Reef Dependency and Change: St Kitts and Nevis Case Study

2013

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Report prepared as part of the Future of Reefs in a Changing Environment Project

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# Contents

Acknowledgements .................................................................................................................. 3
Abbreviations .......................................................................................................................... 4
Introduction ............................................................................................................................... 5
  Research Background ........................................................................................................... 5
  Research Approach ............................................................................................................. 7
  Research Process and Method ............................................................................................. 9
Research Site Profile ............................................................................................................... 12
  Geography .......................................................................................................................... 12
  Coral Reefs .......................................................................................................................... 12
  People .................................................................................................................................. 13
  Local Economy ..................................................................................................................... 14
  Local Coral Reef Governance .............................................................................................. 17
Research Findings .................................................................................................................. 18
  Livelihood Dependency ........................................................................................................ 18
  Change and Response to Change ......................................................................................... 38
Summary of Key Findings ....................................................................................................... 56
  Livelihood Dependency ........................................................................................................ 56
  Changes in Coral Reefs ......................................................................................................... 58
  Response to Change ............................................................................................................. 59
Implications for Understanding and Action ........................................................................... 61
References ............................................................................................................................... 64
Acknowledgements

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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ARDB</td>
<td>Aquatic Resources Dependency and Benefit Flows</td>
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<td>CERMES</td>
<td>Centre for Resource Management and Environmental Studies</td>
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<td>CRFM</td>
<td>Caribbean Regional Fisheries Mechanism</td>
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<td>DFID</td>
<td>Department for International Development</td>
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<td>EU</td>
<td>European Union</td>
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<td>FORCE</td>
<td>Future of Reefs in a Changing Environment</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<td>IMM Ltd</td>
<td>Integrated Marine Management Limited</td>
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<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<td>RLA</td>
<td>Reef Livelihood Assessment</td>
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<td>SCL</td>
<td>Sustainable Coastal Livelihood</td>
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<td>SLED</td>
<td>Sustainable Livelihood Enhancement and Diversification</td>
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<tr>
<td>TNC</td>
<td>The Nature Conservancy</td>
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<td>USD</td>
<td>United States Dollar</td>
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<td>WP</td>
<td>Work Package</td>
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<td>XCD</td>
<td>Eastern Caribbean Dollar</td>
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**Introduction**

This document explores the findings of research conducted in St Kitts and Nevis as part of the Livelihoods and Reefs component of the Future of Reefs in a Changing Environment (FORCE) Project. The document is organised into the following five sections:

1. **Introduction**: this section presents background to the FORCE project and in particular the Livelihoods and Reefs research component, including an outline of the research approach, process and method.
2. **Site Profile**: this section provides a description of the two locations that the research team visited, presenting the broad environmental, socio-economic and governance context as a foreground to the research findings.
3. **Research Findings**: this section presents an in-depth examination of the research findings in relation to the two key themes of: i) livelihood dependency; and ii) change and response to change.
4. **Summary of Key Findings**: this section distils the key learning from the research results.
5. **Implications for Understanding and Action**: this final section provides a brief discussion of the implications of the research findings for understanding livelihood vulnerability to coral reef change.

**Research Background**

The FORCE project was developed in response to the recognition that coral reefs in the Caribbean are being subjected to a wide range of pressures driven by a complex combination of factors, from direct reef use to wider economic changes\(^1\). As a result, the state of the coral reefs in the Caribbean has, in general, been on a long-term path of decline, and is expected to experience further significant pressure from climate change (Burke et al. 2011). As highlighted in Box 1, a key challenge for the FORCE project is to explore how to support coral reef stakeholders in the region to understand and respond to changes in the state of coral reefs.

For many Caribbean countries the relationship that people have with the natural resources which surround them is critical to their survival, their ability to economically thrive and, through governance relationships, to the levels of equity and opportunity in society. These natural resources and the benefits they provide are closely interrelated with the livelihoods which people adopt and these interactions are often complex and changing (Mahon et al. 2008). Historically the relationships between Caribbean people and their natural resource base has been strong (UNEP, 2008), through fishing and agriculture for food and for trade. More recently, the natural resource base has provided people with income and employment through tourism. The relationship between people and ecosystem services is now under considerable stress as population pressure, economic growth, and impacts from climate change increase (UNEP, 2006). Understanding and responding effectively to this relationship now and in the long-term is becoming a major and urgent need.

\(^1\) For an analysis of drivers of reef health see Forster et al. (2012)
The Livelihoods and Reefs component (work package 2) of the FORCE project is led by IMM Ltd in partnership with The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies and the School of Marine Science and Technology at Newcastle University. The work package is concerned with exploring the relationship between people and coral reefs in the Caribbean. Considered in its simplest form, this relationship may be defined by how people use coral reefs and in turn what services are provided by coral reefs to those people. Coral reef ecosystems provide services which people may depend on directly and indirectly and which go beyond the provision of food and income. As highlighted by the Millennium Ecosystem Assessment (MA, 2005), human well-being is supported by a range of services, including supporting services (e.g. habitat provision, support for life cycles, nutrient cycles); provisioning services (e.g. fish for food and sale, employment and income); regulating services (e.g. protection from coastal erosion and storm damage, maintenance of water quality, formation of beaches and islands); and cultural services (e.g. cultural identity, tourism and recreation, research and interest).

Issues of coral reef-use expand to include who uses the reef, how they use it and how they negotiate access to different services from the reef. Likewise the delivery of coral reef ecosystem services expands to consider issues such as, the quality of the reef for diving, or the condition of the reef-associated fisheries for fishers. Moreover, coral reef use and service delivery are driven by a dynamic and complex web of interacting factors, acting directly or indirectly, over which people have varying degrees of control. For example, factors range from the influence of

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**Box 1: Background to the FORCE Project**

Future of Reefs in a Changing Environment (FORCE) is a collaborative project funded by the European Union. The FORCE project brings together researchers from the natural and social science disciplines in an effort to better understand changes in coral reefs in the Caribbean and to support coral reef stakeholders in responding to those changes. To address this complex challenge, 20 organisations located in 10 countries within Europe, the Caribbean and Australia and North America have come together. Their work is organised into 11 work packages (WP), as outlined in the diagram below.
changing markets, or extreme weather events on fishing practices, to the effect of political stability or global exchange rates on tourist arrivals.

A key part of understanding the relationship between coral reefs and associated resource-users is to understand the dependency people have on coral reefs, what forms that can take, and how that is changing. This understanding will have significant implications for how managers can respond to future changes in ecosystem services flows and the benefits which people derive from them. To that end, the Livelihoods and Reefs component of the FORCE project aims to characterise the varied nature of people’s dependency on coral reefs in the Caribbean and their vulnerability to changes in the ecosystem services coral reefs provide, including those provisioning, regulating, cultural and supporting services. This is articulated through the following three research questions:

1. How do people in the Caribbean depend on coral reef resources?
2. How are people’s relationships with coral reefs affected by change in reefs and access to reef services?
3. How do people in coastal communities respond to changes in coral reefs?

**Research Approach**

The approach presented here builds upon over 10 years of action research experience at IMM Ltd related to understanding coastal and aquatic resource dependent livelihoods and the factors that influence livelihood change. This work started as part of the DFID-funded Sustainable Coastal Livelihoods (SCL) project, which focussed on understanding coastal livelihoods in South Asia; exploring how policy processes could more effectively address poverty. This research was extended through the DFID-funded Reef Livelihoods Assessment (RLA) work in South Asia and East Africa, which sought to understand the links between poverty and coral reef dependence. Research on aquatic resource dependency was further developed through an Aquatic Resources Dependency and Benefit Flows (ARDB) project in Cambodia; investigating how natural resource dependency affects people’s ability to change their livelihoods. Building on these experiences, work has subsequently focussed on a Sustainable Livelihood Enhancement and Diversification (SLED) process; designed to promote livelihood development, while encouraging people to move away from harmful exploitation and degradation of natural resources. In this context, the research tests well established approaches and methodologies and presents a means of extending and adapting this experience to the Caribbean.

Given the complexity of the research topic, an appropriate framework which helps to systematically explore the research questions is important. For this purpose the research overlaid two frames of reference: first, a livelihoods framework; second, a vulnerability framework.

The livelihoods framework\(^2\) is a comprehensive framework that helps to understand the complex linkages between people and the various factors that affect their choices and actions. Its scope ranges from the very specific nature of individuals, their characteristics and their local circumstances, to include a broad range of factors that might influence people’s options and choices.

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\(^2\) In the first stages of the research the *Caribbean Reef and Livelihoods Framework* (Cattermoul et al 2011) was developed as a means of building on existing understanding to help the research team visualise and scope out the multitude of factors which might influence people’s lives and their relationships with coral reefs in the Caribbean.
at the local, national, societal and broader global levels. As a frame of reference for the research the livelihoods framework represented a lens or ‘sensitizing concept’\(^3\) that guided the field level research to uncover the diversity and inherent complexity of people’s relationships with coral reefs.

In order to place this understanding of livelihoods into the context of vulnerability to change, the research also drew upon a vulnerability framework. This framework was adapted from the Intergovernmental Panel on Climate Change definition of vulnerability as “the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity” (IPCC 2001). In this way, it interpreted the key elements of vulnerability as follows:

1) **Exposure** is the exposure of coral reefs and the provisioning, regulating, cultural and supporting services they provide to socio-ecological-driven changes (including but not limited to climate-related change).

2) **Sensitivity** is the extent to which people’s livelihoods are likely to be affected by changes in coral reef services, as measured by the degree to which people’s livelihoods depend on coral reef services.

3) **Adaptive Capacity** is the ability of a society and individuals or households to respond, cope with and capitalise on changes in access to coral reef services.

Applying this framework provided a means of examining livelihoods in the context of the key research questions. In this way it helps to understand how changes in the context of people’s livelihoods, combined with their variable sensitivities and capacities to cope and respond in relation to change, can generate different types of impacts and responses from people and institutions.

Guided by the livelihoods and vulnerability frameworks, the research adopted an interpretive qualitative approach and focused on specific case studies with the aim of generating a rich in-depth understanding. While this research approach limits generalisation to those case studies gathered, it does allow for the inference of issues that are of wider relevance to understanding livelihood dependency and change. In the context of the research, this approach presents policy makers and planners with an understanding of: the diversity of forms that coral reef dependency can take; how coral reef dependency has been affected by change; and how different people have responded to those changes in research sites across the Caribbean. Overall, the following report aims to highlight the types of issues that need to be understood locally in order to formulate the appropriate policy responses, while simultaneously contributing a framework and approach for analysing and responding to reef dependency and change in the Caribbean.

Alongside the qualitative research approach, was an emphasis on participation and collaboration with local co-researchers and research participants, which recognised the importance of mutual learning. Such a participatory approach provides a means to jointly analyse and communicate information of relevance to people’s livelihoods; providing an understanding of local realities in

\(^3\) A ‘sensitising concept’ refers to Blumer’s (1954 cited in Bryman 2008) suggestion that concepts used to understand the social world should guide what to look for and so uncover diversity, rather than be applied definitively with fixed indicators which will limit what can be known of the variety that exists.
different contexts. However, it is also important to recognise that levels of participation may vary considerably at different stages of the research process; from active participant-led to passive researcher-led (Pretty et al 1995). In the current research, the concept and design was largely an externally driven process, with limited participation from those people within the research communities. Yet as the research process progressed, and the research team established themselves in the selected research communities, the researchers were able to build relationships with local partners, agencies and participants. This allowed for greater participation and engagement with the research during the fieldwork stage.

**Research Process and Method**

Field research was undertaken as a coordinated process between the Livelihoods and Reefs (Work Package 2) and Governance and Coral Reefs (Work Package 1) components of the FORCE project. This represented a partnership between research teams from IMM Ltd, The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies and the School of Marine Science and Technology at Newcastle University.

The research took place in four Caribbean case study countries; Barbados, Belize, Honduras and St Kitts and Nevis. The selection of countries aimed to take several key factors into consideration:

- A diversity of characteristics from the point of view of their social and economic development;
- Different levels of development in management, policy and governance arrangements in relation to the marine environment;
- Opportunities to make linkages with the results of ecological research being conducted by other work packages of the FORCE project.

At each case study location, the research sought to follow a seven stage process (Figure 1). This process was adapted from the Sustainable Coastal Livelihoods Research Process (IMM 2003), which was conceived as an iterative cycle of knowledge generation, interpretation, reflection and feedback relying on primary and secondary sources. It is important to note that the knowledge generated at each stage not only addresses the research questions, but also informs subsequent stages of the process.

As the cycle progresses and participants become involved in the different stages, there is an explicit intention to make the research process more participatory. This is based on the assumption that participants perceive a benefit from the opportunity to articulate their own experience and to share this with others. Among householders, or common interest groups, this may represent an important chance to voice their priorities and concerns to service providers, policy makers or practitioners. Likewise, for local, regional or national service providers, policy makers or practitioners, this may represent an important opportunity to reflect on the specifics of a local situation, as well as to strengthen or form new relationships with other institutional participants.
In its idealised form, the process starts with the collection of secondary data relevant to the particular research locations. Prepared with this background knowledge, researchers are then in a position to begin consultations with participants. This stage begins by engaging individuals and groups of institutional participants; firstly at a wider national, or regional levels, then at local research site levels. The process then moves on to engage community participants who represent individuals, households and groups with varying dependence, or interests in coral reefs and experience of coral reef and livelihood change. Having worked with these varying levels of participants, the research process then commits to revisit local, regional and national levels in order to present back and validate research findings and to engage in a discussion of future scenarios of community development and reef management.

The FORCE Livelihoods and Reefs research process used two core methods to capture case study examples, namely semi-structured interviews and opportunistic conversations. These methods formed the basis of the research and were used for individual key informants and household interviews. Accompanying this, the research team used participatory visualisation tools, such as timelines and seasonal calendars, to assist the interaction between the interviewer and the respondent(s). To support the research team, detailed guidance notes on the research process and methodology were prepared and were updated as the methods were tested and adapted in the field.

Within each of the four case study countries, two research sites were selected. These sites were selected paying particular attention to different patterns of dependence on coral reef resources. At each research site, the research process began with scoping activities in order to determine site boundaries and broadly identify the typologies of households within the community. This scoping helped to organise a sample of households for the in-depth

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4 To ensure proper coordination between the Livelihoods (WP2) and Governance (WP1) research components and given limitations of time in-country and at the research communities, the order in which different stages of the research process were undertaken was adapted. In practice this meant that community and national-level consultations were often conducted once the field research work had already commenced.

5 To view detailed method guidance readers are referred to Cattermoul et al 2012.
interviews. The purpose of the in-depth household sample\(^6\) was to develop detailed case studies of households across a spectrum of relative well-being and dependence on coral reefs, which would be illustrative of the diversity of households in the community. A target sample of ten to twelve households\(^7\) was identified at each research site and attempts were made to conduct an initial in-depth interview with a household, and if necessary a further follow-up interview where more information was needed. Key informant interviews were undertaken where possible at local, or national levels and focussed either on individuals involved in implementing livelihood change interventions, or the beneficiaries of those interventions. Concurrently, conversations were conducted opportunistically to validate emerging themes and uncertainties encountered through household and key informant interviews.

The field team undertook the research in St Kitts and Nevis for 10 weeks from February to April 2012. Table 1 below summarises the research encounters in relation to the two research sites (Dieppe Bay and Jessups) in St Kitts and Nevis.

<table>
<thead>
<tr>
<th>Type of research encounter</th>
<th>Wider area consultation</th>
<th>Local area consultation</th>
<th>Dieppe Bay consultation</th>
<th>Jessups consultation</th>
</tr>
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<tbody>
<tr>
<td>Area consultation / validation meetings</td>
<td>1</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Initial in-depth household interviews</td>
<td>-</td>
<td>-</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Follow-up in-depth household interviews</td>
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<td>-</td>
<td>7</td>
<td>4</td>
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<tr>
<td>Opportunistic conversations</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>16</td>
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<td>Key informant interviews</td>
<td>12</td>
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<td>4</td>
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Where possible and with consent from participants, all research encounters were recorded and subsequently transcribed. Analysis of transcriptions was undertaken using NVivo software. In the following sections, research findings are presented as quotes from these different encounters. To anonymise and protect the identity of participants, the names of all sources have been changed and occupational details have been assigned to broad categories.

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\(^6\) To view details of the household sampling strategy readers are referred to Cattermoul et al 2012.

\(^7\) This sample size reflected what was possible given the time available in the field.
Research Site Profile

Geography
The Federation of St Kitts and Nevis is a two island nation separated by a channel approximately 3 km wide known as ‘The Narrows’. The two islands cover an area of 168 km$^2$ and 93 km$^2$ for St Kitts and Nevis respectively, with the combined length of the coastline extending 135 km (US DoS, 2011, Agostini et al, 2010). As volcanic islands, the terrain is mountainous with central peaks that are covered in tropical rainforest (US DoS, 2011). The highest peaks reach 1,156 m on St Kitts and 985 m on Nevis (US DoS, 2011).

The St Kitts and Nevis case study research took place in the villages of Dippe Bay and Jessups. As illustrated in Figure 2, Dieppe Bay is situated on the north-east coastline of St Kitts, on the Atlantic coast. The second research location of Jessups village is located on the west coast of Nevis, with its coastline bordering the Caribbean sea.

Coral Reefs
St Kitts and Nevis are surrounded by a relatively small ocean shelf, which drops off steeply on the western side of St Kitts where it is primarily covered with sand (>50%) (Agostini et al. 2010). Coral reefs inhabit a small percentage of the ocean shelf area (Agostini et al. 2010), with a total reef area estimated between 160 – 180 km$^2$ (Burke and Maidens 2004; Spalding et al 2001). The small shelf area, stable water temperature and minimal upwelling act to limit marine biodiversity and offshore fisheries productivity (Agostini et al. 2010). Yet, despite this, the islands’ marine environment hosts a number of endangered coral, marine mammal and fish species and sea turtles (hawksbill, green and leatherback) (Ibid). There are approximately 460 species of fish, of which 126 are threatened or endangered (Agostini et al. 2010). Additionally, large sea-grass beds, particularly in The Narrows
area between the islands, provide important breeding grounds for fish and conch (Agostini et al. 2010).

Coastal development, unsustainable fisheries, land-based sources of pollution, rising sea temperatures and increasing intensity of hurricanes and storms are all considered threats to the marine environment in St Kitts and Nevis (Agostini et al. 2010). According to Burke and Maidens’ assessment (2004), 77% of the coral reefs around St Kitts and Nevis are estimated to be facing high threats, specifically from fishing pressure, inland pollution and sedimentation and coastal development. Reported reductions in mean fish size and increases in algal cover provide evidence that coral reefs of St Kitts and Nevis are under pressure (CRFM 2008). Interestingly, shallow reefs are reported to have lower species diversity than some deeper reefs such as those around Sandy Point, Guiana Point and the Narrows (Jeffers and Hughes n.d.). Mangroves and sea grass beds have also been affected by coastal development, such as those in the Southeast Peninsula of St Kitts (Horwith and Lindsay 1999).

Tropical storms pose a significant threat to the coastal habitats and infrastructure of St Kitts and Nevis. Over the period of 1985 - 1994, three of the nine storms that passed St Kitts and Nevis were ranked as category 3 or higher (Gardner 2006). In 1998 Hurricane George caused Eastern Caribbean $ 445 million\(^8\) in damages to coastal infrastructure and hotels, almost equalling the country’s GDP for that year (Jeffers and Hughes n.d.). Into the future a changing climate is expected to inflict substantial losses on the St Kitts and Nevis coastal and marine sectors. By 2050 estimated losses from the effect of sea level rise and coral reef decline on coastal lands is projected to amount to between U.S. $ 832 - 1026.4 million (ECLAC, 2011). Taken together with the projected losses from the effect of a rise in sea surface temperatures this figure increases further to between U.S. $ 1,479 - 2.061 billion (Ibid).

People

St Kitts was the first English colony in the Caribbean in the early 1600s and served as a base for further colonisation in the region (US DoS, 2011). In 1983 St Kitts and Nevis became an independent state within the Commonwealth (US DoS, 2011) and following this in 1998 the people of Nevis voted on a referendum to separate from St Kitts (Agostini et al. 2010). While this vote fell short of the required majority, there remains continued support for secession among Nevisians, who perceive an inequality of benefits and lack of sensitivity to their needs by the central administration in St Kitts (UNDP 2006).

The majority of the population resides in flatter coastal areas (Agostini et al. 2010). The estimated population in 2010 was almost 50,000 people, including 12,000 on Nevis (Ibid). English is the official language, and the majority of the population is of African descent, with some of British, Portuguese, and Lebanese descent (US DoS, 2011). The main religion is Christianity, predominantly Anglican with

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\(^8\) Equivalent to 165 million USD.
Evangelical Protestant and Roman Catholic sectors (Ibid). According to 2001 census data, the estimated population for the parish of St John where Dieppe Bay is located was 3,248, while on Nevis, the parish of St Thomas where Jessups is located had an estimated population of 2,047 (CARICOM 2009).

Marginalised groups include the youth, women, the elderly as well as the disabled (UNDP 2006). A 2001 poverty survey highlighted particular marginalisation among women and the youth (KAIRI 2001 cited in UNDP 2006). This was associated with high levels of poverty among these groups, which was linked to high unemployment, as well as the lack of educational certification, in spite of the presence of educational opportunities (Ibid).

Local Economy
The sugar monoculture in St Kitts and Nevis, previously the mainstay of the economy, ended in 2005 when the government closed the state-run sugar industry due to significant losses (US DoS, 2011). The outcome of this closure was the elimination of over 1,000 jobs, representing 12% of the labour force (OECS 2005, cited in UNDP 2006). To compensate for this, a programme of diversification and economic stimulation has taken place within the agriculture, tourism, export-oriented manufacturing, and offshore banking sectors (Agostini et al. 2011). As a result, today, tourism and consumer product assembly are the main sources of income for both islands (Agostini et al. 2011), with financial and business services additionally playing an important role, along with the construction industry (US DoS, 2011). At the local level, commercial and artisanal fisheries are also an important provider of employment and income opportunities.

In the following subheadings, we consider two key aspects of the economy, fisheries and tourism, which are associated with dependency on coral reef resources in St Kitts and Nevis and the two research sites.

Fisheries
According to the Caribbean Regional Fisheries Mechanism (CRFM), there are approximately 350 fishers on St Kitts (46% full-time) and 300 fishers on Nevis (70% full-time) (CRFM 2010). The coastal demersal fishery, targeting fish from the shallow reef and shelf areas, is the largest fishery across the islands with over 80% of the registered vessels and over 75% of registered fishers involved (FAO 2000; FAO 2006). Common gear types include fish traps, hand-lines and spear guns. There is no specific targeting of species in this fishery and fishers harvest multiple species opportunistically. Parrotfish are frequently caught in trap and spear fisheries, and conch and lobster represent an important coral reef resource to harvest.

The coastal pelagic fishery involves a small portion of the fishing fleet but accounts for over 40% of the total annual landings. Target species include gars, jacks and ballyhoo as well as demersal reef
fish species caught in beach seine and gill nets. The seasonal ocean pelagic fishery, targeting
dolphinfish, tunas and mackerel employs trolling lines and occasionally, fish aggregating devices.

Fishers in St Kitts have five major landing sites, accounting for 70% of fishing vessels. On Nevis, the largest landing site is in Charlestown, where fishers have access to ice, walk-in freezers, outboard engine repair along with processing and sales facilities. Most fish on St Kitts are sold directly from fishing boats to consumer or vendors, but in Nevis some catch is also sold to the Nevis Fisherman’s Marketing and Supplies Cooperative, which serves as an exporter of fish (FAO 2000). Lobster is also occasionally exported to Guadalupe, though much of the lobster and many ocean pelagic are exported or sold to local hotels and restaurants (FAO 2000; Agostini et al. 2010). In 2005, approximately USD 3.8 million of St Kitts and Nevis’ GDP was accounted for by commercial fisheries (FAO 2006, cited in Agostini et al. 2010).

In a 2010 survey of 116 fishers across 12 sites on St Kitts and Nevis⁹ found that on average fishing accounts for around 68% of household income, with greater income dependence reported in St Kitts (79% household income) when compared with Nevis (60% household income) (Agostini et al. 2010). Overall the greatest income dependency year-round on both islands was found to be associated with the conch fishery, which also represents the primary export fishery (Ibid). Importantly, coastal fisheries have reportedly declined, with fishers reporting smaller catches of both shellfish (conch and lobster) and fin fish (Agostini et al. 2010).

Of the two research sites, Dieppe Bay represents the community with the greatest focus on fishing activities. The FORCE team’s initial research scoping activities¹⁰ identified Dieppe Bay as possibly the most active near-shore fishing village on St Kitts, with the reef located close to shore. In comparison, at the second research location of Jessups on Nevis, fishing is part of a more varied local economy that includes agriculture and tourism related activities. Nevertheless, fishing is an important activity and Jessups is one of the main conch fishing sites on Nevis. Estimates¹¹ suggest that there are approximately 50 commercial fishers in Dieppe Bay, compared with 33 in Jessups.

**Tourism**

Tourism has replaced the sugar industry as the mainstay of the economy on St Kitts and Nevis representing a rapidly growing industry for the country and a major source of foreign exchange (US DoS, 2011; Agostini et al. 2010). The government has provided incentives for tourism investments,

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⁹ This included 51 fishers from 5 sites on St Kitts and 65 fishers from 7 sites on Nevis.
¹⁰ Source: WP1 Fieldwork Scoping Notes, February 2012.
¹¹ Source: Fieldwork scoping at Dieppe Bay and Jessups and Fisheries Department, pers comm.
including tax incentives, duty-free imports and subsidies for training local employees (US DoS, 2011). Much of the tourism sector is centred on the marine and coastal environment with areas of the coast dominated by developments, cruise ships, private yachts, and the associated water-based activities such as scuba diving (Agostini et al. 2010). St Kitts and Nevis receive a mixture of over-night visitors and cruise ship tourists with the main port, Port Zante, located on St Kitts. Cruise ships also visit Charlestown in Nevis using small ferry boats to transfer international visitors from the cruise ship.

As can be expected, tourism in St Kitts and Nevis has been influenced both positively and negatively by external drivers. In particular, a growing economy spurred by tourism investment was disrupted by hurricanes in 1998 and 1999, and the terrorist attacks of 2001 in the US had a discernible impact on international visitor numbers (US DoS, 2011). Since these events, economic growth has resumed with construction and tourism investments including those related to hosting the Cricket World Cup in 2007 (Ibid).

At the two research locations, the level of development in the local tourism economy differs. In the first location of Dieppe Bay, tourism development is limited, especially when compared to other parts of St Kitts and Nevis. Tourism activity in Dieppe Bay centres on a viewing point at a peak above the community that looks out across the coral reef and to the sea. At the viewing point there are three small vending stalls that sell handicraft to onlookers, but unlike other viewing points in St Kitts there are no bathroom or refreshment facilities.

Tourism in Dieppe Bay was not always this limited, as from the 1970s there was a hotel in the village, the Golden Lemon Hotel. A respondent in Dieppe Bay, Angel, described this hotel as having been an important part of the local economy in Dieppe Bay providing jobs for many people, as well as providing spin-off benefits for handicraft sellers and local vendors. Angel reported that around 2010 the Golden Lemon hotel closed, along with their restaurant. She stated that Lemon Court, a development of six condos which used to be part of the hotel, is still functioning and attracts some international visitors to the community. Yet she noted that there is much less tourism now, highlighting that most visitors are cruise ship tourists that pass through the community after taking a photo from the viewing point.

For the second research location of Jessups, initial research scoping identified the village as one of three areas in Nevis that host marine tourism activities such as scuba diving and snorkelling. A number of dive sites are situated close to the beach and Jessup’s fishers’ landing site. Adjacent to Jessups beach is the internationally renowned Four Seasons resort development. This resort is

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12 Source: In-Depth Household Interview, Dieppe Bay, 23/02/2012, 28/02/2012 and 10/04/2012
13 Source: Opportunistic conversation, Dieppe Bay, 01/03/2012
considered an important employer for households across Nevis. For example, Nico¹⁴, a resident of Jessup, suggested that the Four Seasons is the main industry for Nevis and highlighted the resort’s role not only as an employer but also as a purchaser of fisheries related harvests.

Local Coral Reef Governance
St Kitts and Nevis are small islands, and as such there is little distinction between local and national level administration. Consequently, national level government departments are responsible for the coral reefs. However, there is an added complexity because St Kitts and Nevis is a federation of two island states. This means that the federal government based in St Kitts deals with both federal issues (for both islands) as well as governance issues specific to St Kitts. In addition, Nevis has its own administration and government to manage and implement issues specific to Nevis. Matters relating to the management of marine environment are therefore dealt with by both island government departments of St Kitts and Nevis. In some cases the federal government in St Kitts may have ultimate authority for decision-making; however for other issues the island-specific government may be responsible (e.g. Nevis Department of Fisheries is responsible for enforcement of reef resource-use in Nevis).

Although St Kitts and Nevis is in the process of working towards a management plan for the marine environment surrounding both islands, none of its marine area is currently protected (Agostini et al. 2010). There are also very few local level or non-governmental organisations involved in reef management in St Kitts and Nevis. NGOs are limited primarily to the sea turtle conservation groups active on both islands which operate largely using volunteers. Some project work has been undertaken by international NGOs such as The Nature Conservancy (TNC), supporting the development of marine spatial planning.

Legal restrictions are in place for most of the major reef-related fisheries, however enforcement is lacking (pers. comm. national level key informants). Fisheries regulations comprise mainly input measures, regulating gear use and timing of exploitation of particular resources. In particular, spear fishing with scuba or hookah gear requires written permission, yet this is a commonly used method of fishing, and there are concerns about health and safety implications of this unregulated activity, which has been associated with the death or injury to many fishers through unsafe practices.

¹⁴ Source: Opportunistic conversation, Dieppe Bay, 08/03/2012
Research Findings

The following section presents an in-depth exploration of the research findings from Dieppe Bay and Jessups. Findings are organised into two main sub-sections relating to the key themes of i) livelihood dependency, and ii) change and response to change.

Livelihood Dependency

The purpose of this section is to explore how people at the two research sites depend on coral reef and associated resources. Focused around the role of coral reef-associated fisheries and tourism, the section explores the varied nature of livelihood dependence within households and throughout the year; highlighting both the importance and the uncertainty of this dependence.

Fisheries Dependence

In both Dieppe Bay and Jessups coral reefs were recognised for their importance as a habitat for fish and other marine life, which in turn was identified as being crucial for fishing. In Jessups, Morris15 a former part-time fisher, currently unemployed due to an injury, expressed this in saying: “You get fish from the sea, you get conchs and all of those things and without the reef the lobsters and all of those things they are going to go away”. Likewise, Cooper16, a part-time farmer and carpenter in Jessups noted, “we always need the reef cause if the reef die out then the fish will be gone so we have to keep that alive”. In Dieppe Bay, where there is limited tourism activity, the coral reef was principally associated with fishing, as Maxwell17, an unemployed tradesman and part-time fisher highlighted, “people really use it (the coral reef) for fishing, it’s the main thing just for fishing”.

A fishing tradition

Case studies indicated that fisheries dependence in both research sites was focused around activities such as spear and trap, or pot, fishing, diving for conch and lobster, near-shore and deep water hand-lining and gleaning for whelks. For many individuals and households in Jessups and Dieppe Bay, fishing has been a way of life, learnt as children watching and helping elders. Nearing his 60s, Kurt18, a part-time fisher from Dieppe Bay recalled the beginning of his fishing career:

“Boy I am 59 now and I start fishing from the time I was in the teens ... Let me tell you, from the time I growing up I decide I going to become a fisherman. The fish thing I decide to do was go with my father when he going out and go with him when he going on the boats. He was a captain of a net boat. I learn to do that. I used to be a captain too. It’s a lot of things I do. I had me own boat and me own crew and thing”.

15 Source: WP2 In-depth household interviews, Jessups; 08/03/2012 & 09/03/2012
16 Source: WP2 In-depth household interview, Jessups; 12/03/2012
17 Source: WP2 In-depth household interviews, Dieppe Bay; 29/02/2012 & 28/03/2012
18 Source: WP2 In-depth household interviews, Dieppe Bay; 24/02/2012 & 30/03/2012
Similarly, cruise ship employee and recreational fisher Lincoln\(^{19}\) from Dieppe Bay, described learning how to fish from “*a tender age*” while a school boy “*since during school, the school right here by the sea, so when you get breaks, we used to be fishing*”. In this way, he explained “*almost everybody in the village knows how to fish*” and he continued to describe his learning process:

“...we have older people around all the time and you see what they doing and you just learn from them ....there is a bar and then we say the reef. The reef is the big one out, the bar is the closer one to shore.... That is where we learn, the bar; and then we go to the reef. Like a graduate, and then you go to the reef”.

Jason\(^{20}\), a restaurant manager in Jessups elaborated on the importance of fishing tradition for the community as a whole, irrespective of whether you were a fisher yourself, as he described:

“I more or less have very close ties with the water because predominately back in the past the main source of income for most of the persons in the community was fishing. So then even if you are not closely related to someone who is a fisherman, you had close ties with someone who did some sort of fishing. For instance, we lived in a small little community where my grandmother, my uncles and so forth, they would go on the ocean with other fishermen; plus my neighbours would be fishermen. So the ties are very close with regard to the knowledge that we knew”.

Interestingly, in spite of the evident tradition of fishing in both research sites, there was also a perception voiced by some respondents that this tradition was being lost, as younger people choose other livelihood opportunities (as highlighted in Box 2).

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\(^{19}\) Source: WP2 In-depth household interview, Dieppe Bay; 27/02/2012

\(^{20}\) Source: WP2 In-depth household interview, Jessups; 17/03/2012
Accessibility of coral reef-associated fisheries

Many of the fishing opportunities associated with the coral reefs are easily accessible. As detailed in the Site Profile, few legal restrictions limit fishing activities. Nestor\(^1\), a pensioner from Dieppe Bay noted this fact, saying; “that’s (reef fishing) just an open thing. It open for everybody even for people from other communities”. Moreover, accessing many of the near-shore fishing activities require minimal physical resources. Spear fishing for example, requires only a spear gun along with a mask, snorkel and flippers, with fishers often swimming from shore to the nearby reef. In Dieppe Bay, part-time fisher Maxwell, following his father, has spear fished since he was a boy and reported how he was able to swim out to the reef to fish, feeling secure enough to do this on his own:

“I go out and swim .... That's the good area (the reef) for spearing on the inside, don’t got too much currents so it’s not a hard swim ...... Most times when I go in the week it’s all by myself”.

Freddy\(^2\), a young part-time fisher from Dieppe Bay echoed Maxwell’s experience, describing swimming out from shore to spear fish inside the coral reef and explaining that this area was easier to reach since it was close to shore and had calmer waters compared with areas beyond the reef.

Gleaning the rocks and reefs for whelks also requires minimal resources. In Dieppe Bay, Brett\(^3\) collects whelks, which he pointed out had become “a delicacy on the island now”, and sells them to restaurants. For this activity Brett simply walks out to the near-shore areas, requiring only a mask and steel bar, as he described:

‘...all I need is a... corrugated steel bar... bend so that you know that my palm could have so cushioning. One end of it is pointed because the whelks they live in crevices in the rocks between lancers so you have to gorge them out. I wear gloves, you know the mask, no flippers... because I

\(^{1}\) Source: WP2 Opportunistic conversation, Dieppe Bay; 29/02/2012
\(^{2}\) Source: WP2 Opportunistic conversation, Dieppe Bay; 25/02/2012
\(^{3}\) Source: WP2 In-depth household interview, Dieppe Bay; 24/02/2012 & 11/04/2012
have to stand a lot... I swim a lot but also have to stand a lot because they are on the coastline mostly”.

In Jessups, Daryl\(^24\), a young resort worker noted that without the reef fishers would have to travel further for their catch:

“Without any reefs, there wouldn’t really be like any fish around here. If you want to catch a fish, and there is no reef around here, to catch a fish you would have to go like way out to sea just to catch one or may two”.

In contrast to spear fishing and whelk gleaning, trap, or pot, fishing and deep water hand-line fishing all necessitate a boat with an engine, which demand considerable financial resources to access. Morris from Jessups, prays for the day when he can work for himself on his boat, instead of working on the land for others, but the investment needed to buy an engine prevents him from realising his dream, as he explained:

“I want to work my boat but just that I don’t have ..... I don’t have any money right now to buy an engine and they’re telling me XCD $50,000\(^25\) for the engine ..... First I have to get an engine for my boat then make some fish traps ..... I got to try help myself but the point about it, the engine costs more than the boat ..... so it’s a real difficult situation”.

Other case study households reported making use of bank loans in order to finance their boat and engine. For Kurt in Dieppe Bay, loans from the bank have financed both the boats he has owned:

“I went to the bank, get a loan to buy my first boat ..... then later on buy another boat get some help from the bank again, try work to pay off the bank, and get some more traps. So there I am here today”.

Likewise, full-time fisher Geoff\(^26\) from Jessups made use of a bank loan to purchase the boat and engine he uses for trap fishing, noting:

“It (getting a bank loan) wasn’t really bad I must say, because if you borrow people money you make up in your mind to pay it back. It’s just I borrow their (the development bank) money and I work and I pay them the money and I never got no problem wid dem at all. If I go in there right now and tell them I want whatever I want they give it to me”.

Yet even without owning a boat, access to fishing activities is still possible through opportunities to labour for others. As Cooper, a part-time farmer and carpenter from Jessups, recalled these

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\(^24\) Source: WP2 In-depth household interview, Jessups; 09/03/2012  
\(^25\) Eastern Caribbean Dollars equivalent to approximately 18,500 USD.  
\(^26\) Source: WP2 In-depth household interview, Jessups; 14/03/2012
opportunities were available even for young children and as a young boy it provided a means of survival for himself and his large family;

“I used to have to go and help fishing and then I would go with the seine fishing and crabbing in the night time ….. we had no choice because my father wasn’t looking after us and my mother had ten children so sometimes you come home and there is nothing to eat. Even all up to high school I had nothing to eat sometimes …. I used to go out with an older guy and we would throw out the seine early in the morning and drag it in out by where the Four Seasons is now, and we would go to St. Kitts and sell them. And in those years as a small boy you used to get a fifty or forty dollar in your hand and you could buy many things ….. So we would go to St. Kitts and buy shoes and pants”.

Fishing as a source of employment and income
For many case study households in both Dieppe Bay and Jessups, fisheries dependence represents an important part or full-time source of employment and income for the household. As cruise ship employee and recreational fisher Lincoln in Dieppe Bay remarked, “that is where most of the guys make their living from, you know, the reef”. In the absence of any significant tourism industry in Dieppe Bay, fishing and farming represent key sources of employment, as Bria27 highlighted, “people have to go to the mountain or go on the reef to look work”.

Such is the livelihood of Aaron28, a part-time fisher and farmer in Dieppe Bay, who combines trap and hand-line fishing with work on a flower farm and farming ‘provisions’ such as yam and potato. Learning fishing by working with other fishers, Aaron finally secured a loan for his own boat over ten years ago. For Aaron, fishing brings the greatest benefit for his household and by making use of his freezer he is easily able to secure the sale of his catch, as he described:

“No now when I catch my fish I take them home and I put them in my freezer and people will come and buy. See with the fishing people come to me and with the farming you have to carry it to them. I just catch weigh in the scale and put them in a bag put them in the freezer and when they say they want this or that go check the freezer and give them”.

Also in Dieppe Bay, Kurt combines trap, hand-line and long line fishing with work as a security guard and as a turtle monitor. While the security guard work brings a constant year-round income, Kurt highlighted it is his fishing which brings him the most income:

“… mostly I make me income from fishing really. But with the security I get paid every two weeks but most I make from fishing, like lobster and so on”.

As Kurt explained, his trap fishing, which targets lobster and ‘pot’ fish, is directly associated with the coral reef, taking place “behind the reef we don’t go too far out, really, cause we fishing on the shallow”.

In Jessups, Grant29 was another example of a part-time fisher, in his case combining carpentry work with rod and line fishing and occasional free diving. As he noted, fishing is an activity which fits between his carpentry work:

27 Source: WP2 Opportunistic conversation, Dieppe Bay; 22/02/2012
28 Source: WP2 In-depth household interview, Dieppe Bay; 30/03/2012
29 Source: WP2 In-depth household interview, Jessups; 17/03/2012
“Well the two of them (fishing and carpentry) go together .... Once I get a chance from the carpentry I go fishing .... Because like today if I can’t get a hard day’s work (doing carpentry) tomorrow I’m going fishing and just cool your head and just go on the water and you just get a different atmosphere”.

For his fishing, Grant explained he “use(s) the reef a lot .... we catch a lot of other fish on the reef”; pointing out that “if the reef isn’t there we wouldn’t get any fish”.

For other households in both Dieppe Bay and Jessups, fishing is undertaken as a full-time activity. Such is the case of Geoff30 in Jessups, a full-time trap fisher, who reported:

“me nah do nothing, just de fishing ...... only de fishing ya know, de fishing I go out and I haul the pots and dem, and when I have anything just like how you see me here yeah, just cutting wire and getting the traps and dem organise”.

Likewise, Jonah31 in Dieppe Bay is a full-time fisher, though in his case he carries out a range of fishing activities, including trap, hand-line and spear fishing and will occasionally free dive for conch. Jonah’s full-time fishing strategy came about following the loss of his job as a local cook and is now his sole occupation. But despite being driven into full-time fishing, Jonah was content with this situation, expressing, “I like fishing so I don’t want no change. I want to be able to do my own thing”. Moreover, Jonah viewed himself as a ‘fisher’ and suggested he had no inclination to undertake farming as well:

“I’m into the fishing, everyone got to know something that for them. They have the fishers and they have the farmers, I’m no farmer, I am a fisher ..... that (farming and fishing) would be too much work for one man you know”.

Like Jonah, a number of respondents in both Dieppe Bay and Jessups, revealed they had, or they intended to, become full-time fishers. In Jessups, for example, Cale32 decided to fish full-time having developed a love for it as a part-time fisher during days off from work as a security guard. Though Cale did not yet own his own boat, fishing instead with other fishers from Jessups, he hoped to do so in the future. Similarly, Maxwell an unemployed tradesman and part-time fisher from Dieppe Bay, hoped to own a boat in the future in order to undertake trap fishing and to trade farm products to other islands, as he explained:

“You see if I get a boat, it will be for me self and if I setting pot not setting it far out, I setting it right where I can see them ....... If I only could get a boat with a good engine then I would be set”.

30 Source: WP2 In-depth household interview, Jessups; 14/03/2012
31 Source: WP2 In-depth household interview, Deippe Bay; 30/03/2012
32 Source: WP2 Opportunistic conversation, Jessups; 12/03/2012
Lucrative tourist market for fishing products

In part one attraction of fisheries dependence is the opportunity to access the lucrative market offered by the tourism industry, in particular for lobster and pelagic fish, such as wahoo and mahi-mahi. As Aaron, in Dieppe Bay, highlighted,

“…. we get lobsters and fish from the pots and the lobster will give us a bigger spin off in terms of revenue”.

Such is the market for lobster, that Jonah in Dieppe Bay noted he would prefer to target lobster over fish:

“…… the lobster is it. If I could catch most lobster that would be better because lobster is the expensive one you know. The fish cost XCD$10 and I could sell the lobster at XCD$18 a pound\(^{33}\)”.

Hotels and restaurants are the market for Jonah’s lobster catch, offering higher prices than locals, which as Jonah explained is due to the greater profit they are able to make:

“…… the hotels and restaurants are who are going to make money. If I sell them something and I say I want $16-18 lb they will make back at least three times what I sell them that for. Some of the times they want to give trouble about the price but fisherman them work hard really hard for all their life so if I give them a sack of lobster the amount of money they will make off of that lobster. You know lobster is very expensive like USD$80 for one dish”.

In Jessups, Jason\(^{34}\), a restaurant manager, suggested fishers adjusted their activities in order to access the lucrative tourism market:

“…. instead of doing bottom fishing, they trawl, they go for the bigger catch which of course reap bigger funds”.

Jason also recalled being offered high prices for fish from restaurants:

“I remember when I went fishing there was this one guy who owned a restaurant and he would buy the fish from you on the spot, cash, $1,200, $12 a pound, (if) you got a 20 pounder or whatever the case may be, trust me you going home a happy camper”.

Such is the money to be made in fishing, former part-time fisher Morris in Jessups, suggested fisheries dependence might “make more money than the premier. I mean you’re going out there and you’re making $3,000 for one day”.

Local fish demand supporting post-harvest activities

Alongside the tourist market there is a lower value, but significant local demand for fish products in particular for trap, or ‘pot’, fish. Many of the fishers encountered described selling their catch directly to local customers. In Jessups, for example, full-time fisher

\(^{33}\) XCD (Eastern Caribbean Dollar) equivalent to approximately 3.7 – 3.7 USD

\(^{34}\) Source: WP2 In-depth household interview, Jessups; 17/03/2012
Geoff explained how he takes his fish to St Kitts to sell to locals. Similarly, in Dieppe Bay, part-time fisher Kurt sells his fish catch himself and through his daughter to customers at her workplace.

At each research site, there was also evidence of households, whose fisheries dependence was based upon small-scale post-harvest activities, involving preparing fish for local consumption. In Dieppe Bay, Aldo\textsuperscript{35} cooks fish to sell at his shop and reported “\textit{When I cook fish they sell very good. The people love them}”. Moreover, Aldo recognised the importance of both the fishers and the coral reef in supplying fish to support his business, remarking:

“... the guy that catch fish is very important to me because if he doesn’t go my business wouldn’t get any fish so he’s a very important guy to me …... I love looking at my boys going and catch fish that I can have my business going. I would like to see the reef always stay well and healthy that the men could go and catch the fish”.

Similarly, husband and wife Deshawn and Brandy\textsuperscript{36} from Jessups cook local fish for their small eatery business, reporting that locals prefer the local fish, such as “\textit{snapper, butter fish, doctor fish, the pot (trap) fish}”

**Fishing as a subsistence activity**

Not only is fisheries dependence a source of employment and income, it also represents an important subsistence activity for some households. For part-time fisher, Maxwell, in Dieppe Bay spear fishing is primarily a subsistence activity generating food for his household, which is significant because it saves purchasing food, as he highlighted:

“I do my fishing mainly for the house ……... It (fishing) will be very important because it avoid from buying certain relish (food) ……… See as long as food there, I would be alright but when my food low in the house and reach a certain level I would go (fishing). So like you see I got enough food for today but in two days I would go (fishing) again”.

Likewise, in Jessups, Elizette and Kumi\textsuperscript{37} described fishing for subsistence, highlighting that they “\textit{don’t buy fish}” but rely on Kumi fishing from the shore using a rod and line, sometimes joined by his young son. In this way the family are able to “\textit{eat fish actually every day once we could get it}” and so they recognise the importance of the coral reef, noting,“... it (the reef) important because if you don’t have no reef you would have no fish”.

In the case of Kirsta\textsuperscript{38}, a factory worker from Dieppe Bay, her step-father’s part-time fishing not only provides fish for household consumption, it can also generate enough income for the household’s weekly shopping, as she described:

“They would go fishing on the weekend if the water is good on the shore and bring home fish. Might sell a pound or two pounds here and there and he’ll bring home fish ……... He would bring home (the catch) and sell if he has a lot he would sell them ……… if he gets a lot and he sells it you could get the money to do all of the shopping. On a Saturday when he sells a pound, two pounds here or there the money comes in to buy the food for the week”.

\textsuperscript{35} Source: WP2 In-depth household interview, Dieppe Bay; 22/02/2012 & 27/02/2012

\textsuperscript{36} Source: WP2 In-depth household interview, Jessups; 14/03/2013, 22/03/2013

\textsuperscript{37} Source: WP2 In-depth household interview, Jessups; 16/03/2012

\textsuperscript{38} Source: WP2 In-depth household interview, Dieppe Bay; 03/03/2012
Fishing as a recreational activity

Though fishing dependence is important for generating income and food, it is also a focus of enjoyment and recreation. Even for Jonah, a full-time fisher in Dieppe Bay, fishing is not simply a means to make a living; it is also, as he explained, a source of fun:

“…. we love to catch the fish because there is a joy in it. With the Mahi Mahi sometimes we would have three, four boats out there and want to see who is the fastest and see who could reach out there first and who catch the most. So like it’s fun. And we use it to pay ourselves and it is a good experience. We also like to see who got the best technique and the best skill. It is a skill thing”.

For others, fishing represents a pastime, often undertaken as a social activity involving family and friends, which is simply a way of life. In Dieppe Bay, Joanne described how once or twice a week she enjoys going to the shore where she “throws out her line to catch some fish”. This is something she has always done since she was a girl and which she noted was just the “normal thing” for people in Dieppe Bay. With the catch, Joanne explained she would have “a cook up” with friends, or she would give the catch to others, stating that she is “not bothered about it (the catch)” since she just goes “for the enjoyment of fishing”. Interestingly, Joanne also pointed out how this activity was accessible even when the waters were too rough for fishers to go out, highlighting how “people still go on the shore line and throw lines because the reef creates an area where is mostly calm waters”.

Likewise in Jessups, Morris spoke of the enjoyment of fishing at night from the shore with family or friends:

“Like it’s fun, especially at night. You go on the beach with your family or your girlfriend and you do a little fishing. Might still feel your line take off with a fish”.

Similarly, for Curtis, a resort taxi driver in Jessups, fishing is solely a recreational activity which he does with his children for fun, as he noted:

“The only fishing I would do is if I take the kids to do line fishing ….. Once in a while I would do it for fun because the kids love that. But you got people who do it because they just want to catch the fish to cook. But I do it for fun”.

Recreational fishing in both Dieppe Bay and Jessups was clearly an important social pastime for children. In both locations, individual and groups of children spoke of their enjoyment of fishing. For example in Jessups, schoolboy Bobby and friends explained how they enjoyed going to the beach on weekends and using hand-lines from the shore, or swimming out to see the different types of fish. The best thing about fishing for Bobby was “having fun with his friends” and though they only caught small fish, occasionally he would take some home to “keep as pets”. Similarly, Hugo a 15

39 Source: WP2 Opportunistic conversation, Dieppe Bay; 29/02/2012
40 Source: WP2 In-depth household interview, Jessups; 13/03/2012
41 Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
42 Source: WP2 Opportunistic conversation, Jessups; 12/03/2012
year old from Jessups described enjoying going to the beach and swimming and fishing. As an older boy, fishing had now advanced to line fishing, spear fishing, and free diving for conchs or whelks. But, Hugo noted, none of their catch was for sale, instead they “would get a ‘big’ pot and put everything in and everyone would get”. For Hugo this activity was simply the “normal thing here on the weekends”, with people coming down to the beach to “make a pot for everyone from the community to come and take some”.

In Dieppe Bay, 14 year old Richard has been fishing since he was 11 years old. Though Richard knew how to swim, he was initially frightened of the fish biting him when he joined some older boys the first time he went fishing. But now he uses a surfboard to go fishing out by the reef in an area known as the “blue”, borrowing other boys’ spear guns to catch fish which they eat themselves or if there is enough take home. Also in Dieppe Bay, Axal a 12 year old, began fishing when he was only 8 years old, learning by using a plastic bottle and some line from a friend and watching the other boys. Now Axal goes most weekends and during the school holidays with three or four friends, catching “enough for everyone”, which they either “roast .. right on the beach or take home to eat”.

Fishing as source of reciprocity
As many of the examples of recreational fishing have revealed, fishing activities provide a source of reciprocity or sharing between friends and family. This aspect of fishing is not only associated with recreational fishing activities, but was encountered more widely. As part-time fisher and unemployed tradesman, Maxwell, from Dieppe Bay highlighted:

“….. you know I got some friends that fish and sometimes I would get fish from them no worries, they get work from me the same way”.

Likewise, Elizette and Kumi in Jessups reported how fishers would often share small quantities of their catch with people on shore when the boats were hauled in:

“Normally when the boat come up the bay and whoever out they would give you two or three so long as they have a lot ........We never ask for nothing but once you’re there and anybody got a lot they come in with the boat and they have fish and you ask you get”.

Kimberly, an elderly retired resident of Jessups echoed this, noting that she had always got her fish directly from fishers, pointing out that “they (fishers) don’t sell me them, they give me them”.

Tourism Dependence
As outlined in the Site Profile, after the closure of the Golden Lemon Hotel, tourism related development in Dieppe Bay has become predominantly limited to a viewing point above the village. In contrast, for the Jessups community tourism dependence centres on the internationally renowned Four Seasons resort and the coastal area adjacent to the hotel, which has important coral reef diving and snorkelling sites. Notably, for respondents across both research locations, coral reefs were perceived as a key attraction to international visitors, particularly given the opportunities they provide for water sports activities.

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43 Source: WP2 Opportunistic conversation, Dieppe Bay; 10/04/2012
44 Source: WP2 Opportunistic conversation, Dieppe Bay; 10/04/2012
45 Source: WP2 Opportunistic conversation, Jessups; 24/03/2012
In Jessups, Geoff, a full-time fisher, underlined that the reefs are important to tourism “... because the snorkelers... go by the reef go on the coral... it’s a beautiful sight to watch...”. Another respondent, Grant, a part-time fisher in Jessups, reported that “… the tourists they could come in and look at the reef they want to see the fish swimming around the reefs...”. He added “… I tell you the reef is good for the tourists because they want to go and see, when they come to dive, to see the fish...”.

Similarly, in Dieppe Bay, pensioner Nestor highlighted that coral reefs are important to those tourists visiting the viewing point above Dieppe Bay. He explained that:

“... sometimes there’s tours with the buses would stop at the top of the hill and they would show the tourists the reef because you can see it at the top of the hill, you could see where the reef is running, going all the way up. So it’s a tourist attraction”.

Coral reef-associated tourism and livelihood opportunities
Related to their role as a tourist attraction, coral reefs were recognised by a number of respondents as creating opportunities for generating employment and income. Cooper, a part-time famer in Jessups, gave the example of marine tour guides “who takes the tourist and other people to go diving and snorkelling and they want to see the reef...”. Brett, a part-time fisher in Dieppe Bay reported that this livelihood opportunity also used to be important to some of his friends until the closure of the Golden Lemon Hotel.

Case studies of respondents that pursue marine tour guiding were encountered in Jessups including Daryl, a resort worker. Daryl explained that “my job, it is like, I just carry out the guest (tourists) like kayak, sail boat... snorkel, just like anything to do with water sports”. He highlighted that the “the reef for sure (is important) ... when the guests go snorkelling, they want to see fish...”. Another respondent, government worker Anya46 in Jessups, reported that her husband, Josef, is a dive instructor for another person’s business. She reported that Josef hopes to expand his qualifications, including attaining a boat captain license, and then set up his own water sports business. Anya described Josef’s income generation as moderately to highly dependent on coral reefs “… because even though he does not dive daily for work, it (the reef) still is important in his job...”.

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46 Source: WP2 In-depth household interview, Jessups; 18/04/2012
In addition to those water sports activities that are directly dependent upon the coral reef, tourism provides a range of opportunities, including employment in hotels or resorts, which is indirectly dependent on coral reefs as an important attraction for tourists travelling to Nevis. As summarised in the Site Profile, Four Seasons is an important employer for households across Nevis. A household that is employed at Four Seasons includes Curtis, a taxi driver, whose job involves transporting tourists across the island. Curtis reported that “… the only time I’m exposed to (coral reefs) it is when I take the tourists and they go diving and so forth…”.

Beyond this, coral reefs can also provide an important resource that handicraft makers can use to source shells for jewellery. Part-time fisher Brett in Dieppe Bay, stated that he used to harvest pieces of coral to make pendants, but has since stopped this practice as it was banned. A further respondent, Meadow⁴⁷, a handicraft vendor in Dieppe Bay, reported that in 1987 she received training on making handicraft from shells such as conch shells. Meadow explained that she would like to be able to use conch shells for the handicraft stall, but does not own the appropriate tools. She underlined this, saying:

“(I) would still like to do it to be honest because I really enjoy it. I could go in the reef look conchs and get the shells. You could use the shells to make rings, bracelets, put in a light, you know cut the bottom out and make a light. … (if) get the machines (tools) now… I would do it, I would dive and get all those conch shells in the sea and use them to make bracelets and jeweller. (I) could carve on (the shell) St Kitts and Nevis…”.

Combining tourism and fisheries livelihood opportunities
Two fishers in Jessups described pursuing a combination of tourism and fisheries activities to fulfil their livelihood strategy. Nathaniel⁴⁸ reported that he engages in pot fishing, hand-lining and diving for conch, and stated that he sells his catch to local households as well as hotels in Nevis. Alongside fishing, Nathaniel noted that at times he takes tourists on snorkeling trips to the coral reef. Nathaniel emphasized that as such the coral reef is very important to him as this is where he makes his money, and added that he has never “gone hungry” because he can always depend on the sea for food and money.

Like Nathaniel, Jayden⁴⁹ detailed that he combines tourism and fisheries opportunities to generate his employment and income. He reported that he engages in both coral reef and deep sea fishing, selling his catch to fish buyers, who then supply local customers and hotels. Jayden stated that he has been working on tour boats since “forever” (over 10 years), and is currently attending a training course to become a boat captain. Jayden reported that he offers tourists all types of guided boat

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⁴⁷ Source: WP2 In-depth household interviews, Dieppe Bay; 23/02/2012, 28/02/2012, 10/04/2012
⁴⁸ Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
⁴⁹ Source: WP2 Opportunistic conversation, Jessups; 10/03/2012
tours including snorkelling and fishing, but does not have the qualifications to take tourists scuba diving.

**The Seasonality of Coral Reef Dependence**

Dependence on coral reefs presents a variable source of employment and income throughout the year. As shown in Figure 3 below, respondents from Dieppe Bay and Jessups reported seasonal highs and lows in relation to different fisheries activities and tourism arrivals.

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<th>Fishing: peak lobster season</th>
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<td>Fishing: peak conch/whelk season</td>
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*Based on information from in-depth household interviews in Dieppe Bay and Jessups

**Seasonality of fisheries dependence**

Access to different fisheries activities varies throughout the year. This seasonal variability in many cases was linked to weather conditions. For trap fishers, Aaron from Dieppe Bay and Geoff from Jessups, bad weather limits their year-round trap fishing activities. As Aaron explained:

“If the sea is high and getting on bad I don’t get to go (trap fishing). It don’t be a special month you know, it’s just sometimes when the wind is blowing extra high”.

Geoff echoed this, saying:

“... if it’s (the wind) really too hard we don’t really take de chance to go, we stay port”.

In addition Geoff also highlighted the effect of currents which may seasonally constrain his trap fishing activities by reducing visibility and making setting the traps more difficult, as he noted:

“...at time even like now (March) you find we have a lot of drafty water, I mean the water draft underneath like the current how it got the water ya know ..... because of the draft of the water, it muddy up so you can’t see yeah ..... Because you see we are all time like to see de bottom ..... You will find rocks here like a reef here and then you come from the reef and you find like a smooth bottom just like here. So we don’t want to throw the trap on de rocks and the reef, we want to put it down clear so that why we want to see the bottom”.

Other types of fishing activity are similarly constrained by bad weather. Pensioner and part-time hand-line fisher, Nestor, from Dieppe Bay, described how rough weather, during the hurricane season and January, may even prohibit his fishing from the shore:
“... when the waters are choppy at the shoreline ..... you just can’t fish because the waters would be real rough and the lines would be going to the east or to the west. You really can’t fish those times ..... , nobody can fish down there”.

For Maxwell, a part-time fisher and unemployed tradesman, in Dieppe Bay, the hurricane and rainy seasons are difficult times for spear fishing due to rough and cold water, as he reported:

“Every year from September to March the water going be cold, that always so .... I don’t stay in the water so long. But now I am working on a sea water suit that would keep out some of the cold. When you come from the diving you does be really cold”.

In other cases, the seasonal variability of fisheries activities was linked to periods of peak abundance of different target species. As full-time fisher, Jonah, from Dieppe Bay highlighted, the peak season for conch diving is when, “they just come on the grounds and once it is the season they will be there. I don’t know if they come to mate or whatever but in season they would be there”. Likewise, Jonah referred to a season when snapper were plentiful for hand lining, while part-time fishers Aaron and Brett, also in Dieppe Bay, noted abundant seasons for lobsters and sea eggs respectively.

Equally, other periods of the year were noted for the lack of availability of fish. In Jessups, for example, Cale50, a young full-time fisher, explained that his catch varied, “sometimes you get a lot and other times not so much” and he noted that the Lent period was typically a time of when catches were less; speculating that “around this time the fish are usually spawning”. Full-time trap fisher, Geoff, in Jessups supported this observation, and adding that while trap or ‘pot’ fish decline other fish, such as ‘Gar’ fish are more plentiful:

“I guess you know about Lent, like any time Lent come around, like the pot (trap) fish and dem there knock off so all like this time is only Gar time. You will find Gar whenever you see lent come around you catch a lot of Gar and less pot fish.”

As a consequence of the seasonality of fishing access and availability, household incomes may vary considerably. Geoff noted this, reporting that though he fishes six days a week throughout the year his income may half during the slow seasons for trap fishing. Yet in spite of this he also noted that it was always possible to catch something, even in a slow period, saying, “even though it slow you wouldn’t find that a whole month that you can’t do nothing ..... during the week, one or two days you will make a good catch”. For part-time fisher and construction worker Corbin51 in Dieppe Bay, slow periods in fishing present difficult times for his household, as he reported:

50 Source: WP2 opportunistic conversation, Jessups; 12/03/2013
51 Source: WP2 Household in-depth interviews, Dieppe Bay; 23/02/2012 & 28/02/2012
“So the water, the sea, ain’t giving me no good vibes as yet either these days because we ain’t really get to the calm waters yet. It kind of up and down at the moment. It’s like, you know, you kind of behind on bills, things sky high like, the electricity and so on .... it is hard times like”.

At the same time, those involved in post-harvest activities reported experiencing a decline in availability of local fish, which affects their business. For Deshawn and Brandy’s small eatery business in Jessups hurricane season can mean “the fish go hiding .... you don’t get a lot of fish”. As a result they are forced to make use of fish fillets from the supermarkets for their eatery, which they admitted “… we don’t like to use them because the sale is less”. Likewise, Aldo, who cooks fish to sell in his shop in Dieppe Bay remarked that “sometimes I don’t have any fish and I want to do the fish”.

**Seasonality of tourism dependence**

Tourism dependence was also reported to vary seasonally, with respondents on Nevis noting tourist arrivals tended to concentrate in the period of October to May (see Figure 3). Even for resort employees, this seasonality may mean a reduction in hours. For example, resort worker Daryl in Jessups noted that typically the summer period was a slow time, which meant “basically there is nothing to do” and as a result “the hours usually cut, so I would work like half a day”. However, the slow tourist season does not mean a total cessation of work. Resorts, such as the Four Seasons in Jessups, are still able to maintain some level of tourist arrivals, even if it is less than their peak season. As Daryl explained, “when the slow season starts ... we usually like have groups that comes in, so it wouldn't really be that bad”. Resort taxi driver, Curtis, echoed this, saying:

“For Four Seasons they are not so-so still but for the island in general now that is the slow season, but they (Four Seasons) still have some action in slow season. You see the name Four Season, you still have action going on, and they still keep you occupied but not as big as the peak season”.

In comparison, in Dieppe Bay where there was minimal tourism dependence overall, handicraft vendor, Meadow reported that in spite of the tourist season her work was year round. Moreover, she related her sales less to seasonality and more to the unreliable nature of her trade:

“… you could do it (handicraft vending) everyday ... sometimes you make USD$50 sometimes you make USD$ 5, because they (tourists) come through and don’t buy, especially if they come from another island that is it. Like St Martin if they went there they already buy so no sale for me”.

Nevertheless, the tourism season does have its impacts on livelihoods. One impact noted by research respondents was the effect on markets for fish or farm produce. In Dieppe Bay, fishers Aaron and Jonah both reported the impact of the tourism season on demand for their catch. As Jonah explained, “once the tourist season in you will get more sales .... sell more lobster more fish, we sell them Mahi Mahi and snappers too”. However, the reverse is also true and as Aaron
highlighted, tourism and fishing seasons are not always compatible, leading to a loss of products and earnings, as he reported:

“The bad thing about when we catch the lobster, is that from July to August, September, the hotels are closed. And the hotels are the main people for the lobsters and so we have lobsters putting up putting up putting up .... if no one come from foreign to buy they would stay in a trap and dead, we catch just go down the drain because we have no buyers”.

Sales of farm produce are similarly affected by the seasonality of tourism. In Jessups, for example, farmer and former fisher Lamont, remarked that “we get better sales (of farm produce) during that time (the tourist season)”. Likewise, Heidi a health service employee in Jessups remarked how her brother who farms and sells some of his produce to Four Seasons, finds it difficult during the slow tourist season.

**Strategies to cope with seasonality**

In order to cope with seasonal lows in fishing and tourism, households reported a range of different strategies. Among fishers, alternating fishing practices throughout the year according to the availability of different target species, was identified as an important strategy to cope with seasonality. For example, full-time fisher, Jonah, in Dieppe Bay explained how he alternated between different types of fishing to overcome seasonal variability:

“Well I ain’t catching no lobster or fish in pots, I do hand-line still. I try to do something else you know. If one thing down then try to do something else”.

Similarly, part-time fisher Aaron, also in Dieppe Bay, reported switching between lobster and fish depending on the season:

“The lobster season does go and we have to depend on the fish to keep us going until the lobster season come back again”.

In addition to changing fishing practices, fisher households also reported changing fishing grounds in response to seasonality. In this way, part-time fisher, Kurt, in Dieppe Bay, highlighted the importance of the near-shore reef in coping with seasonal lows, saying “we go on the shallows for fishing, which we call the reef because its less than 30 fathoms”. Factory worker, Kirsta, in Dieppe Bay, also noted that her step-father who fishes part-time would “fish closer in” at times when the weather prohibited fishing further off-shore.

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52 Source: WP2 In-depth household interview, Jessups; 08/03/2012, 09/03/2013
53 Source: WP2 In-depth household interview, Jessups; 23/03/2012
For full-time fisher, Jonah, in Dieppe Bay different fishing grounds around St Kitts have different seasons, so it becomes a matter of moving around the island and following the seasons, as he explained:

“... you have to move them (traps) around the island like up and down. So up we have from June-December you have to go up and then from January–April you got go down ...... (meaning) different direction like up is East and West when we down .... Because the two different sides (of the island) they have different season for catching lobster or if you want to catch some fish you know they have different times”.

This was a strategy also noted by shopkeeper, Aldo, who reported how fishers moved fishing grounds according to the weather:

“... usually the good men that they are they’ll leave from here and go check other reefs because all the reefs don’t work at the same time. For instance if this area here rough they might go into Basseterre and go in some other area”.

In some cases, respondents reported adopting post-harvest strategies. In Dieppe Bay, for example, Jonah described freezing excess fish catch, or keeping lobsters alive in traps during periods of low demand from tourist markets.

“We freeze the fish ... if it’s Mahi Mahi you could put them in a freezer. If you got too much lobster now and ain’t getting them sell you could throw them in the traps and just feed them. Yeah keep them alive ...... They could stay two to three months, long. You just have to make sure the pot doesn’t have in too much you know”.

Similarly, pensioner Nestor in Dieppe Bay remarked that he would rely on fish he had frozen to see him through low periods for his hand-line fishing:

“.... if I can’t go down the bay and throw and my line because of the wave action in the shore, it really doesn’t bother me because by then I would’ve accumulated some fish in my freezer to compensate for those times”.

For Corbin, in Dieppe Bay, slow fishing periods are times when his household cuts back on expenditure:

“.... if you use to run two fridge you cut off one; if you used to use the microwave, you watch the minutes and so on, and the things that you using current; if you ironing your school clothes just do them one time, and try not to waste the current and so on”.

Other respondents emphasised their use of savings during seasonal lows. For example, full-time fisher Geoff in Jessups, described how he was determined to cope through the low periods, relying on savings from the high seasons:

“.... now I can cope with it because I know that they are some bad times, some really bad times that we go out and it seem like nothing. So all that happens we cope with it and we smile about it and we say we just want this period over quick so we can get to the next period and things can flourish again ..... even though it slow, it still seems like I develop more love for it because it makes me determined. I say man that won’t stop me because I have my good times and my good times last for a long time
too. So I mean if I have a slow period like that I just save something for when the bad time come so I could .... turn back on something that you save”.

Fishers, Kurt and Jonah in Dieppe Bay remarked on similar strategies of relying on savings. In addition Kurt revealed that twice a year his wife living overseas played a role in supporting the household cope with seasonal lows, by sending food stuffs:

“.... sometimes you get things from overseas .... Yeah like barrels and things so. Right now me wife packing a barrel to send down. She up in the states right now .... Like some milk she had for the kid she pack in a box and send it .... food stuff and so, tin stuff”.

For respondents working in the tourism industry, savings were also an important means of coping with seasonal lows. For resort taxi driver, Curtis, in Jessups the peak tourism season is the time to build up savings for the slow season:

“I have to have wisdom too when it (the tourist season) is passed I have to put up, save. And then when the so time come, I make sure I make enough to cover my bills that's my thing ..... and this season is busy, save as much as I can”.

For government worker, Anya, in Jessups the tourist season brings in extra money from her husband’s job as a resort worker, allowing them to “go to dinner or travel to St. Kitts”. Yet in contrast during the slow season her husband’s pay is cut and “every dollar counts”. Saving during the “good times” is their strategy to cope, “so that it will balance out in the bad”.

But in other cases savings are not enough and households look for other employment. Such is the case of resort worker, Daryl, in Jessups who plans to look for another part-time job when his hours are reduced at the resort. For resort taxi driver, Curtis, in Jessups the slow tourist season gives him time to pursue work as a craftsman during his breaks.

Being able to draw upon a diversity of options throughout the year clearly provides households with a means of coping and surviving seasonal changes in coral reef dependence. This is evident, as mentioned, above in the diversity of options utilised within fisheries throughout the year, ranging from different fishing practices to different fishing grounds. It is also found to be the case within livelihoods combining fishing with other sources of work, as highlighted in Box 3. Significantly, within this diversity of options coral reef-associated fisheries are often found to act as a keystone resource; offsetting lows in tourism related activities or periods when alternative fishing activities are inaccessible. As a keystone resource they offer an important source of livelihood security against seasonal uncertainties.
Coral Reef Dependence as a Safety-net

In addition to being an important keystone resource helping to cope with seasonal uncertainties, coral reefs were also found to play a role as a ‘safety-net’. As a ‘safety-net’ the coral reef resource is critical in helping households respond to a sudden crisis or period of hardship. In this way, it may only be important occasionally, but at such times it represents a vital source of security.

Evidence from both Dieppe Bay and Jessups, suggested that coral reef-associated fisheries acted as a safety-net in particular for households facing unemployment. Retired government worker, Ethan in Dieppe Bay noted that “when things are hard that is when you going to turn to the fishing and farming more because those are the resources we have”. Moreover, he highlighted that the tradition of fishing within the community meant that everyone knew how to fish, having learnt since they were young. Fishing then provided an accessible means for households to “feed themselves or make a little money when they are under pressure”. Farmer and former fisher, Lamont, revealed a similar situation in Jessups, noting:

“.... when things get hard you got light bill, water bill and no money for it so they would got out to fish. If they can sell they would if not then they at least don’t have to pay for food”.

Source: WP2 Opportunistic conversation, Dieppe Bay; 28/02/2012
In this way, the importance of coral reef dependence as a safety-net was particularly associated with the loss of employment linked to the current economic recession. As handicraft vendor, Meadow, in Dieppe Bay, noted many people faced unemployment with “factories laid off people and other businesses laid off people, times hard”, which forced “people go to the sea and catch fish and pick whelks”. Opportunities in construction work in particular were reported to be affected by the economic recession. As part-time fisher and carpenter, Grant, in Jessups explained:

“It’s slow, it’s real slow ..... apparently we don’t have no market right now. The whole world is slow right now .... Well we aren’t getting anything else to do .... a lot of standstill nothing is doing, everybody is afraid to spend ...... the whole nation is crying out”.

Likewise, part-time farmer and carpenter, Cooper, in Jessups, noted:

“.... things are slow right now, like between last year and this year is the slowest I have ever seen construction since I started. It is tough right now”.

As Cooper highlighted, the lack of employment in construction, is further compounded by the absence of alternative industries, which were relied upon in the past:

“You see in the past when they had cane crop, even though I was doing construction, I used to go over to St. Kitts and cut cane for three or four months and come back. But now there is none of that so there is nothing to lean on, cause they even had a small industry for coconuts and there ain’t even got that now”.

For a number of respondents in Dieppe Bay, it is fishing which acts as a safety-net to cope with the lack of construction work. Part-time fisher and unemployed tradesman, Maxwell, for example, has struggled to find work in construction, reporting:

“.... right now work slow so got no work now .... the last place I was at the man tell me things slow up and maybe check him back in three months but you cannot wait on the next three months because you got to eat”.

For Maxwell, managing the hardships of unemployment means turning to the reef, even though fishing is not his preferred activity, as he explained:

“Honestly I not really interested in fishing I would prefer to stay on the land but it brings in food for me and my household so I does do it ..... See fishing in a sense is our way of getting by because I know even when things hard I can go out there and get a relish (food)”.

Construction worker and part-time fisher, Corbin, in Dieppe Bay, described a similar strategy in response to losing work in construction, stating “whatever the sea water could provide for I just take it”. Similarly, unemployed caterer, Katlyn in Dieppe Bay, explained how her boyfriend, who works in construction, was also currently out of work and so they relied on his spear fishing for income and food.

55 Source: WP2 Opportunistic conversation, Dieppe Bay; 28/02/2012
Change and Response to Change

Coral reef dependency is clearly important for many household livelihoods in both Jessups and Dieppe Bay. However, this dependency is not without associated uncertainties and risks. As highlighted in the previous section, there are significant uncertainties associated with the seasonality of fishing and tourism activities. In addition, coral reef dependence is exposed to less predictable and sudden risks or change, as well as longer-term changes in access and availability of coral reef services.

The purpose of the following section is to present an understanding of how people’s relationships with coral reefs and associated resources at the two research sites have changed and are changing both over the short-term and the long-term. The section also explores how people have and are responding to these changes.

Sudden Changes and Uncertainties

Both fisheries and tourism dependence was found to be exposed to short-term changes or uncertainties which may occur suddenly and unpredictability, often resulting in significant livelihood insecurity.

Uncertainties of fisheries dependence

In addition to the seasonal uncertainties of fishing, a number of respondents also highlighted the unpredictability of fisheries dependence. As part-time fisher, Grant, from Jessups noted, it wasn’t always possible to be certain of a good catch:

“I mean one day you might go and you might make a big catch and you might go for the balance of the week and you might not even see two, three fish .... Yeah ups and downs you don’t really know. Like tomorrow I might go fishing and might catch nothing”.

For part-time fisher, Corbin, in Dieppe Bay, this unpredictability was more extreme with certain gears than others (greater with hand-line fishing than spear fishing). For part-time fisher Maxwell, in Dieppe Bay, it meant that sometimes his family went without fish and ate vegetables or chicken instead.

But uncertainties of fishing were not solely a product of unpredictable fish availability. In both Dieppe Bay and Jessups, theft of fish traps was also identified as an important risk. For part-time fisher Brett, in Dieppe Bay, this was “a new phenomenon” which was “wreaking havoc on the industry”. As he explained:

“.... it (theft of fish traps) affects us in a big way because a lot of times we go out, we say we’re pulling 15 traps today, 20 whatever and we only get 5 with fish, 3 with fish sometimes because 12 went before us and it’s a real situation ...”.

For part-time fisher, Kurt, in Dieppe Bay, it felt like there is nothing he could do about the problem and though he reported the Fisheries Department had come to talk to people about it, “as soon as fisheries gone they do the same thing”. Such is the impact of trap theft that certain fishers have responded by stopping trap fishing, or stopping fishing altogether. Part-time fisher, Grant, in Jessups for example chose to stop using traps and focus on line fishing, as he explained:
“I had traps already but I don’t want no more traps. I’m done with the traps .... Because the guys getting more than me out of the traps ... Sometimes they (take) the traps but most of the time they just take the fish .... I usually just go with the line now because what I get on my line is mine. It’s either me or the bigger fish will get it and then somebody gets it to buy from me”.

In the case of Lamont in Jessups, the impact of trap theft forced him to stop fishing altogether and take up an opportunity to farm instead, as he described:

“Well at first I had to do fishing but I had to run away from that .... I stopped because of the dishonesty of fishermen, like imagine buy your fish pots and you put them out, then you have to buy a boat and rope and stuff, but then when you go out to haul your pot you realise that someone has gone with them .... at the time the government was allowing people to work land and I found it necessary to try my hand at it because I wanted to get out of the fishing”.

In another case, Katlyn reported that failing to find a solution to the trap theft problem, her uncle who had fished in Dieppe Bay for over 50 years, decided to leave St Kitts and move to St Eustatius.

Hazards of fisheries dependence
Fishers from both Dieppe Bay and Jessups also highlighted different hazards or dangers associated with fishing, which challenged and in some cases put an end to their dependence. In Dieppe Bay, Maxwell and Jonah both revealed their fear of sharks when spear fishing, which for Jonah was enough to put him off spear fishing, as he noted:

“I ain’t want to do too much of spear fishing either, all I’m thinking about is the sharks that in the water”.

Likewise, in Jessups, former part-time fisher Morris, described the hazards of sharks and coral burns, reporting that he had stopped as a result:

“(I) used to dive conchs and shoot fish and do with spear gun ... but I didn’t like it, it’s too dangerous ... I’m scared of shark I’m very sorry boy. I’m scared of shark”.

Moreover, Morris revealed he had been forced to go to hospital following a serious injury with a spear gun. Health hazards were also associated with the dangers of diving, both free diving and SCUBA diving. For part-time fisher Aaron in Dieppe Bay, free diving was no longer worth the risks:

“I used to dive .... I work out I getting old and it’s time to stop go under water. One time I went under water in a depth and when me come back up my nose was running blood”.

In Jessups, a number of respondents acknowledged that though SCUBA diving was an attractive option because of the high prices for conch and lobster, there had been many accidents due to decompression sickness. Part-time farmer, Cooper, who used to dive for conch, noted this, saying:
“Well you see with tanks you have to learn the art of diving with tanks, cause some divers don’t know. There was a guy here who had to be transferred to St. Eustatius and he ended up dying and he was a top diver. And two other men in St. Kitts had the bends and one of them died and the other one is still in St. Kitts but he can’t work anymore ... There is good money in diving you know cause you can catch conchs and lobsters and you can get good money for them .... if you make a good haul then you can make a good piece of change, but it real risky”.

Farmer Josephine56 in Jessups, echoed this, reporting that “a lot of the young guys go diving for conch and lobster and shooting the fish because that is good money for them”. But at the same time, she acknowledged that many have suffered decompression sickness, which is costly to treat since the nearest decompression chamber is on St. Eustatius. Consequently, Josephine perceived that people were now afraid to turn to diving as a safety-net when out of work, instead choosing to farm instead. Such was the danger associated with SCUBA diving, that a group of young boys57 in Jessups admitted that “you would have to be crazy to go diving with a tank and risk having that much pain or even death”.

Rough weather also presents a significant hazard to fishers at both research sites. As full-time fisher, Jonah in Dieppe Bay reported:

“We sail hard and rough and the waves sometimes 8-9 feet and then you out there in a small boat .... It is a risk out there is dangerous you have to know what you can do out there”.

Such is the risk, that accidents are not uncommon, as full-time fisher Geoff in Jessups recounted:

“.... the boat just capsize. And when it capsize like so, one of them jump off and boat turn right over on the other one right there .... a lot of us went there and we just lift over the boat back over and let him come out. So you have to be careful here”.

In Dieppe Bay, part-time fisher Aaron revealed that at times he would go out fishing in spite of small craft warnings on the radio “because we gotta do what we gotta do”. But at the same time, Aaron admitted that he was “getting old” which made these risks feel like a reason to stop fishing and pursue his farming interests instead: “it is better I stay on land so I don’t run that risk”. Cooper in Jessups, had already made this choice, stopping fishing because his “stomach couldn't handle the sea” and pointing out:

“.... you have to have a strong stomach and you have to have the stomach to take the sea pounding you and things like that cause all in Jessups you hear about several people losing their lives fishing”.

**Sudden impacts of hurricanes**

In both Dieppe Bay and Jessups respondents also recounted the sudden impacts of extreme weather events such as hurricanes. At such times, part-time fisher Kurt reported, the sea was so rough in

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56 Source: WP2 Opportunistic conversation, Jessups; 14/03/2012
57 Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
Dieppe Bay that it “didn’t break until he reach the lemon hotel .... It was so high, come in and move boat, all up the road”. As full-time fisher Jonah in Dieppe Bay commented, “we just hope and pray a strong one (hurricane) don’t come”.

Heidi in Jessups highlighted, the impact of hurricanes affect the whole community:

“Well they can’t go fishing or swimming, and sometimes it even stops boats from running from St. Kitts to Nevis and that prevents people from doing their business ..... Everyone was affected because we didn’t have any gas for one and some people had electrical stoves and the electricity went off as well along with the water .... You would lose your roof, and sometimes your house, the streets are all messed up and all the trees and fruits are also gone”.

For Meadow in Dieppe Bay, hurricane Hugo in 1989 meant her “house had blown off everything gone .... hurricane Hugo, that affected me bad”. Likewise, Morris in Jessups remembered a hurricane in the 70s which destroyed his house. For fisheries dependent households, hurricanes may also result in the loss of fishing gear. Such was the experience of full-time fisher Geoff in Jessups, as he described:

“There was a year when the hurricane come and I loss all my traps, because the hurricane with the rough seas take all de traps so I had to make a starter again making traps and so”.

Having had this experience, Geoff now attempts to move all his fish traps into deeper water, to avoid repeating such losses. Households dependent on post-harvest fisheries are also affected. In Jessups, Deshawn and Brandy recalled how they were forced to close their small eatery business following a hurricane:

“They would have no electricity and the whole place slow down and full of debris. You have to close down cause you can’t run. So around hurricane time if there was a hurricane then you have to close”.

In addition to the damage and loss of infrastructure, supplies of fresh farm produce to their business were also affected. As Elizette and Kumi from Jessups reported “the farming part they have to go and start over again because the hurricane damage up everything”.

The impact of hurricanes also extends to businesses within the tourism industry. The most notable example of this was encountered in Jessups, where the Four Seasons resort had reportedly closed following hurricanes, at one time for almost two years, leaving its employees out of work. Such was the experience related by Brandy, who had worked at the resort for 15 years, but lost her job after a hurricane forced the resort to close, as she described:

“Well the last hurricane they had, they closed up …. That was 3 years ago... that was in 2008. Most of the staff was laid off; they laid off about 600 employees because they had to get the hotel renovated”.

Having lost their jobs, Brandy reported, that some resort employees found themselves facing hard times “because some people have mortgages and all of that”. According to Brandy and her husband Deshawn, many people tried to find other jobs with varying success, as they noted:

“... they try to find other jobs. Some people didn’t get any jobs at all until the hotel reopened; and some people didn’t go back to the hotel, they find other jobs, and they satisfied and they stayed there
because they like it better than the hotel I guess .... A lot of people they found jobs but it was difficult
to cope with those jobs because at the Four Seasons they were making more money and now they
have to come down to a different level. They made it though. Things were hard but they pulled
through. Some worked for others a lot tried to do business on the street you would see them on the
sidewalk selling stuff and so on”.

Brandy herself was able to fall back on an existing business she had been running alongside her
resort work and highlighted the value of the skills she had to do this, saying:

“You know, the difference with me is that I have a skill; some people don’t have any skill and, you
know, jobs real hard to get”.

Likewise, Curtis a resort taxi driver recalled hurricane Omar in 2008 which again forced Four Seasons
to close and resulted in him losing his job. Relying on his skills as a craftsman and converting his
tourist taxi to a local taxi service, Curtis was able to cope with the sudden loss of his work at the
resort. Through this experience, Curtis also suggested people had learnt to adapt for the future, as
he explained:

“Well you have to be quick, be prepared for the worst of times to meet the best of times. Right now if
anything happens to me right now is that I could flex a lot of different areas because of what
happened there .... I think one of the greatest things that came out of that disaster (the hurricane)
was people really wise up and know they have to equip themselves with another skill or not putting
their eggs in one basket”.

As Heidi in Jessups pointed out, the loss of tourism work forced some “to go to St. Kitts to get work,
and people had to get work in other places”, while others found work in construction associated with
rebuilding and still some “were unable to get work”. In spite of the evidence of some households’
coping with the disaster wrought by hurricanes, restaurant manager, Jason, in Jessups highlighted
the significance of the impact of hurricanes on Four Season for the wider economy and livelihoods
on Nevis:

“A protected anchorage at Dieppe Bay

“Four Seasons has been the biggest employer, biggest financial contributor to the economy of
Nevis, once anything happens to that particular institution everything collapses. So when we had
our first major hurricane in 1999, from a tourism aspect we were hit pretty hard. The company
employs about a third of the working population on the island, being a small society, the inter-
relationships are more or less connected, so everyone knows everyone, so there is the
trickledown effect. So the businesses in town felt it. The Government of course collecting so much
taxes, coming through environmental legislation, so they felt it. And of course on the bottom part of
the pyramid, if you’re feeling it, that is going to affect the top part of the pyramid”.

In response to the vulnerability from hurricanes, Jason reported that the Four Seasons has
attempted to mitigate future impacts by building a breakwater, which he explained had helped
reduce erosion. However, beach erosion following hurricanes and storms remains an important impact, with knock on effects for locals and the tourism industry, as Curtis reported:

“I know the beaches mostly get destroyed because of when you have weather like hurricanes …. that kind of affects the area a lot because tourists love beach so we only have a couple left now because of the storms …. for some of the areas people are nowadays are being robbed of the pleasure of going to the beach because of the destruction caused by the storms”.

Interestingly, the coral reef was recognised by fishers in Dieppe Bay and Jessups for its importance in protecting the shoreline and property from the impacts of rough weather and storms, including hurricanes (see Box 4).

### Box 4: Coral reefs provide shoreline protection

The value of coral reefs as a breakwater protecting the shoreline and property from storms and hurricanes was recognised by a number of respondents in both Dieppe Bay and Jessups. As part-time fisher Maxwell in Dieppe Bay noted,

“If not for the reef this village might be mashed up because it break the waves in hurricane time. The waves hit the reefs and then go down. See that time during hurricane season the reef protect us”.

Likewise in Jessups, former part-time fisher Morris recognised that if the reef wasn’t there “It’s going to be bad ..... it would cause more erosion”. Similarly, famer and former fisher, Lamont, in Jessups described how the reef kept rough seas from reaching the land, noting “the water would break out there on the reef rather than on the shore”.

Exposed to the Atlantic ocean, the reef at Dieppe Bay was also recognised for its role in creating a safe anchorage, sheltering vessels during storms. Part-time fisher Kurt highlighted this, saying:

“.... when the swells come straight in they break on the reef there first, you know, the reef them cut them off. So, they very important role ...... the reef provide the harbour and it is a good shelter for vessels. When the weather bad some of the vessels from town, come out and shelter in it”.

Other fishers in Dieppe Bay noted the same function, adding that the reef also provided a calm area for swimming and as Aaron remarked, it provided a safe harbour which was “good especially when you carrying out your pots (traps)”.

**Uncertainties of tourism dependence**

Beyond the sudden and severe changes brought about by hurricanes, respondents also highlighted the uncertain and unpredictable nature of the tourism industry itself. As restaurant manager Jason, in Jessups noted, “experience has taught us that this industry (tourism) is very fragile and you never know”. For Jason, this uncertainty has led him to adopt a cautious approach to managing his household finances, reducing his risks so that he is in a good position to cope with any sudden changes in tourism.

Similarly, government worker Anya in Jessups pointed out that “tourism is a fickle industry”, describing how her husband had lost a tourism job in the past due to a downturn in tourist arrivals and was forced to attempt a number of different jobs before he found employment again as a resort worker. Given the uncertainty associated with tourism income, Anya highlighted that when their
household recently invested in a new vehicle and a piece of land, it was her more reliable government salary which covered the expense.

In Dieppe Bay, Meadow also recounted the uncertainties she had experienced working in tourism. Having taken up a training programme in housekeeping following the closure of the sugar cane industry, Meadow worked at a number of different hotels and guest houses. However, she was unable to retain her housekeeping work, losing her job each time the tourism industry encountered a slow down, as she described:

“I got a job in the hotel, and that was housekeeping ..... Then moved to (a hotel) in Frigate Bay .... after I went to different places worked a little time and so but then I would get lay off because things slow but then they would call back but then they didn’t call back ..... the biggest job was (a hotel), I had 6 years and one month .... (then) I got laid off and picked up a little break in town by a guest house but then they too said things slow so couldn’t work. After that I was home by myself struggling”.

Such uncertainties have been difficult for Meadow, who was still indebted to the bank for her house. And in spite of receiving some financial support from the government following the loss of her longest serving hotel job, she noted, “you know when you have that little money and bills to pay it doesn’t last long as you see I struggling to pay this house here”. As a result Meadow was forced to rely on her siblings, turning to her sister to “beg her for something …. sometimes she would give me a little change and a little food when she can”. Her brother, a farmer, would also help her out with food, but she pointed out “it is not all the time they will help because they have their family too”.

For others in Dieppe Bay, the permanent closure of the only hotel, the Golden Lemon Hotel, resulted in sudden unemployment for many individuals. As Angel from Dieppe Bay reported cleaners, cooks and gardeners employed by the Golden Lemon Hotel lost their jobs. This was significant, especially for older workers, who Angel stated struggled to find alternative employment. But it also affected local businesses more widely within the community, which, as Angel reported, had depended on the tourists attracted by the Golden Lemon.

Joanne, a former employee at the Golden Lemon Hotel outlined the impact of the hotel’s closure first hand, describing how at first the hotel reduced her hours, but then eventually laid her off. She noted that at this time, she started food vending on the weekend to earn an income. In doing so, she highlighted how she had made use of her existing cookery skills and also a severance package from the Golden Lemon, which helped her purchase supplies.

58 Source: WP2 Opportunistic conversation, Dieppe Bay; 01/03/2012
59 Source: WP2 Opportunistic conversation, Dieppe Bay; 29/02/2012
Long-Term Changes
Alongside sudden and unpredictable changes, fisheries and tourism dependence is also influenced by longer-term changes in the access and availability of coral reef services. Research in both Dieppe Bay and Jessups revealed two key areas of change; firstly a decline in coral reef-associated fisheries, linked in part to declining coral reef health, and secondly, changes in opportunities linked to the development of coral reef-associated tourism. The remainder of this section outlines experiences of these changes, their impact on households and how people have responded.

Decline in coral reef-associated fisheries
A wide range of case studies across Dieppe Bay and Jessups detailed that they have observed a decline in the availability of coral reef-associated fisheries. In Dieppe Bay, part-time fisher, Kurt, reported “... fishes are scarce, sometimes you go and you ain’t catch no fish, they aren’t biting...”. He underlined that this is the case for a lot of fishers in the communities, “… a lot of people bawling saying they ain’t catching no fish and no fish ain’t go in their pot...”.

Correspondingly, in Jessups, Cale, a part-time fisher, explained that he believes coral reef fisheries have been in decline over the last five years. He described that five years ago he was able to catch over a “kit” (box) of fish, but underlined that now fishers struggle to catch a full box of fish. Likewise, Heidi in Jessups commented:

“... we don’t get fish throughout Nevis as much as we used to. Like once upon a time the fishermen would go out and throw out their nets or put out their pots and bring in lots of fish, but it’s not like that anymore .... We got less fish and now we can’t get fish as frequent as we used to”.

In Jessups, two respondents, Anya and Erica60, whose partners fish reported that they have seen a change in the size of fish they catch. Anya gave an example of her husband’s most recent catch, and described the fish as not very big. Like Anya, Erica believed that the fish her boyfriend catches are now smaller, and in particularly highlighted the smaller size of lobster.

Drivers of declining coral reef-associated fisheries
In describing their experiences, many respondents also identified different drivers, which they perceived to be causing, or contributing to the declining access and availability of fisheries. For example, in the Jessups community, a respondent highlighted the possible effect of the invasive species of lionfish on reef fisheries. Morris, a former part-time fisher in Jessups, highlighted that “they (fishers) say (that) they (lionfish) eat off most of the smaller fish now... since last year I heard about them on the radio...”. Another respondent in Jessups, Grant suggested tourism and the increased amount of boat traffic was “running (scaring) the fish...”. Similarly, Kendrick61, a recreational fisher in Jessups, believed that tourism and the associated coastal development was causing pollution which was driving reductions in fisheries by “scaring fish”, causing them to seek out other grounds.

Few respondents in the two communities felt that there had been no changes in the availability of reef fisheries. However, one respondent in Dieppe Bay underlined that “… I ain’t believe that there are less fish around...”. Aaron, a part-time fisher, drew attention to pot stealing in the Dieppe Bay

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60 Source: WP2 Opportunistic conversation, Jessups; 17/03/2012
61 Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
community. He stressed that “... what I believe really, it’s because when you set your traps out there... before you haul them up, someone come before and haul them up, somebody else comes and haul them up...”.

Notably, in both Jessups and Dieppe Bay, respondents commonly associated the decline in reef fisheries with the degradation and decline in health of coral reefs (see Box 5). Kimberly, a retired, elderly resident of Jessups described that there are fewer “pot fish” (reef fish) available for her to consume as “... the reef is damaged ... now people don’t catch as much fish as they used to...”. This was echoed by Morris in Jessups, who stated that fisheries declines may be linked to the state of the coral reef, which he described as covered in sand. Morris noted that, as a result, there is “... nowhere there for the fishes to hide, like when they have rough seas all of those holes cover up with sand from the storms...”.

In Dieppe Bay, Brett, a part-time fisher, reported that “... over the years (I) have missed a lot (of) various species of fish that I used to see (but) I don’t see any more ...”. Brett underlined that “... you used to just find them under the yellow coral lodging (but) we don’t have the coral anymore...”. Jonah, also a fisher in Dieppe Bay, stated that “... you can still catch a little something now but the coral them destroy(ed), and so now it would be a little harder...”. Jonah continued to detail the changes, noting:

“... when I used to be a little boy growing up and see the older folks come in they used to catch more fish to me. But you know things change up, I guess some of the reefs does die out too after a couple years, so if the reefs die out it would be bad ‘cause the fish would go look for other grounds...”.
Another important driver that was identified by respondents in both communities includes the potential impact of overfishing. For example, Grant, a part-time fisher in Jessups reported that “… we’re getting hurricanes more bigger and bigger every year and so the hurricane damages the reef a lot…”. Grant emphasised that the hurricanes are “… mashing up the reef so you’re not getting anything, the reef isn’t coming back…”.

Another part-time fisher in Jessups, Jayden, noted that over the years the coast and reef has been hit “hard” by storms. Additionally, Jayden highlighted the effect of inland runoff which he suggested is damaging reefs. He underlined that when he observes this damage he becomes upset as he knows that this will affect his fish catch.

In Dieppe Bay, Maxwell, a part-time fisher, stated that “… once upon a time, it (the reef) used to be pretty… in the early eighties you used to go down to the beach and see the reef big and right there but then it start to break down, so now it’s not as big as before…”. He reported that the coral reef has “… got mashed up and damaged from different things like storms… when water rough, really rough it does mess up the reefs and break down the shoals…”.

Corbin, also a part-time fisher in Dieppe Bay, stated that “… the reef itself gone in… it change up a lot, a lot of fish don’t be inside like a once ago…”. He detailed that “… you have the certain kind of coral where certain fish dwell and want to live under, the one called the yellow shoal, you don’t see much of them now…”. Like Maxwell, Corbin suggested that this change is “… mainly from hurricanes… hurricanes change up the shoal, because you used to have little shoal and stuff inside shores and so, where people you used to go and they fish from the shore. But since the hurricane, it like it just wash them out, sand just bury them…”.

Similarly, former fisher Lamont in Jessups, identified hurricanes as “a disturbance and the fish go underground like deeper. Sometimes the hurricanes would cover the reefs with sand”. As a result, Lamont reported that those full-time fishers who lack the equipment to fish deeper may be forced to “part-time (fish) for a while till the grounds recover”.

Another important driver that was identified by respondents in both communities includes the potential impact of overfishing. For Erica, an unemployed resident of Jessups, she described that there are less reef fish as fishers have “fished out” the bigger fish and are now catching small fish. Erica stressed that she is worried about the future of fishing in the community as “… the fishermen are living for today, so even if they are crying out that you can’t get the big fish or lobster, whatever size fish they see they are taken, which is what got them into this problem in the first place…”.

Kumi and Elizette, a husband and wife part-time fishing household in Jessups, highlighted that the use of gill nets is impacting on fisheries availability. They noted:

“we are on the beach and see them (fishers with gill nets)... they should use at least something like a one inch eye or something or an inch and a half so the small fish... could get out of the nets, because sometimes a lot of small fish they get...”.

Kumi and Elizette emphasised that if fishers “… continue like that there’s going to be overfishing. If you pull up all the small ones there’s nothing to come back...”.

In Dieppe Bay, Jonah, a full-time fisher, similarly identified overfishing as driving changes in reef fisheries and noted that “… (a) long time ago people would catch more fish but now they catch less,
 maybe it is because they have more fishermen now...”. In particular, Jonah highlighted that there are more people diving with tanks. He suggested that “… when they started to use tank, because before they never used them, but once they start with that the fish get scared, you see they live there but if you keep on going and scare them (fish), they must run away...”.

Lincoln, a recreational fisher in Dieppe Bay, drew attention to the number of fishers as an important driver of change. He stated that “… there are so many people inside the reef fishing every day, and that is why the fish them are smaller now...”. Like Jonah, Lincoln emphasised that “… (there are) more divers now...” and added that “… most guys now they set fish pot also in the reef now, that wasn’t there before...”.

Interestingly, Lincoln believed that there are more fishers in Dieppe Bay because “… jobs (are) limited, so most people now turn to diving or fishing.... and it is like an everyday thing, so eventually the reefs lose it(’s) fish...”. This comment highlights the role of coral reefs as a safety-net within the community (as discussed in the Livelihood Dependency section above). In addition, it implicates this form of dependency as driving changes in reef fisheries. Lincoln underlined that these fishers are catching small fish but explained that as a fisher “you are not going to throw it away, you know, you going to bring it home because you want to eat...”.

Responding to declining fisheries
Case studies captured examples of how some individuals and households in Jessups and Dieppe Bay are responding to the perceived changes in the availability of reef fisheries. As outlined below, these responses range from households’ attempts to modify their fisheries practices, or seek alternative opportunities, to institutional responses.

Modifying fishing practices
A commonly reported response to declining fisheries included strategies that modified fishers’ current activities, such as travelling further offshore or utilising additional fishing grounds. For example, in Jessups, Morris, a former part-time fisher, stated that “lots of the fishes around here (close to the village) are dying out, (so) you have to go way out (offshore) to get your pot fish...”.

Grant, a part-time fisher in Jessups explained his response noting that “because the fish move, you would have to follow the fish. (A) long time ago you could have gone close by (the shore) and fish (but) now you got to go along with where the fish are going...”. Grant underlined that this has “made me go further (offshore) to catch more (fish)... all the fish now start to go in deeper and deeper water ... so now you’re going to end up buying longer line, buy more fuel to reach the part (where) the fish are...”. He stressed that, despite responding in this way, “it’s rough right now...” and underlined that this is “because the reef is crashing (so) we don’t have no good lifestyles...”.

Grant reported that another way he is responding to changes in fisheries is by trying to be “more organised”. He outlined that he and his friend are trying to create a chart that makes a note of the days that are productive in fishing. He believed that this will help him make a decision as to what days he should fish in the future. He stated that “(a) long time ago we just wake up in the morning, probably go fishing [but] now we just got to decide if to go today or just left it out...”.

For Maxwell, a part-time fisher in Dieppe Bay, he reported that he has to swim further away from the shoreline to spear fish. He stated that:
“in the middle nineties you could (go to) the reef midday and catch about twenty to thirty pounds of fish, but now you have to go to the back of the reef which is further so that is more swimming... you got to go to the further ones [reefs] not the inside ones...”.

Maxwell underlined that for fishermen like him, who swim and do not own a boat, it is still hard to catch the same amount of fish as he used to before changes in fisheries availability. He emphasised that “... unless you (are) going... in a dingy or a boat or something like that... you don’t catch much fish like once ago because of all of that (change in fish availability), in the shoals especially...

Another respondent, Jonah, a full-time fisher in Dieppe Bay reported that in response to changes in fisheries resources he utilises additional fishing grounds. He noted that “… I know there is a little shoal out there and I set my traps by that and I go out and realise that I ain’t catching no fish there as some of those grounds get destroy so I have to go hunt now for more grounds so I look around and search...”. Jonah explained that as well as utilising more fishing grounds, he changes the gear he uses, stating that “… if you ain’t catching pot, you go try hand-line...”.

Jonah added that to be successful at fishing now fishers in Dieppe Bay needed access to technology such as Global Positioning Systems (GPS). He stated that “... you got to have a GPS and depth finder, yeah, those type of things to help you out...”. Jonah described that in the past “... we don’t really use them that much because some of us [our] boats don’t have them, we just use a mark off the land mark you know off of other island out there and try to mark them the areas we go...”.

Notably, in the three case study examples above, Grant, Maxwell and Jonah all identified that one way they respond to fisheries declines is by travelling farther offshore, or to additional fishing grounds. However, given rising fuel prices such responses have limited viability, as outlined in Box 6. For example, Corbin, a part-time fisher in Dieppe Bay, highlighted that to travel “the distance, you would got to spend a lot of money now (on fuel)....”. He underlined that as a fisher “you (are) not sure if you can catch enough (fish) to make that (money) back...”.

Cooking the catch in Jessups
Alternative Livelihood Opportunities

Another way in which fishers can respond to declining fisheries is to look for alternative sources of livelihood opportunities. Yet in Jessups, Nathaniel, a full-time fisher and occasional marine tour guide, reported that “… fishermen cannot really do other things, some might do a little construction and others cut grass but most of us would sit down and wait till we can fish again…”. This statement was echoed by Kendrick, a recreational fisher, who stated that for some people in the community fishing is their “bread and butter”, and there is little else. Kendrick noted that while there are some opportunities in farming or tourism, those opportunities that are available are limited. Indeed, evidence of the significance of the coral reef as a safety-net for households suffering the effects of the economic downturn and in particular the loss of opportunities in construction (see Livelihoods Dependency Section), suggests that alternative opportunities are limited.

In spite of this, a case study was encountered in Jessups which provided evidence of an alternative livelihood strategy in response to declining fisheries. This was Kumi and Elizette, who reported that they had found an alternative in farming. Kumi noted that “… I never used to do farming I always used to do fishing. I used to do it (fishing) on a regular basis… but now you catching less and less fish so I cut down on the fishing…”. Kumi added that due to his declining catch “… at one time my mind tell me I must quit, quit the sea and I decide to go and do some farming…” Despite this, he highlighted that he cannot solely rely on farming as he does not have all the necessary equipment, including a vehicle, and “… farming real funny sometimes you get a lot and sometimes nothing…”.

In Dieppe Bay, Lincoln, a cruise ship worker and recreational fisher, emphasised that “… a lot of people depends on the reef…” and as a result a lower fish catch “… would be a big impact to them…”. Lincoln suggested that to help fishers respond to this change, the St Kitts Department of Fisheries
needs to provide training classes for fishers so that they can attain skills for alternative livelihood opportunities. Box 7 details two training programmes that the Department of Fisheries had supported, though these training events were focused on building skills within fisheries. In contrast, Lincoln suggested that training should be provided for an alternative to fishing such as a “hospitality class, you know, something they (government) need to train them (fishers) in to go to...”.

Kurt, a part-time fisher in Dieppe Bay, expressed that he would like assistance from the Department of Fisheries to help him seek alternatives to reef fishing. Though, rather than seeking alternatives outside of fishing, Kurt reported that he wants to pursue offshore pelagic fisheries such as mahi mahi. He reported that “... I would like them (the government) to help me with that...” and detailed that this would include helping him gain access to a larger boat. Kurt believed that this was possible if the Fisheries Department purchases a large boat that all the fishers in Dieppe Bay are allowed to use.

Jonah, a full-time fisher in Dieppe Bay, reported that one way fishers could leverage assistance from the government and make them aware of the pressure of fishery declines is through re-establishing the fishers’ cooperative. He stated that “... the coop will be good for truth, because the fishers could be more together and talk about what problems they have and if they (government) could help us out you know...”. Jonah identified that a challenge to achieving this in Dieppe Bay is that “…these fishers here kind of mix up young man and old man but everyone got their own opinion and we here aren’t really together...”. Support for reviving a local fishers’ cooperative in Dieppe Bay was also expressed by part-time fisher, Corbin, who felt such an institution might help fishers’ access cheaper equipment.

**Institutional Responses**
The Government of St Kitts and Nevis has responded to reductions in fisheries availability and the associated degradation and declines in

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**Box 7: Fisheries training in Dieppe Bay**

An example of training events that the Fisheries Department in St Kitts has supported is provided by two case study beneficiaries in Dieppe Bay, Chance1 and Leo2. These two respondents described that they have both attended programs to improve fisher’s skills on long-lining. Chance and Leo reported that they benefited from this training and learning new skills, with Leo, for example, underlining that “…the technique that they teach us... it’s a lot more effective... the snappers increase, you can say by a hundred percent to what we’re accustomed to...”.

Nevertheless, Chance and Leo stated that they do not use the long-lining technique that they were taught. Chance highlighted that the training “… was just to show us how to do it, we had to get our own (gear) after...” which was hard. Leo corroborated this, explaining that attaining the gear to fish was “… difficult... because have to get them from either Japan or Taiwan or something like that...”.

Both Chance and Leo offered suggestions for training events that they believed would be useful for the Fisheries Department to offer fishers into the future. Leo noted that “…fishing is a big business and some of the fishermen need to know how to money management and how to run their business effectively...”. Alternatively, Chance stated that:

“... (it) would be a good idea for the younger fisher to get some experience, see we know that the way we do it is out of style but we still do it to try make a living out of it. If they have other training from out there that would teach us to get more fish with a different style that would benefit us...”.

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1 Source: WP2 SLED interview, Dieppe Bay; 11/04/2012
2 Source: WP2 SLED interview, Old Road; 29/03/2012
coral reef health by introducing policies that aim to protect these resources through a system of marine spatial planning. Policies that the government have supported such as the imposition of species size limits and open and closed seasons, may in the future additionally include the introduction of a protected area. Across Jessups and Dieppe Bay, respondents expressed some support for such action to protect resources, though some fishers stressed that restrictions add further pressure to their livelihoods. For example, Maxwell, a part-time fisher in Dieppe Bay reported that “... if they [the government] did restrict it (fishing), it would affect me because I wouldn’t be able to fish for my relish (food)…”.

In Jessups, respondents highlighted that if restrictions are enforced, assistance would need to be provided to fishers to identify alternative livelihood opportunities. Former fisher, Lamont, now a farmer in Jessups reported that “… I think if there is a restriction (on fishing) in certain areas then they (the government) have to think about the people that use the area and what else they can do...”. Lamont acknowledged “… I know that the intention is good and I agree with but got to give people something else to do...”. He suggested that there are alternative opportunities “… for work on land, in the hotel in the restaurant, you know. We use the sea but if we can’t use it then we will find something else to use...”.

Like Lamont, Abel62, a student from a family of fishers, commented that if the government restricts fishing areas, fishers will have to find alternative sources of income. While Abel recognised that such restrictions will add pressure on fishers, he felt that this was necessary to “… get their (fish) numbers back up...”. He underlined that there are three possible responses for fishers: retire; fish less; or seek alternative livelihood opportunities such as those provided for by tourism.

For Nathaniel, a full-time fisher and occasional marine tour guide in Jessups, he questioned what alternative sources of employment and income he can utilise. Nathaniel acknowledged that fishers should restrict their own activities, including not harvesting undersized conch, but expressed concern at the possible imposition of an individual conch quota. Nathaniel referred to a new fisheries restriction that he had heard about from other fishers, which could involve limiting a fisher’s conch catch. He stressed that the restricted catch represented just two months of work for him, and asked what he should do to generate his living throughout the remainder of the year if this quota was to be enforced?

An example of an intervention that has restricted fishers’ activities but has also made an effort to provide alternative sources of income, can be found in Dieppe Bay. Box 8 details this intervention which is led by a conservation group who established a turtle monitoring project aimed at protecting leatherback and hawksbill turtles and their habitat. The project sought to provide alternative livelihood opportunities for those fishers who harvest and sell turtle meat, such as jobs monitoring leatherback turtles and providing guided tours (see Box 8).

62 Source: WP2 Opportunistic conversation, Jessups; 10/03/2012
Development of coral reef-associated tourism

As the tourism economy has developed in St Kitts and Nevis, it has created new opportunities for generating employment and income, as outlined in the Tourism Dependency section above. These opportunities may be significant in contributing to livelihood development. In Jessups, the arrival of the Four Seasons resort was recognised by some respondents as being significant for the community more widely. As retired expatriate Maggie in Jessups highlighted, this has been good for “many people from the community”, who have “got jobs and were able to raise their standard of living”. Likewise, restaurant manager Jason in Jessups noted that the “Four Seasons coming on stream it has elevated the status of most Nevisians”, which among other things has allowed people to improve the standard of their housing.

Despite the evidence of livelihood opportunities brought about through the development of tourism, a number of respondents in Jessups perceived that these opportunities were limited. For example, part-time farmer, Cooper, suggested that tourism work was not an attractive option for younger people since “you don’t get much (money) so they will spend a whole day (working with tourists) and probably get gas money”. Given these prospects, Cooper reported that such work was
an option for “older folk … cause they already have pension”, while “younger people who have to hustle for bills and stuff won’t do it”. Similarly, farmer Mustafa indicated that beyond work in “fishing, farming or selling food” it was difficult to find work, since the only alternative is “work in the hotels” but as he claimed “all those jobs are taken already”. Consequently, Mustafa observed that most young people “get educated and look for jobs elsewhere”, leading to a “brain drain on the island”.

Though opinion may be varied as to the current opportunities offered by tourism for direct employment, respondents in both Jessups and Dieppe Bay were unified in their perceptions of the indirect outcomes of tourism development in the creation of a new market for fish products. As described in the Fisheries Dependency section, the lucrative returns offered by this market have contributed to making fishing activities an attractive livelihood option.

Lamont, a former fisher in Jessups, offered a useful description of the progression of the market for fishers’ catch, explaining that traditionally fishers supplied the local market for domestic consumption. He stated that “… before the catch was just for domestic purposes and then they (fishers) would export their catch overseas...”. Lamont added that now with the onset and growth in tourism “…the hotels and restaurants (have) come and so they (fishers) sell their catch to them...”.

Geoff, a full-time fisher in Jessups, highlighted that the tourism and domestic market demand different species. He stated that “… the (tourism) restaurant wants snapper but who owns a little bar (supplying locals) wants pot fish...”. This was echoed by Lincoln, a cruise ship worker and recreational fisher in Dieppe Bay, who reported that fishers have begun to target those species that are popular on the tourism market such as the lobster. He underlined that “… it’s a money making thing, they (fishers) are more interested in the lobster, because the lobster cost more than the fish... the lobster is probably around eighteen to twenty (East Caribbean) dollars a pound, probably more now...”.

While the advent of a lucrative tourism market can be described as positive for fishers, it also appears to have had important implications for those dependent on the domestic market for fish. Lincoln emphasised that the domestic market is especially affected in the lobster season, when fishers focus their effort and time on harvesting for the tourism market. In Jessups, Deshawn, a food vendor, reported that this affects him as, at times, he finds it difficult to source pot fish for his business. He explained that this is because “... more people selling fish, like in a restaurant so then the fisherman now, don’t have enough fish to supply all these people...”. In response to this, Deshawn commented that he sources fish from the supermarket, but emphasised that he cannot source pot fish from the supermarket, which is what his customers prefer.

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Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
In another case study Melinda⁶⁵, a retired Jessups resident, reported that pot fish is important for her household’s consumption. Like Deshawn, Melinda described that she finds it hard to source pot fish, and as a result, she sometimes substitutes pot fish for fish that she can buy at the supermarket such as salt fish or mackerel. She added that she may also substitute pot fish for eggs and meat, as her neighbour farms chickens. Likewise, Kendrick in Jessups noted that he chooses to eat chicken which is cheaper than the pot fish he prefers. Again, Kendrick explained that this is because the fishers have already promised their fish to restaurants and hotels and besides this fish are “too expensive for the residents of Jessups”. In addition to the demand for fish from the tourism industry, Kendrick also highlighted that the price of fish had risen, due to declining catches and the increasing costs of fishing associated with rising fuel prices.

Another outcome of tourism development highlighted by fishers in Jessups was associated with restricting access to fishing grounds. In Jessups, fishers pointed out how they are no longer allowed to harvest in areas that are either in close proximity to hotels, or that are used for tourism activities such as water sports. Cooper, a part-time farmer in Jessups detailed that “...fishing isn’t what it used to be when I was growing up and now where the fishermen used to go all belong to private owners like Four Seasons, and where people have their yachts and thing now, so the fishermen have to go up south...”. Morris, a former full-time fisher and now recreational fisher in Jessups, described the areas fishers can no longer access, stating “…here in Jessups around Four Seasons and down at Nags Head between St. Kitts and Nevis. We used to go over at Bogey Island, we used to go down Hanley’s Road by the horse track there...”.

Geoff, a full-time fisher in Jessups, explained that he used to set fish traps in areas that water sports operators now use to take tourists to snorkel or dive. He stated that he now “avoids” fishing in these areas as “...sometimes when we put out traps there, they (water sports operators) would let go all the fish or they may cut one of the sides of the pot... (or) sometimes we have traps near the buoy so they (water sports operators) would take the buoy and shove it in the funnel so no fish would be able to get in (to the trap)...”. Geoff described that these actions by water sports operators are “...really not nice...”, and to try to stop this happening, he and other fishers talk to the water sports operators “…so they could tell us where we must or mustn’t set up our bait...”.

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⁶⁵ Source: WP2 Opportunistic conversation, Jessups; 08/03/2012
Summary of Key Findings

The aim of this case study has been to present an understanding of coral reef dependency and vulnerability to changes in coral reef services as experienced by a diversity of people living at two research sites in St Kitts and Nevis. In the following section, we summarise key findings of the research in relation to the principle themes of dependency, change and response to change.

Livelihood Dependency

Fisheries Dependence

- In both Dieppe Bay and Jessups, coral reefs were recognised for their importance as a habitat for fish and other marine life, which in turn was identified as being crucial for fishing and fisheries dependence.

- Many of the fishing opportunities associated with the coral reefs, such as spear fishing or whelk gleaning, are easily accessible; requiring minimal physical resources to access. However, other fishing activities, such as trap, or pot, fishing, and deep water hand lining demand a boat, which for many households has required a bank loan to finance the investment.

- For many individuals and households in both research sites, fishing has been a way of life, learnt as children while playing, or watching and helping elders. Yet there was also a perception voiced by some respondents that this tradition was being lost, as younger people choose other livelihood opportunities. Despite this, evidence suggests fishing continues to be important for many households as a source of part or full-time employment and income.

- In part one attraction of fisheries dependence is the opportunity to access the lucrative market offered by the tourism industry, in particular for lobster and pelagic fish. In addition, there is a lower value, but significant local demand for fish products in particular for trap, or ‘pot’ fish, with many fishers describing selling their catch directly to local customers. At each research site, there was also evidence of households depending upon small-scale post-harvest activities, involving preparing fish for local consumption.

- Not only is fisheries dependence a source of employment and income, it also represents an important subsistence activity for some households. In this way, fishing is important for household food security, not only generating food, but in doing so reducing a household’s food expenditure and for some households, generating a source of cash for spending on food.

- Though fisheries dependence is important for generating income and food and for subsistence, it is also a focus of enjoyment and recreation. Evidence from both research sites suggested fishing represented a pastime, often undertaken as a social activity involving family and friends and which was important not only for adults, but also for children. Moreover, many examples of recreational fishing revealed the value of fishing activities as a source of reciprocity or sharing between friends and family.

Tourism Dependence

- While there were many opportunities for tourism dependence in Jessups, mainly associated with the Four Seasons resort, Dieppe Bay in contrast had few opportunities. However, in spite of this difference, respondents across both research locations perceived coral reefs as a
key attraction to tourists, particularly given the opportunities they provide for water sports activities.

- For households in Jessups, tourism offered both full and part-time employment, which was both directly and indirectly dependent on the coral reefs. Those respondents engaged in activities which were directly dependent on the reef, such as marine tour guiding, recognised the value of the reef for their livelihood. In a number of cases, fishers pursued a combination of tourism and fishing activities to fulfil their livelihood strategy, making use of their boats and experience of the coral reef to take up work as marine tour guides.

**Seasonality of Dependence**

- Fisheries and tourism dependence on coral reefs presents a variable source of employment and income throughout the year.
- Seasonal variability of fisheries in many cases was linked to weather conditions, but also to periods of peak abundance of different target species. As a consequence of the seasonality of fishing access and availability, household incomes may vary considerably, with slow periods in fishing creating difficult times for households involved in both fishing and post-harvest fishing activities.
- Tourism dependence was also reported to vary seasonally, with slow periods resulting in a loss of work, as well as a decline in market demand for fishery and farm products. Indeed, evidence suggested that the lack of compatibility between tourism and fishing seasons, in some instances can lead to a loss of products and earnings.
- However, the slow tourist season does not mean a total cessation of tourism related work, as resorts, such as the Four Seasons in Jessups, are still able to maintain some level of tourist arrivals, even if it is less than their peak season.
- Households reported a range of different coping strategies in response to seasonal lows in fishing and tourism. To cope with fisheries seasonality, household responses included alternating fishing practices or changing fishing grounds, as well as adopting post-harvest strategies to store catch, or keep it alive, until market demand increased. In response to tourism seasonality, evidence suggested alternative employment was important to cope with the slow tourism. In addition, seasonally reducing household expenditure and relying on savings accumulated during high seasons, or remittances from household members overseas was reported in cases of both fisheries and tourism dependence.
- The diversity of household livelihood activities was also found to be an important means of coping. Within this diversity, evidence suggests that coral reef fisheries act as an important *keystone resource*, providing accessible opportunities and a means of coping with seasonality. For example, coral reef fisheries were found to provide protected inshore fishing grounds during periods of rough weather, or opportunities to offset seasonal lows in tourism.

**Coral Reef Dependence as a Safety-net**

- In addition to being an important *keystone resource* helping households to cope with seasonal uncertainties, coral reefs were also found to play a role as a ‘*safety-net*’ critical in helping households respond to a sudden crisis or period of hardship.
- Evidence from both Dieppe Bay and Jessups, suggested that coral reef-associated fisheries acted as a *safety-net* in particular for households facing unemployment. This was particularly
associated with the loss of employment linked to the economic recession and with the loss of opportunities in construction work.

Changes in Coral Reefs

Coral reef dependency is clearly important for many household livelihoods in both Jessups and Dieppe Bay. However, this dependency is not without associated uncertainties and risks linked to both short-term and long-term changes.

**Short-term changes**

- Both fisheries and tourism dependence was found to be exposed to short-term changes or uncertainties which may occur suddenly and unpredictability, often resulting in significant livelihood insecurity.
- In relation to fisheries dependence, short-term and sudden changes were found to include the unpredictability of fish availability, theft of fish traps, fishing hazards such as sharks, fishing accidents associated with bad weather or fishing practices and decompression sickness. In relation to tourism dependence, the uncertainty, or “fickle nature” of the tourism industry was highlighted by respondents in both research sites, leading to employment insecurities due to hotels reducing staff numbers or closing altogether.
- Hurricanes were also identified as presenting major impacts at both research sites in relation to both fisheries and tourism dependence. Households recalled experiencing hurricanes on a number of occasions and described impacts including damage to houses and loss of infrastructure, as well as loss of fishing gear and loss of supplies critical to post-harvest businesses. In Jessups, households dependent on tourism also recounted significant impacts due to the closure of the Four Seasons resort due to hurricane damage, resulting in loss of employment for extended periods.

**Long-term changes**

Alongside sudden and unpredictable changes, fisheries and tourism dependence is also influenced by longer-term changes in the access and availability of coral reef services. Research in both Dieppe Bay and Jessups revealed two key areas of long-term change:

1. A decline in coral reef-associated fisheries:
   - A wide range of case studies across Dieppe Bay and Jessups detailed that they have observed a decline in the availability of coral reef-associated fisheries.
   - Case households reported this change as a decline in catch compared to the past, as well as a decline in size of fish and lobster.
   - Case households perceive multiple drivers to be responsible for the decline in fisheries, including the presence of invasive lionfish, increasing tourism development and associated boat traffic. Notably, in both Jessups and Dieppe Bay, respondents frequently associated the decline in reef fisheries with a decline in health of coral reefs, which in turn was mainly linked to the impact of hurricanes and storms. In addition, overfishing was also highlighted as a cause of declining fisheries, which was associated with increasing numbers of fishers, which was attributed in one case to the increasing use of coral reef fisheries as a safety-net as a result of unemployment.

2. Development of coral reef-associated tourism:
The development of coral reef-associated tourism in St Kitts and Nevis has created new opportunities for generating employment and income. In Jessups this was recognised by some respondents as having contributed to raising the standard of living in Jessups and Nevis more widely.

In addition to employment opportunities, tourism development has also led to the creation of a new and lucrative market for fish products. In turn this has led to changes in fishing practices to target species favoured by the tourism market, which are different from those preferred by the domestic market. But as a consequence, local households and post-harvest business owners report a shortage of fish in the domestic market.

While the developing tourism industry has brought benefits in terms of an expanding market for fishers, it was also noted in Jessups that it has led to restricted access to fishing grounds. A number of respondents in Jessups also perceived that opportunities within tourism were in fact limited, due to the low incomes offered and the fact that the job market was already saturated.

Response to Change

Responding to short-term changes

- In certain cases, the impact of sudden change, which may have occurred multiple times, was severe enough to force a household to stop the affected livelihood activity altogether and seek an alternative. For example, repeated theft of fish traps had forced one fisher in Dieppe Bay to stop using traps and focus on hand lining, while in Jessups trap theft had forced a fisher to stop fishing altogether and start farming. In other cases, reports suggested households may be forced to migrate to find alternatives, or they have remained unable to find alternative work and have had to endure hardship.

- Evidence also suggested that repeated shocks and unpredictability, such as that experienced in the tourism industry associated with hurricanes and market uncertainty, had led households to adopt adaptive strategies. Evidence from case households revealed that these strategies included reducing overall household risk through financial management, or increasing capacities to change and find new work through developing skills.

- In both Jessups and Dieppe Bay, coral reefs were perceived to play a role in offsetting the sudden impacts of storms or hurricanes, by providing a physical barrier protecting the shoreline from damage and erosion.

Responding to long-term changes

- In response to the long-term trend of declining fisheries, case studies reported household responses ranging from modification of existing fishing practices to seeking alternative livelihoods.

- Modification of fishing practices included strategies such as travelling further offshore, using different fishing grounds and changing fishing gears, or using new technologies, such as GPS. However, the success of these modifications remained constrained by rising fuel prices. Moreover, by continuing to place pressure on the fishery, may not represent sustainable strategies for adaptation in the long-term.

- Alternative livelihood opportunities were not always perceived positively, with some respondents expressing that there were few options available beyond fishing. However,
although limited, evidence suggested some households were able to find alternatives to fisheries dependence, e.g. by moving out of fishing into farming. In addition, indications that the many of the younger generation at both research sites are choosing alternative employment to fishing, suggests that alternative livelihood opportunities are present.

- In other cases, fisher households highlighted the need for support either from government or a reinvigorated fisheries cooperative, to help them respond to declining fisheries. The support envisioned was typically linked to further modifications of fishing practices. Indeed, the government had already provided such assistance through providing training in alternative fishing methods. However, the success of such support was limited, as trainees lacked access to the fishing gear required to adopt the alternative method.

- Beyond supporting modifications of fishing practices, the government has also responded to fisheries declines by restricting access to fishery resources. While the intentions of such restrictions were supported in theory, many fishers feared they may add further pressure to their livelihoods and should be accompanied by support for alternative livelihoods.

- NGOs have also played a role in responding to fisheries decline through conservation projects, such as a turtle monitoring project in Dieppe Bay. While restricting access to turtle harvesting, this project has also established alternative income sources in turtle monitoring and tour guiding, benefiting local households.

**The significance of livelihood diversification**

- Evidence suggests that livelihood diversification represents an important means of offsetting risks and responding to seasonal, short-term and long-term changes. This was apparent in the way individuals and households depended upon a diversity of activities, both within fisheries and combining fishing with employment in other sectors, notably tourism and agriculture.
Implications for Understanding and Action

Combining an understanding of coral reef dependency, change and response to change provides a picture of livelihood vulnerability for Dieppe Bay and Jessups, from which a number of key insights emerge:

- Coral reefs and the services they provide to households in Dieppe Bay and Jessups are undergoing considerable change. In both research sites this change was linked to the long-term loss of provisioning services as a result of the decline in coral reef-associated fisheries, which in part was perceived to be driven by the degradation of coral reef resources. It was also linked to the long-term growth in use of cultural services as a result of the development of tourism, which was providing direct livelihood opportunities particularly in the case of Jessups. Additionally, growth in use of cultural services was driving increasing demand for the provisioning services associated with particular coral reef species of high value to the tourism market.

-Overlaying these longer-term changes, households in both research sites were also exposed to a multitude of short-term, sudden and unpredictable changes, as well as cyclical, or seasonal changes in availability and access to coral reefs and the services they provide. While seasonal changes expose households to predictable declines in access to coral reefs, sudden changes may be severe and result in a total loss of access to coral reef services (e.g. hotel closure due to hurricanes, or uncertainties of tourism market).

Significantly, it is exposure to this combination of changes operating over different time scales which act to shape livelihoods; leading to livelihood insecurity over the short, medium and long-term.

- Fisheries and tourism dependent households are sensitive to change in coral reefs and the services they provide. For fisheries dependent households, this sensitivity is associated not simply with dependence on employment and income offered by coral reef-associated fisheries. Significantly, in both research sites fisheries dependence was also important for subsistence and food security and was valued socially as a source of tradition, recreation and reciprocity.

- Household sensitivity is not static, but varies according to seasonal changes in dependency, such that households may be particularly sensitive to changes in coral reef services at particular times of the year, due to high levels of dependence at those times (e.g. high dependence on tourism employment or markets for fish products during the peak tourism season). Households may also find themselves highly sensitive to changes in coral reefs as a result of sudden dependence on coral reef services as a safety-net. This was particularly associated with periods of sudden unemployment in both research sites, which in turn was linked to the economic recession and particularly the loss of work in construction.

- Examining the way in which households have responded to changes in access to coral reef services and the factors which have influenced these responses, provides insight to households’ capacity to adapt to coral reef changes in the future. In terms of factors which have supported response to change, case study evidence indicates that, within households, access to a diversity of livelihood activities and resources (e.g. skills or a range of natural resources) is often critical, particularly in relation to seasonal or sudden change. Significantly, access to coral reef resources as a keystone resource in response to seasonal
changes, or as a safety-net in response to sudden change appears to be important for some households. In addition, through experience of repeated exposure to sudden change, such as hurricanes, evidence suggests some households have developed skills and attitudes to managing risk, which make them more resilient to such change in the future.

- In terms of factors which have constrained households’ ability to respond to change, there was evidence that households’ perceived there to be a lack of clear livelihood alternatives to fisheries dependence. This was further frustrated for some fisher households, who could not envision alternatives to fishing, or who perceived there to be few viable opportunities within tourism. Indeed, as an alternative to fisheries dependence, tourism opportunities are subject to significant risks associated with the impacts of hurricanes and the unpredictable nature of the tourism industry. Moreover, there was limited evidence of external support facilitating household livelihood change. In addition, wider changes, such as increasing fuel prices, have acted to limit the viability of existing modification strategies among fishers coping with declining fisheries.

- Given this understanding, vulnerability to change in coral reefs is likely to be particularly acute among fisheries dependent households, who hold strong traditional ties with a declining fishery and who additionally have limited access to livelihood alternatives, or to any external support to develop alternatives. Moreover, for these fisher households any restrictions in access to coral reef resources potentially risk amplifying their vulnerability. In addition, those households who may suddenly become sensitive to coral reef change as a result of safety-net dependence, may also find themselves increasingly vulnerable due to any changing access arrangements, or fishery restrictions. Critically, this represents a group whose interests and vulnerability risks being overlooked, due to the sudden and often temporary nature of their dependence.

This understanding suggests three critical implications for any practical or policy response to changes in coral reef services

1. Addressing livelihood vulnerability to coral reef change needs to understand the varied nature of exposure over the short, medium and longer-term and the way in which these different layers of change act together to shape households’ dependence and their capacity to respond to future change. In particular, evidence suggests there may be value in understanding households’ responses to seasonal change or repeated sudden changes, such as hurricanes, as a potential source of resilience for longer-term change.

2. Restricting access to coral reef resources as a means of responding to declining coral reef health, needs to recognise the varied and non-monetary nature of fisheries dependence and in particular the role of coral reefs as a keystone resource or safety-net, which provide critical sources of livelihood security. Such recognition demands that restrictions to coral reef resources be accompanied by support to build livelihood resilience, enabling households to find alternative means to cope with seasonal and sudden changes and attain long-term livelihood security.

3. Any support for developing alternative livelihoods must be grounded in an understanding of livelihood realities and capacities to change as well as people’s own visions for the future and an appreciation of the wider factors constraining adaptive capacity. In this respect it is
significant to acknowledge the limitations of tourism as an alternative livelihood, associated with its exposure to sudden and unpredictable changes and its continued sensitivity to coral reef change.

4. Acknowledging that change and uncertainty are a central and continuing part of people’s lives, it is essential to build people’s resilience for an uncertain future. To succeed in supporting coral reef dependent households build resilience, policy decisions need to be flexible, adaptive and integrated across sectors, recognising the significance of the wider economy for people’s livelihoods which draw upon multiple sectors, from fisheries to tourism, farming and construction.
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