



# **DESIGNING A CO-OPERATIVE STRATEGY FOR QUALITY FISH EXPORTING**

**By**

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**Submitted in Partial fulfillment of the requirements for the degree of  
MASTERS IN BUSINESS ADMINISTRATION (MBA)**

**GRADUATE SCHOOL OF BUSINESS, FACULTY OF  
MANAGEMENT  
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SEPTEMBER 2003.**

**TO WHOM IT MAY CONCERN**

**RE: CONFIDENTIALITY CLAUSE**

Due to the strategic importance of this research it would be appreciated if the contents remain confidential and not be circulated for a period of ten years.


Sincerely

ET Gebremicael

September 9, 2003

## DECLARATION

I declare that this research thesis is my own work. This research has not been previously accepted for any degree and is not being currently submitted in candidature for any degree.

Signed:  \_\_\_\_\_

Date: September 9, 2003

This dissertation is dedicated to My Parents who have made me what I am today:

**TESFAI GEBREMICHAEL and MEAZA KAFFEL.**

There are no enough words in this world to tell you how much I love you.

Thank you.

E T Gebremichael

## **ACKNOWLEDGEMENT**

I want first to thank my lord, Jesus Christ for his inspiration and guidance through out my studies.

My sincere appreciation goes to my advisor Prof. E Thomson, for the encouragement, motivation and guidance she gave me toward the end of the project.

I wish to express my gratitude to my co-advisor Mr. Mesfin Tsegai, who provided valuable guidance and assistance through out the project.

Acknowledgements are due to the many staff members of Eritrean Marine Products Company who were interviewed during the course of the study.

Acknowledgments are especially due to Mr. Yemane Gebressilassie, Mr. Kifle Weldeselassie, Miss Lia Tesfai, and Mr. Essaw Teklu, for their kind assistance during the data collecting of this dissertation.

My sincere thanks go to all my family members for their contribution toward the completion of this degree. My special thanks goes to my brother Daniel Tesfai, for your patience, eagerness to assist, support, motivation, and having to always go an extra mile for me. I owe you too much!

I am also grateful to my closest friends and colleagues, Tesfazghi Tekle for encouragement and support during times of uncertainty, and Adhanom Mesfin for the assistance he gave me during the writing of this dissertation.

Lastly, the preparation of this dissertation relied extensively upon various secondary data sources, many of which are listed in the Bibliography part of the dissertation.

## **ABSTRACT**

Exports of Eritrean fishery products, for which the European Union is the largest market, has an important share in the socio-economic development of the country. It is very important to earn foreign currency and provide employment opportunities by encouraging local and foreign investors in the sector. The export of fish from Eritrea mainly targets markets of developed nations where food quality and safety standards are increasing rapidly. During the last decade there has been more focus on the application of more stringent quality and safety regulations according to international norms. This paper investigates the determinants of quality in global fish businesses. The paper provides an overview of all the factors that characterize international fish market regulations with special emphasis given to the EU markets. It also investigates the general quality and safety policies of the Eritrean Marine Products Company (EMPC). The paper findings show that the EMPC face some difficulties that may hinder its competitiveness in the global fish market. The paper examines the activities and resources of the three actors, that is the EMPC, European Union Inspectors and Fish Inspection and Quality Control Division, which have a significant contribution to the quality of fish exported from Eritrea. The impact of cooperative strategy or the networking model among the three actors to quality fish exporting from the country is investigated. The study supports the formation of cooperative strategy among these actors in that it is positively related to the export performance of the processing firms with higher compliance to standards.

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## **ABBREVIATIONS USED**

ACP	African, Caribbean and Pacific
CA	Competent Authority
CCP	Critical Control Point
CIA	Central Intelligence Agency
DMRIF	Department of Marine Resources and In-land Fisheries
EEC	European Economic Commission
EMPC	Eritrean Marine Products Company
EROSTAT	European Union Statistics
EU	European Union
FAO	Food and Agriculture Organization
FIQCD	Fish Inspection and Quality Control Division
FVO	Food and Veterinary Office
GCDP	Good Cleaning and Disinfecting Practices
GDP	Gross Domestic Product
GHP	Good Hygiene Practices
GMP	Good Manufacturing Practices
GNP	Gross National Product
GOE	Government Of Eritrea
GPCP	Good Pest Control Practices
GPMWP	Good Plant Maintenance and Water control Practices
GRMP	Good Raw Materials Practices
GSP	Good Storage Practices
GTP	Good Transport Practices
GWDP	Good Waste Disposal Practices
HACCP	Hazard Analysis Critical Control Point
HRM	Human Resource Management
IQF	Individual Quick Frozen
ISO	International Standard Office

IT	Information Technology
LDC	Less Developed Countries
MM	Millimeter
MoF	Ministry of Fishery
MSY	Maximum Sustainable Yield
Mt	Metric tones
Nkf	Nakfa
PGE	Provisional Government of Eritrea
ph	Potential hydrogen
PPM	Parts Per Million
QAS	Quality Assurance System
QM	Quality Manager
R&D	Research and Development
RDA	Resource Dependency Approach
SNA	Social Network Approach
SNM	Social Network Model
Sq km	Square Kilometer
SQAA	Supply Quality Assurance Agreement
SSOP	Sanitation Standard Operating Procedures
TCA	Transaction Cost Approach
TOR	Terms Of Reference
UNDP	United Nations Development Program
UV	Ultra Violet

## **CHAPTER ONE**

### **RESEARCH PROPOSAL**

#### **1. 1 INTRODUCTION**

The fishery sector in Eritrea is considered as a significant source of socio-economic development the same as for many less developed economies. Basically, the development of the fishery sector in Eritrea is essential for earning foreign currency through the export of valuable fish, providing employment opportunities by encouraging local and foreign investors in the sector and improving the nutritional deficiency in the country by increasing the current low consumption level of fish.

The export of fish from Eritrean Marine Products holding Company (EMPC) mainly targets markets of developed nations. Thus, the export performance of the company highly depends on its ability to comply with higher food quality and safety standards in these markets. In order to fully meet the EU regulations of quality and safety, the company needs to overcome its current constraints including the shortage of stores, un-standardized processing plants, ineffective refrigerators and maintenance problems etc.

The strategic management is essential for dealing with the continuous stream of changes that organizations face (Thompson & Strickland 2001). The rapid increase of food quality and safety standards in developed nations can be stated as one of the major challenges of fish exporters. In this case, it is wise to apply networking concept for it enables the firm to obtain the required resources from external partners, gather the necessary information about their markets and customers.

Therefore, the formation of inter-organizational networks is essential for food business firms like the EMPC to overcome its current constraints and be competitive in the global market.

## 1.2 BACKGROUND OF THE STUDY

Quality of a product can be defined as its “fitness for use” (Schroeder 1985). This means that, all characteristics of the product must satisfy the customer’s stated and implied needs. A great consciousness of the competitive potential of quality in products and services is being felt by businesses everywhere. Regardless of a firm’s size or activity, all businesses are increasingly customer driven, so the quality of a product depends upon its ability to fulfill the customer’s expectations.

Quality and safety standards especially in the seafood sector have been an essential component of food consumption. Similarly, with the increases in income, consumers in developed nations started to be selective on the products they purchase (Mahe and Ortalo1998, Roberts et al. 1999).

Food quality has dimensions related both to its production process and the final product. Its determinants can be grouped into four as: hygienic properties, nutritional properties, functional properties and organoleptic properties (Abalaka 1999). Health hazards from the seafood can arise from the raw materials used, from handling and through the other stages involved in the processing, transportation, storage and the sale of the food. Most seafood quality problems from LDCs is related to poorly defined inspection and approval procedures, weak technical regulations, and lack of staff for inspection and laboratory testing. Moreover, poor levels of personal hygiene and sanitation, lack of infrastructure for fish marketing and distribution and poorly defined institutional framework are also the causes for poor quality of seafood from these countries.

On the other hand, importing firms in general and EU wholesalers in particular have tight rules regarding fish imports from developing nations. The exporters of fish from less developed economies have to adapt to the new and more stringent rules concerning safety and quality standards [such as the implementation of the Hazard Analysis Critical Control Point (HACCP) system for EU, USA and other markets], which could have a



considerable impact on the volume of products exported in the short-medium term, (FAO 1996). The exporters from LDCs, therefore, may find it difficult to overcome their problems and meet the requirements of their customers in developed nations easily on their own.

Eritrean fish exporters also face some difficulties in meeting the EU requirements. Some of the major factors that hinder the country from moving to list I<sup>1</sup> exporter are:

- **Loss of quality:** due to shortage of stores, processing problems, etc.
- **Insufficient and inefficient process equipments.**
- **Un-standardized processing plants:** small size of processing and storerooms.
- **Inefficient refrigeration machines and maintenance problems:** ineffective freezers, no water chillers, etc.

To conclude, one of the major challenges for fish exporting concerns meeting quality standards set by importing countries. Similarly, if EMPC is to be competitive in the world fish market, priority should be given to fish quality issues.

### 1.3 MOTIVATION FOR THE RESEARCH

The scientific and practical relevance of the study can be summarized as follows:

- Most inter-organisational theories were applied in the context of developed countries and one rarely finds publications on the developing nations. The very few researches done are general in nature and show the general picture of the countries' economies. However, one hardly finds researches done in LDCs that are based on inter-firm theories and which systematically discuss relevant issues. This research will focus on the fish export strategies and will analyse the existing problems in light of networking theory. It is believed that the

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<sup>1</sup> Countries and territories which have been approved to export to the EU following an inspection by the Commission Services.

result of this study will make a significant contribution to the current theories of inter-firm relations.

- Commercial fishing is of great economic importance in countries with extensive inland waters or with access to the seas and oceans. For many less-developed countries the fish trade represented a significant source of hard currency. The increase in net receipts of foreign exchange in those countries--deducting their imports from the total value of their exports--was impressive, rising from \$5.1 billion in 1985 to \$16 billion in 1994; a further increase to \$18 billion was recorded in 1995 (Encyclopaedia Britannica 1994-2002).
- Moreover, Fish businesses are labor intensive. In Sub-Saharan Africa an estimated 8 million people (nearly 20% of total agriculture workforce) are directly or indirectly involved in the sector, including some 2 million full-time artisanal fisheries, with a little more than half being engaged in the marine sector. Women play an important role in fish processing and marketing, particularly in western Africa (FAO 1996)
- In Eritrea fishery sector is already identified among the fastest potentially growing sectors of the national economy. This means, the increase of fish production and its export enhances foreign exchange earnings and creation of employment opportunities.
- As a result of the increasing health consciousness of consumers, worldwide consumption of fish is growing globally. In addition, the need for convenience and increased income of customers also guarantees the global market for fish and fish products. Therefore, these marketing trends in global markets need to be exploited by countries with abundant fish resources like Eritrea through the choice of a right strategy.

- International business is changing through time and firms are facing new rules, practices, competitive pressures and opportunities regarding quality fish exporting. Thus, this current global competitive environment necessitates proactive application of specific strategies for quality fish exporting.

#### 1.4 VALUE OF THE RESEARCH

One of the major objectives of this research paper is to examine the effect of cooperative strategy in improving the company's export of quality fish and increase its competitiveness in the globally targeted markets. Therefore, once this major objective is achieved through a proper way of strategy implementation, the direct beneficiaries will be:

- **The Eritrean Marine Products holding Company (EMPC):** The Company can implement the strategy and increase its sales in the global market so as to boost its profitability.
- **Global Customers:** They can be provided with the right quality, and/or price and/or quantity of fish as a result of competitiveness of their suppliers.
- **Ministry of fishery:** To earn foreign exchange for the country by increasing exports of valuable marine products and provide employment opportunities by encouraging local and foreign investment in the fisheries sector.

#### 1.5 PROBLEM STATEMENT

Based on the above stated practical and theoretical discussion, the following research problem is stated:

- **How could a cooperative strategy aimed at quality fish exporting be designed?**

And the specific research questions are:

- What are the determinants of quality in fish exporting?

- What are the major constraints of EMPC in fish exporting business?
- How does cooperative strategy affects quality fish export business in Eritrea?

## **1.6 OBJECTIVES OF THE STUDY**

- To provide an understanding of the export strategy that could help the country in competing successfully in the global fish market,
- to identify the major determinants of quality fish in global food business,
- to evaluate the factors that hinder the company's competitiveness in the global fish markets, and
- to recognize the effect of cooperative strategy in improving the company's ability of exporting quality fish.

## **1.7 RESEARCH METHODOLOGY**

### **1.7.1 Research Design**

Taking into account the depth and intensity of analysis required and to get a proper answer for our research problem, we will utilize a case study approach. The main focus of the case study is on seeking insight through the features and characteristics of the object being studied. According to Yin (1994), a cases study is defined as “an empirical enquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between the phenomenon and the context are not clearly evident”.

The case study approach is chosen as an appropriate strategy for this research because of the following reasons:

- The problems statement mainly focuses on answering a “how” questions.
- The researcher has no control over the behavioral events.
- The focus of the study is on a current as opposed to historical events.

Some of the major benefits of using the case study research strategy are: it copes with technically distinctive situations in which there will be many more variables of interest

than data points; it relies on multiple sources of evidence including documents, interviews and observations; and it benefits from the prior development of theoretical propositions.

Our research will be a single-case design, which is a common design for conducting case studies. The single case study is appropriate where the case represents a critical test of existing theory, where the case is a rare or unique event, or where the case serves a revelatory purpose.

The single case study will focus on more than one units of analysis, thus an embedded case study. The specific variables of the study comprise the actors, resources, and activities. Actors include firms or institutions that make a significant contribution to the quality of fish exports. The actors of this research include the EMPC, the EU inspectors, and Fish Inspection and Quality Control Division. Resources incorporate the tangible and intangible resources such as technology, experience, expertise, and knowledge sharing that are owned by the actors. Activities are categorized as transformational activities that change the physical attributes of any raw material, like fish and transactional activities that aimed at the transfer of property rights. The interaction between the actors, resources and the activities determine the quality of fish exported and whether quality standards are fulfilled.

### **1.7.2 Methods of data Collection**

In order to collect the relevant information for the study, first we will conduct an in-depth interview with knowledgeable people and experts of the industry. Following, all the actors who are directly or indirectly concerned with fish quality will be interviewed. In this case both unstructured and structured types of interviews will be used, for having unstructured interviews could result in the identification of several critical factors in the situation, which can be helpful during the structured interviews for eliciting more in-depth information on them. We will also make a direct observation by investigating into

certain value chain activities of the fish processing. The respondents include management staff from EMPC, MoF, and Fish inspection and Quality Control division.

Alongside collecting the primary data, we will also consult secondary data. These include documentary information, archival records from relevant organizations, library books and Internet facilities.

### **1.7.3 Sample Design**

The selection of the management staff for interviewing will be based on non-probability procedure because the objective of the sampling is not to meet a representativeness of the population. Its main objective is to meet certain persons with the required information for the purpose of the study. Therefore, through convenience sampling, members that are likely to give useful information for the study will be chosen as the sample elements.

### **1.7.4 Quality of the Research Design**

Four tests may be considered relevant in judging the quality of a research design: Construct validity, Internal Validity, External Validity and Reliability (Yin, 1994).

- 1. Construct Validity:** Establishing correct operational measures for the concepts being studied. To increase the construct validity of the research, we will use a multiple sources of evidence. First the necessary information will be collected from the administrative documents of relevant institutions including the EMPC, MoF, Fish Inspection and Quality Control Division. In-depth interviews with management staff from the EMPC, MoF, and Fish Inspection and Quality Control Division will also be conducted. As a second tactic of increasing the construct validity of the study, the draft of the case study will be given and reviewed by the key informants from the relevant organizations.
  
- 2. Internal Validity:** Establishing a causal relationship, where by certain conditions are shown to lead to other conditions, as distinguished from spurious relationships. The problem of internal validity in case studies emerges from the

problems of making inferences. Basically, a case study involves an inference, every time an event cannot be directly observed. Thus, an investigator will “infer” that a particular event resulted from some earlier occurrence, based on interview and documentary evidence collected as part of the case study (Yin 1994). In our research for example, most of the data will be collected from administrative documents of the relevant institutions and interviews. This may lead to the problems of making inferences from earlier occurrences. Therefore in order to deal with this problem, pattern-matching strategy of data analysis will be used. Using this analytical strategy, the empirical based patterns will be compared with the predicted ones, and if the pattern coincides, the internal validity of the research will be strengthened.

3. **External Validity:** Relates to the extent to which findings can be generalized to particular persons, settings and times, as well as across types of persons, settings and times (Ghauri 1995). Although this problem is a major barrier in doing case studies, since such a study relies on analytical generalization, we will generalize all the results of the research to some theories related to the research topic.
4. **Reliability:** Demonstration that the operations of a study such as the data collection procedures can be repeated, with the same results. In this case, our major objective will be to ensure that the same findings and conclusions will be arrived by other investigators who followed exactly the same procedures and conducted the same case study. In order to enable the other investigators to repeat this case study, the procedures followed will be documented. Therefore, to increase the reliability of this research, a case study protocol, which contains the procedures and general rules to be followed, will be used.

## 1. 8 SCOPE/ LIMITATION OF THE STUDY

- The key objective of this research paper is on designing an appropriate co-operative strategy for quality fish exports. However, the implementability of the designed framework mainly depends on the company's performance in re-organizing its resources through introducing tight quality control mechanisms.
- In addition to this, this study focuses mainly on European countries, which are the most important importers of fish from Eritrea. Therefore, the applicability of the recommended strategies in other global markets may be questionable.
- The study focuses mainly on quality issues as major factors for determining the company's competitiveness in the global markets. However, it needs to be clear that there are also other factors that are crucial for the export performance of the company. These factors are out of the study's scope and are assumed to be favorable to the company's activities.
- Finally the use of interview as a source of data may lead to a non-response error in which a failure to locate a pre-designed respondent can occur due to inaccessibility.

## 1.9 STRUCTURE OF THE STUDY

The study is categorized in to five different chapters.

**Chapter One:** This section encompasses the research proposal and its major components include, the background of the research, motivation and value of the study, the problem statement, research methodology, objectives and limitations of the study.

**Chapter Two:** This section focuses on the review of literature related to the study. It also incorporates a theoretical framework, which is a brief of the theory on which the study is based.



**Chapter Three:** This section gives a detailed review of the industry. First it gives the reader a general profile of Eritrea and the historical review of fisheries industry in its coastal region. After a brief review of the fishery exports in Eritrea, the section covers a company profile and government fishery policy.

**Chapter Four:** This chapter covers the data analysis part of the study. It includes a detailed discussion of the actors in the network model, their activities and resources. The export requirements of the EU countries and the general quality policy of the focus company are also discussed widely in this section. Based on the networking model, the relationship among the identified actors is examined in detail. Finally, the major constraints of the company in quality fish exporting to the EU markets are presented.

## **1.10 SUMMARY**

The fishery sector in Eritrea is considered a significant source of socio-economic development. Fishery exports is vital for earning foreign currency through the export of valuable fish. It is also a potential source of employment opportunities through encouraging local and foreign investors in the sector.

However, due to the great consciousness of the competitive potential of quality and safety in products being felt by consumers everywhere, quality and safety standards especially in the seafood sector have been an essential component of food consumption. As a result, importing firms in general and EU wholesalers in particular have tight rules regarding fish imports from developing nations. The exporters of fish from less developed economies have to adapt to the new and more stringent rules concerning safety and quality standards, which could have a considerable impact on the volume of products exported in the short-medium term.

Generally, the exporters from LDCs, may find it difficult to overcome their seafood quality problems and meet the requirements of their customers in developed nations easily on their own. Therefore, the formation of inter-organizational networks is essential for food business firms like EMPC to overcome its current constraints and be competitive in the global market. Firms in LDCs can use the formation of networking as a means of ensuring seafood quality and safety, so as to increase their competitiveness in the global fish business.

## **CHAPTER TWO**

### **LITRATURE REVIEW**

#### **2.1 INTRODUCTION**

The export of fishery products to most developed countries requires compliance to their safety and quality standards. The fish exporting businesses need to have a clear understanding of the demands of their current and potential customers in terms of quality and safety. Therefore, this chapter focuses on identifying the major determinants of seafood quality.

The quality of fish is a function of all the activities performed and all the facilities and equipments used during harvesting, production and distribution processes. According to this the value chain analysis, which is essential not only to identify the potential hazards but also to discover the sources of the competitive advantage, is examined in this chapter. In addition, the importance of quality in fish exporting businesses and the different theories of inter-organizational cooperation or networking model which are important concepts for firms located in LDCs are also covered. But, before approaching these topics, the chapter first clarifies the importance of fish with emphasis given to the benefits of developing an export trade in fishery products, which meet international quality standards.

#### **2.2 IMPORTANCE OF FISH**

Seafood refers to edible aquatic animals excluding mammals, comprising both fresh water and ocean creatures. It includes fish. Fish is a word commonly used to describe all forms of edible fish, mollusks (e.g. clams and oysters) and crustaceans (e.g. crabs and lobsters) that inhabit in the aquatic environment (Huss 1994).

Fish from the marine and fresh water bodies of the world have been a major source of food for human kind since long time ago. The increased health consciousness of

consumers has led to the popularity of seafood as part of their diet. The low fat content of many fish species like white fleshed demersal, and the effect on coronary heart disease<sup>2</sup> of the polyunsaturated-fatty-acids<sup>3</sup> found in fatty (pelagic) fish species are extremely important aspects for health conscious people particularly in affluent countries where cardiovascular<sup>4</sup> mortality is high (Huss 1994). This has led to an increase in the demand of fish, thus good opportunity for trade of fish and its products.

Benefits of developing an export trade in fishery products which meet international health and sanitary regulations can be summarized as: improved income and employment in export fish processing and distribution, improved incomes and security of employment in fishing, higher levels of foreign exchange revenues and national tax income, and improved quality and safety of fishing products for the national market.

Despite these benefits, fish consumers are subject to the risk of morbidity and mortality due to intoxication or infection. Some of these diseases have been specifically associated with consumption of fish while others have been of more general nature (Huss 1994).

Consequently, the increased health awareness of consumers increased the demand for quality and safety of fish like in all other food products. Similarly, as the result of the increase in income, consumers in developed countries started to be selective on the products they use. Thus quality and safety standards in the seafood sector have been an essential component of food consumption. This means that although the increased world-wide fish consumption is an attractive opportunity for countries with extensive inland waters or with access to the seas and oceans, quality regulations for seafood products is a pre-requisite to success of exploiting this opportunity. With the intention of doing this,

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<sup>2</sup> A heart attack in which the blood vessels to the heart is blocked.

<sup>3</sup> A type of fat found chiefly in fish, corn, soybean oil and safflower oil that do not appear to raise blood cholesterol levels.

<sup>4</sup> Relating to the heart and blood vessels (arteries, veins, and capillaries); the circulatory system.

there needs to be a clear understanding of the factors that determine the quality of seafood, especially fish.

### **2.3 DETERMINANTS OF SEAFOOD QUALITY**

The term “quality” of a product can be defined in different ways. From the customers’ point of view, quality is often associated with value, usefulness or price and from producers’ point of view it is associated with conformance to specification. This means that, it is related with producing the product according to its design. Recently, quality of a product is not only the responsibility of production function, it was extended outside of the production to include all other functions using a concept of total quality control. With total quality control, the entire organization is mobilized to help produce a quality product.

Generally quality has been defined as ‘fitness for use’ (Schroeder 1985). This means that all characteristics of the product must satisfy the customers’ needs thus the product is fit for the customers’ use. Fitness for use is related to value received by the customer and to customer satisfaction. According to this, only the customers and not the producers determine quality.

The traditional view of seafood quality is based on appearance, technical quality and biological quality (Wood et.al.1994). Thus food is expected to look good, taste good, and be with no direct harm to its consumers. Recently, this definition has extended to look at factors relating to cultural, environmental and ethnical values. Cannon (1990) highlights, biological, sensual, nutritional, and environmental factors. Woodward et al. (1990) categorize the major components of food quality as being authentic, sensual, biological, nutritional and ethical. All these must exist within a social, political and economic environment, and reflect society’s increasing interest in the environment, animal welfare and culture.

From recent papers where the subject of fish and food quality is discussed (Sloan 1998), there seems to be at least three groups of characteristics and features that contribute to quality:

1. Characteristics and features of the product that can be directly measured or assessed. For instance weight, shape, temperature, fish species, color, taste, texture, size, homogeneity, composition, oil content, etc. Most of these characteristics and features are normally specified in the seller- buyer (wholesale) contract.
2. Characteristics and features of services involved with the product: including consistency in the quality of different shipments and within a shipment, integrity (in trade), and communication and keeping time. Most of these are usually part of expected customary and ethical trade practices, although some may form part of local regulations or be included in contractual agreements.
3. Characteristics or features of the product that can have a desired or undesired effect on human health. For instance, nutritional value (desiderated), pathogens<sup>5</sup> counts, pesticides, etc. Most of these characteristics and features are usually defined by law although they may be incorporated to contractual agreements. Recently, characteristics related to environmental and ecology (that could create problems to human beings in the medium and long term) is added to this group (e.g. recyclables and biodegradability of packaging).

Each market, each buyer, will have a working definition of quality that encompasses these three characteristics and features, however excluding the environmental and ecology issues, the last characteristic or feature is given an emphasis in this study since it is mostly used as a prerequisite to export for all fish business exporting to most attractive markets like EU. The producer must know the working definition of the aimed market in order to succeed in business (FAO 1998)

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<sup>5</sup> Any disease producing agent especially a virus or bacterium or other microorganism

Claiming to meet the above three characteristics or determinants of seafood quality does not promise market for fish in most developed nations. The EU issues regulations that lay down conditions for products produced within the union and also for fish imported from third countries. The introduction of some regulations like the HACCP (Hazard Analysis Critical Control Point) system is also being accepted worldwide and is becoming a requirement in international trade as an effective means of ensuring food quality and safety. One reason for this development is that a number of national food legislations today are placing full responsibility for food quality on the producer (e.g. EEC council directive no. 91/493/EEC).

The HACCP is a system based on identifying hazard<sup>6</sup> and controlling risks at specific points of the processing chain, (Zaibet 2000). There are at least two features that characterize the HACCP system. First it deals with the whole system; from receiving of raw materials to the delivery of the final products. Second, it requires the documentation of all the processes (Zaibet 2000).

In other words, the system establishes process control through the identification of points that are most critical to control and monitor in the production process. It has a preventative focus and is designed to provide enough feedback to direct corrective activities (Unnevehr and Jensen 1999). The seven key principles of HACCP system can be summarized as follows (Palfreman 1999):

1. The identification and analysis of hazards in the vertical chain.
2. The identification of critical control points, which must be monitored to avoid the occurrence of hazards.
3. Laying down values for critical limits, which must be observed to control the hazards at each Critical Control Point (CCP)<sup>7</sup>.

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<sup>6</sup> The potential to cause harm.

<sup>7</sup> It is any point in the chain of food production on which the loss of control would result to unacceptable food safety risk.

4. The introduction of a surveillance system for the regular monitoring or observation of the critical control points.
5. Laying down procedures for verification of the correct operation of the HACCP system (functional control system).
6. Laying down corrective measures, which should be taken whenever an inadmissible deviation is recorded at a critical control points.
7. Setting up a system for the effective management of the documentation relating to the HACCP plan (data collection, organization of documentation).

The records should contain information on; ingredients, intermediate and final products, processing steps and process parameters, packaging, storage and distribution, corrective measures, deviations in the process or product, and verification. The document has to be available for the appropriate authorities. (Adapted from Leben Smittelqualitat Sachen, LQS, 1996).

According to this, the HACCP system mainly focuses on preventative quality assurance strategy. The system applies to each specific operation separately. For example, the application of the HACCP concept in fish processing firm, should be unique for every process of every factory. However, some general principles can also be outlined for firms with similar handling and processing practices.

To summarize, although the nutritional properties, hygienic properties and organoleptic properties (its appearance, color, integrity, texture and flavor) are some of the determinants, compliance to the EU regulations including the HACCP system can also be mentioned as a major determinant of seafood quality. Although the main focus of the system may be considered as safety assurance of food, the safety issue is a pre-requisite for assuring quality of the product. In contrast to the principles in traditional quality programs relying heavily on control of end-products, the HACCP system is a preventative strategy based on the study of prevailing conditions and is much more likely to provide a better guarantee of quality. According to this system, the quality assurance of fish and its



products requires an organized way of investigating all the activities in production process of the product. The thorough analysis of all the activities performed in the processing of fish is essential not only to identify the potential hazard of its quality, but also to discover sources of competitive advantage for the firm.

## **2.4 THE VALUE CHAIN AND COMPETITIVE ADVANTAGE**

A systematic way of examining all the activities a firm performs and how they interact is necessary for analyzing the sources of competitive advantage (Porter 1985). The value chain of a firm is composed of a series of distinct value creating activities including production, marketing, materials management, R&D, human resources, information system, and the firm infrastructure. According to Porter (1985,1991) firms can gain a competitive advantage by performing these strategically important activities more cheaply or better than its competitors.

The concept of value system is more critical and relevant to firms involved in food businesses. The application of HACCP system, which is being mandated in an increasing number of developed countries, establishes process control through the identification of points in the chain of food production where the loss of control could result in unacceptable food quality and safety risk. Most of the points in the principles of the HACCP require a systematic way of examining all the activities in the vertical chain. The system identifies critical control points in the production process, thus food safety hazards can be prevented, eliminated or reduced to an acceptable level before they occur.

The value chain that shows the total value of the product consists the value activities and margin. Value activities are activities that are physically and technologically distinct to the firm. Margin is the difference between the amount buyers are willing to pay and cost of performing the activities (Porter 1985). The total value of a firm's product is a function of not only the value chains of a focal firm but also that of its suppliers and buyers. According to Porter (1985) suppliers and channel value chains include a margin that is

important to isolate in understanding the sources of a firm's cost position, since supplies and channel margin are part of the total cost borne by the buyer.

The value creating activities are divided into two broad categories: primary activities and support activities.

**2.4.1 Primary Activities:** The primary activities of a firm include the creating of the product, marketing and delivering the product to buyers, and providing support and after-sale service to the buyers of the product (Hill 2002).

According to Porter, the primary activities include: -

**1. In-bound logistics:** - activities related to the receiving, storing and disseminating of the firm's products. Material handling, warehousing, inventory control, vehicle scheduling and returns to suppliers.

The in-bound logistics activities are vital for firms in food business. The perishability of many food products puts great demands on duration and conditions of storage, and conditions of transportation facilities at all stages of the supply chain. Therefore, the existence of proper way of receiving the raw products from suppliers on a timely basis and a sufficiently powerful refrigeration plant to keep products at prescribed temperatures may be considered as some of the determinants for the quality of the final product.

**2. Operations:** - activities performed to transform the firm's inputs to outputs. Machining, packaging, assembling, maintaining, and testing.

This activity is a good source of competitive advantage for firm's involved in the transforming of inputs in to a final product like fish processing companies. A fish processing company can gain its competitive advantage by meeting the specifications of its customers in terms of size, hygienic standards (quality), packaging, and inspection process. According to the HACCP system, these firms need to follow the standards of

operating under hygienic conditions during processing, in order to comply with the safety and quality standards required by their customers. Moreover, packaging of the products must be carried out under satisfactory conditions of hygiene to preclude contamination of the fishery products.

**3. Out bound logistics:** - Activities related to collecting, storing and distributing of the firm's output. Finished goods warehousing, material handling, delivery operations, shipping, order processing and scheduling.

Like in in-bound logistics , the outbound logistic activities have also a great impact for the quality and safety of products of food businesses . For example, the physical distribution and transportation of the final products in fish businesses is crucial not only in terms of time but also in maintaining and securing the quality of the products.

**4. Marketing and sales:** - Activities that inform buyers about products and services , induce them to purchase the product and facilitate the purchase of these products .

Marketing is about putting distinctive capabilities of a firm into an acceptable form and presenting them to selected market segments (Palfreman 1999). According to Palfreman (1999), the difficulty about marketing in the fish industry is, understanding the requirements of the market. The characteristics of fish products can be very subtle and it requires real knowledge and experience to be aware of these. On the other hand, the existence of assured markets is very important for food businesses because of the perishable nature of the products.

**5. Service:** - Activities required in keeping the product or service of a firm work effectively for the buyer after it is sold and delivered. Training, consulting, installing, repairing, supplying parts.

This activity is also essential for fish exporting firms, which are required to meet the strict rules of their importers like HACCP System. This is because, training and education are important elements in developing and implementing of quality procedures and HACCP program. Employees who will be responsible for the application of these regulations need to be adequately trained in its principles. In addition the HACCP system requires the food businesses to increase the customers' awareness and knowledge on how to use their products, through the instruction of use given to them.

Although almost all firms perform all the primary activities, the emphasized activities are dependent in the nature of the business that the firm is involved. However, all the categories of the primary activities are present to some degree and play some role in competitive advantage.

**2.4.2 Support Activities:** -Support activities provide the inputs that allow the primary activities of production and marketing to occur (Hill 2002). These activities can be divided into four generic categories (Porter 1985).

**1. Procurement:** - Procurement refers to the “function “ of purchasing inputs used in the firm's value chain, not to the purchased inputs themselves. It refers to the acquisition of inputs or resources for the firm. Although it is the designated function of the purchasing department, procurement is also carried out by every employee who purchases equipment, arranges for financing, gathers information, completes a real estate transaction, or acquires any but human resources for the firm (Rowe 1999).

The procurement activity of a firm has a large impact for the firm's cost of production and its ability to differentiate its products. For example, the cost position of fish processing firm is determined by its ability to procure low-cost raw materials like fish from its suppliers. Moreover, in order to ensure the quality of the final product, the purchasing of packaging material for fishery products must comply with all the rules of hygiene. The materials must not be capable of transmitting to the fishery products

substances harmful to human health and must not be such as to impair the organoleptic characteristics of the fishery products. Thus, improved purchasing practices can strongly affect the cost and quality of purchased inputs, as well as of other activities associated with receiving and using the inputs, and interacting with suppliers (Porter 1985).

**2. Technology development:** - Technological development pertains to the equipment, hardware, software, procedures and technological knowledge brought to bear in the firm's transformation of inputs into outputs. Its most important component is knowledge. According to Porter (1985,1991) technology development consists of a range of activities that can be broadly grouped into efforts to improve the product and the process. It takes many forms, basic research and product design, media research, process equipment design and servicing procedures.

The fish businessman has to recognize that the market is always changing and these changes need to be identified (Palfreman 1999). Important factors include: technological change, which alters fish catching and fish farming as well as fish processing and transport in dramatic ways; the regulation of fisheries, much of it emanating from the EU macroeconomic changes, the economy is always on the move in developed countries usually implying gently rising living standards for most people. Therefore, as a result of these market trends in the fish business, some processors of fish have made a very substantial investment in state-of-the-art processing equipment. For example filleting and skinning machines, flesh-bone separators (to maximize the yield of flesh), belt-freezers, spiral-freezers, regulation reforming presses, continuous battering, breeding, and deep-fat frying equipment, have in most cases, become essential items in securing profitability (Palfreman 1999).

**3. Human resources management:** - Human resources management (HRM) consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel (Rowe 1999). According to Porter

(1985,1991), this category of support activities supports both individual primary and support activities and the entire value chain.

Human resources management affects competitive advantage of any firm through its ability to determine the skills and motivation of employees and the cost of hiring and training (Porter 1985). However this activity may be critical for some businesses in particular. For example, in order to meet the HACCP standards, the fish exporting businesses need to have personnel of the highest possible standards of cleanliness working in the preparation, processing and packaging premises. Personnel of these businesses are required to take the requisite measures to prevent contamination of fishery products. Thus, the HRM activities of these businesses should be designed in a way that provide them with highly motivated and committed employees at the work-floor, who are willing to comply with the company rules and regulations. Moreover, the successful application of HACCP requires the full commitment and involvement of the management. It requires a multidisciplinary approach, which should include as appropriate expertise in agronomy, veterinary health, microbiology, public health, food technology, environmental health chemistry, engineering etc. according to a particular situation.

**4. Firm infrastructure:** - Firm's infrastructure consists of a number of activities including general management, planning, finance, accounting, legal, government affairs and quality management (Porter 1985). The firm's infrastructure supports the entire value chain rather than the individual activities. Though they are often referred as, "Overheads" these functions are the glue that holds a firm together (Rowe 1999). For example the concept of quality management is crucial for fish exporting firms, which have to upgrade their quality control standards in order to avoid any kind of rejection from their customers. Hence, since the entire business is heavily dependent on the issue of quality, the industry has to familiarize itself with the prevailing quality control norms in the respective countries of export and ensure strict adherence of their standards.

The major objective of value chain analysis of a firm is to find the most effective and efficient way of adding values, with the aim of generating cross-functional solutions to the many complex problems associated with meeting consumer requirements effectively and at minimal cost. Cross-functionality may occur within organizations (e.g. sales, marketing, logistics and production combining to reduce inventory levels, which maintaining customer service levels) or, between organizations (e.g. third party logistics, production planning etc.) combining to manage raw material supplies in a way that optimizes short-term storage and the utilization of vehicle and processing capacity (Eastham et al. 2002).

According to Eastham et al. (2002), the common functions in food processing company include production of raw materials; which requires breeding, production, storage, and distribution, the procurement of other inputs and the management of a number of discrete production functions.

While most of the functions necessary for the transformation of raw materials into finished food products are universally accepted, the way in which they are undertaken individually and in combination are not. There is no consensus regarding the most effective and efficient way of combining these functions to secure competitive advantage (Eastham et al.2002). According to Eastham et al., (2002), what is quite clear is that in order for any process to be efficiently complete there needs to be effective communication between and within all organizations involved. In theory, market forces and the dynamics of competition will force the discovery or adoption of ‘the one best way’ as failure to do so will, other things being equal, result in loss of market share. However, sharing information causes a real threat to independence, particularly when those involved lack mutual trust and have a tendency to behave opportunistically. Therefore, the success of these businesses is determined by their ability to deal with this real challenge.

To summarize, how value chain activities are carried out determines costs and affects profits. A firm that seeks a cost leadership position reduces the amount of resources it consumes and the price it pays for them. Decisions governing each activity in the value chain determine the nature and quality of the output. A firm that seeks to gain an advantage through the differentiation does so by performing its value chain activities, particularly transformation of the input, differently from or better than its competitors. Improving value chain functions is one of the means of achieving competitive advantage. This idea is especially more important and applicable to firms involved in food businesses. For example, the value chain analysis is helpful for quality assurance of fish and its products, which requires an organized way of investigating all the activities in production process of the product.

## **2.5 ASSESSMENT OF THE QUALITY OF THE RAW FISH**

The methods of evaluation of fish quality can be conveniently divided into two categories, sensory and instrumental (Huss 1995).

**2.5.1. Sensory methods:** The sensory evaluation is defined as the scientific discipline used to evoke, measure, analyze and interpret reactions to characteristics of fish as perceived through the senses of sight, smell, taste, touch and hearing (Huss 1995). This is termed as Organoleptic Check<sup>8</sup>. In this case the quality of fish is analyzed through the senses of humans. The sensory process includes three activities of the evaluator; detection of a stimulus by the human senses organs, evaluation and interpretation by a mental process; and finally the response of the assessor of the stimuli. Although this method is the cheapest, easiest and quickest way of assessing fish quality in terms of manpower, time and cost, variations among individuals in the response of the same level of stimuli can contribute to a non-conclusive answer of the test. Therefore, an awareness of these differences is an important issue in selecting and training judges for sensory analysis of fish quality.

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<sup>8</sup> see appendix 1



**2.5.2 Instrumental methods:** The instrumental method of evaluating fish quality refers to the use of biochemical and chemical methods. This method of evaluation is related to the ability to set quantitative standards. The establishment of tolerance levels of chemical spoilage indicators would eliminate the need to base decisions regarding product quality on personal opinions (Huss 1995).

To conclude, in most cases sensory methods are useful for identifying products of very good or poor quality. Thus, biochemical or chemical methods may best be used in resolving issues regarding products of marginal quality. Since the consumer is the ultimate judge of quality, most chemical or biochemical methods must be correlated with sensory evaluation methods before being used in the laboratory. However, sensory methods must be performed scientifically under carefully controlled conditions so that the effects of test environment, personal bias, etc. may be reduced.

## **2.6 IMPORTANCE OF QUALITY IN FISH EXPORTING BUSINESS**

World fisheries have gone through some dynamic developments. The most important was the expansion of international trade in fish and fishery products. Today more than 30% of the fish caught for direct human consumption enter international trade. The major fish importing countries are the European Union (EU), the United States of America (USA) and Japan (FAO 1998). Such dynamic developments of international trade in fish and the fishery products resulted not only from the gradual liberalization of international trade but also from the growing demand for fish as healthy food. The increasing worldwide fish consumption, as the result of increased health consciousness of consumers, need for convenience and increased income, guarantees the global market for fish businesses.

Accordingly, commercial fishing is of great economic importance for many less developed countries. Around 50 percent of the total fish supply in international markets comes from developing countries. Thus, fish exports are, in general, the largest net hard

currency earner among food products for these countries surpassing other traditional food products like rice, coffee, tea, and bananas (FAO 1998). However, since the consumption of fish and fish products also causes diseases from intoxication and infection of the product, safety and quality issues are vital components in the industry.

The fish exports of less developed nations (LDCs) are mainly targeted into the developed countries where food quality and safety standards are increasing rapidly. The EU issues regulations that lay down conditions for products produced within the union and also for fish imported from third countries. To approve imports from a third country, ‘inspections may be carried out on the spot<sup>9</sup> by experts from the commission and the member states’ (OJ-EU 1991). These EU regulations require information on: (1) the fishery legislation of the exporting country, (2) the organization of the competent authority and its inspection service, (3) the actual health conditions during the production, storage and dispatch of fishery products; and (4) the assurance, which a third party can give, on the compliance with the standards of the EU. The EU directives also require the HACCP approach as a basis for food safety (93/43/EEC).

On the other hand, most exporters of fish from less-developed nations, which have to adapt to the new and stringent regulations related to fish quality and safety, have a difficulty of meeting the requirements of the importers at least in the short to medium term. The fish quality problems that are common in LDCs are related to poorly defined inspection and approval procedures, weak technical regulations, and lack of staff for inspection and laboratory testing. In addition to this, most of the fish exporting firms in LDCs have poor levels of personal hygiene and sanitation, and poorly defined institutional frameworks.

In conclusion, although the commercial fishing is identified as a major source of hard currency for countries in less developed nations, because of the risk of food-borne diseases, importing firms in general and EU wholesalers in particular have tight rules regarding fish imports from these countries. This rapid increase of food quality and safety

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<sup>9</sup> ....where fish is harvested, processed and distributed

standards in developed nations can be stated as one of the major challenges of fish exporters in LDCs. Hence the inter-organizational cooperation is a useful concept that enables the firms to obtain the required resources from external partners, gather the necessary information about their markets, customers etc., so as to increase their compliance level accordingly.

## **2.7 THEORIES RELATED TO INTER-ORGANIZATIONAL COOPERATION**

Firms or organizations are the context in which social relations and economic exchange are embedded (Powell 1999). The social relations and the economic exchanges co-exist as drivers of firm strategy but the rationality assumed in economics, and hence in much of the strategic management literature, needs to be tempered by more focus on the social issues (Granovetter 1993; Uzzi 1999). It may be that the strategic management literature has overly focused on the economic rationale (Grant 1991) and that the industrial marketing literature has focused traditionally on the social issues and what may be needed is an approach combining the two (Ford 1995). Whilst the economic or the social approaches may predominate in the analysis of strategy, and thus in the analysis of inter-firm co-operation and relationships, firm behavior can exhibit both simultaneously (Powell 1999).

There have been several studies focusing on inter-organizational relations. Some of the most common ones include; resource dependency approach (RDA) (Pfeffer and Solanick 1978) transaction cost approach (TCA) (Coase 1937; Williamson 1991), social network approach (SNA) (Birley 1990; Birley et al. 1991; Gronovetter 1995; Ostgaard and Birley 1996; Uzzi 1999), and the Swedish network approach (SNM) (Axelsson 1995; Beijer and Groenewegen 1993; Hakansson 1993; Hakansson and Johansson 1993; Johansson and Mattson 1993).

These theories of inter-organizational cooperation vary based on their view of or rationale for inter-organizational relations. For example, the TCA looks at inter-organizational co-

operation from an economic point of view, while RDA views it from the management point of view, SNA from sociological point of view and SNM from marketing point of view.

**2.7.1 Resource dependency approach (RDA):** Since the early eighties, the RDA has become a very popular theory of competitive advantage in the strategic management literature against other alternative explanatory frameworks (Grant 1991).

This theory emphasizes on the importance of firm specific resources and capabilities in the generation and maintenance of a sustainable competitive advantage, which allows a firm to earn abnormal economic profits. This means that, the successful performance of a firm depends on certain resources or distinctive competencies. These resources especially for small firms are controlled by outside actors. Thus firms are linked to their environment by federations, associations, customer-supplier relationships, competitive relationships, and social-legal apparatus that define and control the nature and limits of these relationships as well ( Butler and Sohod 1995,).

To this approach, in order to survive, any organization requires some sort of transactions with its external environment. Organizations exchange and carry out transactions with other groups or organizations (Pfeffer and Salanick 1978). The exchanges may involve information, monetary or physical resources because enterprises are not self-contained or self-sufficient. Thus, organizations generally rely upon the environment to get supported. This is because a single firm does not have all the necessary resources at its disposal. . For example, the formation of inter-organization relations of a fish processing company located in developing nations with the EU wholesalers is crucial for its success. This means that, the firms in developed nations generally have good expertise or skills in fish processing and marketing, thus they can provide the firms in developing nations with the technical expertise required in fish processing and enable the firm to gain access to markets in the counterparts' country of origin. In addition to this, the firms in developed nations can also provide their exporters with experts to ensure quality standards are met

in the firms. However, this approach indicates that due to lack of coordination of activities among social units, interdependence can create problems of uncertainty. According to RDA, one way of solving these problems is merger and other way is coordination, it also indicates that coordination through inter-firm linkages depends on voluntary behavior.

According to Pfeffer and Salanick (1978), the linkages to other organizations provide three primary benefits to organizations in managing their activities related to environmental interdependence. Firstly, a linkage to another organization provides information about activities of that organization which may impinge on or affect the focal organization. Secondly, it provides a channel for communicating information to other organization on which the focal organization depends. For example, through linkage between a fish processing firm in LDC and EU wholesalers, information concerning demand flows upstream from the market place and ultimately to the raw material supplier. Finally, it provides an important base to ensure a commitment of support from the parties in the network. Therefore, a firm's coordinating relationship with other organizations helps to reduce its uncertainty.

In summary, the major emphasis of this approach is on the importance of formal and informal relations of a firm with its external environment. Since important resources are controlled by other actors in the environment, a firm must ensure a smooth and predictable flow of these resources through cooperative strategy.

**2.7.2 Transaction cost approach (TCA):** The TCA explicitly views the firm as a governance structure. One of Coase's (1937) initial propositions was that firms and markets are alternative governance structures that differ in their transaction costs. A transaction means a transfer of a good or service between technologically separable interfaces (Williamson 1985). The basic premise of transaction cost analysis is that the firm will internalize activities that it is able to perform at lower cost and will rely on the market for activities in which other providers have an advantage. Thus, this theory argues

that firms reduce transaction costs through inter-organizational cooperation. For example, the integration to quality assurance system is especially important for fish business based in developing countries and exporting to developed countries where food quality and safety standards are rising continuously. In this case, the transaction cost between buyers and sellers have three dimension, information search for quality assurance and food safety, negotiation cost and monitoring and enforcement costs. Thus, the firms can integrate them selves to quality assurance systems to reduce these transaction costs.

Williamson's micro-analytical framework rests on the interplay between two main assumptions of human behavior, i.e. bounded rationality and opportunism and three key dimensions of transactions, i.e. asset specificity, uncertainty and frequency. This means that, members are assumed to be subject to bounded rationality and at least some actors are assumed to be opportunistic (i.e. having a tendency to cheat other parties) if given the chance. Imperfect or asymmetric information may give such actors an exploitable advantage in their dealings with other parties. In addition to this, the specificity of assets required for a transaction, the uncertainty surrounding it and the frequency of the transaction determine the firm's decisions of whether to internalize its activities or rely on outsiders.

Transaction costs (i.e. the costs of governing the system) tend to be low in highly competitive markets, there by providing little or no incentive to substitute internal organization for market exchange. In contrast, when faced with an inability of markets to impose behavioral constraints and enforce simple contracts, firms are expected to internalize transactions to reduce costs of exchange. A limit on integration is the fact that organizations are not perfect and transaction costs also are present with in them.

Transaction costs are very difficult to measure because they represent the potential consequences of alternative decisions. Researchers examining transaction cost issues almost never attempt to measure such costs directly, but rather test whether organizational

relations align with the attributes of transaction as predicted by transaction cost reasoning (Williamson 1985).

In summary, the major objective of inter-organizational cooperation to this approach is minimization of transaction costs. Firms attempt to overcome transaction costs by vertical integration or by looking for other alternatives to the market. Under conditions of uncertainty, high asset specificity and small number bargaining power, firms look for inter-organizational cooperation because of high transaction costs.

**2.7.3 Social Network Approach (SNA):** This theory was emerged from anthropological and sociological studies communities. The theory suggests that all businesses interactions, all economic actions, are embedded in social relations (Granovetter 1995). Thus social ties are crucial for establishing relations or transactions. They create opportunities to identify new business ideas, new products, new markets, etc (Gulati and Gargiulo 1999). Moreover, embedded social ties encourage firms to take risks and innovate, and enhance business success under conditions of uncertainty. According to Granovetter (1995), the problems of uncertainty and distrust that often disturb market exchanges can be solved through the use of social networks, thus social networks help to reduce the transaction costs. These ties also provide benefits such as, joint problem solving, information exchanging, resources sharing, etc. to actors in the network (Uzzi 1999).

To this approach, there are three basic purposes of relationships (Veciana and Clarke 1996): (1) Communication or passing information from one person to another, (2) exchange purpose<sup>10</sup>, (3) normative or personal expectations over one another because of some special characteristics. The strength of relationships depends on the level, frequency and reciprocity of relationships between persons, and varies from weak to strong. Therefore, networks can be analyzed in terms of size, density, reachability, heterogeneity and centrality.

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<sup>10</sup> .... that is exchange of goods and services.

Fish is mostly marketed in its fresh form, but the uncertainty of catches, geographical dispersion of landing points and consumption centers, preferential habits of consumers, heterogeneity and high perishability of the product are factors that make the trade complex and full of risks, uncertainties and difficulties. With such a highly heterogeneous and non-standardized commodity, inter-organizational cooperation among fish traders based on friendship and mutual trust is crucial for their performance. Through social ties, these firms can solve the problems of uncertainty and distrust, so as to reduce their transaction costs and improve their performance.

In summary, the basic premise of this theory is that firms gather scarce resources from the environment through their personal networks. These resources include not only tangible resources like finance and other material resources, but also intangibles like information, ideas, etc. According to this approach, the inter-organizational cooperation has communication content, exchange content and normative content.

#### **2.7.4 Swedish Network Model (SNM)**

The basic idea of SNM approach or networking model is that the firms or actors in the network consist of informal contacts between actors creating close relations. In this approach, it is not only the actors and their relations that are important, but also the activities and resources are included in the analysis. The four basic elements in SNM are: actors, activities, resources and linkages (Hakansson and Snehota 1995). The actors can be individuals, organizations and government agencies (Moller and Wilson 1995). Each actor has its own resources, its specific activities and knowledge about their activities, resources and other actors in the network. While the linkages between actors and resources are described as relations among the actors in the network, the linkages between resources and activities are defined as relations between the actors in the network.

The basic assumption in the network model is that the individual firm is dependent on resources controlled by other firms (Johansson and Mattson 1993). The interpersonal relations provide various kinds of benefits for actors in the network. In fish business, for



example, the trend is toward greater interdependence among actors in the network. The ability to produce to specification will increase and the ability to measure product characteristics will also be enhanced for firms following cooperative strategy. Thus, the costs of producing the diverse products demanded by consumers will be lower in a more closely coordinated system. For fish business following a co-operative strategy, market position and financial performance depends upon management rather than ownership of assets. The management is not only internal which refers to the firms operations and strategic management skills, but also external in the form of successful negotiation, of linkages with supplies and distributors and having the proper partners.

In conclusion, actors develop and maintain network due to lack of resources for them. In addition to this, the inter-organizational relationship among firms can reduce costs of exchange and production and promote knowledge development and change. Through these relations, firms get some control over each other, plus indirect access to assets in firms with which they do not have direct relationships.

## **2.8 BASIC STRUCTURE OF THE NETWORKING MODEL**

The network model consists of four basic classes of variables: actors, activities, resources and linkages (Hakansson and Ford 2002).

**2.8.1 Actors:** The actors which can be individuals, organizations, and government agencies have five characteristics (Hakansson and Johansson 1992): they perform and control activities; through exchange process actors help to develop relationships with each other; they base their activities on control over resources, such control can be direct and indirect; they are goal oriented; and they have different knowledge about activities, resources and other actors in the network.

Actors have uneven control over the network, and the increase in network control of one actor may lead to an increased or decreased control of some other actors in the network.

Thus, in a network, there are a number of conflicts and common interests as well as efforts to provide for those interests (Hakansson and Johansson 1992).

**2.8.2 Activities:** According to Hakansson and Johansson (1992), an activity occurs when one or several actors combine, develop, exchange and create resources by utilizing other resources. The two main kinds of activities are transformation and transfer activities. Transformation activities are those directly controlled by one actor and through which resources are changed. Transfer activities are involved in the transfer of direct control of resources among actors in the network.

Transfer activities link transformation activities of different actors to each other. They are never controlled by only one actor and they affect and are affected by the relationship between actors involved (Hakansson and Johanson 1992).

Activities in the network system are linked to one another in different way and degrees. Therefore, there are a number of relationships between activities. Direct relations exist between two activities which are directly coupled to each other, whereas indirect relations exist when activities are coupled to each other via intermediate activities (Hakansson and Johansson 1992). According to them specific relationships exist when two activities are linked to each other through specific actors whereas general relations between activities imply that the link between them is independent of specific actors.

### **2.8.3 Resources:**

Resources are variables in the network systems that are required to perform transformation and transfer activities. Resources incorporate the tangibles and intangible resources such as technology, experience, expertise, and knowledge sharing and are controlled by a single or several actors. The use of resources can be in different ways or different settings. It is not possible to decide definitely how a certain resource can be combined with others (Hakansson and Johansson 1992). They state that, resources can be characterized, first, by the actors controlling them. They can be controlled directly by one

actor or jointly by several actors. Indirectly the resources can be controlled by those actors who have relationships with the actor directly controlling the resources. A second characteristic is the utilization of the resources in activities. How many dimensions of the resource are used and how standardized is the utilization in each of the dimensions. A third characteristic is the versatility of the resources. To what extent and at what cost can the resource be used in other activity cycles and in other transfer chains. If there is unlimited supply of resources, controlling them is of no interest to the actors. If resources are not controlled by actors, a network among the actors is not required. Since resources are controlled by several actors, firms need to develop and use networks.

## **2.9 INTER-ORGANIZATIONAL NETWORKING IN SEAFOOD BUSINESSES**

It is a current issue for strategic writers to argue that competition is dead (Moore 1996), or that co-operation rather than competition is the way forward (Branderburger and Nalebuff 1996). The basic argument of these writers is that, business success will be derived from companies managing the enhancement of the total performance of the relevant organizations, so that it can deliver improved value to customers. Some of the major objectives of the network formation include: gathering of information, response from external environment, canvassing and looking for customers and suppliers, enrichment of own knowledge, psychological significance and sources of finance, exchange of technology etc.

In general, the cooperative strategy is very crucial to food businesses. Some of the arguments for cooperative strategy in food business include (Eastahm et al. 2001):

- The firm is able to focus on its core business, for example food processing: This is a very important reason of cooperative strategy since some operations from a strategic standpoint are non-core activities for such business. For some types of food business, for example, involving home deliveries, distribution is clearly part of the core business.

- Capital investment in non-productive assets can be reduced: Valuable business capital can be tied up when it might be better employed in developing the core business.
- Better budgeting control: Costs are known and budgets can be prepared once the terms of a contract have been signed.
- Leading edge IT systems can be provided and used by the contractor.
- Operational efficiency will improve: The expertise of some actors in the network will bring significant benefits in the performance of other actors.

Moreover, networking is a powerful and cost-effective way of sharing information and achieving various other goals that individual organizations cannot achieve alone. The food quality and safety, that is an important issue for seafood businesses is an example of information asymmetry between sellers and buyers. Sellers know the quality and safety attributes of their products much better than buyers, and it is hardly possible for buyers to fully assess these attributes during transaction. With these features, this issue falls into the boundaries of adverse selection problem (Akerlof 1970). According to him, adverse selection refers to the fact that buyers may buy low quality or less safe food items because of lack of information. In addition, the existence of asymmetric information increases the transaction costs and hence generates private incentives to decrease such costs (Holleron et al.1999). Akerloff (1970) showed that, institutional warranties such as quality assurance standards play an important role to solve such problems. The food quality and safety standards, which are voluntarily accepted and applied by firms to improve their competitiveness, guide them towards quality assurance systems. Fundamental operations of most food quality and safety assurance institutions include the documentation, third party control and accreditations.

Quality assurance systems (QASS) aim to increase the competitiveness by providing confidence on quality and safety in the food production chain (Morris 2000) hence, the integration of firms in seafood business to quality assurance systems leads to the reduction of transaction costs which may include; information search cost for quality

assurance and food safety, negotiation cost and monitoring and enforcement cost (Hobbs 1996). In addition, Mazzocco (1996) and Bredahl and Zaibet (1995) show that most of the firms integrated to QASs have seen not only declines in the cost of transaction but also have experienced improvements related to their production process and final product. Among these, increases in productivity, better management, improvements in consumer relations, elimination of deficiencies in production processes, better adaptation of new personnel, and the conservation of current customers. Bredahl and Zaibet (1995) showed that total cost of integrating to QASs for the firms they studied was less than the benefits acquired directly or indirectly. Consequently, they state that integrating to QASs with consideration of quality and safety standards is an important strategy for firms. This strategy is especially crucial to seafood business located in developing nations and exporting to developed nations where the food safety and quality standards are rising continuously. In addition, forward integration of firms in food businesses gives them better or more timely access to market information allowing a more rapid or specified adjustment of product characteristics, and backward integration may allow these firms to obtain a specialized inputs through which they may improve or at least distinguish their final products (Porter 1985).

To conclude, the cooperative strategy is decisive to seafood business because success of these companies is derived from managing the enhancement of the total performance of all related organizations, so that value to customers can be improved. Networking is useful to ensure seafood quality and safety in that it enables the buyers to fully assess the quality attributes of the products of the sellers during transaction. In addition the integration of firms in seafood business to quality assurance systems leads to an increased competitiveness by providing confidence on quality and safety in the food production chain.

## **2.10 THEORETICAL FRAMEWORK**

Networking is one of the best solutions given for firms in LDCs, because it lies between the hierarchy (beaurocracy) and the market, which are the polar ends of the governance

options (Borg 1991, Jarillo 1998). For firms in LDCs, the economic functions and transactions within the boundaries of hierarchical firms are either impossible or extremely difficult because small firms, being small and alone, lack resources. It causes higher production costs. Market mechanism is also not a better solution because perfect competition is far from reality especially in LDCs. It causes higher transaction costs. Therefore, these firms find it difficult to perform their economic activities either at the level of hierarchy or market. This means that, they need support to compete and survive in their business.

One of the aims of the networking model is to provide a basis for studying the roles of actors and sets of actors in the performance of firms. This model helps to understand how firms mobilize the support they need in order to maintain successful business ventures. The basic elements of the network concept are the actors, resources, activities, and linkages. These elements of the network are related to one another. The actors can be individuals, organizations, firms, or government agencies. In this research for example, actors include all firms or institutions that have a significant contribution to the quality of fish exports. These are the EMPC, Fish Inspection and Quality Control Division, and the European Inspectors. All the actors have their own resources, specific activities and the knowledge about these activities, and resources and other actors in the network. Linkages between actors and resources can be described as relations among the actors in the network, and the linkages between resources and activities can be defined as relations between the actors in the network.

Firms in LDCs can use the formation of networking as a means of ensuring seafood quality and safety. This helps to avoid the information asymmetry between the buyer and the seller regarding the quality of the product. This lowers the transaction cost which may include the information searching cost for quality assurance, negotiation cost between the actors and control costs of maintaining the relationships. For example, in order to survive and succeed in the fish exporting business, the EMPC need to possess the necessary information about the quality and safety standards demanded by the EU inspectors.

Through cooperative strategy, the EMPC can access this information, which is an intangible resource of the Fish Inspection and Quality Control Division.

To conclude, the concept of the network theory implies cooperative efforts among persons, business firms, government bodies, other organizations, and other entities that are interconnected through activities and resources. This means that, the network concept provides a support environment for all the actors and provides them with all the resources that are essential for their competitiveness and survival in the market.

## **2.11 SUMMARY**

The nutritional properties, hygienic properties and organoleptic properties are some of the determinants of quality of fish and fishery products. However, the compliance to EU regulations including the HACCP system is used as a prerequisite to exporting to most attractive markets like EU and the USA. The value chain analysis is essential for the application of the HACCP system, which establishes process control through the identification of points in the chain of food production where loss of control could result in an unacceptable food quality and safety risk.

The export of fishery products, which meet international quality and safety standards, is essential to improve a country's level of foreign exchange revenues and income and security of employment in the fishery sector. However, most fish exporting firms located in LDCs have a problem of meeting the requirements and overcoming their quality related problems on their own. These firms can use the formation of the networking model as a means of ensuring seafood quality and safety because this strategy provides a support environment for all the actors and provides them with the resources that are essential for their survival and competitiveness in the global markets. The following chapter provides a detailed overview of the fishery industry in Eritrea.

## **CHAPTER THREE**

### **INDUSTRY ANALYSIS**

#### **3.1 INTRODUCTION**

Eritrea has a substantial fishery potential, which could highly contribute to the economic growth of the country. In view of this, the government of Eritrea intends to promote sustainable fisheries development for the purpose of ensuring food security, earning foreign currency, and increasing employment opportunities

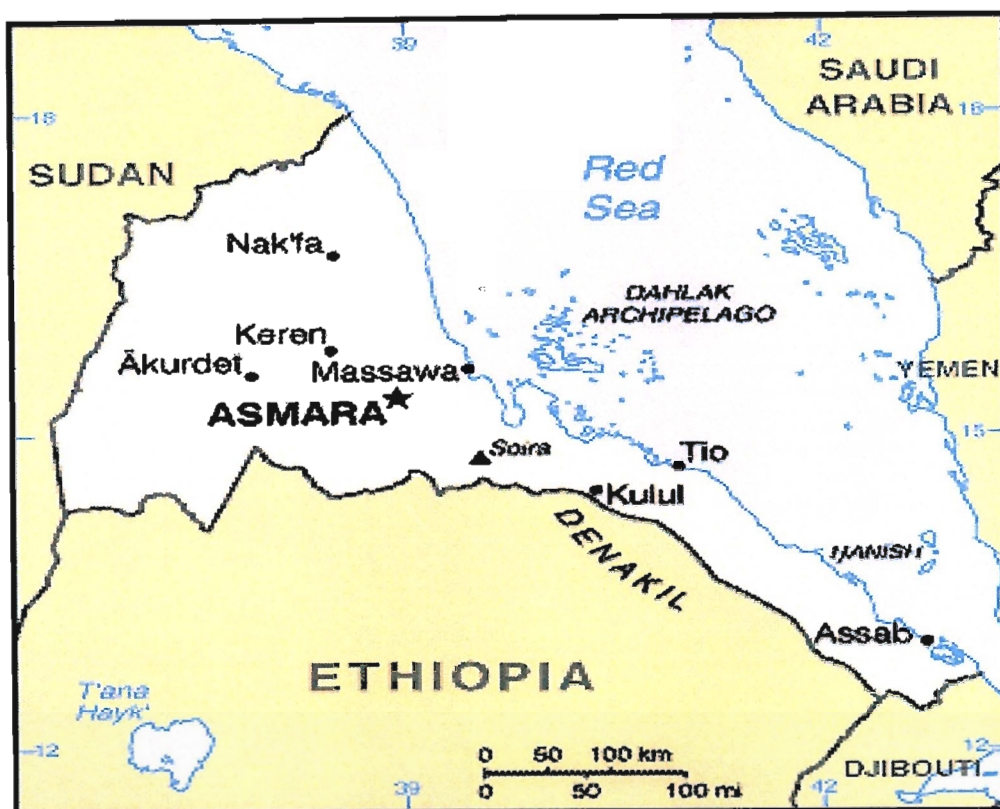
This chapter outlines the analysis of the industry. The main aim is to give the reader general information of Eritrea and the historical review of its fisheries industry. The chapter also deals with the company profile of the EMPC and the fishery policy of the government

#### **3.2 COUNTRY PROFILE**

Eritrea is a country of Eastern Africa situated on the Horn of Africa. It extends for about 600 miles (1,000 km) along the Red Sea from Cape Kasar to the Bab-el-Mandeb Strait and includes the Dahlak Archipelago in the Red Sea. It is bordered on the east by the Red Sea, on the southeast by Djibouti, on the south and west by Ethiopia, and on the north and northwest by Sudan (see Figure 3.1).



Figure 3.1 Map of Eritrea



Source: (Central Intelligence Agency 2003)

Formerly under Italian control, Eritrea was taken over by Britain during World War II and was a British territory from 1941 until 1952, when it was federated with Ethiopia. The creation of an Ethiopian unitary state in 1962, in which Eritrea was incorporated as a province, helped to provoke a long war of liberation that ended in Eritrean independence in 1993.

Eritrea has an area of 121,320 sq km (CIA 2003). Asmara is the capital and largest city. The country has a diverse climate, hot and arid deserts, coastal plains, rugged mountains and plateau, which result in a harsh and yet fragile environment. Rainfall is not only low normally less than 200 mm over two-thirds of the country, but also irregular and hence the risk of drought is ever present. For further background of the country including its basic facts, people, government, and economy refer appendix 2.

### 3.3 HISTORICAL REVIEW OF ERITREAN FISHERIES

Eritrean fish resources have been a major source of food for the settlers of the coastal region since long time ago. In the period of Italian and British colony the fishing activity grew up from subsistence level to commercial. The country had an active fisheries sector with yearly catches reported in 1954 exceeding 25,000 metric tones (Mt) (FAO 1993). Over 80% of this catch was a small pelagic species (Sardines and Anchovies), and were processed to fishmeal in Massawa for export to Europe and Far East markets (Rad Team 1993). However, the total production of fish fell from 21,000 Mt in 1966 to 14,000 Mt in 1967, mainly because of the closure of the Suez Canal in 1967. This blocked the most economical route of the fishery industry in Eritrea.

Fish landings fell to 400 Mt in 1972 and 328Mt in 1980. This is because of the increasing international rivalry that led to the collapse of the fishery sector. Although there was an increase in the annual trend of catch up to 2000Mt in 1984, it was followed by disruption due to warfare and informal exports to Yemen and Saudi Arabia. During that period, some of the marine products were exported to England, Italy, Spain, Greece, America, Belgium, West Germany, France, Canada, Iran, Japan, Israel, Sweden, Holland, Switzerland, Spain, Saudi Arabia, Kuwait, Sudan, Kenya, etc. Table 3.1 shows the level of exports in 1960s.

**Table 3.1: Level of exports of Eritrean Marine products in mid 1960s.**

Products	Quantity In Mt.
Fish meal	1430
Dry fish	3422
Fresh fish	702
Shell products	213
Other products	-

*Source:* E. Grofit, Red Sea Fisheries of Ethiopia (1971)

In the early 1950s up to the beginning of 1970s, there was adequate manpower and fishing activities in the sector. There were about 7,065 fishermen and office workers in

1963 and 830 boats in 1971. Table 3.2 shows the number of fishermen by type of employment.

**Table 3.2 Distribution of Manpower in the fisheries sector**

Type of Employment	Year		
	1955	1959	1960
Full time fishermen	1270	2195	1456
Part-time fishermen	3295	2369	1769
Occasional fishermen	2500	3150	2726
<b>Total</b>	<b>7065</b>	<b>7714</b>	<b>5951</b>

**Source:** E. Grofit, Red Sea Fisheries of Ethiopia (1971)

Although the artisanal fishermen shifted toward the use of more motor during 1960s, the basic fishing techniques remained the same with fishermen using hand-lines, beach seines, gillnets and to a lesser extent long-lines and troll-lines (Rad team 1993). The use of these different techniques varies depending on the season, the target market, and the demand in the market. For example snappers, groupers, breams, were caught using hand-lines, gillnets were used to catch sharks, trolling lines to catch any type of fish, and beach seines were used to catch anchovies and sardines.

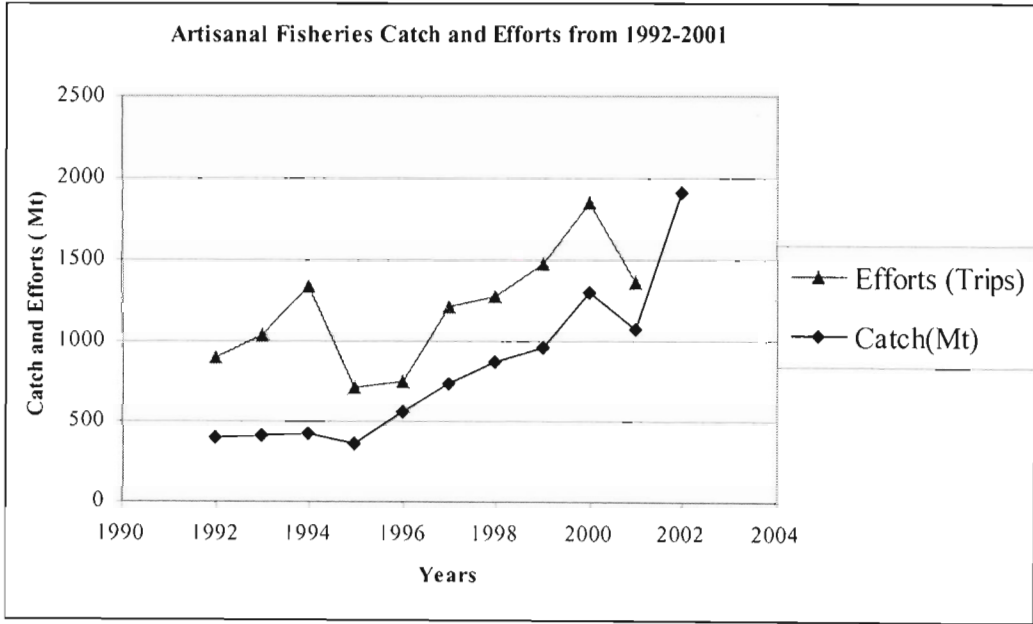
Despite the trend towards motorization, a decline in the number of artisanal fisheries from 23,000 in 1950s to 7000 in 1960s was observed (Grofit 1971). In 1970 there were only about 5000 fisheries, about 80% of which operated on a part-time basis (Rad team 1993). During the Ethiopian Regime, the fishery sector was entirely ignored; as a result most of the fisheries scattered or migrated to foreign countries.

After liberation in May 1991, the Provisional Government of Eritrea (PGE) established the Department of Marine Resources and In-land Fisheries (DMRIF) in October 1991. The DMRIF started its tasks with no adequate personnel and machinery, such as marine engineers, refrigeration mechanics, experienced fishing gear technicians, etc. In May 1993, the Ministry of Fishery (MoF) was established and has made a substantial effort to

rehabilitate the sector by developing the artisanal fishing community through giving them long-term credits to buy fishing facilities, boats and gears.

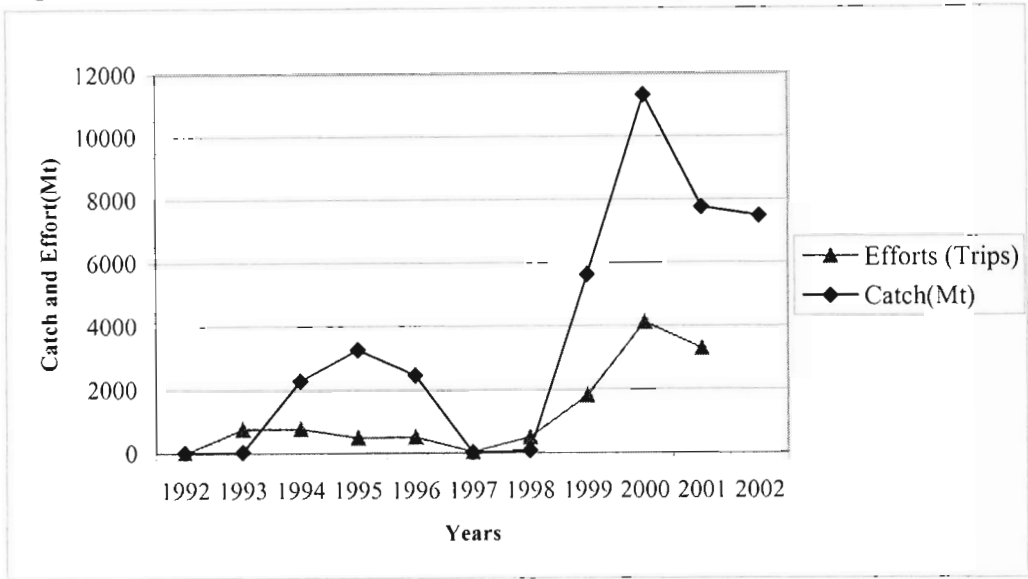
As it is shown in the figures below (Figure 3.2 and 3.3), the major sources of fish in Eritrea are Artisanal Fisheries and Industrial Fisheries. Artisanal fishing is recognized as a major employer in the costal region and also requiring development to improve the living standards of the costal region. Moreover, the government recognizes these fisheries as high quality fish suppliers at low cost than industrial fisheries.

Figure 3.2 Artisanal Fisheries Level of Catch and Efforts (1992-2001)



Source: Research and Statistics division-EMPC (MoF, 2002).

**Figure 3.3 Industrial Fisheries Level of Catch and Efforts (1992-2001)**



*Source:* Research and Statistics division-EMPC (MoF, 2002).

Currently, the MoF is responsible for the management of marine resources and the implementation of government policy for the fisheries sector.

### 3.4 FISHERY EXPORTS IN ERITREA

As indicated in table 3.3, Eritrea's long coastline offers a potential opportunity for expanding the fisheries industry with an average annual sustainable yield of 51,000-79,500 metric tones (FAO 1993). Approximately, there are around 350 species from which over 20 are highly demanded in the global markets because of their scarcity in most other water bodies of the world due to over exploitation.

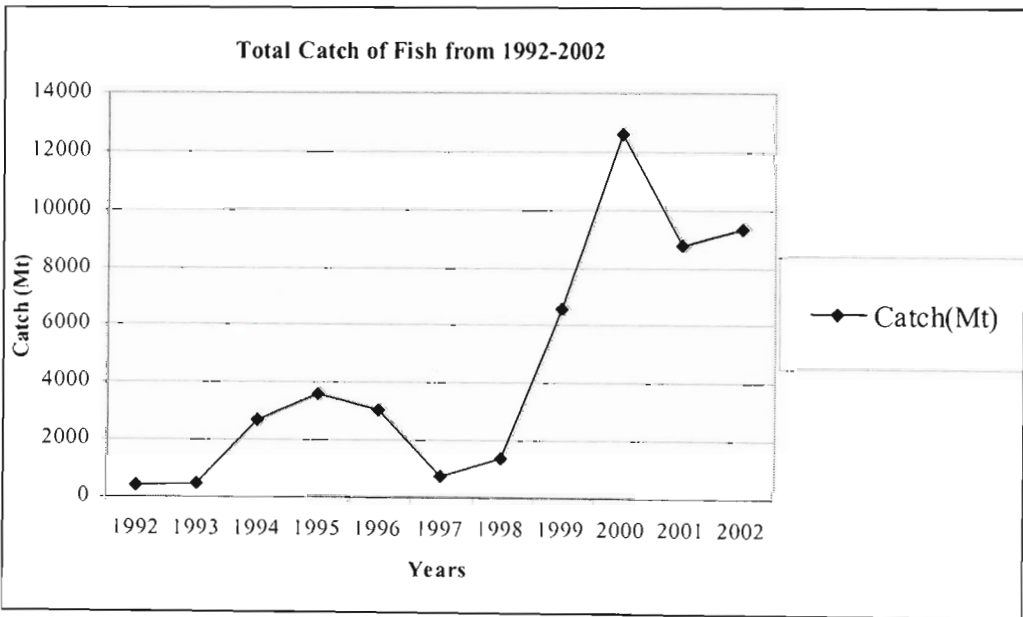
**Table3.3 Maximum Sustainable Yields of Eritrea’s marine fisheries**

Species	Metric Tones(Mt)
Demersal	18,000
Small pelagics	25,000-50,000
Large pelagics	5000
Sharks and Rays	2000-5000
Spiny lobster	500-1000
Shrimp	500
<b>Total</b>	<b>51000-79500</b>

*Source:* FAO Fishery Survey (1993).

The fishery resources in the Red Sea along the Eritrean coasts remained under-utilized in the past few decades. Since 1991 measures have been taken by the Ministry of Fisheries (MoF) to revive the fishing industry of the country and maximize fish catches. Consequently, the number of fishing units and levels of catch have been generally increasing through the last decade (MoF 2002). Figure 3.4 shows the total catch of Fish in Eritrea from 1992-2002.

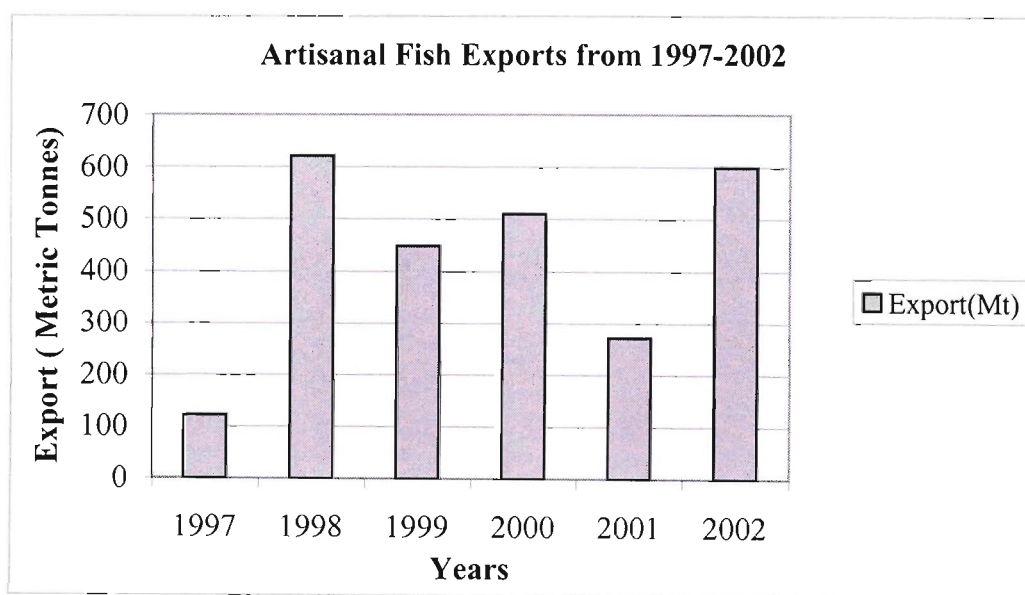
**Figure 3.4 Total Fish Catch from 1992-2002**



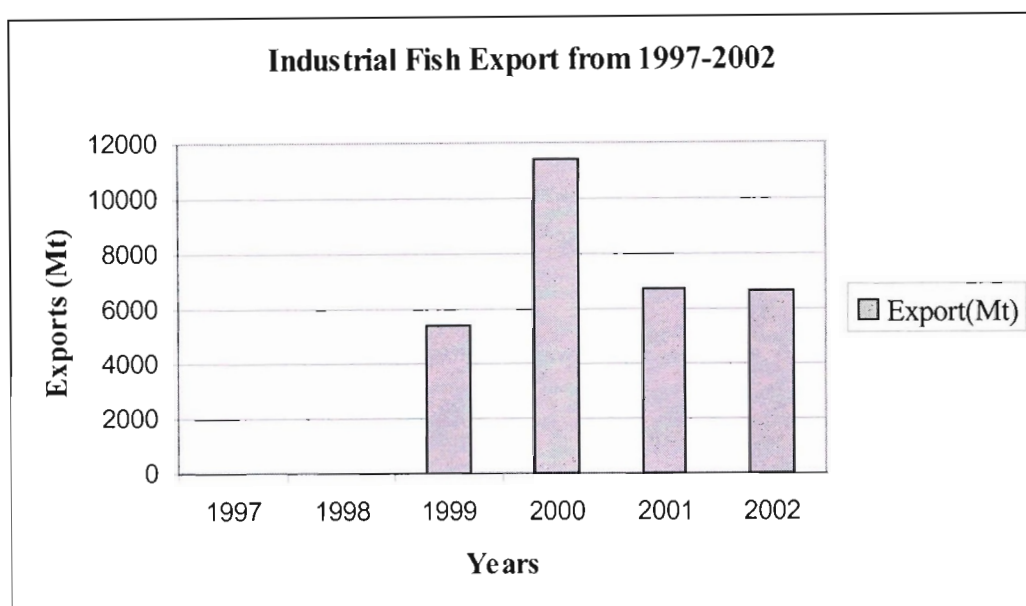
*Source:* Research and Statistics division-EMPC (MoF 2002).

Fish exporting in Eritrea was carried out through two fishing companies, which were established as a result of the government's encouragement to rehabilitate the fishing industry as a whole. The MoF established Leda Fisheries Ltd. Company and ERI-Fish Private Ltd. Company in an attempt to give confidence to investors who were uncertain about the future of the business in Eritrea. The contribution of the Artisanal and Industrial fisheries to the total exports of fish from the country are shown in Figure 3.5 and 3.6 below.

**Figure 3.5 Artisanal Fish Exports from 1997-2002**



*Source:* Research and Statistics division-EMPC (MoF, 2002).

**Figure 3.6 Industrial Fish Exports from 1997-2002**

*Source:* Research and Statistics division-EMPC (MoF, 2002).

Currently, the Eritrean Marine Products holding Company (EMPC) is the only commercial fishing company. EMPC is a parastatal company, which aims at increasing value-added products for export, diversifying its capital base through private investment and increasing employment opportunities.

The EMPC exports frozen /fresh fish and shrimps to selected regional and European markets. The importing countries include the Netherlands, Germany, England, Italy and USA. The total fish export has been increasing in the last six years (refer Table 3.4). The highest record of fish exports was registered in year 2000. This is mainly attributed to the highest number of artisanal and industrial catches.



**Table 3.4 Eritrean Total Fish Exports from 1997-2002**

Year	Export of Fish in Metric tones
1997	123
1998	622
1999	5883
2000	11,897
2001	7033
2002	7281
Total	32,839

Source: Research and Statistics division-EMPC (MoF, 2002).

The MoF, which undertakes the mission to develop fisheries is currently involved in two main tasks, namely- Fisheries Resources Development program that is aimed at infrastructure and community developments and Fisheries Resources Management program that keeps record of marine environment.

### **3.5 COMPANY PROFILE**

Eritrean Marine Products holding Company (EMPC) was established on April 10,1995, as a parastatal company of the Ministry of Fisheries of Eritrea to process and export fish. The processing plant was built in Asmara as simple fish shop, later restructured in conformance to the EU regulation on fish exporting processing plants. Then it started to export its products to Europe and Middle East.

Later in 1997, it invited foreign investors and extended its processing plants in Massawa and Assab, and became a majority shareholder in the two companies -Leda fisheries and ERI-Fish Processing plants. With the establishment of these plants the amount of export showed gradual increase. In the year 2000 due to the boarder conflict with Ethiopia the processing plant in Assab was closed and the exports from Asmara and Massawa highly decreased.

To rehabilitate the fish exporting activity, and since the Ministry of Fisheries is needed to be policy formulating body, the company transferred to the Navy and restarted its activity as autonomous business entity in January 2002. At this time EMPC under its administration includes Asmara processing Plant (EMPC Processing plant), Assab processing plant, Massawa processing plant (ERI-Fish processing plant), REFCO refrigeration workshop, Ocean fishing fleet and Massawa maintenance workshop and encompasses around 452 workers.

### **3.5.1 Mission and Vision Statement of the Company**

Eritrean Marine Products holding Company as a parastatal company with full responsibility of purchasing and distribution of fishery products targets the local market which includes wholesalers, retailers, restaurants, and hotels, and export market. The importing countries include the Netherlands, Germany, England, Italy and USA.

The product lines that are produced in the company include: Fresh fillets (vacuum packed/ skin wrapped) and Frozen fish (whole/gutted) for export market and Spiny lobsters (fresh/frozen) and Shrimps (fresh/frozen) for local market.

EMPC aims to be financially sustainable in the medium to long-term and plans to actively promote private investment in the sector. The company aims to distribute fish at a competitive price, so as to meet customers' needs both at the local and international markets.

### **3.5.2 Objectives of the Company**

Some of the objectives of EMPC can be summarized as follows:

- To be a List I exporter to the EU market.
- To increase the export of fish and other marine products from Eritrea.
- To export high value fish species and thereby obtain foreign exchange earning.
- To encourage the development of local fish consumption by the introduction of suitable low cost fish species.

### **3.6 GOVERNMENT'S FISHERY POLICY**

After an agreement with the Transitional Government of Ethiopia recognizing the sovereign rights of the PGE, and prior to the mid-1993 referendum on independence, the PGE began to rebuild the war-torn economy. At least 80% of the population depended on food aid, thus priority was given to generating an increase in domestic food production. Particular attention was given to the rich coastal fishing grounds.

The fishery policy has put emphasis to the development and strengthening of the sector so as to increase fisheries production to satisfy domestic demand and export. Broadly, the fisheries policy has been mainly concerned with guidance on the management and exploitation of fish resources. The principal objectives of the policies are to:

- Ensure the development of fishing villages and service facilities,
- Increase fish production with especial emphasis to artisanal fishery so as to raise the artisan income and living standards,
- Earn foreign exchange from the export of fish and other marine products,
- Promote and consolidate fisheries training, research and statistical data collection,
- Improve national management system such as parastatal, co-operatives and small-scale fishery ventures, and
- Conserve fish and other marine products by careful exploitation.

### **3.6 SUMMARY**

Eritrea has significant fisheries resources that are being used below their potential to support a growing population. Currently the MoF undertakes the mission to develop

fisheries through two main tasks: Fisheries resources development program and Fisheries resources management.

The EMPC, which was established as a parastatal company in Eritrea, is the only exporting company. The company exports fresh fillets (vacuum packed/ skin wrapped) and frozen fish (whole/gutted) for export markets and spiny lobsters (fresh/frozen) and shrimps (fresh/frozen) for local markets. The major export targets of the company include the Netherlands, Germany, England, Italy and the USA, which are characterized by strict regulations of fishery products of imports. The following chapter deals with the fish quality and safety requirements of the importers, and the quality and safety policies of the EMPC.

## **CHAPTER FOUR**

### **DATA ANALYSIS**

#### **4.1 INTRODUCTION**

A number of empirical studies have demonstrated the existence and importance of networking model for firms in LDCs. The networking model provides a basis for studying the roles of all the actors in ensuring the quality of the final product. This chapter examines, the activities and resources of the three actors- the EMPC, the FIQCD and the EU inspectors, and the impact of the cooperative strategy among them to improve the equality of fish exported from Eritrea. This chapter also examines the export requirements of EU countries and the quality and safety policies of the EMPC in detail. Finally, it points out the quality and safety related constraints of the EMPC.

#### **4.2 THE NETWORK MODEL**

The most important objective of the network model is to make possible an integrated analysis directed at the development of the fish industry. An essential objective of the fishery industry is to deliver a healthy and edible product and the necessary auxiliary services fulfilling a number of requirements and features known generally as quality, in the understanding that safety is the pre-requisite for quality. Thus, quality is a vital dimension for the development of the fishery industry.

The industrial network model provides a basis for studying the roles of all the actors in ensuring the quality of the final product. In this research, the focal firm – the EMPC is the first actor with a significant contribution to quality of fish exported from Eritrea. The other actors are EU Inspectors and Fish Inspection and Quality Control Division, which are important to the focal firm in that they can provide support that are essential for the company's survival and competitiveness in its target markets markets.

The EMPC generally does not possess all sorts of capabilities or resources to perform its activities alone. Therefore, in the network model the company has to enter into relations with other parties that have a role in its effectiveness in order to solve its problems. This

means, in order to acquire the resource that the company lacks, it needs to interact with others who control the resources. The formation of the network model is not only beneficial to the focal firm that is the EMPC, but also for the other actors, the FIQCD and the EU Inspectors in the model.

The FIQCD has an objective of ensuring quality and safety of fish to the ultimate customer where the cooperation of the two actors is essential for the accomplishment of this objective. In addition, the mere existence of the division is dependent on the existence of the EMPC.

Similarly, the EU inspectors who are representatives of the EU community represent the common interest and embody, to a large degree, the personality of the Union. Its main concern is to defend the interests of Europe's citizens'. Using its inspectors, the EU commission attempts to satisfy the high demand of fish and fishery products of the EU community through avoiding the disparities existing in the other countries in respect of health requirements. It also enables the production and placing on the market of fishery products to be better harmonized and bring about competition on equal terms, whilst ensuring quality products for the customer.

According to this, the interdependence of the objectives of the three actors opens a room for cooperation. This means that the successful accomplishment of one actor's goal is dependent upon its cooperation with the other two. The formation of networking among these actors creates adaptations and knowledge of the parties, which means mutual orientation. Through mutual orientation, the actors can develop a common language regarding safety and quality of fish. A most important aspect of the mutual orientation is mutual knowledge of each other in terms of their resources, strategies, needs and capabilities. The following sections of the study assess the three actors in terms of their objectives, activities and the resources they have in detail.

### 4.3 THE ERITREAN MARINE PRODUCTS COMPANY (EMPC)

Currently, the EMPC comprise two processing plants approved by the Fish Inspection and Quality Control Division (Competent Authority) to export to EU member countries, namely EMPC processing plant and ERI-Fish processing plant, located in Asmara and Massawa respectively. These processing plant control resources depending on the activities of each functional branch.

**4.3.1 ERI-Fish Processing Plant:** essentially focuses on supplying frozen products mainly shrimp and fish for export and local markets. The plant owns refrigeration equipments that are installed for processing frozen product only. It has two blast freezing machines, with a capacity of freezing 1.5 to 2 tones of shrimp in 3-4 hours and 2 to 3 tones of fish fillet in 5-6 hours. These two freezing machines include fish products storeroom freezer and frozen products storeroom freezer.

**4.3.2 EMPC Processing Plant:** mostly specializes in processing fresh fish products (fillets, whole round, whole gut), for both export and domestic markets and frozen shrimp and fresh fish fillets for the local market. The plant has two chill rooms. The capacity of these machines reaches up to  $-25^{\circ}\text{C}$ . However, the temperature of the plant is maintained at  $0^{\circ}\text{C}$  to keep the raw and final products fresh. There are two chill rooms, one for the raw material store and the other for finished product store.

When there is an excess supply of fish, the freezing process of the excess products is done by keeping the products in a refrigerated container outside the processing plant. This process takes up to 72 hours to freeze 4-5 tones of fishery products. As a result it has a great harmful effect on the quality of fish since it does not give the required temperature and also takes much time than the standard refrigeration process.

There is also a mini-laboratory in the processing plant for testing small samples like bacteria count, but for big samples the testing process is done in the central health

laboratory. In addition to this, the human capital of the plant comprises 40 working staff and 22 technical staff.

#### **4.4 FISH INSPECTION AND QUALITY CONTROL DIVISION**

The Fish Inspection and Quality Control Division (FIQCD) is an institution within the MoF, in which the ministry delegates an authority to the institution to enforce the fishery product regulations. The major objective of the division is to ensure supply of safe and quality food to the ultimate customer. For this purpose, the division is subdivided into three subunits in which the two units –Inspection and Post Harvest Research and Training, Standard units have an important role in insuring the quality of food produced. The inspection unit has three regional offices, in Asmara, Massawa and Assab.

##### **4.4.1 Inspection Unit**

To this unit, quality is made and not inspected; this means that, inspection should begin right from the beginning where fish is harvested. Checking the final product cannot guarantee quality. Accordingly, this unit ensures the implementation of fish inspection, plant inspection and pre-shipment inspection programs. The division collaborates with international agencies and authorities in importing countries in inspection works to create confidence in Eritrean products and upgrade the quality control system to minimize the need for extensive sampling. In addition it keeps records of misconduct committed by establishments, undertakes appropriate measures and gives recommendations and issues of certification.

Fish inspection refers to monitoring factors affecting environmental hygiene, handling at landing sites and harvest areas, and final product's quality. It also includes inspection of fish landing facilities, landing sites/unloading areas, inspection of hygiene, sanitation and giving recommendations on any closure of fish shops or landing sites. Whereas, the pre-shipment and plant inspection refers to the implementation of quality and safety inspection of export products, inspection of packaging and storage of export products,



and plant inspection based on national legislation and keeping and maintaining sampling records.

Thus, according to this division, fish quality is the function of all the activities performed starting from the harvesting area to the end user and also all the facilities used at all levels. For example, after harvesting, the fish should stay for maximum of three days in the sea. The raw fish should be covered in ice to ensure a good condition in terms of organoleptic criteria<sup>11</sup>, there should also be a cooling chain with out interruption from the vessel to the landing site and finally to the processing firm. A defect in one of these requirements leads to the deterioration of the quality of the final product.

#### **4.4.2 Post Harvest Research, Standards and Training Unit**

This sub-division has an important role in ensuring the quality of food to the final customer. As it is clear from the name of the unit, it primarily focuses on carrying out post harvest researches, establishing, developing and improving national standards accordingly, and arranging and conducting training programs for professionals involved in harvesting, processing and marketing of seafood products. Whenever there is a change in the standard regulations of the importing countries, the unit is responsible for informing the relevant bodies. The quality manuals set by the processing firms are controlled and evaluated by this unit of the division. It also undertakes training programs to fish inspectors, quality controllers, traders on implementation of the HACCP principles and Codes of Best Practices.

#### **4.4.3 The Coordinator**

The third subunit of the division, that is the coordinator essentially focuses on coordinating and controlling the activities of the other two units. It inspects the activities of the Inspection Unit during the routine checks and reviews the research results obtained and the standards developed by Post Harvest Research, Standard and Training Unit. The subdivision also reports the audit outcomes to the head of the Division to take an

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<sup>11</sup> see appendix 1

appropriate corrective action if there are any irregularities, and assists the head of the division in the overall activities of the division.

#### **4.5 THE FOOD AND VETERINARY OFFICE (FVO)**

The EU Commission, in its role as guardian of the Treaties of the European Community, is responsible for ensuring that Community legislation on food safety, animal health, plant health and animal welfare is properly implemented and enforced. As a commission service, the Food and Veterinary Office (FVO) plays an important role in fulfilling this task. The EU's Food and Veterinary Office (FVO) located in Dublin, Ireland, oversees national implementation of binding EU level laws on food safety, animal health, animal welfare and plant health. The FVO carries out on-the-spot inspections on food safety controls in the member states as well as in countries exporting to the EU. Thus the FVO's main activity is to carry out inspections in member states and third countries and to verify the implementation and enforcement of EU legislation by competent authorities. The findings of these inspections are written in inspection reports, together with conclusions and recommendations.

The FVO's objectives comprise; to promote effective control systems in the food safety and quality, veterinary and plant health sectors, to prove on compliance with the requirements of EU food safety and quality, veterinary and plant health legislation within the European Union and in third countries exporting to the EU, to contribute to the development of EU policy in the food safety and quality, veterinary and plant health sectors and to inform stakeholders of the outcome of evaluations.

The number of staff working in the FVO has increased from about 50 in 1997 to its present complement of around 160. The number of inspectors has increased three-fold to around 90 and the number of support staff has expanded accordingly. About 70 inspectors

participate regularly in on-the-spot inspection missions.

To conclude, the food manufacturers, farmers and food operators have the primary responsibility for food safety. The competent authorities monitor and enforce this responsibility through the operation of national surveillance and control systems; and the Commission concentrates on evaluating the ability of competent authorities to deliver these systems through audits and inspections at the national level. In this case it need to be clear that the task of the FVO is not to evaluate the performance of individual plants or establishments but to assess and report on how the relevant authorities in member states or third countries discharge their responsibility in ensuring that the Community legislation is properly implemented in their territories.

#### **4.6 THE EXPORT REQUIREMENTS OF EU COUNTRIES**

The EU is the largest single market for fish in the world. It relies on imports from the rest of the world to meet a large part of its requirements. This means that, the EU is highly dependent on imported fish to meet its domestic demand. For instance, the total imports of fishery products to the EU from non-member states in chilled or frozen form amounted to over 1 million tones in 1993 (Gebresillassie 1998). In 1995, the value of marine imports totaled US\$ 2.1 billion compared to marine exports of similar products worth US \$ 1.7 billion, giving an annual trade deficit in edible fish of US \$ -0.3 to -0.4 billion (Gebresillassie 1998).

The EU is the most important target market for Eritrean fishery products mainly because of high demand and also attractive price of fish in the market. Moreover, there is a direct transportation links with Eritrea through which the export activities to these countries can be facilitated. However, compared to the exports of other developing nations Eritrea's share is not significant. For example, of the 33,794 tones (total quantity) imported to the EU from African, Caribbean and Pacific countries (ACP), Eritrea only exports 7 tones which is 0.002% (Gebresillassie 1998). This is similar to the total exports of some land

locked ACP countries including Mali, Zimbabwe and Ethiopia. Eritrea with its under exploited Red sea fisheries, therefore has an attractive opportunity in European export markets. Nevertheless, the country to exploit its full potential of fish exports needs to meet the more strict rules and rigorous procedures of the EU importers.

The EU commission issues regulations that lay down conditions for products produced within the union and also for fish imported from third countries. The introduction of some regulations like HACCP system for fish and fish products, particularly in EU and the USA, has triggered the need for production under the HACCP system in most fish exporting countries. In the current situation approximately 60 % of the international fish markets require that fish and fish products to be processed under HACCP systems (with the EU market accounting for approximately 32% and USA 18%). Japan is the only large fish market (around 34%) that has not yet requested HACCP compliance (FAO 1998).

In an attempt of establishing equivalence regarding fish and fishery products, the concept of equivalence is included in the regulatory texts of EU community that is the EEC council directive 91/493/EEC. According to this directive, imports of fishery products from third countries should be at least equivalent to those governing the production and placing on the market of community products. In order to ensure the uniform application of this directive or to verify the conditions of production, storage and dispatch of fishing products for export to EU countries, experts<sup>12</sup> from the commission and the EU member states make inspections on the spot. In determining the import conditions of fishery products of the third country, particular emphasis is given to the following parameters: the availability of fishery legislative of the country, the competency of the competent authority, and the assurance that the third country can give on the compliance with the standards in the EU directive.

Based on the inspection results, the third countries are categorized as List I and II. List I comprises of countries and territories which have been approved to export to the EU

following an inspection by the Commission Services. List II comprises those countries which have submitted satisfactory dossiers and pending an inspection by the Commission Services. List II also include some countries that have received inspections but will remain on list II pending the receipt of satisfactory guarantees that certain observed deficiencies have been rectified. Based on the outcomes of the inspection services given to Eritrea on April 2003, there is an optimistic expectation that the country will be List I exporter in the near future. However, currently Eritrea is a List II exporter, and this means the fishery products from the country are distributed in the market only after a sample is taken and checked for its quality and safety in the quarantine section of the importing country. Incase of any faults, the whole batch is destroyed, in addition the exporter is obliged to cover the expenses incurred during its destroying process.

In addition, imports from the third countries must be accompanied by health certificates, and be from a list of approved establishments or factory vessels in which the licensing of these establishments or factory vessels is carried out and monitored by the recognized authority in the country concerned. An approval of establishments by the competent authorities of the third country is a result of compliance with the requirements equivalent to those laid down in the directive and monitoring by an official inspection service of the third country. For identification purposes, the exporting firms are given registration numbers. Thus, imports from the third countries carry an identification mark with the license number of the establishment so that the source of the fishery product can be easily traced.

The EU directives require the HACCP approach as a basis for food safety. This means that, although HACCP is not the only requirement from a regulatory point of view, fishery products safety equivalence can be determined based on regulations that incorporate the HACCP system as one of their basic characteristics.

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<sup>12</sup> These experts are appointed by the commission.

From the regulatory point of view, the introduction of HACCP based regulations implies the need for the procedures to determine equivalence both at national and international level. At national level, it is necessary that the competent authority, following the same type of criteria, validates different plants and processes. At the international level there is the need to determine the equivalence between the regulations and procedures followed by different countries to achieve production under HACCP control. Although a general international procedure to establish equivalence regarding fish and fish products safety has not been reached yet, the HACCP-based regulations have introduced some basic criteria and procedures regarding the assessment of equivalence, therefore of achieving and certifying compliance under current trade conditions. Through its seven principles<sup>13</sup>, the plan deals with the whole system from receiving of raw materials to the delivery of the final products, and it requires the documentation of all the processes as evidence that the processing conditions are met. However, the concept of equivalence and therefore determination of compliance is basically linked to the processing conditions. Whatever the formal procedures to document equivalence are, processing conditions are determinant to achieving compliance (FAO 1998). Therefore, it is very important that fish processors realize that there is no possibility of achieving compliance just through a formal procedure without equivalence of the processing conditions at plant level. In addition, currently there is no possibility of achieving generalized compliance in international trade (e.g. for all the plants or products of a country), but to achieve compliance on a plant-by-plant basis, and for specific products or lines (e.g. fillets or lean fish) (FAO 1998).

To conclude, the EU market, which is highly dependent on imported fish to meet its domestic demand, is an attractive target market for Eritrea fishery products. In addition to the high demand and high price of fishery products of these countries, EU market is also attractive due to direct transportation links with Eritrea. However, exports of fishery products to the EU countries have to meet the EU regulations that lay down conditions for products produced within the union and also for fish imported from third countries. The

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<sup>13</sup>see appendix 4

EU council directive 93/431 EEC on foodstuffs hygiene also urges all food businesses to develop an HACCP system. The HACCP based regulations of importing countries provide working procedures to determine the equivalence of processing conditions and document the compliance.

#### **4.7 GENERAL QUALITY POLICY OF THE EMPC**

While it is apparent that traditional quality control is unable to eliminate quality problems, the quality policy of EMPC mainly focuses on a preventative strategy of assuring quality based on a thorough analysis of prevailing conditions. The two approved processing firms of the EMPC – EMPC Asmara branch and ERI-Fish Massawa branch have their own quality system manuals which are documented in accordance with the Eritrean Fishery Products Regulations Legal Notice No: 40/1998. The Fishing Product Regulations of Eritrea is written on the basis of EEC Directive 91/493, which lays down health conditions for the production and the placing on the market of fishery products.

The policy of fish quality of the EMPC is based on the belief that “customers’ satisfaction through quality products and competitive prices is of a paramount importance to the continued success of the company.” The quality system of this company, which complies with Eritrean Fishery Product Regulation, also considers the recommendations of the competent authority of the MoF.

The employees of the organization are identified as a major component of its strength; therefore every employee has management support and is fully trained, and is totally aware of his/her responsibility. In addition, the management body has a responsibility of monitoring the quality system at appropriate intervals to ensure effectiveness and consistency, and the quality manager has direct responsibility of implementing and maintaining the objectives of the quality policy.

#### **4.7.1 General quality statement of ERI-Fish**

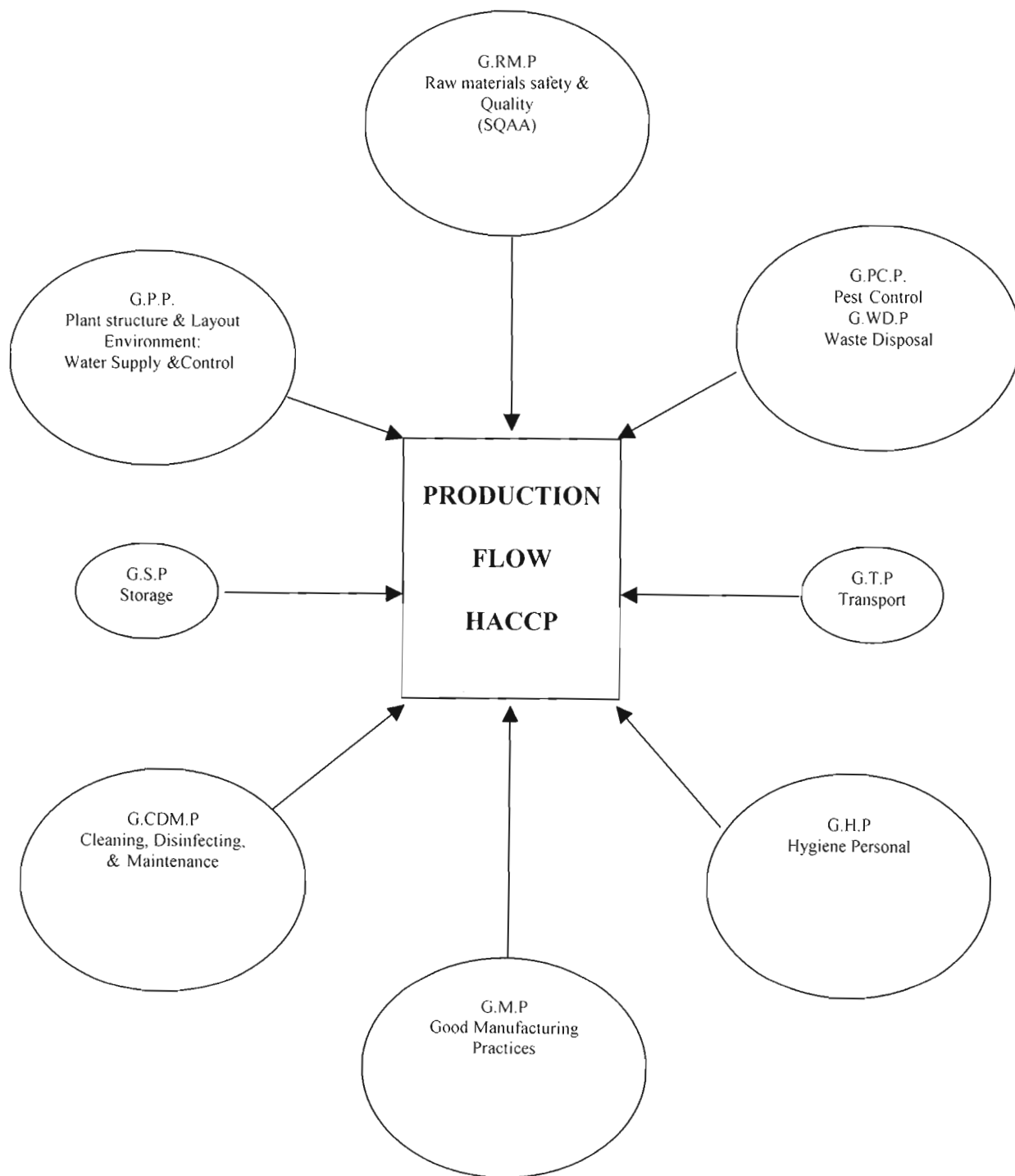
The management of ERI-fish is of opinion that HACCP is not a stand-alone program and for HACCP to function effectively needs to be accompanied by the prerequisite programs, the Code of Best Practices. These programs address operational conditions providing the foundation for the HACCP system. Figure 4.1 below shows the relation ship between the company's Codes of Best Practices or Good Practices and the HACCP system.



**Figure 4.1 Relationship between Good practices and HACCP.**

**Key:**

Preventative Measures



The “Quality In Action Manual” of ERI-Fish includes the Codes of Best Practices (Good Practices) structured in nine categories; Good raw material practices (GRMP), Good plant water control and maintenance practices (GPWMP), Good pest control practices (GPCP), Good cleaning and disinfecting practices (GCDP), Good hygiene practices (GHP), Good storage practices (GSP), Good transport practices (GTP), Good manufacturing practices (GMP) and Good waste disposal practices (GWDP).

On the basis of ISO 9002, each category of the good practices is structured in to three levels in which level one includes the policy and its objectives, level two deals with procedures and level three with instructions. The main contents of the nine categories of Good Practices can be summarized in the following paragraphs.

## **1. Good Plant Maintenance and Water Control Practices.**

### **1.1 Good Plant and Maintenance Practices**

In this case, the major objective of the organization is to keep a high standard of repair and hygiene with minimum risk of physical, chemical and biological contamination to the end product. For this reason, the working rooms of the plant are partitioned to include the reception room, chill room<sup>14</sup> 0°C, ice storage<sup>15</sup>, filleting room, fish box store, washing rooms for utensils and uniforms, offal room, blast freezer room, packing room, cold store (-18 ° C), toilets<sup>16</sup>, and changing rooms<sup>17</sup>, are of sufficient size for the work to be carried out.

The layout and design of the processing rooms are designed in such away that there are no interruptions in the workflow and care is taken to avoid any adulteration at all stages of the production through delivery to customers. All walls and ceilings in the production and storage rooms are smooth, impervious, easily cleanable, and in good repair. Moreover, hygienic waste disposal system, adequate air conditioning, and adequate levels of lighting

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<sup>14</sup> ....where raw materials stored temporarily

<sup>15</sup> sandwiched panel enclosure inside chill room

<sup>16</sup> five for 50-100 workers

<sup>17</sup>for gents and ladies having separate lockers for city dress, city shoes, and uniforms and hungers for gumboots

for all types of operations, are available. The Quality Manager (QM), who also maintains the inspection list, carries out regular inspection of the buildings, equipments and utensils (plastic containers, cutting boards etc.) on a weekly basis.

The maintenance technician is responsible for implementing and maintaining the plan, and also reports weekly the maintenance, defects and repairs record to the plant manger with a copy to the QM.

### **1.2 Good Potable Water Control Practices:**

The aim of the plan is to insure that the water coming into contact with fish and/or fish contact surfaces, or used in the production of ice is potable and safe, in compliance to the Potable Water Regulations of Legal Notice No. 42/1998 of the state of Eritrea. Accordingly, chlorination of water at the intermediate storage tank is carried out to assure the free chlorine of 0.25-0.5ppm (parts per million) everyday. In consultation with the competent authority the QM selects and organizes the disinfectant to make the water safe and potable. The QM who carries a microbiological and physiochemical tests is responsible for implementing, maintaining and verifying this practice. The production supervisor monitors and reports to the QM the daily residual chlorine record.

## **2. Good Raw Materials Practices**

With regard to raw materials, the objective of the organization is to make sure that they are purchased from approved and selected suppliers. The Supplier Quality Assurance Agreement<sup>18</sup> (SQAA) is entered and signed by the buyer and supplier of raw materials subject to some terms and conditions. The raw fish, which are purchased by means of SQAA, are transported, received, stored and/or handled under conditions that guarantee protection against contamination, infestation, and deterioration. The QM is responsible for implementing, maintaining and verifying this procedure, whereas the raw materials purchaser carries out the monitoring activity and also reports the raw materials quality record to the QM.

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<sup>18</sup> see appendix 3

### **3. Good Cleaning and Disinfecting Practices**

Good cleaning and disinfecting practices are aimed at maintaining a high standard of hygiene of equipments, facilities and premises. Cleaning and disinfecting activities are carried out as per the schedule<sup>19</sup>. The QM is responsible for implementing and verifying activities while, the production manger is responsible for maintaining and monitoring of this practice.

### **4. Good Personal Hygiene Practices**

Maintaining a high standard of personnel hygiene is the main objective of these practices. With the intention of achieving this objective, all personnel inside the preparation room is kept with an optimal health status where by there is no likelihood of fish products contamination. These staff members also maintain a high degree of personnel cleanliness and must wear appropriate uniforms, footwear and headgear, which completely covers the hair. Cuts and wound with which personnel are permitted to work are covered by waterproof dressings.

In addition, food handlers are refrained from behaviors, which could contaminate the product, and external visitors are obliged to wear protective clothing, footwear and headgear, and to adhere to other personal hygiene provisions. The QM is responsible for implementing and verification of this plan, and the production manager undertakes the maintenance and monitoring activities.

### **5. Good Pest Control and Practices**

In this case, the objective of the company is to establish appropriate and effective system of controlling pests. Good hygiene, repair and condition of buildings, inspection of incoming material and good monitoring systems prevent pest infestation. The QM is responsible for implementing and verification of this plan, and the production manager undertakes the maintenance and monitoring activities.

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<sup>19</sup> see appendix 5

## **6. Good Manufacturing Practices**

With good manufacturing practices the organization endeavors to produce safe and high quality of finished products through two major activities. The first activity is prevention of cross-contamination through purchasing good quality of raw materials, maintaining an appropriate degree of personnel cleanliness, maintaining the required standard of hygiene in all fish contact surfaces, and appropriate and up to the standard design and construction of plant equipment. The second activity refers to the prevention of growth/survival of contaminants through employing an appropriate and required storage practices, having an appropriate processing techniques/facilities and practicing a correct storage of semi-finished and finished products. While the production manager is responsible for implementing and maintaining of activities of the plan, the supervisor is responsible for monitoring activity and the QM does the verification.

## **7. Good Storage Practices**

The objective of this practice is to ensure the safety and the suitability of semi-prepared and finished products through preventing growth/survival of contaminants and/or contamination. Accordingly, the fishery products and other ingredients involved are segregated and sorted in a way that contamination is precluded. The rejected materials are disposed off in a hygienic manner. The fishery products, packing materials and other fish contact surfaces are protected against contamination by pests, or by chemical, physical or biological contaminants or other substances.

Where and when it is possible, deterioration and spoilage of materials are prevented through an appropriate measure like control of temperature, humidity and others. The QM is responsible for implementing and verifying of the activities and the storekeepers in collaboration with the supervisors take the responsibility of maintaining and monitoring the practice.

## **8. Good Transport Practices**

The good transport practices of the company aim at making the transport mechanisms used for fishery products safe and suitable. Thus, transportation medium is selected based on the type of the product to be transported. Containers and other facilities are designed and constructed in such away to impair or illuminate contamination of the fishery products or packaging, they are also effectively cleaned and where necessary disinfected. Where available, they permit segregation of products at different conditions and from non-fishery product items, they protect against physical, biological or chemical contaminants, protect products against harmful or undesirable microbial growth and deterioration, and allow any necessary temperature, humidity and other condition to be checked. The production manager is responsible for the implementation and maintenance of this practice and the QM does the verification.

## **9. Good Waste Disposal Practices**

In this case, the intent of the organization is to establish an effective system to manage waste so as to minimize the risk of final product contamination to an acceptable level. Solid waste disposal from the preparation rooms is carried out during and after the end production. The production manager decides the frequency of waste disposal depending on the workload of production and organizes the job in such a way that the wastes are disposed off efficiently and appropriately. The QM is responsible to implement and verify the plan, and in consultation with the QM, the production manager and the supervisor are responsible for maintaining and monitoring the activities respectively.

### **4.7.2 General quality statement of EMPC Asmara Branch**

The assurance of fish quality in EMPC Asmara branch is implemented through a proper application of Good Manufacturing Procedures (GMP) plus Sanitation Standard Operation Procedures (SSOP) and an HACCP plan. In American quality manuals or training curriculums, GMP and SSOP are considered as the prerequisite programs to HACCP and the SSOP's are approximately the "Codes of Best Practices" described in the case of ERI-Fish, with out the GMPs. This means that, the GMP provides good lines for

processing, the SSOP deals with hygiene of operations and finally the HACCP plan identifies limits of physical, chemical and biological parameters to ensure an acceptable level of food safety standards.

## **1. Good Manufacturing Procedures**

### **1.1 Good Raw Materials Practices**

The aim of these practices is to make sure that the raw materials received are safe for manufacturing and comply with the required quality levels. All the materials are inspected based on the specifications agreed between the supplier and the organization. The fishery products are inspected on temperature and organoleptic criteria. According the agreements between the organization and the suppliers, the defected raw materials are either returned to the supplier or disposed off. The QM is responsible for implementing, maintaining, monitoring and verifying the Good Raw Materials practices.

### **1.2 Good Manufacturing Practices**

With this practice, the production of high quality and safe products is secured. The major goals of this practice include, avoiding any cross contamination of the product from fish contaminants that are found on the skin, intestines, etc and from the environment. More over, it aims at having an efficient production flow from raw to finished products, flow of removal of dirty implements and offal, and also at avoiding temperature increases above 5°C. The QM of the company carries the responsibilities of implementing, maintaining, monitoring and verifying the GMP.

## **2. Sanitation Standard Operating Procedures (SSOP)**

### **2.1 Water- SSOP Item 1**

The objective of this procedure is to ensure the safety of the water that comes into contact with food or food contact surfaces or used in the production of ice. Since the municipality of Asmara does not provide the company with sufficient water, well water is used in addition to the municipality water. The well water is chlorinated with 0.5-0.3 ppm daily to make it potable.

## **2.2 Cleaning and Disinfecting Practices- SSOP Item 2**

Cleaning and disinfecting practices help the company to ensure the cleanliness of food contact surfaces, including utensils, gloves and outer garments. These practices are carried out on a daily, weekly, and yearly basis. For example, daily all employees are obliged to wear hair/beard nets, clean coats and boots. The employees wash and disinfect their hands every time they leave the food processing area/slicing benches, and the food contact surfaces are also cleaned three times a day.

## **2.3 Prevent Cross Contamination – SSOP Item 3**

In this case, the major objective is to prevent the cross-contamination of the food from unhygienic objects, food packaging materials and other food contact surfaces including utensils, gloves, and other garments. The layout of the plant is helpful in that it enables the isolation of finished products from raw material prior to packaging.

## **2.4 Personal Hygiene- SSOP Item 4**

The employees' toilets and cloakroom facilities are not opening directly to the processing areas. The washing and disinfectant dispensers are available over hand washing-basins, and there are also appropriate signs that warn employees to wash hands before work.

## **2.5 Adulteration- SSOP Item 5**

The objective of the company is to ensure the protection of food, food packaging materials and food contact surfaces from adulteration with lubricants, fuel, pesticides, sanitary agents, and other chemical, physical and biological contaminants. Consequently, the chemical stores are separated from food stores and are accessed only by authorized employees. In addition properly labeled containers of food contact sanitizing chemicals are stored in processing areas at their point of use, food grade lubricants are stored outside the processing area and are separated from non-food grade lubricants, and packaging materials are stored in their own stores and are not exposed to store chemicals or lubricants.



## **2.6 Chemicals- SSOP Item 6**

The goal of the organization is to meet the Ministry of Agriculture's conformance requirement of proper labeling, storage, and use of toxic compounds. In order to comply with this requirement, all bulk quantities of toxic and non-toxic compounds are properly labeled, segregated by food/non-food category, and stored outside the processing areas. Moreover, the cleaning and sanitizing chemicals are kept in the locked chemical storages.

## **2.7 Employee Health- SSOP Item 7**

In this case, the employees' health conditions likely to contaminate food packaging materials and food contact surfaces that could result to the microbiological contamination of food are controlled. The employees are instructed to report any health conditions which might result in contamination of food or food contact surfaces. Superficial injuries like cuts, glazes, sores etc. and infectious disease like stomach disorders and diarrhea are reported to supervisors and management body.

## **2.8 Pest Control- SSOP Item 8**

The objective of the company is to implement and maintain a pest control system so that the likelihood of product contamination by pests will be avoided. Occasionally the plants are inspected and treated with appropriate chemicals, and after each pest treatment, all food surfaces are cleaned. Other insects like houseflies are avoided using UV-Flycatchers.

## **2.9 Waste Disposal Practices- SSOP Item 9**

To provide and implement a proper waste disposal system in a hygienic manner is the objective of these practices. All wastes in the working rooms and the offal are collected every morning using covered bins and are disposed outside the factory.

#### **4.8 SAFETY POLICY OF THE EMPC COMPANY**

In fish business, the safety issue is a pre-requisite for assuring quality of the product. To ensure the safety of their products, the EMPC processing firms apply the HACCP plan. In contrast to the principles in traditional quality programs relying heavily on control of end-products, the HACCP system is a preventative strategy based on the study of prevailing conditions and is much more likely to provide a better guarantee of quality. The management of EMPC has an opinion that HACCP is not a stand-alone program but is one part of a large system of control procedures, thus it is built upon a firm foundation of compliance to their quality in action manuals. The HACCP plans of EMPC processing plant and ERI-Fish processing plant are summarized in Appendices 6 and 7 respectively.

#### **4.9 RELATIONSHIP OF THE FIQCD AND THE EU INSPECTORS**

In the network model of fish industry, all the actors perform a number of interrelated activities, and mostly each activity is more or less dependent on the performance of the other activities. The FIQCD acts as a Competent Authority (CA) to which delegation of authority is given to the capable local institution by the EU community council. A competent authority refers to the central authority of a member state or a third country competent to carry out veterinary checks or any authority to which it has delegated that competence.

The FIQCD as the one competent authority in Eritrea has a direct relation with Food and Veterinary Office (FVO) in Dublin, capital city of the Republic of Ireland. This division has a responsibility of collaborating with authorities in importing countries to create confidence in Eritrean products, and upgrade the quality control systems in the fish industry. In order to do this, the division undertakes the fish inspection, plant inspection and pre-shipment inspection activities. It has also an authority of taking an appropriate measures for transgressions committed by the establishments.

The EU inspecting body makes inspection of the third country exporters which is called an “FVO Mission”, once every three or four years. The objective of this mission is to

carry out an evaluation of the control system of fishery products originating from the third country and intended for export to the EU. They give a particular account to the legislation of the fishery products in the third country, in terms of its compliance or equivalence to the EU requirements laid down in the directives. The inspectors also give a particular attention to the organization of the competent authority of the third country- its inspection services, the powers of such services and the supervision to which they are subject. Based on the results of the evaluation, the FVO writes recommendations. Therefore, every activity of the actors within a network is dependent on other activities in the sense that the outcome of an activity is dependent on how other activities are performed. In addition, the EU inspectors assist the FIQCD in drafting the local legislation on fishery product regulation.

The EU inspectors also evaluate the human skills in the CA. Third exporting countries prior to entertaining the mission, the CA of the country formally request the EU to send delegation to assess the situation of the fishery sector of the country in general, and the competent authority in particular. If agreed a project is set up by the EU and assessment is carried out by the project's coordinator. The coordinator drafts Terms Of Reference (TOR), and based on it experts from the EU visit the CA of the country and give training sessions to local CA staff which helps them to upgrade their skills. The training could be in the form of on-the-job training and/or workshops. The EU covers the total budget of this project.

#### **4.10 RELATIONSHIP BETWEEN THE EMPC AND FIQCD**

The EMPC is a profit-oriented organization, which aims at maximizing its profits by increasing its sales volume. But in order to do this, the company needs to have a market where it can sell its product at a reasonable price. As it is discussed in the previous sections of the chapter, the EU market which is the largest single market for fishery products have strict food quality and safety standards to be followed by firms such as the

EMPC. The FIQCD therefore acts as an agent for EU inspectors through which they control the performance of the EMPC in terms of its compliance with their standards.

The competent authority through an inspection services carried out at an appropriate intervals controls the overall performance of the processing firms. There are some inspection activities carried out once a month by the CA in addition to the daily organoleptic checks of raw materials received in the processing firms. These activities help the CA to collect the general background information of the plant/equipment to be inspected and the degree of its compliance with the requirements.

**1. Establishment inspection:** In this case, the CA evaluates the details of the site, processing activities, approved activities of the establishment, and brands and packaging materials description. It also takes account of other categories like production in terms of quantity of raw materials used, rejected etc., production capacity, and average production in tones. Finally, imported products as raw materials, the destination of exported products for the last three years, and the quality system used in the establishment are also recorded in the first part of the establishment inspection activity.

The establishment inspection also gives the CA a detailed information of the company's (1) buildings: layout, construction, maintenance; (2) water: potable water and processing water (chlorination level); (3) practices: raw materials control, storage conditions, manufacturing, personal hygiene, etc. (4) documentation: approval certificate, establishment layout plans, etc., and (5) implementation of documentation, quality control and assurance systems, staff training, trace-ability etc.,

Finally the CA investigates the application of good practices established in directive 91/493, which lays down the health conditions for the production and the placing on the market of fishing products. The main categories include the production premises, social premises, facilities in all working rooms, availability of water supply, hygiene, pest control plans used, use of chemicals, personnel cleanliness and disposal of wastes. In

addition the processing and handling of fresh products, conditions concerning parasites, storage practices, identifications marks, and use of HACCP plan are inspected rigorously.

**2. Vessel inspection:** The vessel inspection activity by the CA collects the vessel inspection background data, which provides them with general information about the vessel in terms of its name, registration number, approval reference number, etc. It also gives information on the general construction properties of the vessel (type of engine, shelter, sleeping facilities, etc.), hygiene control, protective clothes use in the vessel and use of ice. In addition, the hygiene conditions on board fishing vessel are also assessed. The CA inspects the general hygiene conditions applicable to the fishing vessels designed and equipped to preserve fishery products-on-board under satisfactory conditions for more than 24 hours.

**3. Ice factory inspection:** In this case, the CA gathers information on the site details of the ice factory, processing, approved activities, production capacity and quality systems used. Information on the buildings, water (potable water, and processing water), practices (Ice storage conditions, manufacturing etc.,) documentation, and implementation of the documentation is also collected during this activity. Finally the competent authority makes an assessment of the general conditions for ice making.

**4. Truck Inspection:** The general background information about the truck is collected in this activity and the detailed information of the vessel follows that includes the availability of sections/ separations, internal surfaces of the cargo, drainage systems, etc.

In addition to the above monthly inspections, the CA also makes a daily inspection of the raw materials received in the company. Through the daily inspection activity, the CA checks the temperature at landing, adequacy of ice coverage of the fish, the species of the fish, and other organoleptic criteria.

Based on the results of the above inspections, the C.A arranges and conducts training programs for the staff members of the processing firms. Table 4.1 shows the training programs by C.A for staff members of EMPC Asmara branch for the year 2003-2004. The target groups in this training are the production managers, quality managers, and inspectors.

**Table 4.1\_ Training arrangement for the staff members of EMPC for the year 2003-2004 by the CA**

No.	Type of Training	Target Group	Trainers	2003	2004
1	Codes of best practices	Inspectors (I), Quality Managers (QM), Production Managers (PM).	CA Staff	May-June	March-April
2	Bacteria of public health significance	I, QM, PM	CA Staff	July-August	May-June
3	Introduction to the newly introduced legislations	I, QM, PM	CA Staff	September-October	-
4	HACCP concepts	I, QM, PM	EU Experts	October-December	-
5	Short introduction to laboratory analysis and interpretation of results	I, QM, PM	Dr. T.S. Shetty and Ato Giorgis	June	-
6	Practical training on how to develop a Quality and HACCP Manual	I, QM, PM	EU Experts	October-December	-
7	Food Safety issues	I, QM, PM	Experts from the University of Asmara	-	January-February
8	Food borne diseases, causes and costs.	I, QM, PM	EU Experts	October-December	

*Source:* Fish Inspection and Quality Control Division (MoF, 2003).

As it is mentioned earlier, every export to EU markets from the processing firms needs to be accompanied by health certificates. This certificate contains the detailed information about the product, its species, scientific name, type of the product (fresh /frozen which could be fillet, whole gutted, whole rounded), type of packaging, weight, license number of the approved establishment, required temperature, consignor's name and address, consignee's name and address, means of transportation, etc. This certificate is prepared by the C.A staff, and is received by the inspectors of the destination country. The exported fish is received by the importers (wholesalers or retailers) only after it passed the inspection process at the checkpoint / quarantine section of the importing country.

Finally, the C.A staff act as a conflict settler that may arise between the quality manager and production managers due to difference in their goals. A production manager is oriented toward production maximization and the quality manager has a goal of assuring the safety and quality of all products produced. Thus the FIQCD office acts as a mediator to reconcile the interests of the two managers in a way that doesn't hurt the overall objectives of the company.

#### **4.11 CONSTRAINTS OF THE EMPC IN QUALITY FISH EXPORTING**

As it is discussed in the previous chapters, the quality issue in terms of compliance to the EU requirements is crucial for the fish exporting business especially those largely dependent on exporting to the EU countries. This is because, in order for a company to be recognized as fish exporter to the EU countries, it needs to have a reasonable compliance level to the EU community regulations regarding fish quality. There is no hundred percent fulfillment of all the requirements since the regulations are too strict to be totally fulfilled. Although the EMPC is doing its best to increase its compliance level from time to time and the FVO mission who came on April 2003 has evaluated the company as generally good, currently there are some constraints that need to be overcome so that the long-term company objectives will be realized.

- According to the EU requirements, the working rooms of the fish processing firms need to be of sufficient size for works to be carried out in a logical sequence and under adequate hygienic conditions. The raw materials store in EMPC processing plant is very small compared to the finished products store. Therefore, when there is a large supply of raw fish, the finished products' store is used for the purpose of storing the raw materials. This leads to the likelihood of contamination of the finished products consequently deteriorating its quality. In addition, the EU requirement of the availability adequate hot water in the processing firms for cleaning purposes is not also fulfilled in the plant.
  
- The trucks to be used for the transportation of the fishery products need to be constructed and equipped in such away that the required temperature can be maintained throughout the period of transport. On top of this, since ice is used to chill the raw fish, adequate drainage needs to be provided in order to ensure that water from the melted ice does not stay in contact with the fishery products. The internal surface of the vehicles also needs to be smooth and easy to clean and disinfect. Although the company used to own two Renault vehicles that totally met the EU requirements and were approved by the CA, currently both are out of order. As a result, the company is using two Isuzu trucks – one for the offal of wastes and one for transporting finished products. These trucks are insulated and have mechanical cooling systems but lack ramps<sup>20</sup>. The ramp is essential for loading and unloading of fishery products in such a way that infectivity is excluded. The use of these vehicles for transporting fishery products creates a one to two meters distance between the buildings and the vehicle and this free area can be a source for contaminants. Thus, unless other ways are used to preclude the chances of contamination, the use of these vehicles for transporting the fishery products has a risk of final products' quality deterioration.

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<sup>20</sup> a slope connecting the vehicle to the building from/to which the fish is loaded/unloaded respectively



- In order to make sure that the water coming into contact with fish and/or fish contact surfaces, or used in the production of ice is potable and safe, manual and not online chlorination process is used in the plant. Other than its inefficiency, this procedure is also another source of contamination because there is a possibility of using unhygienic stirrers during the manual chlorination, and this may have a negative impact for the products quality.
- In the ERI-Fish processing plant, although the processing rooms were supposed to be built in a continuous flow according to the regulation, there is no separation between gutting room and filleting rooms, in addition there is no a semi-processed products store, because of this there, is a back flow of products thus possibility of contamination.
- In addition, the processing rooms, the stores and others are divided by sandwich panels (coated steel/polyurethane foam coated steel) and the floor of all the rooms is covered by a strong smooth plastic approved by the competent authority and have effective sewage system, but there is no enough water tubes in the rooms for processing and cleaning purpose. The manual chlorination system employed in the company can also be mentioned as one cause of contamination.
- The other major problem that is related to the Eritrean Marine Products holding Company as a whole is lack of commitment to quality assurance. This is because the level of compliance to the requirements is mostly high during the inspection periods and may not be consistent afterwards. Although the occasional control procedures by the CA are important for the enforcement of the regulations, there needs to be an equal understanding of quality importance on the side of the processing firms. Otherwise, if the quality manuals and others are only followed for scoring good result during inspections, the sustainability of the advantages gained from compliance may be questionable.

- The above problems being related to the individual processing plants and the company as a whole, there are also some constraints which are external to the company. In order to identify the technical assistance and other support needed by each processing plant, there is a coordinating office from the EU inspectors, which occasionally visits the establishments. However, although the FVO Mission provides the processing firms with consultant services for training purposes based on the recognized deficiencies of these firms, mostly these firms are not satisfied with the training given by the trainees. This may be greatly because of unqualified trainers for the identified needs, short time given to the trainees, etc. For example, recently there was such a program organized by the EU inspectors, but the trainer was a veterinarian and not a fish expert thus too much time was spent for preparation purposes by the trainer and little time left for the actual training program.
- Moreover, there is a problem in the flow of important information from the EU inspectors to the CA on a timely basis. The recent periodicals and journals related to fish and its quality, which are important for effective performance of the division's activities are not easily accessed because of the lack of fast and effective way of communicating like the Internet.

#### **4.12 SUMMARY**

The EU market, which is highly dependent on imported fish to meet its domestic demand, is an attractive target market for Eritrea fishery products. However, exports of fishery products to the EU countries have to meet the EU regulations that lay down conditions for products produced within the union and also for fish imported from third countries. In an attempt of complying with these regulations, the quality policy of EMPC mainly focuses on a preventative strategy of assuring quality based on a thorough analysis of prevailing conditions. Nevertheless, the company faces some constraints in complying to the EU including, insufficient and inefficient process equipments, un-standardized processing plants, inefficient refrigeration machines and maintenance problems, lack of commitment

to quality assurance, and a problem on the timely flow of important information from the EU inspectors to the CA.

The interdependence of the objectives of the three actors opens a room for cooperation. The formation of networking among these actors is essential for the firm to overcome its current problems and be competitive in the global market.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 CONCLUSION**

The less-developed countries that export products of natural resources seemingly have the most favorable export prospects because demand for such finite resources is expanding among the developed countries, many of which are concerned over the depletion of their domestic resources.

The EU market, which is highly dependent on imported fish to meet its domestic demand, is an attractive target market for Eritrea fishery products. In addition to the high demand and high price of fishery products, EU market is also attractive due to direct transportation links with Eritrea.

However, exports of fishery products to the EU countries are required to meet the more strict EU regulations that lay down conditions for products produced within the union and also for fish imported from third countries. For instance, the EU council directive 93/431 EEC on foodstuffs hygiene also demands all food businesses to develop an HACCP system, which provides working procedures to determine the equivalence of processing conditions and document the compliance.

In an attempt to comply with these regulations therefore, the quality policy of the EMPC mainly focuses on a preventative strategy of assuring quality based on a thorough analysis of prevailing conditions. The two approved processing firms of the EMPC – EMPC Asmara branch and ERI-Fish Massawa branch have their own quality system manuals which are documented in accordance with the Eritrean Fishery Products Regulations Legal Notice No: 40/1998. The safety issue, which is a pre-requisite for assuring quality of the product, is also addressed by applying the HACCP plan.

This rapid increase of food quality and safety standards in developed nations can be stated as one of the major challenges of fish exporters in LDCs. Some of the major factors that

hinder the EMPC in complying to the EU requirements are; insufficient and inefficient process equipments, un-standardized processing plants, inefficient refrigeration machines and maintenance problems, lack of commitment to quality assurance, and a problem on the timely flow of important information from the EU inspectors to the CA.

Many firms in LDCs find it difficult to overcome their problems and meet the requirements of their customers in developed nations easily on their own. In this case, it is wise to apply the networking concept. The inter-organizational cooperation is a useful concept that enables the firms to obtain the required resources from external partners, gather the necessary information about their markets, customers etc., so as to increase their compliance level accordingly.

The concept of the network theory implies cooperative efforts among persons, business firms, government bodies, other organizations, and other entities that are interconnected through activities and resources. The three actors, that is the EMPC, European Union Inspectors and Fish Inspection and Quality Control Division, have a significant contribution to the quality of fish exported from Eritrea. The interdependence of the objectives of these three actors opens a room for cooperation. This means that the successful accomplishment of one actor's goal is dependent upon its cooperation with the other two. Furthermore, the formation of networking among these actors creates adaptations and knowledge of the parties, which means mutual orientation. Through mutual orientation, the actors can develop a common language regarding safety and quality of fish. A most important aspect of the mutual orientation is mutual knowledge of each other in terms of their resources, strategies, needs and capabilities.

## **5.2 RECOMMENDATIONS**

The major emphasis of this study is to identify the factors that determine the quality of fish in global fish markets and especially in Europe, which is the most attractive sole market for Eritrean fishery products. In addition, as the EMPC is situated in one of the LDCs, the use of a cooperative strategy or networking model is also examined in its ability to determine the company's success in the quality fish exporting business.

Accordingly, the study suggests the following recommendations, which may be implemented at policy level, industry level and firm level.

### **5.2.1 Policy Level Recommendations**

- The government has a Fishery Regulations legislation, which is documented in accordance to the EEC Directive 91/493. This legislation should be maintained and also updated in accordance to the EU legislation to achieve and maintain equivalence. Generally speaking, a green light to EU markets means a secured market opportunity in other markets of developed nations like USA and Japan. This means, once the country has got its export certification as a list I exporter to the EU markets, there will be open market opportunities in other developed countries. Therefore, the government should focus on this sole large market and exert an extra effort to gradually come up with a maximum compliance level.
- Although the current regulations provide the fish processors with a number of useful indications, details on how the regulatory systems can be implemented, operated, maintained and improved in the plants are very few. In the study, a lack of adequate expertise of the HACCP concepts and applications was observed in the processing firms. Therefore, the MoF should cooperate with the European Commission to train individuals from the ministry on how the regulatory systems could be successfully implemented and improved to allow the processing firms develop their skills on the practical application of the regulations.
- The adoption of HACCP is spreading around the world. It has become a mandatory in the EU and the USA since 1997. Companies that have implemented the system have performed better than the others. Thus, upgrading the Eritrean fisheries companies to meet the internationally accepted procedures is a challenge to both the fish business managers and the government. However, since the need to promote seafood exports has been a goal of national strategies to increase national income sources, the government should support the processing firms

especially in solving their stated current constraints like lack of important resources and facilities for their activities and thus improving their compliance levels.

- The ministry of fishery in general and the exporters in particular should adopt a proactive attitude regarding fish quality and safety issues in global markets. There are many reasons for developing this attitude. The most important one is, in Eritrea the fishery sector is already identified among the fastest potentially growing sectors of the national economy. This means, the increase of fish production and its exports enhances foreign exchange earnings and creation of employment opportunities. Therefore, developing a proactive and positive attitude toward the regulations is one way of achieving the long-term objectives of the ministry. In other words, meeting the regulations means market opportunities. The second reason is that, it needs to be clear that many fish businesses that were applying the fishery regulations like HACCP on a voluntary basis before the introduction of these regulations are making profits out of the application of the regulatory systems.

### **5.2.2 Industry level recommendations**

- Quality and safety issues are one of the key success factors in global food business. However, one of the major obstacles in the EMPC is a lack of commitment to quality assurance measures. This was highlighted in the study by the higher compliance level to the regulations observed during the inspection periods, but not afterwards. Thus, the study recommends a need to develop a “Culture of Fish Quality and Safety” in the industry as a whole. Developing this culture is essential in that it ensures an equal understanding, and awareness of quality and safety issues among the employees of the industry and above all willingness to participate in quality and safety assurance procedures and therefore a sustained production of quality and safe products.

### 5.2.3 Firm Level recommendations

- The EMPC faces some difficulties that may hinder its competitiveness in the global fish markets. Although it is difficult to solve all of the stated problems of the company through the design of a cooperative strategy among the three actors, the use of networking is identified as a decisive strategy that provides a supportive environment for all the actors and provides them with the resources that are essential for their competitiveness and survival in the market.
- In fish business the trend is toward greater interdependence among actors in the network. The ability of the EMPC to produce to specification will increase and its ability to measure product characteristics will also be enhanced using a cooperative strategy with the relevant actors. Thus, the costs of producing its products demanded by consumers will be lower in a more closely coordinated system. Following a co-operative strategy, the market position and financial performance of the EMPC depends upon management rather than ownership of assets. This means that the management body of the company needs to focus not only to internal management which refers to the firms operations and strategic management skills, but also external in the form of successful negotiation and linkages with relevant actors in the network.
- As it is discussed in the previous chapters of the study, one of the major objectives of networking is to gather information required for the effective and efficient way of performing activities of the actors. The major source of information in terms of recent EU requirements, or quality expertise and other support like training for the EMPC is the FIQCD. The actors of a network are not limited to individuals and organizations that directly involved in a specific functional activity but also include organizations or individuals providing all sorts of support that are related indirectly as well as to the main functional interest of the focal firm. Therefore, the study recommends that, the information sharing between the FIQCD and the EMPC should be developed towards a communication network. The



communication network is the collection of organizations and individuals with whom the focal firm has non-trading relationship or not commercial links. This helps to increase the flexibility, efficiency and effectiveness of the flow of information resources and also other support services between the two actors. Through the formation of communication network with FIQCD, the company can access the recent and detailed information regarding fish quality, changes in the global fishery regulations, which countries are list I exporters and which ones are banned from exporting and why, etc. in a very effective and efficient way than is accessed without it. In addition to this, a continuous flow of information between these two actors, is crucial not only for the holding company in that it helps to improve or update the quality awareness of its staff members but also it enables the division to have a clear understanding of the company's status in terms of its ability to meet the requirements and its deficiency. The training needs of the EMPC can only be properly identified if there is an open flow of information between the company and the division, that is a permanent two-way communication between the two actors.

- Instead of just waiting for the division members to control the company on its compliance to the regulations, the company employees should endeavor to extend the company's compliance level through an open discussions on relevant issues like training needs with the division members. As a result, the FIQCD can organize the programs to train the company employees based on the deficiencies and training needs of the employees that are identified through the informal contacts.
- The network formation between the two parties can be realized through increasing a constant contacts with the division members in terms of occasional meetings and informal discussions. The FIQCD should be viewed by the company employees not only as a regulatory body, but also as an assisting agent or partner, which is vital for the company's long term goal achievement, for example becoming a list I

exporter to the EU. This builds up the company employees' willingness to develop an open communication with the FIQCD. In other words, the study strongly recommends informal communication through the networking model by which the company can develop an informal flow of information between the two actors. This helps the processing firms to increase their level of awareness of quality determinants, quality requirements, etc. and leads to an equivalence of quality issues understanding between the two actors.

- Moreover, the networking concept is also supportive for the relations between the FIQCD and the FVO office. This means, their relations need to be strengthened to a cooperative level. The development of cooperative relations provides the division with essential resources such the required business information, technical advices, and physical resources.
- The development of social relationships can be a good prerequisite for strengthening the business-oriented relationship between the FIQCD and the FVO office. Through these relationship, the actors in the network exchange information and other resources that are useful for their activities, and these relationship are not just only social exchange processes, but also economic processes. The information needed for the successful achievement of the division's goals can be accessed competently and successfully through developing social network between the division management body and the FVO office.
- The management body can use different types of activities in order to develop social networks such as attending meetings organized by the relevant actors. Through participating in these meetings the management body can get a number of opportunities for communication and meeting the resource actors. The management can also gather information on markets, technology and comments on its over all performance.

- High quality and safety are fundamental to achieving the over all company goals. Thus, it must be the responsibility of all the staff in their various roles to create a culture of quality within the company. The Standards, guidelines or protocols should exist only to indicate what the requirements of quality and safety demand. In order to do this, there are various practical actions the management should take. The management body should begin to work with others in the working ground of the company to develop their own expression of values along with policies and procedures that are consistent with them. These can be implemented through, implementation of team works, the development of open door policies for communication, and regular company meetings to inform every one of what is going on related to quality and other important issues.

Some important points that may help in developing the culture of quality include:

- (1) Elimination of most strict rules concerning time clocks, elimination of rules that favour the managers and not the other workers like assigned parking places. The exclusion of the mentality behind superior-subordinate relationships helps employees to more freely express their ideas and feelings. It also makes it easy to develop a sense of cooperation that comes when employees feel like a colleague and not subordinates. This helps the management to develop not compliance to the stated company rules but commitment to the company, which comes with the trust shown when they minimize rules.
- (2) Members of a company should have full access to important information based on which they can take decisions. This is because; limited information may lead to more speculative decisions by the employees and thus more likely to introduce additional uncertainty into the company and its processes.
- (3) Moreover, training in communication, teamwork, and ongoing skill development are also vital in development of Culture of Quality, in which the management body should be a keen member of the class, as well as a formal and informal teacher. In this case the management body's commitment is most important. Since they are the role models in the company, they should show a consistent and firm commitment to the values they come up with in words and actions.
- (4) Finally, symbolic and not material recognition programs for people and teams that support the

new culture values like open communication or process improvements should also be introduced.

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## **APPENDIX 1**

### **ORGANOLEPTIC CRITERIA -SENSORY QUALITY ASSESSMENT OF FISH**

### Organoleptic Criteria (Sensory Quality assessment of Fish)

PARAMETERS	CHARACTERSTICS	GRADING/SCORE
<b>General Appearance</b>	<b>1. Skin</b>	0.Bright/shining
		1.Bright/not shining
		2.Discolored
		3.Dull Pigmentation
	<b>2. Blood spot on gill cover</b>	0.None (0%)
		1.Small (0-3%)
		2.Big (30-50%)
		3.Very Big (50-100%)
	<b>3. Stiffness (Flesh)</b>	1. Elastic
		2.Firm
		3. Soft
	<b>4. Belly</b>	0. Firm
		1. Soft
		2. Belly Burst
	<b>5. Smell/Odor</b>	0. Fresh sea weedy/ metallic
		1. Natural Fishy
		2. Musty/sour/stale
		3.Spoil/racid
	<b>6. Slime</b>	0.Translucent or Water White
		1.Milky
		2.Yellow
		3.Yellow Brown
	<b>7. Clarity</b>	0. Translucent Cornea
		1.Opalescent Cornea
<b>Eyes</b>	<b>8. Shape of Pupil</b>	0. Convex (normal)
		1.Plain
		2.Sunken
<b>Gills</b>	<b>9. Color</b>	0. Bright Red
		1.Dull
		2. Faded/ discolored
	<b>10. Smell/odor</b>	0. Fresh/ Sea weedy
		1.Fishy

		2. Stale
		3. Spoil
	<b>11.</b> Mucus	0. Absent
		1. Present/ Moderate
		2. Excessive
	<b>12.</b> Open Surface (Appearance)	0.Translucent
		1. Grey
		2. Yellow Brown
	<b>13.</b> Color of Blood	0. Red
		1. Dark Red
		2. Brown

**APPENDIX 2**  
**GENERAL BACKGROUND OF ERITREA**

**GENERAL BACKGROUNND OF ERITREA**

**1. BASIC FACTS**

❖ **Eritrean Flag**



❖ <b>Official name</b>	State of Eritrea
❖ <b>Capital</b>	Asmara
❖ <b>Area</b>	121,144 sq km 46,774 sq mi

**2. PEOPLE**

❖ <b>Population</b>	4,298,269 (2001 estimate)
❖ <b>Population growth rate</b>	3.84 per cent (2001 estimate)
❖ <b>Population density</b>	35 persons per sq km estimate 92 persons per sq mi estimate
❖ <b>Urbanization</b>	
<b>Percent urban</b>	18 per cent (1999 estimate)
<b>Percent rural</b>	82 per cent (1999 estimate)
❖ <b>Life expectancy</b>	
<b>Total</b>	56.2 years (2001 estimate)
<b>Female</b>	58.7 years (2001 estimate)



<b>Male</b>	53.7 years (2001 estimate)
❖ <b>Infant mortality rate</b>	75 deaths per 1,000 live births (2001 estimate)
❖ <b>Literacy rate</b>	
<b>Total</b>	71.1 per cent (2001 estimate)
<b>Female</b>	61.5 per cent (2001 estimate)
<b>Male</b>	80.8 per cent (2001 estimate)
❖ <b>Ethnic divisions</b>	
<b>Tigrinya</b>	50 per cent
<b>Tigre and Kunama</b>	40 per cent
<b>Afar</b>	4 per cent
<b>Saho</b>	3 per cent
<b>Bilen, Hedareb, Nara, Rashaida</b>	3 per cent
❖ <b>Languages</b>	
	Tigre, Afar, Bilen, Hedareb, Kunama, Nara, Rashaida, Saho, Tigrinya, English, Arabic
❖ <b>Religions</b>	
	Muslim, Coptic Christian, Roman Catholic, Protestant, indigenous beliefs (animism)

### 3. GOVERNMENT

❖ <b>Type of government</b>	Transitional government
❖ <b>Independence</b>	27 May 1993 (from Ethiopia; formerly the Eritrea Autonomous Region)
❖ <b>Constitution</b>	23 May 1997
❖ <b>Voting rights</b>	Universal at age 18 ( Source: Eritrean Constitution)

### 4. ECONOMY

❖ <b>Gross domestic product (GDP):</b>	(US\$) 645 million (1999)
❖ <b>GDP per capita:</b>	(US\$) 160 (1999)
❖ <b>GDP by economic sector:</b>	
	GDP, agriculture 17.1 per cent (1999)

GDP, industry 29.2 per cent (1999)

GDP, services 53.7 per cent (1999)

❖ **National budget (US\$)**

**Total revenue** Not available

**Total expenditure** Not available

❖ **Monetary unit**

1 nafka, consisting of 100 cents

❖ **Exports**

Livestock, sorghum, textiles, tobacco products, chemicals, petroleum and petroleum products

❖ **Imports**

Heavy machinery, transport equipment, foodstuffs, chemicals, petroleum, petroleum products

❖ **Major trading partners for exports**

Ethiopia, Sudan, Saudi Arabia, United States, Italy, Germany, Yemen

❖ **Major trading partners for imports**

Ethiopia, Saudi Arabia, Italy, United Arab Emirates, Germany, United States, United Kingdom

❖ **Industries**

Food processing, beverages, clothing, textiles

❖ **Agriculture**

Sorghum, livestock (including goats), fish, lentils, vegetables, maize, cotton, tobacco, coffee, sisal

❖ **Natural resources**

Gold, potash, zinc, copper, salt, fish; potential petroleum and natural gas deposits beneath the Red Sea

**SOURCES:**

**1. Basic Facts and People sections**

Area data are from the individual country statistical bureaus. Population, population growth rate, infant mortality, and life expectancy data are from the United States Census Bureau, International Programs Center; International database, 2001; ([www.census.gov](http://www.census.gov)). Population density data are from the individual country statistical bureaus, and the United States Census Bureau, International Programs Center; International database, 2001; ([www.census.gov](http://www.census.gov)). Largest cities population data and administrative divisions data are from the individual country statistical bureaus. Literacy rate data are from the United Nations Educational, Scientific and Cultural Organization (UNESCO) database, 2001; ([www.unesco.org](http://www.unesco.org)). Urban and rural population data are from the Food and Agriculture Organization (FAO) of the United Nations (UN), FAOSTAT database, 2001; ([www.fao.org](http://www.fao.org)). Ethnic divisions and religion data are largely from the latest Central Intelligence Agency (CIA) World Factbook, as well as various country censuses and reports. Language data are largely from the Ethnologue, Languages of the World, SIL International; ([www.sil.org](http://www.sil.org)).

**2. Government section**

Government, independence, constitution, and voting rights data are largely from various government Web sites, the latest Europa World Yearbook, and the latest Central Intelligence Agency (CIA) World Factbook.

**3. Economy section**

Gross domestic product (GDP), GDP per capita, GDP by economic sector, and national budget data are from the World Bank database, 2001; ([www.worldbank.org](http://www.worldbank.org)). Monetary unit, exports and imports, natural resources, agriculture, and industries information is from the latest Europa World Yearbook, and various International Monetary Fund (IMF) publications.

Note: Due to rounding, totals may not add up to 100 per cent.

Source: Microsoft® Encarta® Encyclopedia 2002.

**APPENDIX 3**  
**CONDITIONS AND TERMS OF SUPPLIER QUALITY ASSURANCE AGREEMENT**  
**(SQAA)**

## Conditions and terms of Supplier Quality Assurance Agreement (SQAA)

This SQAA is entered and signed by the Buyer and Supplier subject to the terms and conditions stipulated hereunder.

### 1. Quality standards

- 1.1. Every raw fish material shall reach the quality standard laid down in the raw material specification agreed between the Buyer and the Supplier(Refer to 3.0 same page below)
- 1.2. Upon arrival at the Buyers' landing site the core temperature of the raw material shan't exceed 2°C.
- 1.3. Any rejected raw material shall be disposed off and taken care of by the Supplier.
- 1.4. Where necessary, for raw materials requiring further reselection to meet the said specifications the entailed costs shall be settled by the Supplier.
- 1.5. Raw material handling and transportation shall be in accordance with the temperature regimes laid down in the same specifications below.
- 1.6. The time between catching and chilling shan't exceed a maximum of three hours.
- 1.7. Fishing days for pelagic/prawns and demersal fish shan't exceed a 2 and 5 days respectively.

### 2. Hygiene and catch safety

- 2.1. Stowage shall be in a well-drained, shallow layers of fish and ice; deep layers cause loss of weight and some damage to the fish. The fish shan't be stowed tightly in which case good chilling is impossible. Small fish shall be placed in ice on top of large ones in order to alleviate physical damage.
- 2.2. All postharvest operations shall be carried out with due regard to the risk of contamination and toxin formation, and deterioration of the product.
- 2.3. All surfaces in contact with the catch shall be maintained in a high standard of hygiene. The means of transport should provide appropriate physical and thermal protection to the catch.
- 2.4. The fishermen shall maintain a high standard of personal hygiene. Any staff appearing to have an illness, open lesion, or any other source of microbiological contamination must not handle the catch and catch-contact surfaces.
- 2.5. The catch should be boxed/stowed in clean containers as approved by the Buyer.
- 2.6. Documents are provided to the Buyer to enable traceability of the raw material.

### 3. Raw material specifications:

#### 3.1 Freshness grading of fish

<i>Parts of fish inspected</i>	<i>Grade one</i>	<i>Grade two</i>	<i>Grade three</i>	<i>UHC*</i>
Eye #	Convex; black pupil;	Plane; slightly opaque	Slightly concave;	Completely

	translucent cornea	pupil; slightly opalescent cornea	grey pupil; opaque cornea	sunken; grey pupil opaque; discoloured cornea
Eye ##	Bulging with protruding lens; shiny jet black/blue with metallic brown iris; transparent eye cap	Convex; slight clouding of lens and wrinkling of iris; clouding of eye cap	Plane; cloudy lens with black specks in iris; pale golden eye cap	Sunken eye covered with yellow slime
Skin #	Bright; shining; iridescent or opalescent; no bleaching	Waxy; slight loss of bloom; very slight bleaching	Dull; some bleaching	Dull; gritty; marked bleaching and shrinkage
Skin ##	Strong blue and turquoise colours; iridescence over all body; well defined lateral line; reticulation on upper surface; clear distinction b/n upper and lower surfaces	Loss of bright colours with fading of reticulations; pale golden tinge on lower surface	Golden tinge over all body; skin wrinkles on flexing; washed out appearance of colours; patchy iridescence	Yellow slime; little distinction between upper and lower surfaces
Outer slime #	Transparent; water white	milky	Yellowish-grey; some clotting	Yellow-brown; very clotted and thick
Gills #	Dark red or bright red; mucus translucent	Red or pink; mucus slightly opaque;	Brown/grey and bleached; mucus opaque and thick	Brown or bleached; mucus yellowish grey and

				clotted
Gill appearance ##	Uniformly dark red/purple with free blood and water clear slime	Loss of colour with red/brown slime; pale margins to gills	Further loss of colour with patchy bleaching; increase in red/brown slime	Bleached; thick yellow slime
Flesh #	Firm and elastic; smooth	Less elastic	Slightly soft(flaccid); less elastic; waxy and dull surface	Soft, wrinkled surface; floppy
Flesh ##	Stiff	Firm	Some softening	Limp and floppy

Keys: # White bony fish      ## Bluefish (tuna, mackerel..)

\* Unfit for Human Consumption

### 3.2. Freshness grades of prawns

<i>Parameter</i>	<i>Extra</i>	<i>A</i>
Minimum requirement	Flesh must be free from any foreign odour; no foreign matter, mucus and/or sand; intact cephalothorax and hepatopancreas; no melanosis; no red legs	Same as for Extra except red legs and opened hepatopancreas
Shell	Moist and shiny	Moist and shiny
Smell	Fresh seaweed; slightly sweet smell	No smell of seaweed; acidulous

### 3.3. Microbiological specification

In Conformance with Article 20 of the Fishery Product Regulations Legal Notice No. 40/1998,

The raw material's microbiological criteria shouldn't exceed the following limits:

<i>Organism indicating poor hygiene</i>	<i>m*</i>	<i>c/n*</i>
Total plate count/aerobic microorganisms	10 <sup>5</sup> cfu/g	2/5
Faecal coloforms	10 cfu/g	3/5
Escherichia coli	10 cfu/g	3/5
Staphylococcus aureus at 46°C	100 cfu/g	3/5
Anaerobic sulfite reductors at 46°C	10 cfu/g	3/5
Salmonella, Shigella and V. cholera	Absent in 25 g	

\*m is the criteria fixed as per Annex No.: 2 of Fishery Product Regulations Legal Notice No. 40/1998  
c is the number of units of the sampling giving value comprised between 3m and 10m.  
n is the number of units of the sampling.

3.4. Chemical specifications

3.3.1. The concentrations of histamine in the fish families of Scombridae, Clupeidae, Engraulidae, and Coryphaenidae shouldn't exceed 100 ppm.

3.3.2. The mean total mercury content of the edible parts of the raw fishery products must not exceed 0.5 mg/kg of fresh weight. For such species as sharks (all species), tuna (Thunnus spp.), little tuna (Euthynnus spp.), bonito (Sarda spp.), swordfish (Xiphias gladius), sailfish (Istiophorus platypterus), marlin (Makaira spp.) and rays (Raja spp.), the total mercury content is 1 ppm of fresh weight.

Having read the above conditions and terms of the SQAA, I hereby, willfully, commit myself to comply to the above agreement.

For ERIFISH Pvt. Ltd. Co.

For the Supplier

\_\_\_\_\_

\_\_\_\_\_

Witness: Inspector's Name, Competent Authority\_\_\_\_\_

Sign.:\_\_\_\_\_



**APPENDIX 4**  
**THE SEVEN KEY PRINCIPLES OF THE HACCP SYSTEM**

## **The Seven Key Principles Of HACCP System**

1. The identification and analysis of hazards in the vertical chain.

This principle applies to the detection of hazards in the area of application, or the sphere of influence of the business. If an operator can exert an influence over raw materials then he should do so along the vertical chain. If he buys in his ingredients the purchaser should ensure that hazard analysis has been carried out. A systematic assessment of the ingredients and constituents should be carried out. This analysis should include physical and chemical hazards as well as biological. The hazard analysis is based on product descriptions containing information on microbiological, chemical and physical parameters and variables. Flowcharts of the entire process are used for hazard analysis.

2. The identification of critical control points, which must be monitored to avoid the occurrence of hazards.

A control point becomes critical if contamination might increase to an unacceptable level and which might not be eliminated later in the production process (such as by high-temperature cooking).

3. Laying down values for critical limits, which must be observed to control the hazards at each Critical Control Point (CCP- it is any point in the chain of food production on where the loss of control would result to unacceptable food safety risk).
4. The introduction of a surveillance system for the regular monitoring or observation of the critical control points.

The monitoring system constitutes a plan under which the critical control points (CCPs) and corresponding limit and /or guide values are examined and/ or observed. The monitoring is carried out using microbiological, analytical and / or sensory methods. Microbiological tests are rarely suitable for monitoring a CCP as they take a long time to complete. Analytical and sensory procedures are preferable and the values measured with them can be used as indicators, yielding information on the microbiological status. Continuous monitoring is always preferable to random sample testing but is not always possible. Where random sample testing has to be used the test parameters and conditions must be planned in such a way that the values measured are statistically significant. In principle, however, even in a statistical process control scheme, none of the values measured should be above the critical limit values. It is essential to use suitable measuring instruments which insure accuracy of the results. Adequate documentation is also an essential component of the monitoring procedure.

5. Laying down corrective measures which should be taken whenever an inadmissible deviation is recorded at a critical control point.

The measures in question should limit any hazard which has arisen and should ensure safe management (labeling and use) of the products. Corrective measures should be drawn up for each CCP as the methods of labeling and use have to be specifically adapted for every hazard. The corrective measures must also deal with the question of how the process can be brought under control again. The appropriate measures for this purpose should be documented.

6. Laying down procedures for verification of the correct operation of the HACCP system (functional control system).
7. Setting up a system for the effective management of the documentation relating to the HACCP plan (data collection, organization of documentation).

The records should contain information on; ingredients, intermediate and final products, processing steps and process parameters, packaging, storage and distribution, corrective measures, deviations in the process or product, and verification. The document has to be available for the appropriate authorities. (Adapted from Lebensmittelqualität Sachsen, LQS, 1996).

**APPENDIX 5**  
**CLEANING AND DISINFECTING SCHEDULE OF ERI-FISH Pvt. Ltd. Co.**

## CLEANING AND DISINFECTING SCHEDULE OF ERI-FISH PVT. LTD. CO.

❖ **KEY:** CAYG = clean as you go; AES = after every shift; AED = after every despatch; AESp = after every shipment; and AEF = after every freezing; AAYG = Arrange as you go

### 1. Reception room

Items	Frequency	Revision No.	Comments
UV Insect killer	Weekly	3	
Evaporator	Tri-monthly	3	
Light bulb	Monthly	3	
Weighing scales	AES	3	
Hand washing sink	CAYG, AES	3	
Walls (and Ceiling)	AES, weekly	3	
Floor	AES, weekly	3	
Doors	AES, Weekly	3	

### 2. Fish-box store

Items	Frequency	Revision No.	Comments
Light bulb	Monthly	3	
Walls (and Ceiling)	Weekly	3	
Doors	AES, Weekly	3	
Floors	CAYG, weekly	3	

### 3. Filleting room

Items	Frequency	Revision No.	Comments
Fire extinguisher	Monthly	3	
UV Insect killer	Weekly	3	
Evaporators	Tri-monthly	3	
Light bulb	Monthly	3	
Weighing scales	AES	3	
Water hoses	CAYG, weekly	3	
Stainless steel filleting table	CAYG, AES	3	
Hand washing sink	CAYG, AES	3	
Pallets	CAYG, AES	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

### 4. Washing room

Items	Frequency	Revision No.	Comments
UV Insect killer	Weekly	3	
Light bulb	Monthly	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

### 5. Chill room

Items	Frequency	Revision No.	Comments
Evaporators	Tri-monthly	3	
Light bulb	Monthly	3	
Cold water tank	Tri-monthly	3	
Water pump	Monthly	3	

Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

#### 6. Offal room

Items	Frequency	Revision No.	Comments
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

#### 7. Blast freezer

Items	Frequency	Revision No.	Comments
Evaporators	Tri-monthly	3	
Light bulb	Monthly	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

#### 8. Cold store and anteroom

Items	Frequency	Revision No.	Comments
Evaporators	Tri-monthly	3	
Light bulb	Monthly	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

#### 9. Packing room

Items	Frequency	Revision No.	Comments
Fire extinguisher	Monthly	3	
UV Insect killer	Weekly	3	
Evaporators	Tri-monthly	3	
Light bulb	Monthly	3	
Weighing scales	AES	3	
Hand washing sink	CAYG, AES	3	
Pallets	CAYG, AES	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

#### 10. Changing rooms and toilets

Items	Frequency	Revision No.	Comments
City clothes-and uniform Cabinet	AES	3	
Hanger for working boots	AES	3	
Cabinet for City shoes	AES	3	
ACs	Tri-monthly	3	
Light bulb	Monthly	3	
Hand washing sink	CAYG, AES	3	
Flush lavatories	AES	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

**11. Offices and Corridors**

Items	Frequency	Revision No.	Comments
ACs	Tri-monthly	3	
Light bulb	Monthly	3	
Office tables	CAYG	3	
Walls (and Ceiling)	AES, weekly	3	
Floors	AES, weekly	3	
Doors	AES, Weekly	3	

**12. Packing materials Containerized Store**

Items	Frequency	Revision No.	Comments
Containers	AAYG, Bi-monthly	3	

**13. Plant's Compound**

Items	Frequency	Revision No.	Comments
Outside-Processing-premises area	CAYG, Monthly	3	

**14. Washing room for uniforms**

Items	Frequency	Revision No.	Comments
Floor and windows	CAYG, Weekly	3	

Issued by QM: \_\_\_\_\_

Authorized by GM: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Competent Authority: \_\_\_\_\_

**APPENDIX 6**  
**HACCP PLAN OF THE EMPC PROCESSING PLANT**



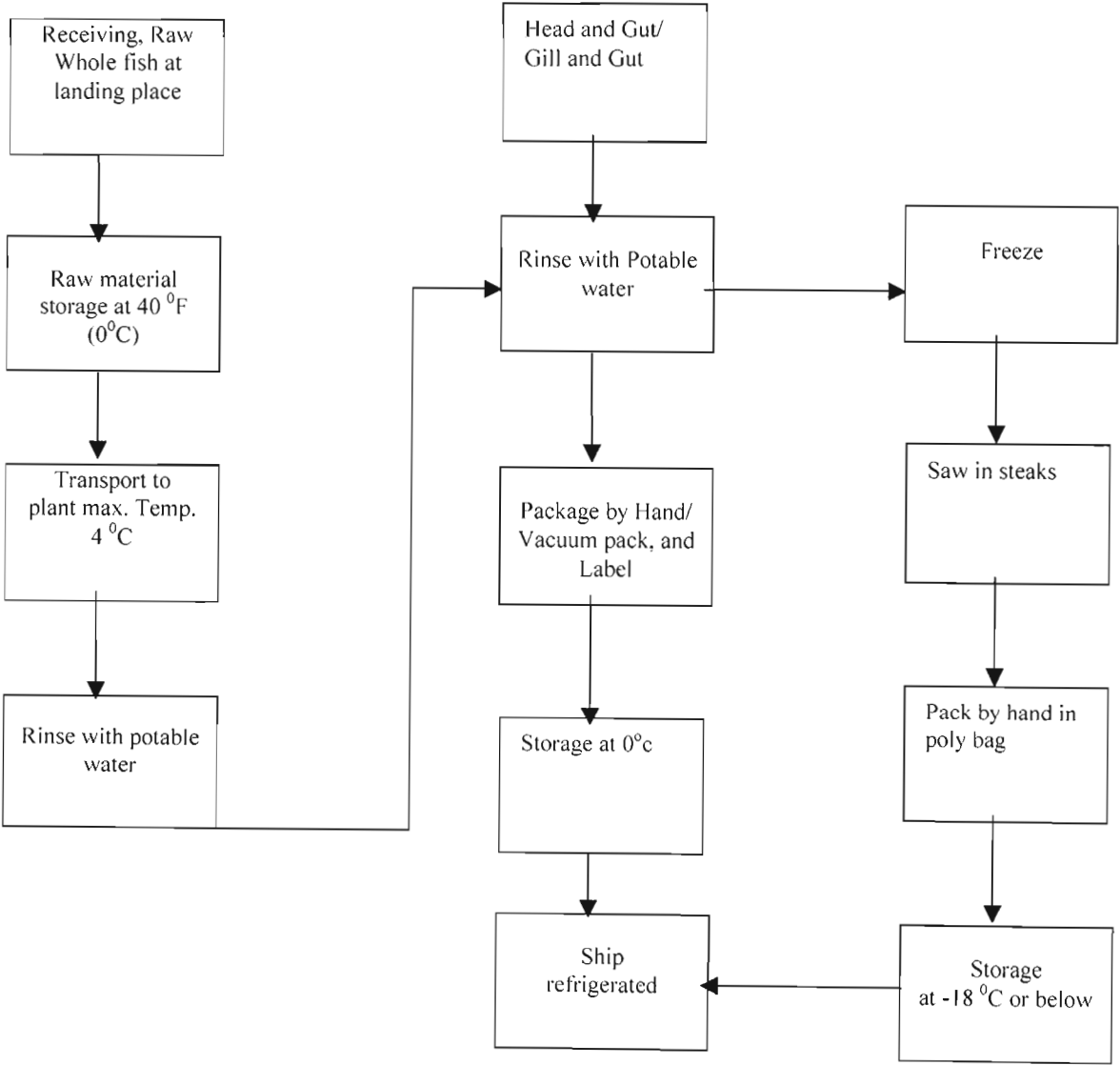
HACCP PLAN OF THE EMPC PROCESSING PLANT

❖ Fresh fish Whole/Gutted

1. Product Description

- ❖ Aquatic Product Raw Material: Lutjanus spp., Euthunnus affinis, Sphyaena jello, Panulirus spp, Epinephelus spp., Lethrinus spp., Scomberomorus commerson. (Snapper, Grouper, Emperor, Spanish mackerel, tuna, Barracuda, Spiny lobster)
- ❖ Raw material harvest Area: Massawa, Assab landing places Eritrea
- ❖ Raw material received: Directly from harvester
- ❖ Finished Product: Fish, whole, headed and gutted, gilled and gutted, fresh and frozen
- ❖ Food additives, ingredients, processing aids: None
- ❖ Shipping: Shipped in the firm's refrigerated trucks
- ❖ Intended use: Fully cooked before consumption
- ❖ Intended consumers: General public

2. Flow Diagram



### 3. Potential Hazards

- ❖ Potential species-related hazards: Parasites
- ❖ Potential process-related hazards: Chemical contamination:  
Food and colour additives

### 4. Hazard Analysis Worksheet

Following steps are evaluated:-

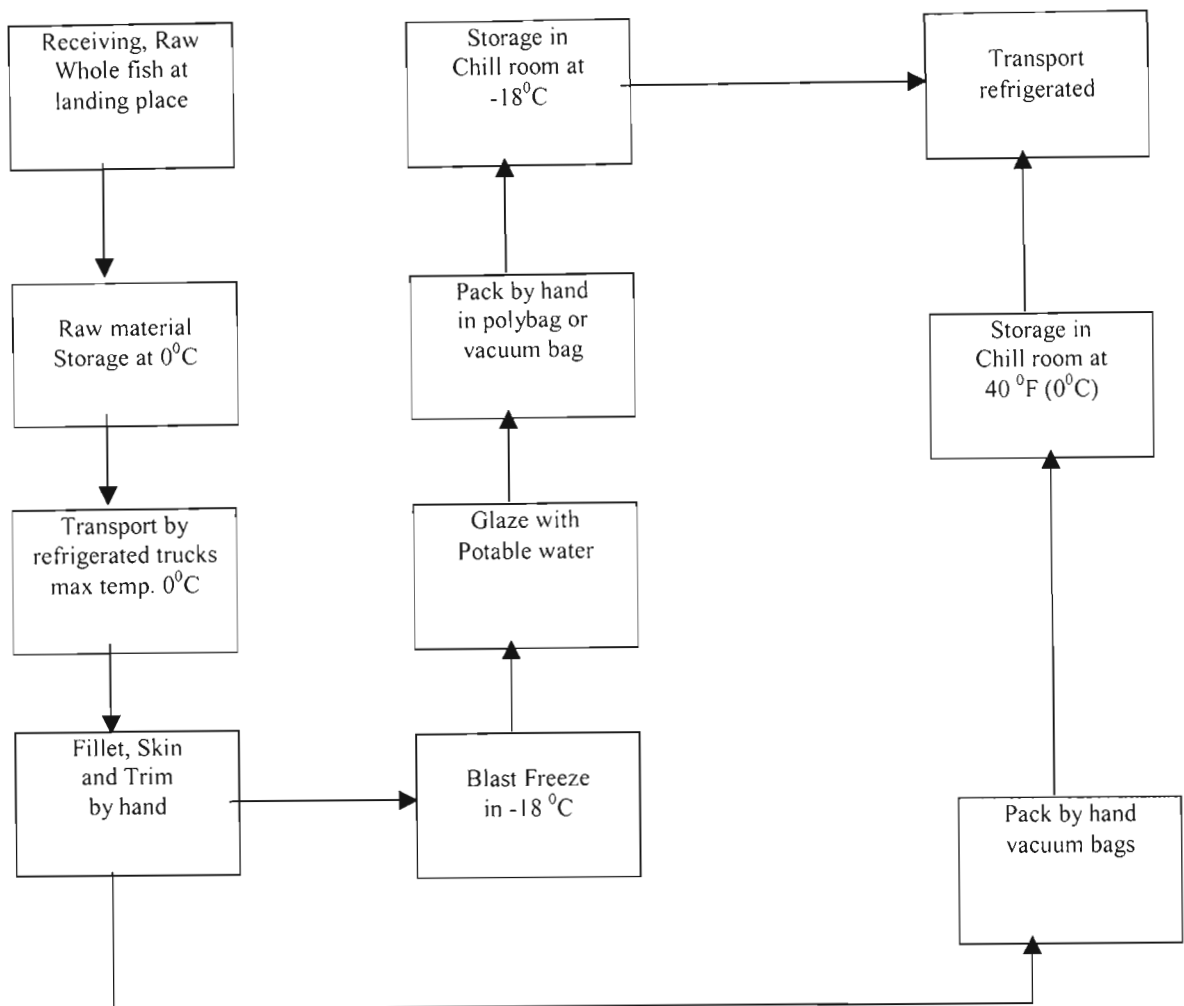
1. Ingredient/ Processing Step
  2. Potential Hazard Introduced or Controlled
  3. Is the Potential Hazard Significant (Reasonably Likely to Occur - Yes/No)
  4. Justification for Inclusion or Exclusion as a Significant Hazard (Consider the likelihood that the hazard would or would not be introduced, or intensified, or a hazard from a previous step can be controlled)
  5. Preventive Measure(s) for the significant Hazard from Column 3 (Existing plus additional, if needed)
  6. Critical Control Point (Yes/No)
- ❖ Receiving
    - BIOLOGICAL: Parasites are a possible risk, if the fish is fully cooked before consumption risk is not present
    - CHEMICAL: Chemical contamination is not reasonably likely to occur in the harvest area
    - PHYSICAL: None
  - ❖ Rinse
    - BIOLOGICAL: Pathogen growth due to untreated water, strict control on chlorinating water will eliminate risk.;
    - CHEMICAL: Chlorine Pollution, strict monitoring of 0.5-3.0 ppm concentration will eliminate risk
    - PHYSICAL: None
  - ❖ Material storage/ Process/ Freeze / Package / Finished product storage / Shipping
    - BIOLOGICAL: None
    - CHEMICAL: None
    - PHYSICAL: None

#### ❖ Fresh fish Fillets

#### 1. Product Description

- ❖ Raw material: Lutjanus spp., Euthunnus affinis, Sphyrna jello, Panulirus spp, Epinephelus spp., Lethrinus spp., Scomberomorus commerson. (Snapper, Grouper, Emperor, Spanish mackerel, Tuna, Barracuda, Spiny lobster))
- ❖ Raw material harvest Area: Massawa, Assab landing places Eritrea
- ❖ Raw material received: Directly from harvester
- ❖ Finished product: Fish, fillets, fresh and frozen
- ❖ Food additives, ingredients, Processing aids: None
- ❖ Packaging: Air-packaged, Vacuum packaged
- ❖ Storage and distribution: Stored and distributed frozen, in ice, or under refrigeration
- ❖ Intended use: Fully cooked before consumption
- ❖ Intended consumers: General public

## 2. Flow Diagram



### Products produced:

- ❖ Fresh, skinned fillets
- ❖ Frozen, skinned, shatter-packed fillets
- ❖ Frozen, skinned, IQF fillets
- ❖ Fresh, skin-on fillets
- ❖ Frozen, skin-on, shatter-packed fillets
- ❖ Frozen, skin-on, IQF fillets

### 3. Potential Hazards

- ❖ Potential species-related hazards: Parasites  
Chemical contamination
- ❖ Potential process-related hazards: Pathogen growth & toxin formation (other than Clostridium Botulinum) as a result of time/temperature abuse.  
Food and colour additives

### 4. Hazard Analysis Worksheet

Following steps are evaluated:

1. Ingredient/ Processing Step
2. Potential Hazard Introduced or Controlled
3. Is the Potential Hazard Significant (Reasonably Likely to Occur - Yes/No)
4. Justification for Inclusion or Exclusion as a Significant Hazard (Consider the likelihood that the hazard would or would not be introduced, or intensified, or a hazard from a previous step can be controlled)

5. Preventive Measure(s) for the significant Hazard from Column 3 (Existing plus additional, if needed)
6. Critical Control Point (Yes/No)

❖ Receiving

- BIOLOGICAL: Parasites, no risk as fish is intended to be fully cooked before consumption
- CHEMICAL: contamination is not reasonably likely to occur in the area
- PHYSICAL: None

❖ Raw material storage

- BIOLOGICAL: Pathogen growth, not a risk, Pathogen growth is not reasonably likely to occur due strict temperature control
- CHEMICAL: None
- PHYSICAL: None

❖ Rinse

- BIOLOGICAL: Pathogen growth due to untreated water, strict control on chlorinating water will eliminate risk.
- CHEMICAL: Chlorine pollution, strict monitoring of 0.5-3.0 ppm concentration will eliminate risk
- PHYSICAL: None

❖ Fillet

- BIOLOGICAL: None
- CHEMICAL: None
- PHYSICAL: None

❖ Skin

- BIOLOGICAL: None
- CHEMICAL: None
- PHYSICAL: Metal inclusion .Metal inclusion is not likely to occur.

❖ Trim/ Package/ Chill/Freeze / Glaze

- BIOLOGICAL: None
- CHEMICAL: None
- PHYSICAL: None

❖ Finished product storage

- BIOLOGICAL: Pathogen growth, however it growth is not likely to occur as strict temperature control is maintained.
- CHEMICAL: None
- PHYSICAL: None

## **APPENDIX 7**

### **HACCP SYSTEM OF ERI-FISH LTD. Co.**

## HACCP SYSTEM OF ERIFISH LTD.CO.

The seven basic principles of HACCP are implemented in 14 separate stages.

### Stage 1: Define the terms of reference/scope of the plan

Policy of ERIFISH Ltd.

The general policy is to cover only safety hazards in this HACCP plan. Quality is treated in the Quality in Action Manual. All hazard categories are considered. All the preparation steps between the reception of fish at our plant till it is loaded (stuffed) into the container for shipment are covered in this HACCP plan.

The products are fresh/IQF fish (whole gutted/fillets) and prawns (undeveined/ deveined, head-on/head-less) being prepared in our plant.

Temperature control and the maintenance of the cold chain during storage and distribution at the country of destination are necessary to maintain the shelf life of the product. Although our responsibility ends at the port of dispatch, the HACCP plan is extended to include the consumer.

### Stage 2: Selection and assembling of a team

Policy of ERIFISH Ltd about the team requirements:

Team selection is done by the Coordinator. The team includes personnel from quality control and safety assurance, production and maintenance. The HACCP team includes members who are directly involved with the plant's daily operations. The team consists of five members, although additional member(s) may be co-opted when necessary. The team has some initial training in HACCP. Adequate financial and human resources are available to the team. The team develops, verifies and implements the HACCP plan.

### Stage 3: Describe the product

Policy of ERIFISH Ltd :

**3.1. Raw product harvest area:** Eritrean Red Sea coast.

**3.2. Raw product Received:** directly from harvester.

**3.3. Type of product and production:** the finished products are fresh/individually quick frozen:

1. Whole gutted fish
2. Skin on and boneless fillets
3. Skinless and boneless fillets
4. Undeveined/deveined shell-on prawn tails
5. Head-on, shell-on prawns

**3.4. Physicochemical properties:**

Ph value of fish is between 6.6 and 6.8; water activity<sup>1</sup> is 0.985.

**3.5. Packaging:**

1. Frozen whole-gutted fish with sizes <5 kgs/piece and fillets are enclosed with a transparent plastic bags, and then packed in a 10-/20-kgs printed and double corrugated master cartons.
2. Products not fitting into the cartons are packed in polybags.
3. Prawn tails are first packed in a 1-kg plastic bag with ERIFISH loggo and then into a 10/20 kg same master carton.
4. Fresh products are packed in foam boxes within plastic bags.

**3.6. Labeling:**

1. Product type: Fillet (wholegut/ Headless/headon shell-on)prawn tails
2. Size or count: per kg(for wholegut)and per pound(for prawn tails)
3. Net weight
4. Production date
5. Lot number

**3.7 Method of distribution and storage:** the product is to be kept frozen/fresh-on-ice during distribution and storage. We record this information in the spaces provided on the Hazard Analysis Worksheet and the HACCP Plan Form.

**3.8 Exportation:** frozen and fresh products are exported by sea freight in reefer containers and airfreight respectively.

**3.9 Instructions for use:** fully cooked before consumption.

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<sup>1</sup>

An expression of the relative availability of water in a substance. Pure water has an water activity of 1.000. The water activity of a solution is one-hundredth its relative humidity.

**Stage 4: Identify the intended use of the product**

ERIFISH Ltd. identified the general public as the likely consumers of the product which shall be kept frozen/chilled. Before final consumption by the end user, the product shall be fully cooked.

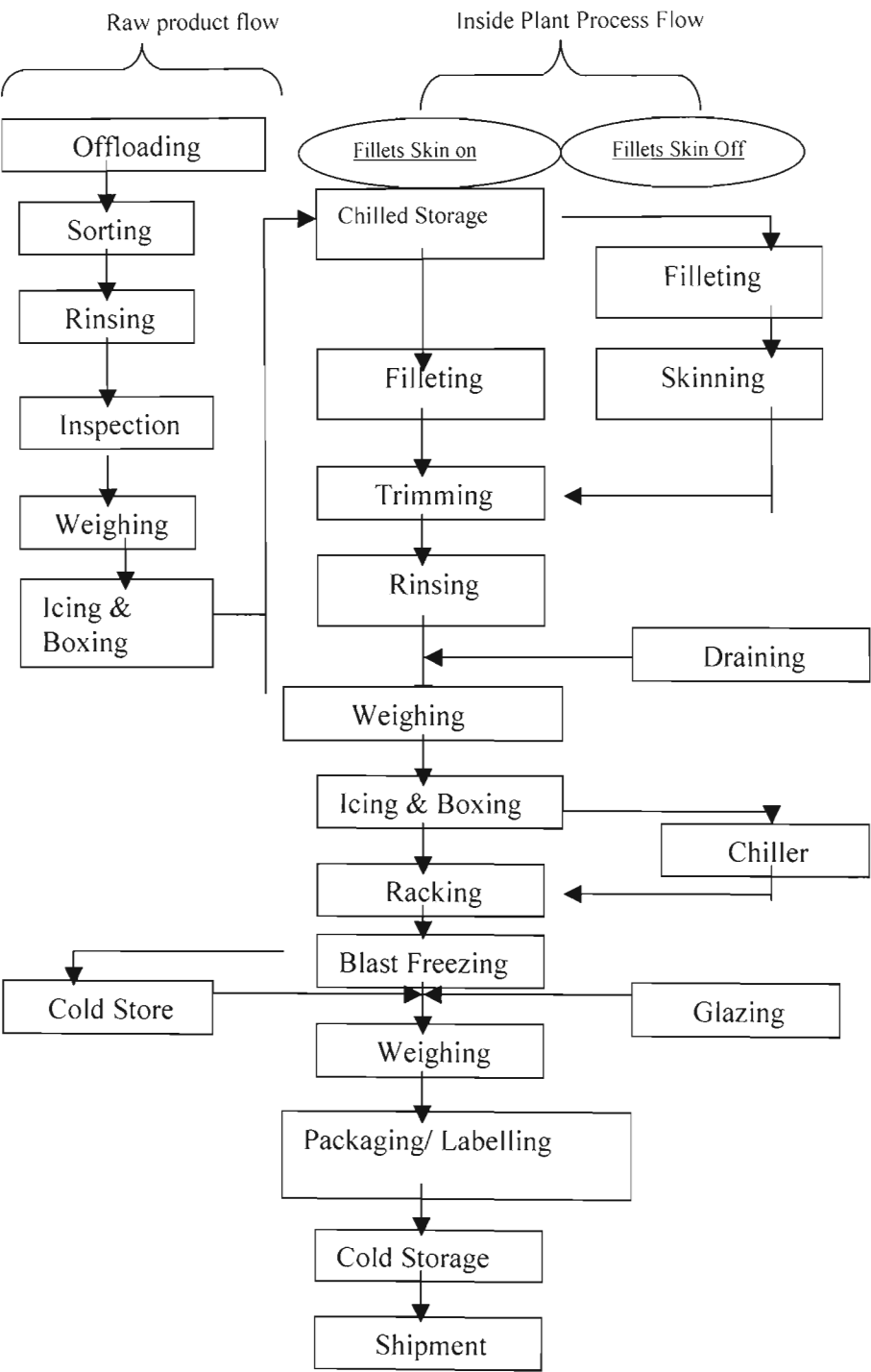
**Stage 5: Develop a flow diagram**

Policy of ERIFISH Ltd.:

The flow diagram shows, in simple block or symbol form, the steps required to prepare the product and store. This step provides an important visual tool for our team to complete the remaining steps of the HACCP plan. A clear, simple, but complete, description of the process is provided so that people unfamiliar with the process can quickly comprehend our preparation stages.

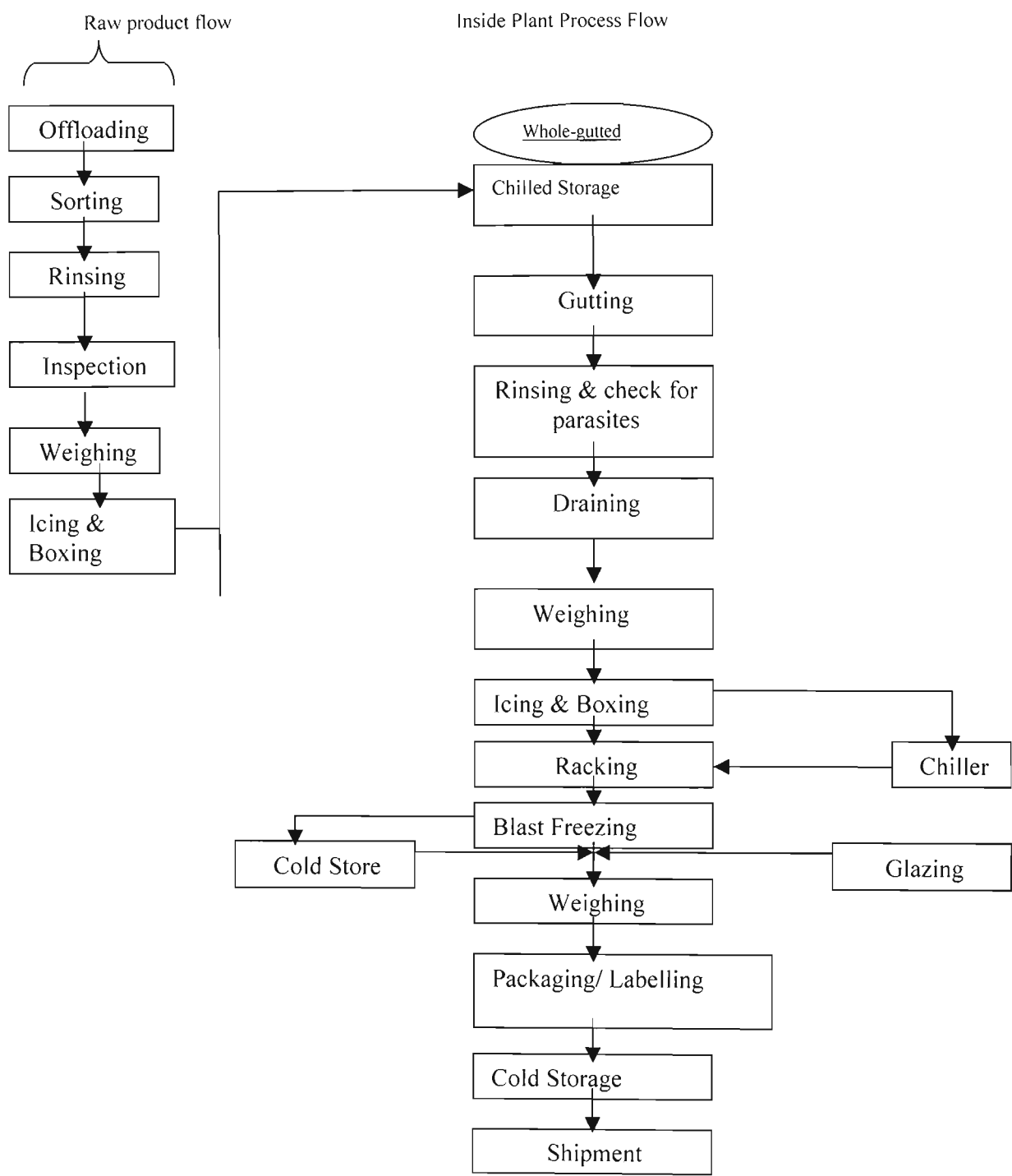
All the steps within the facility's control are incorporated, including receiving and storage steps for all raw materials. The Process Flow Diagram is used in our plant as the basis of the hazard analysis and therefore contains sufficient technical detail for the study to progress. It is carefully constructed by members of the HACCP team as an accurate representation of the process, and covers all stages from raw materials through to end product, as defined in the HACCP study terms of reference. Whichever style of presentation is chosen, our key point is to ensure that every single stage is covered and is in a correct order.

5.1. ERIFISH product flow chart for IQF fillet

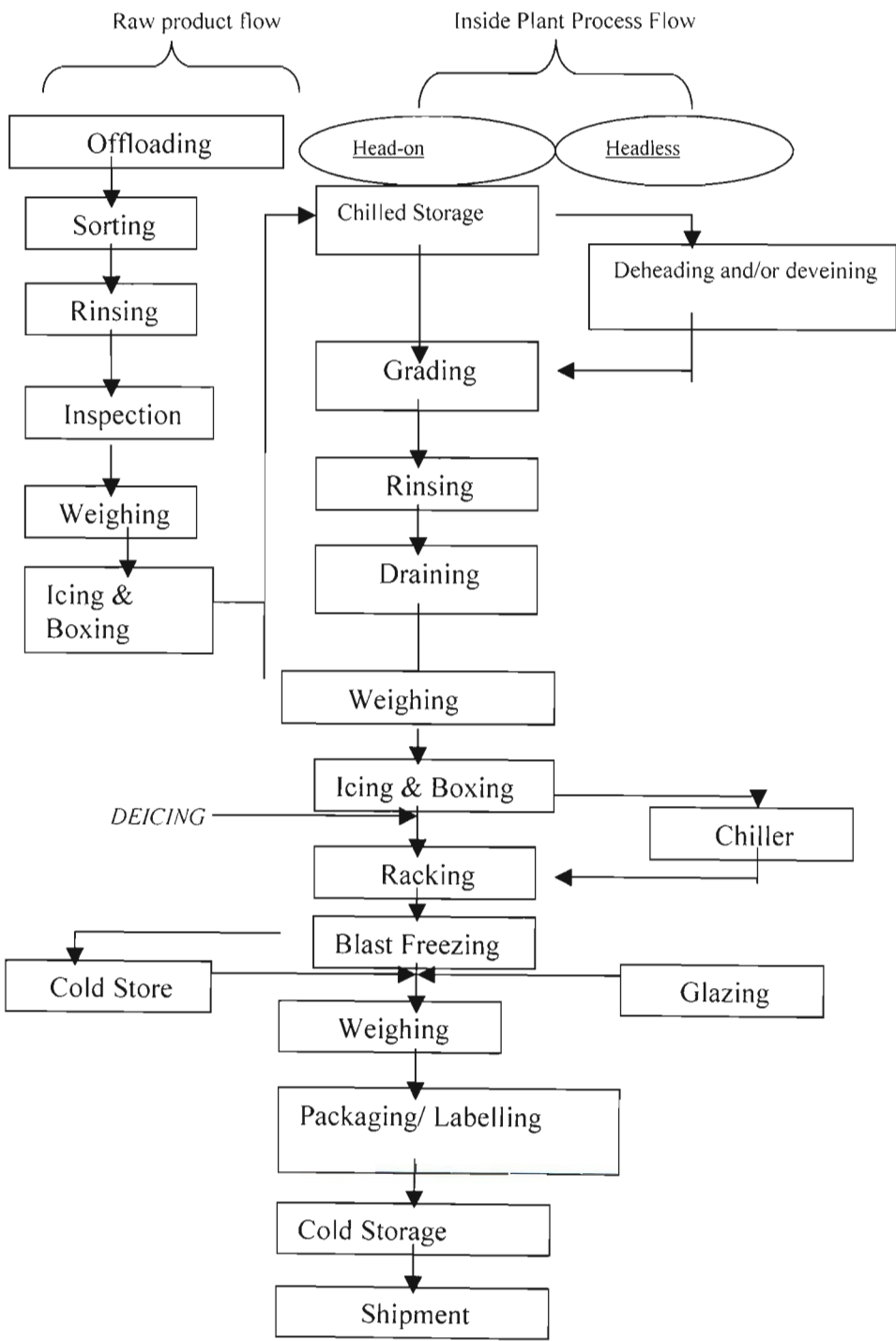




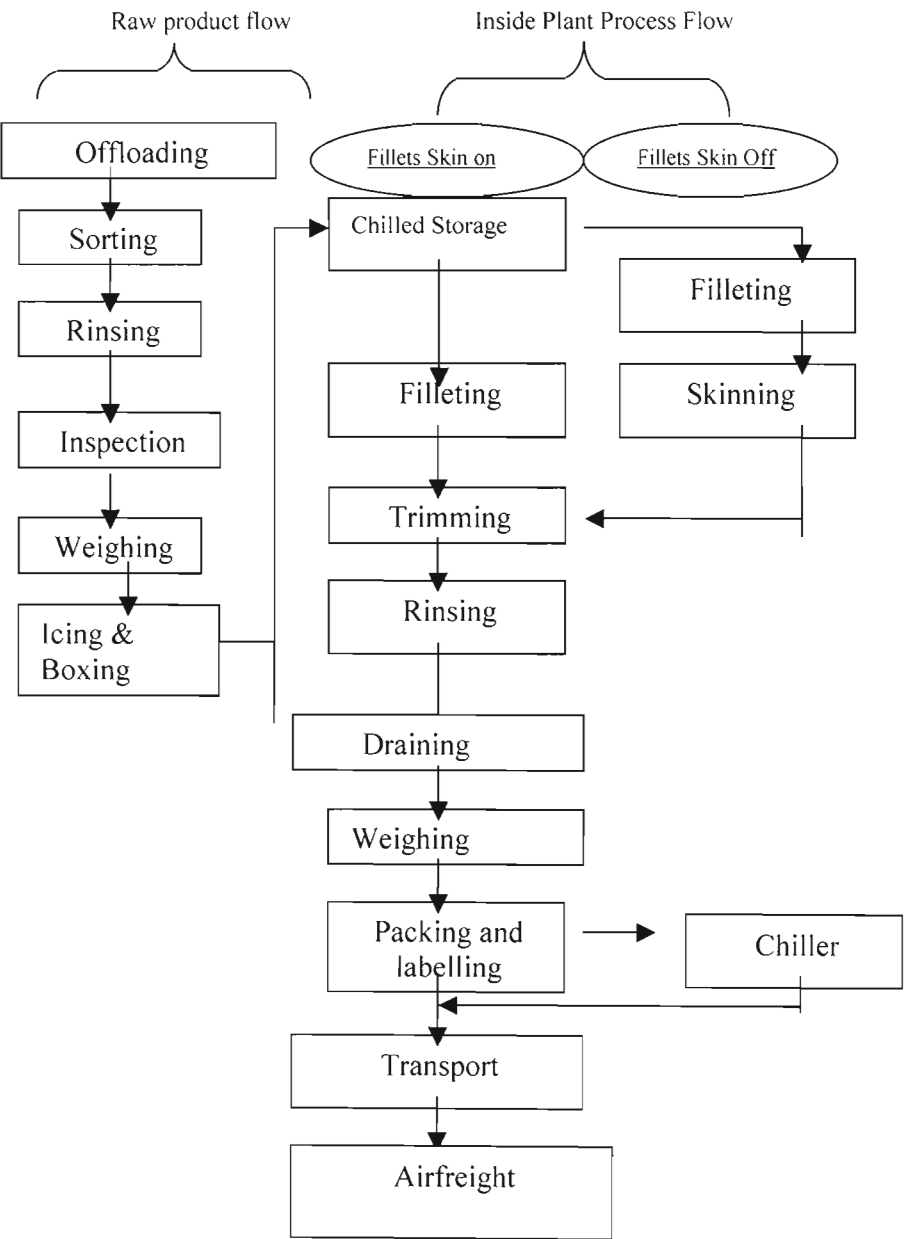
5.2. ERIFISH product flow chart for IQF whole-gutted fish



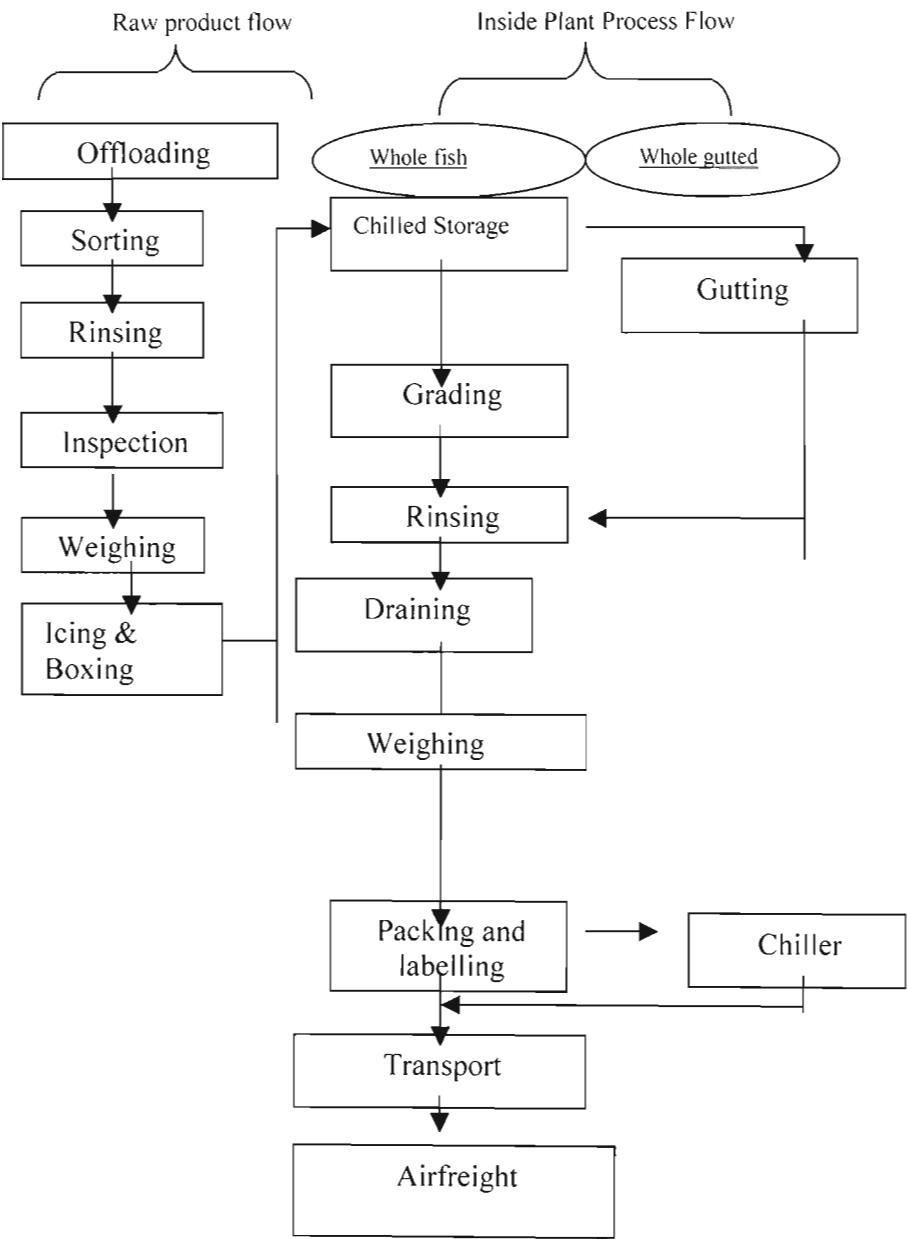
5.3. ERIFISH product flow chart for IQF head-on-shell-on-prawns and/or undeveined/deveined shell-on-prawn tails



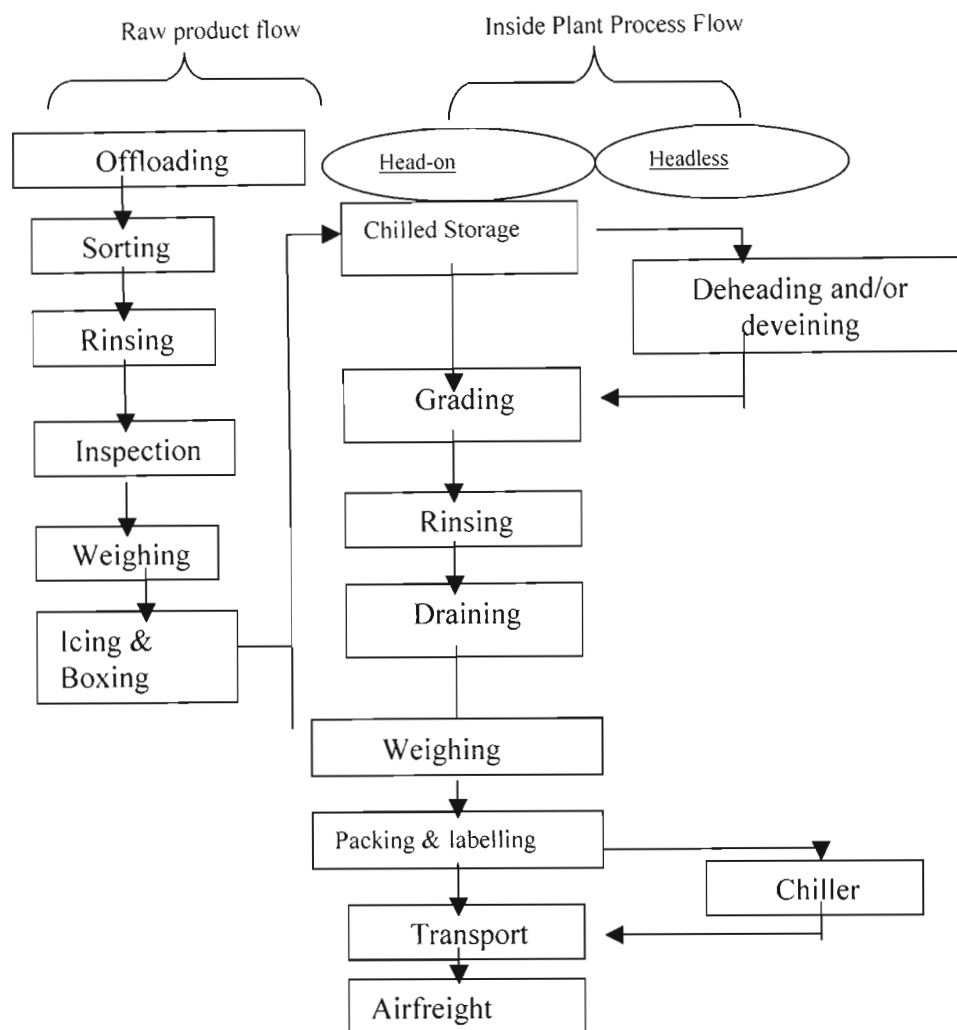
5.4. ERIFISH product flow chart for fresh fillet



5.5. ERIFISH product flow chart for fresh whole/whole gutted fish



## 5.6. ERIFISH product flow chart for fresh head-on-shell-on prawns and/or undeveined/deveined shell-on-prawn tails



### Stage 6: On-site confirmation of flow diagram

It is the Policy of ERIFISH Ltd that the Process Flow Diagram is complete and verified by the HACCP team who observes the process in action to make sure that what is practiced is the same as what is written down. Since the accuracy of the flow diagram is critical to conduct a hazard analysis. If a step is missed, a significant safety issue may not be addressed. The HACCP team walks through the facility and made changes required in the flow chart. Additional Plant personnel are invited to review the diagram during the walk-through.

### Stage 7: Identify and list all relevant hazards and preventative measures

#### 7.1. Tools and techniques for identifying hazards (species and process related hazards)

Once the hazards have been identified, it is important to consider how they can be present in the food product. Part of the hazard analysis therefore is the identification of operational malpractices or events that lead to contamination. Techniques that may be useful in this process are Brainstorming, Cause and Effect Analysis and Failure Mode and Effect Analysis. The aim of these techniques is to generate ideas so that they can be used separately or together.

The approach used in ERIFISH Ltd. is brainstorming: At each stage in the Process Flow Diagram, the hazards and their causes are brainstormed. This is done either formally through a structured brainstorming session or informally as part of a general discussion. Brainstorming is one of a number of standard problem-solving techniques that can be applied successfully to HACCP and is particularly useful at the hazard analysis step for a number of reasons:

1. Analytical thinking stifles creativity. Where team members are analytically or scientifically trained, lateral thinking and new ideas may be repressed.
2. The group is too close to the process and how it has always been done. This makes it difficult to challenge what is known or understood, and leads to assumptions being made and beliefs being accepted.
3. The belief that there is always one correct solution to every problem. This leads individuals into searching for the one correct answer, and in doing so overlooking alternative, less apparent solutions.

In order to overcome these barriers, brainstorming is a structured approach where each HACCP team member offers an idea. An individual is allocated the position to ensure that all ideas are recorded and a time limit is set to keep the pressure on. Brainstorming should be carried out as a quick-fire session and team members should say whichever hazards come into their heads, however outlandish they may initially seem. It is important to build on other people's ideas and to think laterally. Ideas are never praised, criticized or commented on and company status is left outside the room.

Brainstorming results in a list of potential hazards at each operational step in the process from the receipt of raw materials to the release of the finished product. During brainstorming, the team need not be confined by the hazard's likelihood of occurrence or its potential for causing disease.

## **7.2. Set up the hazard analysis worksheet**

Policy of ERIFISH Ltd:

Management of ERIFISH Ltd is aware that a structured approach to hazard analysis helps to ensure that all hazards have been identified. It really is crucial that any hazards shouldn't be missed and having personnel from a wide range of disciplines in our HACCP team working from a verified Process Flow Diagram carries this out.

In the Hazard Analysis Worksheet, each processing step is recorded. It's been found helpful to record all hazards as they are identified against the process steps where they occur in a structured manner. The documentation produced is then used as the basis for the hazard analysis and discussion of preventive measures. The use of such informal documentation helps to structure the thinking and discussions of the HACCP team, and therefore helps to ensure that all potential hazards are covered.

## **7.3. Identification of the potential species related hazards**

**A. Species related hazards are:** hazards that are associated with specific species of vertebrate and/or invertebrate fish.

1) Chemical hazards:

- Mercury
- Histamine
- Natural toxins: Paralytic Shellfish Poisoning, Neurotoxic Shellfish Poisoning, Diarrhetic shellfish Poisoning, Amnesic Shellfish Poisoning, Ciguatera Food Poisoning, Clupeotoxin, Chondrichthytoxin, Tetrodotoxin (puffer fish), and Gempylotoxin (escolar)
- Food and colour additives
- Aquaculture drugs

2) Biological hazards:

- Parasites (safety hazards)
- Pathogens

In order to assist in identifying the level of control needed, a decision tree question has been developed.

## **B. Establishing a safe raw material supply :**

In order to make safe products, an understanding of the hazards and risks associated with our raw materials is crucial. The raw materials should either contain no hazards, or any hazards present must be controllable by the process. This is achieved through a planned and managed programme of Supplier Quality Assurance Agreement (SQAA).

## **7.4. Identification of the potential process related hazards**

**Process related hazards are :**

1. Cross-contamination
2. Temperature abuse during preparation, storage and distribution.
3. Important physical hazards

## **7.5. Risk and severity assessment**

During hazard analysis it is necessary to assess the significance of each identified hazard in order to build an appropriate control mechanisms. This procedure is known as **risk assessment** and must be understood by the HACCP team.

The potential significance of each hazard is assessed by considering the possible risks and severity of the identified hazard. After taking into consideration the risk and severity of a hazard, the remarks (significance) are recorded in the Hazard Analysis Worksheet.

#### **7.6. Identify preventative measures**

**Preventive measures** are control mechanisms, actions and activities, or factors, which can be used to control an identified safety hazard.

When all potential hazards have been identified and analyzed, the HACCP team lists the associated preventive measures. These are the control mechanisms for each hazard and are normally defined as those factors that are required to eliminate or reduce the occurrence or the impact of hazards to an acceptable level. Preventive measures for each significant hazard are recorded in the hazard analysis worksheet

#### **Stage 8: Identify the critical control points**

For every significant hazard identified during the hazard analysis there must be one or more CCP's where the hazard is controlled. The CCPs are the points in the process where the HACCP control activities will occur.

It is the policy of ERIFISH Ltd. to keep the number of CCP's to a minimum, so that full attention is given to those preventive measures that are essential for food safety.

Identification of Critical Control point (CCP) is done by using following decision tree.

#### **Stage 9: Set-up critical factors (parameters) and critical limits**

Policy of ERIFISH Ltd.:

Critical parameters and critical limits for each CCP identified in the hazard analysis are established.

##### **A. Critical factors (parameters)**

Critical factors associated with the control point are factors which have an influence on the process.

##### **B. Critical limit**

A critical limit is a criterion that must be met for each preventive measure at a CCP. The absolute tolerance at a CCP, i.e. the division between safe and unsafe, is known as the critical limit. If the critical limits are exceeded, then the CCP is out of control and a potential hazard may exist.

**Sources of information on critical limits:** in many cases, the appropriate critical limit may not be readily apparent or available. However, the information is collected from scientific publications, regulatory guidelines, and experts.

#### **Stage 10: Establish monitoring system**

The monitoring of the ERIFISH Ltd's approach measures accurately the chosen factors which control a CCP/CP. It is simple with a quick result and is able to detect deviations from specifications or criteria (loss of control) and provide this information in time for corrective action to be taken. When it is not possible to monitor a critical limit on a continuous basis, it is necessary to establish that the monitoring interval will be reliable enough to indicate that the hazard is under control. Statistically designed data collection or sampling systems lend themselves to this purpose and frequency of measurements is based upon the amount of risk that is acceptable to the management. The effectiveness of control is therefore monitored by visual observations or by chemical and/or physical testing. Microbiological methods have limitations in HACCP system, but they are very valuable as means of establishing and randomly verifying the effectiveness of control at CCPs/CPs (challenge tests, random testing, verification of hygiene and sanitation controls).

Record keeping and trend analysis constitute integral parts of monitoring as well as a reporting system. Monitoring records are made available for review by regulatory authorities. All records are signed by a designated person responsible for the quality aspects.

#### **Purpose for our monitoring:**

- A. To identify when there is loss of control.
- B. To provide written documentation of the process control system

#### **Stage 11: Establish corrective actions plans**

Corrective action refers to procedures to be followed when a deviation, or failure to meet a critical limit occurs.

##### **1. Objective**

The primary objective is to establish HACCP program that permits rapid identification of deviations from a critical limit. The sooner the deviation is identified, the more easily corrective actions can be taken and the greater the potential for minimizing the amount of expenses incurred by non-compliance.

##### **2. Responsibility**

Individuals who have a thorough understanding of the process, product and HACCP plan and who have the authority to make decisions are assigned the responsibility of making corrective actions.

### 3. Four steps of corrective actions

Step one: determine if the product presents a safety hazard based on:

- a. expert evaluation
- b. physical, chemical or microbiological testing

Step two: if no hazard exists based on the evaluations in Step 1, the product may be released.

Step three: if a potential hazard exists based on the evaluations in Step 1, determine whether the product can be re-prepared or diverted for a safe use.

Step four: if potentially hazardous product cannot be handled as described in Step 3, the product must be destroyed. This is usually the most expensive option and is regarded as the last resort.

### 4. Corrective action records

Predetermined corrective actions are written into the HACCP plan. When critical limits are exceeded and a corrective action taken, it is recorded. A corrective action report form is helpful.

The corrective action report contains the following :

- a. Product identification (e.g. product description, amount of product on hold).
- b. Description of the deviation.
- c. Corrective action taken including final disposition of the affected product.
- d. Name of the individual responsible for taking the corrective action.
- e. Results of the evaluation when necessary.

HACCP plan records contain a file in which all deviations and corresponding corrective actions are maintained in an organized fashion.

## **Stage 12: Establish effective documentation and record keeping**

### A. General policy of ERIFISH Ltd.

- Accurate record keeping is an essential part of successful HACCP program for management of ERIFISH Ltd. It provides us with confidence that our product is safe and allows auditors to do their job.
- The approved HACCP plan and associated documentation and records are in file, and assembled in a manual and available for inspection by regulatory agencies.
- It is clear at all times who is responsible for keeping the records.

### B. Types of records

Four kinds of records are kept as part of the HACCP system.

1. HACCP plan and support documentation used in developing the plan.
2. Records of CCP/CP monitoring.
3. Records of corrective action.
4. Records of verification activities.

### C. Record review

Monitoring records for CCPs and critical limit deviations are reviewed in a timely manner by the QM. All records are initialled, signed and dated by the reviewer.

## **Stage 13: Establish Verification Procedures**

Policy of ERIFISH Ltd.

Verification is the application of methods, procedures, tests and audits, in addition to monitoring to validate and determine compliance with the HACCP plan and/or whether the HACCP plan needs modification.

### **A. General approach**

Verification is one of the more complex HACCP principles. Although it is complex, the proper development and implementation of the verification principle is fundamental to the successful execution of the HACCP plan. The purpose of the HACCP plan is to prevent food-safety hazards, and the purpose of verification is to provide a level of confidence that :

1. the plan is based on solid scientific principles,
2. is adequate to control the hazards associated with the product and process,
3. and is being followed.

### **B. Elements of Verification**

1. Monitoring and corrective action records are reviewed monthly to verify that the HACCP plan is being followed.
2. Tests are conducted for checking the safety of the intermediate and final product of every lot produced.
3. Calibration of all measuring equipment is done annually to ensure the accuracy of measurements.
4. Record keeping systems are reviewed annually.
5. Training is conducted every two months.
6. Audit procedures are reviewed annually.



7. Regulatory agencies are given free access to records that pertain to CCP deviations, corrective actions and the information pertinent to the HACCP plan that may be required for verification.

### **C. Verification of CCPs**

Verification activities developed for CCPs are essential to ensure that the control procedures used are properly functioning and that they are operating and calibrated within appropriate ranges for food safety control. Additionally, CCP verification includes supervisory review of CCP calibration, monitoring and corrective action records to confirm compliance with the HACCP Plan. CCP verification may also include targeted sampling and testing. So verification activities for CCPs are calibration, calibration record review, targeted sampling and testing, and CCP record review.

### **D. Verification of the HACCP System**

In addition to the verification activities for CCPs, strategies are developed for scheduled verification of the complete HACCP system. The frequency of the system-wide verification will be yearly at a minimum or whenever there is a system failure or a significant change in the product or process. The HACCP team is responsible for ensuring that this verification function is performed. Often, the HACCP team contracts an independent third party to conduct a system-wide verification audit.

As explained already, microbiological testing is ineffective for routine monitoring but can be used as a verification tool. Microbiological testing of both intermediate and final products is used to determine (i.e. during verification audits) that the overall operation is under control.

### **E. Validation**

Validation is obtaining evidence that the elements of the HACCP plan are effective.

There are several approaches to validating the HACCP plan, among them are :

1. incorporation of fundamental scientific principles;
2. use of scientific data;
3. reliance on expert opinion or conducting in-plant observation or tests.

Who is doing the validation ?

- Members of the HACCP team can carry out all of the HACCP plan validation.
- Individual qualified by training or experience

What does validation involve ?

A scientific and technical review of the rationale behind each part of the HACCP plan from hazard analysis through each CCP verification strategy.

Validation frequency :

An in-plant validation has been performed initially, before actual reliance on the HACCP plan, and subsequently the following factors may warrant validation of our plan :

- changes in raw materials;
- changes in product or process;
- adverse audit findings;
- recurring deviations;
- new information on hazards or control measures;
- on-line observations, and
- new distribution or consumer handling practices

### **F. Audits**

Audits are an organized process for collecting information used in verification. They are systematic evaluations that include on-site observations and record reviews. Audits are performed by a trained or experienced third party. Audits occur at a frequency that ensures the HACCP plan is being followed continuously. This frequency depends on a number of conditions, such as the variability of the process and product.

Audit verification activities of the HACCP systems followed by the plant are:

- checking the accuracy of the product description and flow chart.
- checking that the CCPs are monitored as required by the HACCP plan.
- checking that the processes are operating within established critical limits.
- checking that the records are completed accurately and at the time intervals required.

Record review audit :

- Monitoring activities have been performed at the locations and frequencies specified in the HACCP plan.
- Corrective actions have been performed whenever monitoring indicates deviation from critical limits.
- Equipment has been calibrated at the frequencies specified in the HACCP plan.

### **Stage 14: Review of the HACCP plan**

A review of the HACCP plan is carried out by ERIFISH Ltd. to determine whether the plan is still appropriate and is additional to the process of verification. Reviews are carried out annually and when changes occur e.g.

change in processing, processing equipment or raw materials, the results of the review are recorded and fed back into the extant HACCP plan.

A HACCP review is done if at least one of the following seven changes occurs:

1. Factory lay-out
2. Factory environment
3. Cleaning and disinfect ion program
4. Processing system
5. Health or spoilage risk associated with the product
6. Modification to process equipment
7. New information on hazards/risks/intended use and/or consumers.

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