

学校编码: 10384

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学号: 33120121154192

厦 门 大 学

硕 士 学 位 论 文

厄 尔 特 里 亚 渔 业 管 理 评 估

Appraisal of Fishery Management in Eritrea

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论文提交日期: 2014年4月

论文答辩时间: 2014年5月

2014年5月

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**List of Acronyms**

CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CITES	Convention on International Trade of Endangered Species
CPUE	Catch Per Unite Effort
COMSAT	College of Marine Science and Technology
ECMIB	Eritrea's Coastal, Marine and Island Biodiversity
EBM	Ecosystem Based Management
EBFM	Ecosystem Based Fisheries Management
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMPC	Eritrean Marine Products Company
EU	European Union
FRDD	Fisheries Resources Development Department
FRP	Fiber Reinforced Plastic
FRSD	Fisheries Regulatory Services Department
GDP	Gross Domestic Product
HACCP	Hazard Analysis Critical Control Points
ICAM	Integrated Coastal Area Management
MLWE	Ministry of Land, Water and Environment
MMR	Ministry of Marine Resources
MPA	Marine Protected Area
MSY	Maximal sustainable yield
NFC	National Fisheries Corporation
NGO	Nongovernmental Organization
PIC	Prior Informed Consent

## List of Acronyms

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UNCLOS	UN Convention on the Law of the Sea
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wildlife Fund
ZNRS	Zoba Northern Red Sea
ZSRS	Zoba Southern Red Sea

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廈門大學博碩士論文摘要

## **Abstract**

In developing country context, the fishery sector is increasingly being mentioned as a source of livelihood creation, food security and to generate income. However, the sector has been facing challenges to achieve sustainable development and erroneous fishing management methods have resulted in depletion of fish stocks. In Eritrea, even though the lightly exploited fishery represents an invaluable opportunity, the fishery sector has been struggling to attain continuous expansion in the past 60 years. The fish catch production has been much lesser than the estimated Maximum sustainable yield.

This paper, therefore, addresses the reasons behind the low performance of the Eritrean fishery sector through analyzing the constraints faced in terms of fishery development and management. Nonetheless to do this it will first examine the potential of the Eritrean waters as a whole and also assess the present state of Eritrean fishery by examining the past and present catch production levels. In addition the study explored the country present fishery policy and management frameworks towards exploitation of its marine resources to provide an overview of the institutional environment in which small-scale fishery in Eritrea operates. This study also aims to contribute to the debate on sustainable development of the country lightly exploited fisheries, by recommending future steps that have to be taken to insure boost in production by balancing economic benefits with ecosystem management.

The findings of the work portray that fishery in Eritrea is constrained by decade's long security instability and economic fluctuation which restricted the investment to the sector. Also although this Small-scale fishery is increasingly important to the country, yet they struggle with access to modernized fishing technology, infrastructure, markets, and credit. Over all increased foreign investments, improved fishery export, superior market conditions, fishing technology upgrading and better infrastructure facility will enhance the future development of the fishery industry. Nevertheless for long term sustainable harvest some precautionary fishery management has to be taken

equivalent to these adjustments.

**Keywords:** Fisheries development; Fishery policy and sustainable management;  
lightly exploited fishery; Appraisal Eritrea

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摘要

在发展中国家，渔业作为居民生计、食品安全、收入改善的重要保障，正越发受到整个社会的重视。然而，长久以来存在的非可持续开发利用方式以及不完善的渔业管理制度，导致了渔业资源的枯竭。当前，厄立特里亚渔业资源的开发程度较小，尽管过去 60 年的渔业产量持续增加，但仍然远低于该国被估计的最大可持续产量。

因此，本文通过分析厄立特里亚渔业开发与管理中的制约因素，以期发现该国渔业产出较低的原因。为实现该目标，本文首先调查了厄立特里亚海域潜在的渔业资源量，同时根据过去和现在的捕捞水平评估了当前渔业资源的开发程度；其次，本文探究了该国当前的渔业政策以及海洋开发管理结构等制度环境，并分析了其对小规模渔业的影响。根据分析结果，本文针对厄立特里亚的渔业资源开发提出了若干建议，以期实现经济效益与生态保护的协调，达到可持续发展的目标。

本文的研究结果表明，厄立特里亚的渔业资源开发受限于长达十年的社会动荡与经济波动，直接制约了渔业资源开发方面的投资。尽管小规模渔业对厄立特里亚的重要程度逐渐增加，但这些渔民难以获得现代化的捕鱼技术、捕鱼设施、渔业市场以及渔业信贷的支持。因此，吸引更多的外国投资，增加渔业出口，创造更好的渔业市场条件，升级渔业捕捞技术，以及建造更好的渔业基础设施等举措，将会促进厄立特里亚今后的渔业发展。当然，为了实现渔业资源长期的可持续开发利用，预防性的渔业管理模式在指导厄立特里亚的渔业发展中同样重要。

**关键词:** 渔业发展;渔业政策与可持续发展; 渔业资源轻度开发区; 厄立特里亚渔业资源评估

## **Chapter 1 Introduction**

### **1.1 Background**

Aquatic ecosystems, including rivers, lakes and inland seas, flood plains, coastal lagoons and estuaries, coastal shelves and open oceans cover a very large part of the earth's surface and, among other amenities, goods and services, sustain the production of fisheries and aquaculture. They yield about 120 million tons of fish and fishery products per year and provide a livelihood to as many as 140 million people (FAO, 2014). The more considerable and substantial contribution of fisheries worldwide is the supply of highly nutritious animal protein for human consumption and the employment and income generation in often-remote coastal areas. While globally some 17 % of the animal protein supply is derived from fisheries, in many developing countries this share is above 50 %.

Eritrea possesses abundant fish stocks, which have the potential to considerably contribute to and diversify national food security and reduce the incidence of poverty, particularly among coastal communities (IFAD, 2010). Unlike to other coastal waters of the world fisheries of Eritrea are unique today, in that they are not generally overcapitalized or over exploited. Many of the fishing ground in the world have been depleted and are yielding declining returns, Eritrean fisheries resources are still relatively healthy and in some cases underexploited. The prospects of Eritrean fisheries development are very high due to the availability of untapped potential of natural resources. The current challenge of Eritrean fishery is to boost the fishery growth to realize its potential to national economy development, food security and poverty alleviation and at same time to ensure the sustainability of fishery stock. Therefore, Eritrea finds itself in a unique position of managing and exploiting a relatively young and healthy resource with the potential to offer great prospects for

economic growth, meeting national food security objectives and earning foreign exchange for the country (GOE, 2004).

Preliminary studies to identify constraints impeding the development of the fishery have been done (MMR, 2007; Pasiencie, 2009). But these few studies have focused on how to increase catch production and effort in order to achieve economical and social gains, without properly concerned about providing appropriate management advice on precautionary development strategies. Most marine ecosystems are unavoidably affected by fishery activities that involve a selective removal of part of the natural productivity for human subsistence, economic returns and development. Undesirable fishing practices in some cases, such as overfishing and use of destructive methods, are unduly affecting these precious ecosystems and jeopardize the sustainable development of fishery.

This calls for long term sustainable fishery development strategy which takes in to account precautionary management approaches in order to efficiently harvest the lightly exploited Eritrean waters. However before pursue and also to aid with this process, first detailed investigation must be done to examine constrains behind the development of the country fishery. Thus this paper assesses the fisheries potential and past catch production to analyze the challenges to sector progress. It will also explore the country's policy, legal and institutional frameworks in accordance to the development and management of the fisheries. The main purpose of the paper is to identify the limitation and challenge of fishery development and fishery management in Eritrea and based on this to propose recommendation that have to be taken to insure long term sustainable development of fisheries.

### **1.2 Literature Review**

There are many studies in academic community on fishery stock assessment, fishery policy and fishery management. Considering that the study area, Eritrea, has not yet utilized their potential yield, the main challenge of Eritrea fishery is to boost

the fishery growth while ensure the sustainability of fishery resources. This section reviews the research progression in 4 perspectives: (1) constraint of under or lightly exploited fishery; (2) assessment of fishing impacts in small scale fisheries; (3) conventional fishery management; and (4) ecosystem based fishery management.

### **1.2.1 Constraint of Lightly Exploited Fishery**

Most of the current literature focus on fisheries as the chief human activity of interest because of concerns about the status of fish stocks and their management, direct and indirect impacts of fishing, and the ability of the marine environment to satisfy human economic and nutritional needs and wants in the form of fish (Christie *et al.*, 2007). In accordance fisheries planning in Eritrea in recent years have concentrated on development activities to increase catch level (Morgan, 2006). This is due to country like Eritrea have not yet utilized their potential yield, in which landings for all major species are significantly less than maximum sustainable yield (MSY). However recently owing to resources overexploitation, most countries are increasingly concerned and due attention to sustainable management of their resources. Consequently, the literature concerning sustainable development of under exploited or lightly fisheries are very scarce comparing to its counterpart, management of the resources already over exploited fisheries (Demena, 2011). As such, it is vivid that the main concern is confronted with many development challenges of the sector.

The production of lightly or under exploited fisheries can be constrained by a number of factors. Lack of capital and low level of technology is among the foremost ones (FAO, 2011a). The low technological artisanal fishing techniques in Gulf of Aden and Red Sea area in Yemen (Wagenaar and D'Haese, 2007) and Kenya's south-coast (Okeyo, 2010) can be stated as examples of low level of technology and capital intensity that are responsible for scanty fisheries production. Another equally important factor is related to processing and marketing of their catches. Lack of financial assistance, appropriate infrastructure, standard processing techniques, to improve the production and marketing know-how are challenges of the sector

(Teweldemedhin, 2006). One another descriptive study also concluded marketing channel is blocking the sector from development (Wagenaar and D'Haese, 2007). They accentuated this argument that in addition to higher rejection rates of fisheries products, superior cost of transportation, involvement of brokers and substantial auctioning commissions contributed to a costly marketing channel.

Competition and conflict between artisanal and industrial fisheries is also pointed as another impeding factor. The southern Red Sea, for instance, there is frequent competition for cuttlefish and demersal fish between trawlers and artisanal fisheries (Bonfiglioli and Hariris, 2004). While exploration study on the development of artisanal fisheries in Yemen found that competition with large fleet is an important impeding factor particularly for Red Sea area fishermen (Wagenaar and D'Haese, 2007).

In the past, increasing fishing efforts are among most desirable recommendation in order to achieve as one of fisheries development approaches (Christy, 1997). Improvements in landing and processing facilities, transportation networks, provision of low cost ice and fuel, efficient gear, and enhance marketing situation can increase catch level. However parallel to this kind of suggestion to increase catch production; appropriate management steps to avoid destructive depletion of fish stock are not taken in to consideration. Many literatures are based on overemphasis of social benefits and profit from fisheries that tend to result in overexploitation and environmental collapse (or at least shifts into states of lower biodiversity) (Christie *et al.*, 2007). Any alternative fishing strategies and their long term consequences have to be studied before implementation in order to take precautionary fisheries management approaches (Jennings and Polunin, 1996). The statuses of fish stocks at a given time and to the different level of fishing exploitation of response knowledge of the fish stocks are first required for sound management.

While the majority of the world's fish stocks are at least fully exploited, there do remain a number of lightly exploited fisheries, many in the waters of developing countries, and new fisheries continue to be found (Kirkwood, 1999). A lightly exploited fishery represents an invaluable opportunity for developing country, either



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