AN ASSESSMENT OF IMPACTS OF ILLEGAL SUBSISTENCE FISHING ON RIVERINE BIODIVERSITY ON SELECTED AREAS OF THE EASTERN CAPE PROVINCE, SOUTH AFRICA.

(Running Title: The impact of illegal fishing on Eastern Cape Province River and marine biodiversity)

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DEDICATION

I wish to dedicate this thesis to my family and many friends. A special feeling of gratitude to my loving parents, Makhosezwe Mbanjwa and Hildigard Mseleku whose words of encouragement and push for tenacity ring in my ears. My sisters Zintle, Nokuthula and my younger brother Sihle have never left my side and are very special.

I also dedicate this dissertation to everyone who was giving me support and give me lot of information that was required, their support meant lot to me and it helped throughout the process. I will always appreciate all they have done, but most important person I would like to dedicate this work is my supervisor Professor Roger Coopoosamy. There is no doubt in my mind that without his continued support and counsel I could not have completed this process.

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I would like to acknowledge the very active and professional support and mentoring by my Supervisor Professor RM Coopoosamy without whose guidance this thesis would not have been possible.

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I would also like to acknowledge the support and assistance given me by Eastern Cape Parks Board staff members (ECPB). ECPB has been very generous in their support of my academic pursuits and many of their co-workers have contributed ideas, feedback and advice. Ayanda Shamase, in particular, has assisted this research with his photographic expertise. Finally, I would like to thank my family for their support and encouragement. I could not have completed this effort without their assistance and tolerance.

DECLARATION

I Mr. ST Mbanjwa, student number 45744181, Identity number 8608255993083, hereby declare that this is my original piece of work. Where alluding to other works in the field, I have indicated those in a normal standard way of acknowledgement.

To the best of my knowledge, I have not committed any plagiarism or deliberate omission in the acknowledgement of original works of others.

Signed at _____ on this _____day of _____(month) 2014

_____

Mr. ST Mbanjwa

_____ _____

Supervisors: Prof. RM Coopoosamy Date

CHAPTER 1: Introductory Chapter

1.1 ABSTRACT

Subsistence fishing is impacting on freshwater and marine biodiversity to the extent of extinction of some fish species. These illegal subsistence fishermen have created a huge impact on marine biodiversity, irrespective of marine and riverine laws that are put in place and practiced. There have been attempt to provide subsistence fishing extension officer services to facilitate in bringing subsistence fishermen fully into the management system, in an orderly and equitable manner, by facilitating the granting of formal subsistence fishing right, providing permits via policy management and effective rules via permit applications. However the follow up process as to whether these policies and rules administered is effective or not has not been measured.

This investigation attempts to identify potential fishing that should be considered as suitable for subsistence fisheries in selected highly exploitable areas. Though it cannot be confirmed from previous studies that some relevant organizations are not fully taking their responsibilities, the study will further enable exploration of options and challenges associated with future management of subsistence fisheries and provide recommendations to enable proper implementation of the policies and legislations.

1.2 INTRODUCTION AND BACKGROUND INFORMATION

Subsistence fishing can be defined as fishing, other than sport fishing, that is carried out primarily for feeding purposes, both for family and associated friends. It could also relate to use of low tech fishing techniques being carried out by people who are very poor. Subsistence fisheries can catch a large variety of species of smaller sizes, but generally only those relatively close to shore or in fresh waters. Subsistence fisheries, when conducted by the poor social classes in a country for survival can also result in contamination of the marine and freshwater resource and can lead to the threatening of fish stocks.

Subsistence fisheries extend at least 100 000 years in Southern Africa (Thackery 1998). In South Africa subsistence fishing was formally recognized as a special fisheries sector in 1998 by the Marine Living Resource Act No18 of 1998 (MLRA), which was provided for conservation of marine ecosystem, long term sustainable utilization of marine living resources and the orderly access to exploitation, utilization and protection of certain marine living resources. This act outlines and provides the exercise to control over marine living resources in fair and equitable manner to the benefit of all the citizens of South Africa.

According to Brouwer *et al.*, 1997, shoreline and subsistence fishers will create a knock on effect to shoreline and river biodiversity in utilization of baits for the purpose of fishing. Due to this knock on effect, there exists a possibility that the level of bait collection can serve as an indicator of the fishing effect in direct line to that of the line fisheries (Clarke and Buxton 1989, Attwood and Bennett 1995, Brouwer 1997, Holtzhausen and Kirchner 1999, Zeybrandt and Barnes 2001, Pradervand and Baird 2002, Mackenzie 2005).

Based on exploitation and prevention of such, the development of the white paper for Sustainable Coastal Development in South Africa, (White paper on the Conservation and Sustainable Use of South Africa Biological Diversity Notice 1095 of 1999) defined sustainable coastal development as enhancing the capacity of the current and future generations to realize human potential, within the content of maintaining diverse, healthy and productive coastal ecosystem. In order to maintain this diversity, proper management of the resources based on education to subsistence fishers and provision of skills to these fishers to enhance employment as well as create a source of income and nutrition to coastal communities is of utmost importance (Daniels 2001).

The Marine and Coastal Management Unit (MCM) of the Department of Environmental Affairs and Tourism (DEAT) appointed a specific group, namely the Subsistence Fishers Task Group (SFTG 2000), to provide recommendations of system for the implementation of Subsistence Fishermen Management (SFM). The recommendations that were derived formed the basis for the subsistence fishermen management system.

1.3 GLOBAL CONTEXT

In broad, aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater, tidal, and marine regions of the world and their interactions. Aquatic biodiversity include freshwater ecosystems, including lakes, ponds, reservoirs, rivers, streams, groundwater, and wetlands (Cockrane 1995).

When addressing the issue of aquatic biodiversity ecosystems associated with marine as well as fresh water environments, including oceans, estuaries, salt marshes, sea grass beds, coral reefs, kelp beds, and mangrove forests should be considered (Cockrane 1995). The biodiversity within these environments will include all unique species, their habitats and interaction between them and further consists of phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others (Clarke and Warwick 1994).

The importance of aquatic biodiversity cannot be underestimated as it impinges enormously on economic and aesthetic value which largely leads responsibility for maintaining and supporting overall environmental health (Cockroft *et al*., 2002). It is a well known fact that humans have long depended on aquatic resources for food, medicines, and materials as well as for recreational, commercial purposes such as fishing and tourism as well as economic benefits. Aquatic organisms also rely upon the great diversity of aquatic habitats and resources for food, materials, and breeding grounds (Cockrane 1995).

Many factors can lead to overexploitation of species within the aquatic environment. These can include the introduction of exotic species, pollution from urban, industrial, and agricultural areas, as well as habitat loss and alteration through damming and water diversion (Clarke *et al*., 2002, Cockroft *et al*., 2002). Ultimately these factors contribute to the declining levels of aquatic biodiversity in both freshwater and marine environments. As a result, valuable aquatic resources are becoming increasingly susceptible to both natural and artificial environmental changes (Clarke *et al*., 2002, Cockroft *et al*., 2002). Thus, conservation strategies to protect and conserve

aquatic life are necessary to maintain the balance of nature and support the availability of resources for future generations.

Human activities, such urbanization in and around river estuaries, are causing species to disappear at a fast rate (Daniels 2001). These aquatic species are becoming a high risk of extinction than mammals and birds. Losses of this magnitude impact the entire ecosystem, depriving valuable resources used to provide food, medicines, and industrial materials to human beings. Runoff from agricultural and urban areas, the invasion of exotic species, and the creation of dams and water diversion have been identified as the greatest challenges to freshwater environments (Clarke *et al*., 2002, Cockroft *et al*., 2002).

Overexploitation of aquatic organisms for various purposes is the greatest threat to marine environments, thus the need for sustainable exploitation has been identified by the Environmental Defense Fund (EDF) as the key priority in preserving marine biodiversity. Other threats to aquatic biodiversity include urban development and resource-based industries, such as mining and forestry that destroy or reduce natural habitats (Clarke and Warwick 1994).

In addition, air and water pollution, sedimentation and erosion, and climate change also pose threats to aquatic biodiversity (Clarke and Warwick 1994).Overexploitation of species affects the loss of genetic diversity and the loss in the relative species abundance of both individual and groups of interacting species.

The effects of this overexploitation are resultant in population size reduction due to the disturbances in age structure and sex composition (Harris *et al*., 2002). Due to larger individual within a species being sourced out of the system, the proportion of slow growing ones increases and the average size of individuals in a population decreases. Over-fishing causes change in the genetic structure of fish populations due to loss of some alleles which lead to genetic diversity being reduced (Harris *et al*., 2002).

There is about nearly 40% of commercial fisheries that have now collapsed or are in serious decline. In response, governments have invested millions of dollars into artificial breeding programs, but many programs have failed to rehabilitate declining wild stocks (Neff, *et al*. 2011).

1.4 SOUTH AFRICAN CONTEXT

With South Africa becoming a democratic country since 1994, there have been pressures imposed to uplift previously disadvantaged communities (MacKenzie, 2005). This has led to the Subsistence Fisheries Task Group focusing mainly on the needs of these disadvantaged communities (Branch *et al.* 2002, Clark *et al*. 2002, Klienschmidt *et al.* 2003, MacKenzie 2005).

The Marine and Coastal Management (MCM) branch of the Department of Environmental Affairs and Tourism (DEAT) is the custodian of South Africa's natural marine resources. Management and allocation of this resource had always had a strong scientific influence but, with the advent of democracy, a paradigm shift was necessary to incorporate more people-centered and development-focused approaches (MacKenzie 2005).

Since 1994 MCM has been exploring various frameworks to introduce a social policy to address the problems facing the coastal poor, including fisheries co-management, sustainable coastal livelihoods and poverty alleviation. However, the science-heavy institution lacks a deep understanding of development and social needs, meaning that there is insufficient capacity and common purpose within MCM to carry through its social objectives once current donor support comes to an end (Klienschmidt *et al.* 2003, MacKenzie 2005).

MCM has been unable to move from its preoccupation with natural resource management and regulation to fit into the broader government priority of reducing poverty. As long as this is the case, the credibility and legitimacy of South Africa's coastal management as a developmental intervention in a democratic dispensation is at stake. Anger from rural communities over the government's granting of experimental fishing quotas for abalone along the Eastern Cape coastline to companies based in the Western Cape results in improper harvesting (Klienschmidt *et al.* 2003, MacKenzie 2005).

1.5 EASTERN CAPE CONTEXT

Subsistence fishing communities in the Eastern Cape allegedly accused Fisheries Minister Tina Joemat-Pettersson of using the abalone quotas to buy votes among impoverished communities around Hermanus, where the shellfish has been poached almost to extinction. In the previous

month (June 2012) Department had issued seven quotas for the harvesting of more than 31 tons of abalone along 400km of the Eastern Cape coast. Similar harvests would be allowed every year for the next three years as part of the experiment (Macleod *et al.* 2009).

According to Gavin Prins, the representative of the Ibhayi Historical Sea Harvest Divers in Port Elizabeth, local fishing communities were not informed about the quotas and hence did not benefit economically from them. It has been established that at least two permits have been issued to employees in the Kouga Municipality and two Western Cape companies, i.e. Overberg Commercial Abalone Divers in Gans Bay and Pesculana in Claremont, they have been contracted to do the harvesting, processing and distribution of the abalone (Macleod *et al.* 2009).

The Western Cape is controlling fisheries, causing diving companies and processing factories to close down. These quotas are not benefiting the Eastern Cape, (fishermen had come across five boatloads of divers from the Western Cape searching for abalone around Jeffrey's Bay and St Francis Bay (Macleod *et al.* 2009).

There seems to be no scientific surveys done or any no knowledge of the sustainable level of harvesting. Investigation by Macleod *et al.* 2009 determines the geographical distribution of abalone in the Eastern Cape and whether it could sustain a viable abalone fishery (Stern 2012).

The scientists have warned that through the opening experimental fisheries, this could lead to the further decline of the species, already on the edge of extinction because of poaching (Neff, *et al.* 2011). Breeding grounds were essential to protect the species. If tons of abalone and other fish species are removed from restricted localities, irrespective of whether this is for experimental purposes or not, already heavily stressed natural reproductive processes will be weakened even further (Macleod *et al.* 2009, Daniels 2001).

Experimental quotas for the annual removal of 12 tons of abalone and even more fish species have also been approved along the eastern side of False Bay in the Western Cape, from Cape Hangklip Lighthouse to the Steen bras River mouth. The Environmental Affairs and Tourism Department is considering a proposal to extend quotas into marine zones around Betty's Bay, but said this had not been approved and was still at an early stage (Macleod *et al.* 2009).

Different conservation organizations, including the World Wide Fund for Nature South Africa, have recommended that the Betty's Bay marine reserve be declared a no-take protected area because it is part of the Kogel berg Biosphere Reserve, established in 1998 through an agreement between the government and the United Nations Educational, Scientific and Cultural Organization (Macleod *et al.* 2009).

At present, South Africa is not fulfilling the requirement of core-zone protection of the marine environment as is necessary for internationally recognized coastal biosphere reserves throughout the world. Consequently, South Africa is at risk of losing international recognition for the Kogel berg Biosphere (Macleod *et al.* 2012).

1.6 RESEARCH METHODOLOGY

1.6.1 Research design

This research contains both qualitative research and quantitative research. The findings will be based on structured questionnaires, investigations and evident.

1.6.2 Qualitative research

This research includes structured questionnaires and responses from individual interviews and also investigations outcomes of other researchers.

1.6.3 Quantitative research

Descriptive quantitative research examines the research situation as it is. Thus, the method of sampling will be used to determine the quantitative data. This method of inquiry does not involve changing or modifying the situation under investigation. These approaches yield quantitative information that can be summarised and is amenable to statistical analysis to ascertain average age groups of fisher folks, sex groupings of fisher folks, frequency of fishing, etc.

1.6.4 Ethical Clearance

The ethical clearance was obtained from University of South Africa. The ethical clearance form was required for purpose of safety of information and due to information of respondent via questionnaires.

1.6.5 Data collection

The information was gathered from literature searches through the internet and also from Department of Environmental Affairs and Tourism. Some information will be gathered through the findings of the Eastern Cape Parks Board. Data was also obtained from field experimental findings.

1.6.6 Data Analysis

The data was interpreted through responses to questions, and tabulating the responses was done to produce tables and graph. Selective statistical methods were employed.

1.6.7 The identification of subsistence fishermen

The Department of Environmental Affairs was contacted to provide information on permit holder. The field experimental approach was performed with aid of conservation structure.

1.7. PROBLEM STATEMENT

Due to the ever increasing unemployment rate in South Africa, rural communities are resorting illegitimate activities such as illegal subsistence fishing to provide support for their families (DEAT). These activities have a direct impact on the biodiversity within ecosystem in the riverine and marine environment. By removing populations of fish species, mortality rates are increasing and reproduction is limited, thereby altering biodiversity and possibly collapsing the marine and riverine ecosystem (DEAT).

The rural communities have run out of options to survive and to support their livelihood. Thereby marine and the riverine biodiversity are declining due to overexploitation/over harvesting. The production cycle of the fish population is affected by this and this causes an imbalance on riverine biodiversity (DEAT).

1.8. HYPOTHESIS

Rural communities are not properly educated when it comes to the managing the riverine biodiversity. Government does play big role together with Non-Government Organization.

1.9 ASSUMPTIONS

The assumption is that government, conservation bodies, local government and communities lacks facilities to solve or to protect riverine biodiversity.

1.10. DELIMITATIONS

The study will only cover the rural communities that are from transitional zone between the estuaries and Study Rivers, from the ocean mouth to river; approximately from 1 to 4km upstream. The primary focus is maintaining riverine biodiversity.

1. 11. RESEARCH QUESTIONS

1.11.1 The main research question is:

- What impact does the illegal subsistence fishing have on the riverine biodiversity?

1.11.2 The sub questions are:

- What is your maximum fishing limits?
- How often do you come to fish per day, week, month or year?

- Do you have other source of income?
- Do government departments provide you with environmental education?
- What do you know about Marine Living Resource Act?
- What do you know about sustainable development?
- Do you receive an environmental awareness campaign?
- Do you do anything to maintain and to sustain the environment?
- How do you minimize the imbalance in marine biodiversity? What does sustainable development means to you?
- How frequently do you come to fish?

1.12. AIM

- The aim of this study is to investigate the impact that illegal subsistence fishermen has on riverine biodiversity and to provide most suitable solution and potential conservation strategies to protect the fish population within fisheries in various areas of Eastern Cape Province, South Africa.
- The aim is also to provide subsistence fishing extension officer services that aims to facilitate in bringing subsistence fishermen fully into the management system, in an orderly and equitable manner, by facilitating the granting of formal subsistence fishing right.

1.13. PURPOSE

- The purpose of the research is to visit various subsistence fishing areas in the Eastern Cape Province. These areas include Bushman River, Tyolomnqa River Mouth, Hamburg River, Jeffrey Bay, Kei River and Sunday River. This will enable the study to assess the popularity of permits among subsistence fisherman thereby determining adequate or required communication between government officials and local fishermen of the Eastern Cape.

1.14. OBJECTIVE OF PROJECT

- To facilitate the Implementation of the MLRA for the subsistence fishers in terms of directions given by Marine and Coastal Management.
- To link with communities to implement the above.
- To develop the local management structure through which subsistence fishers will be reached.
- To assist Marine and Coastal Management with application, right allocations and control.
- To monitoring of subsistence fishery resources.
- To communicate problems experienced by subsistence fishers to MCM by means of immediate notification of crisis areas, special report on problem areas and successes and regular progress report.
- To identification of subsistence fishery species.
- To register subsistence fishermen in the data base.

1.15 STUDY AREA

The studies areas will be mostly those areas that have been reported previously that there is overexploitation of inter marine biodiversity such as among Bushman River, Hamburg River, Jeffrey Bay River, Great Fish River, and Kei Mouth River. The study will be conducted into transitional zone from estuaries and river at an early stage from ocean mouth to river (Fig 1.1).

Fig 1.1: Map of Eastern Cape showing rivers under this investigation. 1 = Kei mouth region, 2 = Tyolomnqa river region, 3 = Hamburg region, 4 = Bushman's river region, 5 = Sundays river region and 6 = Jeffreys bay region (Google maps)

The chapters (2 – 7) that follow will highlight each of the abovementioned 6 rivers independently as a chapter followed by an overview chapter (chapter 8) of all the findings. The letter from the Department of Economic Development, Environmental Affairs and Tourism is included as Annexure 1.

CHAPTER 2: Great Kei River

Fig 2.1: Photograph of the mouth region of the Great Kei River

2.1 Description of the Great Kei River

The Great Kei River is located in the Eastern Cape province of South Africa (Fig 2.1). It flows for 320 km and ends in the Great Kei Estuary at the Indian Ocean with the small town Kei Mouth on the west bank. Historically the Great Kei River formed the southwestern border of the Transkei region.

The Kei Mouth is situated about 70 kilometers north of East London and about 20 kilometers off the N2 National road. While middle to upper income residents live closer to the coast and the river mouth, the subsistence fishers reside in Cwili Township situated on the western outskirts of

town. Subsistence fishers here experience a relatively low socio-economic status with the majority being unemployed and a few having part time work as domestics or gardeners. The community of Cwili lives in an informal settlement with homes built from wood and corrugated iron sheets. The fishers of Kei mouth harvest a diversity of resources such as abalone, line fish, mussels and oysters. Due to the influence of illegal buyers, fishers say that most of their effort is concentrated on the harvesting of abalone.

Fishers from the Kei Mouth Fishery harvest a diversity of marine resources that may include abalone (said to be the most widely harvested resource) white and black mussels, oysters and line fish. The following are the line fish harvested as well as the bait used to harvest the line fish (Table 2.1).

Table 2.1: Fish and Bait resources available at Great Kei River estuary and mouth region

Fish resources	Bait Resources
Kabeljou	Mud prawn
Steenbras	Sand prawn
Spotted Grunter	swimming prawn
Galjoen	Pencil
Shad	Mussel
Mussel Cracker	Red bait
Garrick	Octopus

Line fish, mussels and oysters are harvested for own consumption and sales while abalone is harvested primarily for the illegal trade.

2.2 Methodology: Implementation of the questionnaire to the Kei River community

Potential subsistence fishers were identifies from the only black township Kei Mouth, viz Cwili. The extension officers assisted with making contact with people in charge of the community after which the survey was carried out. It was indicated that a Local Management committee (LMC) existed with management of the subsistence fishers (Annexure 2). With the help of the LMC thirty two (32) subsistence fishers were confirmed to be present in the community of Cwili. The participants were addressed on the issues of management of the biodiversity of the river before responding to the questionnaire.

2.3 Results:

Table 2.2: Summary of Responses from the Kei River Community

No.	Age	Age/M	Age/F	Residence	Empolyment	Duration (Hrs)	Equipment	Est Catch	Purpose	Bait type
1	52	52		CT	unemployed	3 to 4 hours	RR	4	SF	various
2	43		43	CT	unemployed	whole day	RR	3	SF	various
3	38	38		CT	unemployed	3 to 4 hours	Net	20	SF	N/A
4	18	18		CT	unemployed	whole day	RR	3	SF	mudprawn
5	37		37	CT	unemployed	3 to 4 hours	RR	3	SF	mudprawn
6	50	50		CT	unemployed	whole day	Net	15	SF	N/A
7	43	43		CT	unemployed	whole day	Net	20	SF	N/A
8	31		31	CT	Part Time	3 to 4 hours	RR	4	SF	mudprawn
9	37	37		CT	unemployed	3 to 4 hours	RR	6	SF	various
10	39	39		CT	unemployed	6 to 8 hours	RR	5	SF	various
11	42		42	CT	Part Time	3 to 4 hours	RR	4	SF	mudprawn
12	55	55		CT	unemployed	whole day	Net	18	SF	N/A
13	48	48		CT	unemployed	whole day	RR	3	SF	various
14	40		40	CT	Part Time	6 to 8 hours	RR	2	SF	various
15	37		37	CT	Part Time	6 to 8 hours	RR	4	SF	various
16	49	49		CT	unemployed	whole day	Net	15	SF	N/A
17	32		32	CT	Part Time	3 to 4 hours	RR	5	SF	mudprawn
18	50	50		CT	unemployed	3 to 4 hours	Net	20	SF	N/A
19	44	44		CT	unemployed	whole day	RR	8	SF	various
20	38	38		CT	Part Time	6 to 8 hours	RR	5	SF	mudprawn
21	34		34	CT	unemployed	3 to 4 hours	RR	3	SF	various

22	47	47		CT	unemployed	6 to 8 hours	Net	15	SF	N/A
23	59	59		CT	Part Time	6 to 8 hours	Net	20	SF	N/A
24	39		39	CT	Part Time	3 to 4 hours	RR	5	SF	various
25	41	41		CT	Part Time	3 to 4 hours	RR	5	SF	various
26	40		40	CT	unemployed	3 to 4 hours	RR	4	SF	various
27	45	45		CT	Part Time	3 to 4 hours	RR	3	SF	various
28	47	47		CT	unemployed	3 to 4 hours	RR	4	SF	mudprawn
29	40		40	CT	unemployed	6 to 8 hours	RR	5	SF	sandprawn
30	32		32	CT	Part Time	3 to 4 hours	RR	4	SF	mudprawn
31	38	38		CT	Part Time	3 to 4 hours	Net	15	SF	N/A
32	36	36		CT	Part Time	3 to 4 hours	RR	4	SF	various
	1321	**874**	**447**					**254**		
	41	**44**	**37**					**8**		

CT = Cwili Township, Age/F = Age of female respondent, Est Catch = Estimated catch, RR = Rod and Reel, Age/M = Age of male respondent, SF = Sales and Food, Whole day = above 9 hours of fishing

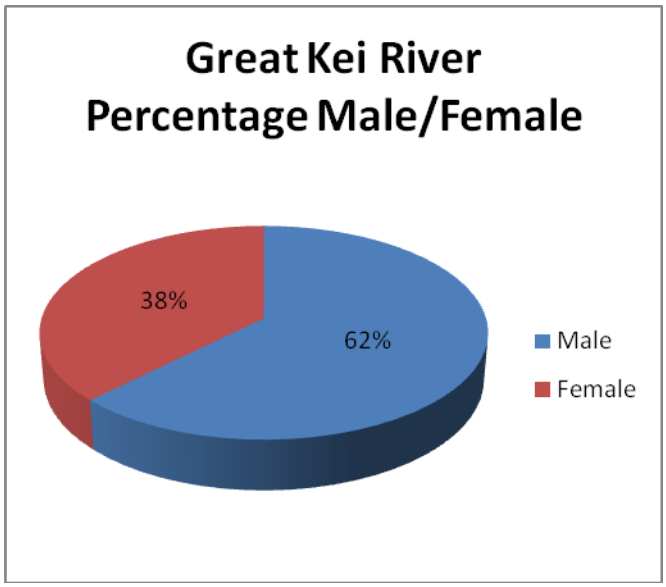

Fig 2.2. Graph indicating percentage male and female fishers along the Great Kei River

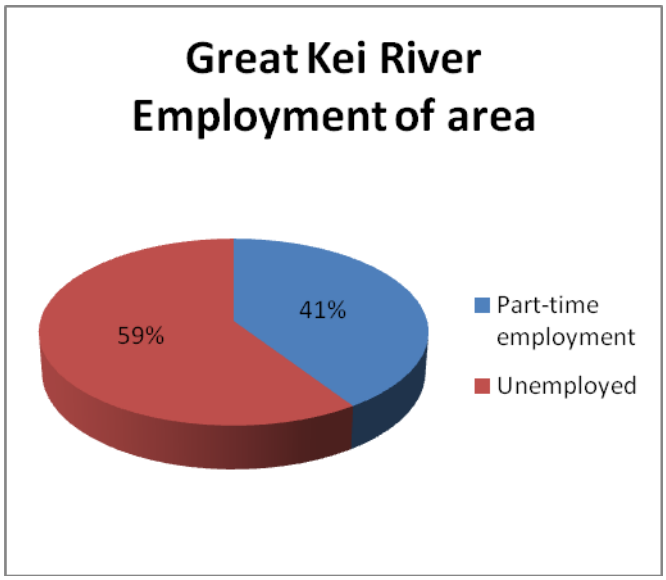

Fig 2.3. Graph indicating the employment of the community of the fishers along the Great Kei River

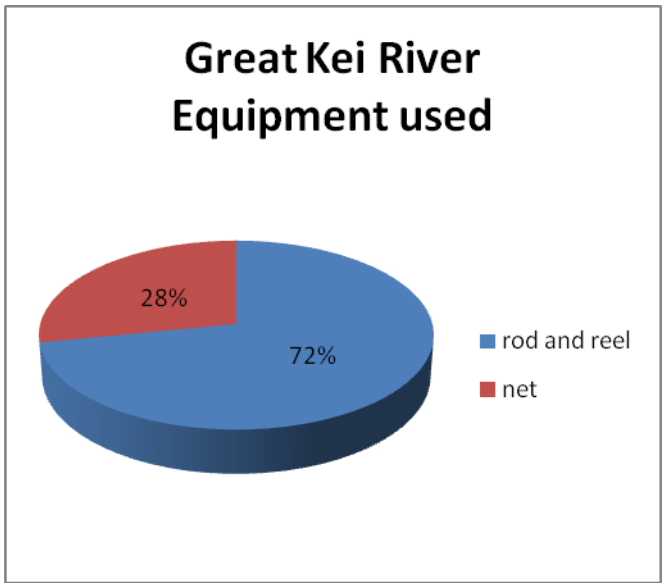

Fig 2.4 Graph indicating the different equipment used by fishers along the Great Kei River

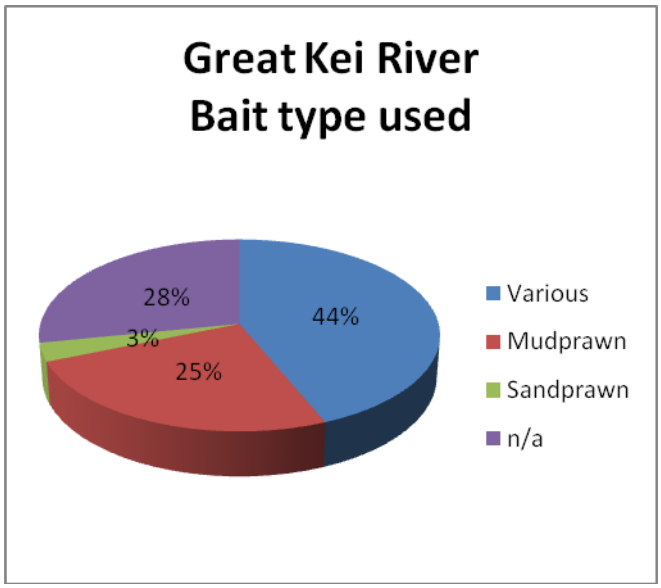

Fig 2.5 Graph indicating different bait species used by the fishers along the Great Kei River

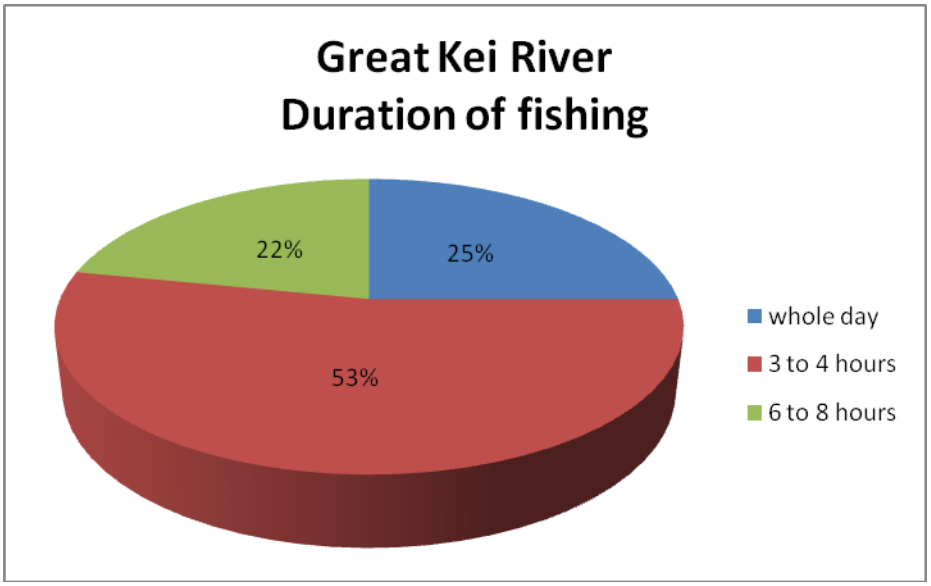

Fig 2.6 Graph indicating duration of fishing done by the fishers along the Great Kei River

2.4 Discussion:

There exist diverse opportunities to settlements along the river system (Harris *et al.* 2002). There should be a consideration for the effects on biodiversity due to exploitation if not properly managed (Riechers *et al.* 1991). Fishers living near the Great Kei River, utilize the river as a means of income as well as for food purposes. The Extension Officers had indicated that subsistence fishers in this region experience a relatively low socio-economic status with the majority being unemployed and a few having part time work as domestic helpers or workers. The community of Cwili lives in an informal settlement with homes built from wood and corrugated iron sheets. The fishers of Kei mouth and other mouth areas harvest a diversity of resources such as abalone, line fish, mussels and oysters (Branch *et al.* 2002, Clark *et al.* 2002, Kleinschmidt *et al.* 2003). Due to the influence of illegal buyers, fishers say that most of their effort is concentrated on the harvesting of abalone along the mouth region. However the river and estuary provides support via the rich diversity of fish species (Clark and Turpie 2007).

The Establishment of the Local Management Committee proved to be suitable for management of the river system and educating the community on the legality associated with subsistence fishing (Clark and Turpie, 2007). This markedly improved the outcomes in terms of catch quantities. However a compounding factor which increased pressures onto the river and estuary was the sub-standard living conditions of the community at large due to the elevated unemployment factors. Both male and female undertook subsistence fishing as a means to support the family financially as well as for sustenance. Some of the subsistence fishers supplement their daily catches with harvesting of abalone, rock mussel, mud prawn and sand prawn. A total of 32 respondents (Table 2.2) to the survey, comprising of 20 males and 12 females, with a combined average age of 41 years (average age of males 44 and females 37) indicated unemployment of 59% as compared to part-time employment of 41% (Fig 2.2). None of the respondents had permanent employment. Fifty three percent of the respondents had indicated that they spend the entire day fishing (Fig 2.3). These individual send their catch to their spouses or kids to sell whilst they fish. Remainder of the catch of the day serves as food for the families.

2.5 Recommendations

It is recommended that the fishers in Kei Mouth receive exemptions for harvesting of line fish for own consumption as primarily non-commercial species are caught. It is further recommended that the Cwili community that utilizes the Great Kei River as a source of income be educated on sustainable harvesting so as not to compromise the biodiversity of the river and maintain populations for future generations. There should be a restriction to quantities caught by net and further implementations of the restrictive numbers using a rod and reel. It is also strongly recommended that the viability of developing abalone, mussels or oysters and other fisheries be investigated.

CHAPTER 3: Tyolomnqa River

Fig 3.1: Aerial photography of the Tyolomnqa mouth region (google maps images)

3.1: Description of the Tyolomnqa River (Chalumna)

The Tyolomnqa River (english: Chalumna) is a river in the Eastern Cape, South Africa. It is approximately 78 km long, forming at the confluence of two small rivers, the Qugwala in the West and the Mtyolo in the East. It empties into the Indian Ocean though an estuary near Kayser's Beach (Fig 3.1).

Its catchment area of 441 km² makes it one of the smallest river basins on South Africa's eastern coast. Its tributaries are Nyatyora, Nxwashu, Quru and Mpintso on the left and Rode, Twecu and Tsaba on the right. The African longfin eel *(Anguilla mossambica)* is common in its waters.

It was near the mouth of this river in 1938 that Captain Hendrik Goosen trawled a catch of fish, one of which Marjorie Courtenay-Latimer preserved. This fish was later identified as a coelacanth, a species which was previously thought to be long extinct and was at that point in time only known from the fossil record. After the discovery, the name of the Chalumna River became part of the scientific name of the species, *Latimeria chalumnae*.

Historically the Chalumna River formed the northern border of the former Ciskei shoreline until 27 April 1994 when all the Apartheid era political regions were reincorporated into South Africa. A portion of the east bank of the Tyolomnqa Estuary is utilized as residential development for lower income or unemployed groups. According to Wood (2002) the Tyolomnqa Conservancy bought the farmland. The dominant communities on the west bank of the estuary are the Phozi, Ncera, Sandile and Xhama village communities. The east bank has little or no agricultural influence. The steep-sided west bank, crops and cattle can be found along its entire length (Wood 2002). Tyolomnqa Estuary lies within the Buffalo City Council boundary and is controlled and monitored by the regional Department of Environment Affairs and Tourism (DEAT), together with Marine and Coastal Management of the Buffalo City Marine Services.

Pozi village, Dyam-Dyam and Kaisers beach are situated some 40-50 kilometres south of the east London city centre on the costal side of the R72 national road and are communities that make up the Tyolomnqa River Mouth Fishery. These villages are all situated in close proximity to the Tylomnqa River Mouth. Pozi village and Dyam-Dyam are situated about 1-2 kilometres apart and easily accessible to one another (Wood 2002). Although Pozi Village and Dyam-Dyam are situated about 4 kilometres from Kaisers beach, they are only accessible to one another by road covering a distance of more than 10 kilometres. This is largely due to the Tyolomnqa River running between the villages of Pozi Village and Dyam-Dyam on the Southern Side and Kaisers Beach on the northern side close to the Tyolomnqa River mouth.

3.2 Methodology: Implementation of the questionnaire to the Tyolomnqa River community

Potential subsistence fishers were identified from the three villages associated with the Tyolomnqa River, viz, Pozi village, Dyam-Dyam and Kaisers, with the aid of extension officers. As in the case of the Great Kei River, yet was indicated that a Local Management committee (LMC) existed with management of the subsistence fishers (Annexure 3).

Although over 200 individuals volunteered to participate in the questionnaire, with the help of the LMC eighty three (83) fishers were confirmed as subsistence fishers, 29 from Kaisers beach, 21 from Dyam-Dyam and 33 from Pozi Village. The participants were addressed on the issues of management of the biodiversity of the river before responding to the questionnaire.

3.3. Results

Table 3.1: Summary of Responses from the Tyolomnqa River Community

	Age	Age/M	Age/F	Residence	Empolyment	Duration (Hrs)	Equipment	Est catch	Purpose	Bait type
1	39		39	KB	Part Time	3 to 4 hours	RR	5	SF	various
2	59	59		KB	unemployed	whole day	Net	25	SF	n/a
3	42		42	KB	unemployed	whole day	RR	4	SF	sandprawn
4	47	47		KB	Part Time	3 to 4 hours	RR	3	SF	mudprawn
5	52	52		KB	unemployed	6 to 8 hours	RR	5	SF	sandprawn
6	44		44	KB	unemployed	whole day	RR	4	SF	mudprawn
7	57	57		KB	unemployed	whole day	Net	15	SF	n/a
8	52	52		KB	Part Time	3 to 4 hours	RR	6	SF	various
9	39		39	KB	unemployed	whole day	RR	4	SF	various
10	37		37	KB	unemployed	6 to 8 hours	RR	5	SF	mudprawn
11	32	32		DD	Part Time	3 to 4 hours	Net	15	SF	n/a
12	45	45		DD	unemployed	whole day	Net	20	SF	n/a
13	48	48		DD	unemployed	whole day	RR	5	SF	various
14	48		48	DD	unemployed	6 to 8 hours	RR	5	SF	various
15	43		43	DD	Part Time	3 to 4 hours	RR	3	SF	various
16	44		44	DD	Part Time	3 to 4 hours	RR	4	SF	mudprawn
17	39	39		DD	unemployed	6 to 8 hours	Net	15	SF	n/a
18	27	27		DD	unemployed	whole day	RR	6	SF	sandprawn
19	40		40	DD	unemployed	whole day	RR	3	SF	mudprawn
20	35		35	DD	unemployed	6 to 8 hours	RR	4	SF	sandprawn
21	53	53		DD	unemployed	whole day	Net	20	SF	n/a
22	49	49		DD	Part Time	3 to 4 hours	RR	4	SF	various
23	44		44	DD	unemployed	6 to 8 hours	RR	4	SF	various
24	52	52		KB	unemployed	whole day	RR	5	SF	mudprawn
25	47		47	KB	unemployed	whole day	RR	3	SF	sandprawn

26	45		45	KB	Part Time	3 to 4 hours	RR	4	SF	sandprawn
27	36		36	KB	Part Time	3 to 4 hours	RR	4	SF	mudprawn
28	49	49		KB	unemployed	whole day	Net	20	SF	n/a
29	54	54		KB	unemployed	6 to 8 hours	Net	15	SF	n/a
30	38		38	KB	unemployed	whole day	RR	4	SF	various
31	41		41	KB	Part Time	3 to 4 hours	Net	15	SF	n/a
32	59	59		PV	unemployed	whole day	RR	3	SF	mudprawn
33	61	61		PV	unemployed	whole day	Net	20	SF	n/a
34	54	54		PV	unemployed	6 to 8 hours	Net	15	SF	n/a
35	35	35		PV	Part Time	3 to 4 hours	RR	3	SF	mudprawn
36	44		44	PV	Part Time	3 to 4 hours	RR	3	SF	mudprawn
37	40		40	PV	Part Time	3 to 4 hours	RR	4	SF	mudprawn
38	23	23		PV	unemployed	6 to 8 hours	RR	3	SF	mudprawn
39	29	29		PV	Part Time	3 to 4 hours	Net	10	SF	n/a
40	36		36	PV	unemployed	whole day	RR	5	SF	various
41	54	54		PV	unemployed	whole day	RR	4	SF	sandprawn
42	43		43	PV	unemployed	whole day	RR	4	SF	mudprawn
43	51	51		PV	unemployed	6 to 8 hours	RR	5	SF	mudprawn
44	36		36	PV	Part Time	3 to 4 hours	RR	3	SF	various
45	41		41	PV	Part Time	3 to 4 hours	RR	4	SF	various
46	58	58		PV	unemployed	whole day	Net	15	SF	n/a
47	55	55		PV	unemployed	whole day	RR	3	SF	various
48	41		41	PV	Part Time	3 to 4 hours	RR	4	SF	various
49	34		34	PV	Part Time	3 to 4 hours	RR	4	SF	various
50	52	52		KB	unemployed	6 to 8 hours	RR	3	SF	mudprawn
51	45	45		KB	Part Time	3 to 4 hours	Net	10	SF	n/a
52	43		43	KB	unemployed	whole day	RR	4	SF	mudprawn
53	54	54		KB	unemployed	whole day	RR	3	SF	various
54	44		44	KB	unemployed	6 to 8 hours	RR	4	SF	various

55	39		39	KB	unemployed	6 to 8 hours	RR	5	SF	various
56	59	59		PV	unemployed	whole day	Net	15	SF	n/a
57	54	54		PV	unemployed	whole day	RR	3	SF	various
58	43	43		PV	Part Time	3 to 4 hours	Net	20	SF	n/a
59	38		38	PV	Part Time	3 to 4 hours	RR	2	SF	various
60	52	52		PV	unemployed	6 to 8 hours	Net	15	SF	n/a
61	44	44		PV	unemployed	6 to 8 hours	RR	4	SF	various
62	49		49	PV	Part Time	3 to 4 hours	Net	18	SF	n/a
63	45		45	PV	unemployed	whole day	RR	4	SF	various
64	36	36		DD	Part Time	3 to 4 hours	RR	4	SF	various
65	50	50		DD	unemployed	whole day	Net	15	SF	n/a
66	45	45		DD	unemployed	whole day	RR	3	SF	various
67	42		42	DD	unemployed	whole day	RR	2	SF	various
68	39		39	DD	unemployed	6 to 8 hours	Net	15	SF	n/a
69	58	58		KB	unemployed	whole day	Net	20	SF	n/a
70	52	52		KB	unemployed	6 to 8 hours	RR	3	SF	mudprawn
71	29	29		KB	Part Time	3 to 4 hours	RR	4	SF	mudprawn
72	34		34	KB	unemployed	6 to 8 hours	RR	3	SF	mudprawn
73	41		41	KB	unemployed	whole day	RR	2	SF	mudprawn
74	45	45		PV	unemployed	whole day	Net	10	SF	n/a
75	47	47		PV	unemployed	whole day	Net	15	SF	n/a
76	41		41	PV	Part Time	3 to 4 hours	RR	4	SF	mudprawn
77	52	52		PV	unemployed	6 to 8 hours	Net	15	SF	n/a
78	48	48		PV	unemployed	6 to 8 hours	RR	4	SF	various
79	47		47	PV	unemployed	whole day	Net	18	SF	n/a
80	39		39	PV	Part Time	3 to 4 hours	RR	3	SF	mudprawn
81	55	55		DD	unemployed	whole day	Net	15	SF	n/a
82	47	47		DD	Part Time	3 to 4 hours	RR	20	SF	various
83	49	49		DD	unemployed	whole day	Net	10	SF	n/a

3724	**2187**	**1518**
45	**48**	**41**

661
8

KB = Kaisers Beach, DD = Dyam-Dyam, PV = Pozi Village, SF = Sales and Food, Age/F = Age of female respondent, Age/M = Age of male respondent, Est Catch = Estimated catch, RR = Rod and Reel, SF = Sales and Food, Whole day = above 9 hours of fishing

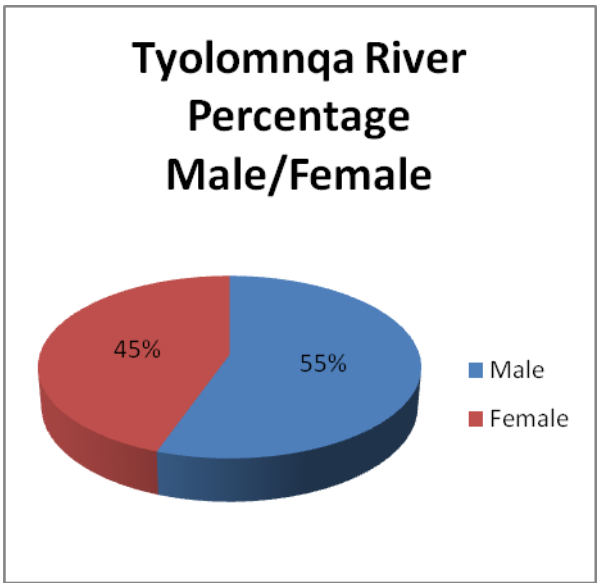

Fig 3.2 Graph indicating percentage male and female fishers along the Tyolomnqa River

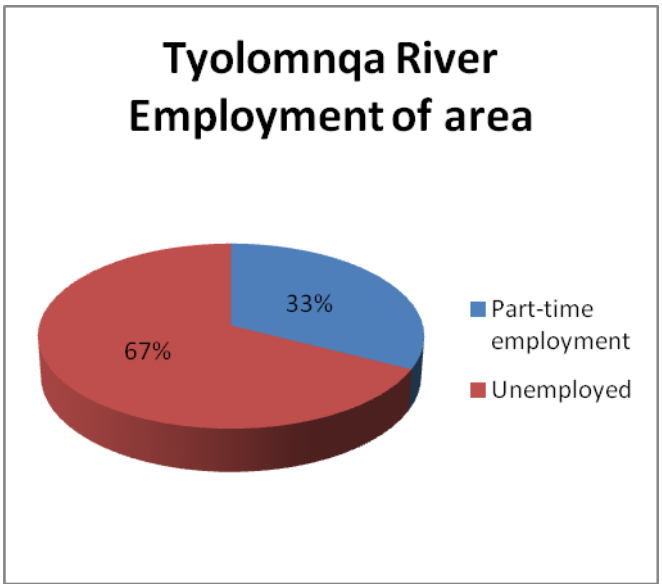

Fig 3.3 Graph indicating the employment of the community of the fishers along the Tyolomnqa River

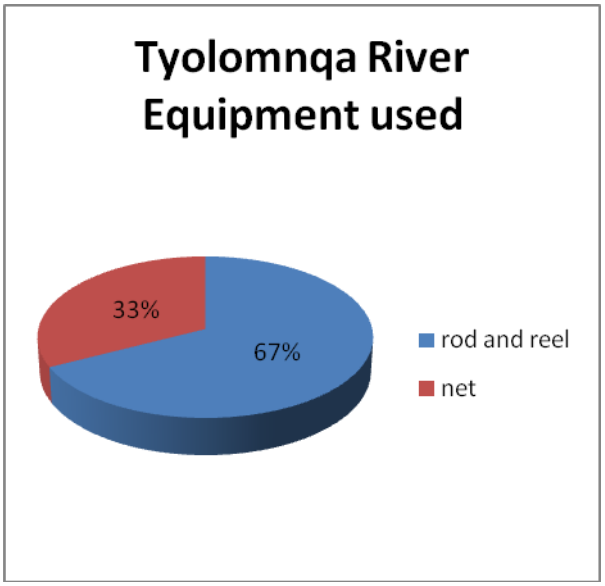

Fig 3.4 Graph indicating the different equipment used by fishers along the Tyolomnqa River

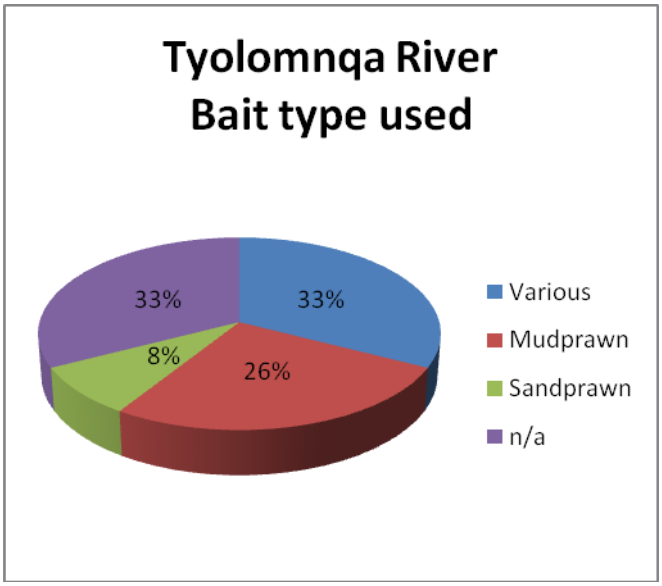

Fig 3.5 Graph indicating different bait species used by the fishers along the Tyolomnqa River

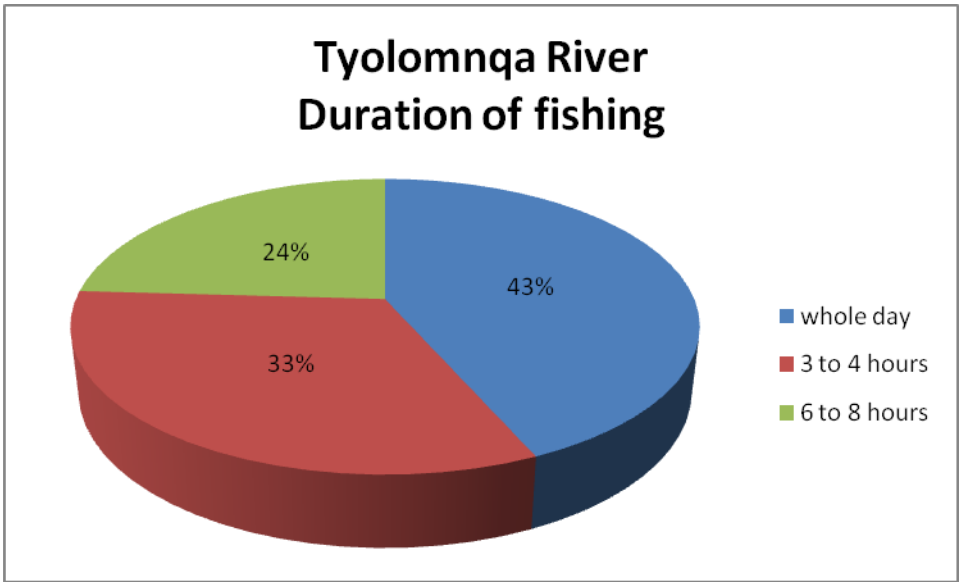

Fig 3.6 Graph indicating duration of fishing done by the fishers along the Tyolomnqa River

3.4 Discussion:

The communities of Pozi Village and Dyam-Dyam are similar with regards to their socio economic status (Wood, 2002, Maponya, 2003). They are fairly established communities that spend a considerable amount of time with subsistence farming and fishing activities. Most families live in huts or rondavels with a sizable cultivated area. These communities are also characterized by a high unemployment rate leaving families with little income for needs such as water, electricity and education (Bloor *et al.* 2001). The subsistence fishing community of Kaisers Beach is a fairly newly established community with many individuals coming from Pozi Village and Dyam-Dyam. Most families here live in shacks and wooden cottages. In this village families are faced with a high unemployment rate and a generally more challenging socio economic environment than that of Pozi Village and Dyam-Dyam. The employment of community members is restricted to part-time employment as gardeners, maids or general cleaning works. Often these individuals are employed for a day or two per week. The survey

indicated that 67% of the community of fishers is unemployed with only 33% having part-time employment (fig 3.3). Due to this high unemployment level, many of the fishers tend to count on fishing and ultilize the river and estuary as a means to support their families. Both males and females utilize the river a mean of financial support. Of the 83 fishers identified, 37 females and 46 males with an average age of 41 years and 48 years respectively harvest from the river and estuary (Fig 3.1). The equipment most often utilized for harvesting is rod and reel (67%) and net (33%) (Fig 3.4). A total of 43% of the fishers harvest the entire day when compared to 33% for 3 to 4 hours and 24% for 2 to 3 hours (Fig 3.6). Some fishers in the Tyolomnqa River area have a long history of harvesting marine resources while others were attracted to it by the prospect of earning money from the illegal trade of marine resources. Those who have a long history in harvesting marine resources tend to harvest a diverse number of species while the poachers tend to concentrate on one particular species such as sea weed or abalone. Individuals relying on seaweed and abalone as a source of income are often the younger generation.

Informal (verbal) interviews conducted reveal that the subsistence fishing communities along this coastline have been harvesting resources from the coast for many years. Resources regularly harvested include abalone (the most widely harvested resource), Mussel, Octopus, Grunter and more recently seaweed. A few of the subsistence fishers indicated that they also exploit cockles and a number line fish species. The informal discussion with subsistence fishers also reveal that seaweed is harvested mostly at night and sold to buyers based in the East London area. It was further stated that some of the buyers often do not pay the agreed amount or end up owing fishers money for long periods of time.

Apart from harvesting species for sale and food, many bait species are also harvested for the leisure purposes. Many fishers used various bait species (33%) with 23% using mud prawn as a primary source and 8% using sand prawn. Those individuals using nets to harvest did not have a need for bait.

3.5 Concerns and Recommendations

The Tyolomnqa fisher's community seems to consist of two groups. One younger group who concentrate much of their harvesting time collecting seaweed and abalone, particularly for the illegal trade and another older group who have a long history in harvesting a diversity of marine species. The latter group harvest line fish and other marine and fresh water species. It is further recommended that line fish exemptions be issued only for own consumption.

Depending on the availability of mussels, it is recommended that mussels be harvested on a small scale commercial basis. Some subsistence fishers particularly in Pozi village are concerned that their area might not be issued with permits, especially as extension officers are not able to provide them with any guarantees. As a result some subsistence fishers were found attending meetings in other areas in the hope of increase their chances of receiving a permit. This however does not increase their chances and only serves to disrupt the meeting in the other areas.

CHAPTER 4: Hamburg River

Fig 4.1: Photograph of the Hamburg River

4.1. Description of the Hamburg River

Hamburg is a small town with a relatively small population size. It is located on the coast between the city of East London and the town of Port Alfred, about 15 kilometers away from the R 72 national road and about 35 kilometers South-west from East London. Majority of the population are classified as poor and are located at the mouth of the Keiskamma River (Fig 4.1). Hamburg subsistence fishers have a long history of harvesting marine resources along the coast, with emphasis on abalone, mussels (white and black), giant periwinkle, line fish, crab, oysters and sea weed. Exemptions were only issued for the harvesting and sale of abalone in this area, after which extension officers were assigned to monitor these exemptions (Stern 2012).

According to Stern (2012), many fishers claim that access to the inshore fish is highly restricted by the set limits of the subsistence permits. This is compounded by further dwindling fish stocks, escalating the time spent fishing. The quotas maybe achieved during high tides but severely under achieved during extremely low tides. An added compounding factor that leads to the disadvantage of the inhabitants is that Hamburg is a fast growing tourist destination, with visitors obtaining recreational permits to fish in the area. This leads to added declining fish stocks.

4.2 Methodology: Implementation of the questionnaire to the Hamburg River community

Although Hamburg region does have extension officers employed for monitoring the effect of subsistence fishers on the estuary and river, it was not possible to use these officers due to the differences and conflict that exists between various stakeholders. The conflicts occur between and among subsistence fishers, fishers and the department and between fishers and buyers which has been an ongoing process for quite some time. These conflicts have impacted negatively in the steady development of the fishery and have resulted in a divided fishing community. Hamburg now has two fisheries with two separate recognized LMCs (Annexure 4).

With the assistance of the Department of Environmental Affairs and Tourism, marine and coastal management (subsistence fishing management unit), potential subsistence fishers were identified and interviewed as per this investigation. A total numbers of 133 fishers were initially identified to the Hamburg Fishery, and to date 133 are registered as fishers of the Hamburg. However, only 49 fishers decided to participate in this investigation. These 49 subsistence fishers undertook to complete the structured questionnaire similar to that of the Great Kei River and Tyolomnqa River.

4.3 Results.

Table 4.1: Summary of Responses from the Hamburg River Community

No.	Age	Age/M	Age/F	Residence	Empolyment	Duration (Hrs)	Equipment	Est catch	Purpose	Bait type
1	46	46		HS	part time	3 to 4 hours	Net	15	SF	n/a
2	52	52		HS	unemployed	whole day	RR	5	SF	various
3	41		41	HS	part time	3 to 4 hours	RR	3	SF	various
4	41	41		HS	unemployed	whole day	Net	20	SF	n/a
5	55	55		HS	unemployed	6 to 8 hours	Net	10	SF	n/a
6	49	49		HS	unemployed	whole day	RR	4	SF	mudprawn
7	46		46	HS	unemployed	whole day	RR	4	SF	mudprawn
8	37		37	HS	part time	3 to 4 hours	RR	4	SF	sandprawn
9	52	52		HS	unemployed	whole day	Net	15	SF	n/a
10	53	53		HS	unemployed	whole day	RR	3	SF	sandprawn
11	48	48		HS	part time	3 to 4 hours	Net	10	SF	n/a
12	36		36	HS	unemployed	6 to 8 hours	RR	3	SF	mudprawn
13	39		39	HS	part time	3 to 4 hours	RR	4	SF	various
14	58	58		HS	unemployed	whole day	RR	4	SF	various
15	49	49		HS	unemployed	whole day	RR	5	SF	various
16	41		41	HS	unemployed	6 to 8 hours	RR	3	SF	mudprawn
17	55	55		HS	unemployed	whole day	Net	15	SF	n/a
18	50	50		HS	unemployed	whole day	RR	4	SF	mudprawn
19	39		39	HS	part time	3 to 4 hours	RR	2	SF	various
20	35		35	HS	part time	3 to 4 hours	RR	3	SF	mudprawn
21	47	47		HS	part time	3 to 4 hours	Net	15	SF	n/a
22	49	49		HS	unemployed	whole day	Net	20	SF	n/a
23	41		41	HS	unemployed	6 to 8 hours	RR	4	SF	mudprawn
24	48		48	HS	unemployed	3 to 4 hours	RR	2	SF	various
25	52	52		HS	unemployed	whole day	RR	4	SF	various

26	50	50		HS	unemployed	6 to 8 hours	Net	15	SF	n/a
27	35		35	HS	part time	3 to 4 hours	RR	3	SF	various
28	46	46		HS	part time	whole day	RR	7	SF	mudprawn
29	51	51		HS	unemployed	whole day	Net	15	SF	n/a
30	40		40	HS	unemployed	3 to 4 hours	RR	5	SF	mudprawn
31	43	43		HS	unemployed	6 to 8 hours	RR	4	SF	mudprawn
32	45	45		HS	unemployed	6 to 8 hours	RR	4	SF	mudprawn
33	38		38	HS	part time	3 to 4 hours	RR	3	SF	various
34	49	49		HS	unemployed	whole day	Net	15	SF	n/a
35	45	45		HS	part time	3 to 4 hours	RR	5	SF	various
36	39		39	HS	part time	3 to 4 hours	RR	3	SF	various
37	43		43	HS	unemployed	6 to 8 hours	RR	3	SF	mudprawn
38	54	54		HS	unemployed	whole day	Net	10	SF	n/a
39	46	46		HS	unemployed	whole day	RR	5	SF	mudprawn
40	47	47		HS	part time	3 to 4 hours	RR	2	SF	various
41	42		42	HS	part time	3 to 4 hours	RR	3	SF	various
42	38		38	HS	unemployed	3 to 4 hours	RR	4	SF	various
43	54	54		HS	unemployed	whole day	Net	15	SF	n/a
44	51	51		HS	unemployed	6 to 8 hours	RR	4	SF	various
45	37		37	HS	unemployed	6 to 8 hours	RR	3	SF	various
46	47	47		HS	part time	3 to 4 hours	RR	5	SF	mudprawn
47	41		41	HS	unemployed	6 to 8 hours	RR	2	SF	mudprawn
48	41	41		HS	unemployed	whole day	RR	4	SF	mudprawn
49	52	52		HS	unemployed	whole day	Net	15	SF	n/a
	2233	**1477**	**756**					**335**		
	46	**49**	**40**					**7**		

HS = Hamburg surroundings, RR = Rod and Reel, SF = Sales and Food, Age/F = Age of female respondent, Age/M = Age of male respondent, Est Catch = Estimated catch, SF = Sales and Food Whole day = above 9 hours of fishing

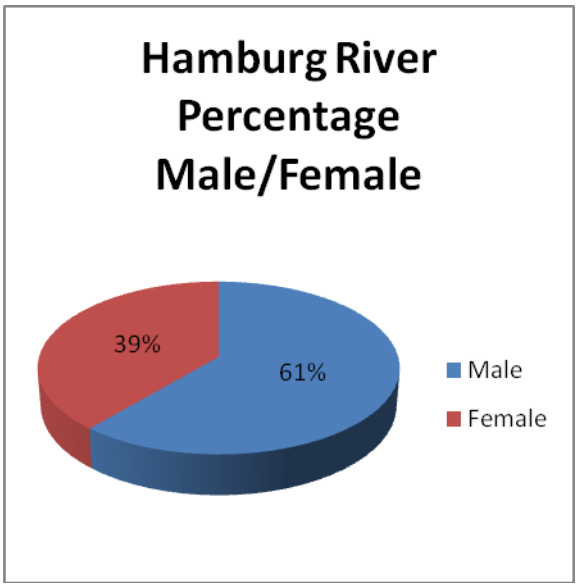

Fig 4.2 Graph indicating percentage male and female fishers along the Hamburg River

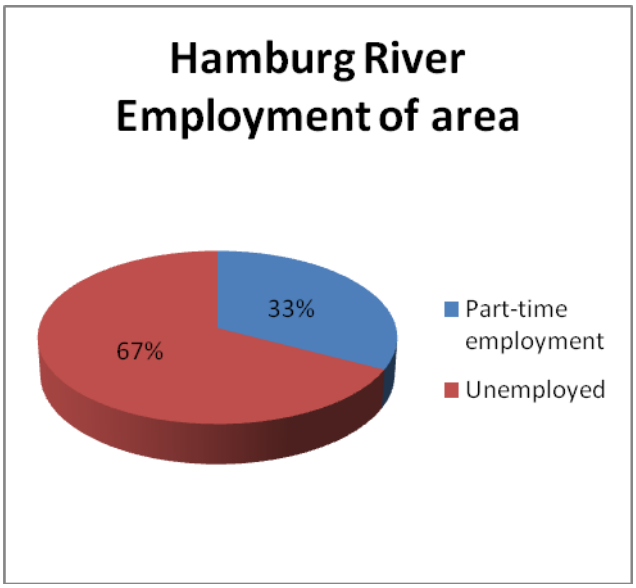

Fig 4.3 Graph indicating the employment of the community of the fishers along the Hamburg River

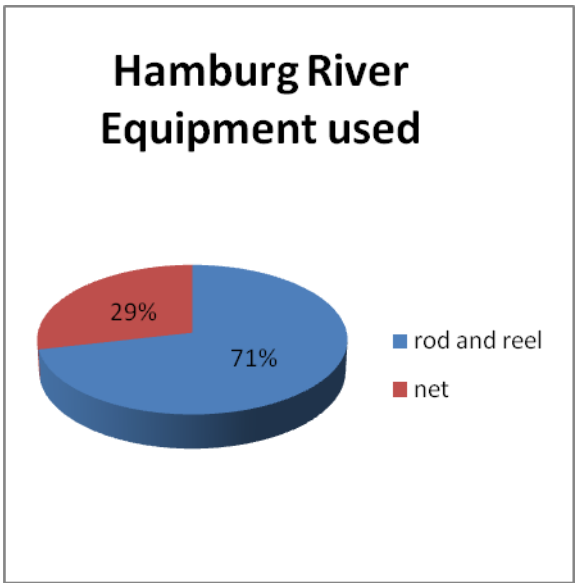

Fig 4.4 Graph indicating the different equipment used by fishers along the Hamburg River

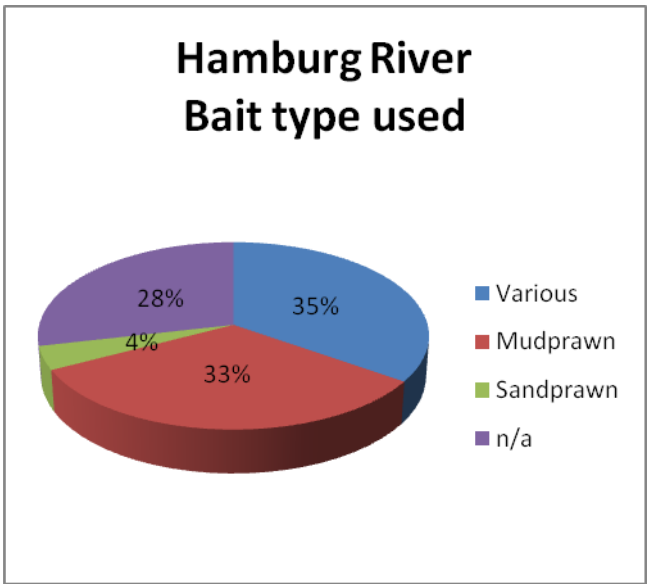

Fig 4.5 Graph indicating different bait species used by the fishers along the Hamburg River

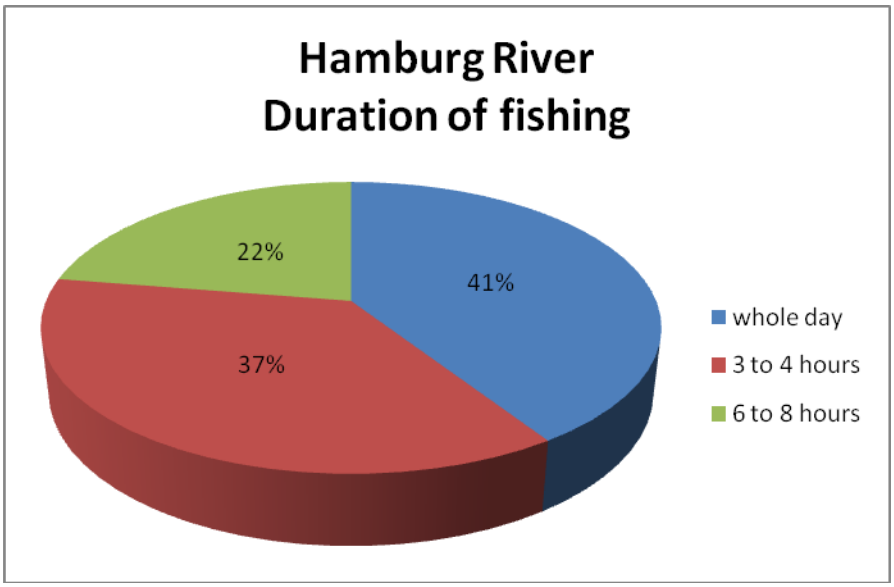

Fig 4.6 Graph indicating duration of fishing done by the fishers along the Hamburg River

4.4 Discussion:

Hamburg river system is closely monitored by experienced extension officers who revealed that the fishing community associated with subsistence fishing is well over hundred fishers. However the fishers were reluctant to volunteer towards this investigation. The survey addressed the harvesting pressures on the river and estuary region and many have noted that they predominantly harvest resources such as oysters, giant periwinkle, line fish and black and white mussels. Furthermore, the outcomes of the survey directly linked to the reduction of the resources due to various pressures. Some fishers in Hamburg have a long history of harvesting marine resources while others were attracted to it by the prospect of earning money from the trade of abalone. Those who have a long history in harvesting marine resources tend to harvest a diverse number of species while the new entrants the fishing sector tend to concentrate on one particular species namely abalone. The influx of visitors, made it difficult for the fishers to reach their quotas for the day (Stern 2012). This has resulted in many fish species being caught below the legal size limit.

The proportion of male to female fishers at the Hamburg River is similar to that of the Great Kei River and Tyolomnqa River, with 19 respondents being female and 30 respondents being male (39% and 61% respectively, Table 4.1, Fig 4.2). The unemployment is also the same as that of the Tyolomnqa River with 67% being unemployed and 33% with part-time employment (Fig 4.3). Similar bait and mode of fishing is employed at the Great Kei and Tyolomnqa Rivers are used at the Hamburg River.

The negative factor when it comes to sustaining the species composition in the river system is the conflict that was alluded to by many of the fishers. The initial establishment of the LMC was not effective. Hence a second LMC had to be established to satisfy the needs of the community (Annexure 3). This has resulted in the establishment of two fisheries with two separate LMCs. Both are recognized by the MCMSFMU.

Concerns and Recommendations

The Hamburg Abalone fishery faces many challenges. For the families of Hamburg fishers, abalone is the primary source of income. The fact that the Hamburg fishers are divided impacts negatively on the ability of the fishery to develop sustainably. With a divided fishing community, conflict is bound to happen especially when considering that both groups are expected to harvest from the same turf. It is the recommendation of the extension office that much effort be invested in ensuring that fishers are able to work as one unit.

It is further recommended that tourists fishing should be an annual national game with strict regulations. This will serve to reduce the daily issuing of recreational permit to visitors which lead to stock reduction. This activity will bring additional revenue due to the attraction of many visitors. Stringent measure should be put in place to avoid species caught below the legal size limit.

CHAPTER 5: Bushmans River

Fig 5.1: Photography of the Bushman's river mouth region

5.1. **Description of the Bushman's River community**

Bushman's river or Boesmans Rivier (Fig 5.1) is located in the Eastern Cape and was established by farmers from nearby rural towns such as Paterson, Cookhouse, Somerset East and Cradock, in the interior. Day (1981) estimated the catchment area to be around 2700 km^2 while Bornman and Klages (2004) stated it to be around 2678 km^2. The Department of Forestry is responsible for the management of the land associated with the Bushmans River. The river has a large diversity of fish species such as kabeljou (kob), elf (shad), leerfish (garrick), spotted grunter, steenbras, cape salmon, stumpnose and many other rarer sea species such as gurnard, rock cod, red river snapper and mussel cracker. Many of these species enter the river as it remains permanently open and is the second largest tidal river in Southern Africa (30km). Other species such as sand and rock

mussels, perlemoen (abalone), oysters, river crab, prawns, crayfish and octopus also occur along the coastline and in the river (Table 5.1).

The Bushman's river Coastal area is situated about 20 kilometres from Port Alfred and about 50 kilometres from Alexandria in the Eastern Cape Province. While middle to upper income communities live on the upper reaches of the Bushman's River banks, the lower income areas are found some 2 -4 kilometres away on the southern side of the Bushman's river. The lower income areas where subsistence fishers reside are Klipfenstein and Marseille. The coastal area supports diverse marine living resources with fishers harvesting a diversity of marine species. Bait collection and fishing as a subsistence level activity has been practiced in the Bushmen's river coastal area for many years. To avoid prosecution, many subsistence fishers have purchased recreational permits while other still harvest resources illegally.

5.2 Methodology: Implementation of the questionnaire to the Bushmans River community

With the lack of a contact person in the Bushman's river area, the extension officers applied a snowballing technique identify potential subsistence fishers of the area. Two areas were identified as areas where potential subsistence fishers could be identified. These areas are the lower income communities of Marseille and Klopfenstein. Informal conversation with some community members revealed that many subsistence fishers reside in the area. This led extension officers to the homes of many fishers where they were invited to participate in this investigation. Some subsistence fishers were also identified by the gear that they were carrying or in their posession. Furthermore the establishment of the LMC (Annexure 5) for Bushmans River assisted in the completion of the investigation of this river.

5.3 Results

Table 5.1: Fish and Bait resources available at Bushmans River estuary and mouth region

Fish resource	**Bait resource**
Kabeljou	Mud prawn
Steenbras	Sand prawn
Spotted Grunter	swimming prawn
Galjoen	pencil
Shad	Mussel
Mussel Cracker	Red bait
Garrick	Octopus

Table 5.2: Summary of Responses from the Bushman River Community

No.	Age	Age/M	Age/F	Residence	Empolyment	Duration	Equipment	Est catch	Purpose	Bait type
1	56	56		Mar	unemployed	Whole day	net	15	SF	N/A
2	44		44	Mar	unemployed	6 to 8 hours	RR	4	SF	various
3	51	51		Mar	unemployed	6 to 8 hours	RR	6	SF	sandprawn
4	48		48	Mar	part time	3 to 4 hours	RR	4	SF	mudprawn
5	43	43		Mar	unemployed	Whole day	RR	5	SF	mudprawn
6	39	39		Mar	unemployed	Whole day	RR	4	SF	various
7	32		32	Mar	part time	3 to 4 hours	RR	3	SF	various
8	48	48		Mar	unemployed	6 to 8 hours	net	20	SF	N/A
9	45	45		Mar	part time	3 to 4 hours	RR	5	SF	various
10	52	52		Mar	unemployed	Whole day	net	15	SF	N/A
11	39		39	Mar	unemployed	6 to 8 hours	RR	4	SF	mudprawn
12	37		37	Klip	unemployed	6 to 8 hours	RR	4	SF	mudprawn
13	61	61		Klip	unemployed	Whole day	net	10	SF	N/A
14	53	53		Klip	unemployed	Whole day	net	15	SF	N/A
15	45		45	Klip	unemployed	Whole day	RR	4	SF	various
16	33		33	Klip	part time	3 to 4 hours	RR	5	SF	sandprawn
17	41		41	Klip	unemployed	6 to 8 hours	RR	4	SF	mudprawn
18	52	52		Klip	unemployed	Whole day	RR	4	SF	sandprawn
19	41	41		Klip	part time	3 to 4 hours	net	15	SF	N/A
20	38		38	Klip	unemployed	6 to 8 hours	RR	3	SF	mudprawn
21	45	45		Klip	unemployed	Whole day	RR	4	SF	various
22	42	42		Klip	unemployed	Whole day	RR	5	SF	various
23	37		37	Klip	unemployed	6 to 8 hours	RR	4	SF	mudprawn
24	44		44	Klip	unemployed	6 to 8 hours	RR	3	SF	various
25	45	45		Klip	part time	3 to 4 hours	RR	5	SF	sandprawn

26	47	47		Klip	unemployed	Whole day	net	20	SF	N/A
27	39	39		Klip	unemployed	Whole day	RR	3	SF	various
28	38		38	Klip	part time	3 to 4 hours	RR	3	SF	mudprawn
29	43		43	Mar	unemployed	3 to 4 hours	net	10	SF	N/A
30	42		42	Mar	unemployed	6 to 8 hours	RR	3	SF	mudprawn
31	35		35	Mar	part time	3 to 4 hours	RR	4	SF	mudprawn
32	38	38		Mar	part time	3 to 4 hours	RR	6	SF	sandprawn
33	47	47		Mar	unemployed	Whole day	RR	3	SF	sandprawn
34	48		48	Klip	unemployed	6 to 8 hours	net	15	SF	N/A
35	45		45	Klip	unemployed	Whole day	RR	3	SF	mudprawn
36	46	46		Klip	unemployed	Whole day	RR	4	SF	mudprawn
37	44	44		Mar	unemployed	Whole day	RR	3	SF	sandprawn
38	36		36	Mar	part time	3 to 4 hours	RR	2	SF	mudprawn
39	42	42		Mar	unemployed	6 to 8 hours	RR	5	SF	mudprawn
40	39		39	Mar	part time	3 to 4 hours	RR	3	SF	mudprawn
41	43	43		Klip	unemployed	6 to 8 hours	net	15	SF	N/A
42	47	47		Klip	part time	3 to 4 hours	net	10	SF	N/A
43	41		41	Klip	unemployed	6 to 8 hours	RR	3	SF	mudprawn
44	36	36		Klip	part time	3 to 4 hours	RR	5	SF	various
45	32	32		Klip	unemployed	Whole day	RR	3	SF	various
46	43	43		Klip	unemployed	Whole day	net	20	SF	N/A
47	48		48	Klip	unemployed	6 to 8 hours	RR	2	SF	various
48	45	45		Klip	unemployed	Whole day	RR	4	SF	various
49	35		35	Mar	part time	3 to 4 hours	RR	3	SF	mudprawn
50	49	49		Mar	unemployed	Whole day	net	10	SF	N/A
	2159	**1271**	**888**					**332**		
	43	**45**	**40**					**7**		

Mar = Marseille, Klip = Klopfenstein, RR = Rod and Reel, SF= Sales and Food, Age/F = Age of female respondent, Age/M = Age of male respondent, Est Catch = Estimated catch, SF = Sales and Food Whole day = above 9 hours of fishing

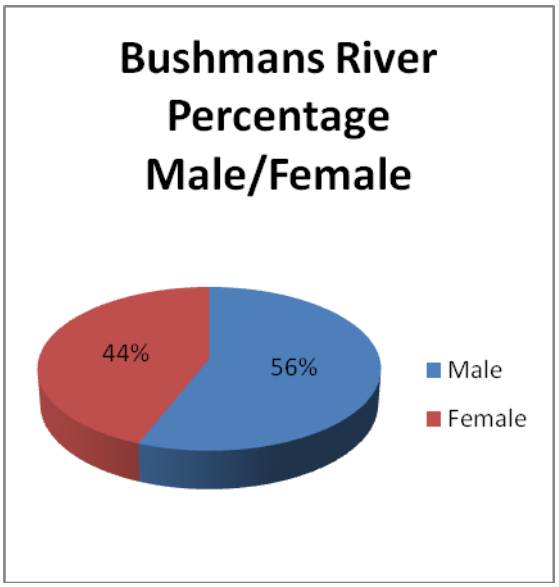

Fig 5.2 Graph indicating percentage male and female fishers along the Bushman River

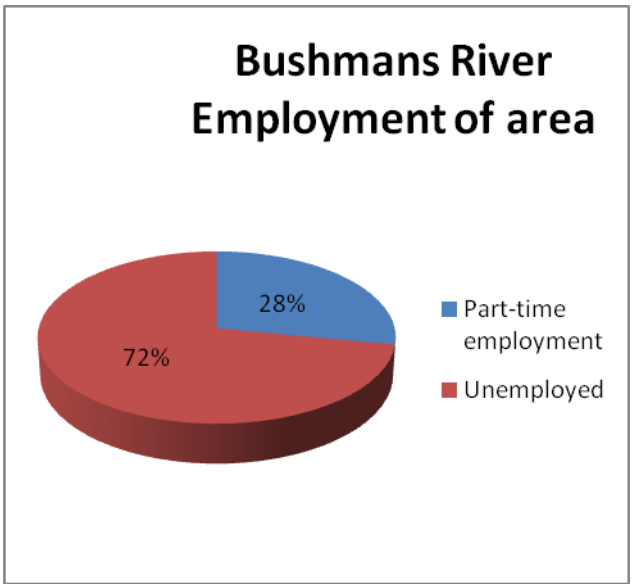

Fig 5.3 Graph indicating the employment of the community of the fishers along the Bushman River

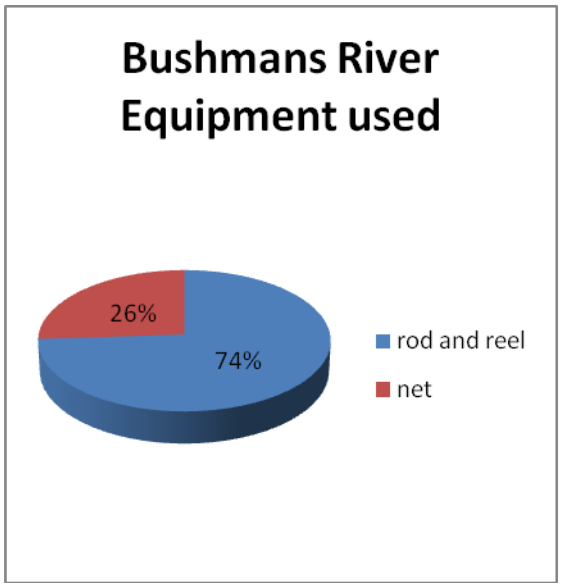

Fig 5.4 Graph indicating the different equipment used by fishers along the Bushman River

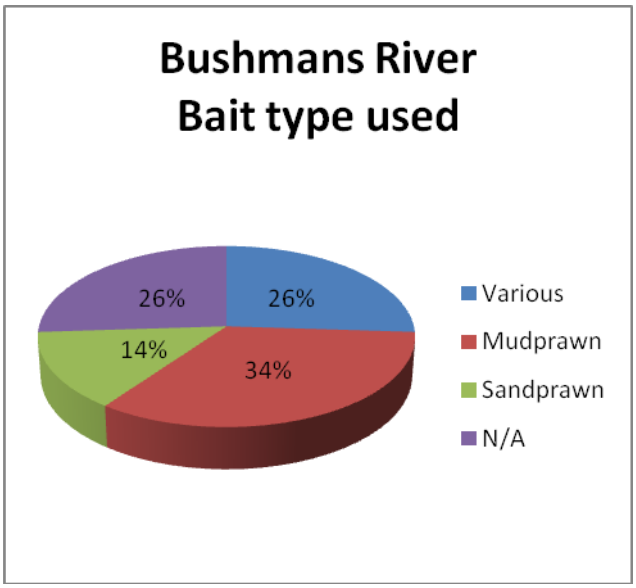

Fig 5.5 Graph indicating different bait species used by the fishers along the Bushman River

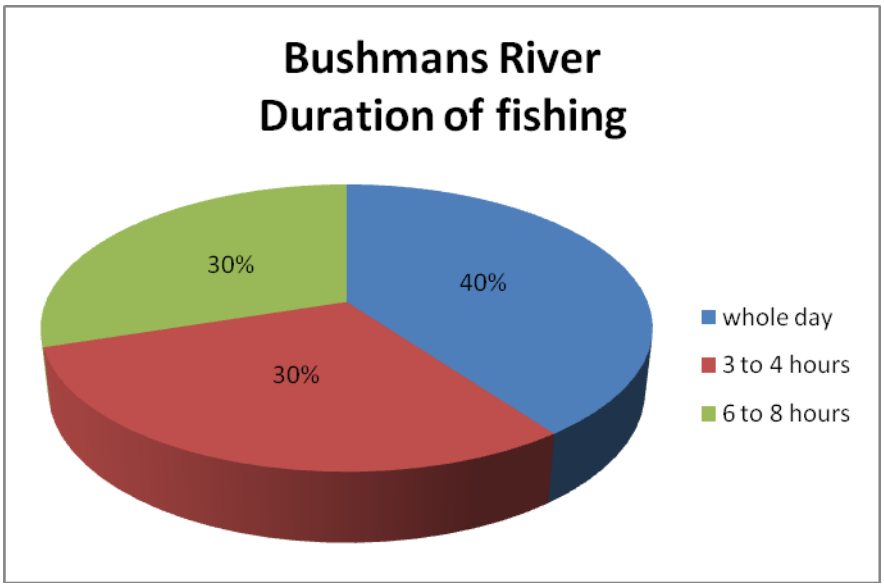

Fig 5.6 Graph indicating duration of fishing done by the fishers along the Bushman River

5.4. Discussion

Due to wide intertidal and supra-tidal flats and sometimes shallow channels the Bushmans Estuary is characterized by sandy sediment and (Reddering and Rust, 1990 and is further drained through mud-depleted source rocks (Reddering, 1988). The presence of marine sand in the lower reaches of the Bushmans Estuary is occurs during flood and ebb tides. Baird *et al.*, (1981) estimated an average of 20 m^3 of sand being transported into the estuary over a single spring tidal cycle (Baird *et al.* 1981).

Subsistence fishers in the Bushman's River area typically harvest sea and river bait and fish resources on a daily basis. While a few subsistence fishers collect bait to sell to the small local demand of recreational fisherman, most collect for their own fishing needs. Fishers typically use a rod and reel to harvest fish resources (Fig 5.4). Some use hand lines. Bait resources are harvested with suction pumps, tin cans, or by hand. Fishing in these communities is regarded as an activity aimed at supplementing nutrition. Fishers catching line fish regard the value that buyers are prepared to pay as less than the actual value of the fish. Subsistence fishers here choose not to sell their fish.

The subsistence fishers from Klopfenstein and Marseille experience a low socio-economic status with high levels of unemployment, 72 % unemployed and 28 % part-time employment (Fig 5.3). Many survive on subsistence fishing and part time employment provided in the construction industry. Some are also employed part-time at the homes of the more affluent in Bushman's River and nearby Kenton on Sea as maids, gardeners or as a handy person.

5.5. Concerns and Recommendations

The subsistence fishers in the Bushman's River area are primarily line fishers harvesting fish and bait resources. The line fish are harvested purely for consumption by the family. Subsistence fishers in the Bushman's River are either completely unemployed or work one to two days a week in the domestic or construction sector. It is strongly recommended that exemptions be issued to this community as fishing provided them with a much needed source of nutrition as well as assist in term of some financial benefits for the household.

CHAPTER 6: Sundays' River

Fig 6.1 Photography of the Sunday's River Mouth Region.

6.1. Description of the Sundays' River community

The Sundays River or Nukakamma is a river (Fig 6.1) in the situated near Port Elizabeth in the Eastern Cape Province, South Africa. It is said to be the fastest flowing river in the country. Due to the river bank always having vegetation cover, the Khoisan people named this river *Nukakamma*. Presently this river forms part of the Fish River to Tsitsikama Water Management Area (Clark and Turpie, 2007, Scharler and Baird 2005).

The source of the Sundays' River is in the Compassberg Mountains (one of the highest mountains in the Eastern Cape) near Nieu-Bethesda. The river then flows in a general south-southeasterly direction, passing the town Graaff-Reinet in the Karoo before winding its way through the Zuurberg Mountains and then past Kirkwood and Addo in the fertile Sundays River

Valley. It empties into the Indian Ocean at Algoa Bay after running through the village of Colchester, 40 km east of the city of Port Elizabeth (Vroumans *et al*., 2012)

The Fish River-Sundays' River Canal Scheme consists of a canal and tunnel system which supplies water from the Orange River to the Great Fish River Valley and subsequently to the Sundays' River Valley in order to supplement the existing water supply of the Eastern Cape. Since 1992 the water from the Sundays River Valley has been supplied to Port Elizabeth.

6.2 Methodology: Implementation of the questionnaire to the Sundays River community

Colchester is situated approximately 35 km Northeast of Port Elizabeth city centre. The identification of potential subsistence fishers has proved particularly challenging. It was decided together with the extension officers to employ the snowballing technique to identify the subsistence fishers. This technique has proved very successful as the majority of fishers are known to each other and information is easily disseminated. Formal and informal visits to Pearson Park, speaking to community members in the street and also doing door-to-door visits were fruitful. The visit was decided upon after speaking to some fishers fishing on the banks of the Sunday's River. The aim of the visit was to identify and inform fishers about the investigation and to request their participation in this investigation. With an initial group of about 41 potential subsistence fishers, 35 were identified as true subsistence fishers that regularly harvest marine resources. These subsistence fishers all reside in the low cost housing settlement of Pearson Park situated on the inland side of the N2 National road. The participants were addressed to the purpose of the investigation and volunteered the completion of the structured questionnaire. The community had also elected a LMC (Annexure 6) for the area to assist in monitoring and assisting the fishers with information on the sustainability of the river resources.

6.3 Results

Table 6.1 Fish and Bait resources available at Sundays' River estuary and mouth region

Fish resources	Bait resource
Kabeljou	Mud prawn
Steenbras	Sand prawn
Spotted Grunter	Swimming prawn
Galjoen	Pencil
Shad	Mussels
Mussel Cracker	Red bait
Garrick	Octopus
	A variety of smaller species used as live bait

Table 6.2 Summary of Responses from the Sundays' River Community

No	Age	Age/M	Age/F	Residence	Empolyment	Duration (Hrs)	Equipment	Est catch	Purpose	Bait type
1	47	47		PP	unemployed	Whole day	net	15	SF	N/A
2	39	39		PP	unemployed	6 to 8 hours	RR	3	SF	various
3	52	52		PP	unemployed	Whole day	net	20	SF	N/A
4	40	40		PP	unemployed	Whole day	net	10	SF	N/A
5	40		40	PP	part time	3 to 4 hours	RR	4	SF	mudprawn
6	49	49		PP	unemployed	Whole day	net	15	SF	N/A
7	59	59		PP	unemployed	Whole day	RR	5	SF	mudprawn
8	55	55		PP	unemployed	Whole day	net	20	SF	N/A
9	42	42		PP	unemployed	6 to 8 hours	RR	5	SF	various
10	37	37		PP	unemployed	6 to 8 hours	RR	5	SF	sandprawn
11	39		39	PP	part time	3 to 4 hours	RR	4	SF	mudprawn
12	45	45		PP	unemployed	6 to 8 hours	RR	5	SF	mudprawn
13	42	42		PP	unemployed	Whole day	RR	4	SF	sandprawn
14	51	51		PP	unemployed	Whole day	net	15	SF	N/A
15	46		46	PP	unemployed	6 to 8 hours	RR	3	SF	sandprawn
16	38	38		PP	part time	3 to 4 hours	RR	7	SF	mudprawn
17	55	55		PP	unemployed	Whole day	net	15	SF	N/A
18	47	47		PP	unemployed	Whole day	net	20	SF	N/A
19	42	42		PP	unemployed	6 to 8 hours	net	15	SF	N/A
20	38		38	PP	part time	3 to 4 hours	RR	5	SF	mudprawn
21	45		45	PP	unemployed	3 to 4 hours	RR	4	SF	various
22	39	39		PP	unemployed	6 to 8 hours	RR	5	SF	mudprawn
23	41	41		PP	unemployed	6 to 8 hours	RR	5	SF	mudprawn
24	37	37		PP	unemployed	6 to 8 hours	RR	4	SF	various
25	45		45	PP	part time	3 to 4 hours	RR	4	SF	various

26	52	52		PP	unemployed	Whole day	net	10	SF	N/A
27	50	50		PP	unemployed	Whole day	net	15	SF	N/A
28	49	49		PP	unemployed	Whole day	net	15	SF	N/A
29	45	45		PP	part time	3 to 4 hours	RR	5	SF	sandprawn
30	38	38		PP	unemployed	6 to 8 hours	RR	4	SF	mudprawn
31	36		36	PP	part time	3 to 4 hours	RR	4	SF	mudprawn
32	45	45		PP	unemployed	Whole day	net	20	SF	N/A
33	40		40	PP	part time	3 to 4 hours	RR	3	SF	various
34	46	46		PP	unemployed	6 to 8 hours	net	10	SF	N/A
35	41	41		PP	part time	3 to 4 hours	RR	4	SF	various
	1552	**1223**	**329**					**307**		
	44	**45**	**41**					**9**		

PP = Pearson Park, RR = Rod and Reel, SF = Sales and Food, Age/F = Age of female respondent, Age/M = Age of male respondent, Est Catch = Estimated catch, SF = Sales and Food Whole day = above 9 hours of fishing

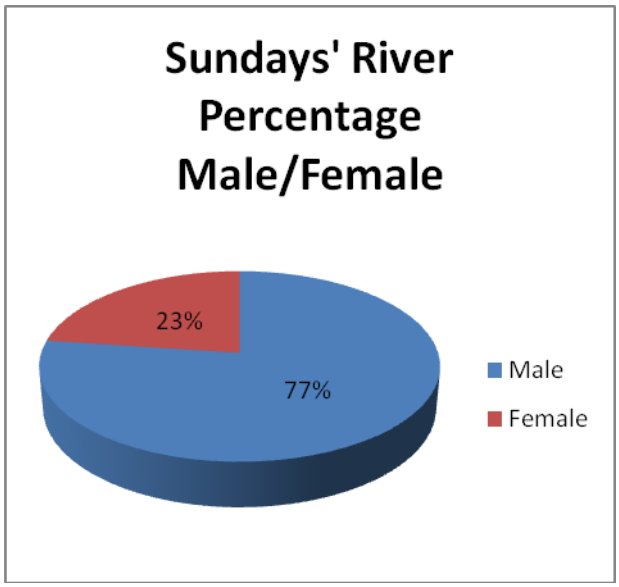

Fig 6.2 Graph indicating percentage male and female fishers along the Sundays' River

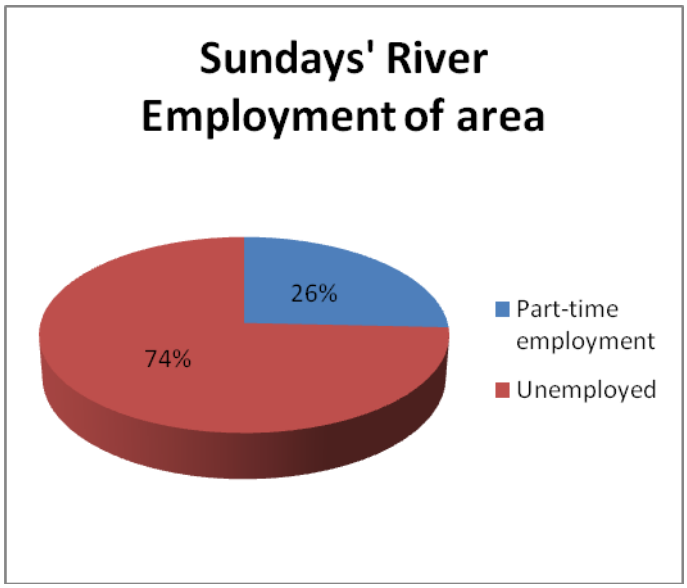

Fig 6.3 Graph indicating the employment of the community of the fishers along the Sundays' River

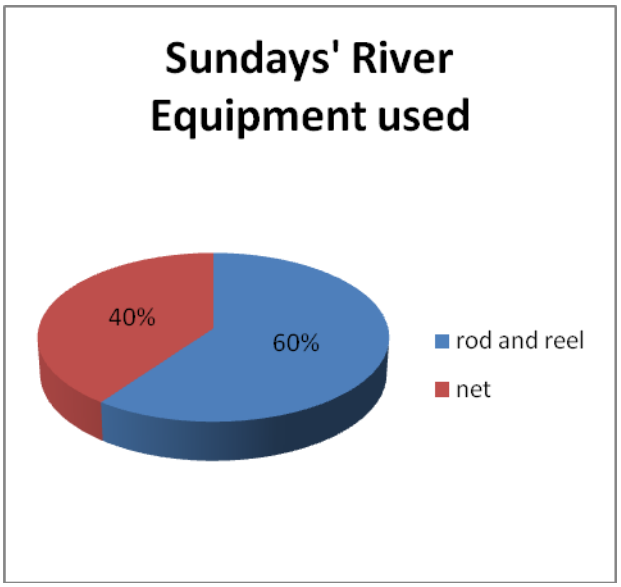

Fig 6.4 Graph indicating the different equipment used by fishers along the Sundays' River

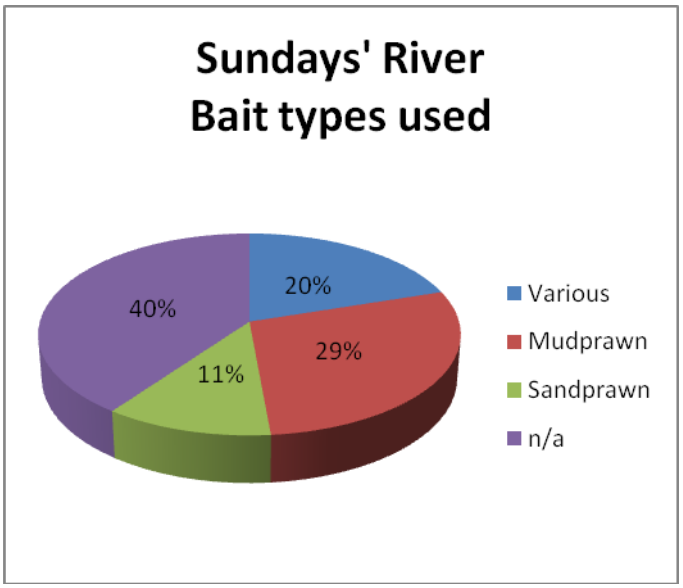

Fig 6.5 Graph indicating different bait species used by the fishers along the Sundays' River

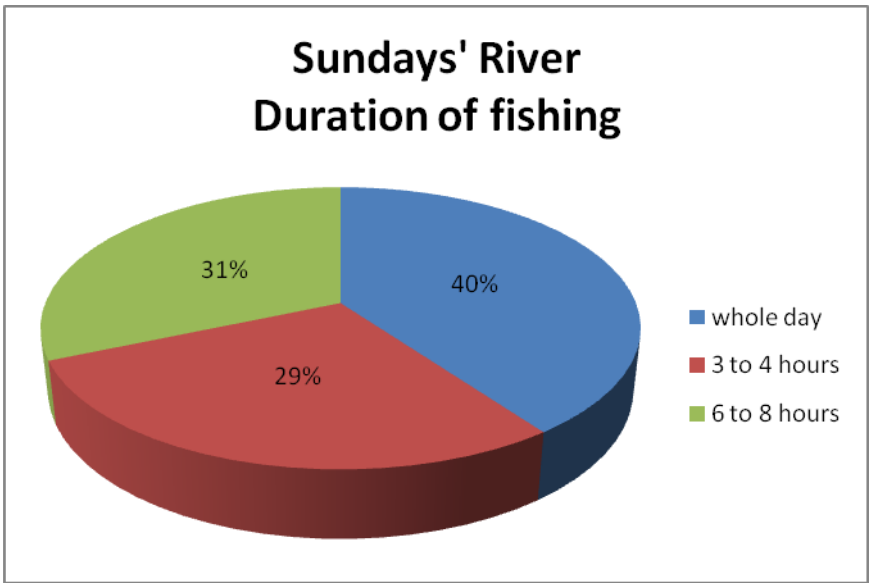

Fig 6.6 Graph indicating duration of fishing done by the fishers along the Sundays' River

6.4 Discussion

Although there are no estuaries in the boundaries of the Sundays' River Valley Municipality, portions of the Sundays' Estuary lie along the western boundary of the municipality, for example at Colchester. Because estuaries are impacted by adjacent land uses and activities far upstream, such as abstraction and agricultural activities, and as far as the mountains where their rivers originate, it is important that these land use activities are managed to reduce impacts on the Sundays' Estuary, such as soil erosion, siltation, sedimentation and pollution (Clark and Turpie 2007, Vroumans, *et al.* 2012).

The majority of residence in the suburb of Pearson Park (low cost housing area) experiences a relatively low socio-economic status with high levels of unemployment, 74 % unemployed and 26 % with part-time employment (Fig 6.3). The part-time employed individuals of the community find employment at the homes of the middle to high-income residence on the coastal side of the N2 national road. The part time work involves 1 to 2 day a week work in gardens and general home maintenance. While many individuals of the subsistence fishing community

survive primarily through part time work provided by the homes of the more affluent, others have no income.

The Colchester subsistence fishers are engaged in both bait collecting and fishing activities. The informal interviews conducted with fishers revealed that while very few collected bait to sell to recreational fishers most did so to harvest fish for the consumption of the family (Table 6.2). Very few subsistence fishers collect and sell bait resources to recreational fishers. With a relatively small recreational sector providing a bait market and the relative abundance of non-commercial fish species caught, subsistence fishers have little chance of receiving some income from the marine resources. The selling of bait is still done on a very small scale and the majority of fishers collect bait and catch fish on a truly subsistence level. Fishers typically use a rod and reel to harvest line fish (Fig 6.4). Those who cannot afford a rod and reel often use hand lines or handmade nets (Fig 6.5), but are restricted to catching fish in the river. Bait resources are harvested using a variety of implements such as suction pumps, wires, cans, hands and feet and throw nets.

6.5 Concerns and recommendations

The investigation with the aid of the subsistence fishing community of Colchester revealed two core concerns regarding the harvesting of resources on the Sundays' River and the nearby ocean coastline. The greatest concern regards access to Marine resources. With many middle to high income residence owning property along the western banks of the river, the subsistence fishing community of Pearson Park are denied access to the river. Only those fishers who have access to a small boat are able to gain access to the resources available. Some property owners charge a fee to gain access to the river as their properties extend right up until where the cliff starts. This makes it even more difficult for fishers too access the river.

With Sundays' river and private property between the Pearson Park fishing community and the coast, fishers have to walk long distances to gain access to the coast. Subsistence bait collection and fishing activities are at present done by those daring enough to risk prosecutions form the law enforcement agencies. Others have resorted to purchasing relatively expensive recreational permits to harvest marine resources. Many subsistence fishers are also denied easy access to the

river and ocean coast by the barrier of private property lining the river's edge. With no subsistence fishing exemptions and restricted access, many are marginalized from harvesting marine resources and in turn cannot derive any form of income or protein. This investigation recommends that the identified subsistence fishers all receive exemptions to collect bait and fish in the waters of the Colchester area.

While research still need to be done on the commercial potential of marine resources, there need to be measures put in place to monitor the fish population on the river system. The exemptions should only cater for non-commercial activities. This means that subsistence fishers should only be allowed to collect bait and fish resources for their own consumption. While subsistence fishers are denied easy access to the river and ocean coast, it is also strongly recommended that the Department of Environmental and Water Affairs provide or investigate options that allow easy access to marine resources by subsistence fishers.

CHAPTER 7: Jeffreys' Bay

Fig 7.1 Photography of Jeffreys' Bay mouth Region

7.1 Description for Jeffreys' Bay community

Jeffreys Bay is a town located about an hours' drive southwest of Port Elizabeth, situated (approximately 5 kilometres) just off the N2 Highway (Integrated Development Plan 2007 – 2012) (Fig 7.1).

The subsistence fishers from Jeffreys' Bay all come from the primarily black community of Pellsrus. Fishers here are primarily men and women who harvest sea shells, black and white mussels and oysters. Subsistence fishers here have a long history of harvesting marine resources

from the coast. Some still have very old photos of their fishing related activities. The mussels and oysters are harvested for own consumption. Sea shells are also collected from the sea shore and used for the making ornaments for sale. However, line fish is also extensively harvested as a source of income.

7.2 Methodology: Implementation of the questionnaire to the Jeffreys' Bay community

Identification and verification

Eddie Appersalie, a community development volunteer contacted the investigation team and the extension office after hearing about subsistence fisher investigation. Mr. Appersalie offered his assistance in identifying the subsistence fishers of the area. He further accompanied and directed the investigation team to subsistence fishers' homes. With Mr. Appersalies' help, the identification of fishers in this area was rendered an easy task. The subsistence fishers were willing to assist in the investigation and provided the information need for the questionnaire as well as interviews. A total number of 48 fishers were verified as subsistence fishers in the Jeffrey's bay area. Subsistence fishers here are already relatively organized around their small informal shell ornament business. The Jeffrey's Bay region also has a LMC (Annexure 7) in place.

7.3 Results

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Table 7.1 Summary of Responses from the Jeffreys' River Community

No	Age	Age/M	Age/F	Residence	Empolyment	Duration (Hrs)	Equipment	Est catch	Purpose	Bait type
1	38	38		PEL	part time	3 to 4 hours	RR	6	SF	various
2	62	62		PEL	unemployed	6 to 8 hours	net	10	SF	N/A
3	43	43		PEL	unemployed	whole day	net	10	SF	N/A
4	41	41		PEL	unemployed	whole day	net	15	SF	N/A
5	45	45		PEL	unemployed	whole day	RR	4	SF	mudprawn
6	43		43	PEL	part time	3 to 4 hours	RR	5	SF	sandprawn
7	55	55		PEL	unemployed	whole day	net	20	SF	N/A
8	53	53		PEL	unemployed	whole day	net	15	SF	N/A
9	42	42		PEL	part time	3 to 4 hours	RR	4	SF	mudprawn
10	45	45		PEL	unemployed	6 to 8 hours	RR	5	SF	various
11	37	37		PEL	part time	3 to 4 hours	RR	3	SF	mudprawn
12	35		35	PEL	part time	3 to 4 hours	RR	6	SF	sandprawn
13	41	41		PEL	unemployed	6 to 8 hours	RR	4	SF	various
14	29	29		PEL	part time	3 to 4 hours	RR	3	SF	various
15	34	34		PEL	part time	3 to 4 hours	net	10	SF	N/A
16	55	55		PEL	unemployed	whole day	net	15	SF	N/A
17	59	59		PEL	unemployed	whole day	RR	4	SF	mudprawn
18	32		32	PEL	part time	6 to 8 hours	RR	4	SF	mudprawn
19	34		34	PEL	part time	3 to 4 hours	RR	3	SF	various
20	39		39	PEL	part time	6 to 8 hours	RR	4	SF	mudprawn
21	55	55		PEL	unemployed	whole day	net	15	SF	N/A
22	54	54		PEL	unemployed	whole day	RR	5	SF	sandprawn
23	43	43		PEL	unemployed	whole day	RR	5	SF	mudprawn
24	47	47		PEL	unemployed	whole day	RR	6	SF	mudprawn
25	41	41		PEL	unemployed	6 to 8 hours	RR	5	SF	mudprawn

26	42		42	PEL	part time	3 to 4 hours	RR	5	SF	various
27	60	60		PEL	unemployed	6 to 8 hours	net	15	SF	N/A
28	56	56		PEL	unemployed	whole day	net	20	SF	N/A
29	42		42	PEL	unemployed	3 to 4 hours	RR	5	SF	mudprawn
30	45	45		PEL	unemployed	3 to 4 hours	RR	6	SF	various
31	42	42		PEL	unemployed	6 to 8 hours	RR	4	SF	various
32	35	35		PEL	part time	3 to 4 hours	net	20	SF	N/A
33	39	39		PEL	part time	3 to 4 hours	RR	5	SF	various
34	39		39	PEL	unemployed	3 to 4 hours	RR	3	SF	mudprawn
35	37		37	PEL	part time	6 to 8 hours	RR	4	SF	mudprawn
36	49	49		PEL	unemployed	whole day	RR	4	SF	mudprawn
37	48	48		PEL	unemployed	whole day	net	15	SF	N/A
38	37		37	PEL	part time	3 to 4 hours	RR	4	SF	mudprawn
39	42	42		PEL	unemployed	whole day	RR	5	SF	sandprawn
40	40	40		PEL	unemployed	whole day	RR	5	SF	various
41	36	36		PEL	unemployed	whole day	RR	5	SF	various
42	33	33		PEL	part time	3 to 4 hours	RR	3	SF	various
43	32		32	PEL	part time	3 to 4 hours	RR	4	SF	various
44	30		30	PEL	part time	3 to 4 hours	RR	3	SF	mudprawn
45	54	54		PEL	unemployed	whole day	net	10	SF	N/A
46	46	46		PEL	unemployed	whole day	RR	6	SF	various
47	51	51		PEL	unemployed	whole day	net	20	SF	N/A
48	41	41		PEL	part time	whole day	RR	5	SF	mudprawn
	2078	**1636**	**442**					**362**		
	43	**45**	**37**					**8**		

PEL = Pellsrus, RR = Rod and Reel, SF = Sales and Food Age/F = Age of female respondent, Age/M = Age of male respondent, Est Catch = Estimated catch, SF = Sales and Food Whole day = above 9 hours of fishing

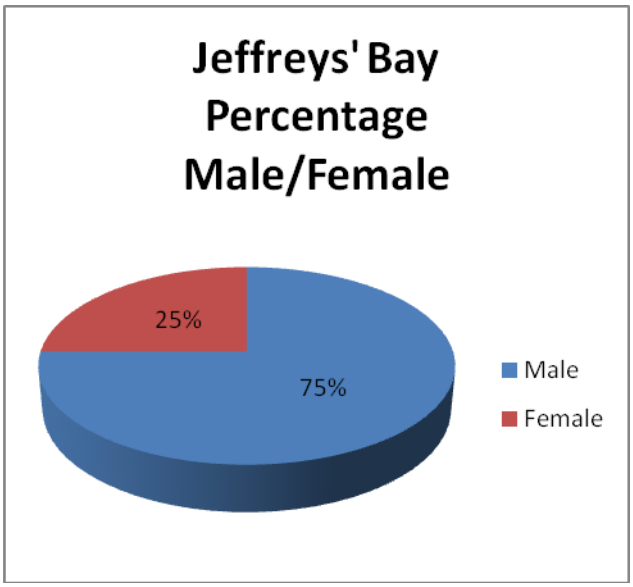

Fig 7.Graph indicating percentage male and female fishers along the Jeffreys' River

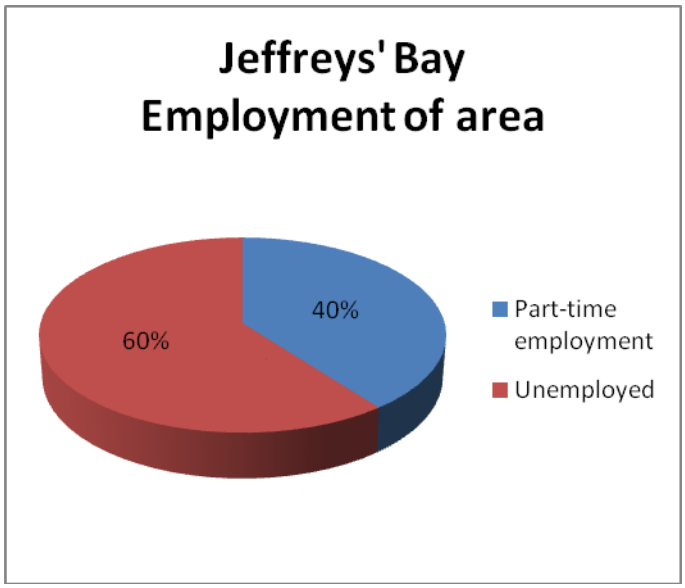

Fig 7.3 Graph indicating the employment of the community of the fishers along the Jeffreys' River

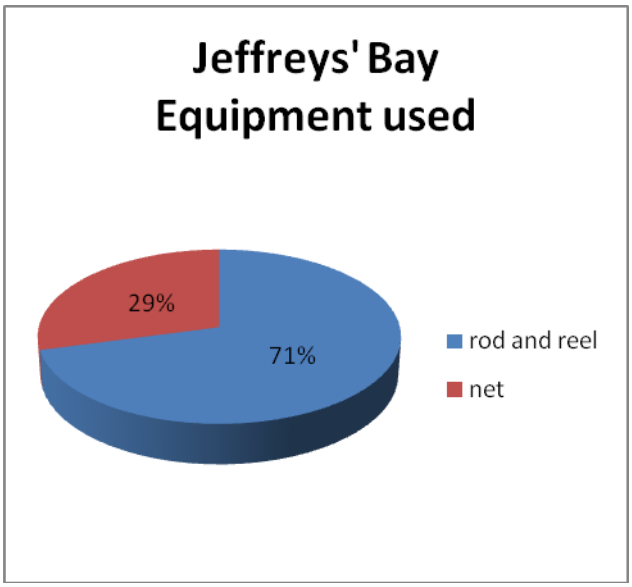

Fig 7.4 Graph indicating the different equipment used by fishers along the Jeffreys' River

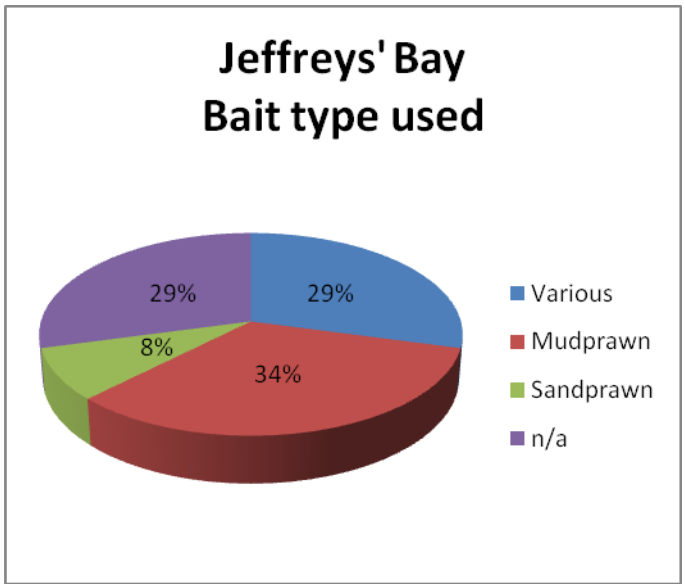

Fig 7.5 Graph indicating different bait species used by the fishers along the Jeffreys' River

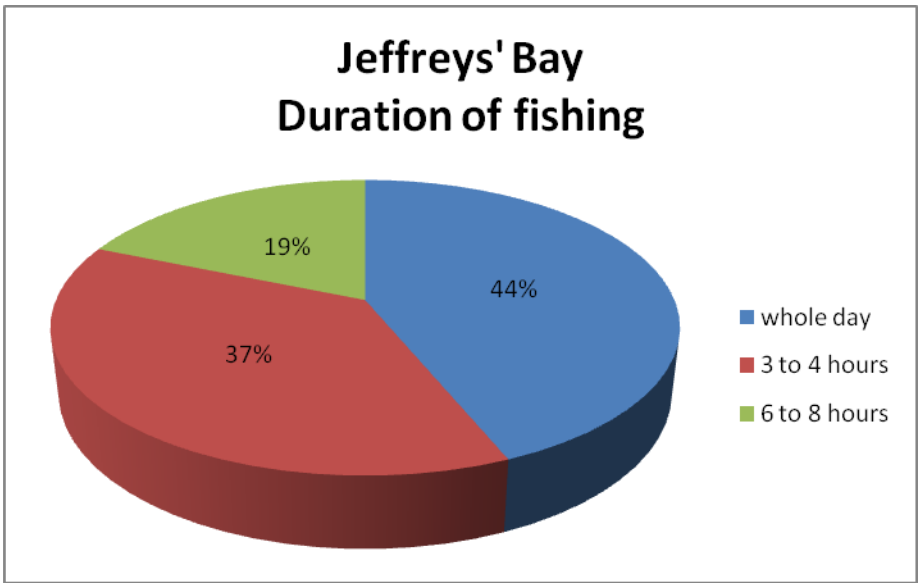

Fig 7.6 Graph indicating duration of fishing done by the fishers along the Jeffreys' River

7.4 Discussion

The subsistence fishers in Jeffreys' Bay alluded to harvest of mussels, oysters and line fish. Fishers argue that they do have a history of harvesting abalone as well. However they have not harvested abalone for a very long time as it is has become illegal and they would be subject to very heavy fines and penalties. The women collect primarily mussels and oysters while the men collect mussels, oysters and harvest line fish. The white mussels are collected by digging with their hands in the sand on the sea shore and the black mussels and oysters are collected off the rocks using metal implements. The black and white mussels and oysters are collected during a low tide. Line fish is caught using a rod and reel. The shells are used to make ornaments and are sold on the informal street market. Except for shells, the marine resources harvested are used for the consumption of the family. Although all these resources are being harvested by the subsistence fishers, line fish remains as source of food for the household. Many also sell their catches to substantiate any income that they may be earning. The employment rate is relatively high with 60 % being unemployed and 40 % part-time employment (Fig 7.3). 75 % of the subsistence fishers are male and with 25 % being female and 44 % of these individuals spend the entire day fishing and harvesting (Fig 7.2). Although the community is relatively a low income

group, many of the fishers (71%) use a rod and reel as a method of catching fish, whilst 29% uses nets, either purchased or handmade (Fig 7.4). Of the many fishers (34%) who used mud prawn for bait purposes, some of them sold the bait to recreation fishers when the opportunity arouse (Fig 7.6).

7.5 Concerns and recommendations

There seem to be an absence of exemptions in this area, which contributes negatively on the fishers' ability to supplement their nutritional needs by collecting marine resources.

The following is recommended for the area:

a. The collecting of shells to make ornaments and to sell them

b. To harvest white and black mussels and oysters

c. To harvest line fish for own consumption

With relatively high value resources being harvested, it is strongly recommended that a feasibility study be done to determine the small scale potential of the Jeffrey's Bay fishery, particularly in the trade of mussels and oysters which can assist the subsistence fishers to market their catches to the public or to a supplier of various stores or restaurants.

CHAPTER 8: Overall Analysis and Recommendations

8.1 Analysis

The communities associated with the six rivers under this investigation have provided vital information on the utilization of resources from these rivers as well as provided an insight into the needs for the communities. Although each river has a LMC associate with it, the need to empower the people to gain employment and not be totally reliant on the river for sustenance is of paramount importance. An overview of the combined analysis provides a picture of vast poverty and at time the lack of education. The analysis is tabled and graphed below.

Table 8.1 Summary of Questionnaires from all six river Communities

Area	M	F	Unemploy	Part time	rod & reel	net	Various	Mudprawn	Sandprawn	N/A	whole day	3 to 4 hours	6 to 8 hours
Kei	20	12	19	13	23	9	14	8	1	9	8	17	7
Tyolomnqa	46	37	56	27	56	27	27	22	7	27	36	27	20
Hamburg	30	19	33	16	35	14	17	16	2	14	20	18	11
Bushmans	28	22	36	14	37	13	13	17	7	13	20	15	15
Sundays'	27	8	26	9	21	14	7	10	4	14	14	10	11
Jeffreys'	36	12	29	19	34	14	14	16	4	14	21	18	9
Totals	187	110	199	98	206	91	92	89	25	91	119	105	73

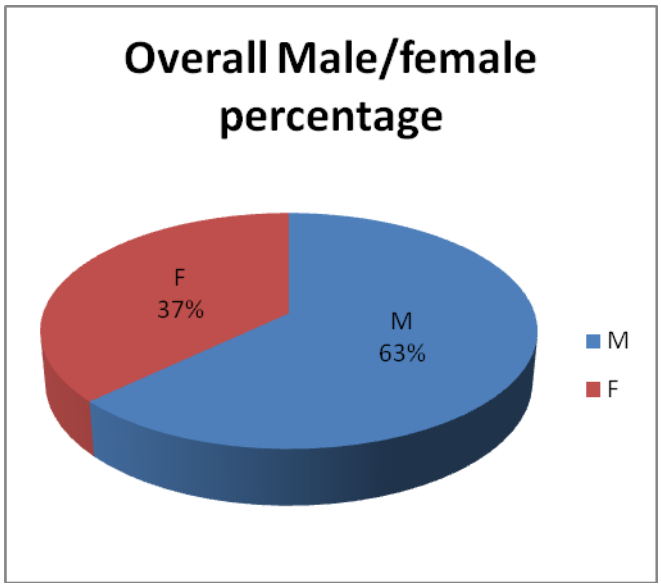

Fig 8.1 Graph indicating percentage male and female fishers along the all six river communities.

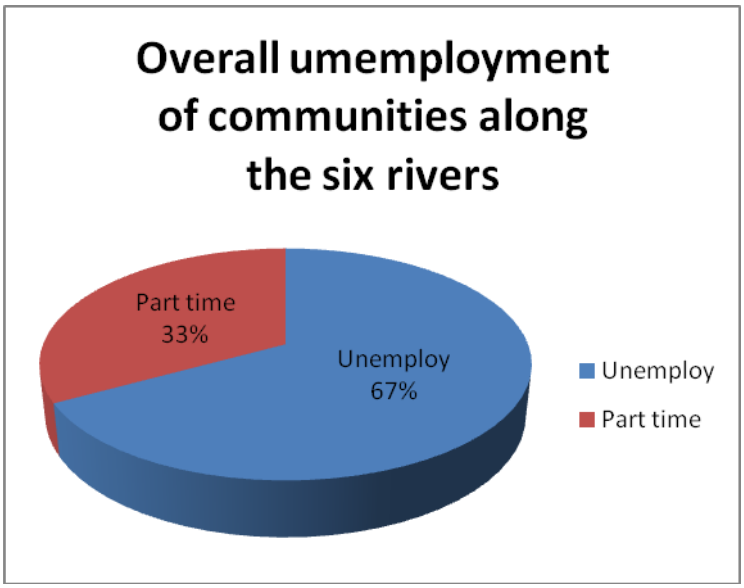

Fig 8.2 Graph indicating the employment of the community of the fishers along all six rivers

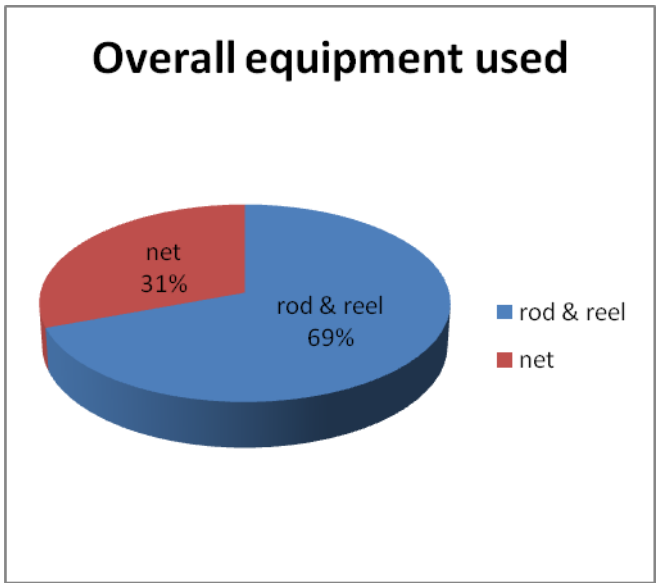

Fig 8.Graph indicating the different equipment used by fishers along all six rivers

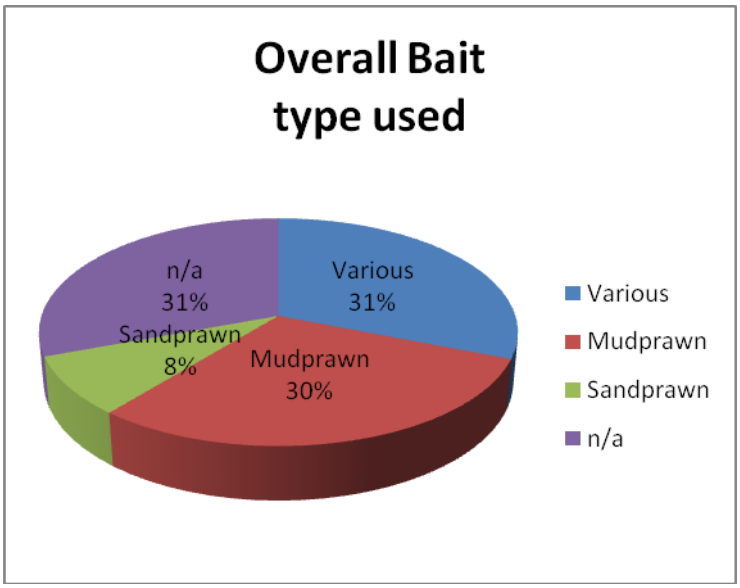

Fig 8.4 Graph indicating different bait species used by the fishers along all six rivers

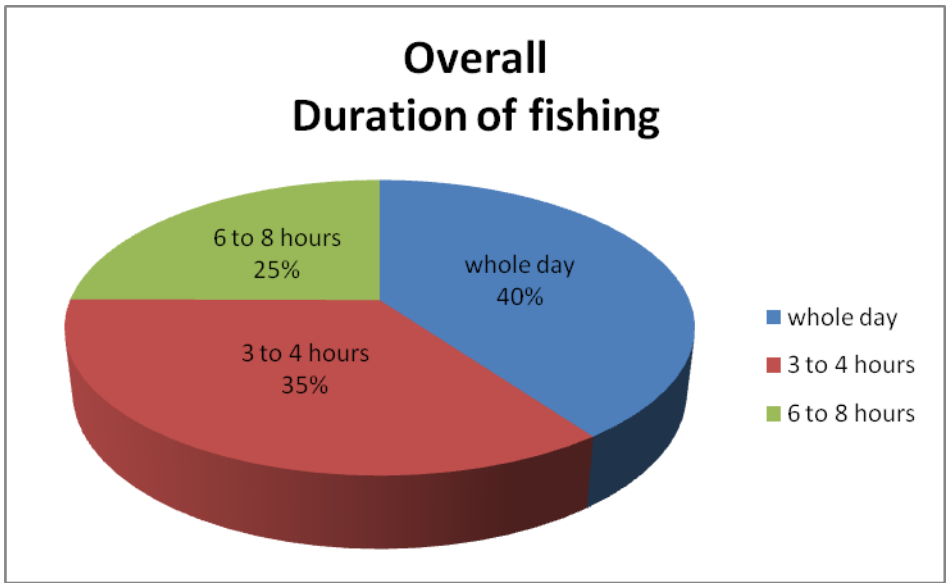

Fig 8.5 Graph indicating duration of fishing done by the fishers along all six river comunities

Of the 297 respondents (Table 8.1) covering all areas under investigation, 63 % of them were males as opposed to 37 % being females (Fig 8.1). This can be attributed to the relatively high unemployment level of 67 % with only 33 % having part-time employment (Fig 8.2). The process of fishing assists the communities in sustenance as well as a source of income. Throughout the investigation all respondents indicated that the reason for fishing is food and sales. This directly correlates with the high unemployment level in which fishers used their catches as a source of income.

8.2 Recommendations

The six rivers under investigation highlighted the extent of poverty in South Africa. Various respondents allude to the fact that the country being plagued with poverty is the reason for them sourcing food from the rivers and at times disregard the permit restriction. Pressure for personal and family development is of paramount importance to the communities.

As the recommendation of the Kei River fisheries would be to provide exemptions for harvesting of line fish for own consumption as primarily non-commercial species are caught. It is further recommended that the Cwili community that utilizes the Great Kei River as a source of income be educated on sustainable harvesting. This will promote and assist conservationist in promoting the sustainability of the river biodiversity.

Due to the lack of industry and excessive poverty of the Tyolomnqa fishers community harvesting of both linefish as well as collecting seaweed and abalone, particularly for the illegal trade has been escalated. It is recommended that line fish exemptions be issued only for own consumption. Depending on the availability of mussels, it is recommended that mussels be harvested on a small scale commercial basis. Some subsistence fishers particularly in Pozi Village are concerned that their area might not be issued with permits, especially as extension officers are not able to provide them with any guarantees.

Tourism is a selling factor in Hamburg area and the River is an attraction. As the river provides the families of Hamburg fishers as a primary source of income, it is recommended a more relaxed exemption be provided for this community. The fact that the Hamburg fishers are divided impacts negatively on the ability of the fishery to develop sustainably. With a divided fishing community, conflict is bound to happen especially when considering that both groups are expected to harvest from the same turf. It is the recommendation of the extension office that much effort be invested in ensuring that fishers are able to work as one unit.

The subsistence fishers in the Bushman's River area are primarily line fishers harvesting fish and bait resources. The line fish are harvested purely for consumption by the family. Subsistence fishers in the Bushman's River are either completely unemployed or work one to two days a week in the domestic or construction sector. It is strongly recommended that exemptions be issued to this community as fishing provided them with a much needed source of nutrition as well as assist in term of some financial benefits for the household.

There should be investigations carried out on the Sundays' River as it supports both subsistence and commercial entities. An exemption should only cater for non-commercial activities. This will mean that subsistence fishers should only be allowed to collect bait and fish resources for

their own consumption. While subsistence fishers are denied easy access to the river and ocean coast, it is also strongly recommended that the Department of Environmental and Water Affairs provide or investigate options that allow easy access to marine resources by subsistence fishers.

There seem to be an absence of exemptions in this area, which contributes negatively on the fishers' ability to supplement their nutritional needs by collecting marine resources. With relatively high value resources being harvested, it is strongly recommended that a feasibility study be done to determine the small scale potential of the Jeffrey's Bay fishery, particularly in the trade of mussels and oysters which can assist the subsistence fishers to market their catches to the public or to a supplier of various stores or restaurants.

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ANNEXURES

Annexure 1: Letter from Department of Economic Development, Environmental Affairs and Tourism

Province of the Eastern Cape

DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENTAL AFFAIRS AND TOURISM

Chief Directorate: Environmental Affairs
Cacadu Region

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Mr Thanda Mbanjwa
P961 Umlazi
P O Umlazi Township
4031

Tel/Ifoni: (041) 508 5813
Fax/Ifexi: (041) 508 5865
Enquiries/Imibuzo: A. Southwood
Ref/Ireferensi: ANO 3/5/4
Date: 9th May 2013

Dear Mr Mbanjwa,

RE: APPLICATION FOR A PERMIT

Your application dated 8th May 2013 to undertake research on Eastern Cape Rivers refers.

You do not require a permit to be issued in terms of the Nature and Environmental Conservation Ordinance (No 19 of 1974) as you will not be collecting any species of plants or animals. You will be collecting information by using a questionnaire.

Yours sincerely,

DAYALAN GOVENDER
REGIONAL MANAGER: ENVIRONMENTAL AFFAIRS

Annexure 2

The following are members of the Kei Mouth fishery

LMC Members of the Kei Mouth Fishery

No	Surname	Name	Gender	Village	Port folio	Telephone
1	Khuphiso	Zandisile	Male	Cwili township		
2	Komani	Monde	Male	Cwili township		
3	Mnyamana	Sindile	Male	Cwili township		
4	Madikane	Bonisile	Male	Cwili township		
5	Gama	Mzoxolo	Male	Cwili township		0837591921

Annexure 3

The following are members of the Tyolomnqa River Fishery

The subsistence fishers from the three villages elected members to the LMC. Members were proportionately elected to the LMC from all three villages. The following table represents the elected members and their details.

LMC of Tyolomnqa Fishery

No	Surname	Name	Gender	Portfolio	Village	Telephone
1	Zolile	Patrick	Male	Chairperson	Pozi village	0723304101
2	Kafile	Kepu Snow	Male	Deputy chairperson	Dyam-Dyam	0836734560
3	Mayile	Vuyokazi	Female	Secretary	Pozi village	0835999484
4	Fikile	Lungiswa	Female	Deputy secretary	Kaiser's Beach	0837147030
5	Mangaliso	Michael	Male	Additional member	Kaiser's Beach	0731968023
6	Luningo	Mzwemfengu	Male	Additional member	Pozi village	
7	Ncedani	Monde	Male	Additional member	Pozi village	

Annexure 4

Hamburg LMC 2011-2013

No	Surname	Name	Portfolio	Telephone
1	Mangwane	Billman Joel	chairperson	0835067083
2	Ndlakuhlola	Margaret	Deputy chairperson	0732106664
3	Mtshonisi	Nosipho	Secretary	0835067083
4	Dlakuhlola	Stanley	Deputy secretary	
5	Mtshonisi	Zimasile	Additional member	
6	Tshobingana	Nopeddie	Additional member	

Hamburg LMC current

No	Surname	Name	Portfolio	Telephone
1	Mangwane	Zam	Chairperson	0826403391
2	Matshobongwane	Cecilia	Deputy chairperson	0731770800
3	Mangwana	Nondumiso	Secretary	0723123696
4	Bojana	Nomonde	Deputy secretary	
5	Nxadi	Zolisa	Treasurer	
6	Tobingana	Vuyokazi	Additional member	0826403391
7	Mavela	Nontsikelelo	Additional member	0835735013

Annexure 5

LMC of Bushman's River

No	Surname	Name	Gender	Port Folio	Telephone
1	Rhodes	Harold	Male	Chairperson	0466488610
2	William	Nogxolo Wanki	Male	Deputy chairperson	
3	Nahakoe	Jane Anne-Marie	Female	Secretary	0466488600
4	Peters	Joyce Alfreda	Female	Deputy Secretary	
5	Nangu	Phindile Elliot	Male	Additional Member	
6	Van Rensburg	Casper Magnes	Male	Additional member	0731459927
7	Van Rensburg	Eva	Female	Additional member	0466488600

Annexure 6

LMC of Sundays River (Colchester)

No	Surname	Name	Gender	Port Folio	Telephone
1	Loff	Shawn Nico	Male	Chairperson	073150019
2	Botha	Joseph	Male	Deputy Chairperson	
3	Pullen	Louis Hendrik	Male	Deputy Secretary	0414680235
4	Peacock	Clifford	Male	Secretary	
5	Khusal	Chezlyn Joseph	Male	Additional Member	0414680690
6	Pullen	Gideon	Male	Additional Member	
7	Nortje	Kenny	Male	Additional Member	

Annexure 7

LMC of Jeffrey's Bay

No	Surname	Name	Gender	Port folio	Telephone
1	Hammond	Alec George	Male	Chairperson	0724801339
2	Van Eyk	Sarie	Female	Deputy chairperson	0422931314
3	Brown	Mary Anne	Female	Secretary	0835956519
4	Philander	Marius	Male	Deputy secretary	0847880972
5	Moos	Serina	Female	Additional member	0725083350
6	Kokobel	Spars Elizabeth	Female	Additional member	0422060276
7	Appersalie	Edward	Male	Ex –Officio member	