TÍTULO

INTRODUCTION OF SEA CUCUMBER CITES SPECIES LISTED IN APPENDIX II FOR TRADE IN ZANZIBAR, TANZANIA

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Master's Thesis:

INTRODUCTION OF SEA CUCUMBER CITES SPECIES LISTED IN APPENDIX II FOR TRADE IN ZANZIBAR, TANZANIA

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DEDICATION

This work is dedicated to my Parents who had laid the foundation of my education.

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ABSTRACT

This study focused on determine the status of the trade of sea cucumbers in Zanzibar, and to inform national and international policy for the taxa's improved conservation and management were investigated. To determine the trade routes that are being used for illegal trafficking bêche-de-mer in Zanzibar; and to develop CITES Non- detrimental Findings (NDF) for selected species in trade in Zanzibar's were investigated.

A survey was conducted in eighteen (18) landing sites using questionnaires (Appendix 1) to capture information. Participants in this study were representatives of the community, including the elderly, the youth, local leaders (*shehas*), MPAs Manages, heads of units of Department of Fisheries and Department of Conservation and Zanzibar Fisheries and marine Resources Research Institute (ZAFIRI). The study was aimed at reviling whether fisherman and Government officer has clearly understood the CITES listed species in Appendix II, and CITES is very useful for biodiversity conservation and promote sustainable trade. Fishermen marine knowledge is found to be useful in identifying and locating resources.

The study examined the trade routes that are being used for illegal trafficking bêche-de-mer and how network operated. The network/ route is found to very harmful for marine resources and in consistent with sustainable trade of CITES listed species in Appendix II .

The findings also revealed the development of NDF are very important for *H. fuscogilva* and *H. nobils*. However the information regarding NDF in this study is not adequate, there is a need to undertake further effort to require more information regarding NDF process.

ACRONYMS

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DSA	Dissemination Sensitization Advocacy
GPS	Global Positioning System
IT	Information Technology
KC	Kobo Collection
MT	Metric Tone
NDF	Non-Detrimental Findings
ROV	Remotely Operated Vehicle
SAR	Special Administrative Region
WCS	Wildlife Conservation Society

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Over the last several decades, there has been a marked increase in marine invertebrate fisheries. One group that is increasingly being harvested is sea cucumbers (class Holothuridae) (Anderson *et al.*, 2011a). Holothuroids encompass approximately 14,000 known species, although most fished species are within the order Aspidochirotida and occur in most benthic marine habitats worldwide, in temperate and tropical oceans, and from the intertidal zone to the deep sea (Anderson *et al*., 2011a). Sea cucumbers play a key role in marine ecosystems through bioturbation, burrowing and feeding on organic matter in marine sediments, and for humans are a source of protein and revenue (Namukose *et al.*, 20 16). Sea cucumbers are important for the economies and livelihoods of many coastal communities and are the most economically important non-finfish export for many countries (Namukose et al., 2016). This is true for Zanzibar, a semi-autonomous island-state off the shore of Tanzania, which has had a growing trade in sea cucumbers in response to increased demand from Asia (RGoZ, 2015). Although Zanzibar has recently established national laws protecting sea cucumbers in its waters, as with most sea cucumber fisheries, Zanzibar is in need of better monitoring, reporting of catch and abundance, scientific stock assessment, and stronger international trade regulations to ensure long-term and sustainable harvest.

It is estimated that over 3 million people around the world participate in different types of sea cucumber fisheries targeting more than 60 species. Sea cucumbers are harvested and traded in more than 70 countries worldwide, with exploitation occurring at scales ranging from semi-industrial fisheries (Seychelles) to small artisanal fisheries (Tanzania). Several species such as *Holothuria scabra, H. fuscogilva, H. nobilis, H. whitmaei,* and *Actinopygna miliaris* are harvested in large volumes for export to Asia, where they are processed as bêche-de-mer, also called trepang, which is boiled, dried, and smoked flesh of sea cucumbers used to make soups (Bűrgener, 2020). Processed and dried sea cucumbers are considered a seafood delicacy, commonly served at special events, or consumed as health tonics and aphrodisiacs, predominantly in Chinese communities. As a consequence of their biological and ecological life history traits, sea cucumber populations are particularly vulnerable to overfishing. For example, sea cumbers have low motility, and shallow water holothurians in particular are easily harvested. In addition, sea cucumbers mature at a late age, and slow growth and low

rates of recruitment make for slow population replenishment (Anderson *et al*., 2011b). Sea cucumber stocks can be slow to recover, often taking decades for populations to become re-established even after harvesting has been discontinued (Anderson et al., 2011a).

Sea cucumber species can be ranked as high, medium, or low commercial importance based on abundance, appearance, odor, color, the thickness of the body wall, main market demand, and value (Louw & Bűrgener, 2020). Species with high economic value (*H. fuscogilva, H. scabra, H. nobilis,* and *Actubioygna millaris*) are harvested in most range countries and are the most threatened, but as their numbers decline other species with lower economic value are increasingly being harvested (Conand *et al.*, 2014). Many species have declining population trends as a result of unregulated or illegal harvesting on all continents Louw, (2020). According to the IUCN Red List, of the 377 species assessed, 16 are classified as threatened with extinction (7 as endangered, 9 as vulnerable) (Conand et al., 2014); 244 species are data deficient and therefore their conservation status is unknown.

An estimated 4,300 to 4,600 metric tons (MT) of sea cucumber imports flowed into Asia in 2019. Global sea cucumber revenues in 2019 were estimated at US$ 1.053 billion, with expected growth of 5.28% between 2020 and 2025. Hong Kong, as the largest global importer of sea cucumber, imported around 3,800 MT of dried sea cucumbers from Africa between 2012 and 2019, accounting for 13% of the total dried sea cucumbers imported by Hong Kong. However, exports to Hong Kong from 5 leading African exporting countries decreased by 57% from 2012- 2019 as a result of declining stocks (Ben-Hasan,2021). Tanzania (mainland and Zanzibar combined) was amongst the 5 leading exporters of sea cucumber from Africa to Hong Kong from 2012 and 2019, even though harvesting and export of wild sea cucumber was banned in Tanzania mainland in 2006 (Louw & Bűrgener,2020).This could suggests that sea cucumber from Tanzania mainland nearshore waters continued to be traded through Zanzibar, where export of wild-caught sea cucumber was halted in 2016 however harvesting and export of ranched sea cucumber remained legal despite passage of Zanzibar's fisheries Act No. 7 of 2010 prohibiting sea cucumber harvesting (RGoZ, 2022). The other top 5 sea cucumber exporting countries in Africa were Madagascar, Seychelles, Mozambique, and Mauritania.

Much of the sea cucumber trade worldwide exists through informal channels, so global production metrics are not comprehensive. The trade market is supplied through illegal harvesting, or from stocks that are mismanaged, either through neglect or intentionally

through the misreporting of import and export data (Ben-Hasan *et al.,* 2021). For example, between 2012 and 2019, Hong Kong reported receiving sea cucumber imports from 33 African countries, whereas only six of those countries reported exporting to Hong Kong during the same period (Ben-Hasan *et al.,* 2021).

Despite a lack of data for many species, unregulated and illegal trade appears to be having a negative impact on a number sea cucumber species. Regional assessments have shown that population declines from overfishing occurred in 81% of sea cucumber fisheries, average body size of harvested species declined in 35%, harvesters moved from near- to off-shore regions in 51% and from high- to low-value species in 76%. Thirty-eight per cent of sea cucumber fisheries remained unregulated (Anderson, 2011).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), provides mechanisms to ensure that the international trade in specimens of plants and animals does not threaten the survival of species in the wild. In response to unsustainable levels of trade, three *Holothuria* species were listed in CITES Appendix II at the 18th Conference of the Parties (CoP18 Prop. 45) in 2019, including *H. whitmaei, H. nobilis* and *H. fuscogilva*. These three species are amongst the 20 species found off the shores of mainland Tanzania and Zanzibar Mbaga and Mgaya, (2004). Moreover, Thelenota ananas were listed in CITES Appendix II at the 19th Conference of the Parties (CoP 19 Prop.42) as Endangered under IUCN criteria because it is commercially exploited throughout its range for its medium-high value as beche-de-mer. The population trend is declining, and IUCN estimates that populations have declined by 80-90% in at least 50% of the species' range, and populations are overexploited in at least 30% of its range(CITES, 2016).

Historically, sea cucumber exports from Zanzibar have been driven exclusively by wild-capture fishing of 10 species with high or medium market demand. Following global market trends, high market prices since the 1990s have driven overfishing that has significantly depleted stocks in Zanzibar's nearshore waters, as it has been in Tanzania mainland. As a result, sea cucumber harvesters have had to venture into deeper waters as nearshore populations have been wiped out. The United Republic of Tanzania (Tanzania mainland and Zanzibar) ratified CITES in 1979. Tanzania mainland adopted national legislation for the implementation of CITES in 2009, and ten years later Zanzibar officially adopted regulations under the Forest Act of 1996 for the implementation of CITES (Kunzmann *et al.,* 2018).

Zanzibar's Ministry of Blue Economy and Fisheries, has identified sea cucumber harvest as a key contribution to the island's economy and for the livelihoods of its coastal communities yet recognizes that alternative methods for sea cucumber production are needed (RGoZ, 2022). As such, the government is promoting sea cucumber farming to safeguard wild populations while providing alternative sources of income (Kunzmann *et al.,* 2018). The government has established sea cucumber hatcheries and demonstration farms and conducting training to facilitate sea cucumber farming. Sea cucumber aquaculture proposals appeal to political and economic agendas of economic growth and employment, and to the government's ambitions of supporting village economies through the creation of an alternative livelihood (RGoZ, 2022).

The sustainable trade in sea cucumber in Zanzibar will require a 1) better understanding of which species are impacted by illegal trade and the drivers of that trade, 2) an understanding of the synergies between captive propagation and wild harvests, and 3) improved capacity to ensure that legal trade is regulated and monitored including those species impacted by a CITES Appendix II listing. The objective of this research is to contribute to the body of evidence on the status of the trade of sea cucumbers in Zanzibar, and to inform national and international policy for the taxa's improved conservation and management. The proposed research will target two CITES-listed species (*Holothuria fuscogilva* and *H. nobilis*) as practical references to explore more broadly the trade in sea cucumber species in Zanzibar.

1.2 Problem statement

Sophisticated wildlife trafficking networks exploit inconsistencies in legislation between Tanzania's mainland and the island of Zanzibar by moving illegally harvested sea cucumbers for transit into international trade supply chains(Louw & Bűrgener, 2020). , As a result of overfishing of sea cucumbers, Tanzania instituted a ban on the harvest and trade of sea cucumbers in 2006; however, harvesting of sea cucumbers remained legal in Zanzibar (Louw & Bűrgener, 2020). The inconsistent quantities exported from Tanzania may be a result of a ban initiated in 2006 for the collection and trade of sea cucumbers from mainland Tanzania, despite sea cucumber harvesting and trade being allowed in Zanzibar. The facilitation of a trade network involving smuggled sea cucumbers from the mainland entering the legal trade in Zanzibar has been attributed to the different management regimes in Tanzania (Louw & Bűrgener,2020). *Holothuria nobilis* and *H, fuscogilva* are among of high value species of sea cucumber that are CITES-listed species in Appendix II (Conand,2008). As we know species in Appendix II are allowed in trade but in control manner, meaning that the trade of species

must obey a provision imposed by the Text of the Convention. That compliance is Legality (legal acquisition, national laws), Sustainability (stock assessments, NDFs) Traceability (identification, reporting, databases). In doing so, strategies must be developed in line with the CITES compliances in order for the trade that species to be allowed at the international level.

This research is help to fill the large gap for management of sea cucumber fisheries. The large gap on status of sea cucumber (by observing the current under water drone), this is the base line of the data of sea cucumber, abundancy information of sea cucumber, baseline to collect biological and ecological data and this study is the base line of the identified of potentials sites for sea cucumber CITES Appendix II listed sea cucumber species (*Holothuria fuscogilva* and *Holothuria . nobilis).*

1.3 Objectives

1.3.1 General Objective

The objective of this research is to contribute to the body of evidence on the status of the trade of sea cucumbers in Zanzibar, and to inform national and international policy for the taxa's improved conservation and management.

1.3.2 Specific Objectives

1. To determine the status of trade in Zanzibar for CITES Appendix II listed sea cucumber species (*Holothuria fuscogilva* and *Holothuria . nobilis)*.
2. To determine the trade routes used for trafficking of sea cucumbers (*Holothuria fuscogilva* and *Holothuria. nobilis)* in Zanzibar;
3. To develop CITES Non- detrimental Findings (NDF) for selected species (*Holothuria fuscogilva* and *Holothuria. nobilis)* in trade in Zanzibar.

1.4 Expected Results

This study will produce baseline biological and trade data for sea cucumber species traded off the shores of Zanzibar and which are listed in CITES Appendix II (*Holothuria fuscogilva* and *H. nobilis)*. These data will provide an empirical foundation from which a conservation and trade strategy can be developed for the species, in alignment with of Zanzibar's Blue Economy (BE) initiative: the government has established sea cucumber hatcheries and demonstration farms and conducting training to facilitate sea cucumber farm. Moreover, they

establish one hundreds (100) sea cucumber farms for both Islands Unguja and Pemba. The Ministry of Agriculture, Natural resources and livestock Zanzibar, establish Scientific Authority in the Legal notice number : L.N 44 of 2023.

Understanding the status of illegal and trade in Zanzibar for CITES Appendix II Sea cucumber species (Objective 1) will help to inform national and international policy for the taxa's improved conservation and management.

Determining trade routes (Objective 2) will help the administrative regions that works with law enforcement to put more efforts and other initiatives aiming to controls the existing illegal routes that aiming at conserving CITES-listed sea cucumber in order to promote the sustainable utilization of that species.

The objective 3 aims to consolidate the biological and trade information for *Holothuria nobilis* and *Holothuria fuscogilva* required to establish a CITES non-detriment finding for the two species.

1.5 Limitations of the study

A number of constraint issue were faced while conducting the study. The first limitation of the study was budget restructuring, I was supported to reduce some of the activities (meetings). Second, hardly in gathering information (statistical data) from the Department of Fisheries, this is due lake of sea cucumber data. Third, difficulties to collect information about trafficking of sea cucumber. Fourth, difficult to collect information about price and market, this is because the fishermen were not much aware with market of sea cucumber. Time constraint for writing result and discussion.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

This chapter encompasses five sections. Section one defines key concepts related to CITES, section two describes biological, trade and market status, section three explain review of research of sea cucumber CITES listed species in Appendix II in the world, in Africa and Tanzania and section four explains the wildlife trade related laws and policies in Zanzibar,

2.2 Definition of the key concepts

2.2.1 CITES and NDF

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), is an international agreement between 183 countries (184 including the European Union economic bloc). Its aim is to ensure that the international trade in specimens of animals and plants does not threaten the survival of the species in the wild (Wijnsteker, 2018).

The species protected by CITES are listed in three Apendices to the degree of protection they need. Appendix I includes species threatened with extinction and trade in specimens of these species is permitted only under highly regulated circumstances. Appendix II includes species not necessarily threatened with extinction, but for which trade must be controlled to avoid a negative impact on wild populations (Wijnsteker, 2018).

Export permits for CITES Appendix II species, or parts or products derived from these, require that the Scientific Authority of the exporting country carries out a Non-Detriment Finding (NDF). NDFs are a procedure to scientifically evaluate parameters such as species distribution and habitats, population status and trends, harvest practices, as well as volumes and impact of trade in target species. They result in a recommendation to the CITES Management Authority of the exporting state. In general, this recommendation is made as a positive NDF (necessary precondition for a CITES permit) or a negative NDF. The structure, content and methods used to develop NDFs vary considerably. This is partly explained by the fact that there are different analytical requirements for different groups of species. In addition, there is an absence of specific guidance documents on how to develop CITES NDFs for specific taxa (Wolf & Oldfield, 2018).

2.5 Biological, trade and Market status

Holothurians (sea cucumbers) are one of the five extant classes of echinoderms. There are about 1,500 species distributed in six orders and 25 families. The six orders are divided by

the presence or absence of tube feet or podia (ambulacral system), the shape of the mouth, the presence or absence of oral retractor muscles, respiratory trees and cuvierian tubules (Secretariat, Nations, Programme, et al., 2019).Very little research had been done on holothurians in the Seychelles(Aumeeruddy & Conand, 2008) listed 151 Echinoderm species, including 35 sea cucumbers, and gives some brief information on the ecology of the most common ones such as *Holothuria atra, Stichopus chloronotus, Bohadschia marmorata, Actinopyga mauritiana and Holothuria nobilis*. A recently completed holothurian population survey has shown that out of the 35 sea cucumber species recorded previously in the Seychelles, there are more than twenty commercial species, some not currently exploited. These are predominantly from the *Holothuriidae and Stichopodidae* families. However, only about six species are regularly fished. These comprise three species of teatfish: the black teatfish (*Holothuria nobilis*), the white teatfish (*H. fuscogilva*) and a teatfish yet to be described and locally named "pentard" (the export name of flower teatfish is used for this species). The two other species found in the catch are the prickly redfish (*Thelenota ananas*) and the yellow surfish (*Actinopyga mauritiana*). The sandfish (*H. scabra*) used to be collected in fairly large numbers, but in the past few years, landings of this species have dropped to very low levels compared to the other five species. Even though this species fetches a high price on the market, the fishers target it less because of its burying behaviour, hence making it more difficult to find. Other species like the lollyfish (*H. atra*) or the elephant trunkfish (*H. fuscopunctata*) are collected in small numbers. The five main species caught (pentard, white teatfish, black teatfish, sandfish and prickly redfish (Aumeeruddy & Conand, 2008).

In Papua New Guinee, it has been traded recently USD42–88 kg-1 dried. In New Caledonia USD40–80 kg-1 dried. In Fiji USD30–55 per piece fresh. Prices in Hong Kong China SAR retail markets ranged from USD128 to 274 kg-1. Prices in Guangzhou wholesale markets ranged from USD25 to 165 kg-1 dried (Catalogue & No, 2012). Markets are Hong Kong China SAR, Singapore, Taiwan Province of China, China and Malaysia. It is sold at USD20–80 kg-1 dry wet, depending on size and condition. Prices in Hong Kong China SAR retail markets ranged from USD106 to 139 kg-1 dried (Catalogue & No, 2012).

Trade in sea cucumber is widespread and one of the oldest forms of commerce in the world. Mostly to satisfy markets for luxury food in East Asia. Major consumers are China, Hong Kong SAR, the Republic of Korea, and Malaysia (Secretariat,(2019). Once caught, sea cucumbers are gutted, boiled and/or dried or roasted. Prepared sea cucumber, or beche-de-mer is then preserved through drying, smoking, canning or freezing. Currently the highest

value species are *Holothuria scabra, H. fuscogilva*, and *H, nobilis* which are worth USD $15-40/kg. Species of medium value include *Actinopyga echinites, A, miliaris* and *Thelenota ananas*, worth USD $10-12/kg. Low value species include *Bohadschia marmorata*, *H. atra, H, fuscopunctata*, *Stichopus tichopus chloronotus* and *S. variegatus*, fetching USD $2-10/kg (Bruckner, 2005). The quoted prices are those on final markets Singapore and Taiwan province of China (Louw & Bűrgener,2020).

The status and the scale of illegal wildlife trade is reported as being among the largest illegitimate trade around the world (Cruze & Macdonald, 2016).Moreover, there are a total of 33 source countries in Africa from which Hong Kong SAR imports dried sea cucumbers. Only six countries in Africa have reported exports of dried sea cucumbers to Hong Kong SAR over the last 10 years (Louw, 2021). This is clearly showing the status of illegal sea cucumber trade in majority of the Africans countries.

Between 2015 and 2021, 92 tons of sea cucumbers and an additional 112,694 parts of sea cucumbers have been seized from at least 23 countries worldwide. These occurred in a total of 204 incidents, where sea cucumbers were occasionally trafficked with other wildlife parts including pangolin scales, rhino horns, ivory, lion teeth, abalone and shark fins. As the overall volume of sea cucumbers seized here is based solely on quantities that have been openly reported, the true volume of sea cucumbers trafficked is likely much higher (Ong, 2022). Malaysia is among the top five countries by volume of sea cucumbers seized, reporting on 14 seizures since 2017, totaling 6.2 tones. Over 80% of this was seized in 2019 alone. One seizure of CITES Appendix II teatfish occurred in Singapore in 2021 (Ong,2022).

The illegal trade in sea cucumbers is mainly a result of illegal fishing operations in source countries, or they have been traded under the declaration of other species, or they have not been declared and were smuggled with other commodities. Of the limited data available on illegal trade in sea cucumbers; there were nine seizures (reported) for sea cucumbers involving African countries between 2017 and 2019 (Louw & Bűrgener, 2020).

2.7 Review of research of sea cucumber CITES listed species in Appendix II in the World, in Africa and Tanzania

In many fisheries *H. fuscogilva* has been overexploited. In the Africa and Indian Ocean region, it is fished in the Comoros, Mozambique, Kenya, Madagascar and Seychelles. In Seychelles, it is considered fully exploited(Catalogue & No, 2012). While, *H. nobilis* is one of the most valuable commercial species and, therefore, is overexploited. Exploitation of *H. nobilis* is at scales ranging from artisanal (e.g. Tanzania) to industrial (e.g. Mauritius). This species was previously harvested by hand collecting from reef lats in Egypt. It is collected by free diving and SCUBA diving in Madagascar and Mauritius. It has been fished commercially in Eritrea, Madagascar, Egypt, Maldives, Mozambique and Seychelles. In Kenya and Tanzania, it is among the most valuable commercial species; however, in Tanzania it is captured in low numbers due to its scarcity. This species has been depleted in Mozambique, India, Madagascar, Egypt, Red Sea, Maldives and probably in Tanzania and Kenya due to over fishing (Catalogue & No, 2012).

The (Secretariat, Nations, Programme, et al., 2019) explained the typical habitant of sea cucmber, live in coastal areas at low depth (from the surface to tens of meters), in coral reefs and seagrasses. They are benthic species: they live at the bottom, on sandy substrates. *Holothuria (Microthele) fuscogilva*, their habitats is external slopes of coral reefs, fairway of reefs and sandy areas in semi-sheltered reefs. Their depth is from 10 to 50 meters - from 0 to 40 meters in seagrasses. *Holothuria (Microthele) nobilis*, their habitats are in low depth habitats of coral reefs (lagoons). on the intern slopes and in seagrasses, with a higher abundance on intern slopes - Their depth is up to 20 meters - from 0 to 40 meters and from 10 to 40 meters (Africa et Occidental areas in the Indian Ocean).

Table 1 World distributions of sea cucumber

Species	Ocean/Sea	Country/Region of distribution range	Distribution
Holothuria (Microthele) fuscogilva	Red Sea Indian Ocean Pacific Ocean	Madagascar, Easter Island, from South China to Lord Howe Island, French Polynesia, Réunion, New Caledonia, Scattered Islands, Wallis and Futuna, Mayotte, Salomon Islands, Australia, India, Zanzibar, Tanzania, Madagascar, Philippines, Kiribati, Tonga, Fiji, Papua New Guinea, Sri Lanka, Indonesia, Cook Islands, Egypt, Vanuatu, Kenya, Somalia, Soudan, Eritrea, Yemen, Saudi Arabia, Hawaii (United States of America), Viet Nam, Seychelles, Malaysia, Singapore, Guam, Micronesia, Jordan, Comoros, Djibouti, Samoa, American Samoa, Brunei Darussalam, Christmas Island, Cocos Islands (Keeling), Mozambique, Tuvalu, Marshall Island, small islands away from the United States of America, Northern Mariana Islands, Oman, Palau, Timor-Leste, Norfolk Island, Tokelau, Pitcairn Islands, Nauru, Niue	
Holothuria (Microthele) nobilis	Indian Ocean Red Sea	India, Maldives, Mayotte, Reunion, Scattered Islands, Kenya, Zanzibar, Tanzania, Egypt, Madagascar, Eritrea, Mauritius, Sri Lanka, Seychelles, Mozambique, Sudan, Yemen, Somalia, Israel, Comoros, Jordan, Djibouti, [Chile]	

2.3 Wildlife Trade Related Laws & Policies

Tanzania became a signatory to the CITES in 1979 and the provisions of its principal law governing trade in wild animals' species were enacted in 1974, a year after the CITES came into force. Tanzania's CITES .However, this does not mean that there exists a lacuna in this respect. The implementation of the CITES in Tanzania has generally been coordinated by the Directorate of Wildlife in the Ministry of Natural Resources and Tourism. Whereas the Director of Wildlife acts as the Management Authority, the Chief Research Officer of the Game Division, also under the Directorate of Wildlife assumes the role of the Scientific Authority as envisaged by the CITES Majamba,(2016).

According to the Text of the Convention, the Management Authority has two basic roles: granting permits and certificates under the terms of the Convention and communicating with

the CITES Secretariat and other Parties. There are many other tasks imposed by the text of the Convention, included in Resolutions and Decisions and other that would be seen as logics for a Management Authority Goldsmith, (1978).

The Scientific Authority provides advice to the Management Authority on issuing permits for the export and import, of a CITES-listed species. The Management Authority first consults with the Scientific Authority prior to issuing CITES export permits. Essentially the Scientific Authority's key role is to ensure that the trade of a CITES-listed species will not be detrimental to the survival of the species in the wild Goldsmith,(1978).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of Study Area

3.2 Geographical Location

Zanzibar, Swahili, Unguja, island in the Indian Ocean, lying 22 miles (35km) off the coast of east-central Africa. The proposed research will target two CITES-listed species (*H. fuscogilva, and H. nobilis*) as practical references to explore more broadly the trade in sea cucumber species in Zanzibar.

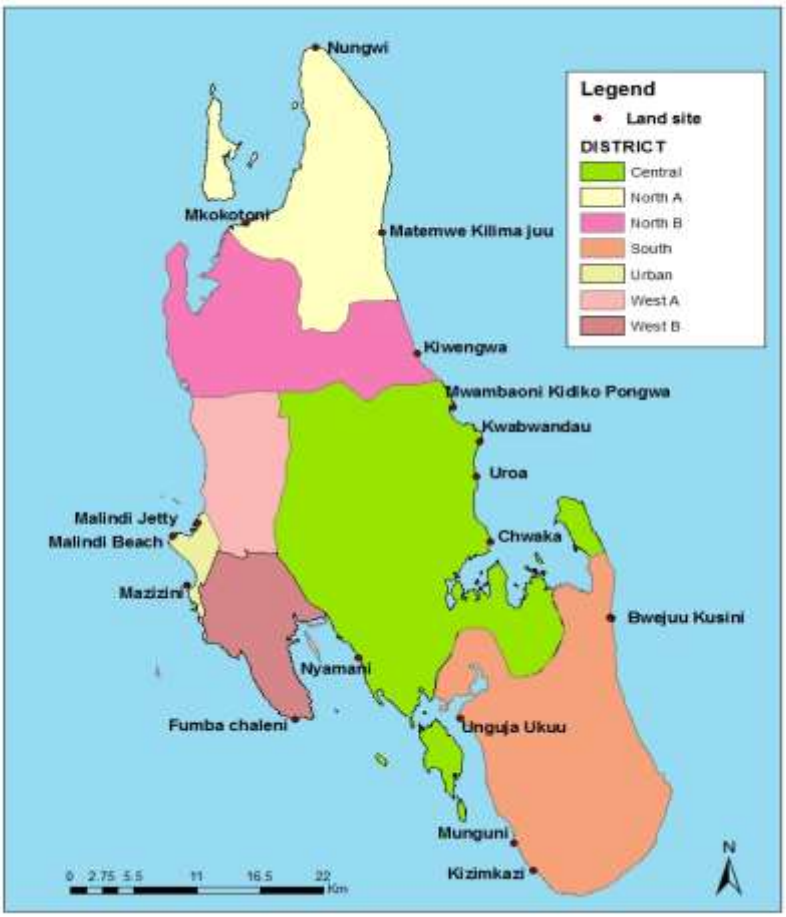

Figure 1 Map of 18 registered landing sites of (Unguja) Zanzibar

3.3 Research design

Given the limited time for data collection, sampling methods were based structured using a cross-sectional sampling design, which is a type of observational study meant to collect data from a population, or a representative subset of a population, at a specific point in time.

3.4 Research sample size

The research was carried out in two phases. Phase one was conducted from October 2022 to November 2022. Out of 234 landing sites existing in all five Regions of Unguja (Zanzibar). It was confined to 18 landing sites (Figure 2). The sample size for sea cucumber farmers / trades will depend on the sea cucumber farmers trader's population in selected landings sites, but it will not be more than 30% of the total fishers / sea cucumber farmers / trades. Also, sea cucumber farm owners in each Region/District/Village will be visited and interviewed by conducting focus group discussion.

3.6 Methods of data collection

Two methods of data collection were integrated. Interview and direct field observation were employed through smart phones software (Kobo Collection). There was a special training on how to use the respective programme. The training was conducted by Information Technology Officer (IT) of the Ministry of Blue Economy and Fisheries Zanzibar. A purposive sampling was used for the selection eighteen (18) landing sites on availability of sea cucumber.

Effort was made to diversify the category of respondents to include those who kept in captivity the sea cucumber and those who fish in the wild. However, while conducting the interviews, it soon become clear that most fisherman were not willing to interview because they were fishing sea cucumber by using destructive fishing gear, which is strictly prohibited in Act No 7 of 2010 of Fisheries.

3.6.1. Qualitative Data Collection

3.6.1.1. Focus Group Discussion

Focus Group Discussions (FGDs) were used to capture information on the status of the trade of sea cucumbers in Zanzibar; one FGD was organized in each landing site. Each group was comprised of 8-12 local fishermen. Guiding questions via mobile phones to lead the discussions which simplified the coding process for data analysis.

3.6.1.2. Interview guide/check list

Set of questions were asked to workers of Department of Fisheries, Marine Protected Areas managers and heads of units to capture important information related to management of sea cucumber and taxa's management, compliance and enforcement. Checklist were administered via smart phones to allow coding and analysis.

3.6.2 Quantitative data

Questionnaire/ electronic questionnaire survey was employed to collect quantitative data for fisherman commonly known as divers. Specific techniques were used for each specific objective. The sampling unit for this study was individual fisherman who uses respective landing site for his activities. The fisherman who fishes sea cucumber, octopus and crustacean are targeted, but in occasion where the fisherman who fish the mentioned species were not around or not willingly to be interviewed a fisherman who participated in fishing activities was involved.

3.6.2.1. Data Collection for Objective one

To address the question of which Appendix II listed species of sea cucumber are in trade in Zanzibar and the extent of that trade (Objective 1) data were collected through questionnaire and focus group discussion. Primary data collection was done through face-to-face interviews and observations. Both open and closed- ended questions were used. Structured questionaries were administered to participants at each landing sites, while checklist was used for fisheries officers. FDGs were used for selected group of sea cucumber farmers. Data was obtained through Kobo collection.

3,6.2.2. Data Collection for objective two

Objective two focused on determination of trade routes that are being used for trafficking bêche-de-mer in Zanzibar. In this objective two unstructured interviews were employed in order to get one depth information about particular cases of interest, for example information about smuggling in Kiswahili known as *Magendo*. Also structured questionnaires were used to collect information about enforcement, for example information about rule and regulation governing illegal trafficking of bêche-de-mer in Zanzibar. Structure interview involved subjecting every information in a sample to the same stimuli in which interviewer asked each respondent similar question. This is because the study wanted to seek data on specific issue such as: formation, location, species, company, agent, fishing gears. An additional checklist was used with department of Fisheries, Department of Conservation and MPAs Managers to gather information on trafficking bêche-de-mer in Zanzibar.

3.6.2.3. Data Collection for objective three

Objective three focused the eventual development of CITES Non-Detrimental Findings (NDF) for selected species in trade in Zanzibar's. Structured and non-structured interview were used to gather information for objective two. It's a research instrument for data collection that involves the collection of data through direct verbal interaction between the

interviewer and interviewee. Focus group discussion and questionnaire was used to collect data of objective number three. Respondent explained the typical habitant of teatfish and their features characteristics. For example, the species life history, abundance and trend, major threats, information about monitoring population and regulating harvests and taxonomy.

In consultation with heads of landing sites, a list of the active fisherman / divers in this study area was prepared to be interviewed, based on their time of landing, type of their practices and activities.

Moreover, the site visit for GPS coordinates verification and observation of marine ecosystem and its environment (biological characteristics and ecological adaptability) remotely operated vehicle (ROV), was conducted in which the major aim of these activities is to get practical knowledge of the areas and information that could be applicable for the objective number three

3.6.2.4 Data collection by using under water drone:

Based on the knowledge of fishers, we took GPS coordinates of the area, and launched the drone in the water, from that point and dive until we start getting visibility and do transient/move along the direction around the area. The drone was able to give compass directions so we know which direction we travel and record video and take a few pictures for analysis.

Table 2 GPS coordinates

S/N	Name of the launch site	GPS coordinates
1.	Kipwa area	S 06° 17.030 E 039°04.424
2.	Kipwa area	S06° 17.217 E039° 03.857
3,	Kipwa area	S 06° 17.097 E039 °03.894

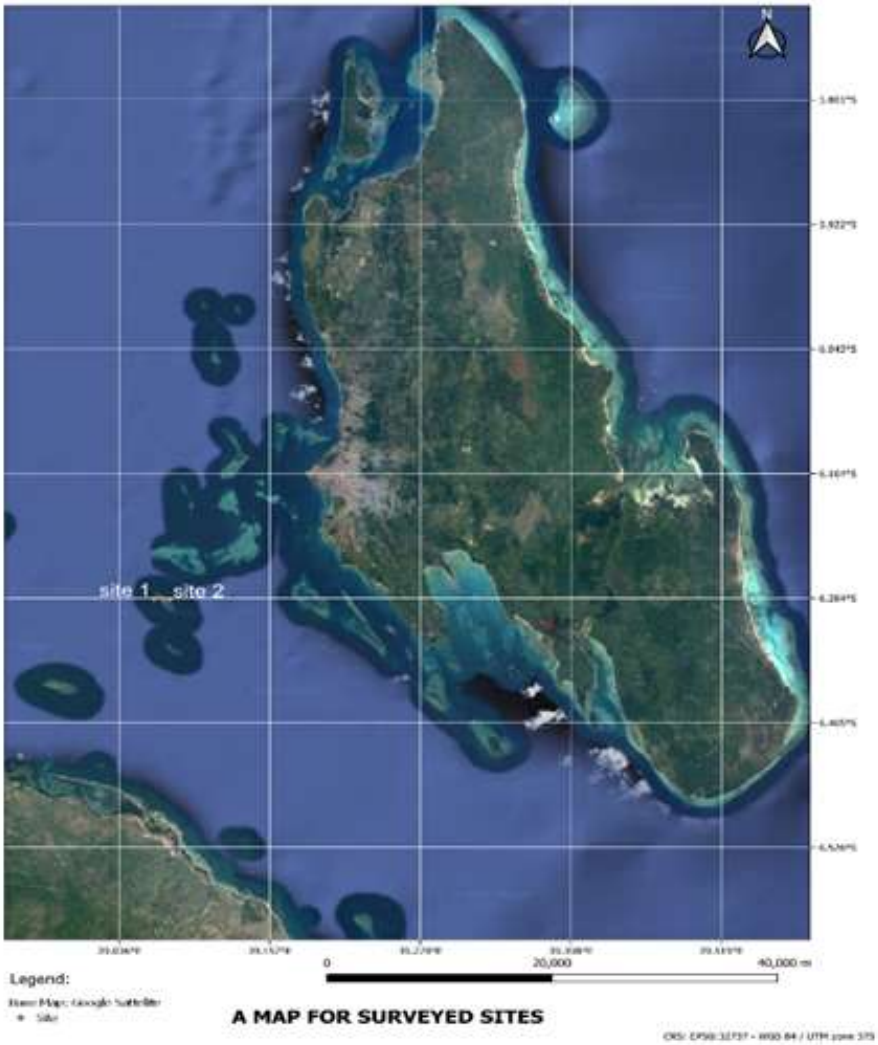

Figure 2 Map of surveyed sites

Figure *3.* Picture of drone and transfer of data from drone to laptop

3.7. Method of Data Analysis

Prior to analysis, qualitative data were processed categorized, summarized and presented in a tabular form. Common and agreed points or views by all discussants from the FDGs were listed in point form, summarized, and coded to resemble to quantitative data to facilitate analysis. Quantitative data were verified coded and transferred to the computer code sheet for process, frequency and percentage. This involved computer data entry, using SPSS programme for statistical analysis, followed by data editing and cleaning.

3.7.1. Qualitative Data Analysis

The qualitative data were analyzed by summarizing the attitudes or opinions of participants recorded in the FDGs by the note takers by using computer application. The analysis employed an ethnographic approach. That is, relying on the direct information given by the respondents according to the themes used during the discussion. On FDGs, the group and not the number of participants, is the main unit of analysis.

3.7.2 Data Analysis for status of sea cucumbers, trade routes that are being used for illegal trafficking bêche-de-mer and CITES Non- detrimental Findings (NDF).

Responses and proceedings of the FDGs were recoded. The cut and paste analysis was used to select the relevant information from key informants and other various respondents, this information was compiled forming the results and discussion chapter.

The quantitative data were edited, summarized and coded before entered/punched into computer for processing. Statistical Package for Social Science (SPSS) computer program was used for analysis. Also, multiple responses were used to analyze all open-ended questions in this study. Descriptive statistics such as frequencies, percentages and means were computed to determine distribution of the responses. After the analysis research findings were put in categories based on the research objectives. Presentation is done through use of tables and figures.

The component of verbal discussion with key informant were analyzed in detail using content analysis method. In this way, the content of the interviews was subdivided into smallest meaningful information. This helped the study in ascertaining values and attitudes of the respondents.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-economic characteristics of the respondents

This section explains the background variables (demographic and socioeconomic factors) which influences sustainable trade. The demographic factors used in this study are age and sex of respondents, whereas, the socioeconomic parameters examined in this study are level of education for respondents. The purposes of choosing these characteristics were to determine whether they have any effect on the understanding of introduction of sea cucumber CITES species listed in appendix II and understanding of the existing illegal trade routes and how the routes being operated.

The total of eighteen (19) outputs successful were produced in the application. The respective out puts were categorized in to four (4) groups.

4.1.1 Socio-economic information;

This section explains the background variables (demographic and socioeconomic factors) which influences sustainable trade. The demographic factors used in this study are age and sex of respondents, whereas, the socioeconomic parameters examined in this study are level of education for respondents. The purposes of choosing these characteristics were to determine whether they have any effect on the understanding of introduction of sea cucumber CITES species listed in appendix II for trade in and understanding of the existing illegal trade routes and how the routes being operated.

4.2.1 Output 1.1: Main occupation,

Occupation in this study means any work related to fishing and farming activities. It has been revealed that 93% respondents in the respective area are engaged in shing. Fishing is a major economic activity in the area and the residents are heavily depend on the marine environment for their daily subsistence. Fishing provides most of the household with cash and food, whereas agriculture provides subsistence needs. While 5% and 2% deal with simultaneously engaged in fishing, sea weed faming and farming.

The trend of occupation above has been dictated by various factors, including inability to manage the simultaneous occupations of fishing and farming lucky to the schedule, nature and their fishing gear, seasons and fishing methods.

Table 3 Main occupation of the respondents

Economic activities	Frequency	Percentage
Fishing	112	93%
Seaweed farming	6	5%
Fishing, sea weed and farming	2	2%
Total	120	100%

4.2.2 Output 1.2: Level of education,

Figure five (5) show level of education attained by various age group of males respondents. They had attained some form of education but none of them had gone beyond primary level. Most of 59% had attained primary education.

Graduates from primary schools or above can be considered to be informed enough on matters regarding biodiversity and conservation. So, they have got clear knowledge of identification of sea cucumber species listed in Appendix II.

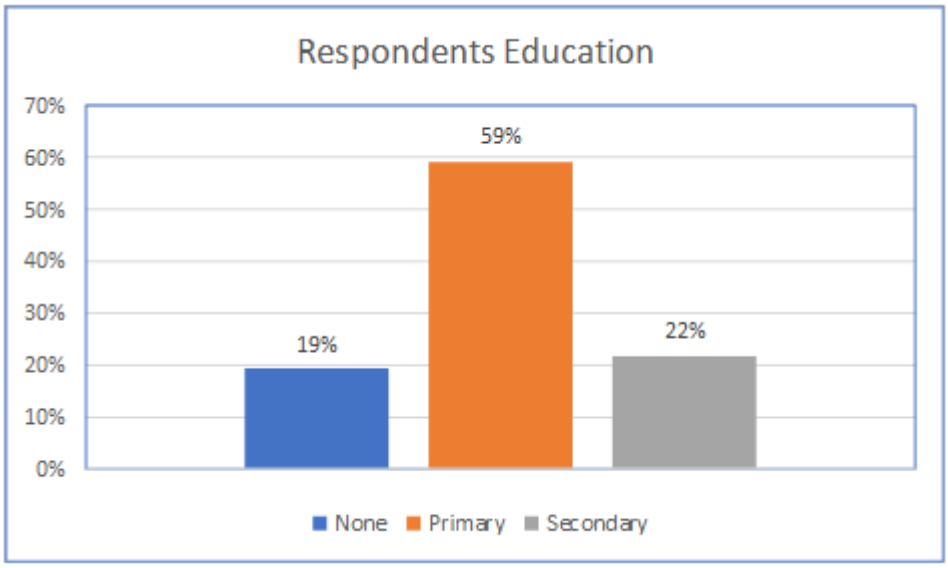

Figure 4 Level of education of respondents

4.2.3 Output 1.3: Gender distributions and age,

Figure six (6) presents the age distribution of the respondents. It can be noted that most respondents were aged between 20 and 59 years. The age distribution is descriptive of what may be expected in most social settings. It is common observation that active working class in Tanzania includes individuals ranging in age between 20 and 59 years.

Cultural transmission through wide age differences may help on conserving taboos, norms and values of society. In Zanzibar such a mixture of age groups could be a conduit through which traditional conservation methods may be sustain over a long time. Young fisherman can learn behaviors, information, values, norms and taboos that my help very much to govern the conservation of sustainable trade of sea cucumber CITES listed in appendix II, from the senior members of the community.

Most of the respondents were men, an observation common in most coastal districts of Zanzibar. Results also showed that all the sea cucumber fishers in Kenya were men (N. Muthiga *et al.,* 2013).The low representation of women in fishing activities reflects the pattern of gender roles in Zanzibar, a strictly patrilineal society, and where it is common place for women not to be involved in outdoor activities. Women are traditionally expected to engage themselves in domestic duties such as taking care of children and prepare meals. Indeed, no female respondents during field visit.

Kunzmann (2018) observed similar practice as applied in Zanzibar's Ministry of Blue Economy and Fisheries, has identified sea cucumber harvest as a key contribution to the island's economy and for the livelihoods of its coastal communities yet recognizes that alternative methods for sea cucumber production are needed. Though women provide bridge of a new ways of economic growth and new source of incoming, by engaging themselves in sea cucumber farming.

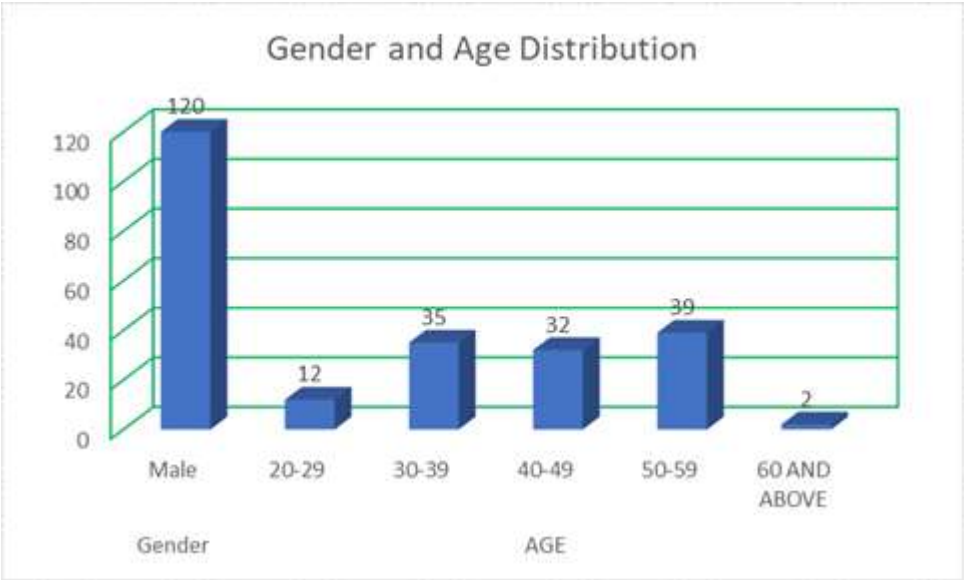

Figure 5 Gender and Age Distribution

4.3 Identification and status of trade in CITES-listed species in Appendix II;

There are four (4) outputs which have been discussed in this objective number one (1): -

4.3.1 Output 2.1: Current status of Sea cucumber in the study area

During survey, it was observed that, one of the most critical elements of successful fishing is the ability to locate right fishing sports. Since the fishermen in this study have no access to modern technology (e,g sonar equipment, GPS and under water drone) they have developed their own local knowledge that is applied for locating correct fishing grounds. Fishermen used application of Luna calenda/ cycle, (generally, fishing schedule is concentrated during or shortly before the new moon. They also able to locate fishing grounds by using indicators of fish habitats this include marine coral formations, marine vegetation and migratory routs). (Hampus Eriksson et al., 2010) who conducted their research at a different area found out the current status of sea cucumber populations was also assessed in the reef areas of Chumbe Coral Park. Chumbe provides a reference site for comparison of commercial sea cucumber assemblage to the nearby reefs Ukombe and Kwale.

Moreover, during field survey with the help of Tanzania Flaying Labs, based on the knowledge of fishers, we took GPS coordinates of the areas, and launch the drone in the water, from that point and dive until we start getting visibility and do transient/move along the direction around the area. The drone was able to give compass directions so we know which direction we travel and record videos and taken a photos. The condition of the commercial sea cucumber stock was investigated using a visual census of sea cucumber populations during June 23, to August 23, 2009 in the coastal areas around three villages i.e. Mkokotoni, Fumba, and Uroa . These specific sites were chosen because they have an active fishery and the geographic location provides fishery information from different sites around the island. Stocks where sampled using two techniques at different scales: a broad-scale assessment using manta tows, and a fine-scale assessment using swimming (or walking) line transects according to(Hampus Eriksson et al., 2010).

Moreover, the underwater videos and images give us information concerning the ecological, biological (taxonomy) status and trend of sea cucumber. In the videos and photos, you might view sand, mud, rocks stone corals, fish and sea cucumber. The only challenge for using under-water drone was appeared difficulty to identify sea cucumber CITES listed in Appendix II. The study further suggests to use more proper technology for identification and abundancy for sea cucumber CITES listed species in Appendix II.

Figure…. Under water drone operated and transient along the direction

Besides, at Mazizini landing site and Mtoni landing site fisherman showed a very high degree of identification of sea cucumber *H. fuscogilva & H. nobilis.* Similar observation has been reported by (Catalogue & No, 2012) Pauni myeupe (Zanzibar, Tanzania were identified by the community.

Figure 6 H. fuscogilva at Mazizini landing site

Figure 7 H.nobils at Mtoni landing site

4.3.2 Sea cucumber abundancy

During FDGs they reported that, preferred sea cucumber abundancy are those areas known locally as *mkondo* which is an area of fast-moving ocean current usually formed by narrow channel between two separate formations of coral rigs. Such locations provide breeding grounds for fish and sea cucumber and are thus more likely to give higher catches to the fisherman. Fishermen reported that, adult sea cucumber are easy to detect and to collect, *Holothuria fuscogilva* local known *Pauni*. The overall average abundance was less than 10 individuals.ha-1 in Kenya and Zanzibar. (N. Muthiga et al., 2013).Fishermen reported the species are very lazy to spawning, they take long lime for this reason their abundancy is low in this study area. Similar observation done by Muthiga,(2013), explained the juvenile sea cucumbers are rarely observed in nature.

Though it's hard to get exact amount of the catches due to local fishermen's lack of traditional practice to measure the sea cucumber products in kilograms. The comparative historical data from previous studies Muthiga, (2013) showed the few surveys that are available indicate a trend of decreasing abundances for species of commercial value.

The divers fished at depths down to 50 m with poor training and worn-out equipment (no buoyancy control device, old regulators, rusting steel tanks were observed). The diving fishers were opportunistic and harvested in areas based on experience and hearsay, both in nearby fishing grounds and in distant waters requiring days at sea (Hampus Eriksson *et al.*, 2010).It is very important to note that, Chumbe reef was the only site where the high value species black teatfish, *H. nobilis*, and the medium value species *S. herrmanni* and *T. anax* (Hampus Eriksson *et al.,* 2010). The study shows 40m underwater video and photos that indicate a low abundancy of sea cucumber in the surveyed areas.

However, it was also revealed in this study about more than one- third of the respondents preferred to dive shallow water (from the service to10m). while about 28% preferred to dive deep water (10-50m) as most suitable depth for sea cucumber CITES listed in Appendix II and 24% of the respondents preferred to dive far from the shore (0-40m). Similar study done by Catalogue, (2012) indicates the common inhabits outer barrier reef slopes, reef passes and sandy areas in semi-sheltered reef habitats in 10 to 50 m water depth. Can also be found in seagrass beds (Papua New Guinea and India) between 0 and 40 m. In Fiji, this species recruits in shallow seagrass beds and then moves to deeper zones.

Experience from this survey showed abundancy were affected by different factors such like gears and methods which fishermen used, scuba diving, climatic variables and scholars methods using while conducting survey. In this study the survey method used was Remotely Operated Vehicle. The methodology appeared difficult to identify the CITES species listed in Appendix II. But, this methodology helped to identify the current status of the selected sites, as indicated in the photos below.

Table 4 Sea cucumber abundancy in the study area

Description	Frequency	Percentage
Deep water (10-50m)	33	28%
Shallow water (from the service to 10m)	58	48%
shallow water far from the shore(0-40m) in the sea grasses	29	24%
Total	**120**	**100%**

Figure 8 Sea cucumber abundancy in Kipwa areas

4.3.3 Output 2.2: Locating fishing grounds in study area,

There are differences in the proportion of fisherman locating fishing grounds, or its variant among the other grounds. Proportionately more fishermen locating in Kitame,Fungumbili, Pwaakuu, Bawe & Pungume than Mkokotoni Boribo & Chumbe. This observation corroborates the earlier one where fishermen who locating fishing ground Kitame,Fungumbili, Pwaakuu ,Bawe& Pungume were shown to be more likely to use the grounds than those at Mkokotoni Boribo &Chumbe.

Table 5 Locating fishing grounds in study area

Description	Frequency	Percentage
Chumbe	13	11%
Boribo,Pwakuu,Kitame	10	8%
Bawe,Pwakuu,Pungume ,Mkokotoni	26	22%
Kitame (nearby Bagamoyo)	25	21%
Kitame,Fungumbili, Pwaakuu,Pungume,Bawe	46	38%
Total	**120**	**100%**

4.3.4 Output 2.3: Use of marine resources

Though hard to get amount of the catches due to local fishermen's lack of traditional practice to measure the fishing products in kilograms, the response indicates about 38% preferred to catch octopus and sea cucumber. As crustaceans and sea cucumber accounted for 20% of all catches. Followed by octopus, sea cucumber and crustaceans its 18% and sea cucumber itself is 16%. The lowest catch of about 9% was observed in relation to shark and rays.

Table 6: The use of marine resources

Species	Frequency	Percentage
Crustaceans Sea cucumber & octopus	21	18%
Octopus & sea cucumber	45	38%
Sea cucumber	19	16%
shark & rays	11	9%
Sea cucumber& crustaceans	24	20%
Total	**120**	**100%**

4.3.5 Output 2.4: Fishing methods used.

The study shows a tendency of mixed varieties of fishing methods ranging from 84% including those using oxygen, shoes, glass, gun & stick rod to merely 8% including those using the fish traps and fish nets. (table 5) the use of those methods goes in line with both economic status of the user and his knowledge of fishing. It is equally important to note that species composition and size of the fish varies with gear type and location. A study on the eighteen landing sites has shown that a vast number of residents are not economical sound to own fishing nets and fishing boats. Though, they engaged in scuba diving.

Table 7 Fishing methods used in the study area

Description	Frequency	Percentage
Fish traps	10	8%
Fishing nets	9	8%
Oxygen, Shoes, glasses, Gun& Stick Rod	10	84%
Total	**120**	**100%**

4.3.6 Output 2.4: Good season for fishing

Experience from the fishermen in the country showed their good knowledge and can able to produce the available information on seasonal and trend in fishing. During focus group discussion it was revealed that most coastal villages within the study area were influenced by seasonal variations. The study showed that in many areas the fishing catches were reportedly higher during six months of the cool North-East Monsoon winds starting October than during the next six months characterized by stronger winds and rough sea of the South- East Monsoon. As a rule, North-East Monsoon winds pave a way for maximum fishing, as opposed to fishing and sailing unfriendly South-East Monsoon is environmentally friendly when it comes to marine biodiversity conservation.

Table 8 Good season for fishing in the study area

Description	Frequency	Percentage
North East wind (kaskazi)	110	92%
South East wind (kusi)	10	8%
Total	**120**	**100%**

It was also revealed in this study that about 92% of the respondents selected the north east wind in local name called *Kaskazi*, as the most suitable season for fishing sea cucumber. *Kaskazi* stats at November until end of January. The same system applied In New Caledonia the study conducted by Catalogue 2012, the species reproduces between November and January. While about 8% of respondents preferred south east wind in local name called *kusi*. Their reason behand they mentioned that no competition of fishing and selling the catches during that *kusi* season. The seasonal pattern with spawning for *Holothuria fuscogilva* occurring between December and April towards the end of the northeast monsoon period on the Kenyan coast according to (N. A. Muthiga et al., 2009). Juvenile *H. atra* were also observed in Kenya between August and December during the north-east monsoon season (N. Muthiga *et al.,* 2013).

4.4 Determination of trade routes that are being used for trafficking bêche-de-mer and how networks operate;

There are three (3) outputs which have been discussed in this objective:

4.4.1 Output 3.1: illegal trade routes of bêche-de-mer,

Smuggled batches of sea cucumbers from Tanzania mainland were observed at trader's facilities (mainly medium and high value species *H. scabra, S. herrmanni, T. ananas, T. anax*, and the three sea cucumber (varieties), which indicates that Zanzibar could be a regional exit point for legally and illegally fished sea cucumbers. (Hampus Eriksson et al., 2010). About two thirds of all fishermen in the respective landing sites said, that there are smuggling routes which used to export bêche-de-mer from Bagamoyo, Mafia and Tanga to inter into unofficial ports, such as Kizimkazi and Nungwi. 15% of respondents said the bêche-de-mer are smuggling from Mozambique to Mailand Dar es a lam and brought to sold in Zanzibar Island.

During the FDGs they reported that there are two existing illegal trade channels in Tanzania. The first illegal route stats at the North West Mozambique in the ocean called Mocimboa da Praia, they took four hours to reached Palma da Praia, from there they navigate until Mtwara in the Malindi peninsular and Shangani Mainland Tanzania.

From that point they used Bodaboda to transfer the half-boiled sea cucumber up to Mtwara bus station; they prefer to use bus for the safety and to minimize long trip by using ocean). Moreover, it is un usually to have boat transport from Mtwara to Kilwa. It has got fast moving ocean currency, though, it is difficult to navigate by boat. In Kilwa they prefare four landing sites to navigate so that they can easily and possible way to land in Zanzibar. (mavunji bus station to Mapimbi landing site, from Nangurukuru bus station to Kilwa Kivinje, from Somanga buss station to Somanga landing site and from Miteja bus station to Mtoni landing site.

The second routes were North Eastern Part of Tanzania. From Tanga to Pemba Islands up to Malindi port in Unguja. Another rout is from Tanga to Mkokotoni Zanzibar. The respondents said in the second routes it does not seems to appear many activities, this is due to the over exploitation of sea cucumber of northern eastern part of Tanzania.

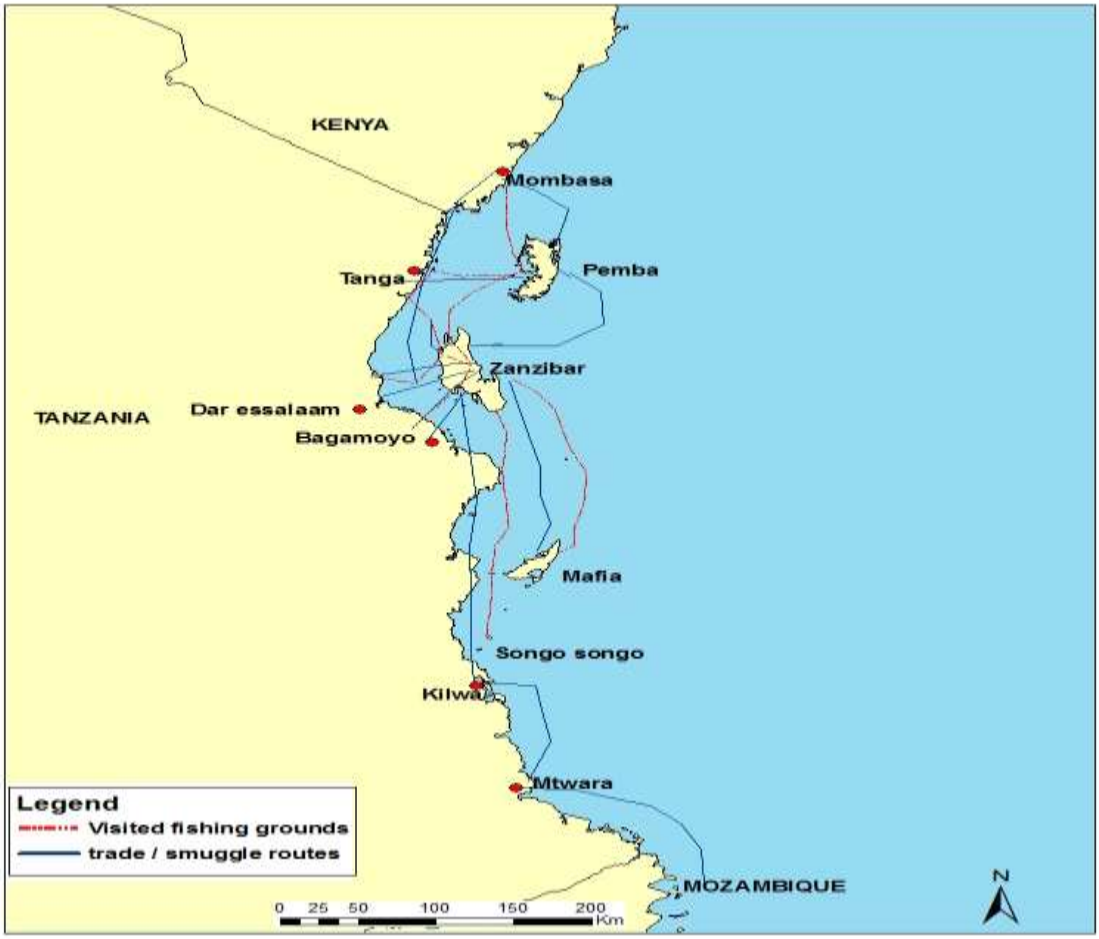

Figure 9 Maps shows existing illegal trade routes

Table 9 Existing illegal trade routes

Description	Frequency	Percentage
Bagaomyo,Mafia, Tanga	102	85%
Msumbiji	18	15%
Total	120	100%

4.4.2 Output 3.2: Markets and price of bêche-de-mer,

85% of respondents said that the market of sea cucumber is China and remaining 2% said they sold their products in Zanzibar.

In the FDGs the sea cucumber trade is a significant industry in Zanzibar, generating thousands of jobs and millions of dollars in revenue annually. The market for beche-de-mer in Zanzibar is primarily for export to Asia, where they are highly prized for their supposed medicinal properties. China, HongKong and Singapore are among the biggest importers of beche-de-mer from Tanzania. The price of beche-de-mere in Zanzibar varies depending on various factors, size, quality. And demand. Generally, larger and rarer species of sea cucumber fetch higher species. The price per kilogram of beche-de-mer in Zanzibar can range from US$40 to US$500, depending on the species and quality.

Description	Frequency	Percentage
China	118	98%
Zanzibar	2	2%
Total	**120**	**100%**

Table 10 Market and price

However, its important to note that the sea cucumber trade is highly regulated in Tanzania Mainland, and it is illegal to harvest of export certain species, sizes, or quantities of sea cucumbers. Offenders can face hefty fines or imprisonment. The government closely monitors the trade to ensure its sustainability and protect the species future.

4.4.3 Output 3.3: Buyer and supplier of bêche-de-mer.

The role of the international trader is to facilitate the transport of the animal from the ecosystems to the recipient markets, while making a profit. Through this role the traders perform a key function in the trade system linking the world market to the local fishery system and the ecosystem (Hampus Eriksson et al., 2010).

About 76% of respondents said they supplied their bêche-de-mer in private company and individuals. 18% said the private company only and 6% they engaged with individuals.

During study FDGs reported that, fisherman and farmers of sea cucumber they do not have even idea of the price and exactly of foreign market. They fish the cucumber but they do not decide the price.

Table 11 Buyer and supplier

Description	Frequency	Percentage
Individuals and private company	91	76%
Private Company	22	18%
Individuals	7	6%
Total	**120**	**100%**

4.5 Development of CITES -NDF for selected species in Zanzibar's;

There are five (5) outputs which have been discussed in this study:

4.5.1 Output 4.1: Legal protection and management of the species status

Tanzania and Zanzibar in particular, has clear national legislation on the protection and preservation of endangered marine species in 1979 (Majamba, 2016). Results from survey and focus group discussion have been used to reflect the existence of national/local laws/regulations in the study area. According to this study national, local laws and regulations referred to those who are written rules, laws and constitutions that guide the behavior of the people/ community and protection of the species. Department of Fisheries and Department of Conservation Zanzibar, they set up the rules that is managed locally by the community and government officials. The main goal is to conserve the natural resources of the areas for sustainable use with active community participation.

Table 12 Existence of National laws that protect species against illegal trade.

Description	YES		NO			
Institution	**Number of respondents**	**%**	**Number of respondents**	**%**	**Total Respondents**	**Total % of Respondent**
Department of fisheries	4	27%	1	20%	5	25%
Department of Conservation	5	33%	2	40%	7	35%
ZAFIRI	6	40%	2	40%	8	40%
Total	**15**	**100%**	**5**	**100%**	**20**	**100%**

Figure 10 DfD heads of units, DfC heads of units & MPAs Managers

Results indicate that the vast majority of the respondents were very much aware of the rules and regulations, training are done to educate the fishermen and patrols are done to preserve marine natural resources and those caught are taken action in accordance with the law. Thanks to regular awareness seminars and meetings to government staffs and village conservation committees. This leaves the remaining very few respondents who are from the new institute of Zanzibar Fisheries and Marine Resources Research Institute to be not well-informed about the regulations.

The Department of Fisheries and Department of Conservation provide technical (training) and financial support to the conservation areas. The main goal of it is to conserve the natural resources for sustainable use with active community participation. The main objective is to :- To protect the marine ecosystem and improve resource yields through management systems that include active local community participation; involve local community in planning, implementation and monitoring of natural resources of Marine Protected Areas.; increase awareness of conservation through educational and public awareness programs; and support biological and socio- economic research and monitoring to provide the basic for rational management.

Furthermore, in the specific meeting with institutions, staffs revealed the current policies and laws in protecting species against illegal trade by listing some of quotations from Fisheries Act No 7 of 2010 and Zanzibar fisheries regulation 1993 that explains: -

‘No person shall practice or undertake any destructive within the area.’

‘No person shall use breathing apparatus for the purpose of fishing’

The study also indicates the importance of legal trade in the conservation and management of sea cucumber, CITES listed in appendix II which is driving factor in the conservation and regulate the trade. Experience from the Department of fisheries and Department of Conservation also showed that, there is no management plan related to the harvest of the species, no system of quotas yet. Similar study conducted by (Hampus Eriksson et al., 2010), the current formal management is insufficient to control the fishery, both in terms of lack of regulation and lack of implementation. The weak formal management capacity is illustrated for example by the paucity of formation of rules and laws.

4.5.2 Output 4.2: Species distributed nationally

Majority reported the species are widespread and fragmented (55%). 25% said widespread and fragmented. According to this study *Holuthuria fuscogilva & Holuturia nobilis* are widely distributed and fragmented followed by 15% said the species are restricted and fragmented and 5% said uncertain. Similar observation was done by Muthiga,(2013) showed the sea cucumbers were ubiquitous and common but the distribution and abundance were highly variable ranging from less than 1 to 2500 indiv.ha-1 depending on the species and the site in Kenya and Zanzibar.

Table 13 Species distributed nationally

Description	Frequency	% of Respondent
Widespread, contiguous	5	25%
Widespread, fragmented	11	55%
Restricted and fragmented	3	15%
Uncertain	1	5%
Total	**20**	**100%**

4.5.3 Major threats

It was also revealed in this study that restrictions of the use of diving equipment, scuba diving on the harvesting of marine natural resources in accordance with the Fisheries law No 7 of 2010. Immature harvesting of marine resources is not allowed according to that National law. However, during underwater drone survey. We captured evidence of the use of spear/gun, and also there is evidence of gas/oxygen found at the landing sites of Mazizini and Mtoni. The same results in harvested by hand collecting, free diving and lead-bombs and by SCUBA diving in Madagascar and hookah in Australia were reported by (Catalogue & No, 2012).

Figure 11 Oxygen cylinders in Mtoni Landing site

Figure 12 Spear gun in Underwater survey in Kipwa

4.5.4 Output 4.4: Species that are protected by law

This study shows a tendency of mixed of variety of species protecting by law ranging from 35% those they respond for dolphin and according to this study, dolphin is the common species protected by law, 29% who respond sharks and rays 24% sea cucumber CITES listed in appendix II, which are *H. fuscogilver & H. Nobilis*.12% sea turtles. According to this study several species are protected through restriction and prohibition from using them. This includes dolphin and turtles. A belief that eating from such kinds of species could result into getting skin diseases, misfortunes and sometimes death, prevents people from catching. Some of the fishermen tends to return their catches back to the water on accidental fishing

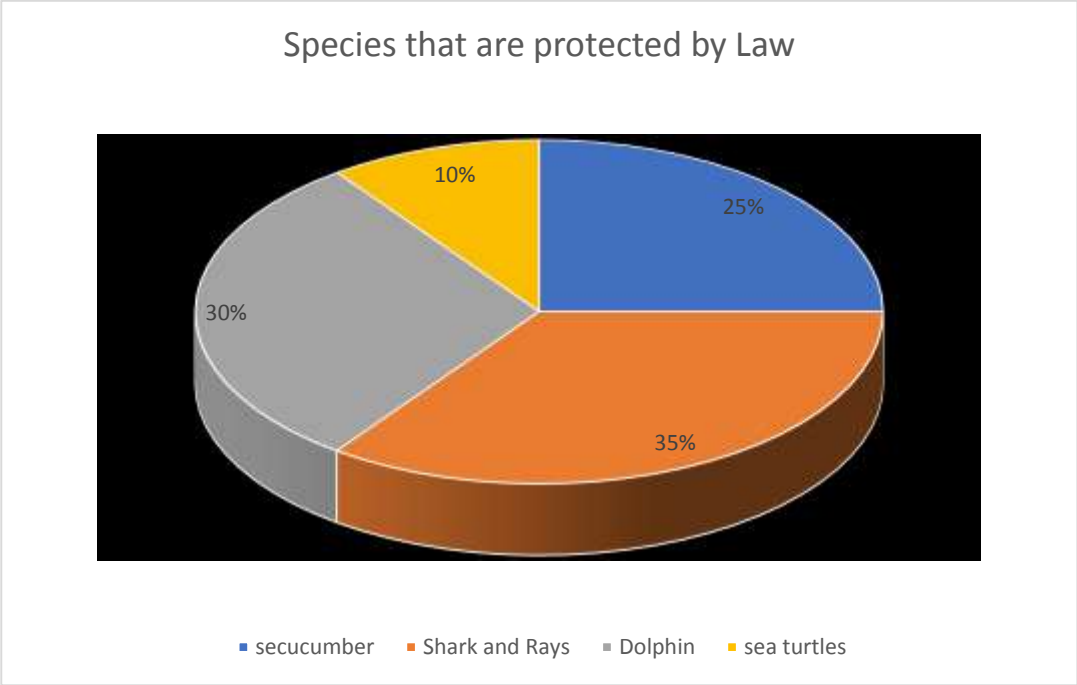

Figure 13 Species that are protected by Law

4.5.5 Output 4.5: Status of biological and ecological characteristics of sea cucumber.

Table 12 shows the contemporary biological and ecological characteristics of sea cucumber in study. Majority of respondents agreed the high reproductive rate of sea cucumber CITES listed in Appendix II. 10% of respondents reported uncertain. Similar study done by (N. A. Muthiga et al., 2009) the reproductive output of marine invertebrates has been shown to be dependent on several factors, including sex, the individual size and ecological factors such as population density. In addition to that the study done by(Lumpur, 2006) little information is published on their population biology, compared with other living marine resources. Basic biological and ecological information is still limited for most commercial species (Lumpur, 2006).

Table 14 Status of biological and ecological characteristics of sea cucumber

Description	Frequency	% of Respondent
High reproductive rate, long-lived and Extreme generalist	7	**35%**
High reproductive rate, short-lived and Generalist	6	**30%**
Specialist	5	**25%**
Uncertain	2	**10%**
Total	**20**	**100%**

4.5.5 The needs of Non-Detrimental Findings for CITES listed species in Appendix II

The study of eighteen (18) landing sites of Unguja has shown the obligatory of conducting the NDF for CITES listed species in Appendix II by highlighting the basic criteria (i.e. species distributed, species abundancy, species' life history, management plan, harvest based on a system of quotas, illegal, unmanaged off-take and trade). According to Eriksson ,(2010) the Zanzibar sea cucumber fishery has passed all indicators (i.e., presence of breeding groups, fishing gear used, sea cucumber abundance, ratio of species abundance, size of sea cucumbers and profit to fishers. It is equally to note that several management measures including minimum size limits, gear restrictions, closed seasons and mariculture are either currently under consideration or implementation (N. A. Muthiga et al., 2009).

In this regards the most important features of the life history strategy of organisms is the appropriate allocation of resources towards growth, maintenance and reproduction so that fitness is maximized. Body size is the main life history trait against which other morphological and physiological features are measured. Body size has also been related to reproductive fi tness because it is assumed that the larger body size results in greater reproductive success. The sex ratio and the differences in the sizes of the sexes are also life history traits of relevance to populations (N. Muthiga et al., 2013).

Table 15 *H. fuscogilva & H. nobilis* NDF criteria standardize & summarized

NDF standards	Results	Conclusions
Species distributed nationally	Holuthuria fuscogilva & Holuturia nobilis are widely distributed and fragmented their harvested in Chumbe Island, Boribo,Pwakuu,Kitame, Bawe,Pungume,Mkokotoni & Fungumbili	Islets closures, spatial and temporal scheduling mitigation could potentially apply to identify and conserve the sensitive sea cucumber CITES listed in Appendix II in Zanzibar.
Species abundancy nationally	Low abundancy	Agent effort needed to replenish stock in the named areas
Species' life history and extents the species adaptable	Low densities and coverage levels of coastal commercial sea cucumber stock	Conservation measures should be undertaken
Management plan related to the harvest of the species	No management plan in place	Establishment of strong management plan
History of harvest	No information	Establishment of strong mechanism to collect sea cucumber species data
Harvest based on a system of quotas	No information	NDF will recommend
Problem of illegal or unmanaged off-take or trade	No data is collected in landing sites	Establishment of strong mechanism to collect sea cucumber species data

CHAPTER FIVE

5.0 CONCLUTION AND RECOMMENDATIONS

5.1 CONCLUTIONS

The study shown that fishermen have active role in identification and status of trade in CITES-listed species in Appendix II. Also, study come out with the fact that a mixed of variety of species protecting by law, this is useful for biodiversity conservation and promote sustainable trade. It is truly examining the restrictions of the use of diving devices, scuba diving on the harvesting of marine natural resources in accordance with the Fisheries law No 7 of 2010. Immature harvesting of marine resources is not allowed according to that law. Awareness and training are done to educate the fishermen and patrols are done to preserve marine natural resources and those caught are taken action in accordance with the law. Moreover, in the issues of legal protection of the species, Tanzania, has clear national legislation on the protection and preservation of endangered marine species in since, 1979.

As indicated earlier in objective two a good season for fishing and abundancy are showed that in many areas the fishing catches were reportedly higher during six months of the cool North-East Monsoon winds starting October than during the next six months characterized by stronger winds and rough sea of the South- East Monsoon. As a rule, North-East Monsoon winds pave a way for maximum fishing, as opposed to fishing and sailing unfriendly South-East Monsoon is environmentally friendly when it comes to marine biodiversity conservation. Moreover, preferred sea cucumber abundancy are those areas known locally as *mkondo* which is an area of fast-moving ocean current usually formed by narrow channel between two separate formations of coral rigs. Such locations provide breeding grounds for fish and sea cucumber and are thus more likely to give higher catches to the fisherman. A study on the eighteen landing sites has shown that a vast number of residents are not economical sound to own fishing nets and fishing boats. Though, they engaged in scuba diving. The study given the current status by using the underwater videos and images that give us a lot of information concerning the ecological, biological (taxonomy) status and trend of sea cucumber. In the videos and photos, you might view sand, mud, rocks stone corals, fish and sea cucumber. The under-water drone was appeared difficulty to identify sea cucumber CITES listed in Appendix II.

Two thirds of all fishermen in the respective landing sites said, that there are smuggling routes which used to export bêche-de-mer. There are two existing trade routes. The first illegal route stats at the Northwest Mozambique up to Mtwara and Kilwa. In Kilwa they use

four landing sites to navigate so that they can easily and possible way to land in Zanzibar. The second routes were Northeastern Part of Tanzania. From Tanga to Pemba Islands up to Malindi port in Unguja. From Tanga to Mkokotoni Zanzibar.

The price of *Pauni* in Zanzibar is $40/kg. But local fisherman and farmers of sea cucumber are not aware of the cost of sea cucumbers in foreign markets. They fish the sea cucumber but they do not decide neither the price no the market place.

The study concludes that eventual development of CITES Non- Detrimental Findings (NDF) for selected species *H. fuscogilva & H. Nobilis*. Promotes biodiversity conservation in many ways and that eventual development of NDF acquired through legal protection and management of the species status, national monitoring & exports for bêche-de-mer, harvesting restrictions for sea cucumber, species that are protected by law, status of biological and ecological characteristics of sea cucumber.

There is a need for eighteen (18) landing sites, statistics section in Department of Fisheries and ZAFIRI, to develop a system that used in defining fishing scheduling and locating fishing grounds. For the reason that, system will identify best fishing areas (sea cucumber CITES listed in Appendix II) for example in spawning areas, feeding areas and immigration.

5.2 RECOMMENDARTIONS

The study suggests that conservation planners should focus their attention on the illegal trade routes for partnership strategies with TRAFFIC International. The study also suggests that conservation management of Ministry of Blue economy and Fisheries Zanzibar and all other natural ecosystems should involve everybody, especially local people who are considered to be part of the problem and also potentially part of the solution. There is a need to work more and to research on the how this illegal route operates? This will help to strengthen enforcement authority in Zanzibar.

It is recommended that the data from this research have made it possible to do analysis which has given an insight into the eventual development of CITES Non- Detrimental Findings (NDF)for selected species. However, a lot remains to be done (monitoring and restriction on harvesting, control on National harvesting, surveillance, statistics, monthly reporting and research to better understanding on all NDF process.

The study also recommends to establish a standard mechanism to record and process the information required and available to a CITES Scientific Authority (SA) in order to make an adequate NDF in ZAFIRI& TAFIRI for selected species.

Capacity building training program on identification of sea cucumber species and detection or tracking of illegal fishing in the areas.

Establishment of daily catch monitoring data for the sea cucumber cooperating with trade middleman.

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APPENDIX 1

INTERNATIONAL UNIVERSITY OF ANDALUSIA (UNIA) MASTER'S DEGREE IN MANAGEMENT AND CONSERVATION OF SPECIES IN TRADE: THE INTERNATIONAL FRAMEWORK (14TH EDITION) 2022-2023.

INTRODUCTION OF SEA CUCUMBER CITES SPECIES LISTED IN APPENDIX II FOR TRADE IN ZANZIBAR, TANZANIA

QUESTIONNAIRE NO: .....

LATITUDE (NUMERIC GPS UTM)

LONGITUDE (NUMERIC GPS UTM)

PERSONAL PARTICULARS

SHEHIA: .....

VILLAGE: .....

1.0. DETAILS OF A NUMERATOR

NAME		**DATE**	

2.0.DETAILS OF THE RESPONDANT

a. GENDER	**1. MALE**	**2. FEMALE**

b. AGE	**20-29**	**30-39**	**40-49**	**50-59**	**60ABOVE**

c. EDUCATION	**PRIMARY**	**SECONDARY**	**COLL/UNI**	**NONE**

BIODIVERSITY

3. What type of boat are you going out with?

Type of boat	**Tick**
Outriggers	
Dug-out canoes (Ngalawa),	
Sailing boat	
Motorised boat	
Auxiliary boat	

4. What type of fisheries resources are you targeting during your fishing operations?

Species	**Tick**
Fin fish	
Octopus	
Sea cucumber	
Crustaceans	
shark and rays	

5. What is the main type of sea cucumber fishing /collecting method do you use?

Fish traps	Fishing nets	Various types of lines
Other (please specify)		

6. Do you use any other method for fishing/ sea cucumber collecting?

   1. Yes 2. No

7. If yes, mention those methods

8. Where do you fish /collect sea cucumber? Select two most important places that you normally fish / collect.

Shallow water closes to the shore	shallow water far from the shore	D deep water

9. Which season is good for fishing / collecting? (In which you get more collection)

Season	Tick	Comment why
South East wind (kusi)		
North East wind (kaskazi)		

10. In the table below indicate whether the access of fishing/ collection grounds and species in the area is limited or unlimited.

Resources	**Limited**	**Unlimited**	**Please give your comments**
Fishing grounds			
Species			

COMMUNITY CONTRIBUTION ON KNOWLEDGE AND STATUS OF SEA CUCUMBER TRADE IN CITES-LISTED SPECIES IN APPENDIX II

11. Which sea cucumber species are mostly catching in the area?

Scientific name	Local name	
1. *H. fuscogilva*	Pauni	
2. *H. nobilis*	Pauni	
3. *Thelenota ananas*	Spinyo baba	
4. *Theleonota anax*	Spinyo mama	
5. *H. pentard*	Pauni	
6. *Holothuria scbra*	Jongoo mweupe	

12. Are there any sea cucumber species which are no longer caught in the area?

Yes / no

If yes list down

13 Which Sea cucumber species are no longer catch in this area?

Scientific name	Local name	Comment why?
1. *H. fuscogilva*	Pauni	
2. *H. nobilis*	Pauni	
3. *Thelenota ananas*	Spinyo baba	
4. *Theleonota anax*	Spinyo mama	
5. *H. pentard*	Pauni	
6. *Holothuria scbra*	Jongoo mweupe	

14 Please indicate to which extent you agree or disagree with the following statements

Statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Sea cucumber depleted and species lost					
The demand of sea cucumber incidents has increased					

Sea cucumber stocks is more unstable now than ever					

15 Which sea cucumber species is highly harvested in Zanzibar? Why is it highly harvested?

……

16 Has the abundance of sea cucumber resources change over the last 5 years in the following areas?

Shallow water		Deep water	

17 If yes, how?

Increased	Decreased	Stayed the same

18 What do you think are the major 3 causes of this change?

Illegal trade	Changes of the ocean	Increase demand	Deterioration of coral reefs
Conservation strategies	God's will	Long duration of kusi	Long duration of kaskazi

19 Do you feel that the above-mentioned changes have an impact in your life and that of your family?

……

Yes/ No

20 If yes, have they impacted any of the following factors related to your household wellbeing?

Impact	**High**	**Moderate**	**Low**	**No impact**
Income from sea cucumber				

Money for education				
Poor health-poor nutrition				
Household saving				

21 Which fishing ground where wild teatfish species are found or previously?

……. **SUPPLY AND DEMAND OF SEA CUCUMBER TRADE FROM ZANZIBAR**

22 Who is the buyer of sea cucumber in Zanzibar?

Government	Private Company	Individuals		

23 Who re the supply of sea cucumber?

Government	Private Company	Community		

24 what are the reasons attracting traders to get involved in the capture and trade in sea cucumber?

25 Who are the main consumers of this species in Zanzibar?

26 Who are the main consumers outside Zanzibar?

27 What are the main markets for the species?

THE TRENDS OF ILLEGAL TRADE OF SEA CUCUMBER SPECIES SOUCED FROM ZANZIBAR

28 Do you know anything about illegal fishing of sea cucumber?

1. Yes 2. No

29 Do you know about sea cucumber CITES species listed in appendix 11?

1. Yes 2. No

30 What are the factors that have affected the control of illegal and unsustainable trade of species you are familiar with?

Factors	
Poverty and Income generation	
Economic value of species	
Institutional effectiveness	
Local culture and tradition	
Weak or no decentralization Authorly	
Demand of foreign investors	

31 What other comments do you have about sea cucumber trade?

CHECKLIST FOR KEY INFORMANT

MARINE CONSERVATION AREA MANAGERS

FISHERIES OFFICERS

RESEARCHERS

	Legal protection and management of the species	
1.	Are there any National/local laws/ regulations that protect species against illegal and unsustainable trade?	Yes No If yes mention
2	Do you know any species that are protected by law?	Yes No If yes please provide example
3	If yes what laws do you know that protect sea cucumber CITES species against illegal trade?	Mention
4	Do you know the importance of legal trade in the conservation and management of sea cucumber?	Yes No If yes explain
5	How effective are current policies and laws in protecting species against illegal trade	Explain
6	What do you see as opportunities for improving the protecting of species (*H. fuscogilva & H, nobils*) against illegal trade ?	Explain
7	Have you been able to identify teat-fish species to ensure they have the proper permit for import, export, or re-export?	Explain
8	Do you know anything about sea cucumber species listed in CITES Appendix II?	YES NO If yes, Explain
9.	Do you know best sites for sea cucumber collection in Zanzibar?	Yes No if yes explain
	Biological characteristics	
10	What is the species' life history?	High reproductive rate, long-lived High reproductive rate, short-lived Low reproductive rate, long-lived Low reproductive rate, short-lived Uncertain
	Ecological adaptability	
11	To what extent Is the species adaptable (habitat,	Extreme generalist

	diet, environmental tolerance etc)?	Generalist Specialist Extreme specialist Uncertain
12	Is the species tolerant to human activity other than harvest?	No interaction Tolerant Sensitive Uncertain
	National status	
13	How is the species distributed nationally?	Widespread, contiguous Widespread, fragmented Restricted and fragmented Uncertain
14	What is the abundance nationally?	Very abundant Common Uncommon Rare Uncertain
15	What is the recent national population trend?	Increasing Stable Reduced, but stable Reduced and still decreasing Uncertain
	Quality of information	
16	What type of information is available to describe abundance and trend in the national population?	Quantitative data Good local knowledge Qualitative data Anecdotal information None
	Major threats	
17	What major threat is the species facing (underline following: overuse/ habitat loss and alteration/	None Limited/Reversible Substantial Severe/Irreversible Uncertain
	Harvest management	
18	How significant is the national problem of illegal or unmanaged off-take or trade?	None Small Medium Large Uncertain
19	What is the history of harvest?	Managed harvest: ongoing with adaptive framework Managed harvest: ongoing but informal Managed harvest: new Unmanaged harvest: ongoing or new
20	Is there a management plan related to the harvest of the species?	Approved and co-ordinated local and national management plans

		Approved national/state/provincial management plan(s) Approved local management plan No approved plan: informal unplanned management Uncertain
21	What is harvest aiming to achieve?	Generate conservation benefit Population management/control Maximise economic yield Opportunistic, unselective harvest, or none Uncertain
22	Is the harvest based on a system of quotas?	Ongoing national quota: based on biologically derived local quotas Ongoing quotas: "cautious" national or local Untried quota: recent and based on biologically derived local quotas Market-driven quota(s), arbitrary quota(s), or no quotas Uncertain
23	What percentage of the legal national harvest occurs in Marine Protected Areas?	High Medium Low None Uncertain
24	What percentage of the legal national harvest occurs outside Protected Areas, in areas with strong local control over resource use?	High Medium Low None Uncertain
25	What percentage of the legal national harvest occurs in areas where there is no strong local control	None Low Medium High Uncertain
26	What is the principal method used to monitor the effects of the harvest?	Direct population estimates Quantitative Qualitative National monitoring of exports No monitoring or uncertain
27	At the national level, how much conservation benefit to this species accrues from harvesting	High Medium Low None Uncertain
28	At the national level, how much habitat conservation benefit is derived from harvesting?	High Medium

		Low None Uncertain
29	How effective are any restrictions on harvesting (such as age or size, season, or equipment) for preventing overuse)?	Very effective Effective Ineffective None Uncertain
30	What other comments do you have about the sea cucumber trade	Explain

MONITORING CONTROL AND MANAGEMENT OF SEA CUCUMBER SPECIES

13 Who gives Authority /Permission for the capture and trading of sea cucumber?

14 How many sea cucumber farms are there in this area?

15 Does sea cucumber farms are officially registered?

16 Are there different institutions collaborating and sharing information?

17 What could be done to strengthen the conservation of sea cucumber?

18 What other comments do you have about illegal sea cucumber trade?

QUESTIONAIRE FOR VILLAGE LEADERS

1. Are you aware about the sea cucumber listed in CITES Appendix II?
2. Do you know about *H. fuscogilva and H. nobilis*?
3. Are you aware about illegal sea cucumber trade?
4. Does Local leader understand about conservation and management of sea cucumber species in trade?
5. What other comments do you have about illegal sea cucumber trade?
6. Where are they currently fishing/collecting the sea cucumber?
7. Where do they previously used to catch the sea cucumber?

QUESTIONAIRE FOR FDG

1. Do you know about sea cucumber species listed in CITES Appendix 11?
2. Do you know teatfish species (*H. fuscogilva and H. nobils*)?

3. Do you fish sea cucumber?
4. List the species you fish
5. Do you keep in captivity? (Sea cucumber farm)
6. Which species do you keep in captive?
7. Where do you fish sea cucumber?
8. Do you export sea cucumber? OR you cell to the company?
9. Who participate in sea cucumber fishing in your village?
10. In your opinion the existing fisheries law is useful for aspect of conservation and management of sea cucumber?
11. Is there any particular season of the year for fishing sea cucumber?
12. Do you know about illegal trade of sea cucumber?
13. What other comments do you have about illegal sea cucumber trade?