safety or quality standards is hard work, they are very stringent. One Ministerial employee noted that the EU should focus more on the actual fishing activity than constantly on food safety.

Under Economic Partnership Agreements (EPAs) with the EU Ghana receives preferential import duty rates into the EU. This boosts the competiveness of the Ghanaian tuna entering EU markets. The 2000 Cotonou Agreement is the basis for these preferential tariffs, the successor of the Lomé Agreement in 1975.

The processors must adhere to the different health, safety and quality certifications that the EU markets require. They must be issued with many different types of certificates and be audited before the tuna products can be sold in the EU. Société Générale de Surveillance (SGS) are an international inspection, testing and verification company based in Switzerland, they provide some of the needed documentations to sell in the EU. They look at all aspects of tuna production in Ghana before certifying the processors. SGS verify health and safety, environmental impact, quality control, risk assessment, product safety and more.

The British Retail Consortium (BRC) is a trade association that issues food safety certifications which most UK supermarkets demand. Therefore the Ghanaian processors must apply to them, adopt all the recommendations and pass the audits before being able to sell in the UK.

4.4 Important Actors

Over 50% of respondents also agreed that ICCAT and the EU have the most control over the Ghanaian industry. Research in Tema saw that PFC is a very important actor at the processing stage, it almost monopolizes the business as it processes the majority of the tuna. They even have an influence over the tuna companies due to their control in the financial transactions between them.

This research established that women play an important role in the Ghanaian tuna industry. They enter the value chain at each step as crucial value chain supports. 65.2% of the questionnaires reported that women are 8 and above on the importance scale, 1 being unimportant (Mean score=8.11, SD= 2.37, n=19). At the production stage they help to finance the industrial trips for the tuna companies. Women are fully responsible for all the next steps in the local value chain. They trade it between themselves, process it, transport it and retail it throughout Ghana. The local value chain finally ends with women, they are the ones in most cases that will cook and serve it.

4.5 Revenue Flow

When asked which link or step in the value chain had the highest value 65% of respondents agreed it was either the processors or the companies or both. Only 13% thought it was the foreign retailers. According to the empirical data from 2012 and early 2013 tables 4.10, 4.11 and 4.12 were produced. They give an account of the distribution of revenue through the value chain at three different steps; production, processing and retail. The minimum, the maximum and the average prices and costs are displayed in table 4.10 according to the different selling prices during the year and the quoted average landings of the vessels. In table 4.11 and 4.12 the ranges are given as a result of the various can conversion factors applied, a comprehensive view of how much the can conversion factors can affect the financial results of a report is evident.

The ranges at the production stage (table 4.10) give an indication of changes that can occur in selling and purchasing prices as well as total costs during a fishing year. Therefore, they show how much the profit per MT can vary depending on the different circumstances i.e. cost of fishing and selling prices. Profit is the same as margin and added cost at this step. The companies made the most profit when a purse seiner sold a MT to the Ghanaian processors. The least profit was made by the baitboat selling to the Big Mammies.

The revenue spread at tuna processing (table 4.11) indicates the Ghanaian processors made little or sometimes no profit. The production costs are actual costs given by a processor. The three conversion factors change the total costs by between 600 and 1,000 US$. When the minimum production costs are applied in combination with the highest average selling price from the CEPS files the maximum profit is only 1,334US$. The least profit was made by selling to the Ghanaian retailers and the most was made through exporting the tuna to foreign

retailers. The margin also exhibits the increased revenue in this path. The added costs at this stage appear to be very little, more cost was supplemented by the tuna companies.

Table 4.12 demonstrates that the higher selling prices and profits are in the foreign supermarkets. The average purchase prices by both types of retailers are similar, however, the foreign market adds on more cost before selling the product.

Tuna Production: Revenue Distribution US $ per MT				
Vessel Type	***Total Cost/Added Cost***	***Selling Price***	***Customer***	***Profit***
Purse Seiner	715.86 Min: 596.55 Max: 894.83	1,926 Min: 1,342 Max: 2,720 →	Ghanaian Processors	1,210.14 Min: 447.17 Max: 2,123.45
		1,651.4 Min: 1,154 Max: 2,418 →	Big Mammies	935.54 Min: 259.17 Max: 1,821.45
		1,704 Min: 1,642 Max: 1,780 →	Bulk Export	988.14 Min: 747.17 Max: 1,183.45
Baitboat	1,140.04 Min: 940.53 Max: 1,659.76	1,926 Min: 1,342 Max: 2,720 →	Ghanaian Processors	785.96 Min: -317.76 Max: 1,779.5
		1,651.4 Min: 1,154 Max: 2,418 →	Big Mammies	511.36 Min: -505.76 Max: 1,477.47
		1,704 Min: 1,642 Max: 1,780 →	Bulk Export	563.96 Min: -17.76 Max: 839.47

Table 4.10: The revenue distribution in the production sector of the Ghanaian tuna Industry. The two types of vessels are shown along with their costs of fishing 'total costs'. Selling prices to the different customers are quoted and the profit each type of sale makes. Ranges are given according to the maximum and minimum tonnages quoted by the companies. All prices are in US Dollars.

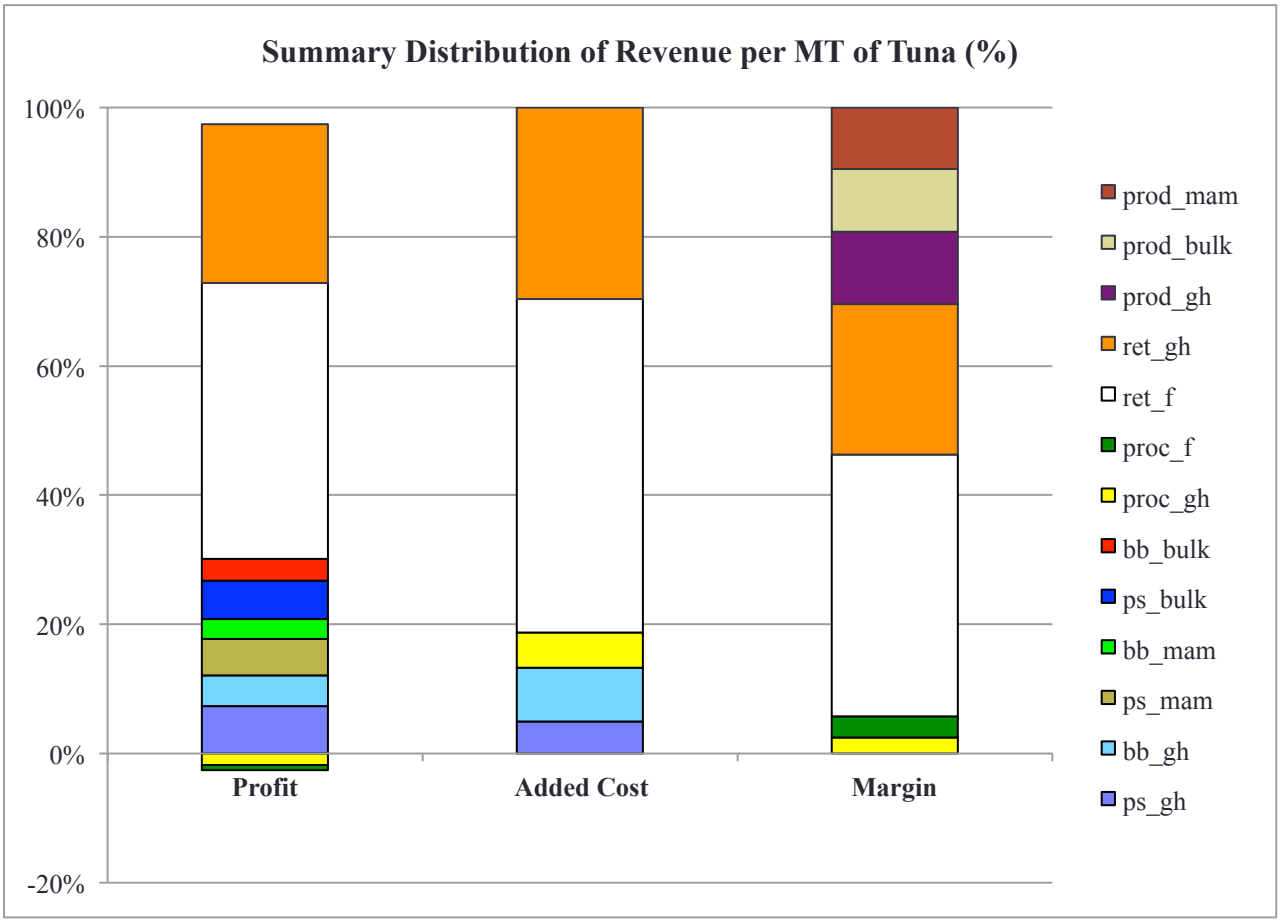
Tuna Processing: Revenue Distribution US $ per MT						
Purchasing Price	***Total Cost***	***Selling Price***	***Customer***	***Profit***	***Margin***	***Added Cost***
1,926 Min: 1,342 Max: 2,720	2,673.6 Min: 2,015.66 Max: 3,693.05	2,386.46 Min: 2,241.38 Max: 3,208.58 ⟶	Ghanaian Retailers	-287.14 Min: -1,451.67 Max: 1,192.92	460.46 Min: -478.62 Max: 1,866.58	747.6 Min: 673.66 Max: 973.05
		2,528.02 Min: 2,383.02 Max: 3,349.72 ⟶	Foreign Retailers	-145.58 Min: -1310.03 Max: 1,334.06	572.98 Min: -336.98 Max: 2,007.72	

Table 4.11: The revenue distribution at the processing stage. Purchasing prices from the tuna companies, total costs of processing and selling prices to the Ghanaian or foreign retailers are all used to show the profit, margin and added costs. Ranges are given according to the different conversion factors.

Tuna Retail: Revenue Distribution US $ per MT				
Actor	***Purchasing Price/ Total Cost***	***Selling Price***	***Customer***	***Profit***
Ghanaian Retailers	2,386.46 Min: 2,241.38 Max: 3,208.58	6,451.18 Min: 6,017.87 Max: 8,735.97 ⟶	Ghanaian Consumers	4,064.72 Min: 2,809.29 Max: 6,494.59
Foreign Retailers	2,528.021 Min: 2,383.02 Max: 3,349.72	9,604.89 Min: 8,990 Max: 12,990 ⟶	Foreign Consumers	7,076.87 Min: 5,640.28 Max: 10,606.98

Table 4.12: The revenue distribution at the final stage in the value chain, retail. Selling and purchases prices are used to show the profit at this stage. Ranges were added according to the minimum, average and maximum conversion factors.

Graph 4.17 summarizes the spread of revenue through the whole value chain using the average added costs, margins and profits as percentages per MT of tuna. These were derived as proportions of the whole value chain. What is clear is that the retailers hold the most profit than any other actor, over 70% of the profit per MT goes to the Ghanaian and foreign stores. The foreign retailers constitute alone almost 45% of the profit; the highest added cost is at the retail stage also. It appears fishing with a baitboat requires more revenue absorption (over 8%) than the using a purse seiner; in fact the added costs for a baitboat are the highest value after the retail stage. The margin reiterates the increased revenue in the retail stage, it also reveals the producers receive quite a large percentage. The margin for the different tuna pathways from landing to customer is almost the same. The running costs per metric ton of the retailers were not able to be retrieved for the analysis so the total cost at the retail stage is the equivalent of the purchase price; therefore the margin, profit and added costs are the same at this stage. In reality the profit could be slightly increased or decreased depending on if the total costs per MT of tuna are higher or not than the purchase price.



Graph 4.17: A summary in percentage of the profit, added cost and margin of the actors and stages in the value chain. The percentages are the proportions per MT of live weight tuna that each actor or path holds. Deficit profit can be seen for the processors when they sell to Ghana or to foreign retailers. prod_mam= The margin of the producers when they sell to the Big Mammies, pord_bulk=the margin at production when they sell tuna to bulk export, prod_gh= the margin when the tuna companies sell to PFC and Myroc. ret_gh= the Ghanaian retailers selling to Ghanaian customers. ret_f= foreign retailers in Europe selling to consumers. proc_f= Processors in Ghana export products. proc_gh= Processors sell to Ghanaian businesses. bb_bulk= A baitboat fishes and exports the tuna as bulk tuna. ps_bulk= A purse seiner sells their tuna to bulk export. bb_mam= Baitboats sell their tuna to the Big Mammies. ps_mam= Purse Seiners sell their tuna to the Big Mammies. bb_gh= Baitboats catch goes to the Ghanaian processors. ps_gh= Purse seiner catch goes to the Ghanaian processors.

Image 4.2 sums up the margin that each of the main stages in the value chain captures. For every 180g tuna can bought in a supermarket in Europe over 70% of the revenue goes to the retailers, 22% to the producers and 6.6% to the processors. The processors, according to their accounts, receive surprisingly little while the retailers clearly make the most money out of each can purchased.

Please see the second PDF on the CD which includes this Image

4.6 Unofficial Dynamics and Issues in the Value Chain

A few issues that are affecting the value chain emerged during research in Ghana. As the study had close contact with most organizations, companies and Governmental Ministries involved in the tuna industry a good understanding was achieved. The interviewees revealed current issues and problems they are dealing with, as well as future strategies and past actions in the business of tuna fishing.

Unofficial Dynamics

Over 45% of questionnaire respondents said pre-financing is the biggest unofficial dynamic occurring in the Ghanaian tuna industry. Running a tuna vessel is very cost heavy and regularly many of the companies will not have the cash available to send their ships to sea. In these cases they will rely on the Big Mammies to pre-finance them. In return they will designate a certain tonnage of tuna to them.

Certain companies said they could not run without Big Mammies and are financially dependent on them. It is extremely hard for the companies to obtain bank loans in Ghana. Fishing is a high-risk high-investment type of business and therefore not appealing to many financial institutions to support it. On some occasions a vessel might return to port with as little as 50 MT, or even less, fishing is very unpredictable. When the companies are able to secure bank loans they will pay a huge amount of interest. Therefore the preferred option is to receive unofficial loans from a third party, the Big Mammies, who themselves can receive bank loans.

Issues

Over 50% of questionnaire respondents said that there are illegalities occurring in the production stage of the tuna industry. When asked what type of illegalities 67% said the vessels do not fish where they should, many of them mentioning the lack of a VMS. The remainder responded with illegal FAD use, fishing with them when not permitted.

According to six of the interviewees the VMS system of Ghana was broken during an unknown period of time. It was unclear if it was still broken as of April 2013 but at least for a period during early 2013 it was broken or not in use. As it was apparently only installed in November 2012 it seems that the Ghanaian tuna fleet have been unmonitored for a substantial period. This means that MCS were relying solely on the logbooks of the vessels to monitor

their movements, these records are self-reported by the Captains and crew of the vessels. VMS reports are meant to accompany the tuna landings, according to the Ghanaian Government, there must have been no reports for this period. In 2005 Ghana was monitoring its fleet with the VMS from Blue Fingers but allegedly they could not pay the bills so this service was suspended. It is not clear when the service was stopped.

Another huge problem in this area is the lack of resources that the Government provides to the MFRD and MCS in Tema. The MCS do not posses a VHF (Very High Frequency) radio so communication with the vessels while at sea is impossible for them. Therefore even with a working VMS the MCS are powerless to take corrective measures against illegal movements until the ships dock in Tema. In the event of an illegality the MCS need to call on the Navy to attend to the scene. Without a VHF radio they cannot communicate with the fishing vessel to confirm anything. Calling out a Navy vessel is an extremely expensive operation, to do so when unsure is impossible. Therefore the fleet was and is unrestricted by Ghana.

A reoccurring theme during the study was the want of Government-Agency interactions. Many of the Ministerial workers said that getting data and information from the tuna companies was very difficult. The link between governance and tuna production seems to be very weak. For example, the vessel crew fill in the logbooks inaccurately, and often only complete it once docked. The logbook should be filled during the trip as a record of positions. It seems the companies are reporting to the Government incorrect information about the positions during the trip. The companies tend not to communicate much information about landings or vessels to the Government either. Landings are seemingly self-reported by the companies.

Financing seems to be a problem recently, at least for the smaller companies with baitboats and in the local market. The companies find it expensive to fish with the baitboats, they are old and need repairs, they can't travel great distance after tuna and are labour intensive. This combination can lead to small tonnages and increased expenditure. One company hadn't broken even in months for these reasons. 21% of questionnaire respondents were unhappy with the price decided by the committee and said it was unfair. On more than one occasion did respondents from the tuna companies state that each time they sell to PFC they loose out, that PFC will have the most power in deciding a first hand price for the tuna. Sometimes they will not even abide by the committees price and offer their own. They have told companies that they have no space for storage of tuna, this forces companies to sell at a lower price when they have no other customers or better offers.

In the local market one Big Mammie had a problem with the debt owed to her by customers. She said it was a similar case for other Big Mammies and Fish Mammies. The women come to buy the tuna from her on a credit basis and then don't return the money. As they can come from as far away as Kumasi (270Km+) it is impossible to locate them and receive payment. She said she was almost bankrupt but had no choice to leave the tuna industry as that is all she knows.

Research in Ghana showed that there is evidently a power imbalance within the fishing activity. As reported earlier in the results the Koreans are the decision makers while at sea. They can make significant earnings, thousands of dollars more than other crewmembers, depending on the tuna tonnage. It is in their best interest to locate, catch and land the tuna as quickly as possible. Tuna are highly migratory and all three species are only present off the Ghanaian coast for certain months of the year. The industrial tuna fleet catch them all year round. What was grasped from the interviews and questionnaires was that the crew in charge of a tuna vessel are not going to let a school of tuna evade them by passing into the EEZ of another country.

Chapter 5.

5.1 Discussion

5.1.1 Introduction

This study shows that the industrial tuna fisheries in Ghana functions at the production level under some foreign influence and with a certain degree of lawlessness. Governance over the value chain is well composed however is lacking in implementation. The processing stage exerts some control over the producers and their sales, however the high value links are highlighted at the retail stage. The investigation allowed the researcher to come to an understanding of how an industrial fisheries, with a globally important target species, works in a certain region. For the first time, the individual stakeholders behind the tuna industry were consulted and important issues revealed. The major characteristics of this value chain, the changes in recent years and its influences in Ghana shall be discussed and finally compared to other VCAs in different regions.

5.1.2 Changing Production Methods

What emerges from the value chain analysis at this stage is that there is a shift in the production methods and organization. Production methods have switched to a fleet dominated by more efficient purse seiners who now land the lion's share of tuna (graph 4.1 results). Purse seiner landings began to outweigh the baitboat landings permanently after 2009. From the start of the industrial tuna business in Ghana up till the early 21st century the Ghanaian baitboat fleet was described as the largest tuna fleet, in terms of landings, in the East Atlantic (Kwei, 1997; Bortier-verstraaten, 2002). In 1991 over 60% of the Skipjack catches in the East Atlantic were made by the Ghanaian baitboat fleet (Kwei, 1997). In the mid nineties the fleet was comprised of about 30 baitboats that caught an average of 30,000MT per annum (Kwei, 1997). Today the number of vessels has not changed hugely, 37, however now there are 16 purse seiners and the average annual catch for 2012 was 90,000MT (MFRD). The increase in tuna purse seiners in tropical waters has increased dramatically worldwide, not only in Ghana (FAO, 2010[1]). This transition to purse seiners has occurred partly due to advancement in fishing technology and the increased demand in the world market for tuna products, especially canned tuna (FAO, 2013[1]). In 2002 TTV, one

of the largest companies reported their cost for fishing per MT to be 314 (purse seiners) and 370 (baitboats) US Dollars (Bortier-verstraaten, 2002). These quotes are significantly less than the fishing costs estimated in this study (671.13 US$ Purse Seiners and 1140.04 US$ Baitboats). This may be due to a decrease in tonnages amongst the smaller companies recently, most of which own baitboats. It therefore costs them more per MT to fish as are they not selling as much tuna but are fishing for the same amount of periods. It also may be linked to the increased cost of fuel, which constitutes the largest part of trip costs (table 4.5 results). In January 2002 the average price of a barrel of crude oil was almost 19.50 US$, by January 2012 it had risen to just over 110 US$ (US Energy Information Administration, 2013). The TTV figures included the crew salaries, fuel, provisions and spare parts however they do not include licenses and certificates as this study does. Even so, medical expenses and crew insurance is added, which this value chain does not. The cost of fishing in Ghana, as results show, is mainly down to fuel (69-81%), however in other parts of the world this percentage can change. In Iceland (2002) the industrial trawlers fishing for cod, which is another globally important high valued species, spent 40% of their fishing costs on salaries and only 13% on fuel (FAO, 2006). The EU purse seiner tuna fleets were spending only about 30% of their budget on fuel by 2002 (Oceanic Development, Poseidon and Megapesca, 2005). This could be from the heavy subsidiaries they are receiving from the European Community, which can reduce their fuel costs considerably (Agritrade, 2009). In the Moroccan Anchovy fisheries purse seiners are also used, however fuel costs constitute only 9% of the trip costs and salaries over 40% (FAO, 2006). The Moroccan purse seiners are on average up to 10m smaller than the Ghanaian vessels and are also much younger (average age=11.5 years) so these advantages could mean less fuel consumption. Thai tuna purse seiners spend more or less 45% of their budget on fuel, still less than the Ghanaian vessels but much higher than the Anchovy fleet (Kuldilok, 2006). The fishing costs for the year with an average of nine trips, not including the extra costs of running the company, reach 1.6-1.7 million US Dollars for the Thai purse seiners, the Ghanaian vessels, making an average of six trips a year cost over two million Dollars. This indicates the Ghanaian vessels cost allot more to run even though they make fewer trips, Thai fleets are clearly more competitive.

The Captains of the Thai fleet get paid a salary of about 2,000 dollars per trip; they spend on average nine months of the year fishing, 20 days per month. The Captains in Ghana can receive more than this as a basic salary, from 2,000 up to 5,000 US Dollars. Engineers receive around 1,800 Dollars a trip on Thai vessels while the Korean engineers in Ghana make up to 4,000 US Dollars, not including bonuses. The regular crew on

the Thai boats get paid 500 US$ per trip (40 fishers, 9 trips a year) while the Ghanaians only get between 100-200$ as a basic wage. This is not including the possible bonuses which are only 5$ per MT above the breakeven tonnage, even if they landed 50 MT extra Ghanaians still wouldn't make as much. The salaries on the Thai vessels seem more evenly spread than on the Ghanaian boats, the Captains in Thailand are paid less than the Koreans in Ghana and the fishermen are paid more. The power structure in the production stage can therefore be described as less lopsided than in Ghana. Kuldilok (2006) mentioned that the Captains and crew can often be foreign so Nationality asymmetry on board is the same as in Ghana. Thai Baht values were converted into US Dollars for the discussion using the 2006 average rate from xrates.com (0.02640017 Baht= 1 US Dollar).

In Ghana today, according to the results of this analysis, the purse seiner fleet are more economically viable than the baitboats. They receive the most profit regardless of the customer and cost less to run per MT of tuna landed. The margin in the revenue analysis emphasizes the increased dividend with these vessels, especially when selling to the Ghanaian processors. The Ghanaian baitboats are making little profit and sometimes none at all (table 4.10 results) The least profitable path for the companies is to sell baitboat landings to the Big Mammies. These outcomes show that the local value chain is not as profitable as the export orientated value chain for companies, least of all when they use baitboats. Purse Seiners may be more profitable regardless of who they sell to due to their fishing capacities. The efficiency level of purse seiners is higher than baitboats, these types of vessels can travel further in pursuit of tuna and hold more tons than the baitboats (FAO, 2013[2]). They require less crew than baitboats, so less salaries and bonuses need to be paid; fishing bonuses to crew can remove a large portion of the trip costs (table 4.5 results). The Ghanaian baitboats are aged and thus are much less efficient. The age of vessels is closely related to profitability (Barclay, 2005; FFA, 2011[2]). The Ghanaian baitboats are on average 39 years old, while the purse seiners are on average 25 years old. The baitboats require more repairs and spare parts and have reduced hold capacity, thus costing more revenue to run. The two largest companies have the youngest vessels in the fleet, Panofi's purse seiners have an average age of 18, the youngest being four years old. This leads the research here to an arbitrary conclusion; the Ghanaian baitboat fleet is no longer commercially viable.

5.1.3 Changes in the Private Sector

According to table 5.6 the main landings are made by the three largest companies, all of whom are sister companies, or future sister companies of the Ghanaian processers. Therefore it is these companies that are making the most revenue from Ghanaian tuna production. This indicates a move away from small tuna companies towards those that are backed and ultimately protected by larger owners. These types of tuna companies have large amounts of capital behind them, this buffers them, somewhat, from increased fuel prices or lowered tuna selling prices that can have real consequences for the smaller companies. There are inevitably years when every company will make losses, so a 'cashed up' investor is vital, this is the nature of industrial tuna fishing (Barclay, 2005). The two biggest companies in Tema are ultimately owned by large Asian firms; Thai Union Group of Thailand and Silla Company of South Korea, these are Ghana's 'cashed up' investors. PFC and the soon to be Cosmos (tuna cannery) are owned by these two groups also.

These larger companies, now landing most of the Ghanaian tuna, might have more of a tendency to tranship, Panofi currently owns two reefers and uses them to tranship to non-Ghanaian processors. Companies are also bulk exporting depending on the prices offered. When PFC and Myroc do not offer good prices they are therefore influencing, to a certain extent, the tuna to move out of Ghana. In the past three or four years, however, there has been no increase in bulk export (graphs 4.12 and 4.13. results). This is the bulk export registered by customs in the Port; transhipment may very well bypass the customs officers and not be accurately recorded. Transhipment skips the processing step, the port handling and the cold store procedures. Unfortunately for Ghana this takes away some of the contribution of the tuna fisheries towards GDP and the local economy. In three Pacific Island nations (Marshall Islands, Papua New Guinea and Solomon Islands), whom also pursue industrial tuna fishing, economic assessments showed that there were increased economic benefits from domestically based tuna fishing ventures (Philipson, 2013). The Government did earn more from the licenses fees of foreign purse seiners that transhipped in their waters. However, there were no local purchases made, no contribution to local salaries and no domestic companies making any profit (Philipson, 2013). The large Ghanaian tuna companies use mainly purse seiners to fish, Panofi and TVV own ten between them. The Solomon Islands found that the large multinational company fishing with purse seiners in their waters tended to tranship their products, while the national smaller company using baitboats landed the fish on-shore for processing (Barclay, 2005). For developing countries, like Ghana, the Marshall Islands, Papua

New Guinea and the Solomon Islands, tuna transhipment will not bring to the nations the potential more widely-spread economic returns that could be gained by their tuna industries. To facilitate the economic development of more local-based tuna fleets, both foreign and local, members of the FFA (Forum Fisheries Agency of the Pacific Islands) used domestication policies in fisheries legislation to encourage shore based processing activities in their own countries (FFA, 2011[2]).

Benefits to local economies from onshore processing could drive the public-private relationships that are fundamental to the fisheries sector (DEVFISH, 2008). These interactions are currently lacking in the Ghanaian tuna fisheries between the companies and Ministries. Ghanaian fisheries legislation does lean towards domestication measures yet there are options for those who have the ability, to receive the proper licensing to tranship. The issue is how to stop or at least discourage transhipment in Ghanaian EEZ while still attracting opulent multinational fishing companies to invest.

5.1.4 The Future of the Ghanaian Tuna Companies

The purse seiner fleet appears to be making revenue at this current moment but it is hard to say if this will continue in the future. Changes to fishing regulations and to stock health coupled with the financial burdens of increasing fuel prices and unfavourable currency exchange could affect the economic stability of the fleet.

The Ghanaian tuna purse seiners have been using FADs since the nineties; this has lead to increased fishing efficiency and landings (Bortier-verstraaten, 2002). The gear efficiency of purse seiners with FADs is seven times higher than without (Obeng, 2003). It can be deduced that the Ghanaian purse seiners rely heavily on FADs to catch their tuna efficiently. FADs are thought to reduce the fuel costs per trip up to 50% as much less travel time is needed (Bailey *et al*, 2011), without FADs it is hard to say how the Ghanaian purse seiners would fair, fuel is already as much as 75% of their trip budget. As of 2012 ICCAT introduced a seasonal ban on FADs in the East Atlantic tuna fisheries from the 1st of January to 28th of February each year (ICCAT, 2011). FADs had been noted to cause increased catches of juvenile tuna and incidental bycatch (Bortier-verstraaten, 2002; FAO, 2010[2]). As there is no proper governance over the Ghanaian fleet it is unknown whether they have been using FADs or not during this time. If ICCAT and Ghana were to actually enforce the ban the purse seiners would find themselves with a decreased fishing efficiency and tuna catch over

the four weeks. The cost of fishing would go up and they may not be profitable during that period. If ICCAT where to increase this ban to a couple of months it might seriously affect the Ghanaian purse seiners' profitability and future business options in the country. It has already been noted that Purse seiners in the Pacific tuna fleet would notably lose out if FADs were banned seasonally or even permanently (Bailey *et al*, 2011). As one tuna fisheries specialists put it in Liam Campling's 2012 paper 'The Tuna Commodity Frontier'; " Purse seiners at the moment need FADs because there are too many boats and the value added is not enough. There is too much capital chasing too few fish".

Nonetheless these FAD bans need to be put in place to protect the tuna from being over exploited and affecting the long-term health of the industry (ICCAT, 2011).

The Ghanaian Cedi has been notably experiencing an increased depreciation to the US Dollar in recent months; at the start of September 2013 the Ghanaian Cedi has lost 0.4 units to the American Dollar already (Ghana Trade, 2013). By the end of 2013 the local currency is project to depreciate by between 5 and 9%, it has been noted as the worst performing West African currency this year (Ekow, 2013; Ghana Agenda, 2013; Ghana Trade, 2013). If it does drop this amount against the US Dollar it will hit a record low (Ekow, 2013), this can have significant impact on businesses that deal in both Dollar and Cedi like the tuna companies and processors. The ill performance of the Cedi is being debited to the increased demand for imports in Ghana after the sharp economic growth in 2010 as the country debuted as an oil producer (Ekow, 2013; IF-Foundation, 2013). Imports are dealt with in Dollars; pressure was put on the Cedi since 2010 as traders looked for notes to exchange (Ghana Web, 2013). As stated in the results the tuna companies depend on Dollars to pay for fuel, spare parts, Expatriate salaries and many other areas in their budget. The loss in value of the Ghanaian Cedi could really affect their running costs and hence their profitability, for the worst.

5.1.5 Tuna processing in Ghana

PFC are clearly the big players of the tuna processing, in 2012 they dealt with over 70% of the tuna that went to the canneries. This reiterates the power of the foreign companies in the Ghanaian tuna industry. Myroc is Ghanaian owned but in comparison to PFC the play a relatively small role in tuna processing and export.

The cost structure of the processors final tuna product is similarly composed in canneries in Thailand, the Seychelles and Mauritius (Campling and Doherty, 2007). The raw

product, tuna meat, represents the largest proportion of the production costs followed by the packaging costs, the ingredients costs represent the lowest. Average prices per MT of tuna processed from canneries in Senegal, Cote D'Ivoire and Madagascar, as well as parts of Latin America, between 2000 and 2002 all showed a smaller profit or commercial margin than Ghana today. So it may appear that the Ghanaian processors are making more revenue than canneries in other developing countries a decade ago. For the sake of this discussion their costs in Euro were converted to US Dollars using an average 2002 rate from about.com (0.93). Total costs per ton in other African countries were very similar to the Ghanaian processors, just slightly less (2,046 US$ for Skipjack and 2,405.91 US$ for Yellowfin) (Oceanic Development, Poseidon and Megapesca, 2005). Production costs in Latin American processors, also receiving preferential trade agreements for the same period, were averaged at 2,060 to 2,170 US Dollars per MT. Again less than the costs in Ghana, though only slightly. The African canneries sold their tuna to export (EU) for between 2,125 and 2,521US$ while in 2013 Ghanaian processors sold it for an average of 2,528 US$ (Oceanic Development, Poseidon and Megapesca, 2005). The South and Central American tuna processors also exporting to the EU sold their tuna canned tuna for a rough average of between 2,277 and 2,399.4 per MT (Oceanic Development, Poseidon and Megapesca, 2005). What can be deduced from these figures is that tuna processing costs and selling prices have not dramatically changed in the past decade, in fact they are similar across the lesser-developed and developing world. This may be caused by the preferential trade agreements and tariffs offered by the EU to these parts of the world, it could be buffering the effect of rising costs of utilities, foreign exchanges and other factors experienced elsewhere. Some of the canneries in Africa and Latin America used as an example here were supplied by EU tuna fleets to different extents (Oceanic Development, Poseidon and Megapesca, 2005). This supply may act as another protection to rising production costs as the EU tuna vessels are heavily subsidised to catch tuna (MRAG, 2004). Deficit in Ghanaian profit can be seen within the figures of this research. Either they can't process tuna competitively anymore as costs have risen beyond their capacity to absorb them or perhaps profit is being hidden from view by other means. This goes against how the stakeholders view Myroc and PFC, rather than believing it is the foreign retailers that make the most profit they agreed it was the processors or the companies, or both. Either they are misinformed about the industry in which they work or the accounts given to this study are inaccurate.

5.1.6 Trends in the Export and Import

In 2006 there was a noticeable drop in annual canned and processed tuna from the exporters (graphs 4.15 and 4.16 results). Mensah (2010) also noticed a drop in Ghanaian canned tuna exports to the EU for 2006 as well as a loss in the Ghanaian market share and Revealed Comparative Advantage* (RCA). This was coupled with an increase of 65,387 tons (product weight) in imported canned tuna from Thailand to the EU (Mensah, 2010). Ghanaian tuna landings in 2006, according to the MFRD data were down about 19,000 MT from the previous year. These reasons more than likely explain why the processors produced less tuna, which resulted in more tuna going to bulk export. Graph 4.2 in the results indicates this increase in bulk export in 2006. The amount of total tuna exported in 2006 (graphs 4.15 and 4.16) shows a peak in the MT gone to export however there is a corresponding huge drop in the value of the export. This is probably caused by the increased bulk export that year. The value in US Dollars does not accompany this rise in exported weight, probably because the prices of processed products are sold at a much higher price to retailers abroad than the whole tuna The value of the general tuna export is greatly increased in 2008. Graphs 4.8 and 4.9 showed that the processors received increased values for their tuna products in 2008 also. A reason for this increase in value could be partly from the depreciation of the US Dollar between 2003 and 2008, which was accelerated in 2008 (Zucchi, 2011). Ghana, as we know, exports mainly to the EU so will be paid for its tuna mainly in Euro, which they then will convert to US Dollars. A weak US Dollar during these years indicates a strong foreign currency i.e. the EU (Zucchi, 2011), so Ghana was receiving more Dollars during 2008 from foreign exchange than ever before. After 2008, as the rest of the world began to fall into recession the US Dollar appreciated again quite sharply (Elwell, 2012). This pattern could very well explain the trend in the value of the tuna export from Ghana. The general export of tuna increased in value and quantity sharply in 2005. The increased quantity could be simply explained by the great increment in tuna landings that year, almost 20,000 MT more of tuna is landed in 2005 than 2004 or 2006 (graph 4.1). In fact, in January that year Ghana gave licenses to three foreign tuna vessels to fish in their waters (WorldFishingToday, 2008). This was apparently done to increase the supply of fish to the processors at a request from PFC (WorldFishingToday, 2008).

PFC decreased their sales of tuna dramatically to Ghana from 2005 until the value and quantity reached an all time low by 2008. This may result from an ever-increasing supply of imported tuna in the Ghanaian stores (graphs 4.3 and 4.4). PFC and Myroc gain the least

profit when they sell their tuna to the Ghanaian retailers, they are subjected to taxes as they are located in the freezone enclave. They make the most profit by exporting the tuna abroad, duty free. The Ghanaian imported tuna originates largely from Thailand; this isn't surprising as Thailand is the largest exporter in the world of tuna (FAO, 2013[1]). Thai tuna exports were growing until 2011 when reduced tuna catch was reported in the Western Pacific (FAO, 2013[1]). Since then Thai tuna imports have dropped around the world, in 2012 the EU suffered a 44% decreased in tuna from Thailand (FAO, 2013[1]). Imports into Ghana have diminished sharply since 2011, conceivably due to this trend in the pacific tuna supply.

**RCA is an index that reveals the relative advantage or disadvantage a country has in a certain class of traded goods or products (Balassa, 1965)*

5.1.7 Revenue Distribution

The revenue distribution across the value chain is clearly in favour of the retail stage. This pattern can be seen in other seafood value chains also. The retail stage of Icelandic cod export to the USA holds the majority of the added costs at over 30%, however this is more severe for the Ghanaian chain as retail (Ghana and abroad) has over 70% of the added costs (FAO, 2006). This discrepancy could be down to the fact the production and processing for the Ghanaian tuna chain are taking place in a developing country, therefore utilities, labour and extra costs are much lower. Value addition can be extremely high at the retail stage in the developed country, running costs of business are relatively more expensive. Also they can afford to add more revenue at retail if the production and processing stages are that much cheaper. This theory may be supported by an example of the Tanzanian Nile perch value chain. The production and processing stages take place also in a developing country (Tanzania) and the perch product is then exported to the European and USA markets. The retail value addition is worth 60% (FAO, 2006) while the value added at harvest is worth around 15%, almost the same for the Ghanaian chain. Moroccan Anchovy is caught and processed domestically before being exported to foreign markets such as Italy (FAO, 2006). Fishing activities account for as little at 4% of the added costs while the retail stage in Italy adds up to 75% (FAO, 2005). These values are very similar to the Ghanaian value chain. The anchovies and the tuna leave their countries of origin as shelf ready, either in cans or jars already labelled. All the labour is done in Morocco and Ghana, where only 18.7-24% of the added cost exists, the remainder can be found on the EU market. It can be considered that these types of chains represent a highly processed export orientated product. The distribution

of the added value also reflects where the power is absorbed in the value chain; in the examples of Morocco, Tanzania and this study it is by the developed markets. The Icelandic export chain demonstrates a more even spread of revenue and power through the value chain. In fact the country of origin, Iceland, hold power over 70% of the chain activities as Icelandic nationals own the exporting companies in the US (FAO, 2005). The Sri Lankan tuna value chain (Yellowfin) compiled by Gestsson, Knútsson and Thordarson (2010) shows the value addition of the tuna products in the local shops to be on average 4,100 US Dollars per MT of tuna sold. This is very close to the value added by the Ghanaian shops, 4,064.72 US Dollars on average. The tuna head through slightly different routes to the local market shelves in Sri Lanka or Ghana. The majority of the Sri Lankan tuna is sold in local shops as fillets, slices or whole; they pass through multiple middleman and transport methods that hike up the value addition. While in Ghana it is usually canned and will pass through probably only one wholesaler. In the end the value addition is the same or similar. The foreign retailers to which the Sri Lankan tuna is exported (mainly the UK, France and Germany) add as much as 14,500 US Dollars per MT while for the Ghanaian tuna they add on average 7,076.87 US Dollars pet MT, a maximum of up to 10,000 Dollars in this study. The Sri Lankan tuna therefore receives more value addition once exported. The exported tuna is processed, fresh or chilled. The UK tends to airlift the tuna through the processors for import, this type of transport is generally more expensive than shipping and could add extra price to the charges for the tuna, added costs must be increased at retail to compensate. Another reason could be the selling prices, the exported tuna is sold for an average of 4,600 MT to the EU retailers, over 1,500 US Dollars per ton more expensive than the average price of the Ghanaian tuna. The tuna that is being exported is mainly fresh, there are apparently no canned exports. This type of fresh product is much more expensive than canned tuna meant which is designed to be low-priced (OPRT, 2004). The vessels in Sri Lanka are mainly longliners that catch tuna for the export market, this type of fishing catches larger and more expensive tunas than purse seiners (FOA, 2005; OPRT, 2004). CBI (Centre for the Promotion of Imports from developing countries) of the Netherlands mentions that the product price of Sri Lankan tuna can be quite high as the fishing practises are sustainable and are promoted as so abroad, therefore demanding increased costs. All these types of reasons could make the Sri Lankan catch more expensive and hence with a greater effort from the retailers to make profit. In conclusion the revenue distribution of actual costs through a fisheries value chain, even when it is the same species, is very dependent of the type of product that is desired from the fisheries in particular. The highest revenue link is seen at retail in the EU while revenue

addition is decidedly lower in the domestic stores, just as in Ghana.

5.1.8 Governance of the Value Chain

This report suggests that the IUU occurring in Ghana is hugely as a result of uneven power distribution and the inability of the MCS to act. In the fishing activities the expatriates are making the decisions, they are the captains and chiefs on board. When vessels are found in the wrong EEZs or undertaking illegal activities the crew in charge of the vessel can evidently be given some of the blame. IUU fishing, which is itself driven by economics, can really impact a developing country financially (MRAG, 2005). For example, illegally transhipping the tuna at sea (Panofi) can result in a direct loss of value that could be taken to Ghana. Landing fees, certificates, taxes and other tariffs will directly by-pass Ghana. Unlicensed border hopping by Ghana can negatively impact neighbouring West African countries. This causes a direct loss in value as potential catches are removed by IUU vessels; this is one the largest impact of unlicensed fishing in developing countries waters (MRAG, 2005). Ghana can't control these vessels and their crew, let alone contact them when they are at sea. For the lack of MCS activity, IUU allegations (fishing outside Ghanaian EEZ) have already been made this year against Ghana's tuna fleet by the EU and fines have been paid on two occasions (Daily Graphic Ghana, 2013; Joy Online, 2013; Stop Illegal Fishing, 2013). The big companies will be able to get their hands on licenses to fish in foreign EEZs while the smaller companies with baitboats may not have the funds or the capacity to go fishing that far. The large companies (3) that own the majority of the Ghanaian purse seiner fleet are the ones that will make a difference to the fish stocks, they are landing most of the catch. Unfortunately it is a sad fact that they will get away with any illegalities that they carry out and will continue to fish where they like as they can afford to pay the fines. The three million Dollars that the Ghanaian companies were fined last month (Daily Graphic, 2013) is not so significant to them, though it could be bad news for some of the other companies this research met with.

The scarcity of MCS is a major problem faced by developing countries (MRAG, 2005). It has already been addressed as an area for African fisheries to tackle, notably with the support of developed countries and greater cooperation amongst African countries (Stop Illegal Fishing, 2011). Actual implementation of MCS is absolutely key to preventing IUU in the Ghanaian tuna fleet and further damaging the value chain. Ghana is certainly missing the technology to monitor the fleet sufficiently i.e. VMS and VHF, though it is not clear if Ghana has a working VMS or not. Either way it is not being implemented. Unfortunately this is the

same story across the developing world; the economy and infrastructure is not there to allow the provision and implementations of MCS technology (FAO, 1998).

The VMS was established first in Portugal for the simple reason that measures dedicated to enforcing fisheries laws were recognized as insufficient (Navigs, 2005). Stocks were rapidly being depleted in Europe, as well as in Portugal, and they needed a management regime that ensured generalized compliance with much less effort (Navigs, 2005). The VMS was born with their idea to track all national vessels automatically, thus saving time and resources that they were spending on trying to find vessels with patrols (Navigs, 2005). This research already showed that Ghana can't afford to send out patrols when needed to check on their tuna vessels, be it by sea or air, their only option for proper MCS assistance is the VMS. In 1998 the FAO estimated to set up and establish a VMS it would cost 50,000 US$, plus 5,000 US$ per vessel for installation and roughly 1,000 US$ per year to upkeep the vessel receiver. In 2002 an actual VMS model was quoted in the USA as costing up to 5,800 US$ plus 5,000 Dollars per vessel instalment (Enforcement Consultants, 2002). On top of that, the price of transmitting a VMS position report was costing between one and five dollars a day (Enforcement Consultants, 2002). The FFA (Pacific Islands Forum Fisheries Agency) reported the VMS system to have an annual upkeep per vessel of 845 Dollars (FFA, 2011[1]). As there are only thirty-four Ghanaian tuna vessels, these initial and continued investments are not that outrageous. According to the results the companies spend more on plane tickets for their expatriate staff members. The cost effectiveness of a VMS in a developing country depends on a range of different factors which can be interchangeable depending on the regions; health of the fisheries, value of the fisheries, size of fisheries, personnel in fisheries management and availability of MCS (FAO, 1998). There are other types of MCS methods that can be employed if a VMS is deemed unsuitable for a country, such as Fishery Observers, however nothing is as practical or as unbiased as the VMS (FAO, 1998). Self-reporting by the tuna vessels in Ghana, or anywhere else, via the use of logbooks is useless and completely archaic. The reality is Captains and officers will chase the tuna until it's caught, borders are insignificant when up to 10,000 US Dollars can be made by a single Captain. The VMS must be recognised as not an end to but an aid to preventing illegal fishing (Navigs, 2005). Its relevance for developing coastal states makes more sense than anywhere else. In countries like Ghana it can not only help to stop illegal fishing by the Ghanaian vessels but by foreign fleets like the EU who may come into their waters (Falaye, 2008). Ultimately the VMS can help protect an economically important natural resource that could really provide some help towards economic stability in a developing coastal state.

It is clear from this study's results that the EU and ICCAT hold a significant amount of control over the Ghanaian tuna industry. The EU insists Ghana goes through countless inspections for health and safety and quality standards at the production and processing stages. They require that for imported fisheries products, including tuna, the countries of origin must be on a 'Positive List of Eligibility' (EC, 2007). This means that before the EU will accept fish products the exporting country must have a competent authority that exerts control over the fisheries value chains (EC, 2007). The imports must be caught by only the EU approved vessels and be certified as caught by legal means i.e. no IUU (EC, 2007; EC 2009). Clearly this is not the case and they accept tuna caught by IUU fishing methods. The EU is the largest importer of fish and fish products in the world (EC, 2007).

ICCAT provides countless 'recommendations' in regard to fishing activities, management and research. Recommendations appear to be heavily concentrated on Bluefin tuna. Records dating back to 1974 only focus on Yellowfin tuna conservation four times while it has 64 reports of Bluefin tuna recommendations (ICCAT, 2013[2]). How ICCAT regulates its recommendations on a regular basis in Ghana is unknown to this study. Ghana provided 9.8% of ICCAT's 1,937,860 US Dollar budget in 2004 (Oceanic Development, Poseidon and Megapesca, 2005). They were the second highest contributor after the European Community and provided almost 3% more than the largest economy in the world, the USA (Bergmann, 2013; Oceanic Development, Poseidon and Megapesca, 2005).

Both the EU and ICCAT support and fund millions of dollars worth of research into sustainable marine fisheries each year (SPC, 2011; Kulabako, 2011; IW:LEARN, 2005; ICCAT, 2013). Accordingly the EU and ICCAT have access to a wealth of fisheries research on West African fisheries and tuna fisheries. Resources include up to date descriptive and empirical data on the economics, governance and realities of the industries. Therefore it can be assumed that they know well the capacity of Ghana and other developing states to govern their fisheries. The other countries apparently dealing with the IUU allegations (Cape Verde, Senegal, Cote D'Ivoire) are all ICCAT members and all export their tuna to the EU (ICCAT, 2012; Undercurrent New, 2013[1, 2]).

5.1.9 Women of the Fishing Industry

The Big Mammies of Ghana have managed to come along in a male-dominated industry. They provide employment and household revenue all over Ghana. Traditionally women have usually played the supporting roles on-land; trading and processing the fish (Browne, 1998).

Today however women can own vessels, employ crew and pay for the fishing activities both in the artisanal and industrial sector (Browne, 1998). In Sierra Leone there exists the equivalent of Big Mammies in the fishing industry that own or finance trawlers and purse seiners (which catch tuna as well as other finfish) (Browne, 1998). All the women in the study were born into relatively advantaged homes and have found their way into the fishing business through family or friends; they generate employment, foreign exchange and increased house hold nutrition to Sierra Leon (Browne, 1998). In Nigeria (Akwa Ibom State) the large-scale entrepreneurial women or what Ghanaians would call 'Big Mammies' of the fishing industry were also more well off than the general population (Udonga, Van Tilburgb and Niehofa, 2010). Medium-scale financers who were building their capital tended to find their way into fishing through family tradition (Udonga, Van Tilburgb and Niehofa, 2010). The women financers can own boats, gear and crew and will very often be the family breadwinners (Udonga, Van Tilburgb and Niehofa, 2010). The degree to which women are involved in the fishing industry reflects the culture and the laws of a state (Siason *et al*, 2002). The local status of women in fisheries is undervalued and underappreciated in many Asian countries, especially where Islamic laws are strictly conservative (Siason *et al*, 2002). Lack of opportunities for women to hold managerial and decision-making jobs in Asia are evident, even in the more developed countries, such as Japan and Malaysia (Siason *et al*, 2002). In the EU, despite all its economic and cultural diversity, women feel unwelcome in the capture fisheries and have not been able to progress into fisheries management (MacAlister Elliott & Partners Limited, 2002). They are even economically discriminated against in the sector, getting paid 30% less than men in what appears to be the same job (MacAlister and Partners Limited, 2002). It seems that in West Africa traditionally separating jobs according to gender and the existence of a female focussed family society has given women more power and independence (Udonga, Van Tilburgb and Niehofa, 2010). In Ghana, for example, women are measured by their economic independence from their husbands among other things (Udonga, Van Tilburgb and Niehofa, 2010; this study). West Africa women, through hard work and much risk taking have become empowered entrepreneurs in the fishing industry. Successful Big Mammies and Fish Mammies take care of their families, they tend to invest in their houses and see the importance of their children's continued education, they enhance their families social as well as their economic positions (Udonga, Van Tilburgb and Niehofa, 2010; this study). In all three countries (Nigeria, Ghana and Sierra Leone) women are playing a critical role in fisheries development and therefore deserve much more power when it comes to decision-making and future plans or strategies.

5.1.10 The Future for the Foreign Investors

Ghana needs the big Asian investors for its economy; they employ thousands in Tema and pay substantial licensing and certification fees. They locate in Ghana for competitive means, it is close to the resource and local labour is far cheaper than many other places. As soon as the Ghanaian industry starts to become uncompetitive or unprofitable many of the Korean partners and investors will pull out and locate to somewhere with cheaper labour and infrastructure. This has happened on multiple occasions in the past (Pers. Comm. World Marine and Panofi). Thailand upheld international competitiveness based on cheap labour for decades, however, today it is declining due to increased economic growth (Kuldilok, 2009). Resultantly Thailand's tuna industry and its thousands of employees face a difficult future, possibly the decline of the tuna processing sector due to increased labour costs (Kuldilok, 2009). This all depends if tuna processors are willing to improve wages and working conditions, if they are not they stand losing the business to a lesser developed country (Kuldilok, 2009). Competitiveness is key to the success of the Ghanaian tuna industry. According to this study, the domestic competiveness is completely ruled by the larger companies who are owned by Asian Corporations. This research considers the international competitiveness level of the Ghanaian industry to depend on them. Between 1999-2001 and 2006-2009 Mensah (2010) found that Ghana had already lost 3% of its market share in canned tuna export to the EU, Madagascar and Cote D'Ivoire experienced declines also. However he observed that both Ecuador and Thailand saw their shares increase. Ghana and its fellow ACP countries appeared to be uncompetitive during that time period (1999-2009). Mensah (2010) called for more international and national support through trading policies to help ACP countries exporting canned tuna increase their competitive advantage. Relying on reduced tariffs and zero percent import tax that the EU can decide to remove is very risky. These trade agreements have not boosted local economies or stimulated growth as they were meant to, they encourage ACP countries to trade with the EU and not between themselves (EC, 2013). This study disagrees with Mensah (2010), reliance on these types of deals are not the way forward for increased competitive tuna trade from Ghana.

Trying to keep the foreign investors interested when competitive advantage is already decreasing will be very difficult for Ghana. In theory they could apply value addition to certain parts of the chain that could increase returns and maintain investors interest. For example the improvement of basic infrastructures, Ghana is constantly experiencing power cuts, or 'lights out' as they call it, due to the inefficient energy station at the Volta lake dam.

When this happens, which is usually at least 2-3 times a week companies are forced to use their diesel generators, which causes their running and or production costs to jump up. Regional trade of tuna could be made possible if the main roadways were improved, even slightly. The roads around Tema are absolutely horrendous, large container trucks are constantly falling over or getting stuck in huge potholes or fractures. It takes over two and a half hours to get to the capital that is under 30Km away (personal experience; Googlemaps, 2013). If basic issues like these can be sorted perhaps a slight difference to the profit margins through the value chain could be made. Of course this would not just help the tuna industry, these issues are fundamental points for Ghana and beyond the scope of this research. But it is worth pointing out that a fishing industry in a country like Ghana faces completely different challenges to those in the 'first world', often incomprehensible to those that have not experienced them. VCA's highlight the issues that are unique for each and every commodity chain. Unfortunately the lack of basic infrastructure, reliability on services and regional connections could make Ghana a very unattractive country for business to foreign investors in the tuna industry and in general.

5.2 Recommendations

Value addition is needed in the governance over the value chain. Some type of MCS project needs to be set up with the help of ICCAT or the EU, or both, so Ghana can start to control it's fleet with efficiency. The Ghanaian Government clearly can't seem to support this themselves and as most of the tuna supplies the EU, the European Community have a responsibility to step in. ICCAT demands VMS reports so they should also help Ghana reach its own requirements. These types of projects already exist i.e. the VMS Project of the Pacific Islands Forum Fisheries Agency (FFA, 2011[1]). The members provide 20% of the funding, the rest comes from foreign fishing licenses and funding organizations. The EU is going against it's own policies by accepting tuna from a country they know does not have the ability to implement MCS and more than likely is illegally fishing. ICCAT should know very well the tuna industry in Ghana as the country joined the commission in 1968. The VMS is cost effective, there is no doubt, the alternative is continued IUU which can jeopardize Ghana's industry even further.

A permanent tuna observer programme needs to be put in place in conjunction with the VMS. The VMS alone can be tampered with and corrupted, depending on the type and model (Navigs, 2005). Unbiased observers need to be on the tuna vessels in Ghana at all

times. They need to be paid a proper wage so that any bribes or incentives offered on board will not be attractive. Observers can sample all the catches, confirm logbook entries, observe FAD use and summarize bycatch.

Strengthening national regulations and upgrading technology, with help from the EU and ICCAT, will increase the fishing costs of IUU vessels (OECD, 2004).

Conversion factors for converting tuna products into live weight need to be properly developed, preferably at the main canning ports around the world. At these ports the proper information can be used to calculate the regional differences in tuna biometrics and for various types of tuna product. The processors know roughly the yield of the species they put in the cans and pouches but as they are so competitive it is not thought that they are willing to divulge the specifics. The appropriate tuna management bodies need to manage this type of work i.e. ICCAT in the Atlantic, so that more accurate tuna statistics can be presented to conserve stocks. ICCAT has put work into Bluefin tuna conversion factors but now it is maybe time to work on the other species existing in the Atlantic before they too also reach precariously low levels.

This study calls for the upgrading of Governmental and private sector correspondence. Ghana does hold control over these companies as they provide the licenses, certifications and authorization to fish in the EEZ. Ghana has the power to insist for more transparency. The only officials who knew the tuna industry well where in the MFRD and MCS in Tema. They need to interact with the Korean or foreign investors and the Korean captains on regular basis, even if there is nothing urgent to discuss they need to make communication with these stakeholders. The Ghanaian directors already know personally the Officials but seemingly this does not help transparency in the fishery. Brief meetings could be held every 3 months with available expatriates to convey tuna conservation issues, relay approved fishing procedures and understand how activities at sea are changing or not. Before the 1992 cod stock collapse in Atlantic Canada there were little or no communication between the Governmental and private sectors (Corbin, 2002). As the fisheries became more and more industrialized, as tuna fishing is doing today, there was less and less connection between the Government and the fishing companies, segregation began to deepen in the sector, overfishing was neither suggested nor opposed until it was too late (Corbin, 2002). The economic nature of industrial fishing can bring about little room for open communication and free expression between companies and the Government, especially if there is IUU happening. It is all very well in writing to call for open communication in the Ghanaian tuna

industry, the question is how can they structure an industrial fisheries to allow so? Social norms and cultural practises do not allow Ghanaians to be very generous with information; to them it is golden, something to guard even if there is no reason to. There appears to exist a very difficult path ahead if the Government and private sector are to work hand in hand. It may be clear theoretically that working together could be the best ammunition to protect national resources, but in the field this can seem almost impossible to establish.

Skilled Ghanaian crew are needed, Captains, Officers and Engineers. Ghanaian Captains, in theory, should feel more of an urge to protect the tuna stocks and prevent IUU. It is pleasant to think that they would. That is only if during their training the facts and figures of IUU and its effects are presented in the right way. It needs to be highlighted that IUU means less tuna and less money for everyone in the future. If the power share was more balanced there might be more of a tendency for the private and public sectors to communicate, countrymen to countrymen. There would on one less foreign foothold in the tuna industry at least. Hiring Korean Captains and crewmembers also adds costs to the production stage. Agents, flights, social securities and a whole range of expenses are added to the company's accounts when expatriate employees are involved. This is also seen in the tuna industry in Thailand. Fishing companies, due to lack of local expertise in the labour force, had to hire captains and foreign crew with high salaries that increased their fishing costs (Kuldilok, 2009). Economically it would be a good recommendation for Ghana to train tuna captains and skilled crewmembers; it may also be better for the health of tuna stock and the long-term sustainability of the industry.

5.3 Conclusions

The Ghanaian tuna industry has been described in as much detail as possible while monetary values have been highlighted along the commodity chain. What has been identified is that the link with the highest value is the European retailers and the stage with highest value is retail in general. This is contrary to what Ghanaians thought about the value chain. The EU and ICCAT exert the most control; both the stakeholders and the principal researcher established this. Socioeconomic dynamics acting in the chain included the lack of communication between the public and private sector, power imbalances amongst players at production, the role of local businesswomen as actors in the chain and the general characteristics of workers

in the industry (salaries, movement, connections). It was discerned that governance is weak within the industry and this is where value addition and upgrading is needed the most, especially within MCS.

It can be argued that purse seiners are more economically viable than baitboats, especially in conjunction with FADs; fishing costs less and the fleets are more efficient tuna producers. However, the larger companies that own them don't do as much as they could for the local economy. They employ less people and tend to tranship or bulk export rather than continue the value chain in Ghana. If purse seiners continue to dominate the fleet the Maximum Sustainable Yield will be reached sooner (OPRT, 2004), the power imbalance between production players will deepen and ultimately Ghanaians will play a smaller part in tuna fishing. Baitboats are inclined to be owned by the smaller, more domestically orientated, tuna companies. The ships are not economical as they are old, they can't travel as far as the purse seiners and they land less fish. Revenue distribution analysis shows that the export orientated value chain is most rewarding while the least profitable path is the local value chain, particularly when companies use baitboats and sell to the Big Mammies. In conclusion, baitboats may be better for the local economy but they are not profitable, purse seiners are profitable but their efficiency may affect tuna stocks and their management can direct revenue away from Ghana. However their future is unstable in light of ICCAT regulations and economic dynamics such as increased fuel prices and competition with Asian tuna.

Companies that have purse seiners, links to the processors and 'cashed-up' investors dominate the Ghanaian part of the value chain. They will succeed in light of fines and future fishing licenses but are likely to reduce the benefits of the tuna industry to the local Ghanaian economy. Overzealous regulation of smaller companies in the absence of Government training and support will sooner or later destabilize them, paving the way for big companies, which are less beneficial to the local economy, to completely dominate the industry. These companies are the actors that will make the difference to the health and future of Ghanaian tuna stocks.

Tuna processing in Ghana is dominated by PFC who is ultimately owned by one of the largest tuna companies in the world, Thai Union Group, one of Ghana's 'cashed-up' investors. The Myroc accounts, used to calculate revenue distribution, show a loss in profit that means they are not processing tuna competitively anymore or there is a lack of transparency at this stage. Exports from these processors appear to be affected by external factors like foreign exchange, competition from Asia as well as the domestic tuna supply. Even so, the costs and prices of tuna processing have not dramatically changed in lesser developed and developing

countries in recent years. This may indicate a reliance on preferential trade agreements with the EU that haven't been shown to boost economic development in ACP countries. It can also indicate that even as the industry develops these countries still do not see an increase in their share of the value chain, they continue to receive low profits and margins even with advances in technology and efficiency.

Revenue distribution heavily favours the retail stage when developing countries are the producers and the highly processed products are exported as shelf ready. As added value reflects the power spread in the value chain it can be deduced that the power is more evenly distributed when developed countries trade with each other than when developing countries take part.

Value addition is desperately needed for Governance over the value chain. IUU is a major issue in the tuna fleet in Ghana and is caused by power inequalities at the production stage and lack of MCS. Power imbalance, as reflected by salaries, is deeper in the Ghanaian tuna fleet than in others (Thailand). Financial backers will allow producers to carry out IUU unless Governance is strengthened. Weakness in fisheries vale chain Governance is found throughout the developing world. Technology, such as the VMS, is highly relevant and certainly cost effective for these circumstances. ICCAT and the EU should play a role in supporting an MCS programme where they already know clearly, and have known for many years, that it is needed. The Ghanaian tuna supplies the European supermarkets and restaurants so the EU has a responsibility to offer funding. Ghana pays hundreds of thousands of dollars to ICCAT each year but it is unclear what support they get in return, besides recommendations and research results. Many of ICCATs members in West Africa illegally fish tuna, ICCAT needs to organize Governance support for these countries and also for species other than Bluefin tuna.

This study showed how a globally important industrial fishery works. Production and processing trends were presented in terms of both organization and finance. The Governance, or lack of, was looked at in detail. The future of this tuna industry appears to lie in the hands of multinational companies; a pattern repeated in fishery value chains all over the world. Ghana needs to maintain its' position in the global tuna trade by proving itself still attractive to investors and international markets while keeping the local socioeconomics of its own country in mind. Issues like IUU are unattractive complications for future developers or investors in this industry. For the future of both the tuna stocks and the business itself law enforcement needs to take place.

The question now is how can Ghana's tuna industry prosper when up against more competitive Asian countries with cheaper production rates, better infrastructures and effective management? In fact, the basics of this question are fundamental to countries trying to control the exploitation of a natural resource competently. This is where value chain analyses can be slotted in.

One of the downfalls of West Africa as a region is the complete absence of good infrastructures and functional logistics. Governments in the region do not appear to make infrastructure or administrational development a high priority; this in the end is their ruin. Supply chains in countries like Ghana are crippled by their own Governments inadequacy to invest in the needed supports and building blocks. As a result, centres of value addition in supply chains can remain thousands of kilometres away on the shelves of European supermarkets. Ghana has done well by managing to capture more than just the basic stages of the tuna supply chain, what they need to do now is manage it effectively.

This value chain can be used as a source of precise information to those who have interest in the Ghanaian tuna industry or in the tuna industry in general (Governmental, conservational, private, Educational). The thesis should offer an insight into the workings of a cost heavy fishing industry in a developing country. Public or private sectors that need to know where to focus funding, who holds control of the industry and what's in the near future for the business can use this thesis as a guide. This research also presents an up-to-date snapshot of the industry in 2012/2013; how many vessels there are, how much fishing costs, what are they landing, who are they selling to and much more. An update like this is needed for the industry as it has recently been in the spotlight allot over IUU allegations. By reading this report it can be understood why IUU happens and how it can be stopped. A glimpse of how stakeholders involved in the business feel and think can be grasped, something that has not been done before.

In conclusion, this VCA provides a wealth of material about an industry on which many eyes have recently turned. It can be very beneficial for those that need to comprehend the financial complexities and real life dynamics of the Ghanaian tuna fishing industry today.

5.4 Limitations

5.4.1 Conversion Factors

Tuna is one of the most traded fish commodities in the world today yet there is a serious lack of available literature on converting from tuna product weight to tuna live or round weight for species other than the prized Bluefin. The literature online that does provide conversion factors for Skipjack, Bigeye and Yellowfin is rather limiting as they barely give any details on how and why they produced certain factors (Cunningham, Restrepo and De La Serna, 2002; EMOFA, 2012; USDA, 1992; FAO, 1990-2013; FAO, 1980; FAO, 2000). The species of tuna and the region it was caught used as well as the processing and packaging procedures all affect the tuna meant going into a product (FAO, 2010[1]). The percentage yields of tuna cans and pouches are very variable, the method of defrosting and cooking the tuna and the species and the weight of the tuna will all affect the yield. There is a large difference between the yields of larger Yellowfin tuna and smaller Skipjack tuna. For large Yellowfins over 10Kg there is a minimum yield of 45% and for Skipjack tuna of approximately 1.5Kg the yield reaches just 37% (Pers. Comm. Myroc, 2013). The moisture loss during the defrosting period can affect yield, if not carried out correctly the tuna can lose more moisture than necessary resulting in a smaller yield (Pers. Comm. Myroc, 2013). Atlantic Bluefin *Thunnus thynnus* can be over 30 times heavier than the Skipjack tuna and over two and a half times longer in forklength (NOAA, 2013). Much more meat can be retrieved from this type of tuna and far less waste will be generated. The conversion factors used for the different types of tuna cuts or parts (eggs, belly, tail and head) in this study are for Bluefin as they were none other available. There therefore may be an overestimation of the actual live weight of the tuna. Unfortunately there were no other options.

Generalized conversion factors, which were found to be so often employed in seafood studies, are negligent when used without explanation or in context. The data represented after being treated with these factors may be a gross misrepresentation of the truth. This report showed the huge differences that can occur in a dataset when the live weight is calculated from different conversion factors. These inconsistencies are then carried through to the profit calculations and revenue distribution analysis and so effecting the presented results. This should be the same for other reports that used these factors, once applied they have great consequences on the data, the trends and possible future indicators or prediction.

5.4.2 Data Collection

Unfortunately due to the current climate of the Ghanaian tuna industry many companies and ministries were unable to complete the questionnaire or even be interviewed. Meeting with different ministries associated with the tuna fisheries was somewhat difficult and complicated. Firstly, contact had to be made by either email or phone to initiate the process and arrange a meeting. Regretfully much of the contact information available for Ghanaian ministries was either incorrect or no answer would be received. This lead to a month long process of locating offices, looking for contact personnel, phone numbers and addresses. Once the ministries had been located correctly visits were made to introduce the study and confirm its origin and purpose. The same issue was found when trying to locate the fishing companies all over Tema. More than often data from the Ministries was not available, especially at the main ministry offices in Accra. Frequently it was not collected in a single place or file or was unable to be found. When it was available it was either in hard copy form or the soft copy could not be given. The ministries themselves didn't have detailed information about the tuna fisheries as they found it hard to extract the data from the fishing companies. Many ministry departments were interested in the findings of this thesis as a source of information about the tuna industry and especially the tuna companies. Repeatedly, those who could provide data could not explain the data collection or compilation methods. This was an issue because the same datasets from different ministries were in fact highly inconsistent. The same datasets from governmental organizations like CEPS were different to the ministries'.

Although contact was made with 100% of the fishing companies, not all could assist in this study. The tuna industry is extremely competitive, canned tuna alone is a multi billion dollar industry, hundreds of thousands of dollars are spent on trips and processing every month in a single tuna landing port (Campling, 2008). Because of this competitiveness, coupled with the European export issues, it was thought that companies and Ministries were not willing be involved in the study. Many people were interested in the funding of the project as it is not unheard of for European organizations to fund a student to collect information on a business of interest to them. Consequently this study seemed, on more than more occasion, suspicious. Approaching the fishing harbour in Tema was extremely difficult as there were four different security check points where immigration officers and security personnel were extremely apprehensive. They demanded all types of paperwork, were very assertive and on many occasions tried to take passports away to hold while the principal researcher entered the

harbour. The data that this research initially wanted for the Ghanaian tuna value chain was therefore not able to be fully collected. The artisanal tuna value chain had to be completely disregarded as it took so long to research the industrial chain.

Questionnaire and interview results were initially proposed as primary data, contact was planned to be made with the tuna fisherman, crewmembers and multiple Big Mammies. On arrival in Ghana it quickly became clear this would never happen. Getting close to the fishermen was impossible due to the harbour dynamics and many companies would not allow the principal researcher to meet the captains or fishermen. The questionnaire had to be redesigned on many occasions as respondents found it hard to understand, didn't want to answer certain questions or complained about the length. In the end, to make the process more efficient, the principal research held the questionnaire and asked the respondents the questions orally while marking the answers swiftly at the same time. It became clear that if a questionnaire was left with a respondent over time the answers would not be answered correctly or sometimes truthfully, more than often they would never be completed. To deal with this the questionnaire became like a semi structured interview so the most information possible could be extracted and a better feel for the real life dynamics could be gained. Initially the questionnaires were intended for a large group of local market actors also. Unfortunately the costs of translating and the level of comprehension did not allow for the value chain analysis to move into the Ghanaian local market.

Another limitation that should be mentioned when researching in West Africa is the environment itself. Research days had to but cut in half, from 8am till 1pm as the temperature and humidity became too much to continue walking back and forth to different offices. This meant that research took allot longer than was planned and organization became more difficult with the shorter days. Roads and public transport systems in Ghana caused huge delays in getting around to meetings, interviews and delivering questionnaires or introductory letters. Moving between two offices in Tema that were less than 8Km apart took over an hour as the roads are completely unable for the amount of traffic that travels them. Sickness (Malaria) also became a problem into the third month of research; this reduced the investigation by over two weeks, which is a significant period of field study time. These limitations are mentioned as they impacted undeniably on the thesis and should be taken into account when carrying out studies in environments such as West Africa.

5.5 Future Research

Further research could include more details on the European side of the value chain. The prices and costs at retail need to be further investigated to get a more accurate idea of revenue distribution at this stage. The local value chain could definitely be studied in much more detail. This would require allot of in-field support such as translators and contacts in different markets. A better idea of the tuna trade, prices between fish mammies and tuna transactions could be understood thus highlighting how import tuna really is as a food commodity for locals. To further this the artisanal tuna value chain could be described; canoe fleets that target tuna or just catch it by chance could be surveyed. An estimate of how much tuna these fleets supply could really add a new dimension to tuna as a food source in Ghana. Interactions between the artisanal and industrial tuna fleets and consequent tuna trade would be very interesting to investigate.

Biological time series data could really offer this study another aspect of approach to the value chain. Data like sampled tuna fork lengths or weights could allow the value chain to map costs and prices against changing stock characteristics.

If this study was offered financial and or logistical support an even more in-depth value chain could be uncovered with improved empirical data. Fiscal incentives were often indicated as an easier way of data extraction while in the field. Better recommendations could be put together for the Ghanaian Government or even ICCAT or the EU for supporting more locally based development in the value chain.

To deepen the understanding of the industry more interviews could be carried out if logistics and current climates could permit that. Interviews and questionnaires can offer a unique view of the industry and really help researchers come to grips with the complexities of a working fishing industry like this one.

This research agrees that the value chain approach to studying fisheries gives a better awareness of the business today and moreover a better base for future fisheries sustainable development.

"I argue that the complex dynamics of capture fisheries can be better understood through the prism of a commodity frontier."

Liam Campling, 2012.

Appendix

Image 1.A: A map of the Ghanaian coastline, which includes some of Cote D'Ivoire. The blue balloons show the research sites for this study. Sekondi-Takoradi in the Western Region is where the 2nd largest port in Ghana is located. Cape Coast in the Central Region is where the University of Cape Coast (UCC) is established. Accra is the capital and is found in the Greater Accra Region, many of the ministries and offices are located here. Tema, also in the Greater Accra Region is where the fishing harbour is, where all the tuna companies and based and where the largest port for the country is found. The red balloon shows Abidjan where currently allot of the Bulk tuna is being sent from Ghana. Source: Google Maps (2013).

Visits, Questionnaires and Interviews in the Field						
Name	***Type***	***Times Visited***	***Questionnaire?***	***Interview?***	***Date?***	***Location***
Ghana Customs Excise and Preventive Service	Governmental	3	No	Yes	Yes	Accra
Ghana Export Promotion Authority	Governmental	2	No	No	No	Accra
Ministry of Fisheries and Aquaculture Development	Governmental	3	No	Yes	Yes	Accra
Ministry of Trade and Aquaculture	Governmental	3	No	Yes	Yes	Accra
Food and Agriculture Organization	Governmental	3	No	No	No	Accra
Environmental Protection Agency	Governmental	2	No	Yes	No	Accra
Ghana Standards Authority	Governmental	1	No	Yes	No	Accra
Friends of Earth	Non- Governmental	1	No	No	No	Accra
Worldfish Centre	Non- Governmental	1	Yes	Yes	No	Sekondi-Takoradi
University of Ghana	Educational	1	Yes	Yes	No	Accra
Ghana National Association of Farmers and Fishermen	Non- Governmental	1	Yes	Yes	No	Accra
Ghana Statistical Service	Governmental	5	No	No	Yes	Accra
FAO-Statistical Service	Governmental	1	No	Yes	Yes	Accra
Marine Fisheries Research Division	Governmental	5	Yes	Yes	Yes	Tema
Monitoring, Control and Surveillance	Governmental	2	Yes	Yes	No	Tema
Monitoring, Control and Surveillance	Governmental	1	Yes	Yes	No	Sekondi-Takoradi

Name	*Type*	*Times Visited*	*Questionnaire?*	*Interview?*	*Date?*	*Location*
Ghana Ports and Harbour Authority	Governmental	3	No	Yes	Yes	Tema
Pioneer Food Cannery	Private	1	Yes	Yes	No	Tema
Myroc Food Processing	Private	3	Yes (2)	Yes	Yes	Tema
Regional Fisheries Directorate	Governmental	2	Yes (2)	Yes	No	Tema
Mankoadze Cold Store	Private	1	Yes	Yes	No	Tema
Afko Fisherieis Co. LTD.	Private	4	Yes (2)	Yes	Yes	Tema
Agnespark Fisheries LTD.	Private	2	Yes	Yes	Yes	Tema
Clear Skies Fishing Co. LTD.	Private	3	No	No	No	Tema
Panofi Co. LTD.	Private	4	Yes	Yes	No	Tema
World marine Co. LTD.	Private	5	Yes	Yes	Yes	Tema
D-H Fisheries, Co., LTD.	Private	2	Yes	Yes	Yes	Tema
Rico Fisheries LTD.	Private	2	Yes	Yes	Yes	Tema
Trust Allied LTD.	Private	1	Yes (2)	Yes	Yes	Tema
TTV LTD. (Tema Tuna Ventures)	Private	1	No	No	No	Tema
G-L Fisheries LTD.	Private	1	Yes	Yes	Yes	Tema
Total	***31***	***69***	***23***	***25+***	***15***	***3***

Table 1.A: A summary of all the organizations and bodies visited during research and the help they offered. 31 places were visited on 69 occasions, 23 questionnaires were completed and over 25 interviews. 15 places supplied empirical data.

Example Questionnaire

ELIZABETH DRURY O'NEILL, MASTERS THESIS DATA COLLECTION.
QUESTIONNAIRE: Fishing Companies
Masters: Marine Science with the University of the Algarve and the University of Cape Coast.
Thesis title: A Value Chain Analysis of the Tuna Industry in Ghana.
Sponsorship: None
Supervisor at University of Cape Coast Contact: Dr. Noble Asare, 0278499899.
My contact: 0249572625, nelson_rabbit@hotmail.com

Please CIRCLE OR HIGHLIGHT OR FILL IN your answer. Remember the answer DON'T KNOW is also important.

-Role in tuna industry/job title:

-What type of vessel does your company operate or do you fish on?
[purse-seiner] [baitboat/pole & line]

-How important do you think the tuna industry is to Ghana? 1 being of no importance and 10 being extremely important.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
Why did you choose this level:

-Who/what would you say has the most control over the tuna industry and how it works in Ghana? [Tuna fishing companies] [Government of Ghana] [Tuna processing companies] [International Legislation] [Other, please specify:

-Who do you think makes the most money in the Ghanaian tuna industry?
[Tuna fishing companies] [Government of Ghana] [Tuna processing companies] [Foreign retail companies selling Ghanaian tuna] [Other, please specify:

-Is there any unofficial things which greatly affect the tuna industry i.e. Loans for expeditions, credits for selling the fish, only family is employed, local fishing rules on board? [YES] [NO] [DON'T KNOW]
If YES what are they:

-How popular would you say smoked tuna is for consumption in Ghana? 1 being not popular and 10 being extremely popular.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
Why did you choose this level:

-How popular would you say canned tuna is for consumption in Ghana?1 being not popular and 10 being extremely popular.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
Why did you choose this level:

-Describe the crew on your vessels (i.e. what nationalities are the Captain, Officers, Engineers, Fishermen, Bosan etc.):

Questionnaire continued.

-How many purse seiners are there fishing from Tema:

-How many baitboats are there fishing from Tema:

-What depths does your vessel/the vessel from your company fish in:

-Do you/the fishermen on the vessel see any/know of any foreign ships also fishing for tuna in Ghanaian waters:

-Do you think any of the tuna fishing done is illegal:

-How are the tuna fishermen employed, explain:

-Do fishermen ever leave the company and why:

-How are the expats employed, explain:

-When and why do expats leave the company:

-How important are women in the tuna industry? 1 being not important and 10 being extremely important.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
Why did you choose this level:

-What rules/regulation/governance/legislation do you have to follow and which are the most important? E.g. quality control, fishing permits/licenses, international fishing laws:

-How much of an influence would you say the rules/regulations have on your role in the tuna industry? 1 being no influence and 10 being fully influential.
[1] [2] [3] [4] [5] [6] [7] [8] [9] [10]

-How are regulations communicated to you? [Meetings] [Notices/reports]
[Word of mouth from colleagues] [Other, please state:

-What happens if the vessel doesn't comply with the official legislation/regulations? [Given a warning] [Reduced pay] [Reduced work hours]
[Pay a fine] [Nothing] [Other, please specify:

-Has it happened before that any Ghanaian tuna vessel has not followed the rules? Explain

-Who enforces the official regulations? [Captain of the boat] [Head of your company/ group]
[Government officials] [International inspectors] [Nobody]
[Other, please specify:

-Where does the tuna that is caught go after landing and where is it sold? Explain the paths it takes in detail:

-What species of tuna is caught?

Questionnaire continued

-What species of other fish are caught?

-Do you companies ever interact or meet for deals? Explain:

-Do the tuna companies get on well together? Explain

-Do the fishermen/vessel crew interact at sea or on land? Explain.

-Do the crew from each vessel get on well together? Explain

-After landing who comes to get the tuna from the vessels or who is present at the landing site? Identify all present in detail.

-Are there inspections carried out after or before the trip?

-Have there been any improvements in the vessels in the past 10 years? Explain.

-Has there been new rules/regulations to follow in the past ten years? Explain.

-Where do you suggest the most improvement is needed for the tuna industry?Explain

-Which tuna company is the biggest?

-Are the canneries big players in the tuna industry and the expeditions?

-Do you know if tuna export prices change allot of stay the same and what do you think affects the price the most?

-Do you know if tuna first-hand prices (price companies sell tuna for) change allot of stay the same and what do you think affects the price the most?

-Do you know if tuna prices in the local market change allot of stay the same and what do you think affects the price the most?

-Do you think the first-hand prices for tuna are fair or not, compared to tuna prices in other big tuna ports?

ADDITIONAL DATA NEEDED

-Sales prices of each tuna species to processors.

-Sales prices of each tuna species as bulk export per month.

-Sales prices of each tuna species to local market per month.

-Tonnes of each species of tuna landed per trip.

-Tonnes of each species that go to the processors per trip.

Questionnaire continued.

-Tonnes of each species that are exported as bulk per trip.

-Tonnes of each species that go to the local market per trip.

-Cost of Fishing: cost per trip divided between all of the different categories i.e. Ghanaian salaries, Korean Salaries, Provisions, Oil, Fuel, Spare parts, Certifications, Harbour bills etc.

Ghanaian Tuna Vessels 2013						
Company	**Vessel Name**	**Gross tonnage (MT)**	**Net tonnage (MT)**	**LOA (m)**	**Type**	**Built**
AFKO Fisheries	AFKO 803	638	217	49	BB	1974
	AFKO 805	549	304	56.75	PS	1981
	YOUNG BOK	1020.16	306.5	50.5	PS	1971
Agnes Park	Agnes 1	1106	501	60	PS	1975
	Agnes 11	497.56	235.39	54.9	BB	1974
D-H Fisheries	Sea Plus 87	417.33	202.17	47.25	BB	1975
	Sea Plus 89	416	201.95	55	BB	1975
G/L	ACE 1	416.9	201.97	55.47	BB	?
TTV	Cap Finistere	2109	633	79.8	PS	1991
	Drago	1799.93	867.66	76.52	PS	1980
	Cap Des Palmes	768.46	315.85	55.45	PS	1982
	Cap Formosa	470	221	47.69	PS	1989
	Cap Lopez	768.46	315.85	55.43	PS	1983
WorldMarine	Marine 703	498.48	242.28	54	BB	1974
	Marine 707	497.76	243.04	54	BB	1975
	Marine 711	545.76	213.99	49.25	BB	1974
Clear Skies	Owuompesika	704	368	54.1	BB	1971
	Adjoa Amisaba	607.95	289.6	51	BB	1975
	Delali	607.95	287.6	50.98	BB	1974
	Eli	631	205	57.7	BB	1973
	Edem	499.71	269.23	62.1	BB	1975
	Eyram	607.95	289.6	51	BB	1975
	Ewura Esi	434.94	202.68	50.35	BB	1976
Rico Fisheries	Rico Uno	298.68	161.25	44.78	BB	1973
	Rico Siete	334	176	57.08	BB	1974
Trust Allied	Trust 77	499.87	263.01	54.56	BB	1975
	Trust 79	416	201.97	47.25	BB	1977
Panofi	Panofi Master	995	-	56.6	PS	1988
	Panofi Discoverer	1100	-	70.6	PS	2009
	Panofi Frontier	994	-	56.5	PS	1987
	Panofi Volunteer	989	-	56.1	PS	1984
	Panofi Path Finder	1100	-	62	PS	2009
	Volta Victory	2716	-	91	R	1996
	Volta Glory	2829	-	94	R	1983
TTV/Belize	Cap D'Ambre	1664	499	72.5	PS	2000
	Cap Coz	2109	633	79.8	PS	1991
	Cap Verga	2109	633	79	PS	1991

Table 2.A: The vessels currently active in Ghana according to the research carried out there. The company name, the vessels they own, their net and gross tonnages, their Length Over All (LOA), the type of vessels (PS: Purse Seiner, BB: Baitboat) and the year they were made are all shown here.

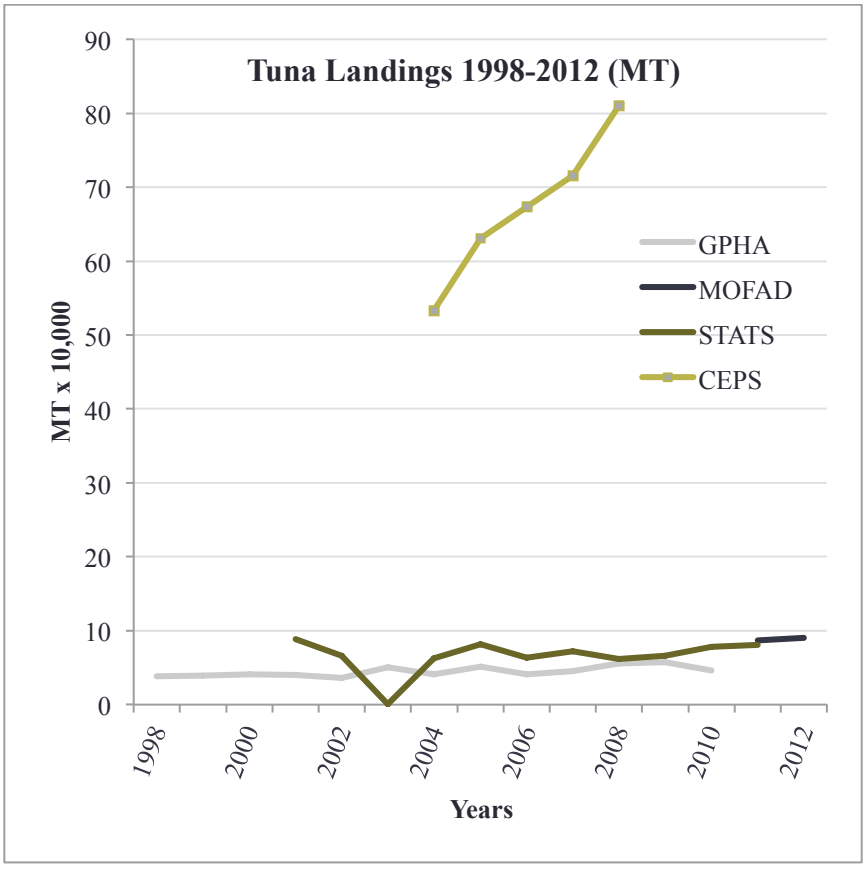
Image 2.A: The bamboo FADs being made by a Ghanaian tuna fisherman on board one of the vessels (FAD: Fishing Aggregating Device). Source: Mr. Paul Bannerman, MFRD.

Image 3.A: The FADs (Fishing Aggregating Devices) being prepared for deployment from one of the tuna fishing vessels in Ghana. Source: Mr. Paul Bannerman, MFRD.

Image 4.A: The transfer of tuna from a purse seiner to a baitboat while at sea, the metal tray they use to pass the fish over can be seen. This process happens when two vessels communicate and work together at sea. Source: Mr. Paul Bannerman, MFRD.

Image 5.A: The scaws or containers into which the tuna is offloaded from the vessels in Tema. They are still frozen when landed; the men in the picture are the stevedores and or the Ghanaian crewmember. Source: University of Cape Coast.

Image 6.A: The scaws in which tuna is transported around Tema, from landings to cold stores and processors. Those in the picture take 218 Kg of tuna and are owned by PFC. Source: This study.



Graph 1.A: This graph is compiled from the data provided by GPHA, MOFAD, the Statistical Services and CEPS. It represents all the tuna species landed in MT in Ghana between 1998 and 2012. There is a huge inconsistency between what the ministries and GPHA say and what CEPS report.

Image 7.A: An image of the Fish Mammies smoking tuna for the local market in Ghana. Source: <http://www.smokingmeatforums.com/t/127943/lightbox/post/862353/id/168778>

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