CONSERVATION OF GREEN TURTLES ON THE CARIBBEAN COAST OF NICARAGUA – A GOVERNANCE APPROACH

By

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Cover Pictures

A fisherman from Sandy Bay Sirpi on the beach doing repairs on is traditional turtle boat "Dury tara"(Big boat)

ABSTRACT

Policy-makers often regard community as one of the main conflicting and challenging points in the coastal-marine resource management context. Community response to implemented policy often poses a challenge for management institutions when addressing the complexities of the community◄► resource interaction and societal resilience to policy implementation on their social welfare. This is usually the main reason why communities and local-communal knowledge are often omitted or ignored as a crucial part of resource management. In the effort to preserve marine green turtles (*Chelonia mydas*) on the Caribbean coast of Nicaragua, coastal indigenous communities are often left alone with the burden to cope with the challenges of socio-economic changes imposed by the management institutions. Green turtle management policies are effectively addressing the problem of resource overharvest. However, they also effectively ignore the impact of these policies on coastal communities'. This research is an effort to highlight some of the socio-economic challenges and problematic faced by the indigenous communities in the Rio Grande Delta on the Caribbean Coast of Nicaragua. While addressing the negative effect of resource management when local-Indigenous knowledge and participation is ignored, it also takes into account the need for effective management strategies which integrates the collective conservation effort and community participation, as many researchers have exposed. There is an increasing awareness and concern for the cultural motivations behind the harvesting of green turtle. Pointing out the evidently critical need to shift conservation efforts from a top-down approach based purely on scientific knowledge to a joint bottom-up effort involving the local indigenous communities and their experiences as firsthand users. In time, this effort will lead to improvement of management policies and strategies which will not only provide more reliable and effective conservation methods for the green turtle population which incorporate both biological and social factors, but also ensure the compatibility with the communities' socio-economic and socio-cultural livelihood system as resource-dependent.

Keyword: Rio Grande Delta, green turtle, resource management, Indigenous communities, conservation, community development, fisheries development, governance

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ACKNOWLEDGMENT

I would like to first give thanks to god allowing me opportunity to fulfil one of my most cherished dreams. The inhabitants of the communities of Sandy Bay Sirpi and Rio Grande Barr for their trust and for giving me the opportunity and warn welcome when approached with the research project. Without their support, it would have not been possible to carry out my thesis.
I hope that this thesis become and additional stone in your struggle to become more visible and look upon, with your knowledge and expertise highly valued because of your ancestral, cultural and spiritual link as true owners of your lands.
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We must respect each other's right to choose a collective destiny, and the opportunity to develop the legal and political rights for Indigenous and non-Indigenous peoples so that we may enjoy the right to maintain our culture, our heritage and our land.

Jackie Huggins

"It's a gift from me to them. They don't have what most people have and hopefully this will help them get what they need."

Nick Smith

By request of the people interviewed and of respect to their intellectual property and rights to freedom of speech some names were omitted in the statements given.

LIST OF ACRONYMS

BICU: Bluefields Indian and Caribbean University

CIDCA: Centro de Documentación e Información de la Costa Atlántica de Nicaragua

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.

FAO: Food and Agriculture Organization of the United Nations.

GDP: Gross Domestic Product.

GNP: Gross National Product.

GPS: Global Positioning System

HDI: Human Development Index

IAC: Inter-American Convention for the Protection and Conservation of Sea Turtles.

IDB: International Development Bank

ITQ: Individual Transferable Quotas

MARENA: Ministerio del Ambiente y los Recursos Naturales (Ministry of the Environment and Natural Resources)

MSY: Maximum sustainable yield

NGOs: Non-Governmental Organization.

PNUD: Programa de Naciones Unidas para el Desarrollo.

PRODEP: Programa de Ordenamiento de la Propiedad

RAAN: Región Autónomo Atlántico Norte (Northern Autonomous Atlantic Region)

RAAS: Región Autónomo Atlántico Sur (Southern Autonomous Atlantic Region)

TEDs: Turtle Excluder Device.

UNDP: United Nation Development Program

URACCAN: Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense.

WCS: Wildlife Conservation Society

Chapter One: Introduction

1.1. The Nicaraguan Caribbean Coast

The Caribbean Region (Atlantic or Caribbean Coast) of Nicaragua is much more extensive compared to the Pacific Region. Consisting of over 47% of the surface of the country and yet contains only around 9% of its total population, divided into the Northern Autonomous Atlantic Region (RAAN[1]) and the Southern Autonomous Atlantic Region (RAAS), both mainly inhabited by indigenous and ethnic groups such as the Miskitus, Creoles, Garífunas, Sumus-Ulwas, Ramas and Mestizos[2]. It represents a perfect and plausible proof of human-ecosystem interaction. It is a complex mosaic of interrelated coastal and terrestrial ecosystems and multiethnic communities that extend approximately 500 kilometers from Honduras (North) to Costa Rica (South), and contains one of the largest remaining areas of tropical lowland rainforest in Central America and one of the most pristine fisheries of the Caribbean basin, making this an area of impressive biodiversity (Christie et-al. 2000).

This research is focused on the harvesting of green turtle and the lifestyle the of indigenous communities of Sandy Bay Sirpi and La Barra in the Rio Grande Delta[3]. The management implication for success, poverty and resource dependent issues and policies inefficiency to address the pressing global concern of Green turtle (*Chelonia mydas*) conservation and the role played by coastal communities.

Fishing has long been a traditional economic and cultural activity of the inhabitants of the different communities on the Caribbean Coasts of Nicaragua, among which marine green turtle have been harvested by Amerindians since before the arrival of Europeans to the New World (Lagueux 1998). Green turtle harvesting on the Caribbean has been dated

[1] The Caribbean Coast of Nicaragua, also known as Atlantic Coast of Nicaragua, is divide into sub-regions Northern Autonomous Atlantic region (RAAN – Spanish translated) and Southern Autonomous Atlantic Region (RAAS – Spanish translated)
2 Mix of European and indigenous Amerindian ancestry
3 A landform where a river mouth flows into an ocean

back to more than 400 years (Campbell, C. 2003). It was used not only by the indigenous peoples for local consumption, but also to feed crew on ships exploring the region. Jackson (1997) emphasizes that coastal ecosystems in the Caribbean were severely degraded by fisheries long before ecologists began to study them. Large vertebrates stocks such as green turtle, hawksbill turtle, manatee and extinct Caribbean monk seal were decimated by around 1800 in the Central and North Caribbean.

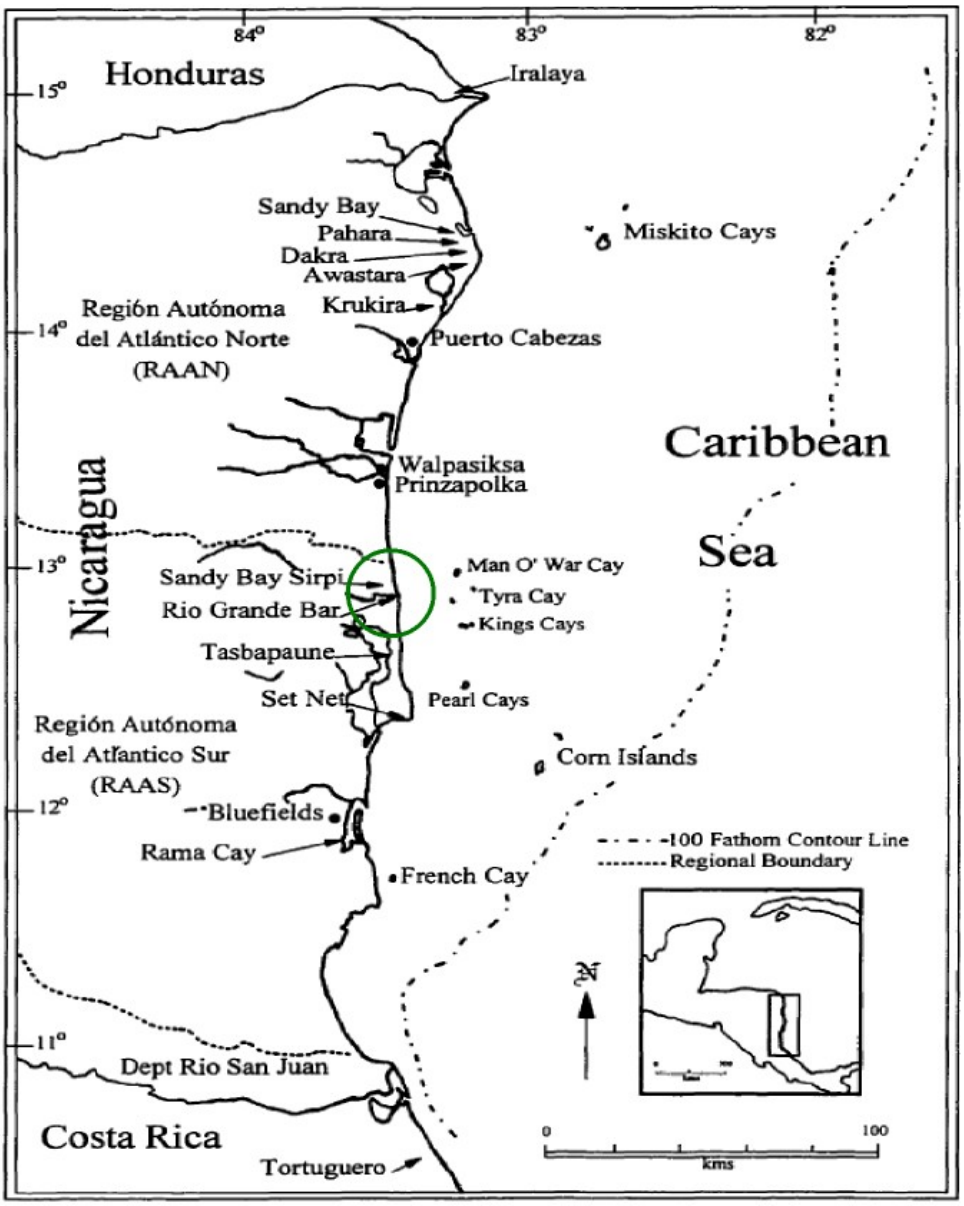
Today, fisheries and marine resources represent the basis of social and economic development on the Caribbean Coast of Nicaragua. Effort towards protecting precious resources such as green turtle, however, has been limited; instead the increase of fisheries production or maximum sustainable yield[4] (MSY) of some of the major fisheries stocks (shrimp, spiny lobster and scale fish) has been the major concern, with negative effects (due in part to the migratory pattern of tropical species that migrate between countries competing for the same resource); e.g. Caribbean spiny lobster (*Panulirus argus*), habitat degradation, illegal fisheries and the low disposition of continuous monitoring efforts.

Extended for approximately 200 km, at its widest point eastward from Cabo gracias a dios, near the Honduras-Nicaragua border approximately 20 km wide near the Costa Rica-Nicaragua border, divided in two regions RAAN and RAAS (Lagueux, 1998), (Figure 1).

The continental shelf on the Caribbean coast of Nicaragua could be pictured as an admirable combination of overlapping and complex socio-cultural beliefs, diverse culturally based subsistence systems, harmonious and cooperative resource harvesting patterns evidenced among the culturally diversified indigenous and ethnic groups living in the region, combined with a scenario un-influenced or limitedly affected by the globalization process and the extensive degradation of the natural environment.

[4] The largest catches that can be taken over a long-term without causing population to collapse

Figure. 1: Caribbean Coastline of Nicaragua with coastal communities and towns.



Source: adapted from Lagueux, 1998.

1.2. Traditional indigenous linkage to turtle fisheries

Marine turtle conservation has grown into a pressing issue and focus for government agencies, international fisheries monitoring agencies, management agencies and NGOs[5]. Since the approval of the CITES[6] treaty in 1973 to protect wildlife against over-exploitation, and to prevent international trade from threatening species and also the enforcement of the IAC[7] in 2001, strict policies have been adopted and established in various countries members of these intergovernmental treaties regarding the use of sea turtles as a result of compromises adopted by various countries governments to protect marine turtles.

As a result of such international agreements, various laws and regulations have developed to protect marine turtles, in most cases with evidence (i.e., IAC, article IV section 2 - g., section 3 - a., Article VII section 2 - c)[8] focused on the analysis and inclusion of socio-economic effects of policies on coastal communities. This has resulted in very little or no sign that coastal communities are actually playing a more participative role in the management and policy-making in most countries worldwide, other than a semi-consultative role in some cases where turtle nesting occurs.

The traditional harvesting linkage to the use of green turtle in the Rio Grande Delta, the lack of socially sustainable management and development alternatives, along with the

[5] Non-Governmental Organization
[6] Convention on International Trade in Endangered Species of Wild Fauna and Flora
[7] Inter-American Convention for the Protection and Conservation of Sea Turtles
8 Article IV, Measures –

> 2. Such measures shall include: g. The promotion of environmental education and dissemination of information in an effort to encourage the participation of government institutions, non-governmental organizations and the general public of each State, especially those communities that are involved in the protection, conservation and recovery of sea turtle populations and their habitats;
>
> 3. With respect to such measures: a. Each Party may allow exceptions to Paragraph 2(a) to satisfy economic subsistence needs of traditional communities, taking into account the recommendations of the Consultative Committee established pursuant to Article VII, provided that such exceptions do not undermine efforts to achieve the objective of this Convention. In making its recommendations, the Consultative Committee shall consider, inter alia, the status of the sea turtle populations in question, the views of any Party regarding such populations, impacts on such populations on a regional level, and methods used to take the eggs or turtles to cover such needs;

conservation effort which directly disrupts the lifestyle of coastal inhabitants on the Caribbean coast of Nicaragua.

Not only excluding these communities from direct management participation but also limiting the intake of one of their main protein source without any direct and effective replacement means. This particular approach to managing marine turtles is leading these communities into a future of uncertainty.

1.3. Conservation effort and indigenous knowledge

Human dependence on marine and coastal resources is increasing. Today, small-scale fisheries employ 50% of the world's fishers, practically all of whom live in developing countries (Berkes et al. 2001). However, it is considered to be one of the less managed fisheries sectors. Therefore, management, sustainability and development solutions rely on the capacity of these small-scale fishers, government agencies, and NGOs to seek and achieve new and sustainable alternatives for development, that do not imply the further degradation of marine and coastal resources and ecosystems.

Conservation over the past five decades has become a growing concern since major fish stocks all over the world have been severely overexploited and in some cases depleted (FAO[9], World Bank[10]).

The growing concern and focus in more recent discussions on conservation issues have also involved the role played by indigenous peoples in conservation initiatives not only as conservationist but as resource managers. Nevertheless the concerns to incorporate the indigenous participation in resource governance in many cases are likely to be governed by a top-down approach.

[9] http://www.fao.org/newsroom/common/ecg/1000505/en/stocks.pdf
[10] http://www.worldbank.org/html/cgiar/newsletter/May96/5ifpri.html

For many years, fisheries scientists have tried to provide advice that could be used to prevent the overexploitation or collapse of fish stocks. However, the increasing intensity of fishing globally has had impacts on the marine ecosystem other than those on targeted species (Jennings et al 2000:14). Therefore, sustainable resource use has become a central to contemporary conservation policy.

Not until recently, has the governance of marine resources and effort to maintain the current level of major fish stocks sustainable as well as the assessment of the implications and the effect that coastal inhabitants (artisanal) fishing practices could have on the marine ecosystem become a major concern in the global resource governance discourse. This has highlighted and proven to be a major puzzle to address in the attempt to prevent marine wildlife stock depletion and in severe cases extinction.

The acknowledgement of this concern is the key indicator of an urgent demand f a shift in governance policies away from exclusionary practices restricting access, toward more inclusive ones that involve some form of resource management (Campbell L. 2002) which includes the direct participation of coastal inhabitants' in resource conservation strategies.

On the Nicaraguan Caribbean coast, effort to promote the sustainable use and protection of marine and coastal resources has been a priority and a pressing concern of the two Universities on the region, Universidad de las Regiones Autónomas de la Costa Caribe Nicaraguense (URACCAN) and the Bluefield Indian and Caribbean University (BICU) along with the Wildlife Conservation Society (WCS) which as been carrying out research about the marine turtle fisheries on the Caribbean coast.

1.4. Research questions and objectives

The current marine green turtle population is considered to be endangered. Coastal inhabitants and their fishing practices are often regarded as the core problem in coastal-marine resource management. Because of this, current fisheries management in many countries is still disregarding the level of community involvement in the management context. As stated by Jentoft (2000:53) communities are frequently ignored or seen as a drag on the fisheries management rather than as a critical source of contribution.

Jentoft's (2000) statement is not an exception and is a present reality in the current situation of the coastal communities on the Caribbean coast of Nicaragua, which are mainly composed of a combination of diverse indigenous and ethnic communities with fishing practices targeting the same resources (Caribbean Spiny Lobster, Shrimp, Scale fish, and marine turtle).

Too often, the centralized governance system, along with the political discordances, the inconsistencies in the policies direction and misleading political practices in Nicaragua suppresses, marginalizes and limits the development and self-governance capacity of the regional authorities, therefore destabilizing any attempts to structure resource sustainability and conservation initiatives and practices.

The ethno-demographic distinctiveness conveys an already complex scenario and paradigm of marine green turtle harvesting, sustainability and effectiveness of conservation effort to protect this specie. This particular aspect demands a more holistic approach to understanding the collective harvesting patterns of the indigenous settlements along the Nicaraguan coastline and the effect that social and cultural collective heterogeneity action on natural resources as to the effect of management strategies on these communities.

As Acheson (1981: 276) argues, fishing generally takes place in a very heterogeneous and uncertain environment. This uncertainty stems not only from the physical

environment, but also from the social environment. Acheson's argument begs for a more holistic conceptualization of the human effect on the environment and environmental management strategies on rural human settlements.

Given the multi-ethnic and multi-cultural characteristics of the Nicaraguan Caribbean communities and the reality of management strategies, research initiatives need to focus thoroughly on the level of resilience of resource dependent communities in response to non-participative management initiatives.

In an attempt to highlight the difficulty that indigenous communities are facing to cope with the current management strategies, these particular research questions are the point of emphasis in this thesis:

I. What is the effect of current marine turtle management strategies on indigenous communities on the Caribbean coast of Nicaragua?

II. How do these communities cope with current management strategies?

III. What is the role played by communities in green turtle management?

IV. How have the inhabitants of these indigenous communities been involved in the use of green turtle in their daily lives?

V. What is the perception of future community development trends by the inhabitants of these communities due to the reduction in the green turtle fishery during the past years?

VI. Do the locals perceive that the current conservation method for green turtles is providing these communities with future development alternatives?

1.5. Hypothesis:

I. The considerable decrease in the green turtle fishery and current regulations can affect the socio-economic livelihood of indigenous communities on the Caribbean coast of Nicaragua.

II. The socio-economic development of these communities is directly linked to the use of green turtle as a source of food and economic income.

III. Use of common (local) knowledge is indispensable for establishing effective management and control mechanisms in these communities.

IV. Effectiveness of any and all applied regulation and control mechanisms regarding green turtle fisheries and sustainable natural resource use rely on close cooperation between government agencies, local NGO's and local community leaders.

V. Alternative activity combined with green turtle fishing could and will help increase household income and promote the sustainable use of green turtle.

These hypotheses were developed by addressing the socio-economic and socio-political limitations that are affecting their livelihood and limit the community integration within the natural resource use and management context of sustainable use and development.

An example of this, is that the linkages between the problems of rural poverty and natural resource degradation is always a present reality.

1.6. Research design

Prior to the fieldwork, the research project, interviews and surveys were designed to address the current governance situation as perceived by the locals in order to highlight the current socio-economic context in the two communities studied.

The fieldwork was done over a period of three months (June-August 2007) in the indigenous communities of Sandy Bay Sirpi and Rio Grande Barr in the, Rio Grande Delta.

Secondary data analysis and reviews were done during June in Bluefield, during which interviews were reviewed and re-adjusted to obtain a broad empirical indigenous overview of the current resource governance settings in the region. Workshops were designed by analyzing previous research and observing the critical community position in the resource governance.

Primary data collection was scheduled and carried out during the months of July and August due to the increased intensity of the rainy season and the difficulty to reach the communities at this time.

1.6.1. Data collection

Data collection was carried out between June and August 2007. For the primary data collection, structured surveys along with interviews targeting fishermen, elders and women were used. Validation of data was established by using focus groups to obtain both generalized and specific local-communal insight on current socio-economic problems and specific conflicting issues.

Secondary data was obtained from selected literature at the Centre for Documentation and Information on the Atlantic Coast of Nicaragua (CIDCA), and the URACCAN University.

1.6.2. Limitation

The main disadvantage during the data collection was the climate factor. High level or rain caused the rivers (which are the only means of accessing these communities) to flood. Therefore precious time was lost due to several weeks travel setback.

The time availability factor for interviewing the targeted portion of the population (fishermen) was the main constraining factor, since most of their time is spent on the different Cays fishing for lobster and fish.

Very little information was found that reflected the direct socio-economic benefit from restraining the green turtle harvesting in these indigenous communities that in addition promote relevant development incentives in sectors other than fishing.

1.6.3. Thesis outline

Chapter One: Presents an introduction to the research site and overview of the indigenous communities in the region and their ancestral link to the usage of their natural environment on the Nicaraguan Caribbean coast.

Chapter Two: Presents the relevant background about the fisheries sector development and constraints. It also provides information on the historic use of green turtle in the Caribbean and in Nicaragua, addressing some factors that might have contributed to its reduction and some empirically based fisheries implication and stock recovery analysis. In also highlights the need to develop and incorporate indigenous knowledge into the current resources governance context.

Chapter Three: Introduces the theory of indigenous people, their knowledge its structure, complexities, role in strengthening the current governances scheme and the need for a comprehensive and interactive and thorough analysis of the role played by this

in the natural resource management initiatives. It exposed their community governance structure based on traditional hierarchic authority system. And the acceptance and overview of the indefinite closed season as the current regulatory mechanism to marine turtle management.

Chapter Four: This section portrays the current governance settings as it is, the limitations, complexity and challenges that this initiative inflicts upon the indigenous communities based on centralized top-down approach and insufficient community participation in the policy design process.

Chapter Five: Introduces a more detailed overview of the different methodologies used in the research project and the acceptance and comfort in applying these methodologies in these indigenous communities.

Chapter Six: This section introduces the green turtle commercialization and the economic dependence of the indigenous communities on this resource, and the perceived uncertainties and exclusion of their knowledge in the national policy design process. It provides analysis of data and theory application. It is drawn from the responses to the surveys and interviews, and compared them to previous data collected on similar issues. This chapter also exposes how indigenous knowledge can be used for comparison of the resource trends with modern scientific methods.

Chapter Seven: Presents the sense of poverty and the resource dependence as expressed by the locals during the interviews and workshop.

Chapter Eight: Provides the concluding and a summary discussion remakes based on the analysis of the data targeting the responsive pattern of the local perception surrounding the current natural resource (marine turtle) governances and a comparison to the applied theories.

Chapter Two: Background Information

2.1. The Nicaraguan fisheries industry and development trends

Although fishing has long been a source of food for the domestic market in Nicaragua, the rich fishing grounds of the Caribbean began to be exploited for export of shrimp and lobster in the 1980s.

In 1987 a loan from the IDB[11], allowed the country to double the size of its fishing fleet to ninety boats. However, damage by hurricane Joan in 1988 to two processing plants and the United States trade embargo from 1985 kept production levels far below the potential catch. Restoration of trade with the United States in 1990 did produce a surge in exports, and the government hoped that fishing would provide a significant share of export earnings in the 1990s (www.allrefer.com).

During the past fifteen years, the fisheries and aquaculture industry in Nicaragua has shown a significant growth. In 1990, fisheries and aquaculture activities combined, produced a total of 4,589,000 pounds (Lb) (2081.535 tons[12]) which has increased considerably over the past fourteen years, showing a high production output of 35,896,000 pounds (16282.15 tons) registered landings in 2004, and an estimate of 7,847,000 pounds (3559.339 tons) (Rivera C 2004).

Since 1998 the fisheries' contribution to the GNP has experienced a dynamic growth. Between 1998 and 2001, the growth level has been rather slow and relatively levelled and since 2001 has shown a significant reduction due in part to the decrease in exportation prices (II Informe GEO, 2004).

[11] Inter-American Development Bank
[12] The measurement unit is pounds (Lb), converted to **metric ton**, a measurement unit of mass equal to 1,000 kilograms. (2.2 Lb=1kg), (1000 kg =1metric ton)

2.2. Bottlenecks in the fisheries

The Nicaraguan fisheries governance is highly influenced by several bottlenecks such as violations of the legal dispositions (legislations), close season and undersize catch, lack of trustworthiness of the data published in the annual fisheries journals because of incoherence in data provided by researchers and fishing companies (Ryan 2003), broad approach of the fisheries legal regulations (laws and decrees) toward the fisheries sector, insufficient aid toward the development of the artisanal fisheries, influence of the private industry, among others, have been identified in the Nicaraguan fishing industry. Most of these bottlenecks derive from the lack of sufficient governmental investment.

2.3. Production trends

After the depression of the 1980s struggle in Nicaragua, a noticeable growth was shown during the 1990-99 period, during which time the export value increased from approximately 10 million US$, to 80 million US$ dollars (fao.org). Since the 1990s, the contribution of the fisheries and aquaculture industry to the national economy and exportation trends has shown a considerable increase; little direct effort has been placed in this sector by the government, the development responsibilities of this industry shifted over to private investment and international aid (see appendix, figure 24.).

2.3.1. Main fisheries resources

The main resources that represent substantial economic input toward the national economy are; shellfish fisheries from which the most important ones are; Caribbean spiny lobster (*Panulirus argus*), red shrimp (*Farfantepenaeus sp.)*, pink shrimp (*Litopenaeus schmitti*), Atlantic seabob (*Xiphopenaeus kroyery*). These constitute the most important shrimp species in the Atlantic region. Pink shrimp from the genus (*Litopenaeus sp.*), red shrimp from the genus (*Farfantepenaues sp.*), and titi shrimp also known as camaroncillo (*Xiphopenaeus rivetti*), constitute the main fisheries in the Pacific region of the country.

The Caribbean spiny lobster fisheries have shown considerable growth from the early 1990s to 2000 (see appendix, figure 25), from where it has been noticed that a relatively high fishing effort has been placed on these fisheries and the effect has been a reduction in landings.

It might not be for sure that the reduction in landing can be directly attributed to the high effort input (due to both biological and economic factors), since this resource in particular represents a rather large industry along the entire Caribbean and it is known to be highly migratory species. The shrimp fishery in the Atlantic region has also been following this same reduction pattern (see appendix, figure 26), and this could be attributed to the same factors as the spiny lobster fishery.

2.4. Fisheries employment

Like the Atlantic shellfish fisheries, the Pacific shrimp has also shown a dramatic reduction in the fisheries that can be noticed since 1999, however unlike the Atlantic shrimp fisheries, this reduction is led by the increased effort in shrimp farming, showing an increase in land space use from 4,032 acres in 1995 to 10,335 in 2004 (Rivera 2004) for both extensive and semi-intensive farming, and has shown an increase in production level over 5,1 million pounds in 1995 to 17,2 million pounds in 2004. This industry, however, has shown some substantial decrease in employment (table 1).

In the year 2000, fisheries occupied the tenth place as the main employment source in the country with little over 18,000 people directly employed, from which approximately 15,000 were from the Caribbean Coast of which 50% were directly accounted for as artisanal fishers (Ryan 2003).

Table 1. National Employment rate vs, Fishery and aquaculture[13]

Year	Total National	Marine & inland fishery	Aquaculture	Fisheries aquaculture vs. national employment
1995	1,228.2	9,1	n/d	0.74
1996	1,291.8	9,3	n/d	0.72
1997	1,369.9	10,2	n/d	0.72
1998	1,441.8	17,4	20.0	2.59
1999	1,544.2	18,1	23.5	2.69
2000	1,637.3	18,3	23.5	2.55
2001	1,697.6	17,6	n/d	n/d
2002	1,720.0	19,7	11	1.14
2003	1,765.7	n/d	n/d	n/d
2004	1,780.01	20,3	12	1.8

Source: Rivera (2004) & fao.org

Fishing is considered as the main source of employment and subsistence in many rural communities in Nicaragua where there are limited or no alternative sources of employment.

In areas where valuable resources such as lobster and shrimp are exploited, they remain economically depressed and there are no visible improvements in the quality of life measured in infrastructure and services (improvement in roads, sewage, electricity, access to clean water). Not many studies or documented information on the socioeconomic aspects of fishing to measure the social impact have been documented (fao.org).

2.5. Historical use of green turtle in the Caribbean

The Caribbean region contains some of the largest known sea turtle nesting aggregations in the world. Unfortunately, a variety of complex factors have accelerated the sea turtle mortality rate. Because of this, several sea turtle stocks have been fully exploited, and others are in a critical biological situation (Burgos 1985).

[13] In thousand of people employed

Harvested mainly for their meat and eggs, marine turtle have in general been exploited over many centuries in a sustainable way by coastal inhabitants, from which small scale fisheries have been identified as one of the main industries submerged in turtle fisheries. It has become part of the daily diet in the villages of coastal communities, especially the green turtle, which was even exported in the last century from Mexico, Costa Rica and Nicaragua to the markets in the United States and Europe (FAO 2004:14).

Their high traditional role as a basic protein source for many riparian peoples in tropical and subtropical areas place sea turtles among the marine resources groups of major interest to fisheries in coastal communities around the world. On the other hand, they also have become part of the rapidly increasing group of marine animals that are seriously threatened by over-exploitation and other man-related disturbances (FAO 1990).

Intensified harvesting was recorded from the seventeenth century and has shown that turtle trading provided products and the basis for indigenous communities to become involved in a developing international trade, as well as local subsistence (Bell et al. 2006).

Currently marine turtle fisheries has been banned in most countries worldwide as part of an international initiative to protect these species. However, this does not guarantee successful management on a long term basis.

2.5.1. The Nicaraguan turtle harvesting

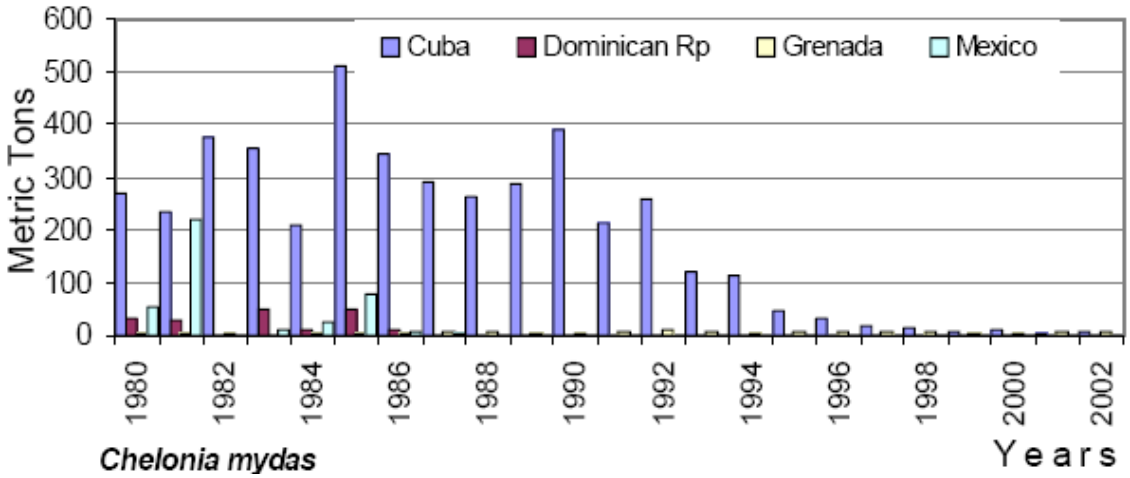
The dated harvesting of green turtle on the Caribbean coast of Nicaragua by the indigenous inhabitants (Mískitu Indians), have been remounted back for at least the past 400 years (Lagueux 1998; Campbell C. 2003), ever since the first prolonged contact between the Mískitu began around 1634 when English colonist from Providence Island set up a trading station at Cabo Gracias a Dios (Nietschmann 1973; Lagueux 1998).

Because of the expansion of the Europeans along the Caribbean during the early 1600s, the need for a reliable and continuous source of fresh food could be attributed as the main reason for turtle trading along with the demand for the exquisite jewelry and handicrafts made by the natives from turtle shell. Green turtle provided ship crews with a source of fresh meat and allowed extended periods of travel (Lagueux 1998).

The green turtle was also a major dietary staple of the Mískitu Indians and much of their subsistence systems, settlement patterns and scheduling of activities were gathered to the spatial and temporal occurrence of turtle. They were considered to be the best "Turtle men" in the Caribbean, which attracted the attention of sea travelers (Nietschmann 1973).

2.5.2. Reduction trends

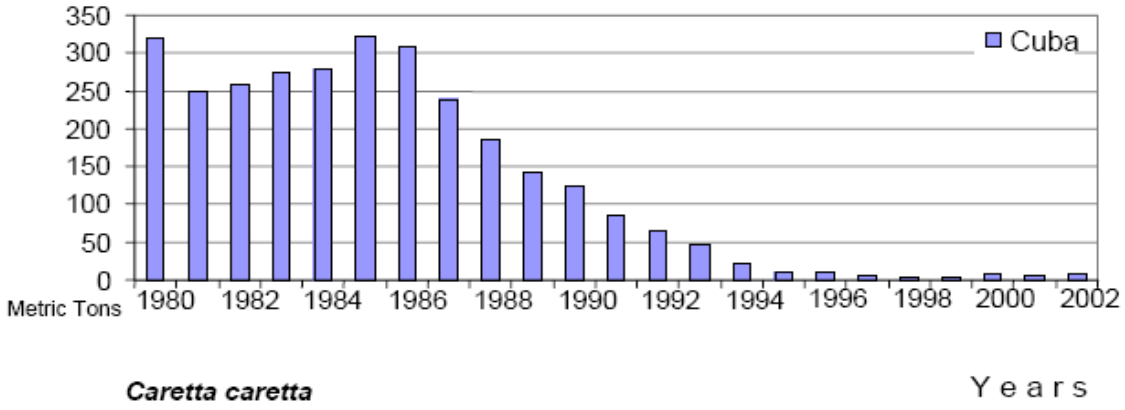
Over the past years, there has been some considerable reduction in the green turtle fisheries (commercial fisheries) along the Caribbean coast (figure 2), and in most cases fisheries have been targeted as the main reason for such occurrences. A legal-intentional reduction was imposed by government agencies along with NGO's through management mechanisms in order to reduce catch pressure and landings, and promote conservation. However, only Cuba, Dominican Republic, Grenada and Mexico have registered commercial catch data, leaving the other small-scale or local communal catches as an uncertainty regarding management effectiveness and success.



Source: (FAO, 2004)

Figure. 2: Reported commercial capture of green turtle (*Chelonia mydas)* in western Atlantic countries

Considerable decrease in the marine turtle catches along many countries in the Caribbean has been influenced in part by intentional catch reduction, either by closed season or other management and conservation mechanisms, or because of over-exploitation (FAO 2004). In Cuba, for example between 1987 and 1990, it is considered that the decrease in Loggerhead turtle (*Caretta caretta*) fisheries catches, could be a result of over-exploitation (figure 3.) ,however, in1990 it was intentionally reduced by restricting access (FAO 2004:16).



Source: (FAO, 2004)

Figure. 3: Reported commercial capture of *Caretta caretta* in western Atlantic countries

Since the first encounter with the Europeans in the early 1600s, turtle trading-harvesting activity has changed its course for the first time recorded, going from a daily livelihood resource to being a highly dependable economic resource for the Mískitu Indians and further on a regional market. Nietschmann (1972), for example, reports that Mískitu inhabitants turned from farming and growing crops to turtle fishing with the beginning of a strong market for turtle meat in the early 1970s (Christie et al. 2000), until the early 1980s trends of depletion had become evident at some of the major fisheries sites.

In the 1830's Cayman turtlers went to the Mískito Cays (the major foraging grounds for the Tortuguero turtle rookery) located on the Caribbean of Nicaragua. By 1890, concerns were expressed over growing scarcity of turtle on the Mískito Cays (Bjorndal & Bolten 2003).

2.5.3. Stock recovery and fisheries implication

Until recent years, marine wildlife conservation has been addressed from a biological perspective. With solutions considered to be linked directly to the social capacity to restrain or reduce biological harvesting by fishers. This approach is often considered the key to solving modern times resource depletion, since now most biologists, conservationists and environmental economists agreed that it is the people who are the ones to be managed and not the wildlife stocks.

Martin (2001) argues that in the early twentieth century, understanding how fish (therefore fisheries) populations were maintained and/or how they fluctuated, was done with numeric models developed in an attempt to mirror these fluctuations due to fishing pressure. These models are based on how fish stocks respond to human intervention that actually affects the output yield. As stated by Berkes et al. (2001), the output in fishery is referred to as yield.

The yield can be measured as quantity of fish harvested (biological), revenues obtained from the fishery (economic), or an integrated and immaterial "benefit to society" represented in the form of social and cultural iconic or spiritual values assigned to them, depending on the type and characteristics of fisheries and species harvested (biology, reproduction rate, life cycle, etc).

The maximum sustainable yield is often the centre of focus in the harvesting of a resource. However, this approach in conservation is often discouraged by conservationists when attempting to manage an endangered species. The question of sustainable harvesting is, rather, seen as a counter effort to sustainable livestock when attempting to obtain the maximum.

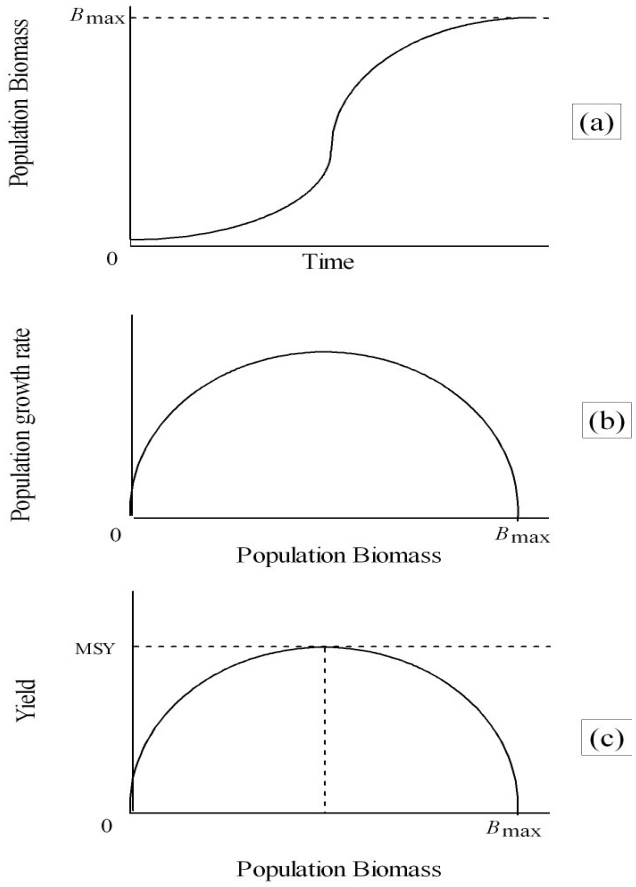
> *When an over-exploited natural resource to be managed plays a key role in the survival of a community or communities, sustainable harvesting needs to be considered as a possible solution to the overexploitation problem.*

By no means is a conservation effort to be discouraged, but rather optimum sustainable yield (OSY) for both resource stock and community and ensur sustainable stock recovery should be considered. As interpreted in environmental science "OSY is the optimum economic yield of a renewable resource achievable over a long time period without incurring to decrease in the ability of the exploited population or its surrounding environment to support the continuation of this yield level[14]".

Therefore, OSY could be allocated at a minimum allowed catch instead of the MSY, which targets the largest yield/catch from the stock over an indefinite period, assuming a logistic growth (figure 4) where population growth begins slowly and increases over time to a maximum point, before incurring into biological "recession" as part of a "natural stock growth control."

[14] http://en.wikipedia.org/wiki/Optimum_sustainable_yield

For a slow population growth species MSY could and will incur either in long term stock depletion or community degradation because of time lapse when population growth is at its highest point of sustainable extraction.



Source: Jennings et al (2001)

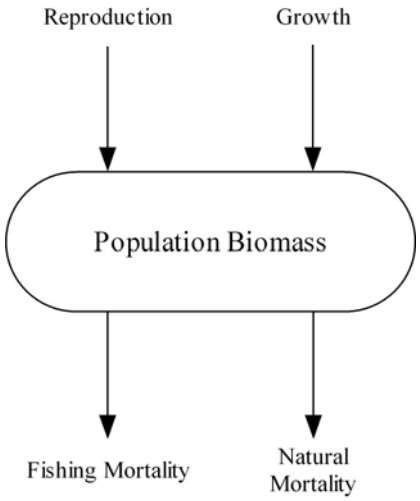
Figure. 4: Schaefer model for population growth[15]

MSY is feasible if the objective as describe by Jennings et al (2001) is to maximize yield. As long as the main target is the yield below the theoretical MSY (or OSY), the balance between fishing mortality, natural mortality, population growth and biomass (figure 5). Where growth and reproduction are the input factors to the stock sustainability and both fishing and natural mortality are the removal or "out-take" factor through which either

[15] (a) Represents the Logistic population growth. (b) Population growth most quickly at intermediate sizes up to a maximum total biomass, (B_{max}). (c) The maximum sustainable yield in biomass occurs at a level of fishing mortality where the population growth is at an intermediate size.

biomass control, preventing stock over growth (natural process) or stock reduction (fishing mortality) is achieved.

The "slow population growth factor" is a limitation for MSY goals which targets the largest possible yield/catch in a short time space over a long time period.



Source: Jennings et al (2001)

Figure. 5: Inputs and out-takes from fishing stocks[16]

One argument employs MSY harvesting that could be seen as callous and ruthless to societal welfare and development. MSY is often design based on species with a high turn over rate, assuming a logistic growth model. It targets only at the biological measure of fish harvested and figure most prominently biological approach (Berkes et al 2001), addressing mainly the level of impact that harvesting can pose to the resources harvested (biological approach) and not the effect of harvesting on the resource depended communities (social approach).

If the goal of management is to exclude fisheries practices on a resource stock with slow turn over rate, then MSY could be considered a drastic and high risk initiative, as to deplete the stock to a level where no considerable positive socio-economic benefit is

[16] Population biomass depends on growth, reproduction, natural mortality and fishing mortality.

obtained from fishing given the effort input. Fishers, therefore, communities engage in this activity (turtle fishing) will then be forced to diversify their economic activities and effort into another sector other than fishing.

This extreme measure should be avoided at any cost due to post-effect, such as high conservation and recovery cost, social-economic ambivalence, and in a more broad effect international policy reprisal.

Although considering the current status of marine turtle and effectively assuming that OSY might not be the most acceptable solution for conservation scientists, national and international management institutions to approve as an alternative to ban fisheries (which would then force government agencies to assume responsibility for the community welfare). In the indigenous communities, marine turtle harvesting debate options are limited. MSY can not be considered as an alternative unless stock biomass is increased above both OSY and MSY levels, considering the slow population turnover rate.

2.5.4. Fisheries engagement point

Based on Jennings et al (2001) assumptions for single species stock assessment and the Schaefer model (yield curve) (figure 4). Three different arguable points of view (biologic, economic and social) for the current marine population decline could be identified:

1- Insufficient or no studies on population growth, mortality, migration patterns, life style, feeding habits, etc. from the biological point of view.

2- Market demand with the European expansion through the Caribbean. Which subsequently established the economy based fisheries. From the Economic point of view.

3- Social “traditional” lifestyle transition from local consumption fisheries to regional commercialization. Social point of view triggered by a market demand.

As described by Jennings et al (2001:127), for a given level of fishing mortality to be sustainable, there must be a balance between mortality which reduces population biomass, and reproduction growth which increases it. Therefore, leading to Charles' (2001) statement which effectively acknowledged that whatever decisions are made at the strategic level of management, the renewable nature of the fisheries resource will lead naturally to the fundamental question: how much fishing can take place, and how much catch can be harvested without incurring into detrimental fishing?

Charles' statement require a full understanding of three critical reference criteria to achieve sustainable resource use in fisheries management, as described by Campbell L (2002:1230) 1), harvest must not exceed production. Therefore, it is required that sufficient data is obtained in order to understand the resource biology and to provide assessment, 2) management goals which must clearly specified. This demands a thorough analysis on the effect of management on fishers (i.e. on coastal communities) and 3) biological, social and political conditions must be in places that allows an appropriate use and an effective management.

Assuming strictly from a biological point of view that over-time sufficient biological data on the population growth rate and stock biomass is acquired. This could lead to better stock assessment and therefore sustainable yield assumption and calculation from fisheries, a suggested "theoretical" point (Figure. 6.).

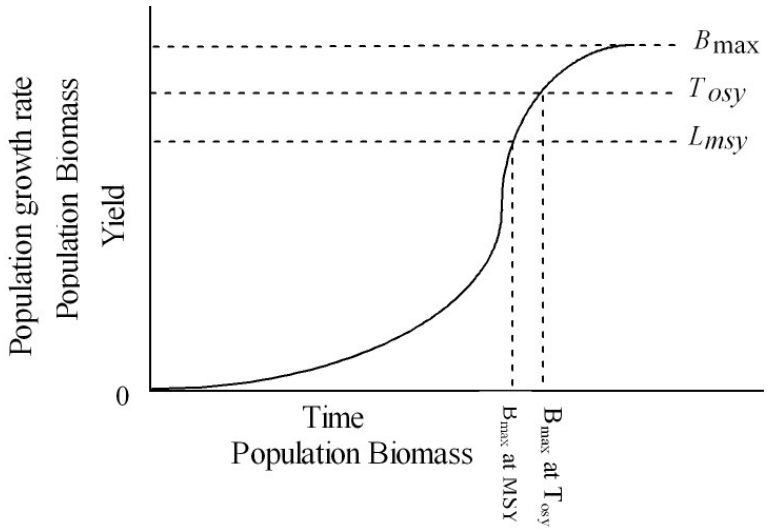
For a total-temporal allowable engagement on behalf of indigenous coastal communities or for the case of this study could be interpreted as a T_{OSY} (theoretical optimum sustainable yields) could be established at any given point between the MSY and B_{max} and therefore be the allowed "fishery" point.

Acknowledging Campbell L (2002:1230) that long lived animals with slow reproductive rates and a low level of density dependence (referred to the compensatory response of species to take-of such as; increase fecundity, survival of young or decrease natural

mortality), which in term give the populations the resilience required to sustain elevated mortality from fisheries (Jennings et al 2001:127), pose particular challenges for use regimes.

Due to the slow growth rate of marine turtles, density dependence levels must surpass the MSY level in Jennings et al (2001) surplus production model assuming a logistic growth. Surplus can only be removed when the population biomass is at its highest point (B_{max}).

Any point below MSY or at the MYS point it self could easily incur in biomass reduction to unsustainable levels. This suggests that MSY in this case then should be considered as the lowest allowed stock reduction or fisheries point or interpreted in this study as L_{msy} and therefore should be avoided or be considered as a "critical recovery point" at which fisheries should be closed.



Source: adapted from Jennings et al (2001)

Figure. 6: Theoretical OSY fishing point, assuming sustainable green turtle stock

In terms of sustainable harvesting by local-communal inhabitants, limited allowed access could be granted, with particular attention placed directly on the community or communities in question. Not from a more holistic (regional) approach to management as the case of marine turtle fisheries, but from a de-centralized or semi-decentralized management with close participative cooperation of National and International NGOs.

Effort to protect and preserve the green turtle population, is highly appreciated and regarded as a priority to maintain a stable population in Nicaragua and considered by many a leap toward establishing the future well-being of this resource.

However, positive as it may seem to be, the current level of success is dubious and questionable simply because there is no relevant linkage between coastal communities-government cooperation in the design of management policies; the coastal communities, the ones using directly this resource, and little direct effort employed by management institutions.

The above discussion on the temporary allowed commercial community fisheries point at which the Nicaraguan indigenous communities could be allowed to engage in turtle fishing activities for commercial purposes, is suggested by assumptions only if the Costa Rican green turtle rookery population (known to be the largest Nicaraguan fishery stock in the region), could be considered as stable. This requires a more efficient and participative involvement of coastal communities in the management, policy-making and scientific discussions.

Because of the above discussions and acknowledged researchers who have been studying up close the use given to marine turtles by coastal indigenous communities, it is possible to assure that up to the present day the activity of green turtle fishing, has, is and will probably continue to be a key provider of food as well as income to coastal communities on the Caribbean coast as long as sustainable harvesting measures and alternative resource markets are established.

2.6. Management

There is a lack of a management plan to aid in the conservation of the marine turtles, as well as long term development programs to provide new alternatives and strategies to

obtain a more stable and increased socio-economic status of the indigenous communities of the Rio Grande Delta by other means rather than turtle fishery.

This absence of a structured development framework has resulted in a deplorable living situation, and uncertainty about development trends for future socio-economic development of these communities resulting in a long term poverty forecast.

There is an urgent need for participatory-management policies to be re-designed and re-located to somehow fit to the needs of these communities or to encourage the development of alternate activities. This should become a priority before incurring over a long period to manage the Nicaraguan green turtle fisheries from a top-down approach. Even from a minimum allowable harvesting strategy.

2.6.1. Management success and the involvement of coastal communities.

Bird et al. (2003) points out that the use of sea turtles by many coastal communities worldwide remains as part of their traditions and culture despite evidence of reduction in turtle population and strict laws that prohibits turtle harvest. For instance, in the Taveuni villages and adjacent offshore islands in Northern Fiji, turtles remain an important prestige-food gift and seasonal subsistence food source (Morgan 2007), and Nietschmann (1973) emphasizes that turtle meat and cassava[17] (*Manihot esculenta*) are the most highly regarded and sought after foods in indigenous villages such as Tasbapauni[18], where turtle meat is the major source of animal protein.

There is evidence recorded by Burgos (1985), Lagueux (1998), Nietschmann (1973), FAO (1990), Christie et al. (2000), Campbell (2003), Troeng & Drews (2004), Roe (2005), and Morgan (2007), that acknowledges the traditional linkage of between turtle fisheries and indigenous communities survival.

[17] A woody shrub of the Euphorbiaceae (spurge family)
[18] Indigenous community located on the Caribbean Coast of Nicaragua

The evidence of population decline and the need to establish a more intricate, participatory and a more dynamic role of communities in conservation efforts, and delegating "some" responsibility on the shoulders of coastal (indigenous) communities is to be seriously addressed in order to create a sense of responsibility in preserving their resources.

These studies provide positive and strong discussion points which to establish the historical and traditional evidence that indigenous and ethnic communities along the Caribbean coast of Nicaragua (as in many parts of the world) such as of Sandy Bay Sirpi and Rio Grande Bar in the Rio Grande Delta, have depended on the green turtle fishery as the main source of protein and income.

Indeed green turtle has long represented a keystone species in the survival for many indigenous communities on the Atlantic Coast of Nicaragua, linking the use of traditional knowledge in its fishery and cultural values of the harvesters to create a sustainable harvesting environment for local consumption.

This simple but effective structured lifestyle, however, was sustainably efficient before the arrival of the European trade, which influence in essence converted the local-sustainable fisheries initiative developed around their livelihood and dependence on the surrounding natural resources for their survival, to a more commercial fishing.

Roe (2005: 92) emphasizes after an extensive feedback from his research on the use of Indigenous knowledge in marine ecosystem conservation in the Rio Grande Delta, that despite the fact that current regulation established by the government authorities on green turtle harvesting:

> *"Fishing continues to be the main activity in these communities (in the Rio Grande Delta) for economic income. The open access system of the fisheries means a drastic over exploitation of the resources. As a consequence, there is a great need for management plans imposed by the government. Nevertheless,*

people in the communities disagree strongly with regulations imposed by the government, mostly because they are not acquainted with these regulations and have not been involved in their making. As a result, the communities still cling to their own traditional ways, despite their ineffectiveness".

2.6.2. Community based conservation and sustainable use

As Berkes et al (2001:193) point out; modern approaches to management and governance of fisheries resources are undergoing significant transition. Shifting towards ecosystem based management and conservation, governance is shifting towards community based and co-management approaches focusing directly on fishers' involvement as part of decentralization of management authority and responsibility.

This observation of Berkes et al (2001) is partially becoming a reality in the marine turtle management initiative through Caribbean. Nevertheless, in some countries this transition from a centralized top-down approach to a decentralized one is still undergoing the challenging task of promoting direct resource users inclusiveness in policy design, where management and governance initiative is centralized.

In countries where significantly high frequency encounters with humans and turtles and increased harvesting facilitation occurs, centralized or insufficient management-governance shifting approach could encourage illegal trade opportunities, particularly in countries that possesses nesting sites for the remaining turtle population.

In the Nicaraguan case, there are large foraging grounds with widespread coastal fishing communities, and little surveillance effort on landings and fishing grounds that could effectively contribute to manage the resource harvested.

2.6.3. Conservation and community empowerment

Like most slow growing animals, marine turtles in general face various threats throughout their life, including the direct consumption by humans from both incidental and targeted fisheries.

In an effort to address the continues decline of major stocks, some countries have resourced to prohibit all activities relating to turtle fisheries and egg poaching (on nesting sites), while others have tried to address the problem from different perspectivea such as sustainable use and community based conservation.

The current challenge for management institutions therefore is to merge the use of modern conservation initiatives along with traditional-cultural sustainable lifestyles to address the community initiatives not as an external factor that could contribute to sustainable use of the resource, but rather as an implicit variable to guarantee success in the approach to conservation.

The complexity of this joint management strategy is that empowering communities often represent a downfall to top-down governance.

As such top-down approaches is commonly used by government institutions empowering coastal communities often represent and force governments institutions to establish, not only new, but also more inclusive and participative management policies. But this is also to restructure their governance regime itself in an effort to prevent resource loss due to community exclusion by inadequate conservation policies and initiatives.

Chapter Three: Theory of Indigenous People and Natural Resource Use

3.1. Human Development and Resource Dependence

Human interaction with the natural environment as the source of his survival has long been a friendly one, going from a day to day scavenging task o combining the use of

alternative methods for conservation-preservation of food, taking what is needed without disrupting the environment balance of resource use.

Over the past years, the trend of green turtle fisheries in indigenous communities has considerably changed its fishery focus, starting as a local - auto consumption (local market demand) resource combining fisheries along with other activities such as agriculture, to being a highly dependable economical resource distributed along a regional market demand.

The early identification of depletion trends in resource harvesting, is considered a key that will provide a secure basis that implies the giving of advice or a warning in order to rectify or avoid fish stocks from collapsing. As Berkes et al (2001) argues that fisheries science has been developed mainly from scientists working with large stocks, therefore, science is the basis to justify stock assessment. It has become almost a conventional approach for managers who believe that until proper stock assessed and a management reference point are chosen based on assessment little can be done to approach management.

3.1.1. Local-indigenous knowledge structure and development

The term “indigenous people” is often used to refer to an ethnic group who inhabit the certain geographic region which somehow is linked to their societal development and encompasses a deep historical connection. There s no fixed definition of this term, however as quoted from Anaya (2004:3);

> *As empire building and colonial settlement proceed from the sixteenth century onward, those who already inhabited the encroached-upon lands and who were subjected to oppressive forces became known as Indigenous, Native, or aboriginal. Such designations have continued to apply to people by virtue of*

> *their place and condition within the life-altering human encounter set in motion by colonialism.*

Posey (1996: 7), in Ellen et al. (2000:3).

> *Indigenous peoples are "Indigenous and Local communities embodying traditional lifestyles"*.

Far more important than a definition is the fact that indigenous peoples and their traditions for centuries around the world have maintained an ancient link with nature and because of this have a thorough understanding of it. Therefore, coastal and marine resource harvesting around the world has always somehow shown an abstruseness link to the survival of indigenous or minority groups as a means of subsistence that only they understand.

This particularity in the relationship between humans and nature in some cases has shown the unnecessary or little aid of modern science to explain and trigger the sustainability expectations and outcome in the management of natural resources.

> *Indigenous peoples' knowledge, conservation beliefs and values, environmentally adaptive and sensitive land use, resource management practices, and determined defense of territory and natural resources have enabled many of them to inhabit their homeland for centuries without devastating their ecosystems and biodiversity*. Stevens (1997: 2).

Nietschmann (1973:1) points out that a large number of societies live at the "subsistence level" in tropical Latin America, and a variety of these subsystems are characterized by diverse indigenous groups, some of which have been modified by external influences, being more highly organized. Others have shown little altered vestiges of widespread subsistence systems.

In Latin America this is particularly evident within the marine turtle harvesting, where the main harvesting and landing sites are actually indigenous communities, with the resource caught by indigenous fishermen's by means of small-scale and artisanal fishery methods.

3.2. Local-indigenous knowledge: a comprehensive approach

Before attempting to become immersed into the dilemma of indigenous, local-traditional or communal knowledge, the definitions of such is rather uncertain therefore they pose a challenge to steadily approach a contextual issue within the borderline that responsively defines each discussion.

When analyzed as a cultural holistic cumulativeness of knowledge which has been developed by means of observation of the surrounding environment, it becomes evident that it is a system based on and improved by a trial-failure learning processes. Mainly characterized by having a practical and dynamic yet sustainable interaction feature with nature and has been stratified by age and gender (Christie 1999).

Whether it is local-traditional, communal and/or indigenous knowledge, they all show similar development patterns and coincide as a form of knowledge developed by and/or within a group or groups of people living in a determined area that could be acknowledged as a community.

They also share similar pattern as to been developed within an environment that shows population growth somewhat mild or relatively slow, and that are directly dependent and affected by the level of natural resources harvested and the sustainability of harvesting practices.

3.2.1. Local-indigenous knowledge transmission

Knowledge among indigenous settlers is transmitted down from generation to generation by means of social values, cultural expressions, beliefs and respect for nature, and sustainable use of the surrounding resources. It is transmitted in a rather informal way with very little changes in its structure occurring over time, yet with effective results. It differs largely from western knowledge which is developed by a much larger group or groups of people with a more accelerated population growth, which is then formally established and transmitted with changes, modification and adaptation parameters in its structure to meet the growing demands of space and food.

Local indigenous knowledge could be acknowledged as derived from a "life time and generations of experience, observation and direct interaction with their surrounding environment".

Tella, (2007:185), describes indigenous knowledge as:

> *Indigenous knowledge refers to the unique, traditional, local knowledge existing within and developed around the specific conditions, indigenous to particular geographic area. The development of indigenous language, covering all aspects of life, including management of natural environment, has been a matter of survival to the peoples who generate these systems. Such knowledge systems are cumulative, representing generations of experience, careful observations, and trial-and-error experiments.*

Local indigenous knowledge is usually developed in a community with "simplified" subsistence rural lifestyle, often isolated from the urban hassles. There are countless numbers of factors that could affect positively and negatively on their lifestyle, among which the most common ones are; social exclusion (out of the community), informally structured learning process(based on empirical or non scientific methods), often excluded

by scientific learning and training methods, social corruption of traditional practices from outsiders, among others.

The above mentioned factors often provide a framework on which development arrangement that positively benefits the communities can be established.
However, it can only be effective when there are clear socio-institutional arrangements such as; 1) clearly delegated-shared responsibilities, 2) mutual and reciprocal benefits schemes that guarantee the uninterrupted continuity of their cultural values, 3) participative formulation of rules, regulation and development strategies that formally legitimize and govern the institutional framework.

As explained by Jentoft (1989), legitimacy could be seen as reciprocal to governance success. Where the crucial question for success of any management scheme is what measures are needed to get fishermen voluntarily to advance their collective interests at the expenses of private ones that could motivate fishermen to adhere loyally to the regulations (Jentoft 1989:139) established throughout governance.

3.3. The management context and local-indigenous knowledge.

The use of local indigenous knowledge in resource management on the Nicaraguan Caribbean coast is often under-estimated and unappreciated, due to the lack of scientific validation methods to establish direct linking patterns with management efficiency and success.

Time over it has been proven that the indigenous communities posses the empirical managerial capacity attached to the spiritual and socio-cultural values and respect for nature to exercise sustainable resource management practices.

Nietschmann, in Stevens (1997:198) expresses that the indigenous and coastal peoples uses a wide variety of strategies to manage and protect their natural resources.

These strategies are associated with fisheries encompasses three approaches:
1) Regulation of the fishing catch by restrictions on species, size, amount, types of gear permitted, and seasons; 2) regulation of the fishermen by restrictions on who can and can not fish; and 3) regulation of access to fishing areas through customary marine tenure.

Nietschmann in Stevens (1997:202) highlights that on the Nicaragua Caribbean coast each coastal community possess a traditional bounded territory containing land, sea, rivers and lagoon areas, with individual families possessing the right to use a reasonable portion of the community's land for agriculture and other subsistence activities; where communal land tenure is the regulatory tool used to locally manage the resource usage.

3.3.1. Understanding the complexities: an interactive approach

Management schemes often ignores that the direct interrelated dependence, development and composition of local knowledge is a direct result of years and generations of experiences, practices, adaptation, structure, productiveness and resource dependability, as a response to the need of human (indigenous) settlement parties to improve their welfare as part of their development initiatives.

When attempting to merge the local knowledge with western philosophies as a key requirement to secure a bottom-up-top-down reciprocal relationship and approach to resource management from the indigenous perspective, there is a series of crucial factors to take into consideration and to understand in order to define a functional structure of the relationship.

Tella's (2007) points out some of these factors that are to be understood and considered (table 2.) that enhance the view on which both modern scientific knowledge and indigenous knowledge effectively approach the understanding of their surrounding environment and transmission of the amassed knowledge throughout generations:

Table 2: Differences between science and indigenous knowledge

Factor	Science	Indigenous Knowledge
How Approached	Compartmental	Holistic
How Communicated	Written	Oral
How Taught	Lectures, Theories	Observations, Experience
How Explained	Theory, "Value Free"	Spiritual, Social Values

Source: Tella, 2007

The above factors described by Tella (2007) can be effectively used to analyze the approaches and promote the understanding of the link between designing governance systems effectively (scientifically based) and effective governance systems success by incorporating indigenous knowledge (empirically based).

As Tella's separates these four crucial factors, by observing them closely it is clear how the distinctiveness of each can be used effectively to strengthen the other when incorporated in to governance by understanding the values, principles, uniqueness and role of local-indigenous knowledge, i.e;

While the compartmental approach of modern science attempts to analyze the holistic behavior of "a" system/group to be governed by separating crucial and vulnerable segments of the system based on the level of importance and that effectively contribute to governance process based on policy design and implementation (i.e., taxation on resource landings, closed areas, closed seasons, ITQ, etc.).

This approach often marginalizes the vulnerable segments of the system regarded as having low importance (ancestral property rights, local-indigenous knowledge, minority rights, etc.), making it difficult to foresee the function and tangible approach to a bottom-up minority inclusiveness and empowerment.

The holistic approach of local-indigenous knowledge often contrast with modern scientific approach by incorporating and emphasizing the human-societal values and the impact upon the governance system (i.e. land tenure, ancestral property rights, cultural

and spiritual values and significances, etc), and accepting those as highly relevant to governance success as resource users.

3.4. The Nicaraguan coastal indigenous communities

The development of the Nicaraguan Caribbean indigenous communities has always been linked to resource use, particularly fisheries, which take place in the Caribbean Sea continental shelf, in rivers and lagoons near the communities.

They are most vulnerable to changes in their surrounding environment and nature of subsistence, since decisions, laws and regulations concerning conservation of natural resource are often highly restricted from the inhabitants of the coastal communities, whose daily lifestyle depends entirely on a direct economic, ecologic and social interaction between inhabitants and environment.

The local knowledge surrounding their natural environment, their socio-economic subsistence structure, the cultural and religious values, practices and development have always been known to be linked to the seasonal harvesting of marine turtle (green, hawksbill and loggerhead) for food and money along with different scale fish with their livelihood depending almost entirely on the marine resources harvesting.

However, the marine resources harvesting patterns differ slightly from one indigenous group to another. While some depends almost entirely of the offshore marine fisheries, others combine offshore marine fishing with agricultural activities.

The current dilemma of natural resources on the Nicaraguan Caribbean Coast, cultural and collective use of these, the territorial demarcation process of indigenous lands based on ancestral property rights, and the income generation through utilization of these resources has become a subject of political order.

Therefore the designs of socio-cultural and socio-economic policies that benefits and aids the development of the indigenous communities is a major challenge for community outreach and development of its peoples.

3.4.1. Traditional-indigenous resource administration systems

The intern communal governance and resource administrative system is based on well defined communal organization structured under a hierarchic governance structure based on which the communal assembly (all the community inhabitants) is the maximum authority, the elders council (advisory body), the local-communal leader (Sindico[19]), the communal directive board, judge and other organized groups (women, fishermen, church, etc.)

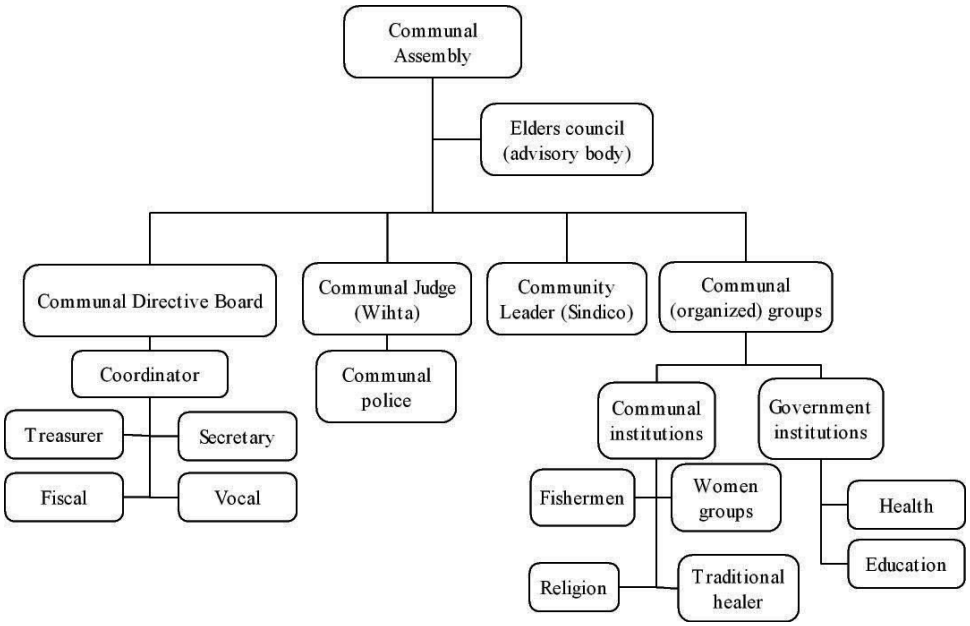
The functions of these organizations as internal-communal administrative bodies is to try to provide solutions to the problems faced in the community, to ensure appropriate use of resources they have, and to make efforts with outside agencies to improve the living conditions of its inhabitants.

The administration of resources is still carried out by traditional authority empowerment given to the chosen by the communal assembly (figure 7), from which the community leader under the direct supervision of and advisory of the communal assembly, communal directive board and elders council, is directly responsible for the protection and administration of the natural resource within the community territory.

The Sindico is also responsible for extending guarantees (under the approval of the communal assembly) to companies, individuals and/or organizations from outside the communities that are interested in exploiting the natural resources.

[19] Community elected tribal or community leader.

In the case of resources used by a local for issues related to farming areas, construction, and household-domestic use, the communal assembly's authorization is not required to extend a permit, however the Sindico's authorization is needed.



Source: Focus group

Figure. 7 : Community organizational structure

Often when the problems surfaced in the communities are complex and varied, these traditional organizations are unable to cope and resolve them, and fall into a phase of stagnation that creates crisis in the leadership structure as to whom will manage the resources and for how long will this leadership power be vested to him/her.

This is mainly observed and occurs when there is some direct negative political intervention in the community administrative structure where leaders adopt a position of selectiveness to political parties and interests.

3.5. Vulnerabilities

Because of this, uncertainty is as to what extent the inhabitants and leaders of these communities have a clear understanding of the laws and regulations, regarding the green turtle fishery, as well as other marine resources. This could emphasize the critical need to analyze other potential economic alternatives for development, as a means not to depend upon a resource that is considered as endangered internationally.

Currently, there is an immediate need to seek and develop new alternatives other than green turtle fisheries; there is the need to asses the level of dependence and commercialization legally within the communities and illegally out of the communities, and the management implication to aid the conservation of this resource focused on the use of local-indigenous-communal knowledge as support to western scientific knowledge and vise-versa.

Desire for food and income drive the behavior of fisher, but social and religious factors can also have marked effects. Even in the most primitive economies, relationship between the work input to fishing activities and the food or income produced cannot be explained if food and income are traded as the only motivation (Jennings et-al 2001).

As result of the fishing behavior shift, alternative overview of future resource dependence has been required, and such the definition of resource conservation and sustainable use, are furthermost the key point of management strategies, which needs in order to be considered a success, the input of social participation from all societal aspects.

Chapter Four: The Green Turtle Governance Context and the Indigenous People on the Caribbean Coast of Nicaragua

4.1. The governance system[20]

The definition of resource governance as it is has become a fairly new complex top-down resource administrative system approach, portraying a challenge for coastal indigenous communities to merge and readapt their traditional socio-cultural, socio-economic lifestyle to survive in an environment increasingly promoting and shifting towards the sustainability of resource usage.

The definition of the term **"governance"** relates to decisions that define expectations, grant power, or verify performance of a human and/or resource administrative system.

It has become a catchword for social sciences as a focal concept in more scholars' literature stressing the importance to introduce other actors beside the state government at the local, national and international level (Koiman et al 2005)

The consistency of the governance system is either of a separate process or of a specific part of management or leadership processes, developed to uphold the societal demands and expectations unable to be carried out by the traditional state institutions.

As expressed by Koiman et al (2005), governments have often failed to live up to expectations. Constrained by the un-reliability of the state institutions to carry out governing tasks, other actors are compelled by societal socio-economic and socio-political demand to move forward into prominent positions, organized to resolved diverse social issues.

Therefore it is required that sometimes people set up a more state de-centralized local government system to administer these processes and systems, that describe and enable

[20] http://en.wikipedia.org/wiki/Governance The discussion about defining governance is a re-adaptation of the discussion on this (wikipedia) website.

the process of decision-making and the process by which decisions are implemented (or not implemented).

The process of governance relates to consistent management, cohesive policies, processes and decision-rights for a given area of responsibility.

As *governance* derives from the Latin origins that suggest the notion of "steering", one can contrast this sense of "steering" a group or society with the traditional "top-down" approach of governments "driving" society, distinguish between governance's "power to" and governments' "power over".

4.1.1. The governance perspective and the Nicaraguan indigenous communities

The reasoning and focus of Jentoft's discussions within the Nicaraguan regional context of green turtle management could be used to emphasize the compelling facts that a centralized governance approach might and will target more exclusionary practices of the coastal communities in the fisheries management process that could lead to the governance system's failure.

Since governance itself has a conceptually broader approach to understanding the socio-economic interrelationship with humans and their surrounding environment and the sustainable regulatory scheme of this relationship. Failure to incorporate the spatially confined (empirically developed) local-indigenous knowledge system and participation could prove a failure to the governance system and goals as such.

As argued by Nietschmann (1973) the Miskitu communities along the Nicaraguan Caribbean coast have traditionally used a variety of means to regulate and control resource and territorial rights, responsibilities, and use.

This involves a complex overlapping of traditional and culturally bounded territories with other indigenous and ethnic groups, social differences based on communal-intern

hierarchic traditional government system (sindico, whita[21], sukia[22]), and a regional socio-political institution. Where the ethic of subsistence (use only what is needed) to regulate the intensity of terrestrial and marine resource use, as described by Nietschmann (1973), is not all together absent but at present faintly addressed.

Nietschmann (2000:203) also highlights that in the indigenous communities of the Nicaraguan Caribbean Coast the intensity of subsistence activities such as turtling and fishing is determined by kinship obligations, the dominant ethic of generalized reciprocity and communal exchange of productive labor and foods among family, friends and neighbors.

By addressing their economic need as to supply alternative and long term sustainable household income activities could contribute to the "equal" distribution of goods within the community. Supplying "some" of the societal demands will prove crucial for the establishment of an effective governance regime of the resources overlapping the fishing, hunting and harvesting grounds of the Nicaraguan coastal communities,

4.2. Turtle fisheries management

Fisheries are in a state of crisis worldwide. As a result, fisheries continue to be the often-cited example of the "tragedy of the commons". The inspiration for many studies of common property, they are seen as the location where individual behavior, unfettered by community, continues to cause environmental degradation and ultimately the dissolution of potential wealth (St. Martin 2001:122).

Jentoft (2000:53) points out that fisheries management as it is currently done in most countries ignores the community level. Instead it is almost exclusively based on a relationship between a government agency and individual users.

[21] Local or communal judge
[22] Medicine man, bush doctor or traditional healer.

Therefore, the theory of indigenous participation in fisheries management and management success itself require a reciprocal interaction with government agencies involving more deeply coastal communities' influences on management activities.

4.2.1. The commons a wide spread dilemma.

Since the appearance of Garret Hardin's essay (The tragedy of the commons), in 1968, this expression has been adopted by researchers worldwide to address the growing concern of resource scarcity-degradation, based on irresponsible and selfish harvesting patterns reflected in the common users (stakeholders).

It has become a common academic explanation for many social-collective and environmental problems (McCay & Jentoft, 1998) and in some cases as stated by Bené (2003: 915), it has been over-used to emphasize the biological outcome of the tragedy (the overexploitation of the resources).

As portrayed by Hardin's article as a pasture open to all, it is expected that each herdsman will try to keep as many cattle as possible, and hence, maximize his own personal gain. As in fisheries, each fisherman will attempt to fish as much as possible seeking his/her individual or household benefit.

What is commonly identified and targeted from a government point of view is the fact that there is no possible way allowable for commoners' to manage a resource on their own without depleting such at some given point.

This statement is most likely true, and in Hardin's essay this could be interpreted as "The day when long-desire goal of social stability becomes a reality, where the inherent logic of the commons remorselessly generates tragedy" simply because of each individualistic pursuit to maximize their profits from harvesting or resource use.

On the long run the individualistic actions will deplete the resource, leaving behind the picture of social stability for the present reality of competition for resources.

This is evidenced when such a goal is a long term sustainable use strategy, where goals, framework and systematic development and adaptation structure are far away from incorporating the principles and values of the commoners' (the ones responsible for the tragedy) believed to aid the structuring of governance foundation[23]. And instead the centralized effort to contain the tragedy is addressed as the solution.

Green turtle, as well as other marine turtle's management and conservation are currently regarded as a worldwide problem and concern. All effort has been placed directly upon government's agencies as "the" management institution to regulate and control the harvesting of this resource.

This has led to little or no involvement and consideration of community values, ecosystem interaction, and the effect of management on local livelihoods and vise-versa.

4.2.2. The Nicaraguan indigenous social heterogeneity and Hardin's paradigm

Hardin's essay is linked and could be used to justify both; the homogenous yet individualistic population structure within an un-even socio-economic distribution of goods and benefits, and the heterogeneous yet individualistic user effort.

The socio-cultural heterogeneity of the population composition in the Nicaraguan Caribbean coastal communities and the relationship with their environment are linked to a complex inter-cultural relationship between six different indigenous and ethnic groups (*miskitu, sumu-mayagna, rama, garifuna, creole and mestizos*) represented on the region and in most cases also within the communities themselves, with different definitions, insight, cultural and social values for the marine environment.

[23] See Kooiman et al 2005:364 for more detailed analysis on governance foundation.

The representative homogeneity of this interrelation is the evidently significant economic meaning that revenues from harvesting marine resources (turtle, lobster, shrimp, etc.) provided to their socio-economic growth.

While the socio-cultural indigenous and ethnic heterogeneity of the region provides a solid background for distinction and empowerment based on ancestral-territorial rights to land (sea) and resources, it also represents a perplexing predicament for the institutional approach to collective action.

As described by Ruttan (2006) the social heterogeneity may reduce levels of trust and/or create different preferences of cultural views about how the resource should be used and managed, compromising the success of resource management initiatives.

In fisheries where the policies design and management efforts are closed in a top-down approach, they are referred to the question involving a successful management scheme as Jentoft (1989) argues;

> *What measures could be needed to get fishermen voluntarily to advance their collective interest at the expense of their private ones that could in term motivate fishermen to adhere loyalty to the regulations as appropriate and consistent with their persisting values?*

Jentoft's observation in this question is that by providing and improving legitimacy of regulations to the fishers it will enable the trust and desire to follow rules. Jentoft (1989) also points out the four general hypotheses on which fisher's legitimacy of management schemes are related and could be built upon;

1) Content of regulation, coinciding with the fishermen (stakeholder) definition of their problems.
2) Distributional effect, with the equitability on imposed regulations and restrictions.

3) Making of regulations, with more participative and inclusiveness in the process of decision-making, and

4) Implementation of regulations, where fishers play a more direct, cooperative and collective role installing and enforcing regulations. When rules (regulations) enjoy legitimacy, breaking them is considered unethical (Jentoft 2004:143)

As quoted by Jentoft (2000:54);

> *"Fishermen are born, raised and live in local communities. They are enmeshed in cultural and social systems that give meaning to their lives and directions for their behavior. Their fishing practices are guided by values, norms and knowledge that are shared within their community".*

Jentoft 's (1989) statement outstanding of the demand for legitimacy to promote effective participation of fishers in the management process and Jentoft's (2000:54) acknowledgment that the practices of fisher are a guided appraisal of their values, norms and knowledge. Highlighting the evidence that their desire to abide and uphold regulations and management policies is to thrive immensely on their level of perception of legitimacy and participation within the management and policy design process.

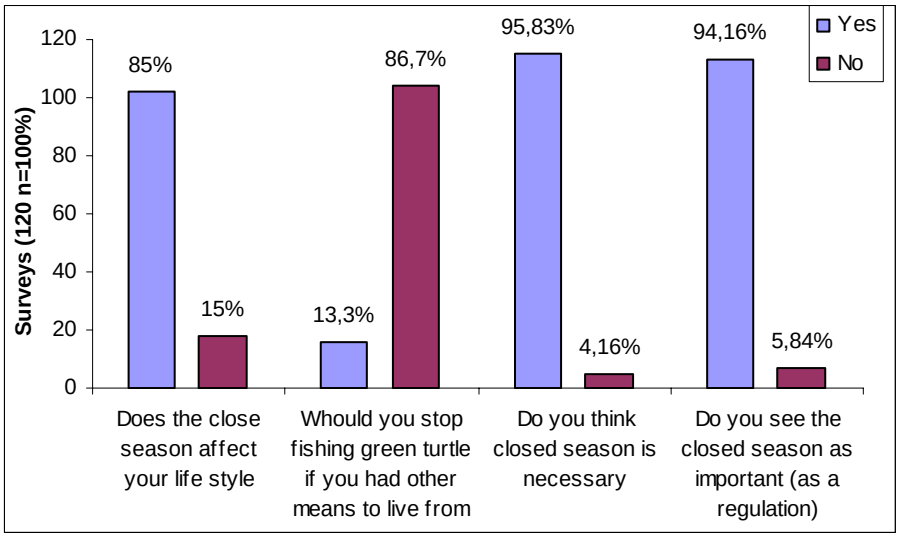
4.2.3. Challenges for management effectiveness

In isolated and rural areas, the level of impact of legal measures regarding resource use is relatively un-sensed and partially un-influential because it often affects cultural and traditional human subsistence levels, which literally do not disappear with the approval of new legal mechanisms for management and conservation.
Therefore, legal accomplishment and compromises have been shown to have a very difficult level of acceptance by coastal inhabitants, and difficult completion by governmental agencies, international agencies and NGOs.

From the community perspective, it is sensed as a negative approach management arrangement for marine resources (green turtle), adopted by the government, whereas there has been little or no participation in the process.

As a result of this there is a high level of mistrust towards the regional and national government agencies when surveyed about their acceptance of the close season and their main arguments regarding why the negative perception towards this state legislation (figures 8 and 9.).

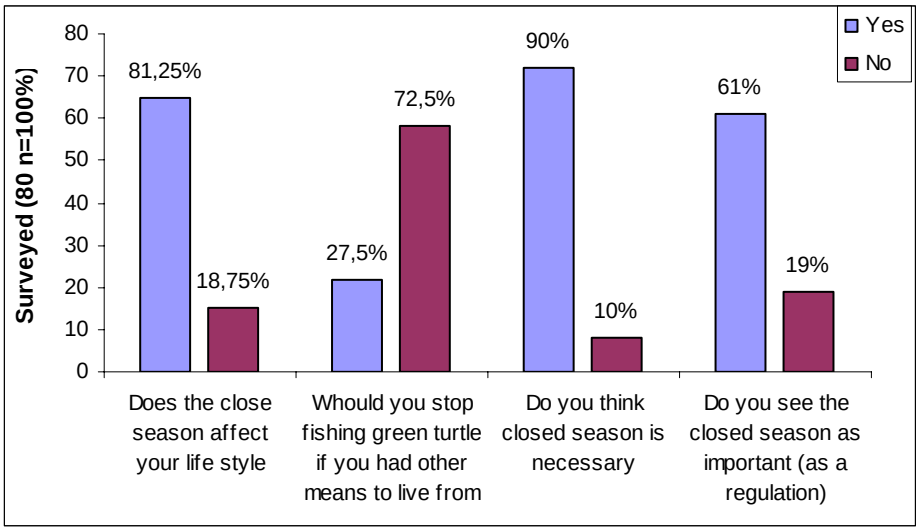
In some cases the government agencies are classified heavily as "Zero credibility[24]" by the two communities case studied. Responses were very negative and attacked government institution regarding the way resources are been managed or the way management is implemented and controlled by government institutions;



Source: Surveys (primary data)

Figure. 8: Close season acceptance (Sandy Bay Sirpi)

[24] Surveys and Interviews were designed with a section to determine the level of confidence in government's institutions. Confidence levels were determines by response to pre-established classification (Credible, partly credible, None or Zero credible)



Source: Surveys (primary data)

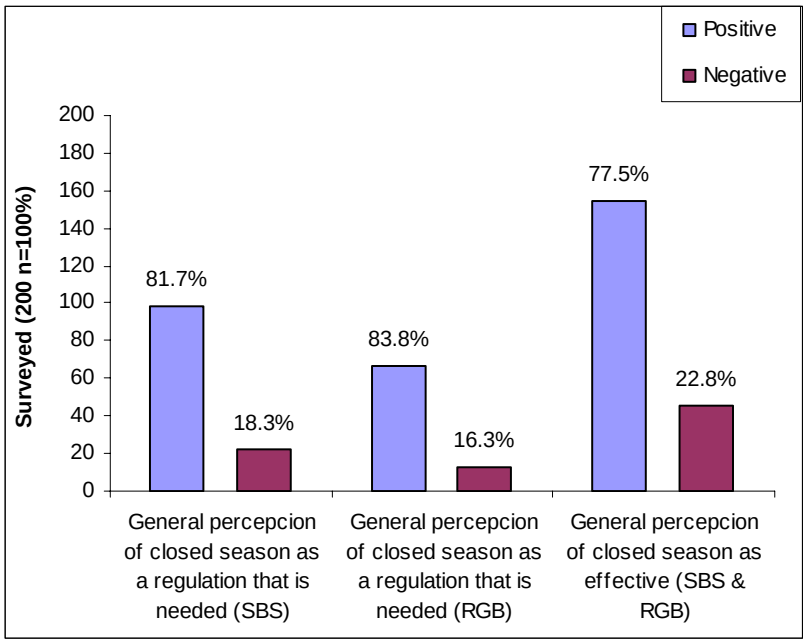
Figure. 9: Close season acceptance (Rio Grande Barr)

The local-indigenous communities and authorities perceive as unreliable, inefficient, and defective the provision ministerial decree that enforces an indefinite closure of sea turtles fishing for all species, except for green turtle fisheries for local consumption by the indigenous communities.

Although there is evidenced denial of acceptance to the closed season as a regulatory mechanism, since it was developed and applied without previous community consultation, they strongly highlighted the need to have and enforce some kind of resource management tool to prevent the extinction of natural resources because of unsustainable harvesting practices.

The closed season has been a matter of criticism by the coastal inhabitants, however, it is acknowledged by the locals, as to have positively affected its targeted goal which is to restrict the access to the resource for commercial purposes outside the communities, not because of the enforcement mechanisms assigned by the state, but because of the community awareness of the need for such, and the lack of other management mechanisms to use for effectiveness comparison.

As shown in the figure 10, their general overview of the perception of the closed season as the only regulatory mechanism for green turtle fisheries.



Source: Surveys (primary data)

Figure. 10: General closed season perception for Sandy Bay Sirpi (SBS) and Rio Grande Barr (RGB)

4.2.4. The socio-demographic challenges

Much of our knowledge of Indian (indigenous) subsistence systems in Latin America is based on scattered ethnographies and geographical field studies offering good descriptions but providing little in the way of accurate measurement of subsistence productivity, yields, labor inputs, caloric inputs and outputs, and time and distance factors (Nietschmann, 1973).

In addition to this there is a continuous dilemma in many researches that seek to determine the level of direct interaction and influence that local-communal activities (fishing) could have upon the stability and successful management of resource use.

In many cases the answer is relatively simple as to say, an individual as such or therefore a community alone could not harm the balance of any given resource being used, regardless of a management plan or not. However, several communities targeting the same objective could lead to disaster.

Putting together the challenging and somehow certainty of Hardin's work (Tragedy of the commons), and the joint reliance upon their surrounding environment we should make certain to acknowledge that community driven approaches to local development and local knowledge is relevant to social planning and resource management.

This presents a real challenge to planners and managers to include this particular feature in the coastal resource management process, not just as an approach to preserve the coastal-marine resource, but also to promote participative indigenous governability actions.

This challenge is also more complex when the stakeholders to be address are dispersed geographically as is the case of the indigenous communities that live along the shoreline on the Nicaragua Caribbean coast.

4.2.5. Geographical distribution and the demand for local participation

Despite inadequate population estimates and utilization assessment, through the world fishers have been blamed for the declining sea turtle populations (Bird et al 2003:179). Over the past fifty years, efforts to protect marine turtles in general have increased considerably. However, these efforts protect only breeding adults and eggs, and conservation of the entire population depends on cooperation among several nations (Campbell C. 2003: 5) due to the migratory pattern observed in the biology of this specie.

As a response to inefficient regional "community inclusiveness" cooperation initiatives, local "science" has historically been excluded from the conservation process and the

active participation by fishers in sea turtle initiatives was and in some cases still is rarely considered (Bird et al, 2003: 179).

In the Nicaraguan Caribbean region, the geographical patterns of indigenous community structures and distribution, are located along or within protected areas and natural reserves. This often gives place to disagreement between the indigenous communities, NGOs, and regional-national authorities on the joint administration and management initiative.

The indigenous communities however are disregarded as influential in marine resource management, it is clear that to fisheries management initiatives this particular aspect presents a complex management scenario for highlighted reasons such as; 1) wide distribution of indigenous (turtle fishing) communities, 2) traditional use resource, 3) monitoring and surveillance unreliability with little input effort from government agencies, among others, that could also be acknowledged, but somehow are attached to the ability to meet a long-term sustainable development insight and to accomplish long-term social growth in these communities.

The bio-geographic, distributional, seasonal and interrelated "lifestyle" of marine turtles has shown that little cooperative effort among marine turtle "host" nations could lead to a rapid population decline.

Tag returns, genetic analysis and satellite telemetry show that the majority of green turtles nesting at Tortuguero rookery in Costa Rica, migrate to feeding grounds in Nicaragua (Troëng & Drews 2005: 44), where they become easy target for artisanal fishers, considering that green turtle represents an inexpensive source of meat and a source of income with which to purchase other goods and services (Lagueux 1998: 162) for coastal communities.

4.2.6. Regional management challenge

Many countries in the Caribbean have regulations to preserve green turtles within their borders however, they rarely provide complete protection, and enforcement of these regulations is often inadequate (Campbell C. 2003: 5).

With green turtle the population has been valued as iconic to conservation, relating to or having the characteristics of an icon to acclaim conservation initiatives. and therefore exalt the protection of turtles as a moral issue in the contemporary world with values for the immaterial principles that they invoke in the global culture described by many as a charismatic value (Morgan 2007:61).

The question that arises is as to what extent will the regional-international management and conservation efforts to promote the biological sustainability of this resource be considered as effective within a transnational harvesting and biological migratory insight?

The underlying truth is that the sustainable use and community-based conservation effort is not directly linked to the regional management strategies but is presented as “the” fishing effort leading the turtle reduction trends.

As quoted from Campbell L.2000:169;

1- **Biological sustainability** is theoretically achieved when human extraction rates match the bounds dictated by the biology of the species, such that extraction is low enough to ensure its long term survival.

2- **Socio-economic sustainability** is theoretically achieved when users are provided with adequate incentives (economic, social, legal, institutional, political and so on) to respect the extraction rates dictated by the biologic and life history of the specie in question.

The biological sustainability of green turtle *per se* can then be explained to directly be linked to the perceived legal, institutional, political and socio-economic stability when sensed and perceived as visible by the resource users as positive to their welfare.

Considering that coastal communities are directly blamed or linked to the depletion trends of green turtles along the Caribbean, it becomes critical to shift conservation effort towards local communities, particularly to the fishers who are in the position to make choices directly impacting the fate of turtles (Bird et al 2003: 179).

This leads to Campbell, L. (2000) affirmation that sustainability is a goal, but is by no means guaranteed when implementing management regimes and has proven difficult to implement in practice. Therefore regional green turtle population sustainability and the conservation approach demand a more integrated coastal management approach.

Management options for the marine turtle fishery that can impinge on social, economic, and cultural aspects of the turtlers, turtle butchers, and coastal inhabitants will need to be discussed and agreed on among the turtlers, turtling-community representatives, and regional and central government officials (Lagueux 1998:26).

In any case a comprehensive approach to management with interest and particularities in both communities, should focus on acknowledging the true value of targeting the use and application of local-communal knowledge of fishers in the management process, forming a bottom-up approach initiative with community leaders and fishers as first hand users of marine and coastal resources participating directly in decision-making and consensus.

By doing so it is necessary for effort to be focused upon the intricate, interrelated and interconnectivity of the (human-ecosystem, social-natural) reciprocal stability and benefits with final output targeting a successful solution to a major concern such as human development stability and ecosystem health.

Jentoft, 2000 quotes that: "A government that does not provide communities some role in fisheries management losses an important opportunity, not only to support community viability but also to make management systems work more proficiently".

4.3. Local-communal and indigenous property rights

Debates and discussions over the "management" ownership of the coastal Nicaraguan Caribbean coast resources has been an active and in some cases controversial issue.

With the local economy of the indigenous communities on the Nicaraguan Caribbean coast continuously undergoing a transitional re-adaptation period, during which various changes have impacted them positively, such as, the permission granted by the Miskitu king[25] to the United States companies[26] for the expansion of the banana plantations between1890's and 1900's (Andrews 2008).

The approval of the autonomous law, passed by the National Assembly in 1987 the Frente Sandinista de Liberación Nacional (FSLN) government, offers Nicaraguans Caribbean inhabitants the chance to construct a society that harmonizes very diverse racial, political and cultural interests (Grisby 2008).

Others delayed and even restrained their economic development, for example the Somoza dictatorship that came into power in 1936 and plundered the regions natural resource (gold, silver, lumber and seafood) (Andrews 2008) and the 1979 national revolution by the FSLN. While the FSLN succeeded in introducing the autonomous law post-revolution.

However the effort of the FSLN revolution to overthrow the Somoza regime incurred into the high national capital indebtedness, violation of human rights, loss of ancestral land

[25] During the 1800's the miskitu societal system was structured and govern by a monarchic system, where sovereignty was held by a single person (the Miskito King)
[26] Eventually these companies were representing private interest from the both US parties and the Somoza family that had a dictatorship established in 1936.

tenure and the establishment of widespread extreme poverty in indigenous livelihood systems, delaying the development of the indigenous communities.

4.3.1. Property rights and the historical turtle harvesting

Green turtles have been harvested for around 400 years on the Nicaraguan coastal waters (Campbell C. 2003, Lagueux 1998, Nietschmann 1973), considered as on of the most important food source for Caribbean explorers during the colonization of the region (Campbell C. 2003), and have contributed considerably to the local indigenous economy.

Since the English establishment of a trading station at Cabo Gracias a Dios around early 1633 (Lagueux 1998, Nietschmann 1973), the indigenous economy was boosted from subsistence to commercial.

Therefore the trade relationship with the European buccaneers, English settlers and traders, Cayman island turtle men and later on the American lumber and banana companies had evidently impacted the Miskitu culture, subsistence and their environment (Nietschmann 1973). Where extractive resources (lumber, jaguar and deer skins, dried green turtle meat, hawksbill turtle shell, sarsaparilla, gum, rubber, cacao and other goods) were exchanged for cotton cloths, machetes, knives, axes, saws, fish hooks, nails, gunpowder, cooking pots and other western products (Nietschmann 1973).

By the 1800s regular visits and harvesting occurred, with reports showing that by 1878 over 15,000 turtles were annually landed in Europe, caught by the Cayman turtle man fishing in Nicaraguan waters (Lagueux 1998). With a good relationship developed with the Miskitu fishermen, known to be exceptional turtle fishers (Campbell C. 2003), large portions of the European landings might have come from the Cayman turtle men – Miskitu Indians turtle trade, along with the Rama Indians, Creole and Garifuno ethnic groups, also known to harvest turtles, although in lesser amounts than the Miskitu Indians.

The discomfort of the indigenous communities towards the current fisheries management system, along with the establishment of the Autonomous law in 1987, and the approval of the demarcation law (Law 445[27]) regarding the properties of the indigenous peoples and ethnic communities of the Caribbean coast, Bocay, Coco and Indio Maiz Rivers, has increasingly promoted the recognition of the lack of participation and respect of their ancestral property rights to land tenure.

4.3.2. Poverty and the indigenous communities

The poverty threshold or poverty line, is defined as the minimum level of income deemed necessary to achieve an adequate standard of living. This is the key suggestion and reasoning for the community approach and involvement in management, since in most cases coastal communities are developed around small-scale fisheries and live at the minimum level of income basis.

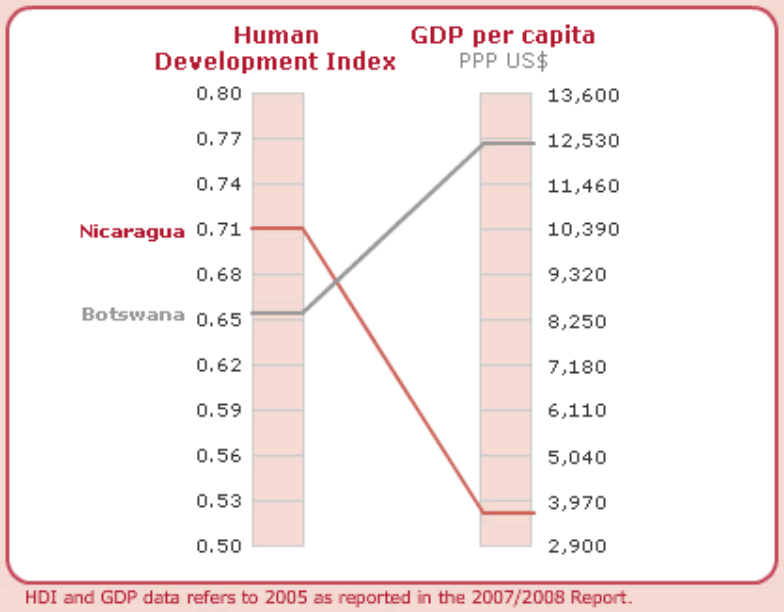
The basic question to ask is: Can government policies alleviate community necessities without their participation, when the very resource their life depends upon is at risk of extermination?

In a country where approximately 12% of its population (5,142,098[28]) is located on the Caribbean Region, divided in 6% (314,130) on RAAN and 5% (306,510) on the RAAS, like in other parts of the country, this shows a facet of both widespread poverty and isolated abundant private wealth, having the most unequal distribution of income and wealth in Latin-America (Wermundsen 2006:1).

[27] Enacted in December 2002, this legislation empowered the indigenous and ethnic inhabitants of the Nicaraguan Caribbean coast to self determination and use of their territories and all natural resources on their land extended also to the coastal marine resource within a 3 miles radius from the low tide line on the beaches to the open ocean water, based on ancestral property rights.

[28] National census 2005.

On the Caribbean coast of Nicaragua over half of the population on both the RAAN (226,065) and the RAAS (193,556) are located in rural areas distributed mainly along the coastline where poverty levels are considerably high, and therefore subsistence economy and/or small- scale production systems is directly responsible for economic growth. Estimates by the United Nations Development Program (UNDP) for 2005, reflected that 47.9 % of the Nicaraguan population is living below the National poverty line. Human Development index (HDI) for 2005 estimated by the UNDP showed a considerable increase. However, compared to other countries with lower (HDI), GDP per Capita, is still considerably low (figure 11).



Source: hdrstats.undp.org

Figure. 11. The Nicaraguan human development index (HDI)

The poverty measurements currently based on the income line (monetary), does not allow for, or poorly perceive the benefits and role of the non-monetary income or the natural and human capital in indigenous communities' livelihood and welfare. This therefore highlights the slow growing economy, making it possible to only assume that coastal fishers in rural areas will inevitably continue engaging in unsustainable fishing manners.

The Caribbean region particularly is characterized by relying upon an economy that is developed under 3 basic production modes (PNUD 2005);

1. Peasant Economy,
2. Indigenous and ethnic community economy (subsistence economy),
3. Business economy of exporting raw materials at the primary level

Surveys carried out by the Nicaraguan government, showed that poverty levels in the country have been reduced. Nevertheless, the Caribbean Region of the country has not only shown to possess the highest level of poverty but also the highest level of extreme poverty, with nineteen of its municipalities, reported in 2001, to be subjected to extreme poverty (PNUD 2005), distributed mainly among the communities.

Around 12.5% of the population are engaged in fisheries (PNUD, 2005), which is a rather small portion of the region's inhabitants, considering the level of importance of this industry with a total export of over 9,9 million pounds of marine product in 2005 (Rivera 2005) and its population size (620,640[29]). Fresh and salt water fisheries constitute the most important source of living in the RAAS region and particularly the coast-near areas (Wermundsen 2006).

The level of importance of engaging in fisheries by coastal communities, however high, is often focused only on three main issues; 1) revenue from fisheries, 2) increased effort-therefore harvesting to produce revenues[30], and 3) household economy stability-and by so their welfare.

These three issues are addressed and achieved by coastal-indigenous fishers, through fusing all three points into a single focus and could be explained as **consumption fishery**, is primarily because of the simplicity of actions (fishing) and complexity of objectives achievement (subsistence-sustainability). This is a common feature shown in small scale fisheries, outstanding in coastal fisheries.

[29] National census 2005
[30] This feature is particularly observed in cases where fish stocks decline

Chapter Five: Methodology

This research combines both qualitative empirical data obtained from the direct interaction, response and observations with the peoples interviewed, surveyed and focus groups' participants. Quantitative data was obtained form reports and document to compare and support the primary qualitative data.

5.1. Fieldwork preparation and data collection

Research in the Rio Grande Delta is a challenging task when addressing a topic as delicate as marine green turtle fisheries from three different angles (management, conservation and social welfare). Since efforts to promote resource conservation is often misinterpreted by locals as exclusion from resource management policies and resource use.

These parameters were crucial during the fieldwork data collecting preparation to ensure success. Previous research in these communities had proven an evident increasing need to address and highlight the current social problems and limitations challenging the development of the communities in the Rio Grande Delta if the goal is as to promote resource conservation.

Because of my previous research work in these communities there was no need for a broad time span to present to the community the research project, objective of the study, and methods to be used. However, the first two days in the community were used to arrange a meeting and take time to mix with the community members, the leaders and the environment, which was essential for data collecting.

A half day reunion with only community leaders was conducted as part of a first approach for identifying and reviewing issues around the turtle fishery and other problems currently faced by these communities.

Because of the interdisciplinary matters and issues worldwide surrounding the conservation of marine turtles and the broad span of obstacles which makes it difficult to achieve a desired goal, the methodology was designed considering the following aspects of the study area.

1. The two selected coastal communities for investigation in the Rio Grande Delta – a) Sandy Bay Sirpi, inhabited mainly by Mískitu and Ulwa indigenous groups, but also by a minority of Garífuna and Creoles, and b) Río Grande Bar, is inhabited mainly by Creoles and is highly dependent on marine resources.
2. These two communities present a vast similarity in natural resource use as well as fishing methods. That is why a comparative study could provide valuable data for mutual cooperation regarding resource use and management methods.

For more reliable data, and a better understanding of the research goals, and as contribution to the communities as such, the following considerations were taken and as result;

- A two-day management crash course was given to the leaders in each community to ensure a more clear understanding of the need and importance of local knowledge in resource management.
- Identification sheets with the different species known to inhabit the Atlantic Region were used during the workshop in order to identify species living in that area and the particular traditional and commercial use that has been given to them.
- Interviews and surveys targeting local fishers were carried out, obtaining qualitative data with, focusing more on the elders because of their experience in fisheries or otherwise involved in the fisheries sector as “advisers” to the younger fishermen.

The research was based on a *natural social setting* and *semi-natural setting*. As described by Blaikie (2000), a research conducted in a natural setting involves the researcher

entering the area of social activity and study the people going about their everyday lives and the semi-natural setting, where individuals are asked to report on their activities that occur in the natural setting. This research combines the use of secondary sources data with fieldwork notes. Important parts of the research are based on interviews and discussions with community leaders, fishermen, and women.

This research project is aiming to contribute to the development of coastal communities with valuable data that could help such communities to identify sustainable solutions and inclusiveness in the development and resource management policies based on highlighting the current management policy and its effect on the communities.
The research project is an attempt to contribute and to promote become and additional incentive of an environment for sustainable support to community-based natural resource use and management in order to help improve the livelihoods.
The project also aims to help prevent the creation of unstable ecological and economic situation that could disrupt the traditional subsistence system of coastal communities alike.

5.2. Data collection

During the field research, there were some limitations factors such as time, because most of the fishers were out fishing on the nearby cays for periods from two to seven days, and weather since the research was done during the rainy season, and rivers are often unsafe to travel because of flooding.

5.2.1. Focus group

Focus groups as a tool for collecting data were utilized to pinpoint some more specific subjects, discussion and specific problems around the green turtle fisheries, as well as for comparison purposes with the interviews.

The focus group was used to analyze and ensure that the information provided reflected the following remarks;

- A broad range of information on how a representative group of people feels about a topic.
- To guarantee a homogeneous, comfortable, participative and representativeness fishers, elders, women and local authorities and their opinion been guided by their insight and perception not a fixed set of rules and parameters as a survey or interview.
- The discussions panel permits the majority of the participants to give vital information that could immediately be corroborated and certified by the other participants in a flexible environment for discussion.
- A large number of participants can meet in one place to discuss a specific topic.
- Results can be obtained quickly.

For the interviews, surveys and focus group, the literature used to put together these tools, was the *Socio economic Monitoring Guidelines for Coastal Managers in the Caribbean: SocMon Caribbean (Pomeroy & Bunce 2003).*

To ensure the confidence of the people interviewed, two local leaders-researchers were contracted to aid in the data collecting process and workshop establishment.

Chapter Six: Green turtle market demand and commercialization

6.1. Commercialization

The turtles remain an important socioeconomic resource for the Central American societies. Hawksbill and green turtles have been the two historically most important marine resources for the coastal inhabitants of the Honduran and Nicaraguan Caribbean coast (Burgos 1984:21).

Artisanal commercial marine turtle fisheries along the Caribbean coast occurs primarily in the Northern and central coastal regions when green turtles migrate from and to the Tortuguero, Costa Rica, rookery (Campbell C. 2003:12) to the foraging sites on the Nicaraguan continental shelf.

Commercialization of green turtle within and from the Rio Grande Delta into the regional market was considered as one of the largest landings and trading sites on the Region Autónomo Atlántico Sur (RAAS). Data collected by Lagueux (1998: 49), showed that commercialization occurred among at least fifteen local markets, between January 1991 and December 1996.

Data collected form the interviews and surveys identified six main markets for green turtle commercialization (figure 12). Lagueux, monthly data collection showed that 89% of the total turtle landings in the Community of Rio Grande Bar, were sold outside the community followed by Sandy Bay Sirpi with 60.5% of landing through 1994-1996. Data from 2005 showed an increase in the quantity of product commercialized by both communities (Sandy Bay Sirpi and Rio Grande Barr) to the regional market (Bluefields, Corn Island, Laguna de Perlas, Haulover) (table 3.).

Although commercialization of turtle meat has been prohibited since 2006, the increase in products that is sold outside of the community might suggest two theories of this change:

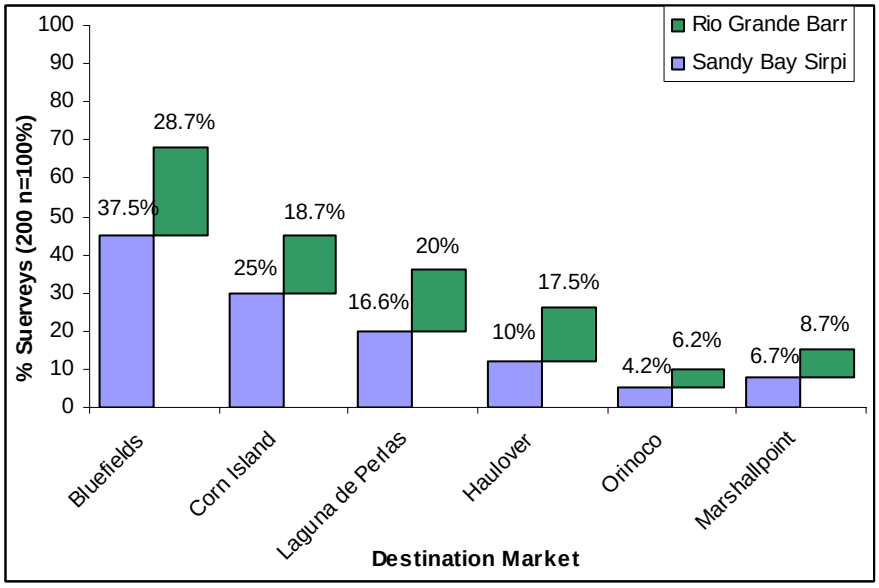
1) There has been a considerable reduction in catches (either by legal mechanisms or stock reduction) therefore landings were reduced, forcing the harvesters to sell a larger portion of their catches to obtain some revenues from fishing.
2) Higher demand for turtle meat on the regional market.

Data collected in 2005 as part of a diagnostic for the demarcation process of the indigenous lands based on ancestral territorial rights as part of the showed that

Table 3: Commercialized landings

Sandy Bay Sirpi		
Product	Sold	Consumed
Green Turtle (*Chelonia mydas*)	99.00%	1.00%
Rio Grande Barr		
Product	Sold	Consumed
Green Turtle (*Chelonia mydas*)	80%	20%

Source: Diagnostico para la demarcación del territorio comunal de Sandy Bay Sirpi, territorio indígena de la Desembocadura de río grande de Matagalpa, RAAS, 2005.

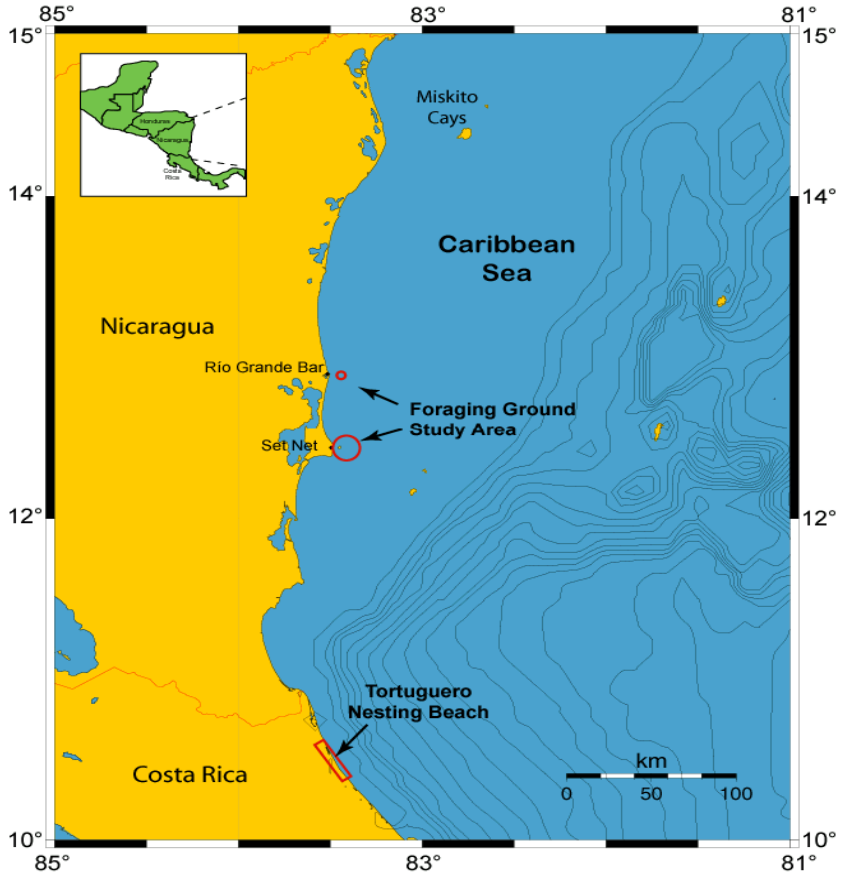


Source: Surveys

Figure. 12: Main green turtle commercialization markets

The main reason suggested for this high harvesting potential is as describe and stated by Burgos (1984: 31), Lagueux (1998:23), Campbell C. (2003:11), Troëng and Drews (2004:44), the Nicaraguan continental platform posses the largest extension of sea grass beds, also known as turtle grass (*Thalassia testudinum*) which is the main dietary staple for juvenile and adult turtles from the Tortuguero green turtle rookery (Troeng & Drews 2004).

Studies carried out by Campbell C (2003). Illustrates a the proximity of both the foraging sites next to the fishing areas, and the Costa Rican green turtle rookery site proximity to the foraging sites (figure 13.). This highlight inevitable turtle fishing tendencies in the Rio Grande Delta.



Source: Campbell, C (2003:15)

Figure. 13: Study areas on the foraging ground in eastern Nicaragua and the nesting beach at Tortuguero, Costa Rica. Bathymetry lines represent contour intervals of 200 m.

Commercialization trends in the Rio Grande Delta occurs mainly within and from the communities of Sandy Bay Sirpi and Rio Grande Barr which are known to be one of the distribution points for green turtle on the RAAS with the main markets located at Bluefields, Corn Island and Pearl Lagoon (figure 12). These two communities that this study is focused on could be considered as direct suppliers of green turtle meat to other indigenous communities such as Karawala (Ulwa-Sumu indigenous community), Kara (Ulwa-Sumu and Mískitu indigenous community) and Walpa (Mískitu indigenous community).

The actual management implementations has limited the feasibility of this local intra-communal trade since catch production need to be focused on the fishing community in question to support their social economy due to the fishing restrain.

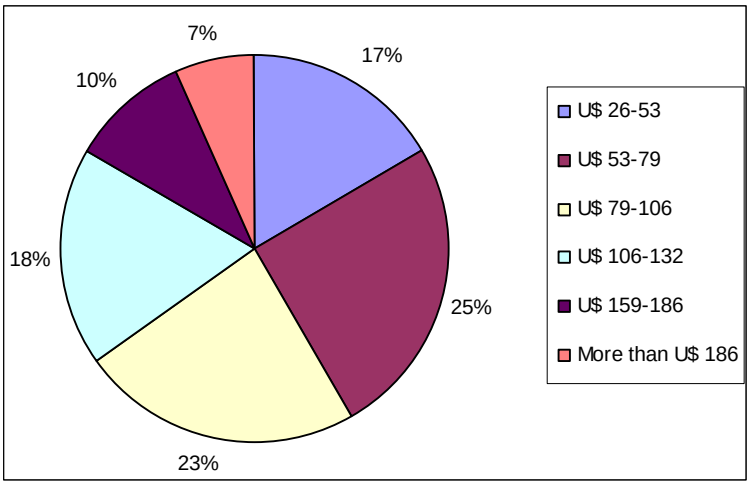
Reduction in green turtle catches could mean that in the long run there will be a reduction in the turtle fishing in general for two main reasons; 1) increase in the community population size and, 2) decrease in benefit obtain from fishing. Hence, the communities in quesiton could have a negative backlash effect on their socio-economic welfare, unless they are able to seek or be provided with some alternative solution to their increasing societal demand limitations.

6.1.1. Local household economy

The local economy in the indigenous communities on the Nicaraguan Caribbean coast is heavily based on the use of diverse ecosystems and species in the region, particularly fishing (marine fisheries) combined with agriculture. The fishery based economy is a seasonal activity depending on the targeted species.

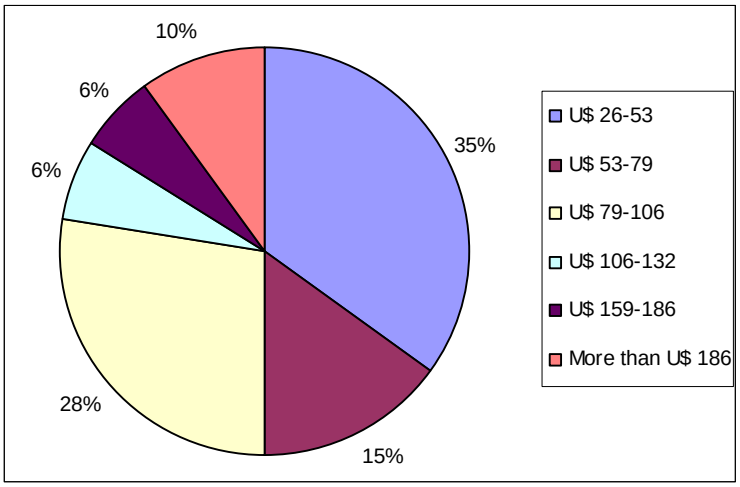
Interviews in Sandy Bay Sirpi and Rio Grande Barr revealed that from the fishery generated income including turtle fishing, over 65% of the interviewees obtained under US$106 a month from this activity excluding the combined agricultural effort in Sandy Bay Sirpi and 78% in Rio Grande Barr (figures 14 and 15).

The remaining portion that obtained above U$106 from fishing activities, were obtained also excluding the combined agriculture effort, however, they had other economic aid from family members living outside the communities (Costa Rica, Cayman Islands & US), however their certainty on the exact amount of financial income from fishing, agriculture and family members was inconsistent and inaccurate, therefore suggesting that in some cases they might have overlapped their family income with fishery generated income.



Source: Surveys

Figure. 14: Sandy Bay Sirpi's average monthly household income from fishing (including turtle)



Source: Surveys

Figure. 15: Rio Grande's Barr average monthly household income from fishing (including turtle)

Data analysis from Lagueux (1998) revealed that the mean weight of animals harvested has, apparently, decreased during the past 20 years on the Nicaraguan Caribbean coats. The mean live weight (80.6 kg ± 23.7, n = 1,438) for green turtles landed in RAAN (Puerto Cabezas) from April 1992 to March 1993 was less than the 90.7 kg mean live weight reported for green turtles harvested by Tasbapaune turtlers during a 12-month period beginning in 1968 (reported also in Nietschmann 1973).

In addition, turtlers have reported decreasing the mesh size of their nets from a 46-cm to approximately 38 - 43-cm so that smaller turtles do not which suggests that turtlers are no longer capturing a sufficient number of larger animals to meet their economic needs and demand for turtle meat (Lagueux 1998).

6.2. Women and fisheries

While fisheries is considered to be a "man's job" in many cultures around the world, the involvement of women is seen ever more frequently. However when seen in coastal communities, it is often limited to the small scale fishing such as oyster's, shrimp fishing

using cast nets[31] harvesting. This is a common feature among indigenous and coastal communities. The Ramas Indians for example, do shell fishing. This is another activity that is done mainly by women. The shell fishing gives fisher women the opportunity to obtain money that is used for support of their family (husband, children and themselves). They harvest mainly oyster, ahi and clams. Lobsters and crabs are also included (Joseph, K. 2002).

The role of women in the management and use of natural resource-based livelihoods in the developing world has long been acknowledge but has rarely been valued on an equal par with that of men, thus reflecting gender hierarchies in individual societies. In many fisheries, women have traditionally occupied the pre and post harvest sector concentrating on financing the fleet, processing and marketing the catch. In addition to these tasks, women have also had to look after the house hold unit taking care of the family educational, heath and dietary needs (Bennett, E. 2004).

The participation of women in the turtle fishery activity as such, is very limited (2 in La Barra and 6 in Sandy Bay Sirpi)[32]. However the role that they play is of considerable importance, to such that the marketing issues are likely to be unsuccessful without their participation. It might even be fair to address that "*the women's role in fisheries*" is even more important than men, because of the direct linkage to commercialization, household and financial management. This is a common feature observed not only in the Mískitu community but as part Latin-American culture (personal observation).

Adelia Dalvis (women form Sandy Bay Sirpi):

> *"The work of the women for a long time has been the one to dedicate to the care of the children whereas the man looks for the food, but when the things are put difficult sometimes we helped our spouses to fish turtle and fish to be able to eat and to sell. We do not have many options since we do not get much help from the government."*

[31] A small round net with weights around the bottom, which is thrown by the fisher. Sizes may vary up to about 4-6 m diameter. The net is thrown by hand in such a manner that it spreads out on the water and sinks. Fish and shrimp is caught as the net is hauled back in.
[32] Data was provided during workshop. It's a rough estimate bye participants and for hence not accurate.

Lorna Churnside (women-leader from La Barra):

> *"We have always been who buy the food, the clothes, and medicine for the children. The men only fish and sell the product and afterwards they give the money to us to buy the house needs, but sometimes many men do not like to give money to the woman and they drink it in liquor so with the little that we obtained we must know how to use. Beside when things get difficult we go and fishing too but most of the time is the woman who sell the turtle meat not the man"*

It is uncertain why the management, marketing and household responsibilities are mainly delegated to women, but can be explained by a number of factors among which probable he most common ones are:

1. The woman is the one that spends most time taking care of the house. In many cases it is attributed as "*her job*" by men's because it's considered diminishing for a man to help out in the house chores.
2. The culture of prominent exhibition of masculinity "machismo", commonly observed in Latin-American's cultures, liked to the fact that turtle fishing is considered as a hard labor job not suited for women.
3. Often in indigenous communities in particular unlike most coastal communities, the women are usually the ones that can read and write, skills required to manage the business, or as commonly said in these communities "*they have the head for this job*".

The women by the role they play in the family as an institution, the community, and the livelihood productivity of their communities, have capacities and limitations as well as particular interest and preoccupations.

Taking into account the knowledge and experiences of the local women could contribute to a better handling of the resources, and to take into account their perspective in different projects entails to two gains; a) to create a more equitable and fair-minded societies terms of gender approach, and; b) to preserve better environment (Figueroa, 2006).

When it comes down to managing the resources in coastal communities, because of the expertise in managing the household, unlike most men (only fish and bring the money and has little or no link to the administration of it), women presents a much better qualify background to be taken seriously in the use, management and policy making around natural resources.

6.3. Resource trends: local-knowledge perception vs. modern scientific methods

In the current contemporary conservation initiatives and policy design, sustainable use of resources and sustainable development of resource user has become the centered of focus of researchers worldwide.
As stated by Campbell L. (2002:1229) this has become an indicator of a shift in policy away from exclusionary practices restricting access toward more inclusive ones that involves some form of resource use.

However the theoretical principles of sustainable practices are far more elegant and achievable than the practical implication of applying those theories which by far has shown that by achieving any goal theoretically established through sustainable practices, presents the undeniable complexity of practical achievement, which lies within equating the balance between both resource user and resource.

As a result of problems that could arise based on the biology of the species or system in question, and the dynamics of economic, social, political and cultural systems that guide or regulate resource use (Campbell L. 2000). The options for conserving sea turtles in developing countries are limited by the inadequacy of national and international laws, and the inability to enforce the laws (Burgos 1984:25).

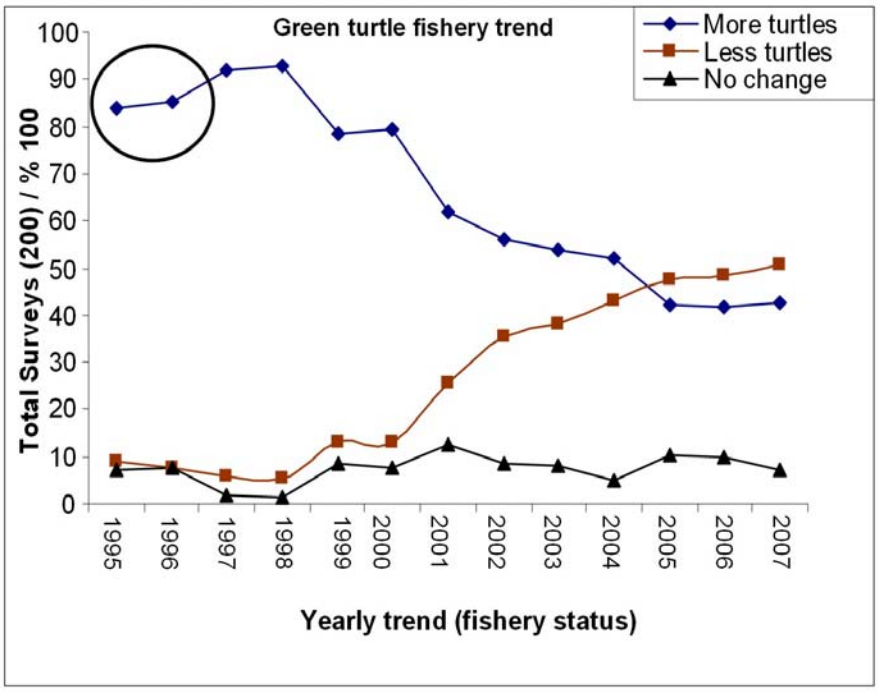
The basic principles to suggest sustainable use of any biological species or resources is drawn on the trends of resource fluctuation over the years either based on mortality by

natural causes or by direct human intervention (i.e. legal or illegal harvesting, over fishing, etc).

During the field data collecting as part of the research, one main goal was to discover the local fisheries perception trends of resource state, for which one question with three different answers were used for comparison purposes with other research around the same topic.

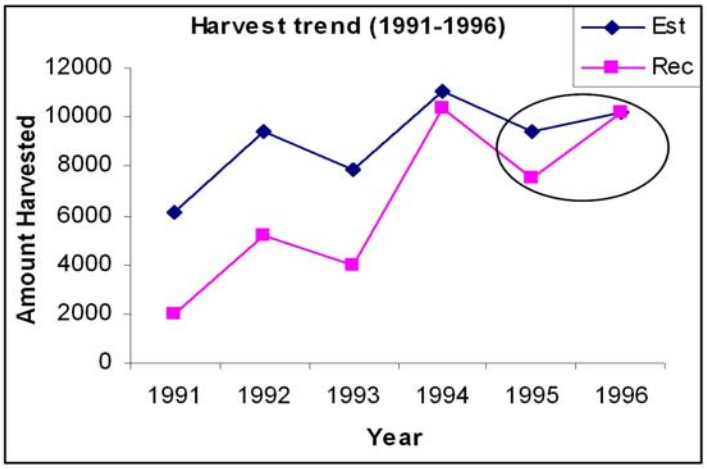
The question asked was (*how has the turtle fisheries been since 1995 on a yearly basis compared to now, July 2007, do you think that there is more turtle, less turtle or no change in the fishery*) By using this means, it was possible to obtain the most recent perception on resource change, (maybe even more recent than a more complex data collecting system).
The results obtained, from interviews, were compared and sustained during the focus groups workshop in order to view its credibility from the individual and group point of view. Astonishingly, the local perception on resource trends from both surveys and focus groups coincided.

The data used for comparison was that of the total recorded and estimate landings of green turtle from 1991 till 1996 in four turtling communities (Awastara, Dakra, Big Sandy Bay and Puerto Cabezas) on the Northern Autonomous Atlantic Region of Nicaragua (RAAN), and four communities (Rio Grande Barr, Sandy Bays Sirpi, Set Net and Tasbapaune) on the Southern Autonomous Atlantic Region (RAAS) by Lagueux 1998.



Source: Surveys, Interviews, and Focus Group

Figure. 16: Local perception of the trend in green turtle fisheries



Source: Adapted form Lagueux[33], 1998

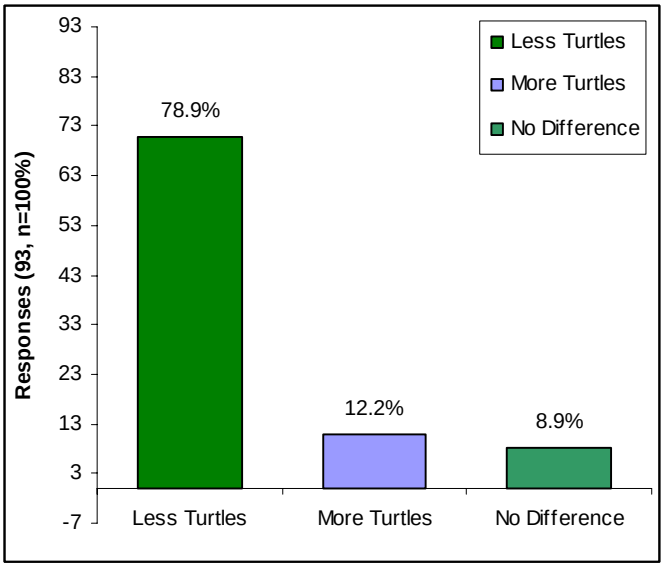
Figure. 15: Green turtle landings

[33] From 1991 to 1993, the estimates annual harvest was calculated based on extrapolations of data collected at three of four sites depending on the year (Lagueux, 1998).
From 1994 to 1996, the estimates annual harvest was calculated basing on extrapolation of date collected at eight collection sites (Lagueux, 1998).

In the figure 16, it is observed that the response to more turtles in previous years compared to now (1995-2007), is on a down slope, meanwhile the response of less turtle now than that of previous years increases, and a somewhat constant pattern in the response of no change in the fisheries is observed. By comparing the response of turtle catches by local fishers from 1995 compared[34] to 2007 at a yearly fluctuation, with the harvesting trend recorded from 1991 -1996 in (Lagueux 1998), shows for the last two years of recorded and estimate landings (1995-1996) by Lagueux, significant similarities (encircled in figure 17) in the trends of recorded landing data (Rec.) and estimate landings (Est.). However, further analysis was not possible due to data insufficiency.

Surveys and interviews carried out by Lagueux et al. (2006) on the Socio-economic value of green turtle in 10 different communities on the RAAS and 6 communities on the RAAN reveal that from 93 (n=100%) turtle boat captains (figure 18) 71 (n=78.9%) of them believed that there is less turtle now than in recent years, 11 (n=12.2) believed that there has been in the fisheries (assuming no stock) and 8 (n=8.9%)[35] believed that there is more turtles now than before.

[34] The comparison was estimated for 1995-1996 and by using only the response from local perception of "more turtle" over a yearly view and the landing estimate and recorded for 1995 and 1996.
[35] For both Lagueux et al (2006), and this research, for the response on no change in fisheries over time, it is not clear and un-documented the level dependence that interviewees have on green turtle as their main economic basis. Since turtle fishery is a seasonal activity (with high catches around June-July) most fishers alternate this activity with scale fish and lobster trapping.



Source: Adapted from Lagueux et al (2006)

Figure. 16: Boat captains response to green turtle fishery trend

This evidenced that the local knowledge on the green turtle fisheries could be used for a much closer analysis of resource fluctuation on years, and validate with prior scientifically structured method. It is undeniable the importance and value of local-traditional knowledge as a certification or comparison tool for resource fluctuation trends and close range-date problem identification, insight and analysis regarding the use and management of natural resources.

Considering that coastal communities and indigenous groups are still known to be key harvesters for marine turtles with its fisheries attached to their traditional-cultural harvesting methods mixed with modern fishing gears and equipments (motorized vessel, Global Positioning System (GPS) and Polyethylene made gillnets) and the migratory pattern of marine turtle in general (migrating within the fishing grounds). It is inconsistent and rather irresponsible to address management of marine turtle without a direct approach of coastal communities' involvement as part of a socio-political, socio-institutional and geographic joint management effort.

Therefore, the initiative of the Nicaraguan government as well as any other country to manage marine turtle fisheries if based on semi-exclusion rights and in a context of

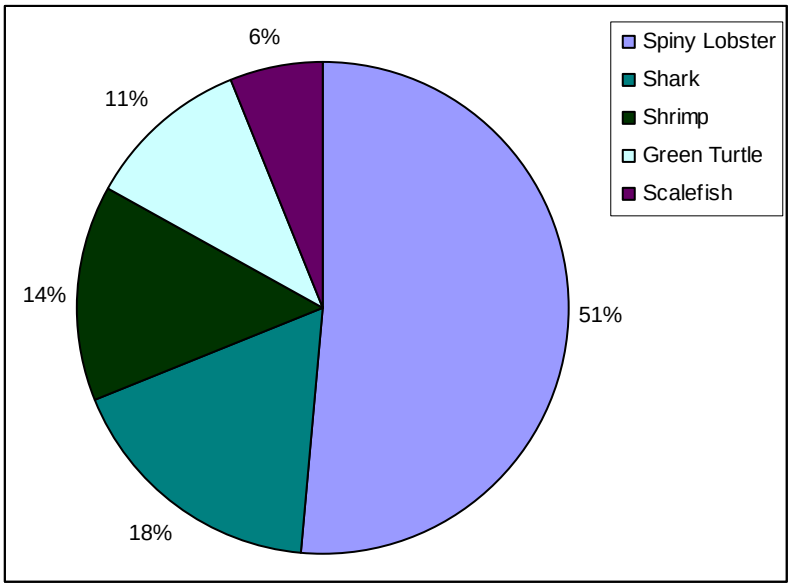
indigenous and/or ethnic socio-culturally rich and resource dependent environment could in the future undoubtedly lead to Hardin's common's dilemma regardless of international conservation effort.

6.4. Resource marketing and distribution

For a long time, marketing artisanal fish product on the Caribbean Coast has been an overall problem discussed mainly by inhabitants of different communities (Joseph, 2002). There are several semi-cooperative systems, formed by private (small investors) capital, that has been providing indigenous communities with the main marketing alternative for their product.

In terms of price per pound of product (C$=cordoba X Lb), Caribben spiny lobster obtained the highest response as to income generated (figure 19). Shark (of various species) was ranked second, in the price scale. Shark fisheries are mainly done for the fins which is dried and then sold for approximately US25$ per pound.

Compared to the price for lobster (US18$ per pound), shark should be considered as the most valuable resource, however, is not a main targeted specie and only a very small amount of people fish for shark in both communities (unknown amount) leaving lobster as the largest economically important resource followed by the shrimp fishery, green turtle (which is sold through the Rio Grande Delta for local consumption) and scale fish.

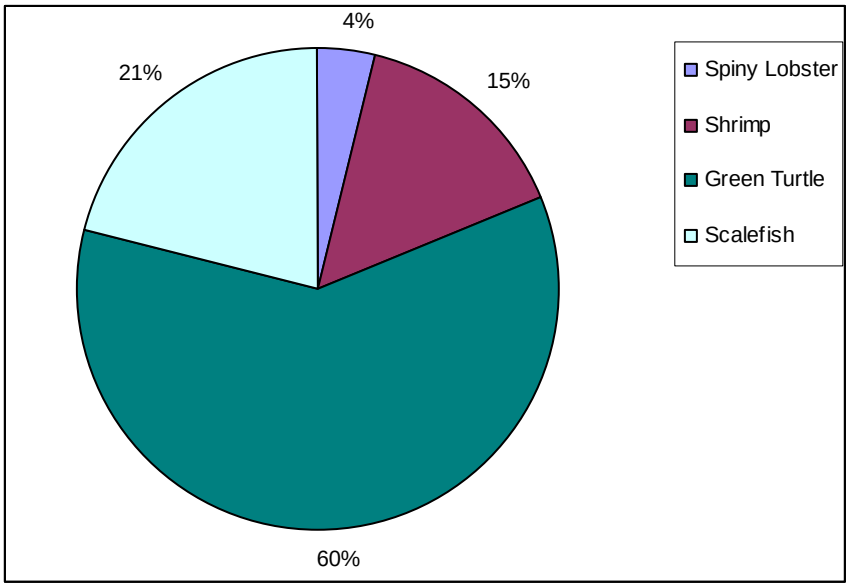


Source: Interviews and Surveys

Figure. 17: Resource importance by price range (C$ x Lb) (SBS & BRG)

For local consumption, green turtle was considered as the mot important resource, compared to shrimp, lobster and scale fish (figure 20).

Most of the justified arguments to why it is considered by the locals as the most important resource for local consumption, was expressed as to traditional-cultural utilization as a food source. Also, the interviewees that responded that green turtle was the most important resource either have been or are fishing green turtle, commercialized green turtle or have a relative involved in turtle fishing.
The other interviewees that did not were involved almost fulltime in other activities such as agriculture, as the owner of a business (diner, guest house, commercialized other products, were been supported by family member outside the community).



Source: Interviwes and Surveys

Figure. 18: Importance for local consumption

6.5. Alternative resource market and commercialization

Fishing represents the main alternative for survival, however other activities could be combined along with fishing to promote the sustainability and reduce the pressure and dependence on the marine resources.

During the workshop, the participant were asked to identify potential alternative sources of income that could be developed in order to diversify their economic (fisheries) dependent activities, from which the below were identified;

1) Ecological tourism along the rivers and lagoons as well as to the different cays located within the traditional fishing grounds.
2) Assessment of the potential to develop the agricultural and farming sector among which banana (*Musasseas spp.*), cacao (*Theobroma cacao*), cassava (*Manihot esculenta*), pineapple (*Ananas comosus*) were the most highlighted ones.
3) Development of the animal husbandry sector, which implicate improving the livestock quality and encouraging market demand (animal husbandry, particularly

pigs and cows was considered as the second most important protein source after fishing).

Most of the data from the interviews, surveys and workshop, reflected that the reduction in fishing have made the locals aware and willing to reduce and shift the dependence and fishing of green turtle, in exchange for alternative protein and income sources. However, they did not entirely showed reluctance in ceasing green turtle fishing despite alternative income source due to the socio-cultural nature of their attachment to green turtle.

6.6. Co-management and user rights (creating a sense of responsibility)

Co-management can be defined as a partnership between government, the community of local resource users (fishers, external agents, NGOs, academic, and research institutions), and other fisheries and coastal resource stakeholders (Berkes et al 2001).

It demands involvement in the management decision-making process through the delegation of regulatory functions to fishermen's organizations, or to organizations especially designed for management purposes where resource users retain central collective role of authority, creating more responsible attitudes towards resource use (Jentoft, 2000: 58).

It should be seen not as a single strategy to solve all the problems of fisheries management, but rather as a process of resource management, maturing and adjusting to changing conditions over time (Berkes et al 2001).

Marine turtle management in Nicaragua in general is enclosed as a complex system of community participation along with governing institutions. In the case of the Caribbean coast of Nicaragua, management efforts and political administrative institutions are stationed directly in the "capital cities" (Bluefields on the southern region and Bilwi on

the northern region) in the region with a governing system heavily influenced by central government politicized top-down approach.

This in term delivers little direct involvement of the coastal communities other than to directly depend on the regional council[36] to promote, analyze and execute their demands for inclusiveness and participation in the management process.

6.6.1. Politicized system and the uncertainties of management success

The current politically un-inclusive policy design is perceived by the locals as of deficient in inclusiveness of their right to administer their resources.

They have acknowledged that there is the need to involve the political discussion into the governance system design, however at both regional and the national level, the state governing institutions are attributed as being heavily politicized, prioritizing the individual political parties preferences misleading the sustainability of the regional-local administrative effort to empower the coastal communities.

Along with the politically unstable governing institutions there are limitations in the financial support to develop the local economy in the communities, technical expertise and political will to enforce regulation, and in most cases the state institutions are perceived by the locals as inefficient in terms of resource management (figure 21.).

Regardless of the crucial role played by the regional council in the regional governance system, in strengthening the governability initiatives on the Nicaraguan Caribbean region, there has been little effort toward directly promoting the community participation perceived by the local community inhabitants.

[36] The regional council is the maximum regional authority on both RAAN and RAAS (one for each region) and it is formed by members of the different communities, cities and islands within the border line of the regional division on the Nicaragua Caribbean Coast through a democratic election system.

This was identified when during the workshop the participants were asked to describe their level of involvement in the green turtle and overall natural resource management, by drawing upon their knowledge of the governance institution that they know about based on a hierarchic system.

From their response and discussions, some main bottlenecks were identified in the governance systems that restrain the community participation;

1) The influence on the communities in the national policy-making discussions has to be channelled via the regional governments thought their chosen regional council member[37] influenced by political parties' preferences.

2) Decision made at a central level and transmitted down to the regional councils that could affect the community or communities are often ignored the direct community participation, because personal-political interests present.

3) Regulations and laws such as the fisheries legislation (Law 489) and the Nicaraguan environmental legislation (Law 217) among other legislation, decrees, and resolutions concerning the use and protection of natural resources, are regulated directly through MARENA with little or no direct participation of the regional council or communities, concerning the impact of these regulations on the coastal inhabitants.

4) The negative politicized influence in the community empowerment process has extended at the community level where in some cases community leaders and local authorities (chosen by the locals) are inclined and respond to political preferences[38].

[37] Responsible to promote the community participation, represent the communities at a regional and national as messenger of their inconveniences, acceptance, and reject to national or regional policies, activities and development initiatives that could affect the community livelihood and integrity. In accordance to the Autonomous Statute (Law 28), Chapter II, Article 19., that states: "Each Regional Council shall be composed of forty-five members elected by universal suffrage, equal, direct, free and secret ballot, must be represented by the ethnic communities in the Autonomous Region respectively, according to the system that determines the.

[38] This observation suggests a major concern and disruption of the community socio-political organization however it is regulated by the community it self through an intern lection of the communal assemble (the maximum local- communal authority)

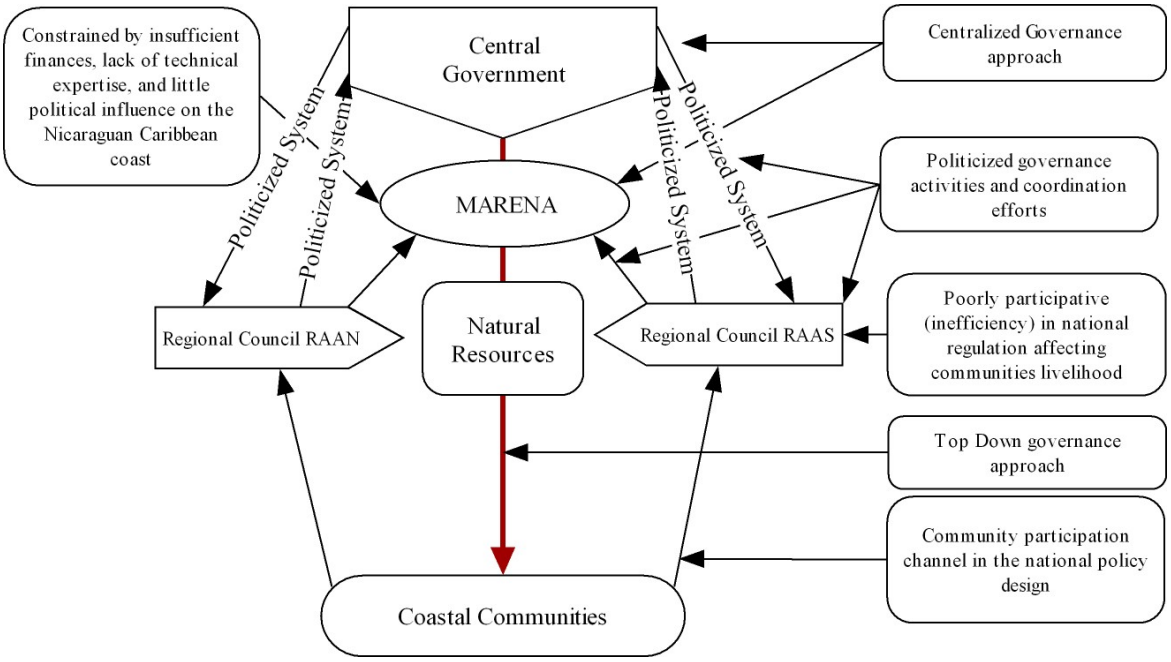


Figure. 19: A politically influenced centralized resource governance system seen from the community perspective.

The above (figure 21), is drawn from on the interviewees and workshop participant description of the resource governance and management system structure and currently how management is executed, and on Roe's (2005). It is clearly evidenced that the more centralized approaches to understand how the management process works, the less effective it seem to results.

From the local perception the current governance system as it is, is likely to become inefficient or insufficient to govern the natural resource use by coastal inhabitants on the Caribbean Coast. This is simply because they (the communities) do not seek or incline to political preferences and instead are driven by their ancestral property rights to determine the use of their resources that determine their community development.

Lagueux (1998: 164) also highlights that the Ministry of the environment and Natural Resources (MARENA[39]) in the country is subjected to constrains by insufficient

39 MARENA is the institution responsible for the conservation, protection and sustainable use of natural resources and the environment. To achieve its objectives, MARENA formulates, proposed, directs and

finances, lack of technical expertise, and little political influence on the Nicaraguan Caribbean coast, in addition to the separated geographically and culturally aspects of marine turtle harvesters and consumers on that coast.

Joseph K. (2002) also emphasize that Co-management is one of the alternatives that Nicaragua itself should develop to the national extent and also regional, so that communities can also be included in the management system.

> ***Fishermen comment:***
> *We know that we have a lot of resources that we can use and for a long time the government has been exploiting these resources for their own benefit. The new law 445 give us the power to use and manage out own resource but it is in the regional government that the political parties holdback the development of the region. That is why we (the communities) need to unite to fight back against these political parties.*

It has also promoted the awareness for the indigenous communities to be included in the regional-political administrative system as active and participative stakeholders and decision-makers which has provoked the rejection on behalf of the coastal inhabitants to the top-down politicized management system.

> ***Humberto Holms (fisherman):***
> *Why should we trust in these institutions that always promise and never comply? Already we can see that in the regional government there is a lot of fight to decide which political party will be in charge of leading the regional council as the maximum regional authority. Once one party gets in power they receive orders form the central government and ignore our demands.*

monitors compliance with national policies such as environmental standards of environmental quality and sustainable use of natural resources.

Storling Molina (fisherman and farmer):

We have seen over and over again that during the election period the leaders of our communities in favor of one specific political party would tell us to vote for them since they will provide economic stability and empower the communities. However after the elections, the story changes and we are always left out. This is enough for us to see that there is little help we can expect form the government institutions.

Inevitably the coastal communities' empowerment depends highly on the direct involvement and intervention of regional councils from a non-politicized overview to aid the facilitation of the financial, political, environmental and governing means to sustainably manage their resources.

The regional governing systems have also been subjected to negative criticism, trustworthiness, and in some cases rejection by the inhabitants because of the political preferences to policy design.

6.7. Management instruments

Modern conservation methods in order to be accepted and acknowledged as successful, has to go through a series of challenges. The most predominant and probably effective methods are the legal ones (Laws, rules, regulations, treaties, etc) with evidence scientifically proven to support conservation initiatives. In the context of indigenous affairs and societal impact by legal management instruments, effectiveness of legal measures often means social struggle for coastal inhabitants.

The challenge of managing marine turtle fisheries and consumption in Nicaragua has shown some shortcoming in it effectiveness, which results in poor success levels. The only "hard" management tools used that directly affect-control the harvesting by coastal communities and by-catch from trawlers are:

1. Closed Season,
2. Limited allowed catches in coastal communities,
3. Gear Regulation (TEDs used by trawlers)

Other "softer" polices are also implemented but not highly regarded as influencing the harvesting control of green turtle fisheries in coastal areas.

6.8. Community co-management (stakeholder participation)

In the particular context where as the very livelihood of coastal communities rely upon the wellbeing of the resource they use, coastal resource management perspectives need to address a more informal and participative approach, such as community based co-management with considerations on ecosystem approachrs to management in order to guarantee a partial coverage on the human-ecosystem interaction.

A particular case could be looked at, such as the Costa Rican management effort by totally banning the fishery of green turtle, considered as a success to protect this resource. On the other hand the Nicaraguan green turtle fishery up and till 2006 was managed by an indefinite closed season, and actually banned, which allowed limited access to fishery by indigenous communities for subsistence purpose only.

The complexity of the Costa Rican-Nicaragua green turtle fishery management interaction effort is that Costa Rica possesses one of the largest green turtle nesting sites in the Americas, whereas Nicaragua possesses one of the largest feeding and breeding ground, hosting the most extensive sea grass – turtle grass beds in the Caribbean (Troëng & Drews, 2004), making this ideal for fisheries, with little surveillance and control on size, sex and landings.

Consideration might be needed to address whether if on a long term the Costa Rican turtle nesting stock will continue to be sustainable. Eventual conflict could result in the

turtle management system failure, from the fact that Nicaragua consumes what Costa Rica produces, and therefore sustainability of the stocks could become somewhat ambiguous.

The solution however implicit or explicit it might be, relies on the success of managers to insure that at least some basic demands of coastal communities are satisfied, since it is the Nicaraguan government that has to take up the responsibility of allowing indigenous communities to fish turtles for subsistence, and the negative utility cost is shared with the Costa Rican conservation effort.

As stated above, the overlapping of management effort, and complexity of goals achievement, makes a consideration for a community based co-management approach more effective to address, for reasons such as:

- First hand users of the resource,
- Social empowerment,
- Stakeholder participation,
- Simplify communication,
- Knowledge supplementation (Local Knowledge-Western Science),
- Detailed monitoring, evaluation and identification of trends,

6.8.1. Governance – a community approach

Probably the most important reason to address a community approach to resource management is that it creates a mutual sense of responsibility for the usage of "*their*" knowledge and role as stakeholders-managers, transforming their role, from an abiding participation action overview, to a more institutional focus and functioning as users. This in turn will contribute to a sustainable governance system development.

However, the current globalized initiatives towards sustainable and participative governance systems and the interaction with coastal communities could greatly misguide the approached solution to a common problem.

When assuming that the search for a solution to a problem in order to be addressed and solved is globally expanded and addressed as a holistic system (globally approached). It lengthens and generalizes the explicit role played by small stakeholder groups (coastal communities) by acquiring a more complex functioning structure that easily ignores their individual impact and dependence level upon a common resource.

For obvious reasons it is necessary to globalize the conservation effort of marine green turtles. As highlighted by Koiman et al (2005:328), by lengthening interaction chains to a global level contributes to a highly diverse system, with fishers' from different backgrounds and locations exercising their professions in widely divergent ways.

However it also incorporates the complexity of coordinating effective management strategies within the governance discourse due to the large number of actors, higher interdependency and greater geographical distances.

The observation by Koiman et al. (2005) is accurate and positive for two key reasons; 1) the exchange of knowledge, experience and expertise, 2) the incorporation of a multifaceted solution to a multifaceted problem.

The negative elements of this reasoning is that it presents a "loophole" in which centralized governance initiatives are used in order to manage a complex and diverse governance strategy, which is often imposed upon small-scale fisher.

Where indigenous communities could and will be regarded as of low importance to the governance process instead of responding to their demands by including a participatory exchange of knowledge and the formulating of policies based on those demands.

This centralized governance exclusion system is often argued and supported by the state institutions based on limited organizational capacity of the stakeholders (communities) to be ordained with this responsibility even as a joint state-community co-governance initiative.

Based on the research surveys responses obtained from the community inhabitants regarding the limited managerial and governance capacity-building in the communities, and observations by Ryan (2003), Joseph (2002) and Roe (2005) highlighs the need for more community participation in policy design.

This limited organizational factor could be linked to several questionable observations that enclose and limit the development of the resource management capacity in the coastal communities (figure 22);

i. Low administrative, academic, managerial capacity and knowledge.
ii. Limited fishermen organization level.
iii. Low fishermen participation in policy-making.

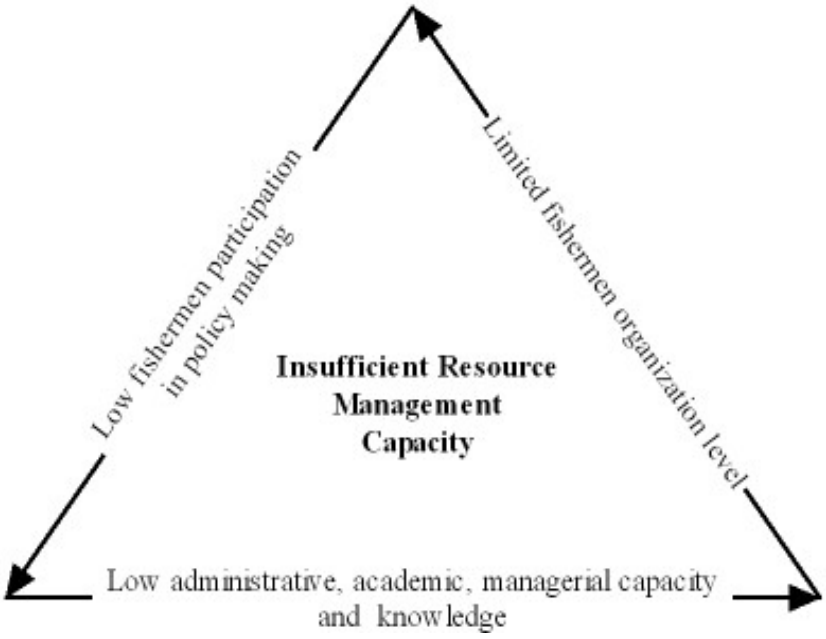


Figure. 20: Managerial capacity and resource management

Albert Gonzalez (fisherman):

There is a limited management capacity from which we (the communities) can effectively participate in the making of regulations. This in part is because within the Municipality of Rio Grande Delta, there is very little unification among the different communities, along with the fact that we don't have enough knowledge about resource management.

Wilby McKloud (fisherman):

The management capacity of these communities is not enough for us to be fully integrated in the national policy-making and it is limited to a simple household subsistence economy. We depend on the regional council, universities and the community leaders to help develop our knowledge so that we can manage our own resource and not depend on central government to make the decisions for us.

However, these three arguable observations in the coastal communities work on an interdependent manner which requires solving one particular feature which is related to the acquiring of academic, managerial and administrative knowledge. Promoting the managerial and academic development in the indigenous communities will contribute to an increase in the organizational level, from a subsistence-local-communal level to a regional participative level.

This effort could undoubtedly promote the inclusiveness of fishers into policy-making, while providing a framework which subsequently will increase the effectiveness and strengthen the organizational deficiencies in small-scale fishers' organizations.

As explained by Charles (2001:329), resource users and coastal communities can hold much wisdom about what resource management arrangement function best within their cultural and beliefs system, about workable approaches to improving compliance among ocean users and about which fishing techniques are most effective, or most conservationist within the local context.

As a result, this approach to governance which is very much seen in the political context of policy-making in many countries around the world, often ignore the influence of small and underdeveloped stakeholders upon resources and resource management practices. This will be a key factor to prove that the institutional failure in fisheries governance is inevitable because the approached is based on a centralized governance regime.

As the discussion attempts to highlight that effective management is only possible with successful participation by stakeholders, to make this illustration more clarifying…there is an equation used by Berkes et-al (2001) to acquire successful participation in co-management by stakeholders:

The degree of successful participation = will + skill + organization

As stated by Berkes, et-al (2001) to achieve the ***will*** for participation, both government agencies and stakeholders groups may need to shift their perceptions about the role of participation in achieving results in fisheries management. Similar, capacity building is inevitably needed for both parties to build ***skills*** to take part in the process constructively, and to develop ***organizational*** platform to take part in the process.

6.8.2. Co-Governance or co-management

In the two communities which this study is focused on, it is imperative and essential to establish more joint cooperation agreement between state institutions and community.

This is of particular importance because of the level of disbelief that coastal-indigenous communities have in the governmental institutions and it is observed in their response to the close season acceptance as management tool for green turtle (figure 8 and 9).

The indigenous communities are surrounded by an environment of socio-political, socio-cultural and socio-economic frailness with high susceptibility to the external influence upon their very subsistence. Co-management is fairly new to these indigenous communities and the Nicaraguan Caribbean coast.

The practice of co-management is at most at the early stages of development and concentrated implicitly and explicitly in the current regional demarcation process; among which the different communities are assisted by a specially designed state institution (Programa de Ordenamiento de la Propiedad - PRODEP) that is partially funded by international cooperation (world bank) to aid the communities with technical assistance required in a joint effort to demarcate the Nicaraguan Caribbean region and its communities based on ancestral territorial rights.

This co-management building and development process however is directly influenced and furthermore relies on the capacity-building, community consensus and the development of the local organizational process through which the framework for a governance regime can be established.

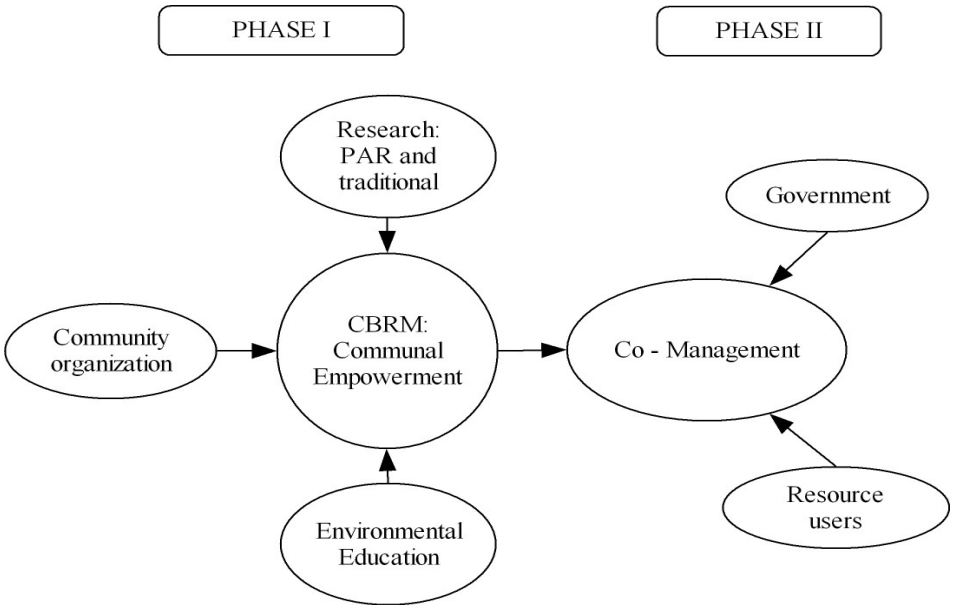
Thorough analysis of the individual community benefits, management capacity and administrative organizational levels of each community at the end of the process of demarcation as concluded need to be of utmost priority for the local and regional authorities to ensure the proper and sustainable use of each community resources.

Since the co-management process itself might be directly linked and correlated to organizational consensus and regional overlapping of cultural expressions, territorial property rights, and biological resources shared among the indigenous inhabitants. The division of these rights once concluded the demarcation process could and will demand an individualistic and diverse resource administrative structure for each community, exposing the vulnerabilities (mainly because of the technical, managerial and financially limited capabilities of the communities) to administrate individually their territories and resources.

The co-management process is a rather complex arrangement of sets of tools for the administrations of resources because of the range of management decisions that may be involved, from policymaking and planning, to setting rules, allocating harvests, investing in resource productivity, monitoring and enforcement, determining membership in user groups, and adjudicating conflicts (Tyler 2006).

Considering that co-management process, it could and will vary with the nature of the resource, the political context, the expertise and skills of participating organizations, and the degree of mutual trust (Tyler 2006).

Patrick (1999) acknowledges the complexities of exercising this process within communal property from which he suggests to consider a percussive participatory action research approach (PAR) (figure 23) towards institutionalizing co-management that could define more efficiently and clearly the role played by outsiders as technical facilitators to the community development process



Source: Christie (1999)

Figure. 21: Model for percussive step to co-management based on a Participatory Action Research (PAR)

This diagram represents a suggestion for how one might proceed in a step-wise fashion to attain meaningful, effective co-management in a context that exhibits some or all of the following conditions: 1) a communal constituency with mixed interest in resource management, 2) a communal constituency which is poorly organized, economically and politically marginalized, 3) a communal constituency that is distrustful of government agencies responsible for resource management, 4) a government with limited experience working collaboratively with communities during policy formulation, 5) a government that has little experience working with resource user knowledge systems, 6) a government which doubts communal commitment to resource management (Christie 1999:453).

Chapter Seven: Resource State: Local-Communal Perception and Perspectives

7.1. The dilemma of addressing poor fishers

Coastal fishers (small scale) in most countries around the world engaged in fishing activities are often too poor to increase their production or too marginalized to participate in policy-making. Partly because small-scale fishers have been marginalized in conventional top-down decision-making processes (Berkes et-al 2001), therefore facing the dilemma of fisheries collapse, the search for income, and difficulty in sustaining fishing livelihood (Salas et-al 2007).

This is evidenced in these communities expression according to their local perception of the resource state:

Storling Molina (fisherman):
It is already a struggle to obtain sufficient resources form the sea and the land. In previous years farming and fishing was done in a cooperating manner, now it is based on money in these time that the resources are getting scarce and it is getting every time more difficult to obtain enough more for both farming and fishing.

Quinto Henriquez (fisherman):
We are aware that the resources are getting low. We see if when we go fishing. We need to spend more time at sea to get some turtle and fish, and we still don't get as much as before. It is good that the government is focusing on protecting the resources, but we don't se how we are been benefited from this initiatives. We need to eat and we are already having g difficulty getting food and money to survive.

This conventional (top-down) approach towards resource governance on the Nicaraguan Caribbean coast has left the indigenous communities to confront the dilemma of

harvesting every and any possible resource that produce some level of income, whether production is achieve in a sustainable manner or not .

Harry Loid (fisherman):

We have always been using every possible resource available to eat to sell for money. We know that a lot of people have been a doing investigation that shows the reduction in green turtle. We don't agree on overfishing the little resource we have left but we have very little alternative to live from. It is difficult to farm when you have no money to start with, and it is difficult to stop fishing when that is the only thing providing money.

Housewife comment:

My husband has been a fishermen all his life, we have tried farming, and other activities, but none provide enough money as fishing. We all know that the communities are only allowed to take a small amount of turtle but I don't think it will be enough. We can't eat the lobster and shrimp because the price is higher than turtle meat, and most of the fish is sold to the processing plant (middleman).

The increased level of poverty and resource dependence is pushing towards un-sustainable harvesting, and currently this is an issue and concern that is taking place in the marine turtle (green turtle) fisheries, and will prove to be a dilemma to be addressed by any management effort. There is something to be aware of and keep present when addressing management among poor fishers is that unless they feel accepted and some basic needs are met, management will not always lead to resource sustainability, on the other hand it could lead to depletion.

Deficiencies in the regulatory scheme is a present reality in the Rio Grande Delta turtle fisheries and in most coastal communities along the Nicaraguan Caribbean coast, where fishermen express their acceptance of the management measures as a negative facet to their community survival.

Statements given by fishermen's in the Rio Grande Delta such as the ones below are evidence of such discrepancies:

Fisherman comment:

"I have been fishing fish and turtle for 30 years and in all this time, we would always hear that the indigenous communities will be the ones who administrate the use of their resources, but so far I haven't seen any changes. We are always been lied by the central authorities, so why should we trust them when they say we need to protect turtle if we didn't help make the law. They have the education and they make the mistakes, we don't have the education, and for so long we have survived peacefully with nature"

Fisherman comment:

"We fish turtle, lobsters and fish because we need to eat, and when these fisheries are in Veda[40] *we are the ones left with the reality to face our economic problems on our own"*

Elder council member*[41]*:

"The Veda is good so that the young turtles can grow to become adults, however they (the government) never consulted us as to say how is this affecting you and what do you think can be done so you could have other alternatives when this resource is on Veda"

[40] Close season

[41] The Elders Council is a local-communal governing body (formed by elders) established and chosen by the community inhabitants from among them selves through a local-communal assembly. This body give advise to the Local-communal leader regarding decisions made in the community that could affect them, help solve communal problems and affairs among others advisory functions. These governing bodies are commonly seen among most indigenous communities on the Caribbean coast of Nicaragua.

Elder council member:

"It is good that the government make policies to protect the resources that we all use, but without the participation of the communities these policies won't be successful, because in most cases indirectly they are submitting our communities to a life of struggles instead of providing alternatives"

By the early 1960 the turtle trade was engaged from an open access point with little or no government intervention in the management of such. Therefore, this suggests that a direct trading relationship between the European, Cayman turtle men, and English settlers was carried out as a local-indigenous property rights and ownership of the resource along the Nicaraguan Caribbean coast. This is evident in some statements by fishermen's such as the comments like the ones below.

Carly Chow:

I remember my grandfather used to say that we (the indigenous communities) own plenty of marine resource that was given o us by god. So we need to make sure we don't finish it and always have.

Community Leader (Member of the territorial authority):

Al the indigenous communities have fished along the cost for hundreds of years, we own most of these areas (fishing grown) by ancestral rights and that is why we were the ones (Miskitu Indians) negotiating the turtle trade.

Elder council member:

Before we had all these law and regulations, the turtle fishermen used to listen to the communities and respect our laws. No one would fish on Sundays since that is god's day, neither during Easter because you could die at sea. People used to fish only what they need, and nobody would fight over the resource since the communities have their rules to control the way we fish and anyone from outside must respect this when fishing in our territory.

7.2. The Local perception of regional governing institutions and regulations

During the focus group workshop, the participants were suggested to highlight the different state institutions present at the communal and regionall level and adresss the level of importance and trustworthiness of these institutions to addres their socio-economic problems.

The regional autorities were addressed as unable to excercise and aid efficiently the empowerment of the communities.

> ***Fishermen comment:***
> *The government only come along and tell us what we should do and how to do it, but they never give us other things (alternatives) to live from. They think because they study and have good education they know what is best for everyone. We live from fishing turtle all our life…we know how, when and how much to fish. Beside the communities are getting bigger, how is it they expect us to stop fishing when we need more food for our families and don't have other alternatives*

> ***Fishermen comment:***
> *Fishing is what we live from. No fishing means no eating and we can't stay home and hope things to get better by them self. We all know that turtle is getting low. Back in the old days when I was a little boy my father used to go fishing with his friends, and in one day they could get 10 turtles easily. Now we go fishing for four and five days and even more to get the same amount. Beside even is we get more the "Guardia[42]" take it way. That is why some people catches them illegally and bring them in the community at night.*

[42] Term used nationally to describe members of the army. In this case patrollers of the national naval guards.

Some participants suggested that there is too little presence in the indigenous communities in the regional government structure limiting the chances of their demand to be heard since they do not follow the interest of the communities but particular interests.

Rafael Zuniga (fishermen and farmer):

We are not certain that our complain and demands ever reaches the stairs of the regional buildings, since we have little participation of each indigenous communities within the government structure. At the national lever there are very few people form the Caribbean coast in the government, and even less indigenous. How are we suppose to work to benefit our communities when the governing system is passed on political preferences.

One participant expressed:

That he thinks the regional governing system and structure as it is (stated in the capital cities on the region) should be dismounted and re-adjust to function at a community level where they (the communities) would be the ones administrating the power.

As a social researcher these negative expressions towards the governance system troublesome, since it highlights the evident weakness of the Nicaraguan governance system and the credibility that the indigenous communities have in it.

Chapter Eight: Summary and Conclusion

8.1. The demand for local-indigenous knowledge use on the Caribbean coast

The development and inclusiveness of the Nicaraguan coastal communities are of essence to establish a sustainable and efficient resource governance process.

For indigenous communities along the Caribbean coast of Nicaragua it is essential to have their local knowledge and traditional values incorporated into the management of resources and complemented with scientific knowledge to address the developing governance process as effective.

The reason for this is that the fisheries industry in Nicaragua is relatively large compared to the monitoring and investment development capacity capable of being assigned by government agencies. Therefore, local community development for coastal fishing communities depends highly on their own adaptive capacity to manage the rapid socio-economic and socio-political change regimes, and their self development activities promotion (social capital investment).

A clear example of this insufficient management potential is the assignment of only two fisheries delegates to monitor the fisheries activities along a coastline of over 500 kilometers consisting mainly of coastal-indigenous communities in isolated locations. It is rather incoherent for any given government agency to even assume that a steady level of management success will be the outcome of the action placed in this scenario. There is, after all, approximately 217 indigenous communities (180 Mískitu, 34 Sumu and 3 Ramas) on the Caribbean coast, where large numbers of these are located along the Coastline.

These is a negative perception within the indigenous communities towards the government policy design, and political discourse that affects their social rights demand

to be aided in the development, promotion and protection of their cultural, territorial, spiritual and social values, norms, traditions and rights.

The overall governance system is perceived as a shortcoming and foremost negatively politicized with individual preferences placed as a firsthand interest instead of the communities' demands. It is acknowledged that the governance system is slowly being developed towards the inclusiveness and participation of the indigenous communities in the policy design system. However, it is still yet lacking of sufficient bottom-up involvement to aid this development.

The current regulatory scheme (closed season) to ensure the sustainable use of green turtle fishing by the indigenous communities, is far from being considered as biologically efficient for the sustainability of the resource stock. This regulatory initiative addresses only the fishery restriction that targets the landings. Therefore, excluding the other vulnerable parameters such as sex, size, alternative use, etc.

The indigenous communities possess vast knowledge about the resource fluctuation, resource state, and seasonal spatial distribution through their traditional fishing grounds that has enabled them to identify their fishing ground of preference based on seasonal resource abundance.

It is sad and discouraging to know that this valuable knowledge embedded in the traditional harvesting practices of the Nicaraguan Caribbean coast indigenous communities, about the marine and coastal environment, has not been implemented as part of the national initiative to sustainable resource governance development, in a region almost fully inhabited by indigenous and ethnic groups.

It would be harsh and unethical to say that the governance system is a failure based on the findings, discussion and expressed sentiments of the indigenous inhabitants. However, the current path followed by the state institution inevitably is leading to more

socio-economic instability, not only in the indigenous communities in the region, but to the Nicaraguan Caribbean region itself.

This thesis therefore attempts to highlight the sensed lack of inclusiveness of the coastal indigenous communities into the natural resources (green turtle) governance context. This clearly demands a more detail analysis and development of a sustainable framework to encourage sustainable use, management and conservation strategies including in the region focusing on providing the indigenous communities with new alternative source of food and income.

Insufficient knowledge by the indigenous communities regarding the surrounding complexities and acquainted responsibility of these rather “new” resource administrative systems (governance and management) was identified as the main reason for their exclusion in policy design.

The solution to a somewhat imperfect but stable governance system relies on the incorporation of local-indigenous participation into management, and assigning responsibility to establish a steady sense of respect for both government agencies, and responsibility for the resources in their surroundings.

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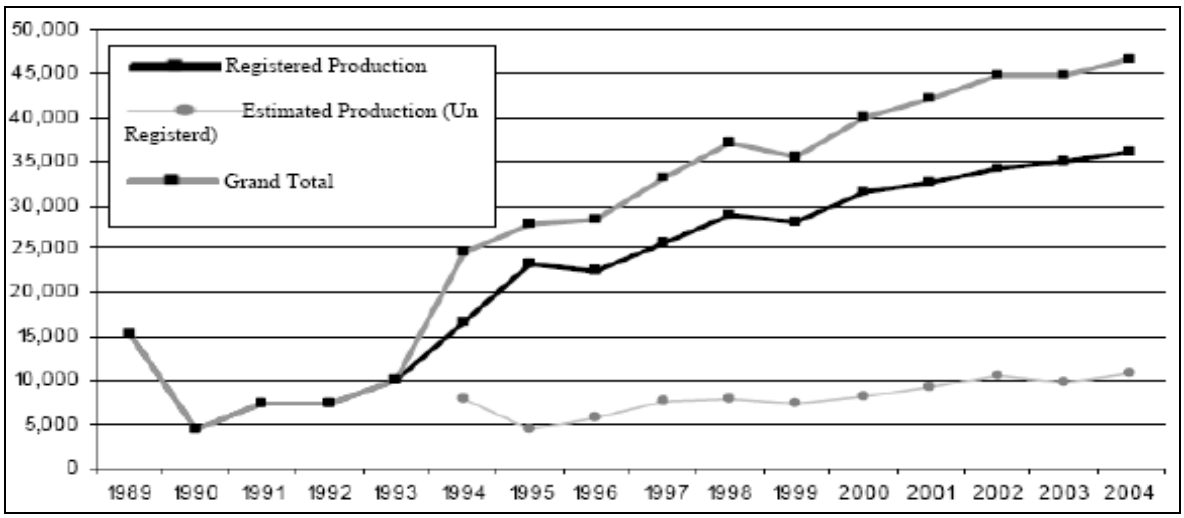
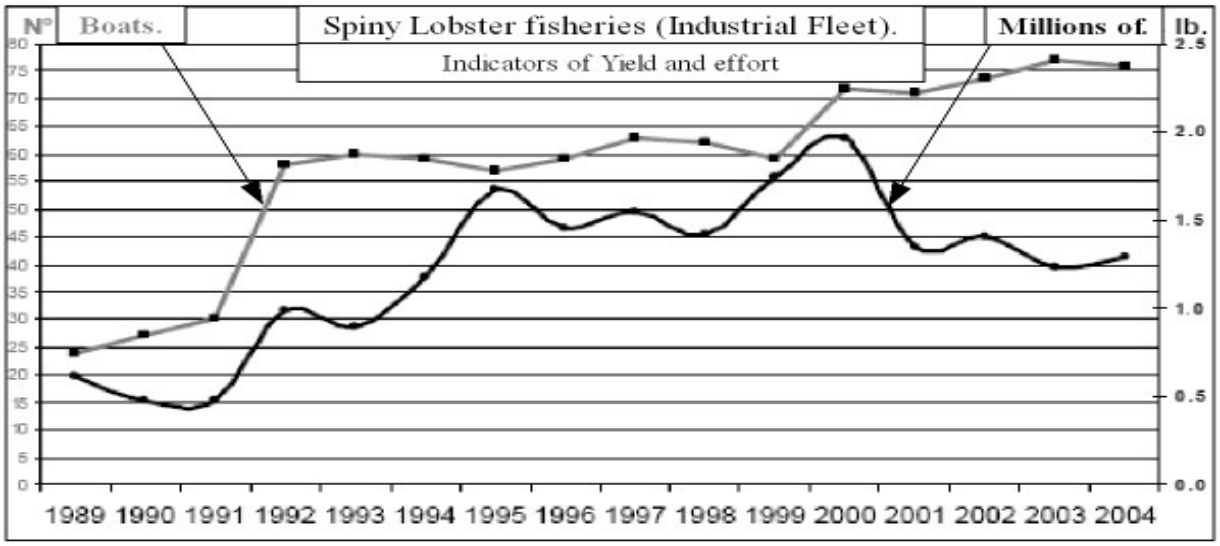
APPENDIX



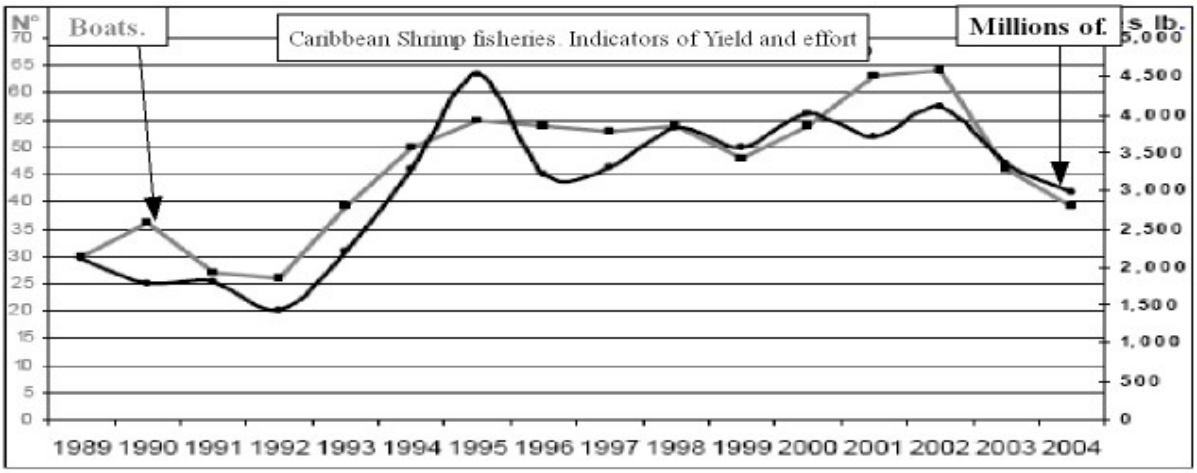
Source: Rivera, C., 2004.

Figure. 21: Nicaragua's Fisheries and Aquaculture production in millions of Pounds



Source: Modified from Rivera, 2004

Figure. 22. Spiny lobsters (Panulirus argus) fishery development trend.



Source: Modified from Rivera, 2004

Figure. 23. Nicaraguan Atlantic shrimp fishery development trend.

Survey Questioner

These were some of the open questions used during the surveys, others were more direct and structured as multiple choices.

Do you own a fishing boat

How many peoples can hold in it

What tipe of activities do you use you fishing boat for

Which activity do you consider as the most important to your income line based on importance level (1,2,3,4)

Is there other activities the also generate income

How much is the average income obtained for each activity

What is your local perception of the resource state?

Has there been a reduction in the landings?

What would you attribute to the cause of this reduction, and why?

Do you think there is a need to regulate the fisheries, why?

How much do you know about the current fisheries law and the closed season?

Would you consider this regulation as effective and why?

Is the current resource management policy affecting your lifestyle, How?

Is there any local regulation that has or is been used to control the use of resources and how is it done?

What is your local perception regarding the green turtle management and resource state.?

Do you think it is affecting the community?

Do you know how is it that the communities influence the national policy making?

Do yo think the communities are taken into account during the policy design process?

Ow do you feel about the overall management system?

Do you think it is reliable and effective for the community development? Why?