

# ANGUILLA FISHERIES DEVELOPMENT PLAN

Department of Fisheries and Marine Resources

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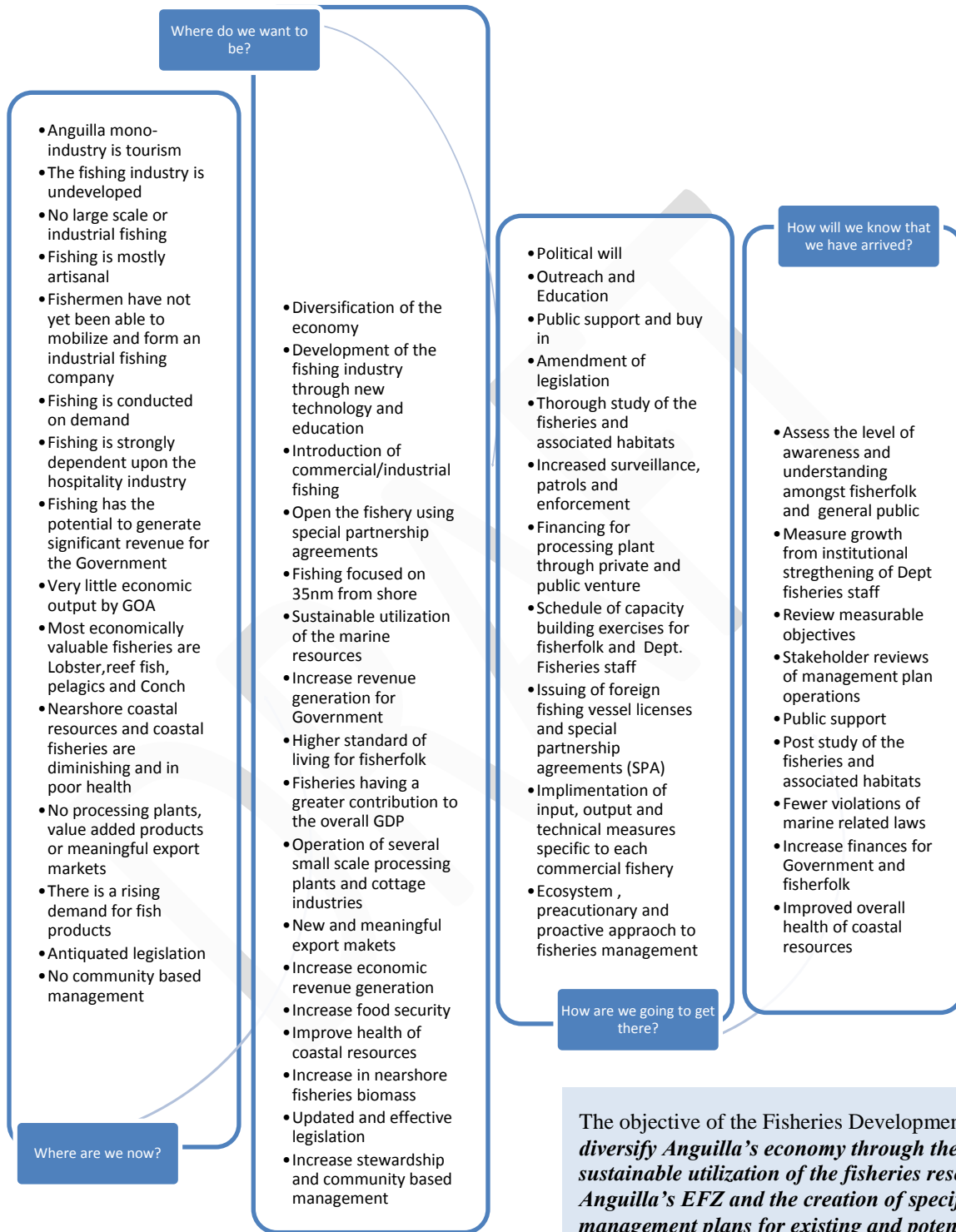
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# Executive Summary

## Anguilla Fisheries Development Plan



**The objective of the Fisheries Development Plan is to *diversify Anguilla's economy through the optimal and sustainable utilization of the fisheries resources in Anguilla's EFZ and the creation of specific management plans for existing and potential fisheries.***

## Keywords and abbreviations

AFDP – Anguilla Fisheries Development Plan

AMMP – Anguilla Marine Monitoring Programme

CNFO – Caribbean Network of Fisherfolk Organization

CRFM - Caribbean Regional Fisheries Mechanism

DFMR – Department of Fisheries and Marine Resources

EFZ – Exclusive Fishing Zone

ELF – Eradication of lionfish tool

FAD – Fish aggregation device

FAO – Food and Agriculture Organization

FCDC – Fish catch data collection

GDP – Gross Domestic Product

GOA – Government of Anguilla

ICCAT – International Convention on the Conservation of Atlantic Tuna

MPA – Marine protected area

OECS – Organization of the Eastern Caribbean States

OSPESCA - Organization of Fishing and Aquaculture in Central America

PMS – Permanent markers

SCUBA – Self-contained underwater breathing apparatus

SPA – Special Partnership Agreements

Chummed – Fish bait, chopped up or grinded and thrown in the water to attract fish

Demersals – Fish that live and feed on or near the bottom of the sea

Dimorphism – Males and females of the same species exhibit different characteristics other than their sexual organs themselves

Diurnal – Animals that are active during the day light (opposite nocturnal)

Land/Landing site – The action of bringing fish from the sea to the land/the area where the fish is brought to land

Pelagics – Fish that live and feed away from the bottom of the sea, they occupy open Ocean

**Acknowledgements**

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# 1 INTRODUCTION

Anguilla is the most northerly of the Leeward Islands, geographically positioned at 18.22° N, 63.07° W. The island measures 35 square miles- 16 miles long and 3 miles wide; and has a geological make up of predominantly coral and limestone. The highest elevation on the island is 213feet (65 metres), while the rest of the island and its surrounding cays are relatively flat. Anguilla's closest neighbour is the French and Dutch sister island St. Martin-St. Maarten, 11 miles to the South. The main economic driver on the island is tourism, but fishing as a small industry also generates direct revenue for more than 200 of the 14,000 residents of Anguilla. In 1987, the gross domestic product (GDP) of Anguilla through fisheries contributions was EC\$2.55 million, in 1981, it was EC\$5.1 million. Preliminary analysis suggests that fishing contributed roughly 2.26% towards the GDP in 2012. Fisheries contribution to the islands GDP has the potential to be higher, and as the industry stands, there is room for improvement that would enhance the Government of Anguilla (GOA) and the nationals' social and economic positions.

The 1987-1997 'Anguilla Fisheries Development Plan' by Albert Stephenson; the Strategic Plan for Management of the Fisheries Sector of Anguilla by Peter Murray; the Strategic Business Plan 2007-2010 and the Strategic Business Plan 2011-2015 by the Departments former Director Department of Fisheries and Marine Resources (DFMR) Mr. James Gumbs was used as a guide to prepare this document, as well as the fisheries development plan concept documents by the Mr. James Gumbs and input from fishers and other stakeholders. The 2015-2025 Anguilla Fisheries Development Plan (AFDP) is essential because it provides guidance for concerned parties, especially the GOA, on the desired direction of the industry; it is a current document that reflects the present situation and the needs of the island. While the AFDP directly seeks to promote sustainable fishing practices in Anguilla's Exclusive Fisheries Zone (EFZ), it will also addresses two of the key contributors of declining coral reef health and integrity: unsustainable fishing activities within the nearshore and coastal development. The AFDP would support proposals for projects needing external funding and the GOA submissions for grants.

This AFDP, which is also a national fisheries policy, will serve the purpose of strategically laying out the plans for developing the fisheries sector; it should be an aid in influencing Government decisions; a guide for fishers wanting to enter the industry, or develop their trade; and a vital resource for persons interested in information about the fishing industry of Anguilla.

The DFMR was tasked with writing the AFDP, as stipulated in the Revised Regulations of Anguilla Fisheries Protection Act R.S.A.c F40, 15 December 2000, part 5 22.(1), " the Chief Fisheries Officer shall prepare and keep under review, a plan for the management and development of fisheries." It was most fitting for the DFMR to write the AFDP because of the Departments mandate and mission. Operating mainly under three units, namely: Fisheries Management; Coastal Resources Management and Marine Parks Management; the mission of the Department is to "*manage and regulate the use of Anguilla's fisheries and marine resources, in a sustainable manner, for the maximum economic and recreational benefit for the people residing in Anguilla.*" This mission statement is at the forefront of the AFDP, and it is from this and the Governments' four national development goals: Restoring macroeconomic stability; stimulating sustainable & diversified economic growth; providing supporting social development and social protection; reducing environmental vulnerability, that all strategies and recommendations within this plan stems from.



## 1.1 Legislation and enforcement

The existing legislation which guides the local fisheries and operations of the DFMR are the Fisheries Protection Act of 1986, the Fisheries Protection Ordinance of 1988, the Marine Parks Act 2000, and most recently the Convention on the International Trade in Endangered Species Act 2010.

Regarding roles and responsibilities, the lead agency responsible for marine capture fisheries management is the DFMR. This responsibility is shared with the Attorney General's Chambers and Judicial Office. The Marine Branch of the Royal Anguilla Police Force also assumes responsibilities as an enforcement authority for marine fisheries related issues. There are no local/community managed areas for any of the fisheries. The current legislation does not provide specific guidance on management tools and approaches, a formal process and fixed timeframe for implementation. Furthermore, with the exception of Sea Turtles, *P. argus* and *P. guttatus*, no management measures and regulations for individual fisheries are specified, and the legislation does not stipulate that management decisions be based on information derived from: biological analyses, stock assessments, economic analyses, social impact analyses, ecosystem analyses/assessments, monitoring, or enforcement activities. Enforcement and prosecution activities, whether involving local or foreign fishing activities are currently handled by the Magistrate Court System. Specific provisions for illegal fishing by foreign vessels include seizures and fines. One of the difficulties and weaknesses with enforcement is that DFMR Officers do not have powers of arrest and there is no on the spot fining system.

Specific legislation for some fishing methods/tools exists at the national level and has been put in place under the Fisheries Protection Ordinance of 1986 and the Fisheries Protection Regulations of 1988. Such legislation serves to provide both a legal and administrative framework for the management of marine captured fisheries in Anguilla, and is focused primarily on the national system. However, the legislation does not provide a definition of the term 'fisheries management', nor does it list objectives for the management of marine captured fisheries. It does not grant the fisheries management authority the legal power to meet the priorities and obligations of international agreements/conventions, regional agreements, or other multi-lateral arrangements. This situation may be related to Anguilla's status as a British Overseas Territory and the lack of political will to amend legislation.

Several pieces of non-fishery legislation and informal agreements exist and are known to impact fisheries management in Anguilla. Among these, the major ones include Convention on International Trade in Endangered Species (CITES); the Biodiversity and Heritage Conservation Act; the Ramsar Convention on wetlands; and the Air and Sea Ports Act.

There are informal agreements and associated relationships that Anguilla is signatory to, they help with setting goals and objectives for Anguilla, build capacity within the DFMR and amongst fishers. They are avenues to access professional assistance and gain recognition on regional and international scenes. The objectives and recommendations of these organizations were also carefully considered in the AFDP towards the conservation of fish. Some of these regional non-binding agreements and relationships include: Anguilla's associated status with the Organization of the Eastern Caribbean States (OECS) and the Caribbean Community (CARICOM), which binds the island to upholding the St. George's Principles for Environmental Sustainability of the OECS; the FAO Code of Conduct for Responsible Fisheries; as well as the CARICOM Regional Master Plan for Sustainable Fisheries Development, which encourages

CARICOM member states to focus on sustainability and community-based management (CARICOM 2012). Additionally, the Eastern Caribbean Regional Ocean Policy and the OECS Fisheries Management and Development Strategy and Implementation Plan, which has four aims for fisheries development and management in OECS countries: management, diversification, sustainability, regional capacity (OECS 1999).

Fisheries management recommendations from the Caribbean Regional Fisheries Mechanism (CRFM), Caribbean Natural Resources Institute (CANARI), renders assistance for capacity building; Caribbean Network of Fisherfolk Organization (CNFO) and the Western Central Atlantic Fishery Commission (WECAFC); the exchange of data with the International Commission for the Conservation of Atlantic Tuna (ICCAT), via CRFM; CARICOM Common Fisheries Policy, which was created to encourage effective cooperation and collaboration among participating parties in the conservation, management and sustainable utilisation of the fisheries resources and related ecosystems in the Caribbean region, in order to secure the maximum benefits from those resources for the region (CARICOM 2011). The goal is to establish appropriate measures for: the conservation, management, sustainable utilisation and development of fisheries resources and related ecosystems; the building of capacity amongst fishers and the optimisation of the social and economic returns from their fisheries; and the promotion of competitive trade and stable market conditions' (CARICOM 2011).

## **2 BACKGROUND**

In the 1900's the WGS 72 Datum system was used to establish the EFZ of Anguilla. In 1981 Commissioner Charles Henry Godden, proclamation established a fisheries zone contiguous to the sea of Anguilla on 18<sup>th</sup> November, 1981 (GOA Fisheries Protection Act 2000). The extent of the EFZ stretches to 200nm in the north, it covers an entire 85,500km<sup>2</sup> (figure 1). It is one of the Caribbean's largest EFZ and most advantageous, with Anguilla being the furthest to the north of the Leeward Islands. Regardless of the expanse of waters to exploit for fish, the historic and existing fisheries has always remained nearshore, going to about 35-40 miles and utilizing only the 2,000km<sup>2</sup> of submerged shelf around the island.



Figure 1. Anguilla location in relation to the other Caribbean islands (Kong 2008)

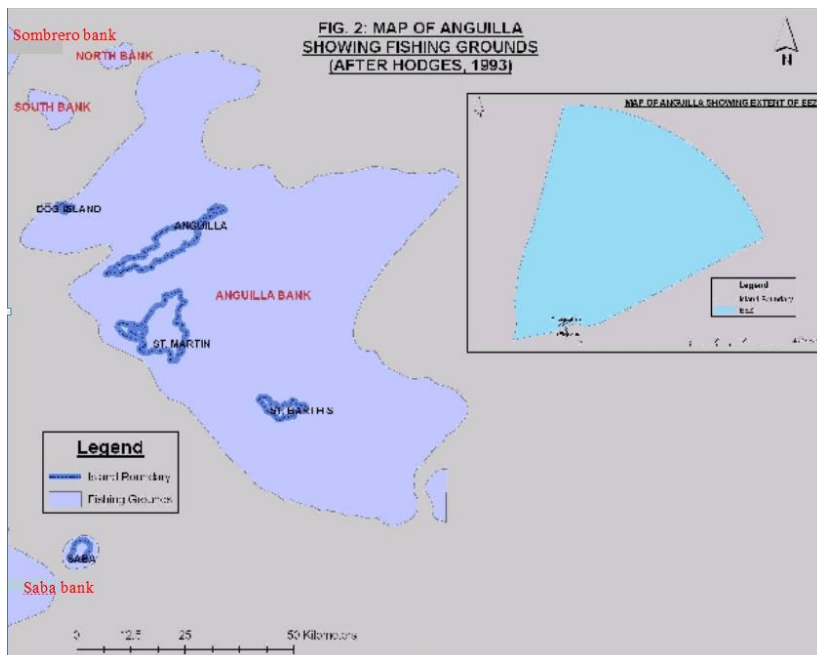
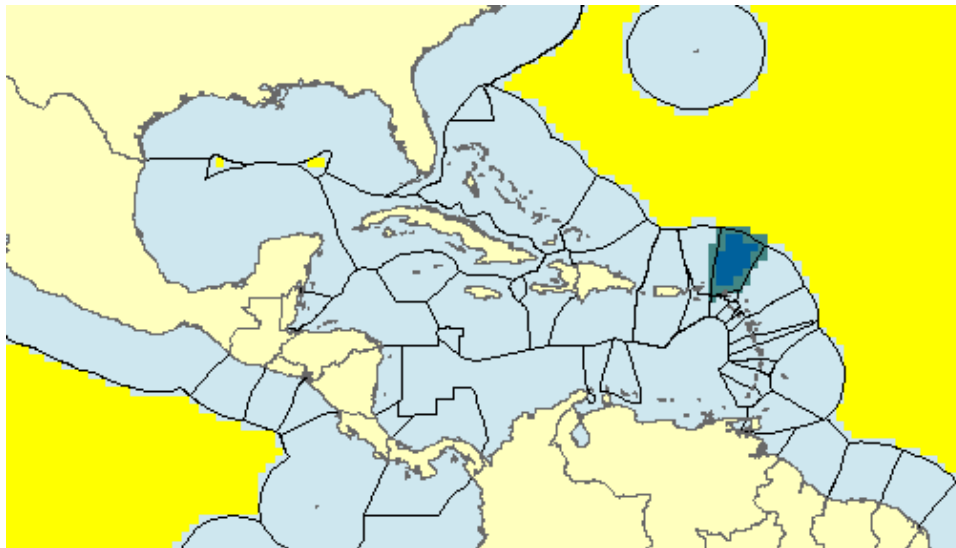


Figure 2. Map of Anguilla fishing grounds and extent of the EFZ (Kong 2008)



**Figure 3. Anguilla exclusive fisheries zone in comparison to some of the neighbouring islands, represented by the dark shade of blue on the map (Sea Around us Project accessed November 2015).**

## **2.1 Fishery and fleet description**

Prior to the introduction of the hospitality industry in Anguilla around the late 1960's, the main fisheries were Snappers and reef fish. Lobsters were caught to bait fish traps and for export to St. Martin/St. Maarten, Puerto Rico and the United States Virgin Islands. The largest fishing community at the time was Island Harbour. Once tourism on the island gained momentum, the supply of Lobsters could hardly meet both the local and export market, hence, the fishery shifted to almost 0% export. As it is today, more than an estimated 60% of fish products sold on island are local, and there is no importation of Caribbean Spiny Lobsters.

Another major advancement that the hospitality industry afforded the fishing industry was an incentive to fish for large pelagics, some of the targets being Tuna (various species), Wahoo, Blue Marlin and Dolphinfish (Mahi Mahi). Nevertheless, unlike the Lobster, Snapper and reef fish fisheries, the local fishing industry was and still is unable to fulfill the restaurant needs for pelagic fish; as a result many of them are imported.

Today, the main captured fisheries include Jacks/Scads, Sharks and mixed reef fish such as Hinds, Grunts, Parrotfish and Surgeonfish. Snappers, Tuna, Wahoo, Mahi Mahi, Caribbean Spiny Lobster and Spotted Spiny Lobster. The Queen Conch is also an important commercial species. Some fisheries with potential commercial value include: the invasive Lionfish, Sea Cucumber, Sea Urchins, Flyingfish and Eels. Currently, the Caribbean Spiny Lobster is the most valuable species financially. Its economic value and commercial demand is higher than the other mentioned species. Although there is currently a moratorium on all species of Sea Turtles in Anguilla waters, it is important that these species be covered under the fisheries development plan. Historically it was a very important fishery, tied to traditional food and culture. Stephenson (1987-1997) Development Plan recommended a five year moratorium, comprehensive research on Sea Turtles and the development of a hatchery. The moratorium which was implemented in 1995 was extended for an additional 20 years and will expire in 2020; therefore Sea Turtles must be included in the AFDP.

The fishing industry of Anguilla is still very much undeveloped, in the sense that there is no large scale or industrial fishing. Fishing is mostly artisanal. Fishermen on the island have not yet been able to mobilize and form an industrial fishing company, fishing is conducted on demand, strongly dependent upon the hospitality industry and the formation of a union or association has been challenging. Fishers have not yet recognized and accepted the benefits of a middleman in the industry and the majority of them continue to be ‘the fisher, the marketer/salesman and bills collector.’ There is one small scale fish market on the island that engages only in scaling and gutting of fish. Furthermore, technology, boats and equipment used are mundane. Less than an estimated 30% of fishers utilize GPS and electronic safety devices such as E-pubs/SPOT.

There have not been a rise in the number of fishers entering the industry, but what is unique about Anguilla’s fishing industry is that it is dominated by many young fishers. In 1987 there were 355 fishers and in 1993 there were 400 fishers (Mahon et al 1996). For the 2014 licensing period, there were 130 licensed seasonal fishers and 84 licensed vessels.

There are currently three, ~14m operational trawlers on the island which are powered by inboard diesel engines. Besides those, the majority of the boats are primarily wood and fiberglass, open hull vessels, powered by outboard engines, Their sizes range from 5m – 15m, most of which are constructed locally.

The fishing methods employed includes: purse seines, handline fishing, Antillean or Z designed fish and Lobster traps, spearguns, vertical longlines, FADS, and rods. SCUBA and skin diving is employed for fishing Conch and Cray Fish respectively. Fishing efforts per vessel has drastically increased. Olsen and Ogden (1982), stated that there were fifteen fish traps per boat in 1982 and Stephenson (1987) estimated twenty five per vessel, compared with today where there are an estimated 200 per vessel, which is usually a mixture of fish and Lobster traps.

Annual fish productions in 2012, based on landings were: reef fish 300-450mt, with gross earnings of EC\$500,000.00 annually; Lobsters 100-150mt, with gross earnings at EC\$200,000 and Conch 30-60mt, with gross earnings at EC\$600,000.00. The annual productions in 2013 were 652mt with gross earnings of EC\$22,236,785.00 and in 2014 annual production was 752mt and gross earnings were EC\$25,149,336.00.

## **2.2 Current situation analysis**

There are four categories of economically important fisheries on the island, for which management or direction for their development must be provided. Anguilla also has an EFZ of 85,500 Square Kilometres and this entire area is not being used by Anguillian fishers. The EFZ has resources of reef fish, Lobster, Conch and pelagics; fortunately the economic potential of these fisheries has been recognized. There are also barriers to their development and the development of the industry as a whole. Addressing these challenges (listed below), is paramount to advancing the fishing industry:

- ✚ Fish products are only marketed locally, surpluses are iced and shipped to St. Martin/St. Maarten in coolers
- ✚ Suitable markets needs to be sourced
- ✚ Although there is legislation that addresses illegal fishing, there is not sufficient resources for surveillance and enforcement, which results in illegal fishing in Anguillian waters by Caribbean French and Dutch Nationals, Taiwanese and other unknown countries

- ✦ The capacity for control, monitoring and surveillance of local fishing and of fish landings are currently limited
- ✦ There are no value added products made from fish or their derivatives
- ✦ There are no large scale storage and processing facilities on the island
- ✦ Other than issues with storage, cultural practices might be a deterrent to local fishers engaging in large scale fishing/industrial. For example many locals may not want to venture far and many share the same distasteful sentiment for overnight fishing
- ✦ Fishers do not have the knowledge and skills required to conduct deep sea fishing or alternates to reef fishing
- ✦ Cost of fuel is high
- ✦ Bait used in deep sea fishing is expensive and not always readily available
- ✦ The landing sites in Road Bay and Cove Bay are in need of a port fuel station
- ✦ Unsustainable and inefficient fishing methods/tools should be abandoned
- ✦ There is a need for an European Union (EU) standard fish market to ensure the best sanitary conditions of fish be consumed locally or exported
- ✦ Fishery and gear quotas do not exist
- ✦ Inland fisheries, aquaculture or aquaponics are not practiced on the island to alleviate nearshore fishing pressure

Despite the relative importance of the fishing industry to the livelihoods of many Anguillian's, its contributions to the economy and GDP is lagging far behind the top contributors of hotels and restaurants, real estate renting and business activities, transport storage and communications, construction mining and quarrying, and financial intermediation. Some fishery resources of Anguilla are underutilised and therefore the industry has the potential to contribute more to the economy of Anguilla. Also the tourism industry continues to grow, and with this growth the demand for fish products in Anguilla will rise. Therefore, in addition to contributing to the diversification of Anguilla's economy, this AFDP also addresses the issue of the rising demand for fish products and the already high and increasing imports of them.

The rising demand for fish products in Anguilla is placing more pressure on the heavily fished nearshore coral reef fish resource. It is hoped that by providing local fishers with training in new fishing techniques, fishers will move away from the coral reef fisheries and into the underutilised offshore pelagic and deep slope fisheries. It is important that fishing is minimized in the nearshore coral reef areas, by more than 50%, as research in Anguilla has indicated that Anguilla's coral reefs are in a poor state of health (Gumbs K 2012). Overall, hard coral cover is low and the reefs are dominated by high levels of macroalgae (Gumbs K 2012). In 1990, the mean percentage of hard coral cover was 13.95% (Gumbs J 2012). 2010 benthic surveys, however, indicate that the percentage of hard coral cover had dramatically declined to approximately 4.1% (Gumbs J 2012). Furthermore, anecdotal data collected from fishers indicate that fish catches in the nearshore coral reef areas have been in decline over the past fifteen years (Gumbs J 2012). Furthermore, given the uncertainty of climate change and its potential impacts on critical marine habitats; it is important that certain steps are taken, such as the reduction of fishing on coral reefs, and stricter guidelines for coastal developments to reduce the potential, negative impacts of climate change on these critical marine habitats.

### **3 OBJECTIVES**

The overall objective of the AFDP is the diversification of Anguilla's economy through the optimal and sustainable utilization of the fisheries resources in Anguilla's EFZ and the creation of a management plan for existing and potential fisheries. This is expected to enhance the fiscal position of the GOA; improve lives, through raising the standard of living of fisherfolk families; strengthen food security and coastal protection; increase the islands resilience to a changing climate and increase the protection of Anguilla's marine habitats, including coral reefs and seagrass beds.

#### **3.1 Purpose**

The purpose of the AFDP is to enable the GOA to maximize revenue collection from the optimal and sustainable exploitation of Anguilla's fisheries resources. The implementation of the AFDP Action Plan would result in increased economic gains for fishers from the fisheries, as the much needed fish processing and storage facilities, where fishers would be able to sell their catch would be provided. Fishers will also benefit from training in new fishing techniques that will enable them to target under-exploited offshore and deep sea demersal fish resources within Anguilla's EFZ.

The guidelines/recommendations outlined in this AFDP should lead to the following outputs:

- ✚ Increased sensitization, stewardship and understanding of the marine environment
- ✚ Diversification of the Anguillian economy
- ✚ The protection and preservation of Anguilla's nearshore marine habitats
- ✚ The optimal utilization of Anguilla's fishery resources
- ✚ The ability for the country to meet the increasing demand for fish products locally, as well as to develop an export market for fish products

#### **3.2 Realization of objectives**

To achieve these objectives, the AFDP Action Plan would be divided into stages (listed below) and a step by step or staged approach in order of importance should be employed.

1. Amendment of legislation (Biodiversity and Heritage Conservation Act, Cruising Permit Act, Customs Act, Environmental Health Protection Act, Fisheries Protection Act and the Marine Parks Act)
2. Conduct a desk study and field pilot project to ascertain fish stock and diversity data within the 200nm to the north of Anguilla and a market feasibility study
3. The results of the desk study and pilot project would be used to design a quota system with the intent of opening the fishery to foreign fishing fleets at a cost, only to engage in longline fishing. Following the proper due diligence on interested parties, the GOA should consider the granting of licenses with an expiration date in less than five years of issuance. The cost of the license should be dependent upon the predetermined quota and value of the target species. Monopolies should not be allowed, and one company or fisherfolk should not be given a license for more than three vessels for a given licensing period. Individuals or companies should be required to submit fish catch data to the DFMR weekly. Failure to comply or falsifying any information should result in revoking of the license. The number of licenses granted should be governed by the allotted annual quotas for each stock. It should not be mandatory for fish to be landed in Anguilla, but vessels should be subjected to random landing calls and on sea boarding. The above

guidelines should form part of the pilot project to allow amendments at the end of the pilot.

4. Implement, with assistance from the British Government, a surveillance and enforcement programme for the EFZ
5. Design and erect an EU certified processing plant. This will increase fish shelf life and marketing opportunities during the slow season; can give fishers an extended period of time to fish, especially if a middleman is involved with doing business with fisherfolk and the fish processing plant; a processing plant would also be a storage facility for when there is a glut in the market and a central place for buying and selling. It would be designed and operated to meet international standards, making the exportation of fish products easier; provide opportunities for the introduction of value added products; and aid in the organization and power of the fishing industry.
6. A well designed/ schedule of training programmes to prepare local fishers for deep sea fishing, to help build capacity, so that they would be able to exploit the 200nm north skilfully, engage in alternative fishing methods and fisheries, how to manage finances effectively and make smart investments and build stewardship.
7. Implementation of the above programmes with the assistance of local fisherfolk
8. Training in enforcement and surveillance for DFMR and Royal Anguilla Police Force
9. Institutional strengthening of DFMR and The Environmental Health Unit (EHU). Individuals from DFMR and EHU would be properly trained in fish hygiene and best practices for fish. Institutional training for the DFMR also includes the addition of staff to a compliment of fourteen. And should include a second Marine Biologist, a Fisheries Biologist and a Research Specialist.
10. Acquisition of a DFMR/Government owned building for DFMR. Besides inadequate staffing to effectively carry out current and future demanding needs of the Department, as the industry grows; DFMR staff needs to be incentivized. Simple things such as a DFMR owned building with adequate space and needed facilities including a lab can make the working environment a better place. If the DFMR owned their own building they would be able to take on new research projects, such as back yard aquaponics, fresh water and salt water experimental stations and lab work.
11. Specifically divide DFMR up into an Enforcement Unit, Outreach Unit, Fish Catch Data Collection (FCDC) and Statistical Analysis Unit, Coastal Resources and Marine Parks Unit.
12. There is also a need for a new patrol and research vessel and an additional vehicle.
13. More than 50% of the goals in the DFMR strategic business plan 2007-2010 by Gumbs J. (2007) have been accomplished. Some that are still outstanding are: the revision of the 2000 Fisheries Protection Regulations; preparation and implementation of management plans for the marine parks (one is currently being prepared to Government approval), implementation of a water quality monitoring programme.
14. The DFMR strategic plan (Gumbs J. 2007) will be revised for the current period, as the former plan expired in 2010.



### 3.2.1 Time frame and action plan for the objectives

**Table 1. Two year action plan, designed to aid in the smooth implementation and operations of the AFDP (adopted from ‘Development of the fishing industry in Anguilla Concept Note.’ Gumbs J 2012). The proposed deadline dates are the dates by which the plans, human and technical resources and discussions should be finalized/agreed upon.**

<b>Primary output</b>	<b>Things to be done</b>	<b>Deadline date</b>	<b>Resources needed and possible sources</b>
Amendments to legislation	Amendments made by Attorney General	December 2015	Local political will and assistance from CRFM
Industrial fishing vessel test programme/pilot	Identify a company or an individual who is willing to undertake a pilot study to aid in stock assessment studies	December 2015-2016	Suitable, trustworthy, knowledgeable and capable company or individual to undertake the project. Personal financing
Increased and broader range surveillance and law enforcement	Request training assistance and actual surveillance tools from UK. Determine the extent & level of illegal fishing through a desk study	January 2016	Special project funding through the Governor’s Office or the FCO and Capable, willing and affordable institutions
Quarterly programmes geared towards fisheries and fishers development e.g. cottage industry courses in table top fish processing, money management, fish aggregation devices construction and deployment and sea moss farming etc.	Design and schedule programmes, source instructors and advertise the sessions	February 2016	Human resources. Anguilla Community College, Anguilla Development board (ADB) and CRFM
Consultation on fish processing & storage facility	Identify a consultant to design a processing plant, and procure the necessary equipment and contractor for the processing plant	March 2016	Financial resources needed. GOA, FAO, CRFM
Design and implementation of an industrial/foreign fishing licensing regime/SPA (Special partnership agreements)	Sort approval from Executive Council	April 2016	Political will
Implementation of Marine	Organize a community	June 2016	Human resources for

Protected Areas Management Plan	based management group and get the support and acceptance of the MPA Management plan by the Executive Council		management and monitoring. Project funding through Defra, Blue Marine, PEW and FCO etc.
Institutional strengthening of DFMR	DFMR staff and other interested persons trained in fisheries biology; fish safety and hygiene; operations of fish processing and sales and in fisheries statistics	September 2016-2017	Suitable training institution(s). Support from Public Administration, CRFM and available scholarships
Introduce Marine Biology as a subject area in the public high school	Meet with Education stakeholders and design a program	September 2016	Political will
Fully functional processing plant	Market and manage the plant	December 2016	Finances and reliable and skilled staff. GOA and private sector company financing
Granting of SPA and foreign fishing licenses as part of a pilot project	Marketing and management of the system	January 2017	Human resources needed for monitoring and management
Full implementation of foreign fishing licenses and SPA	Marketing and management of the system	December 2017	Human resources and digital surveillance systems needed for monitoring and management
At least five fully operational cottage industries involved in export of value added fish products	Provide technical and financial support for interested persons or companies	December 2017	Financial and human resources needed. Funding through Anguilla Development Board

### 3.2.2 Special partnership agreements & licensing

The crux of the AFDP is revenue generation, the SPA and licenses have the potential to generate over EC\$286,000.00 annually, dependent on the species and quota. Hypothetically, if one foreign industrial license is based on 10% of the fishing value for Yellowfin Tuna fishery, at a given quota of 25,000lbs, at EC\$21.44 per lbs (selling cost); 10% of EC\$21.44=\$2.14, \$2.14 X 25,000 = EC\$53,500.00, from one license, per year towards GOA revenue. This is just one hypothetical example, based on one of the most lucrative fisheries.

Through thorough analysis of existing data and data collected from a proposed pilot study; if the results are favourable and beneficial economically and environmentally, notwithstanding a cost benefit analysis, the DFMR will strongly advise that the GOA design SPA and industrial licenses

to individuals or companies to fish in the underutilized 200nm EFZ north of Anguilla, proposed at more than 40nm from Anguilla.

Although a desk and pilot study is now recommended to determine the stock and diversity of fish in the EFZ, to support an industrial fishery for Anguilla, a similar study was done in 1995/1996, ‘The Pilot Project for Longline Fishing for Pelagics in Anguilla EFZ.’ This project focused on retrofitting local vessels to exploit the EFZ and taught fishers about longline fishing. At the end of the project, the report by R. Mahon (1996) stated that they found sufficient evidence of potential for development of a longline fishery for large pelagic fishes in Anguilla. Further to that, in conversation with local Master Fishermen who participated in the above mentioned pilot project, they described how abundant the fish were, so much so, that they had to reduce the number of fishing hours because the amount of fish they caught glutted the market and there was insufficient storage space on the vessel and at the facilities on land..

There have been reports and tangible evidence of vessels fishing illegally in Anguilla’s EFZ. In the mid 1990’s ICCAT data showed that Taiwanese vessels fished to the north of Anguilla in the EFZ, for Albacore Tuna. In conversation with fisherfolk and fisheries authorities of the neighbouring French Caribbean (St. Martin, Guadeloupe and Martinique), they reported sightings of fishers not appearing to be Anguillian’s catching fish in the north of Anguilla in the EFZ. Anguilla would benefit tremendously if the proper surveillance measures are put in place and a licensing regime is implemented to have all fishers engage in the fishery legally.

Anguilla’s EFZ lies across the migration path of pelagics such as Yellowfin, Skipjack, Blackfin and Albacore Tuna, Swordfish, Kingfish and Mahi mahi, which move between the Western and Atlantic Ocean, the Caribbean and the Gulf of Mexico annually (Mahon 1996). From December to May local landings of pelagics are highest. Local fishermen knowledge concurs that the recent influx of *Sargassum* algae is believed to be the impetus for the increased number of pelagics, especially Mahi mahi; although there is no scientific evidence to prove this.

A SPA and a licensing regime can be modelled from an established properly functioning system in the region. Islands such as St. Vincent and the Grenadines, Dominica, Jamaica and St. Kitts utilize such systems. Assistance can also be garnered from fisheries authorities in the Falkland’s, Norway or the British. During an Interpol meeting on illegal unreported and unregulated fishing (IUU) in Lyon France 2013, initial discussions on the topic took place between Anguilla and Norwegian fisheries specialist. Norwegian fisheries specialist explained how Norway established their licensing regime and expressed interest in assisting Anguilla to do the same.

### 3.2.3 Existing challenges & risk analysis

Below is a list of existing and possible challenges and risk associated with the development of the AFDP, with a focus on SPA and licensing regime. The table also proposes management solutions.

**Table 2. Number of possible risk/challenges which can be encountered with establishing SPA and licensing regime**

Possible risk/challenge	Probability	Impact	Management
No resources to effectively monitor the EFZ	High	High	Design SPA to allow random searches and costly fines for violations, joint patrols with St. Martin marine authorities as well as

			the British Military
Zoning may have to be introduced. The establishment of boundaries could be challenging socially and technically	Medium	Medium	Educate the public on the reasons and importance of the zoning and establish community based management for the areas
Limited access and complete closure in certain fishing areas	Low	Low	Educate the affected communities and find suitable alternative livelihoods for persons impacted by closures
Sufficient quantities of offshore fisheries resources are not available	Low	Medium	Perform desk and pilot study before granting licenses
Local fishers do not upgrade their vessels or use new fishing techniques	Medium	High	Ensure that sufficient training & funding sources are made available to fisherfolk
Stakeholders (including regional fisheries management bodies and neighboring islands) view the licensing regime as a threat to the industry	High	High	Have a series of educational town hall and door to door meetings, ensure that the communities are part of the planning process. Get assistance from regional fisheries bodies in developing the licensing regime and keep neighboring islands informed on developments
Targeting of nearshore fisheries continues	Medium	High	Amend legislation to support the AFDP and MPA management plan and educate fisherfolk through a series of outreach activities on the importance of protecting the nearshore resources
Lack of persons trained in conflict management	High	High	Ensure that the community based management groups and DFMR staff are trained in conflict management
DFMR does not receive additional staff, training and other resources necessary to manage the developing fishing industry	Low	High	Encourage GOA to increase the personal emoluments budget for DFMR annually. Source funding outside of GOA for training and scholarships and encourage the addition of Marine

British Government does not support the licensing regime or would not be willing to provide assistance with surveillance	Low	High	Biology as part of the secondary education curriculum
Negative pressure from conservation groups	Medium	High	Provide financial evidence as to how similar arrangements have benefited or, are benefiting other countries. Have the Governor seek permission for British ships to include surveillance of Anguilla EFZ as part of their mandate when visiting the region
			Ensure that all activities are properly documented, fish landings data are properly collected and reported and best practices in fishing methods are employed

#### 4 FISHERIES MANAGEMENT

A salient part of the development of the fishing industry is its' management. As a renewable resource, we must ensure that what is taken out, does not compromise the ability of the resource to replenish itself naturally, or weaken its ability to be resilient in a changing environment; therefore, each commercial and potentially commercial species under this development plan has been given individual/single species and multispecies management measures. The management approaches are measurable, to determine their effectiveness, hence, for all species and their associated habitats, periodic studies and constant data collection are recommended. The management plan for each species should also be considered as a working document and open to change. It is advised that they be thoroughly reviewed and updated every five years.

Below are the existing and proposed management steps, some of which require amendments to the existing Fisheries Protection Act, for established and potentially economically viable fisheries. Some of the management recommendations were derived from observed issues within some of the fisheries; using fish catch landings data; through formal and informal consultations with fisherfolk and regional and international fisheries bodies such as CRFM, FAO, WECAFC, OSPESCA and the CNFO. Some of the recommendations have also been made in non-binding agreements and treaties that the GOA has signed on to and are obliged to uphold. Not all recommendations are scientifically supported, some take a preventative /precautionary and ecosystem based approach to management.

##### 4.1 Bait fish/Silversides

Bait is chosen dependant on the fishery, and Anguilla fishermen are very well versed on what works best. The lobster fishery uses cowhide as bait combined with reef fish that might either have been caught as bycatch or targeted during fishing trips with the use of a speargun. Algae is used as bait for Doctorfish/Blue Tangs in the pot fish fishery, while other reef fish species in this fishery are targeted again using bycatch. and algae is used as bait for Doctorfish and Blue Tangs, in the pot fish fishery. Most of the other fisheries use Silversides as bait for hook and line fishing

or in chum. Silversides are in the Atherinidae family. They are a group of small schooling fish. There are several different species; however their variability, common physical resemblance and the fact that the different species school together in Anguilla waters makes it very difficult to identify them down to species level and determine which species are used as bait. Silversides Occupy shallow water, reef and seagrass areas. Fishers use cast nets to harvest Silversides.

#### Current regulations & non-binding agreements governing the fishery

There are no regulations or non-binding agreements that directly address baitfish/Silversides in Anguilla. In some of the other Caribbean islands, such as the United States Virgin Islands (USVI), a permit is required by recreational fishers to harvest baitfish using a cast net and there is a ban on bait fishing in Bermuda.

#### Objectives of the regulations

There are no regulations in Anguilla.

#### Present state of exploitation

Through observation, in conversation with fisherfolk and analysing fish catch data, there is a strong probability that there is a decline in Silversides. Fishermen recall larger catches in times past in Silversides nearshore, and blame the misfortune on overfishing and not giving Silversides a chance to reproduce. The last five years of fish catch data indicates that most fishers have been purchasing 'Japanese bait' as a substitute for the Silversides. More noticeably is the absence of the birds feeding on Silversides nearshore. Their populations may also be impacted by declining seagrass and coral reef health. The information provided and analysed data proves that Silversides have been overfished and their populations drastically reduced.

#### Objectives to be achieved in the management of the fishery

- ✚ Rebuild the Silverside nearshore stocks and maintain healthy populations
- ✚ Encourage sustainable harvesting of Silversides

#### Management and development measures to be taken

- ✚ Temporary closure of Silverside fishing
- ✚ Establish quotas for Silversides when the fishery is open
- ✚ Educate fishers on the important economic and ecological roles and biology of Silversides
- ✚ Strict management measures implemented against nearshore pollutants that may be causing degradation of seagrass beds and resulting in loss of refuge and breeding areas for Silversides

#### Monitoring, management indicators and reference points

- ✚ Increase patrols, surveillance and data collection
- ✚ Be vigilant to changes in Silverside presence through informal observations
- ✚ 25% increase in Silversides at beaches where they are historically known to occupy, e.g. Crocus Bay and Little bay

#### Management limitations

- ✚ Political will might be lacking

- ✚ Human and technical resources. DFMR has a compliment of only five Fisheries Officers and one patrol vessel, which makes enforcement and data collection difficult
- ✚ Changing people’s attitudes towards the way they fish would be difficult
- ✚ Encouraging fishers to continue substituting Silversides with Japanese bait may cause issues with the availability and affordability of the Japanese bait

**Table 3. Key dimensions for consideration with the management of bait fish/Silversides.**

Biological	Silversides are very small fish, growing to about 5.5 inches long. They spawn in seagrass beds and their eggs are deposited on the sandy bottom. They are omnivorous.
Ecological	Silversides use seagrass beds for refuge. They help to maintain the nearshore ecological balance and form the diet of many carnivorous fish and marine birds.
Social	Silversides swim in schools as a form of defence and to confuse their predators. For small fish, their rate of survival is greater in large schools.
Economic	There is no commercial value in Silversides as a fishery, but savings derived from using them as bait fish is significant.

## 4.2 Lobster

Lobsters belong to the subphylum Crustacea and are of the Nephropidae family. Some of the known species of Lobsters in the waters of Anguilla are: Copper (*Palinurellus gundlachi*), Spanish/Slippery Back/Sea Lice (*Scyllarides aequinoctialis*), Sculptured Slippery (*Parribacus antarcticus*), Ridged Slippery (*Scyllarides nodifer*), Spotted Spiny/Crayfish (*Panulirus guttatus*) and the Caribbean Spiny Lobsters (*Panularis argus*). Only the latter two are commercially important to the islands economy. Ehrhardt *et al* (accessed December 2010) in their ‘Caribbean Spiny Lobster, *Panularis argus* fisheries study,’ described the Caribbean Spiny Lobster as “one of the most economically important resources to Caribbean fisheries.”

In Anguilla the Caribbean Spiny Lobster is caught using mesh wire Lobster traps baited with cow hide and reef fish and set around coral reefs for one to three days. Sometimes fishers also target this species by snorkelling with a lobster loop. Free divers harvest the Spotted Spiny Lobster at night by hand, some fishers also use traps. Spanish Lobsters are not targeted but are brought ashore as bycatch in traps. All Lobsters play key ecological roles and should have some level of protection for their continued existence.

### Current regulations & non-binding agreements governing the fishery

Only the Caribbean Spiny and the Spotted Spiny Lobsters are protected under the Revised Fisheries Protection Act R.S.A.c F40. Fishers are prohibited from catching them if they are soft shelled/moulting (shedding their exoskeleton), egg bearing/berried and tar spotted. It is also an offense to strip the Lobsters of their eggs and/or tar spots. Both species must be landed whole and alive. Size and weight regulations under this Act only protects the Caribbean Spiny Lobster, which must not measure less than 95mm carapace length, or have a tail weight of less than 200g (processed or unprocessed).

The type of gear used in this fishery is also regulated. Fishers are not allowed to use spearguns, hookah, harpoons or any type of hook to fish for lobsters. Mesh wire used to build Lobster traps should have a mesh size of 1.5 inches or greater (generic to all fisheries).

In consideration of the sustainable use of, this important resource, and the social, economic and food security role that it plays in the Caribbean region, on the 15<sup>th</sup> May 2015, CRFM member

states (including Anguilla) signed the St. Georges Declaration on the conservation, management and sustainable use of the Caribbean Spiny Lobster. It further supported the Caribbean Common Fisheries Policy and acknowledged the objectives of the revised treaty of Chaguaramus. Some of the recommendations in this nonbinding agreement are given under the management measures to be taken.

### Objectives of the regulations

The regulations were put in place to safeguard the fishery, ensuring, safe and sustainable harvesting. Throughout a Lobster's juvenile stages they moult frequently, and once mature do so when females are preparing to reproduce. During the moulting stage, Lobsters become more vulnerable. The ban against harvesting moulting, tar spotted and egg bearing Lobsters, aims to protect the reproductive and juvenile populations, ensuring that a sustainable stock is maintained. The prohibitions on the manner in which Lobsters are harvested strive to ensure that if Lobsters are landed in violation of the regulations, they may be returned to the sea and survive.

The objective of the CRFM Lobster Declaration is to “ensure the long-term sustainable use of Spiny Lobster resources through effective implementation of conservation and management measures for the stocks and their habitats, based on the best scientific evidence available” (CRFM 2015).

### Present state of exploitation

Currently the Lobster fishery (Caribbean Spiny Lobster) is the most profitable and demanding fishery. Hodge (1993) found that the majority of fishermen that fished exclusively for Caribbean Spiny Lobster were based in Island Harbour, and the fishery involved about 55% of the islands fishing fleet in 1980. In 2015 a review of the fish catch data from landings and registration of fishers, indicated that the majority of fishers in Island Harbour (the main fish landing site) still fish for Caribbean Spiny Lobster. The area still accounts for the greatest amount of fishing vessels. There are on average twenty two seasonal Caribbean Spiny Lobster fishers and five seasonal Spotted Spiny Lobster fishers. During the high season (December-May) there is little to no export of Lobsters. Recent surveys and informal conversations with fisherfolk indicate that the nearshore Lobster populations have drastically decreased. The number of Lobster fishers however has not increased, but their efforts have. Sporadic Lobster inspections at local restaurants revealed that many fishers catch and sell illegal Lobsters.

### Objectives to be achieved in the management of the fishery

- ✚ Greater understanding of the local Lobster stock dynamics
- ✚ Discourage harvesting of illegal Lobsters
- ✚ Increase nearshore populations of Lobsters
- ✚ Create a source pool for adult Lobster populations and a refuge for juveniles
- ✚ Increase harvesting value and net incomes of Lobster fishers
- ✚ Fulfil the objectives of agreements that Anguilla has signed on to

### Management and development measures to be taken

- ✚ Thorough study of Lobster stocks
- ✚ Continuation of FCDC for Lobster landings and collaboration with restaurants to report monthly purchases of Lobsters



- ✚ The DFMR needs to be given the powers of arrest and an on the spot fining system, to be able to issue tickets to individuals and establishments that are caught with illegal Lobsters
- ✚ The established fines and penalties for Lobster violations needs to be increased to act as a deterrent to violators of the regulations
- ✚ Increased patrols, inspections and outreach activities geared towards education on Lobsters biology and wise practices
- ✚ Enforce the use of biodegradable side panel(s) on all Lobster traps
- ✚ Ban the use of all types of nets in the Lobster fishery (this currently does not take place in Anguilla, but it does in other Caribbean countries and is an unsustainable practice)
- ✚ Set quotas on Lobster catches, number of traps and number of licenses issued per year. The recommendations below, had been made based on Anguilla’s fish catch landings data, AMMP, questionnaires carried out with restaurant owners who purchase Lobsters, regional scientific studies and limits established in the USA, other Caribbean countries and in CRFM working documents, WECAFC, NOAA, FAO:

**Table 4. Caribbean Spiny and Caribbean Spotted Spiny Lobster quota system for MPA.**

<b>Fishery</b>	<b>Number of traps allowed per fisher/vessel</b>	<b>Maximum number of fishers per year</b>
Caribbean Spiny Lobster ( <i>P. argus</i> )	200	50
Caribbean Spotted Spiny Lobster ( <i>P. guttatus</i> )	150	25

- ✚ Establish in legislation size limits for the Slippery/Spanish/Sealice and the size limit for the Caribbean Spotted Spiny Lobster at 50mm carapace length (supported by the following studies: Wynne 2004, Wynne 2009, Robertson and Butler 2003, Losada-Tosteson et al 2001, Sharp et al 1997, Butler M. et al 2013)
- ✚ Establish a network of closed areas (proposed sites are the already established MPAs) that will provide refuge for Lobsters, as recommended for the Spotted Spiny Lobster by Wynne & Côté (2007)
- ✚ Amend legislation to include all Lobsters under the Fisheries Protection Act
- ✚ Enforce a complete closed season from 1<sup>st</sup> May-1<sup>st</sup> October for all Lobsters
- ✚ All Lobster traps and storage boxes should be removed from the sea during the Lobsters closed season
- ✚ All Lobster traps should be outfitted with an escape gap for juvenile Lobsters
- ✚ Prohibit the use of casitas or any other artificial Lobster habitat (exception of lobster traps) to be used for the use of harvesting lobsters. Such intentionally built and positioned structures should only be allowed in MPAs that are closed to fishing and used as fisheries enhancement devices

#### Monitoring, management indicators and reference points

- ✚ Continuation, expansion and analysis of existing studies such as the FCDC to conduct a full fishery assessment and the AMMP to monitor nearshore populations

- ✚ New studies including Lobster fishing areas, thorough focused habitat surveys, restaurant economic studies focused on Lobsters and biological studies
- ✚ Acceptance and cooperation from the public on the new regulations
- ✚ Biannual stakeholder meetings to gather public feedback on the effectiveness of the management measures
- ✚ Enforcement of regulations through increased surveillance
- ✚ Publication of offences in the local press
- ✚ Reference points should be established at 50% improvement from existing data, for sales, habitat improvement and stocks etc. within five years

### Management limitations

- ✚ Political will is needed to move the proposed measures forward and to achieve the objectives
- ✚ Human and technical resources. DFMR has a compliment of only five Fisheries Officers and one patrol vessel, which makes enforcement, data collection and analysis difficult
- ✚ Changing people’s attitudes towards the way they fish would be difficult

**Table 5. Key dimensions for consideration with the management of the Lobster fishery**

Biological	The stocks are unknown. Lobsters feed on slow moving and sedentary animals. They have very low resilience to environmental changes, reach sexual maturity after 3 years and are known to live for about 40 years.
Ecological	Seagrass beds and mangroves are nursery habitats and adult Lobsters live amongst coral reefs. Lobsters help to maintain ecological balance and form the diet of some fish.
Social	A significant amount of people in Anguilla are financially dependent on this fishery indirectly. There are historical linkages to trade between USVI and Puerto Rico before there was local demand.
Economic	Contributions from this fishery go into the local GDP, as it is the most profitable fishery. It may be the most popular dish used to lure visitors to the islands gastronomy.

### **4.3 Conch**

Conchs (Strombidae) are a Molluscan family belonging to the class Gastropoda. Some of the known species of Conch in the waters of Anguilla include: Roostertail (*Strombus gallus*), Florida Fighting (*Strombus alatus*), Hawkwing (*Strombus raninus*), Milk (*Strombus costatus*) and Queen Conchs (*Strombus gigas*). The Queen Conch is the only commercially important species. Queen Conch is harvested by divers using SCUBA or free diving equipment, usually between 10-100 feet of water in or around the grassy areas where they feed. There are approximately five vessels engaged in the Conch fishery, while other Conch fishers may swim from shore, this however limits their harvesting capabilities. Many Conch fishing trips are multispecies trips, where Conch fishers also target reef fish, by use of spearguns.

#### Current regulations & non-binding agreements governing the fishery

The Queen Conch is the only species of gastropods protected under the Revised Fisheries Protection Act R.S.A.c F40. Regulations state that it is an offence to take or be in possession of Queen Conch with a minimum shell length of 18cm/7.08 inches, measuring from the spiral tip to the foremost edge and meat less than 225grams/7.94ozs after the digestive glands have been removed. Violations are liable to a fine of EC\$5,000.00 and or imprisonment for one month. The regulations do not guard against over harvesting of adult populations, nor does it protect the

species during the reproductive season. There are no restrictions on harvesting areas and no legislation safeguarding the species' habitat or the surrounding areas.

Anguilla, as a member of CRFM, should be guided by the voluntary measures put in place under the FAO Code of Conduct for Responsible Fisheries and WECAFC guidelines on the regional Conch fishery, all of which call for closed seasons, input control measures, harvest quotas and habitat protection regulations. However, no such measures exist. In 2014 CITES was extended to Anguilla through the UK Government and as such, Queen Conch is protected under appendix II. Commercial international trade is allowed, but regulated. All imports and exports of Conch, from the wild or captive breed, (including its derivatives) must be accompanied with a permit. CITES is beneficial to the island because it provides accurate statistics of export trade in the species, but it does not regulate local trade.

Conch harvested in the waters of Anguilla is exported to the USVI and the neighbouring French and Dutch islands. The regulations that exist in these islands, as laid out in the Queen Conch Resources Fishery Management Plan (FMP) of Puerto Rico and the USVI, support harvest control. During their close seasons Conch cannot be exported to these islands, and as such the demand goes down.

#### Objectives of the regulations

The regulations aim to give reproductive adults at least one chance to replenish the stocks. The CITES regulations seek to regulate international trade and enforce the collection and use of stock assessment data. Part of the requirements to issuing CITES export permits is that the issuing country must be continuously conducting stock assessments, and the export permits be based on if the produce was taken from a sustainable stock. Furthermore, CITES aids in proper export accountability, even though this may not be one of its direct objectives.

CRFM, WECAFC and other associated regional bodies seek to ensure that all of the Caribbean countries regulations are unified. This is important since the islands are relatively close and more than likely (as some studies have shown) share the same stock. Furthermore, because the Conch fishery is the second most profitable fishery in the region, these bodies strive to ensure its sustainability, for both ecological and economic benefits.

#### Present state of exploitation

Queen Conch is mostly exploited for its meat. The shell, as a by-product, is used in art, jewellery making and decorating and for the occasional rare pearl. Presently only two merchants have CITES and DFMR fish export permits for Queen Conch. They are licensed to export a maximum of 1,500lbs of Conch twice a month to the USVI. The license is valid for six months, after which it has to be renewed. Thus far, owing to unreliable markets and the hassle and expense of importing Conch into the USVI, the license holders have not been able to utilize their full quota.

Like the rest of the region there is a high demand for Conch meat, and this, coupled with coastal degradation, is believed to have led to declines in nearshore Conch populations. This claim is supported through personal visual observations, AMMP data, DFMR on-going Conch scientific studies and reports from Conch fishers. These fishers have expressed concerns that they now have to go further out to sea and in deeper water to harvest Conch, whereas a few years ago nearshore Conch populations were healthier.

As such fishers have been venturing further out, and their yield has been increasing, but the sustainability of this is uncertain. The number of fishers and fishing days has not increased, while the value of the species has been fluctuating through the last five years. See table 6.

**Table 6. A look into the conch fishery landings data from 2010 to 2014.**

Year	Number of boats	Number of trips per week	Annual total catch (lbs.)	Price per lbs. in EC\$
2014	5	3	63,800	17.78
2013	5	4	118,241	10.72
2012	5	4	141,890	12.75
2011	5	4	122,543	13.99
2010	5	4	806,91	13.00

Objectives to be achieved in the management of the fishery

- + Use of scientific data to inform and influence fisheries and physical planning decisions
- + Accurate production estimates
- + Increase stocks, especially nearshore
- + Encourage stock recovery
- + Improvement of nearshore habitats e.g. seagrass beds and related ecosystems
- + Raise in the value of the species
- + Prevent recruitment overfishing
- + Promote local and regional recruitment
- + Production of more by-products e.g. craft and jewellery
- + Improve coordination and management effectiveness in the region
- + Fulfil the objectives of agreements that Anguilla has signed on to directly or indirectly
- + Professionalizing the fishery
- + Procuring new markets e.g. USA, Canada and the UK
- + Remove the existing top down management structure and encourage participatory management

Management and development measures to be taken

- + Continuation of the on-going Conch assessments being conducted by the DFMR, in collaboration with interns from the University of the Netherlands on Conch population dynamics, reproduction, habitat analysis etc.
- + Revision of how the legal harvest size is measured as the current 18cm minimum shell length still allows juveniles to be legally harvested. This should be replaced with a minimum shell length of 23cm (Wynne REF) and minimum flared lip thickness of 5mm (as recommended in FAO Fisheries and Aquaculture Report No. 1029, 2012, O. Hernando et al. 2006, CRFM working group meetings and reports)
- + Prohibition of any form of net to be used in the harvesting, restraining or landing of Queen Conch
- + Total ban on Conch meat, including possession during the proposed closed season from 1<sup>st</sup> May- 1<sup>st</sup> October (as recommended by CRFM, WECAFC, Queen Conch Resources Fishery Management Plan (FMP) of Puerto Rico and the USVI 1997)
- + Develop and share Conch habitat maps with environmental agencies and other decision makers in Government

- ✚ Establish a co-management/community management system for Queen Conch
- ✚ Establish quotas (table 7):

**Table 7. Recommended quotas for the Queen Conch fishery. Total limit of 50,000lbs per year (information based on recommendations made in Queen Conch Resources Fishery Management Plan (FMP) of Puerto Rico and the USVI and from CRFM).**

<b>Classification</b>	<b>Harvest Quota/bag limit</b>	<b>Sale restrictions</b>
Recreational fisher	10 Conch per day	Only for personal consumption
Commercial fisher (10 licenses per year)	5,000lbs per year per fisher	Quotas are not transferable or tradable

#### Monitoring, management indicators and reference points

- ✚ The DFMR began Conch assessments in 2014, in collaboration with the Van Hall Larenstein University of Applied Science in Leeuwarden the Netherlands. The arrangement was done by the Dutch Marine Research Institute IMARES (Institute for Marine Resources & Ecosystem Studies) in St. Eustatius. The research applied three different methodologies: 1. Towed underwater video array transects; 2. Diver transects; 3. And the collection of data from fish catch, through accompanying fishers on trips and from fish catch landings. The applied methodologies are expected to give DFMR information on: Queen Conch population dynamics and genetics; size and sex frequencies; whether the stock is a shared one and if so, with which neighbouring islands; and catch per unit effort for the people involved in the fishery
- ✚ Continued fish catch data collection for this fishery should allow management to note significant trends and changes in the fishery and guide policy decisions
- ✚ The statistics gathered should inform the revision of this fisheries management plan and legislation
- ✚ 2014/2015 recommended amendments to the fisheries legislation should be made by 2016
- ✚ Improvement in the consistency and reliability of Conch landings data collection through increased landing site visits and collaborations with Conch fishers. Over a period of five to ten years one of the most important reference points should be an increase by 50% in nearshore Conch populations, using the current studies as a yard stick

#### Management limitations

- ✚ Assistance from students with Conch studies is for a short period of time
- ✚ The reproductive period for Conch is short and the collection of data during this time may be hindered by other work related task
- ✚ Inability to monitor for biotoxins, hinders a wider export market
- ✚ Insufficient funding and staffing for capacity building training and surveillance
- ✚ Cooperation of fisherfolk especially with the acceptance of new regulations
- ✚ Only the Conch meat is landed, after it has been taken out of the shell, making it difficult to determine if the size of the Conch was legal
- ✚ There is no central market place for the sale of Conch and many times private boats export Conch to neighbouring islands without bringing them to Anguilla
- ✚ Political will is needed to move the proposed measures forward and to achieve the objectives

- Human and technical resources. DFMR has a compliment of only five Fisheries Officers and one patrol vessel, which makes enforcement, data collection and analysis difficult

**Table 8. Key dimensions for consideration with the management of the Conch fishery.**

Biological	It takes approximately three years for conch to reach sexual maturity. Conch can produce up to 180,000–460,000 eggs. Food availability and temperature affects the number of eggs that a Conch would actually produce. They reproduce several times throughout their reproductive season and are believed to live to 6-10 years. Juvenile Conchs are more prone to predation by fish and other snails because their shells are not fully developed to protect them. Whereas adult Conchs greatest predator is humans.
Ecological	All of the Queen Conch early developmental stages and where they spend most of their juvenile life feeding and sheltering, occur nearshore between mangroves and seagrass beds, or in other fairly shallow waters. Because of this, Conchs are very vulnerable to negative coastal changes. Conchs help to maintain a balanced ecosystem, through grazing on seagrass, by their involvement in the exchange of vital gases and as a food source for a number of other marine organisms.
Social	All parts of the Conch are consumed or utilized otherwise on the island. The Conch fishery is not a new one, and throughout the years it has managed to remain relatively small but prosperous. Large conch middens are present at landing sites that have been used for many years, as seen in Sandy Ground.
Economic	Conch has a lot of potential as an economically viable export fishery, because in the French Caribbean islands it is a popular delicacy and our location means that the low cost of transportation, efficiency and other linkages makes export very easy.

#### 4.4 Whelks/Caribbean Top Shell and Hardbacks

West Indian Top Shells (*Cittarium pica*), known locally as Whelks, and the Fuzzy Chiton (*Acanthopleura granulata*) known locally as the Hardbacks, form a small, largely recreational fishery in Anguilla; they are collected from the littoral zone while walking along the sea rocks or snorkeling during periods of calm sea. Whelk picking was once a popular past-time in Anguilla, although now the paucity of large Whelks found in easy to access coastal regions means this practice has largely died out. Sizable populations of both Whelks and Hardbacks are still present on many of the rocky offshore cays, but their inaccessibility mean that they are a highly prized commodity, usually being eaten within the community before reaching local outlets. This further adds to their value, meaning they are one of the more expensive fishery products available, with a cleaned weight value of EC\$26.80 per pound.

##### Current regulations & non-binding agreements governing the fishery

There are currently no regulations in Anguilla and no known specific non-binding agreements. In the U.S. Caribbean territories they are generically categorised as a ‘Caribbean Conch Resource,’ and thus fishers are prohibited to land them out of their shell. In the USVI there are more stringent restrictions with a minimum shell size set at 2.5 inches, a closed season between 1<sup>st</sup> April and 30<sup>th</sup> September, and a one gallon bag limit in National Parks (VINow, 2015).

##### Objectives of the regulations

There are no regulations in Anguilla. The federal legislation in the U.S. Caribbean that prohibits cleaning the ‘conch resource’ at sea, is designed to allow enforcement personnel to identify the species and, thus, enforce the minimum size limit (if applicable). It was also expected that this provision would reduce fishing effort by limiting the amount that can be carried aboard a fishing

vessel (NOAA, 1996), although it may allow more time fishing as less time would be spent cracking the catch at sea.

### Present state of exploitation

Although no records exist it is clear that Whelk resources on mainland Anguilla have been over exploited to the point that they are rarely harvested, as they were years ago. Dense populations in harder to reach areas on the offshore cays still exist, although if this fishery were to be developed, it would likely remove these population pockets in a short period of time. Hardbacks are only harvested by a small amount of recreational fishers. Even so, large individuals are only regularly observed in the same hard to reach areas on the offshore cays. It is thus concluded that this fishery too, if developed, would be difficult to maintain in a sustainable manner.

### Objectives to be achieved in the management of the fishery

- ✚ Establish current levels of exploitation via landing data
- ✚ Identification of population pockets
- ✚ Increase stock levels
- ✚ Protection of coastal habitats

### Management and development measures to be taken

- ✚ Include Whelks in fish catch data collection
- ✚ Conduct rapid assessment of populations around the island
- ✚ Introduce minimum size for the Whelk
- ✚ Introduce closed season to protect breeding population
- ✚ Promote responsible coastal development

### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Whelk and Hardback statistics
- ✚ 50% increase in numbers of Whelk and/or Hardback in coastal areas within five years of the first rapid population assessment

### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits, closed seasons etc.

**Table 9. Key dimensions for consideration with the management of the Whelk fishery.**

Biological	Hard shelled mollusc species. Uses suction to attach firmly to rocks.
Ecological	Littoral zone dwellers, grazing algae from sea rocks.
Social	Hardbacks are not widely recognised as a food source in Anguilla, but whelks have been collected for generations along local sea rocks. Whelk picking is a relatively rare past-time these days as only small individuals are readily found.
Economic	One of the most valuable fishery resources, probably due to a combination of their paucity and sporadic challenges in harvesting.



## 4.5 Sharks and Stingrays

Sharks and Rays are two closely related groups of cartilaginous fishes belonging to a number of different families within the class Chondrichthyes. The following shark species have been confirmed in Anguilla waters: Nurse (*Ginglymostoma cirratum*), Lemon (*Negaprion brevirostris*), Reef (*Carcharhinus amblyrhynchos*), Blackfin (*Carcharhinus melanopterus*) and Tiger (*Galeocerdo cuvier*) Sharks. There have been some unconfirmed sightings from locals of Hammerhead (*Sphyma spp.*), Silky (*Carcharhinus falciformis*) and Bull Sharks (*Carcharhinus leucas*).

An estimated ten fishers in total, from Crocus Bay, Island Harbour and Forest Bay, directly target sharks around the coast. The Shark fisher's traps are anchored line with one to three large buoys at the surface and a baited hook attached to rope or fishing line. These traps are usually checked daily to prevent the Shark from drowning. Sharks are landed whole and stored separately from other fish. Larger Sharks are often tied to the broadside of the boat and pulled to shore alive. Sharks are targeted throughout the year and due to their notoriety, it is usually a spectacle when a large Shark is landed at a port.

Sharks are caught occasionally as bycatch in trap, seine, handline and longline fishing. Sharks are considered a nuisance by fishers using these methods, particularly those deploying longlines which can be more than a 1000ft in length. These fishers often find Sharks entangled in their fishing gear. Sharks tend to either disrupt or destroy fishing gear. Spearfishers when presented with the opportunity would target small Nurse, Reef and Blacktip Sharks. Some spearfishers have also been known to tie the tails of sleeping Nurse Sharks and haul them to the surface.

Stingrays can be easily distinguished by their flattened, wing like pectoral fins which gives them a disc shape appearance. Their pectoral fins are used to propel them through the water. The mouth and five gill slits are located on their underside, while two large openings on the upper side are used for respiration. Most species also have a very long and slender tail. The Stingrays, belonging to the family Dasyatidae have one to two venomous barbs on their tails for protection. Of these the Southern Stingray (*Dasyatis Americana*) is the most common in Anguillian waters and the only one that is usually targeted by fishers, who predominantly use spearguns. Sometimes however this species or other species of Ray may be inadvertently caught as bycatch when using seine nets for rounding jacks or cast nets for bait fishing. Fishing for Stingray, although not particularly common, reportedly takes place year round. As with all ray species they are also popular with sightseers when diving recreationally.

The Spotted Eagle Ray (*Aetobatus narinari*) which belongs to the family Myliobatidae is the second most common species found in Anguilla, but is not known to be targeted by fishers. Whereas the enigmatic Giant Manta Ray (*Manta birostris*) belonging to the family Mobulidae, although extremely rare in Anguilla has been reportedly targeted by fishers on the few occasions over recent years when it has been sighted. This practice is slightly unfortunate as this particular species would be of greater economic value to those conducting sightseeing tours with visiting tourists.

### Current regulations & non-binding agreements governing the fishery

The regulations governing fishing in Anguilla do not specifically address Sharks or Stingrays. However, the ban on gillnets may be preventing a significant number of Sharks and Stingrays from being caught as bycatch, as is seen in other countries. Although there is a lot of pressure



from international environmental agencies and other concerned citizens, for the protection of Sharks around the world, neither local legislation or non-binding regional agreements has implemented measures to specifically address the protection of Sharks in the Caribbean.

### Objectives of the regulations

No regulations exist specifically for Sharks and Stingrays.

### Present state of exploitation

Official and reliable data on the Shark fishery is lacking, which makes the determination of its exploitation and management difficult. The Shark fishery is mostly subsistent in nature. Landed Sharks are utilized for meat or bait in other fisheries. Shark is occasionally sold to households and to small restaurants. It is uncommon to see Shark being served in tourist oriented eateries, but it is a staple at festivals and other cultural events. The liver is very important for the production of Shark oil, which is used as a traditional substitute for cod liver oil, or as a rub to cure or treat various illness and/or deficiencies.

Although the actual stock of Sharks is unknown, some local fishers have noted a proliferation in Shark sightings. Many have linked this increase to the growth in the Sea Turtle populations, due to the current moratorium, but there is no scientific evidence to prove such correlations. It is more likely that any such proliferations are in fact caused by reduced amounts of prey items on reef areas or offshore fishing grounds and as such the Sharks come closer to shore in search of food (including but not limited to Sea Turtles). This presumed increase of Sharks and the fear of Shark attacks, have prompted some fishers to consider targeting Sharks commercially. It is possible to increase the Shark fishery production, but the GOA must have proper legislation in place, geared towards sustainable harvesting, and be mindful that promoting this fishery may cause conflict with international agencies, who may call for a ban or to limit the production. The reason for this conflict is mainly due to the wasteful and highly publicised practice of Shark finning (which is not practiced in Anguilla), but also due to results of recent scientific studies that have shown top down predation from 'healthy' Shark populations can increase overall ecosystem health.

The current stock of Southern Stingrays is unknown, and so is the number of fishers targeting them. This presents a threat to the management of the species. Given that spearfishers concentrate their efforts around coral reefs and at seagrass beds/sandflats, where Stingrays are more likely to forage, their exploitation by spearfishers is minimized. The presence of Stingrays in marine parks and the potential to attract visitors to the parks means that the fish is worth more alive than as a food product.

As a food, the Southern Stingray fishery is more socially important than it is economically to the Anguilla community. It is a favoured meat at social gatherings. It is sometimes found on the menus of small local restaurants. Local fishers state that the Stingray fishery is purely subsistence, but if sold would fetch the same price as the other reef fish, i.e. EC\$13.00.

### Objectives to be achieved in the management of the fishery

- ✚ Maintain a sustainable Shark fishing
- ✚ Use of scientific data to inform and influence fisheries decisions
- ✚ Accurate production estimates

- ✚ Improve regional management of the Shark and Stingray fisheries
- ✚ Explore the possibilities of a Skate fishery

Management and development measures to be taken

- ✚ Sustainable Shark fishing promotions through outreach campaigns
- ✚ Educate fishers on the possibilities of the Shark and Stingrays fisheries, their ecology and biology
- ✚ Promote the production of by-products such as oils
- ✚ Sharks and Stingrays stock assessment
- ✚ Continue FCDC and ensure it captures Sharks and Stingrays
- ✚ Collaborate with regional fisheries bodies such as CRFM on management strategies for the fisheries
- ✚ Establish catch and size limits
- ✚ Amend legislation to ban fishing in MPA
- ✚ Ban fishing on all dive wrecks around the island

Monitoring, management indicators and reference points

- ✚ The acceptance and participation of at least 30% of Shark and Stingray fishers in educational sessions on the fisheries
- ✚ Successful stock assessment of Sharks and Stingrays through a desk study, pilot project and/or landings data
- ✚ The formation of a regional management plan that would address sustainable harvesting of Sharks and Stingrays
- ✚ Acceptance and implementation of the proposed legislative amendments geared towards the protection of Sharks and Stingrays and their habitats

Management limitations

- ✚ Unwillingness of fishers to give data or participate in outreach sessions
- ✚ Absence of a central market place for the sale of Sharks and Stingrays
- ✚ Insufficient funds for studies
- ✚ Inconsistency with landings of Sharks and Stingrays
- ✚ Lack of political will
- ✚ Association as a British Overseas Territory may cause issues with the promotion of a Shark fishery
- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult

**Table 10. Key dimensions for consideration with the management of the Shark and Stingray fisheries.**

Biological	Sharks and Stingrays gill slits are not covered. They both give live birth.
Ecological	The presence of stingrays, particularly Southern Stingrays are a very common attraction within the islands marine protected areas, thus suggesting that these areas may be providing some sort of safe haven or other essentials for stingrays and vice versa. Sharks are apex predators.
Social	Sharks and Stingrays are important cultural and social foods and currently not profitable economically driven fisheries.
Economic	The economic value of these fisheries is unknown, because of unpredictability, sporadic landings and subsistence nature of the fisheries.

## 4.6 Shelf and deep slope fishery

Some fish in this category are also caught on the reef (section 4.7), especially smaller species or juvenile individuals. Many of the larger species, for example Nassau Groupers and Red Snappers, are caught where the island shelf forms a deep slope into the ocean trenches. Amongst these deep slopes several special species of commercially important fish dwell, reproduce and feed. Because of the depths at which they are found, many have special physical characteristics which help them to survive in the dark and reproduce successfully. Such characteristics include large eyes, red or black colourations, large swim bladders and buoyant eggs. They are targeted by baited fish traps and handlines or vertical longlines in areas where the shelf breaks and slopes.

### 4.6.1 Groupers

Groupers (Serranidae) are a relatively large family of commercially important fish with approximately sixteen species reported throughout the Caribbean region. They are easily distinguishable by their heavy bodies, protruding lower jaw, big mouths and thick lips. Of these sixteen species ten have been reported in Anguillian waters with the remaining six unconfirmed or extremely rare. These ten species are Nassau Grouper (*Epinephelus striatus*), Graysby (*Cephalopholis cruentatus*), Red Hind (*Epinephelus guttatus*), Rock Hind (*Epinephelus adscensionis*), Coney (*Cephalopholis fulva*), Black Grouper (*Mycteroperca bonaci*), Tiger Grouper (*Mycteroperca tigris*), Yellowfin Grouper (*Mycteroperca venenosa*), Yellowmouth Grouper (*Mycteroperca interstitialis*) and Goliath Grouper (*Epinephelus itajara*). The latter two species are considered rare in Anguilla. For example, the Goliath Grouper has only been reported by divers once or twice over the last decade, and with all sightings concluded to be of the same individual moving residence between dive wrecks. Of the remaining eight species those of the genus *Mycteroperca* are rarely seen on shelf areas, being more associated with deep water slope fishing grounds. Larger individuals from the genera *Epinephelus* and *Cephalopholis* are also associated with these deeper areas but smaller individuals and/or species can be common on shelf areas and other shallow coastal waters. All of the smaller Groupers are important to the commercial fishery, but of the large ones, only the Nassau Grouper is commonly landed and sold. Groupers are usually targeted on hand line, even though they may also be caught in fish traps and by spear guns.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Groupers. There are restrictions on gear that indirectly protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of gillnets and fish trap wire less than 1.5 inches.

The Nassau Grouper fishery in the USA has been over exploited; as such America placed several restrictions on the fishing of Grouper, and its importation from outside of the USA. It is currently protected under the US National Marine Fisheries Service Species of Concern. This in turn means that exporting Caribbean islands such as the Bahamas and Cayman Islands are forced to have stricter regulations and closed seasons to manage the fishery. Similarly, in all U.S. Caribbean Territories both Nassau and Goliath Grouper are prohibited for harvesting (NOAA, 2015), with other species regulated by bag limits and annual catch limits. In the Gulf of Mexico minimum sizes exist for most of the larger deeper water species, together with generic bag limits for all species combined.

The encompassing recommendations in the FAO code of conduct for responsible fisheries call on all Caribbean islands to protect all species of Groupers. Thus Anguilla should be working feverishly to fulfil its obligation to this aspect of the non-binding agreement.

### Objectives of the regulations

The objective of the restrictions on gear is to protect juvenile species and to avoid the harvesting of non-targeted species and the drowning of fish by the use of a gillnet.

### Present state of exploitation

There is very little information on this fishery because the fish catch data is seldom collected by species. Information on the present state of exploitation can be obtained from interviews with fishers and from AMMP data, but neither of them would give a fair or accurate representation of Grouper populations. As such nothing can be said about the present state of exploitation, but fishers and divers continue to see Groupers on many of the wrecks around the island and they continue to land the smaller commercial species.

### Objectives to be achieved in the management of the fishery

- ✚ Identification of nearshore Grouper spawning grounds
- ✚ Collection of species specific data for Groupers in the FCDC
- ✚ Thorough stock assessment
- ✚ Increase in the overall population of Groupers
- ✚ More informed and educated public on Groupers

### Management and development measures to be taken

- ✚ Research on spawning aggregations and population dynamics of more vulnerable species of Grouper, such as the Nassau Grouper
- ✚ Closure of spawning grounds for vulnerable species of Groupers during reproductive months
- ✚ Collect fish catch data by species so that DFMR would be able to determine the profitability of the species, catch per effort data and other relevant information
- ✚ Protection of Grouper habitats and spawning grounds
- ✚ Conduct several educational activities about the various species and the fishery
- ✚ Introduce minimum size limits for all commercial species and investigate/implement quota systems
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

### Monitoring, management indicators and reference points

- ✚ By the year 2020 a five year reliable database of local Grouper statistics
- ✚ Increase in Grouper populations around the island
- ✚ Regular patrols of spawning grounds and landing sites
- ✚ 50% increase of Groupers on all dive wrecks and within MPA

### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to close certain areas to fishing or introduce minimum size limits, closed seasons etc.
- ✚ Unwillingness of the general public and fishers to participate in educational sessions and/or amend the existing legislation

**Table 11. Key dimensions for consideration with the management of the Grouper fishery**

Biological	Groupers are a large diverse group, with widely varying biological components, which makes management challenging. They are all carnivores and hermaphroditic. They spawn during December-January on the full moon, usually in the same location. This makes managing their spawning grounds less challenging.
Ecological	Live relatively nearshore, amongst the reefs, ledges and amongst wrecks. Some species are known to dwell in very deep waters, but are all solitary.
Social	Although some of the larger species of Groupers are known for ciguatera fish poisoning on the island, many locals still regard it as one of the best tasting choice fish.
Economic	There is insufficient data to determine the economic contribution of this fishery to the island. However, Goliath Groupers are a spectacle on many of the Dive wreck sites and local dive operators lure tourist on their trips with the promise of seeing these large fish.

#### 4.6.2 Snappers

Snappers (Lutjanidae) are a large family of commercially important fish with approximately fourteen species reported throughout the Caribbean region. They are relatively easy to distinguish by their large mouth and oblong-shaped body with sloping triangular head. Of these fourteen species, only one has not been confirmed in Anguilla waters, the Black Snapper (*Apsilus dentatus*). The remaining thirteen species fall into three general groups in terms of fisheries relevance: Species that may be inadvertently caught by traps targeting other species but still landed and consumed: Grey (*Lutjanus griseus*), Mahogany (*Lutjanus mahogoni*), Lane (*Lutjanus synagris*), and Schoolmaster (*Lutjanus apodus*) Snappers. Species that may be inadvertently caught while line fishing, but thrown back or cut up for bait, due to fear of ciguatera poisoning: Mutton (*Lutjanus analis*), Cubera (*Lutjanus cyanopterus*), and Dog (*Lutjanus jocu*) Snappers and commercially important species, targeted by handlines or vertical longlines, depending on depth preferences: Yellowtail (*Ocyurus chrysurus*), Vermilion (*Rhomboplites aurorubens*), Southern Red (*Lutjanus purpureus*), Blackfin (*Lutjanus buccanella*), Silk (*Lutjanus vivanus*) and Queen (*Etelis oculatus*) Snappers. Of this latter group, Yellowtail and Vermilion are targeted only by handline, Queen Snappers are only targeted by vertical longline. The remaining species may be targeted using both methods. Snappers are often targeted by spearfishers, in water shallow enough for free diving. Fishing activity is based from three main landing sites: Island Harbour, Cove Bay, and Sandy Ground. Snapper fishing takes place throughout the year for all targeted species.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Snappers. There are restrictions on gear that somewhat protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. Regional legislation exists for some Snapper species. In the U.S. Caribbean Territories, minimum sizes apply only for Yellowtail Snappers at 12 inches and closed seasons and year

round closed areas exist to protect populations and seasonal spawning aggregations (NOAA, 2015).

### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

### Present state of exploitation

Even though the Snapper fishery is largely artisanal, information derived from the DFMR 2014 fish landing dataset shows that the eight vessels that mainly target Snappers, fished at least three days per week for nine months, landed approximately sixty tons of mixed species of Snappers, valued at EC\$16.3 per pound. The annual value was approximately EC\$2,000,000.

The status of Snapper stocks is unknown. The presence of abundant juvenile Snappers of mixed species on surveyed reefs and sea grass beds, suggests that recruitment levels are favourable. In fact, the deeper water species are considered under-exploited, which is a resource that fishers are being encouraged to investigate. This under-exploitation means stocks of deep water species are likely high, despite DFMR not currently having the logistical capacity to assess them.

Fishers indicate that fishing effort for these deeper water species increases during the high tourism season, with fishing carried out upon request from hotels and restaurants, which are the primary market outlets for the fishery. Snappers are also exported to the neighboring island of St. Martin.

In 2013 DFMR conducted a project which sought to raise interest in the Snapper fishery and further introduce innovative, sustainable fishing gear and techniques to target deep slope dwelling Snappers. The project also served as an exploratory exercise to target Diamondback Squid, which can be used as food or bait. This project is scheduled to be repeated in 2016 to further develop the fishery.

### Objectives to be achieved in the management of the fishery

- ✚ Identification of nearshore Snapper spawning grounds
- ✚ Develop a sustainable yet lucrative deeper water Snapper fishery to ease pressure off other nearshore resources and over exploited fisheries
- ✚ Data collection on population dynamics and more detailed fish catch landings
- ✚ More informed and educated public on Snappers

### Management and development measures to be taken

- ✚ Research on spawning aggregations and population dynamics of most commercially important species of Snapper
- ✚ Closure of spawning grounds for species of Snappers during reproductive months
- ✚ Collect detailed fish catch data by species so that DFMR is able to determine the profitability of the species, catch per effort data and other relevant information
- ✚ Collaborate with restaurants to report monthly purchases of local Snappers
- ✚ Conduct several educational activities about the various species and the fishery, including demonstrations of new gear and existing fishing methods for targeting Snapper
- ✚ Introduce minimum size limits for all commercial species and investigate/implement quota systems

- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Snapper statistics
- ✚ Regular patrols of spawning grounds and landing sites
- ✚ 25% increase in deep water Snapper fishers by 2017
- ✚ AMMP to assess growth in Snapper juvenile populations in shallow reef areas

Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits, closed seasons etc./lack of political will
- ✚ Unwillingness of the general public and fishers to participate in educational sessions

**Table 12. Key dimensions for consideration with the management of the Snapper fishery**

Biological	Snappers are nocturnal predators, feeding on crustaceans, Squid and small fish. Some of the larger species are solitary during the day, whereas smaller species often gather lazily in groups, which make them susceptible to spearfishing.
Ecological	Seagrass beds, mangroves and shallow reef systems are important nursery habitats. Adults live in moderate to deeper areas throughout their life cycle.
Social	Provides income directly and indirectly to fishers and the wider community. A significant source of fish protein for local consumption. Cases of ciguatera poisoning have been reported across the region from consuming large Snappers from all species, except the Vermilion Snapper and Queen Snapper. For this reason it is often the smaller Snappers that are targeted. The local Snapper fishing industry supplies the restaurants with most of their demand and helps to keep the importation of this fish minimal.
Economic	Snapper is the second most profitable locally harvested fish. It is very important as a food product in the tourism industry. There is hope to develop both local consumption and exportation markets, thus increasing the value of the species.

**4.7 Shallow shelf and reef finfish fishery**

This group of fish fall under the category of potfish (named derived from the most popular method of fishing them using fish traps/fish pots). Targeting methods are speargun, fish trap and handline (species dependant). They are the lowest saleable value per pound group fishery in Anguilla. For this reason, the fish in this group are frequently caught through less commercial artisanal means and distributed among the local communities where they are landed. Larger individuals may find their way into local outlets for sale (for example Queen Triggerfish, section 4.5.3), but are rarely found on the menu at tourist oriented restaurants and only opportunistically at local bars and grills. Thus this group of fish are highly important from a local subsistence level, but only of small commercial livelihood importance.

This section will not cover potfish families with species that are not directly targeted and used only for baiting subsequent trap sets, such as larger species of Damsel fish (Pomacentridae), known locally as ‘Katies.’ They are often caught as bycatch in fish traps, but not reported to be consumed. Also not included here are those species that may be targeted by an over-zealous



spearfisher and trap fishers, and would not technically be considered of any fisheries significance, for example the Boxfish/Shellfish (Ostraciidae).

#### 4.7.1 Parrotfish

Parrotfish (Scaridae) are a family of fish with significant ecological importance in reef habitats, while also having some commercial importance. Of the fourteen species reported throughout the Caribbean region, twelve have been recorded in Anguillan waters. The Blue Parrotfish (*Scarus coeruleus*) and the small Emerald Parrotfish (*Nicholsina usta*) has yet to be identified in Anguilla. The twelve species confirmed in Anguilla fall into three general groups in terms of fisheries relevance, Species that either live on seagrass beds, or are too small to be caught in fish pots: Greenblotch (*Sparisoma atomarium*), Bucktooth (*Sparisoma radians*) and Bluelip (*Cryptotomus roseus*) Parrotfish. Large species that are today considered extremely rare, possibly due to over exploitation: Midnight (*Scarus coelestinus*) and Rainbow (*Scarus guacamaia*) Parrotfish. Medium to large relatively common species that are targeted by some fishers: Queen (*Scarus vetula*), Stoplight (*Sparisoma viride*), Princess (*Scarus taeniopterus*), Striped (*Scarus iseri*), Redband (*Sparisoma aurofrenatum*), Redtail (*Sparisoma chrysopteron*), and Yellowtail (*Sparisoma rubripinne*) Parrotfish. From the latter group, Redtail Parrotfish are the least common, and the Striped and Princess Parrotfish are usually too small to be of significant commercial interest.

Parrotfish are targeted by trap and speargun and consumed locally or used for baiting lobster traps. The favoured bait species is the Stoplight Parrotfish, which is considered to attract the most Lobsters, and it will often be targeted by fishers using a speargun while they are out at sea setting their Lobster traps. Tourist restaurants seldom sell Parrotfish, possibly due to the fact that they have gained notable global publicity over recent years, relating to their ecological importance and role in mitigating against coral reef decline.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla does not specifically address Parrotfish. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5inches in diameter and the use of gillnets. Regulations exist in some Caribbean territories. In the U.S. Caribbean for example fishers are not allowed to harvest the larger, rare species (Midnight, Blue and Rainbow Parrotfish) and a minimum landing size for the Redband Parrotfish of 8 inches, with all remaining species limited to 9 inches. There are also bag limits, similar to Groupers and Snappers (see section 4.4) and annual catch limits (NOAA, 2015).

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet. Regional legislation exists to guard against over exploitation and unsustainable harvesting.

#### Present state of exploitation

Historic results of the AMMP, reflects that Parrotfish as a family is abundant, although this is due primarily to large numbers of juveniles, especially Striped Parrotfish, that are amongst the most common species of fish in Anguilla waters. When examining size class distribution however, it is clear that larger species or larger phases of specific species are lacking, and not



within the range that would be expected. Through fishing trips with local fishers it has been observed that even small individuals brought up in traps are retained by fishers and used as bait when setting subsequent traps and as such these numbers will not be reflected in landing data. Fish catch data is seldom collected for individual species and usually split only into broad categories, e.g. reef fish, pelagics etc. For these reasons, true exploitation levels are unknown.

Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Increase in the overall population of Parrotfish
- ✚ Increase in the overall size class distribution of Parrotfish
- ✚ More informed and educated public on Parrotfish

Management and development measures to be taken

- ✚ Collect fish catch data by species, so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Parrotfish habitats
- ✚ Introduce minimum size limits for certain species
- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island
- ✚ Conduct several educational activities about the various species and ecological importance

Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local parrot statistics
- ✚ 50% increase in parrotfish  $\geq 25$  cm (10 inches) in their natural environment
- ✚ Continued high juvenile numbers in shallow reef areas

Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits
- ✚ Unwillingness of the general public and fishers to participate in educational sessions

**Table 13. Key dimensions for consideration with the management of the Parrotfish fishery.**

Biological	Protogynous hermaphrodites, living in harems and changing from female to male throughout their life history, undergoing dramatic colour changes during the process. In each harem the largest individual is male. If this male is removed the largest female change sex and takes its place. In some instances large unexplained groups of terminal male Stoplight Parrotfish have been seen roaming rapidly around large areas.
Ecological	Diurnal grazers, scraping off filamentous algae from rocks with their powerful fused teeth (beak) and occasionally a biting small chunks out of live coral. Rock and coral matter swallowed by parrotfish gets deposited on the sea floor after digestion and is a significant contributor to sand reserves. Their mainly herbivorous diet helps to reduce levels of macroalgae reef areas, which is highly important in terms of the coral algae balance within these ecosystems.
Social	Consumed locally, often grilled, poached or baked, although some of the larger individuals may be sold in local outlets and so be relevant to livelihood interests.

Economic	Primarily are only of economic importance to a limited number of artisanal fishers. Most caught are consumed within the local communities where they are landed, and rarely seen for sale at local outlets. The environmental services provided by this family are far more valuable, potentially contributing towards overall reef health and the myriad of benefits derived from it.
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#### 4.7.2 Grunts

Grunts (Haemulidae) are a large family of fish with some commercial importance. Approximately eighteen species have been reported throughout the Caribbean region, with thirteen currently confirmed in Anguilla waters. Of these thirteen species two are considered rare, the Spanish (*Haemulon macrostomum*) and Cottonwick (*Haemulon melanurum*) Grunts and the Porkfish Grunt (*Anisotremus virginicus*) relatively rare, compared to other parts of the Caribbean. The remaining ten species are abundant or common depending on habitat: French (*Haemulon flavolineatum*), Bluestriped (*Haemulon sciurus*), Smallmouth (*Haemulon chrysargyreum*), White (*Haemulon plumierii*), Caesar (*Haemulon carbonarium*), Tomate (*Haemulon aurolineatum*), Striped (*Haemulon striatum*), French/Kissing (*Haemulon. flavolineatum*), Sailors Grunt (*Haemulon parra*), Black Margate (*Anisotremus surinamensis*) and White Margate (*Haemulon album*) Grunts.

Fishers in Anguilla do not necessarily target species of Grunts, although some of the larger varieties are highly prized, for example the Sailors Choice. Some smaller species are caught as potfish in fish traps, whereas the larger individuals are landed via speargun or hook and line. Juvenile Grunts are often problematic to differentiate, but are found in very high numbers in certain shallow reef areas and on seagrass beds.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Grunts. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire mesh size less than 1.5 inches in diameter and the use of gillnets. There are no specific regional non-binding agreements. Restrictions do exist in other Caribbean territories, or have been proposed. For example in Bermuda reproductive studies on the Blue Striped Grunt recommended a minimum landing size of 28cm (Pitt *et al.*, 2009), although to date no known restrictions have been imposed. In the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all pot fish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

#### Objectives of the regulations

The objective of the restrictions on gear is to guard against unsustainable harvesting, protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

#### Present state of exploitation

Due to the abundance of Grunts observed and recorded during monitoring, most species of Grunt are considered to be under relatively low exploitation. This is especially the case for some of the smaller species, for example the French, Smallmouth and Tomtate Grunts. Some of the larger species are however relatively scarce, Bluestriped, White, Spanish, Sailors Choice, Black Margate and White Margate Grunts; which may be a sign of over exploitation, although this

conclusion is based on best professional judgement. Through fishing trips with local fishers it has been observed that even small individuals brought up in traps are retained by fishers and used as bait when setting subsequent traps, and as such these numbers will not be reflected in landing data. Fish catch data is seldom collected for individual species. For these reasons combined, true exploitation levels are unknown.

Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Increase in the overall population of larger Grunt species

Management and development measures to be taken

- ✚ Collect fish catch data by species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Grunt habitats
- ✚ Introduce minimum size limits for certain species
- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Grunt statistics
- ✚ 50% increase in large Grunt species
- ✚ Continued high juvenile numbers in shallow reef and seagrass areas

Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits
- ✚ Limited data on Grunts, makes management challenging

**Table 14. Key dimensions for consideration with the management of the Grunts fishery**

Biological	Grunts are closely related to Snappers, but have a more obviously notched tail and are usually more colourful. They are nocturnal feeders, searching out small crustaceans at night on sand flats and seagrass beds. By day they usually drift around in small to large groups close to shallow reef areas.
Ecological	Seagrass beds, mangroves and shallow reef systems are important nursery habitats, with all species remaining on shallow to moderate depth reefs throughout their life cycle. Play a small role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.
Social	Consumed locally, often grilled, poached or baked. Some of the larger individuals may be sold in local outlets and so be relevant to livelihood interests.
Economic	Small economical contributor.

4.7.3 Triggerfish

Triggerfish (Balistidae) are a small family of fish, with notable commercial importance. Of the six species reported throughout the Caribbean region, four have been confirmed in Anguilla waters: Queen (*Balistes vetula*), Ocean (*Canthidermis sufflamen*), Sargassum (*Xanthichthys ringens*), and Black Durgon (*Melichthys niger*) Triggerfish. Of these four species, the Sargassum

Triggerfish is considered very rare, with only one or two reported sightings over the last decade. The remaining three species are all common or relatively common habitat dependant, although the Queen Triggerfish is uncommon in coastal areas likely because it is a highly prized among local fishers. Triggerfish are primarily targeted via hook and line or speargun. The Queen Triggerfish may also be caught in fish traps. Ocean Triggerfish are more pelagic in nature and Black Durgon swim in the water column above deeper offshore reef areas, so are not usually able to be harvested by spearguns.

Filefish of the family Monacanthidae, are close relatives of Triggerfish, and form a moderately large family of fish in the Caribbean, but with only minimal commercial importance. Most species are either small or poorly documented in Anguillian waters, with only two species regularly caught as bycatch in fish traps or targeted by spearfishers, mainly for use as bait: The Scrawled Filefish (*Aluterus scriptus*) and The White Spotted Filefish (*Cantherhines macrocerus*). The Orangespotted Filefish (*Cantherhines pullus*), the most common Filefish in Anguilla, is usually too small to be caught in traps. Filefish are usually used as bait, aside from large White Spotted Filefish which may be consumed locally.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Triggerfish. There are restrictions on gear that somewhat protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire mesh size less than 1.5 inches in diameter and the use of gillnets. There are no regional specific non-binding agreements, although some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all pot fish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

#### Present state of exploitation

Through low numbers observed and recorded during monitoring efforts, Queen Triggerfish are considered heavily exploited, especially in coastal areas popular with spearfishers. They are commonly available for sale at local outlets, but are often small in size, which again points to heavy levels of unsustainable exploitation. Black Durgon are also popular with hook and line fishers, but the nature of this fishing method, combined with the free swimming behaviour of this species, is likely the reason for their continued high numbers at certain offshore deeper reef areas. Little is known about the exploitation levels of Ocean Triggerfish, but they are rarely found for sale at local outlets, probably due to their pelagic nature, meaning they are not easy to target. Filefish are not considered heavily exploited as they are not directly targeted by fishers, although if captured, they will be kept for bait, or possible consumption. Fish catch data is seldom collected for individual species so quantifiable exploitation levels are unknown.

#### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Increase in the overall population of Queen Triggerfish, especially in nearshore areas

### Management and development measures to be taken

- ✚ Collect fish catch data by species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Triggerfish habitats
- ✚ Introduce minimum size limits for Queen Triggerfish
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Triggerfish statistics
- ✚ 50% increase in Queen Triggerfish in nearshore reef areas

### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 15. Key dimensions for consideration with the management of the Triggerfish fishery**

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Biological	Both Triggerfish and Filefish have thick leathery skin with elongated first dorsal spines that can be raised and lowered as a defensive measure. They can aggressively defend their nests on the seabed during breeding seasons.
Ecological	The species, especially the Queen Triggerfish, have powerful crushing jaws which combined with their leathery skin means they can successfully consume prey as daunting as the Long-Spine Sea Urchin. This is ecologically relevant as these Urchins are important grazers of algae on reef systems, and currently recovering from the mass mortality event that decimated their population in the mid-early 1980's. Urchins can reach plague like proportions and so once their numbers fully recover Queen Triggerfish will be important in keeping their numbers in check.
Social	Consumed locally, often grilled, poached or stewed, although some of the larger individuals may be sold in local outlets and so be relevant to livelihood interests.
Economic	Moderate contributors economically to the fishing industry as Queen Triggerfish are a highly prized species, but are not regularly caught in large numbers today probably due to decreasing stocks.

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#### 4.7.4 Angelfish

Angelfish (Pomacanthidae) are a small family of fish with only minor commercial importance. Seven species (with additional potential hybridisation) are reported throughout the Caribbean region, only four have been confirmed in Anguilla waters: Queen (*Holacanthus ciliaris*), French (*Pomacanthus paru*), Gray (*Pomacanthus arcuatus*), and Rock Beauty (*Holacanthus tricolor*) Angelfish. Of these four species the Grey and French Angelfish are the most common, followed by the Rock Beauty and lastly the Queen Angelfish. Angelfish are popularly targeted by spearfishers, but are also commonly caught in fish traps. Their diet, consist mainly of sponges, tunicates, zooanthids and algae, which means that they are unlikely to be caught using a hook and line.

### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Angelfish. There are restrictions on gear that somewhat protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. There are no regional regulations, although some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all potfish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

#### Present state of exploitation

Through numbers observed and recorded during monitoring efforts Angelfish are considered relatively heavily exploited, especially when taking into account the high levels of potential food sources (sponges, algae etc.) available to them. This is especially the case for the rare Queen Angelfish and uncommon Rock Beauty, although even Grey and French Angelfish are not considered common in many coastal reef areas. All species of Angelfish found in Anguillian waters may also be found for sale at select local outlets, in quantities proportional to their observed abundance, but often of a size that will not promote their sustainability. Many individuals inadvertently caught in traps, especially the smaller ones, are reportedly cut up to be used as bait or consumed within the local community. Fish catch data seldom collects species specific information, which makes it difficult to determine quantifiable exploitation levels.

#### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Increase in the overall population of Angelfish, especially in nearshore reef areas

#### Management and development measures to be taken

- ✚ Collect fish catch data by species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Angelfish habitats
- ✚ Introduce minimum size limits for all species
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

#### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Angelfish statistics
- ✚ 50% increase in Angelfish in nearshore reef areas

#### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 16. Key dimensions for consideration with the management of the Angelfish fishery.**

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Biological	Differentiated from the similar (albeit smaller) Butterflyfish by a spine that extends from their cheek over the gill cover. Like Parrotfish, Angelfish are protogynous hermaphrodites, meaning that they live in harems and change sex throughout their life, with the largest individual in each harem being male. If this male is removed from the harem the largest female changes sex and take its place. Diurnal.
Ecological	Angelfish primarily inhabit reef areas where they graze on sponges, soft corals and algae. Juveniles may be found on seagrass areas or among mangroves. Play little role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.
Social	Consumed locally, often grilled, poached or baked, although some of the larger individuals may be sold in local outlets and so be relevant to livelihood interests.
Economic	Small economical contributor although a favourite among spearfishers for local consumption.

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#### 4.7.5 Porgies

Porgies (Sparidae) are a relatively large family of fish with fourteen species reported throughout the Caribbean, although only four have been confirmed in Anguillian waters, Sheepshead (*Calamus penna*), Saucereye (*Calamus calamus*), Jolthead (*Calamus bajonado*) and the Pluma (*Calamus pennatula*) Porgy. These four species are very similar in appearance making identification difficult. Porgies may be targeted by spearfishers, and occasionally using hook and line. They are commonly landed through fish traps. The large Jolthead Porgy is the least common of the four species. Juvenile porgies are frequently associated with seagrass beds, with adults migrating across to neighbouring reefs.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Porgies. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. There are no regional specific non-binding agreements. Some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all potfish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

#### Present state of exploitation

Porgies are only observed and recorded in low numbers during monitoring efforts, but most species can inhabit areas beyond safe diving limits, and as fish catch data is seldom collected for individual species, exploitation levels are unknown. Porgies are a popular food fish among local communities and may be found for sale occasionally at local outlets.

#### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings, and a greater understanding of abundances in deeper water areas



- ✚ Maintain or increase current levels of abundances of Porgy, especially in nearshore reef areas

#### Management and development measures to be taken

- ✚ Collect fish catch data by species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Porgy habitats
- ✚ Introduce minimum size limits for all commercial species
- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

#### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Porgy statistics
- ✚ Stable or increasing numbers of Porgies in coastal areas

#### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 17. Key dimensions for consideration with the management of the Porgy fishery**

Biological	Generally silvery in colour, with tints of yellow and/or blue. High back profile with steeply sloping heads. Diurnal.
Ecological	Solitary bottom dwelling reef/rock associated species that feed on small molluscs and crustaceans.
Social	Consumed locally, often grilled, poached or baked, although some of the larger individuals may be sold in local outlets and so be relevant to livelihood interests.
Economic	Small economical contributor although a favourite among spearfishers for household consumption. Playing little role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.

#### 4.7.6 Wrasses

Wrasses (Labridae) are a large family of fish that also include the Hogfish and Razorfish, with eighteen species reported throughout the Caribbean. Of these species twelve have been recorded in Anguilla waters. Most are small in size and so are of little fishery significance. These smaller species include the most abundant fish throughout the region, the Blueheaded Wrasse (*Thalassoma bifasciatum*), and other very common species including, but not limited to, Yellowhead Wrasse (*Halichoeres garboti*), Slippery Dick (*Halichoeres bivittatus*) and Clown Wrasse (*Halichoeres maculipinna*). Of the remaining species, four can reach relatively large sizes and thus be of potential fishery importance, Hogfish (*Lachnolaimus maximus*), Spanish Hogfish (*Bodianus rufus*), Creole Wrasse (*Clepticus parrae*) and Puddingwife (*Halichoeres radiates*). Of these Wrasses, the Hogfishes are those mainly targeted, primarily by speargun. Spanish Hogfish may also be caught in traps and the large Hogfish has been known to be caught using hook and line, although neither species are particularly targeted using these methods.

#### Current regulations & non-binding agreements governing the fishery



The regulations governing fisheries in Anguilla do not specifically address Wrasses. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5inches in diameter and the use of gillnets. There are no regional specific non-binding agreements, although some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all potfish species combined, depending on the number of persons on board (NOAA, 2015). In the Gulf of Mexico the Hogfish has been restricted under a minimum size of 12 inches with a daily bag limit set at five fish per person (GMFMC, 2015). No other minimum size restrictions have been identified within the Caribbean region.

Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

Present state of exploitation

Small Wrasse species are not exploited, whereas larger species are targeted by spearfishers but are only inadvertently caught via fish trap or hook and line. Fish catch data is seldom collected for individual species, thus quantitative exploitation levels are unknown.

Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings, and a greater understanding of abundances of larger species
- ✚ Maintain or increase current levels of abundances of Wrasses, especially in nearshore reef areas

Management and development measures to be taken

- ✚ Collect fish catch data by (larger) species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Wrasses habitats
- ✚ Introduce minimum size limits for certain species
- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local large Wrasse species statistics
- ✚ Stable or increasing numbers of Wrasses, especially larger species

Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 18. Key dimensions for consideration with the management of the Wrasses fishery**

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Biological	Wrasses are closely related to Parrotfish, although they are generally smaller and have a more elongate shape. Hogfish and Razorfish vary slightly in their anatomy, thus acquiring separate generic common names.
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Ecological	Prolific reef inhabitants with some species also associated with seagrass areas throughout most of their life history. Creole Wrasses are free swimming schooling plankton feeders. Whereas all others are associated with the sea bed (rock/reef/seagrass depending), where they swim around in small groups feeding. Larger species are more solitary and less abundant. Playing little role in the maintenance of ecological services although their sheer numbers (smaller species) mean they are important from a biodiversity and food chain perspective.
Social	Some species may be consumed locally, often grilled, poached or baked, with even the larger individuals rarely available for sale at local outlets.
Economic	Minimal economical contributor although larger species may be targeted by spearfishers for local consumption.

#### 4.7.7 Surgeonfish

Surgeonfish (Acanthuridae) are a small family of fish with only minor commercial importance. Three species are reported throughout the Caribbean region, all of which are common in Anguillian waters, Blue Tang (*Acanthurus coeruleus*), Ocean Surgeonfish (*Acanthurus bahianus*) and Doctorfish (*Acanthurus chirurgus*). All three are targeted in Anguilla by a small number of fishers who bait their traps with sea moss. These fish school around reef areas in grazing aggregations. Some large individuals may be targeted by spearfishers.

##### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Surgeonfish. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5inches in diameter and the use of gillnets. There are no specific non-binding agreements. Restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all pot fish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

##### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

##### Present state of exploitation

Through numbers observed and recorded during monitoring efforts, Surgeonfish have been established as one of the most abundant fish groups in Anguilla, coming only second to small Wrasse species. Although a small number of fishers target them directly (traps or speargun), most Surgeonfish captured are done so inadvertently via fish trap where they may be landed for local consumption or, if small in size, used to bait subsequent traps. Blue Tangs have been seen on the menu at tourist oriented restaurants, but this is generally rare. They are usually distributed and consumed within the communities where they were landed, or cooked up in local bars and grills. Surgeonfish are rarely sold at local outlets. For these reasons current exploitation levels are considered low.

##### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings

- ✚ Maintain or increase current levels of abundances of Surgeonfish, especially in nearshore reef areas

#### Management and development measures to be taken

- ✚ Collect fish catch data by (larger) species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Surgeonfish habitats
- ✚ Introduce minimum size limits for certain species
- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

#### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Surgeonfish statistics
- ✚ Stable or increasing numbers of Surgeonfish in coastal areas

#### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 19. Key dimensions for consideration with the management of the Surgeonfish fishery.**

Biological	Named after the sharp spine located at the base of their tail, Surgeonfish are oval shaped with a thin body. They are diurnal grazers of algae. Often swimming around in large mixed species aggregations, sometimes with a Parrotfish or two accompanying them.
Ecological	They are predominantly algal grazers and so very important ecologically, stopping to nibble and the rock flora every few feet or so. Plays a significant role in the maintenance of ecological services through potential maintenance of the coral/algal balance and therefore overall habitat health.
Social	Large individuals are consumed locally, often grilled, poached or baked.
Economic	Minimal economical contributor although species can be targeted by fishers for local consumption.

#### 4.7.8 Squirrelfish & Bigeyes

Squirrelfish (Holocentridae) are a relatively small family of fish, with minor commercial importance. Eight species are reported throughout the Caribbean region, six of which have been confirmed in Anguillian waters, The Squirrelfish (*Holocentrus adscensionis*), Longspine (*Holocentrus rufus*), Reef (*Sargocentron coruscum*), Dusky (*Sargocentron vexillarium*), Longjaw (*Neoniphon marianus*) and Blackbar Soldierfish (*Myripristis jacobus*) Squirrelfish. Bigeyes of the family Priacanthidae look similar to Squirrelfish, with one confirmed species in Anguilla, the Glasseye Snapper (*Herteropriacanthus cruentatus*). Of these species only the Squirrelfish (*H. adscensionis*) is directly targeted by fishers. The large Glasseye Snappers may be harvested if sighted by spearfishers. Squirrelfish and Bigeyes are captured by trap or hook and line.

### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Squirrelfish or Bigeyes. There are restrictions on gear that indirectly protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. There are no specific non-binding agreements. Some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all potfish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

### Present state of exploitation

Through numbers observed and recorded during monitoring efforts Squirrelfish are considered common reef inhabitants under a low level of exploitation. Although a small number of fishers target them directly (hook and line or speargun), most Squirrelfish or Bigeyes captured are done so inadvertently via fish trap. They may also be used to bait subsequent traps, or landed. They are usually distributed and consumed within the communities where they were landed, cooked up in local bars and grills, or sold at local outlets.

### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Maintain or increase current levels of abundances of Squirrelfish, especially in nearshore reef areas

### Management and development measures to be taken

- ✚ Collect fish catch data by (larger) species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Squirrelfish habitats
- ✚ Introduce minimum size limits for certain species
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Squirrelfish statistics
- ✚ Stable or increasing numbers of Squirrelfish in coastal areas

### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

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### **Table 20. Key dimensions for consideration with the management of the Squirrelfish & Bigeyes fisheries.**

Biological	These species have large squirrel like eyes often with a pronounced rear dorsal fin that
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	sticks up in a similar way to a Squirrel's tail. Usually reddish in colour. Nocturnal.
Ecological	Predominantly reef dwellers, foraging nocturnally at night for food. By day they generally hide under shadowy reef recesses that they defend vigorously from any approaching fish.
Social	Large individuals may be consumed locally, often grilled, poached or baked.
Economic	Small economical contributor and playing little role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.

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#### 4.7.9 Goatfish

Goatfish (Mullidae) are a small family of fish with only minor commercial importance. Of the four species reported throughout the Caribbean region, two are common in Anguilla waters, the Spotted (*Pseudupeneus maculatus*), and the Yellow (*Mulloidichthys martinicus*) Goatfish. Although neither species is particularly favoured by fishers, a small number of fishers target the larger Yellow Goatfish by setting fish traps on seagrass beds. Larger individuals of both species may also be shot by spearfishers.

##### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Goatfish. There are restrictions on gear that indirectly protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. There are no regional regulations, although some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits for all pot fish species combined, depending on the number of persons on board (NOAA, 2015). No minimum size restrictions have been identified within the Caribbean region.

##### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

##### Present state of exploitation

Through numbers observed and recorded during monitoring efforts Goatfish are considered common reef/rubble/seagrass inhabitants under a low level of exploitation. Although a small number of fishers target them directly (fish trap or speargun), most Goatfish captured are done so inadvertently via fish trap. These individuals may be used to bait subsequent traps or landed. They are usually distributed and consumed within the communities where they were landed or cooked up in local bars and grills, although they are rarely seen for sale at local outlets.

##### Objectives to be achieved in the management of the fishery

- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Maintain or increase current levels of abundances of Goatfish, especially in nearshore reef areas

##### Management and development measures to be taken

- ✚ Collect fish catch data by (larger) species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Goatfish habitats
- ✚ Introduce minimum size limits for certain species

- ✚ Restrict fishing within Anguilla’s Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Goatfish statistics
- ✚ Stable or increasing numbers of Goatfish in coastal areas

Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits

**Table 21. Key dimensions for consideration with the management of the Goatfish fishery**

Biological	Elongate fish with long chin barbels and the ability to dramatically change colour during inactive phases, particularly at night.
Ecological	Forage using their barbels to dig for food in sand/rubble.
Social	When not foraging some species drift around lazily in large groups near reef structures.
Economic	Small economical contributor and playing little role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.

**4.8 Large coastal pelagics**

Large coastal pelagics are fish that dwell in mid water in the open ocean. They inhabit sunlit waters up to about 655 feet, above the continental shelf. They are not directly associated with coral reefs. They do not live and feed at great depths like fish classed under large offshore pelagics. The fish in this category are relatively strong swimmers, capable of swimming long distances and migrating through different ocean bodies. They are attracted to floating objects such as *Sargassum* and manmade structures such as FADs. Fishermen take advantage of this and fish around these structures using handlines and fishing rods. With the exception of Barracudas, the fish in this section are extremely commercially important, for consumption and sportfishing.

4.8.1 Wahoo, Kingfish and Cero

Wahoo, Kingfish and Cero all belong to the Scombridae family, and are popular game fish. Wahoo is the common name of the (*Acanthocybium solandri*). Kingfish is also known as King Mackerel (*Scomberomorus cavalla*) and Cero (*Scomberomorus regalis*). They are all caught on handline or reels and sold commercially in Anguilla, but there is no large scale commercial fishery for them; partly due to their seasonality, lack of interest and skills in pelagic fishing and unpredictability of where to catch them. Of the three, Kingfish maybe the most popular landed species. Their behaviour and biology are very similar; therefore they can be managed jointly.

Current regulations & non-binding agreements governing the fishery

Wahoo, Kingfish and Cero are currently not species of concern for conservation in Anguilla, and according to the IUCN Redlist, their populations are stable globally. Locally there are no regulations for the management or harvesting of Wahoo, Kingfish or Cero.

WECAFC and the FAO, has recently teamed up with regional and international fisheries bodies such as CRFM, The Caribbean Fishery Management Council, OSPESCA and the Gulf and Caribbean Fisheries Institute, ICCAT, The International Game Fish Association, The World Bank, Common Oceans, to execute the three year, US\$1.95 million Caribbean Billfish Project. The project is funded by GEF and implemented by the World Bank, ‘Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform.’ This project will seek to maximize the associated economic benefits of the fisheries, focus on all Billfish and is expected to produce conservation measures for Wahoo, Kingfish and Cero, which are often caught during billfish fishing.

#### Objectives of the regulations

There are no regulations directly linked to the Wahoo, Kingfish and Cero fisheries. Regional agreements are currently being drafted under the Billfish Project, with the goal of improving the conservation and economic benefits of the fisheries.

#### Present state of exploitation

The Wahoo, Kingfish and Cero fisheries are underexploited and needs to be developed. Many fishermen catch them as bycatch. They are seldom targeted outside of the sportfishing realm. Owing to this, DFMR does not have substantial data on their landings.

#### Objectives to be achieved in the management of the fishery

- ✚ Sustainable development of the fisheries
- ✚ The promotion of game/sport fishing in Anguilla
- ✚ Data collection on fish catch landings for Wahoo, Kingfish and Cero

#### Management and development measures to be taken

- ✚ Assist with marketing opportunities as an incentive to develop the fisheries
- ✚ Develop the capacity of fisherfolk to enable them to engage in pelagic fishing
- ✚ Tailor the existing data collection forms to capture the information needed on Wahoo, Kingfish and Cero fisheries
- ✚ Amend the legislation to implement size restrictions to a minimum landing size of 170cm/1,700mm for Wahoo, 70cm/700mm for Kingfish and Cero

#### Monitoring, management indicators and reference points

- ✚ At least five local restaurants with steady demands for Wahoo, Kingfish and Cero and a reliable local supplier after marketing initiatives
- ✚ One new fisherman from each of the landing sites, with a general interest in these fisheries by 2017
- ✚ A five year time series of data on Wahoo, Kingfish and Cero landings (2016-2021), significant enough to be analysed

#### Management limitations

- ✚ Cooperation from local fishers to venture into these fisheries, participate in trainings, and changing gear types might be difficult
- ✚ Political will to amend legislation might be lacking

**Table 22. Key dimensions for consideration with the management of the Wahoo, Kingfish and Cero fisheries**



Biological	They are pelagic species of fish found in tropical and sub-tropical waters. Reaches maturity at two/three years of age. Lifespan of approximately six years. Wahoo are believed to spawn all year and can produce up to sixty million eggs. Cero and Kingfish spawn during the summer months.
Ecological	They are keystone species and mid trophic predators.
Social	Although there have not been many reported cases in Anguilla, Wahoo, Kingfish and Cero has the potential for ciguatera poisoning.
Economic	There is insufficient data to determine the economic value of these fisheries to the local economy. There is a lot of potential for development as economically viable sport and commercial fisheries.

#### 4.8.2 Mahi mahi

*Corphaena hippurus* throughout the Caribbean region is referred to as Dolphin (most popular in Anguilla), Mahi mahi or Dorado. Of the pelagic species found in the waters of Anguilla, Mahi mahi is the biggest fishery. There is very low importation of this fish. The islands major consumers purchase them fresh from fishers. Fishermen exploit the waters of the islands EFZ from 20-40 miles from shore, using handlines to fish for Mahi mahi after they have chummed the water. Mahi mahi are pelagic fish that swim in schools and aggregate around natural and artificial FADs, making them easy and predictable targets for fishers.

##### Current regulations & non-binding agreements governing the fishery

Under local legislation, no laws exist to conserve and protect Mahi mahi or the fishery. Regional agreements exist, but are not specific, geared towards the sustainable management of Caribbean fisheries.

##### Objectives of the regulations

The non-binding agreements are geared towards conservation and management of the species.

##### Present state of exploitation

While the fishery is not believed to be overfished, DFMR has been noticing an increasing trend in the landing of immature/juvenile Mahi mahi and lots of adult Mahi mahi with eggs, this raises concern for strict management measures to be put in place. The Departments FCDC is on-going, with the collection of data for Mahi mahi, and the collection of size frequency data. However, more time is needed to identify significant trends in landings. An in water assessment of the population dynamics would also help in determining the present state of exploitation. Although the table below does not capture all of the Mahi mahi fishers or fish catch landings, it gives an idea of what is happening in the fishery. There is currently less than ten fishers targeting Mahi mahi (not reflected in table 22).

**Table 23. Overview of the Mahi mahi fishery from 2010 to 2015.**

Year	Number of fishers	Lbs Mahi mahi landed	Total value EC\$
2010	1	150	2,016
2011	1	9	120
2012	2	770	14,430
2013	2	330	6,047
2014	2	159	3,920



### Objectives to be achieved in the management of the fishery

- ✚ Sustainable management of the fishery including catch and sales
- ✚ Increase in the value of the fishery
- ✚ Production of Mahi mahi as an export product
- ✚ Reliable and credible representation of data on the fishery

### Management and development measures to be taken

- ✚ Amend the legislation to implement size restrictions to a minimum landing size of 80cm/800mm, prohibit the use of nets in this fishery and establish harvest quotas
- ✚ Increase FCDC for Mahi mahi
- ✚ Retrofitting of vessels to ensure the best quality fish is landed and spoilage is minimized
- ✚ Ability of Anguilla to sell on the international markets, after achieving required standards
- ✚ Encourage the establishment of cottage industries geared towards the creation of value added products and an export market for the fishery
- ✚ Training in new and or more efficient, cost effective and environmentally friendly methods of fishing for Mahi mahi

### Monitoring, management indicators and reference points

- ✚ Successful acceptance of legislative amendments by fisherfolk by December 2015
- ✚ Successful completion in amending legislation by February 2016
- ✚ Increase by 50% in the existing statistics on the fishery landings by December 2016
- ✚ The successful execution of a FADs workshop, which would involve more than 30 of the local fisherfolk, representative of various cross sections of the island by December 2016

### Management limitations

- ✚ Small staff compliment and insufficient resources
- ✚ Small Department budget
- ✚ Many fishers are very comfortable in the ‘open fishery’ and may be reluctant to accept changes that are suggested for the conservation of the species
- ✚ Political will to amend existing legislation may be lacking

**Table 24. Key dimensions for consideration with the management of the Mahi mahi fishery.**

Biological	Mahi mahi grow rapidly and their life expectancy is five years. They reach sexual maturity at four to five months (Oxenford 1999) and display sexual dimorphism. Spawning occurs throughout the year in warm oceanic waters, such as the Caribbean sea.
Ecological	They are highly migratory species, following <i>Sargassum</i> and other algal mats, opportunistically feeding on smaller fish and crustaceans that live amongst them. Mahi mahi are extremely important to the pelagic food web, as they are preyed on by large billfish.
Social	Importation of Mahi mahi is almost non-existent. It is not a favourite fish of the locals, but is often in high demand at the restaurants associated with the hotels.
Economic	Mahi mahi is an economically valuable fish, although not as costly as Lobster and Tuna. The price per pound can range from EC\$18.00-\$26.00. The fishery supports artisanal and recreational fishers, as it is also considered a game fish.

### 4.8.3 Barracuda

*Sphyraena barracuda* is commonly known in Anguilla as the Barracuda. The fish has a long slender body and is silver in colour. The separated dorsal fins and dark spots on the body easily distinguish them from Wahoo. Barracuda's have behavioural patterns characteristic of both coastal reef fishes and pelagic billfishes. Their larval stage is pelagic, juveniles dwell nearshore amongst seagrass and coral reefs, with adult Barracudas swimming long distances and occupying deep water in the open ocean. However, they can also be found in caves, under ledges and on reefs feeding throughout the day. These patterns make characterizing Barracudas difficult, but it is generally recognised in the scientific literature that they are a pelagic species rather than a reef dwelling one.

Barracudas are popular for their curiosity; following divers and spearfishers around in the water. Barracudas open and close their mouths frequently while swimming, exposing their sharp teeth, which causes onlookers to perceive them as a threat. However, the biggest threat that Barracudas pose around Anguilla is a high risk of ciguatera poisoning, which is very common.

#### Current regulations & non-binding agreements governing the fishery

There are no regulations or non-binding agreements currently governing the Barracuda fishery.

#### Objectives of the regulations

No regulations exist.

#### Present state of exploitation

There is no Barracuda fishery in Anguilla, mainly due to the risk of ciguatera poisoning. Barracudas are usually caught as bycatch when using hook and line or occasionally targeted by bold spearfishers. Owing to the fact that there are such few landings of Barracuda and no market for them, other than house to house small sales or give aways, DFMR is of the opinion that Barracudas populations (based on fishing pressure) are healthy.

#### Objectives to be achieved in the management of the fishery

- ✚ Research on the population dynamics of Barracudas in nearshore areas
- ✚ Effective coastal zone management to protect coastal habitats used by Barracudas
- ✚ Maintenance of a robust stock of Barracudas around the island

#### Management and development measures to be taken

- ✚ Successful execution and completion of a project focused on Anguilla Barracuda populations and ciguatera poisoning
- ✚ Ensure strong integrated coastal zone management and best practices are adhered to

#### Monitoring, management indicators and reference points

- ✚ Credible results of a Barracuda population study by 2017
- ✚ The implementation of an Integrated Coastal Zone Management Plan

#### Management limitations

- ✚ Some of the management and development measures would have to be executed by other GOA agencies

- ✚ A study of Barracuda population dynamics will call for additional financial and human resources

**Table 25. Key dimensions for consideration with the management of the Barracuda fishery.**

Biological	Barracudas show sexual maturity between two to four years. They spawn offshore during spring, summer and fall.
Ecological	Barracudas are important in the marine food web because they maintain species balance by consuming fish, and are also food for other fish.
Social	Barracudas consume reef fish that have biotoxins in them from Dinoflagellate algae. The biotoxins accumulate in their muscles and causes poisoning in humans who consume the affected Barracudas. Locals believe that the presence of ciguatera toxin in Barracudas is dependent on where the Barracuda feeds and consumers resistance to ciguatera toxins. Regardless of this, many Anguillian's still take the risk and consume the fish.
Economic	Because of the risk ciguatera poisoning Barracuda is not economically significant.

## 4.9 Large offshore pelagics

Like most large offshore pelagics, Tunas are strong, fast swimmers and highly migratory, with some being considered as Trans-Atlantic species. Many of them travel in schools and are predators of smaller fish (carnivorous in nature), and are attracted to floating objects in the open ocean. They dwell and feed in waters below the continental shelf. Large pelagic fish in Anguilla are caught by longlines, rods and handlines. In countries with well-developed offshore pelagic fisheries, the fishing pressure on them is believed to be far too great any may likely exceed its maximum sustainable yield (MSY). However, Anguilla does not have this issue, but as we move towards developing this area and possibly granting SPA, their sustainable management is crucial. Maritime boundary delimitations cause issues with managing shared fish stocks, hence it is important to have regional management bodies.

### 4.9.1 Tuna

Several species of Tuna inhabit the waters of Anguilla. There are three species of smaller Tuna: Little Tunny (*Euthynnus alletteratus*); Skipjack Tuna (*Katsuwonus pelamis*); Atlantic Bonito (*Sarda sarda*). The larger ones are: Albacore (*Thunnus alalunga*); Blackfin (*Thunnus atlanticus*); Bigeye (*Thunnus obesus*); and Yellowfin (*Thunnus albacares*). Commercially, Yellowfin Tuna is the most popular amongst local restaurants and the export market. Catches for the Yellowfin Tuna are usually higher during the winter months. Landing of the other species of larger Tuna is very rare.

### Current regulations & non-binding agreements governing the fishery

The Fisheries Protection Act does not have any regulations that directly address the Tuna fishery. The existing general regulations do not have much of an impact on this fishery, because of the method of fishing does not use wire or nets. The only non-binding agreement that is generally associated with the Tuna fishery is the FAO Guideline for Small Scale Fisheries. Through CRFM, Anguilla has an indirect relationship with ICAAT; however, we do not have any quota systems, as is the case with other CRFM member countries. Information shared with CRFM about tuna and other pelagic fish landings are analysed and passed on to ICAAT, who then compiles the data to represent the regions catch. The data can also be found per country for islands with large pelagic fisheries. Although Anguilla is a British Overseas Territory, the island

is not associated to ICCAT by the UK membership, but Anguilla is in the process of formalizing ties with ICCAT through the UK.

Objectives of the regulations

No direct regulations exist for Anguilla. Other Caribbean territories have strict regulations on minimum size and harvest quotas.

Present state of exploitation

In Anguilla, there are less than ten, and the availability of markets are not consistent. From reviewing the fish catch landings data and in conversation with several restaurant owners and fishermen, it is clear that the Tuna fishery in Anguilla has a lot of potential to grow without causing any adverse negative affects to the stock.

Objectives to be achieved in the management of the fishery

- ✚ Determine population abundance and structure, migratory patterns and relevant biological data
- ✚ Sustainable harvesting of Tuna through size regulations, quotas and management of the fishing gear
- ✚ Sustainable development of the fishery for local consumption, export and sport fishing
- ✚ Reduce the importation of Tuna
- ✚ Increase the presence of fresh local Tuna on restaurant menus and in local fish markets and groceries
- ✚ Introduce protection measures for the Tuna fishery
- ✚ Increase in the number of Tuna fishers and their sales
- ✚ Ability of Anguilla to sell on the international markets, after achieving required standards

Management and development measures to be taken

- ✚ Use CRFM Subregional Fisheries Management Plan for Blackfin Tuna Fisheries in the Eastern Caribbean as a guide to the management of the local Blackfin Tuna fishery
- ✚ Comprehensive study and biological analysis to get a greater understanding of Tuna in Anguilla water
- ✚ Amend existing legislation for the sustainable development of this fishery
- ✚ Facilitate pelagic fishing workshops and public education sessions on Tunas, to sensitize fisherfolk about the fishery
- ✚ Encourage fishermen to explore Tuna fishing
- ✚ Source reliable local and overseas markets for Tuna sales and promote the use of local Tuna in restaurants
- ✚ Ensure through capacity building exercises that fishers and fish retailers have the resources and understanding needed to guarantee that the quality of Tuna landed is of high standard and can be marketed in local restaurants and for export, e.g. crushed ice and carbon freezers which keeps the flesh superb and blood red color and also prevents spoilage
- ✚ Anguilla to sign on to ICAAT as an overseas territory under the UK
- ✚ **Table 26. Proposed minimum size landings for various species of Tuna caught in Anguilla waters.**

<b>Tuna species</b>	<b>Legal size</b>
Yellowfin	50cm/500mm
Albacore	60cm/600mm

Bigeye	85cm/850mm
Skipjack	50cm/500mm
Blackfin	70cm/700mm

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### Monitoring, management indicators and reference points

- ✚ The ability of DFMR to establish catch quotas based on the results of a Tuna population study
- ✚ The acceptance and cooperation of the general public, especially fishers, to the proposed new legislation
- ✚ Participation of more than 50% of fisherfolk in capacity building exercise about Tuna and Tuna fishing
- ✚ The transformation of at least three reef fishers into Tuna fishers by 2017
- ✚ Retrofitting of vessels to ensure the best quality fish is landed and spoilage is minimized
- ✚ Ability of Anguilla to sell on the international markets, after achieving required standards
- ✚ Encourage local markets to purchase and request from fishers locally caught Tuna
- ✚ Increased landing site and on sea patrols to enforce new Tuna legislation
- ✚ Anguilla data would be credible and large enough to be entered individually by ICAAT

### Management limitations

- ✚ Limited local and regional data on pelagics causes challenges with sustainable management
- ✚ Funding to have a desk study or pilot project to assess stocks and biological data might be difficult to source
- ✚ Political will to amend the legislation will be needed
- ✚ Support for workshops and other matters might not be well supported by fishermen, as they already express a lack of interest for other topics
- ✚ Surveillance and patrols are usually difficult because of the limited human resources of the DFMR
- ✚ The financial burden of membership to ICAAT might have to be borne by the GOA if the island is unable to join ICCAT under the British Government

**Table 27. Key dimensions for consideration with the management of the Tuna fishery.**

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Biological	Tuna eggs are buoyant and free floating in the water column. All Tunas grow rapidly, have a short life span and many face tremendous fishing pressure above their maximum sustainable yield.
Ecological	Maintains balance in the pelagic zone food chain.
Social	Tuna is not a popular fish amongst local households in Anguilla, because the culture of the people to favour plate size fish such as reef fish.
Economic	The Tuna fishery (as a pelagic fishery) is the second largest fishery (based on economics) on the island. There are very few fishers and seasonally high demand for the fish, commencing during the tourism season, as the largest/main market are the hotel restaurants, hence the economic turnover is very profitable.

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#### 4.9.2 Marlin

Blue Marlin (*Makaira nigricans*) and White Marlin (*Tetrapturus albidus*) are billfishes, found in the waters of Anguilla. They have a very similar in biology, ecology and body structure. Their fin morphology and slight variations in their coloration (White Marlin has small dark fin spots and Blue Marlin does not), maybe used to tell them apart. The Blue Marlin is popular in

Anguilla, especially amongst sport fishers. Both species will be managed together, as 'Marlin' in the AFDP.

#### Current regulations & non-binding agreements governing the fishery

There are no local regulations directly governing this fishery. The only non-binding agreements that exist are broad and not specific to this fishery. The existing general regulations do not have much of an impact on this fishery, because of the method of fishing does not use wire or nets. Marlin is an ICAAT species, and data on this fishery is reported to ICAAT through the CRFM, but Anguilla has no agreements with those two bodies for the protection of the species. Although Anguilla is a British Overseas Territory, the island is not associated to ICCAT by the UK membership, but Anguilla is in the process of formalizing ties with ICCAT through the UK.

#### Objectives of the regulations

No local regulations exist.

#### Present state of exploitation

Local landings are very low. This fishery in Anguilla waters can be considered underexploited by locals.

#### Objectives to be achieved in the management of the fishery

- ✚ Determine population abundance and structure, migratory patterns and relevant biological data
- ✚ Sustainable harvesting of Marlin through size regulations, quotas and management of the fishing gear used
- ✚ Sustainable development of the fishery for local consumption, export and sport fishing
- ✚ Reduce the importation of Marlin
- ✚ Increase the presence of fresh local Marlin on restaurant menus and in local fish markets and groceries
- ✚ Increase protection for the Marlin fishery
- ✚ Increase in the number of Marlin fishers and their sales
- ✚ Ability of Anguilla to sell on the international markets, after achieving required standards

#### Management and development measures to be taken

- ✚ Comprehensive study and biological analysis to get a greater understanding of Marlin in Anguilla water
- ✚ Amend existing legislation for the sustainable development of this fishery
- ✚ Implement legal minimum size at 130cm/1,300mm and quotas for harvesting
- ✚ Facilitate pelagic fishing workshops and public education sessions on Marlins to sensitize fisherfolk about the fishery
- ✚ Encourage fishermen to explore Marlin fishing
- ✚ Source reliable local and overseas markets for Marlin sales and promote the use of local Marlin in restaurants
- ✚ Ensure through capacity building exercises that fishers and fish retailers have the resources and understanding needed to guarantee that the quality of Marlin landed is of high standard and can be marketed in local restaurants and for export, e.g. crushed ice and carbon freezers which keeps the flesh superb and blood red color and also prevents spoilage

- ✚ Anguilla to sign on to ICAAT as an overseas territory under the UK

#### Monitoring, management indicators and reference points

- ✚ The ability of DFMR to establish catch quotas based on the results of a Marlin population study
- ✚ The acceptance and cooperation of the general public, especially fishers, to the proposed new legislation
- ✚ Participation of more than 50% of fisherfolk in capacity building exercise about Marlin and Marlin fishing
- ✚ The transformation of at least three reef fishers into Marlin fishers by 2017
- ✚ Retrofitting of vessels to ensure the best quality fish is landed and spoilage is minimized
- ✚ Encourage local markets to purchase and request from fishers locally caught Marlin
- ✚ Increased landing site and on sea patrols to enforce new Marlin legislation
- ✚ Anguilla data would be credible and large enough to be entered individually by ICAAT

#### Management limitations

- ✚ Funding to have a desk study or pilot project to assess stocks and biological data might be difficult to source
- ✚ Political will to amend the legislation will be needed
- ✚ Support for workshops and other matters might not be well supported by fishermen, as they already express a lack of interest for other topics
- ✚ Surveillance and patrols are usually difficult because of the limited human resources of the DFMR
- ✚ The financial burden of membership to ICAAT might have to be borne by the GOA if the island is unable to join ICCAT under the British Government

**Table 28. Key dimensions for consideration with the management of the Marlin fishery.**

Biological	Very sensitive to temperature and salinity, reproduction is dependent on these two factors. They spawn once a year, in early summer and have a very long life span (25-30 years). Marlins display sexual dimorphism, with the females being larger than the males.
Ecological	Swim solitary or in pairs and are associated with upwellings.
Social	Marlin is not popular with locals as a food source, because it is seldom landed and locals prefer reef fish.
Economic	Landings of Marlins are very sparse. Their commercial fisheries economic value cannot be determined currently, but, many tourists are lured to sportfishing with the hope of catching Marlins. They are believed to be worth more as game fish.

#### 4.9.3 Swordfish

The Swordfish (*Xiphias gladius*) is another billfish that is not popular on the local market. They earned their name from the long sturdy, sword like bill. They migrate through Anguilla waters and are seldom targeted. They may be caught as bycatch in the commercial and recreational fisheries or intentionally during sport fishing. Swordfish do not swim in schools.

#### Current regulations & non-binding agreements governing the fishery

Owing to the fact that Swordfish like all other billfish species are highly migratory, regional and international regulations should be considered and carefully examined, in the management of this



fishery. The existing general regulations do not have much of an impact on this fishery, because of the method of fishing does not use wire or nets. While there are no regulations or non-binding agreements directly governing the fishery in Anguilla, strict regulations exist in the USVI and Puerto Rico. In these countries, fishers are granted limited access permits, there is a closed season, size limits and catch limits (two Swordfish per vessel per trip) and gear restrictions, allowing only bandit, handline, harpoon, rod and reel and buoy gear.

### Objectives of the regulations

Some Caribbean countries have regulations geared towards rebuilding Swordfish populations and for future conservation of the species.

### Present state of exploitation

Underutilized in Anguilla, this fishery should be developed.

### Objectives to be achieved in the management of the fishery

- ✚ Determine population abundance and structure, migratory patterns and relevant biological data
- ✚ Sustainable harvesting of Swordfish through size regulations, quotas and management of the fishing gear used
- ✚ Sustainable development of the fishery for local consumption, export and sport fishing
- ✚ Reduce the importation of Swordfish
- ✚ Increase the presence of fresh local Swordfish on restaurant menus and in local fish markets and groceries
- ✚ Increase protection for the Swordfish fishery
- ✚ Increase in the number of Swordfish fishers and their sales
- ✚ Ability of Anguilla to sell on the international markets, after achieving required standards

### Management and development measures to be taken

- ✚ Comprehensive study and biological analysis to get a greater understanding of Swordfish in Anguilla water
- ✚ Amend existing legislation for the sustainable development of this fishery
- ✚ Implement legal minimum size at 115cm/1.150mm and quotas for harvesting
- ✚ Facilitate pelagic fishing workshops and public education sessions on Swordfish to sensitize fisherfolk about the fishery
- ✚ Encourage fishers to explore Swordfish fishing
- ✚ Source reliable local and overseas markets for Swordfish sales and promote the use of local Swordfish in restaurants
- ✚ Ensure through capacity building exercises that fishers and fish retailers have the resources and understanding needed to guarantee that the quality of Swordfish landed is of high standard and can be marketed in local restaurants and for export, e.g. crushed ice and carbon freezers which keeps the flesh superb and blood red color and also prevents spoilage
- ✚ Anguilla to sign on to ICAAT as an overseas territory under the UK

### Monitoring, management indicators and reference points

- ✚ The ability of DFMR to establish catch quotas based on the results of a Swordfish population study



- ✦ The acceptance and cooperation of the general public, especially fishers, to the proposed new legislation
- ✦ Participation of more than 50% of fisherfolk in capacity building exercise about Swordfish and Swordfish fishing
- ✦ The transformation of at least three reef fishers into Swordfish fishers by 2017
- ✦ Retrofitting of vessels to ensure the best quality fish is landed and spoilage is minimized
- ✦ Encourage local markets to purchase and request from fishers locally caught Swordfish
- ✦ Increased landing site and on sea patrols to enforce new Swordfish legislation
- ✦ Anguilla data would be credible and large enough to be entered individually by ICAAT

#### Management limitations

- ✦ Funding to have a desk study or pilot project to assess stocks and biological data might be difficult to source
- ✦ Political will to amend the legislation will be needed
- ✦ Support for workshops and other matters might not be well supported by fishermen, as they already express a lack of interest for other topics
- ✦ Surveillance and patrols are usually difficult because of the limited human resources of the DFMR
- ✦ The financial burden of membership to ICAAT might have to be borne by the GOA

**Table 29. Key dimensions for consideration with the management of the Swordfish fishery.**

Biological	They exhibit sexual dimorphism, with the females being larger than the males. It takes four to five years for them to reach sexual maturity and life expectancy is about nine years. Swordfish are believed to spawn year round in the Caribbean Sea, while in other seas this may vary. Swordfish vision and reproduction is highly dependent on water temperature, with warm waters being more favourable.
Ecological	Swordfish are important to the food chain, as they are predators and are preyed upon by Mako Sharks and Killer Whales.
Social	Not popular on the local market, because it is seldom landed and locals prefer reef fish.
Economic	Landings of Swordfish are very sparse. Their commercial fisheries economic value cannot be determined currently, but, many tourists who visit the island engage in sportfishing. They are believed to be worth more as game fish.

#### 4.9.4 Sailfish

*Istiophorus albicans* better known as Atlantic Sailfish or Ocean Gar can be easily distinguished by their large dorsal fin that resembles a boat sail. They are the fastest swimmers in the ocean and migrate between tropical and temperate waters in the Atlantic Ocean.

#### Current regulations & non-binding agreements governing the fishery

There are no regional regulations on Sailfish, however some regional non-binding agreements and local regulations may add some level of protection to them indirectly.

#### Objectives of the regulations

No direct regulations and non-binding agreements exist.

#### Present state of exploitation

Underutilized in Anguilla waters, the fishery needs to be developed. Their populations in international waters are deemed stable, and there is no protection status for them.

### Objectives to be achieved in the management of the fishery

- ✦ Determine population abundance and structure, migratory patterns and relevant biological data
- ✦ Sustainable harvesting of Sailfish through size regulations, quotas and management of the fishing gear used
- ✦ Sustainable development of the fishery for local consumption, export and sport fishing
- ✦ Reduce the importation of Sailfish
- ✦ Increase the presence of fresh local Sailfish on restaurant menus and in local fish markets and groceries
- ✦ Increase protection for the Sailfish fishery
- ✦ Increase in the number of Sailfish fishers and their sales
- ✦ Ability of Anguilla to sell on the international markets, after achieving required standards

### Management and development measures to be taken

- ✦ Comprehensive study and biological analysis to get a greater understanding of Sailfish in Anguilla water
- ✦ Amend existing legislation for the sustainable development of this fishery
- ✦ Implement legal minimum size at 160cm/1,600mm and quotas for harvesting
- ✦ Facilitate pelagic fishing workshops and public education sessions on Sailfish to sensitize fisherfolk about the fishery
- ✦ Encourage fishermen to explore Sailfish fishing
- ✦ Source reliable local and overseas markets for Sailfish sales and promote the use of local Sailfish in restaurants
- ✦ Ensure through capacity building exercises that fishers and fish retailers have the resources and understanding needed to guarantee that the quality of Sailfish landed is of high standard and can be marketed in local restaurants and for export, e.g. crushed ice and carbon freezers which keeps the flesh superb and blood red colour and also prevents spoilage
- ✦ Anguilla to sign on to ICAAT as an overseas territory under the UK

### Monitoring, management indicators and reference points

- ✦ The ability of DFMR to establish catch quotas based on the results of a Sailfish population study
- ✦ The acceptance and cooperation of the general public, especially fishers, to the proposed new legislation
- ✦ Participation of more than 50% of fisherfolk in capacity building exercise about Sailfish and Sailfish fishing
- ✦ The transformation of at least three reef fishers into Sailfish fishers by 2017
- ✦ Retrofitting of vessels to ensure the best quality fish is landed and spoilage is minimized
- ✦ Encourage local markets to purchase and request from fishers locally caught Sailfish
- ✦ Increased landing site and on sea patrols to enforce new Sailfish legislation
- ✦ Anguilla data would be credible and large enough to be entered individually by ICAAT

### Management limitations

- ✦ Funding to have a desk study or pilot project to assess stocks and biological data might be difficult to source

- ✚ Political will to amend the legislation will be needed
- ✚ Support for workshops and other matters might not be well supported by fishermen, as they already express a lack of interest for other topics
- ✚ Surveillance and patrols are usually difficult because of the limited human resources of the DFMR
- ✚ The financial burden of membership to ICAAT might have to be borne by the GOA

**Table 30. Key dimensions for consideration with the management of the Sailfish fishery.**

Biological	Sailfish spawn during the summer months in warm open ocean waters, in small groups of one female to several males. Their average life span is five to seven years.
Ecological	Sailfish are associated with small schooling fish and are important to the food web of the open ocean as a prey and predator.
Social	The meat of Sailfish is not as soft and tasty as the other billfish, it is therefore not one of the choice pelagic fish in local restaurants and households.
Economic	More valuable in the sportfishing industry than it is in the commercial fishery.

#### 4.10 Small coastal pelagics

This group of fish fall under the category of schooling silvery fish, and are an important fishery in Anguilla, both economically and socially, from a local subsistence level and commercially. The main targeting method is purse seine. The fishing is conducted seasonally (by choice and fish behaviour), on a community level. Locals refer to it as the ‘Rounding of the Jacks’. Larger more solitary individuals are targeted by speargun and on hook and line (often trolling). Most species listed in this section are associated with reef areas, whilst also being found in deeper water and along coastal drop-offs. Larger species often school around the dive wrecks. Of these particular species, high frequencies of ciguatera poisoning have been reported thus reducing their economic value as a food source.

##### 4.10.1 Jacks, Scads, Herrings, Ballyhoos, Needlefish/Gars

Jacks are a large family (Carangidae) of fish with significant commercial importance. Approximately eighteen species have been reported throughout the Caribbean region, with five species considered of special importance in Anguilla: Rainbow Runner (*Elagatis bipinnulata*), Blue Runner (*Caranx crysos*), Bar (*Caranx ruber*), Horse-Eye (*Caranx latus*) and Black (*Caranx lugubris*) Jack, with three potential species of Scad; differentiating between members of this latter group is problematic. Seasonal ‘Rounding of the Jacks’ occur for some of these species in specific areas, for example close to Dog Island and close to shore in Crocus Bay. Other species may be targeted by speargun or hook and line, although high incidences of Ciguatera poisoning have made some species less favourable as a food source, especially the Horse-Eye and Black Jack. Another species, known locally as the Sailors Choice is highly prized by fishers but is usually caught via hook & line. It is believed this species is actually the Almaco Jack (*Seriola rivoliana*) which lives predominantly in open water and only occasionally forms schools.

Ballyhoo (*Hemiramphus spp.*), belongs to the flyingfish family (detailed in section 4.11.2), but have been included here as they are schooling species and so sometimes targeted using the same methods as Jacks and Scad. Herring of the family Clupeidae and Needlefish of the Belonidae family, have also been included in this group but are of lesser economic and social importance. The species of Herring confirmed in Anguilla is the Redear Herring (*Harengula humerali*),

which would primarily be targeted as a baitfish while schooling and three species of Needlefish, the larger individuals of which are only targeted intermittently in an opportunistic manner.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Jacks, Herring or Needlefish. There are restrictions on gear that protects this family of fish. The Revised Fisheries Protection Act R.S.A.c F40 prohibits the use of fish trap wire less than 1.5 inches in diameter and the use of gillnets. There are no regional regulations, although some restrictions exist in certain Caribbean territories. For example, in the U.S. Caribbean annual catch limits have been set or generic daily vessel limits imposed where Jack species are categorised together with pot fish species, depending on the number of persons on board (NOAA, 2015). Such regulation would pose a problem in Anguilla or in other regions where Jacks (etc.) are seasonally rounded. No minimum size restrictions have been identified within the Caribbean region.

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species and to avoid the harvesting of non-targeted species and drowning of fish by the use of a gillnet.

#### Present state of exploitation

Even though exploitation of many Jack species is considered high, their semi-pelagic nature is probably the reason for their current numbers appearing relatively stable. A lack of historical information however means that this observation is tentative at best.

#### Objectives to be achieved in the management of the fishery

- ✚ Identification of all Jack rounding grounds
- ✚ Data collection on population dynamics and on fish catch landings
- ✚ Ensure overall population of Jacks remains stable or increases
- ✚ More informed and educated public on Jacks (minimum size, ciguatera poisoning etc.)

#### Management and development measures to be taken

- ✚ Research on rounding areas and population dynamics of certain Jack species
- ✚ Research on if rounding occurs during reproductive times, and if so certain areas should be closed to this activity during reproductive months
- ✚ Collect fish catch data by species so that DFMR would be able to determine the profitability of the species, catch per effort data and other relevant information
- ✚ Protection of Jack habitats and rounding grounds
- ✚ Conduct several educational activities about the various species and the fishery
- ✚ Introduce minimum size limits for certain species
- ✚ Establish catch quotas
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island

#### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Jack statistics
- ✚ Stable or increasing Jack populations around the island
- ✚ Seasonal patrols of rounding grounds and landing sites
- ✚ 50% increase of Jacks on all dive wrecks

## Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas or introduce minimum size limits, closed seasons etc.
- ✚ Unwillingness of the general public and fishers to participate in educational sessions

**Table 31. Key dimensions for consideration with the management of the Jacks, Scads, Herring, Ballyhoo and Needlefish/Gars fisheries.**

---

Biological	Silvery, strong swimming predators that often school, with a deeply forked tail that facilitates speed.
Ecological	Sometimes school over reefs in search of small fish and crustacean although most species are more associated with the open ocean or deep drop offs.
Social	Important locally as both a food source and livelihood, although the frequency of ciguatera associated with certain species has affected this over recent decades. Rounding activities are often a community event.
Economic	Economically significant, although primarily during the rounding season. Also important from a subsistence aspect.

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### **4.11 Potential economically viable fisheries**

DFMR spent a considerable amount of time and effort encouraging people in Anguilla to eat Lionfish and for restaurants to add it to their menus. Unlike the Lionfish, there are other fish species that are not new to Anguilla waters, but locals have still not developed a taste for them, and restaurants have not yet begun to use their culinary innovation to indulge tourist with them. Some of these species can also be harvested for the export market, if they fail to gain favour locally and can potentially generate substantial economic earnings. Even though they are not as popular as some of the other fisheries, there is still a need for managing them, in the event that the fishery does develop.

#### 4.11.1 Lionfish

*Pterois volitans* is of the family Scorpaenidae. It is native to the Indo-Pacific region. *P. volitans* is commonly known as the Red Lionfish, Turkeyfish or most popular Lionfish. It is a carnivorous predatory reef fish species, which dwells in coastal and offshore areas, in and around coral reefs, ledges, wrecks, rubble and rocks. Any area with lots of structure, being cavernous or with many crevices ranging from depths of 5-300ft makes a favourable home for these solitary fish.

Lionfish are voracious hunters. Albins & Hixon (2008) observed a large adult consuming more than 20 small Wrasses during a 30 min period. Lionfish usually eat over 5% of their body weight per day (Fishelson, 1997). In its native habitat, an adult individual of 45cm in length (350g) consumed 8.5g of prey per day. This equates to 230kg per year on a 1km stretch of reef, containing 80 adults. Consumption rates in the Caribbean region may exceed this (Morris & Atkins, 2009).

#### Current regulations & non-binding agreements governing the fishery

CRFM Ministerial Council recently approved a regional Lionfish Management Strategy. It is not advisable to implement regulations for the protection of this fishery because of its recent

introduction, the biology of the fish and its ability to negatively impact the islands marine resources. Harvesting methods for Lionfish should be carefully monitored to ensure that they are in accordance with existing fisheries regulations and would not be detrimental to other marine resources. Educational and outreach activities should be on-going for the general public and DFMR should continue its data collection efforts.

### Objectives of the regulations

Regulations for the protection and overharvesting of this species are not advisable.

### Present state of exploitation

Since 2010, when the first Lionfish in Anguilla waters was spotted, the number of reports and captures of Lionfish around the island increased significantly. However, the nearshore numbers began to decline in 2012, after much public education sessions about the fish and encouragement of the restaurants to include it on their menus; hence people began to harvest the fish for consumption.

Today several fishermen target Lionfish, using fish traps or spearguns, while others capture them as bycatch and sell them on the local market. There is no doubt that Lionfish populations are established around the entire island and its surrounding cays, but this has yet to be quantified due to a lack of human resources and some areas are almost inaccessible. However, it is known that Lionfish populations exist beyond recreational safe diving limits, because they have been captured by local fishermen in traps that were set in water more than 200ft deep.

It is believed that the eradication of Lionfish campaigns conducted by DFMR, ANT and DOE from 2010 to present has resulted in the very low numbers of Lionfish nearshore. DFMR hopes that the nearshore fishing pressure on Lionfish will remain relatively high.

### Objectives to be achieved in the management of the fishery

- ✚ Educate the public on the origin, feeding habits, biology, reproductive traits and behavioural patterns of Lionfish
- ✚ Encourage the harvesting of Lionfish for food and as bait fish
- ✚ Sensitize the public on the status and proliferation of Lionfish in Anguilla waters
- ✚ Map Lionfish distribution and 'hot spots' around the island
- ✚ Outline how to deal with Lionfish, in terms of captures, precautions, medical attention and general management
- ✚ Clearly determine the relationship between the Lionfish behavioural patterns and its effects on coral reef ecology and local economics
- ✚ Develop a mandate for reporting sightings of Lionfish, recording Lionfish data and storing them
- ✚ Improve fish stock data collection and analysis, to be able to set realistic targets
- ✚ Ensure relevant and adequate equipment/resources are available to assist in monitoring and managing Lionfish population

### Management and development measures to be taken

- ✚ Use of the existing Lionfish Response Plan
- ✚ Promotion of Lionfish for local consumption and export
- ✚ Public education
- ✚ Increased data collection and public feedback



- ✚ Continued training and education of DFMR staff
- ✚ Analysis of gut contents and gills of Lionfish to determine if there are any parasites that could negatively impact Lionfish populations

#### Monitoring, management indicators and reference points

- ✚ Set annual target for public outreach sessions and at the end of the period evaluate them
- ✚ Set target number of captures per survey by DFMR (dependant on pre-survey numbers)
- ✚ 20% decrease to the 2015 number of nearshore landings of Lionfish by 2017
- ✚ Increase in the number of restaurants selling Lionfish meals by 2017

#### Management limitations

- ✚ Insufficient financial resources for extra in water monitoring, public education and fish catch data collection
- ✚ Fishers may be more interested in higher paying fisheries
- ✚ Biological and ecological data on Lionfish are constantly changing, because it is new to the region and lots of studies are on-going, therefore when new information arise, and existing details changed, and are communicated with the public, DFMR does not appear to be knowledgeable or credible

**Table 32. Key dimensions for consideration with the management of the Lionfish fishery.**

Biological	Typically, Lionfish can grow up to 15-19 inches (38-48cm) in length. They reach sexual maturity in less than one year, although this may vary from place to place, and spawn in pairs, every four days, all year round. Their eggs are free floating, and held together in a gelatinous mass, which disperses at the ocean's surface (Purdy 2012).
Ecological	They are an invasive species and threaten the habitat of reef fish and overall survival of coral reefs. They do not perceive other entities as a threat and are relatively territorial, meaning that once sighted the individual can easily be relocated and captured.
Social	Most of the islands population, especially the fishermen, are now very educated about the Lionfish and no longer harbour initial fears while understanding the threat that they pose to the marine environment. As such they have been playing an active role in removing Lionfish and reporting sightings.
Economic	Lionfish was once a refused and taboo fish; it now fetches up to US\$5.00 per lb.

#### 4.11.2 Flyingfish

While there are several species of Flyingfish, the most common one in the Caribbean is *Hirundichthys affinis*, also known as the Fourwing Flyingfish. The Flyingfish is not one that would be found in the local markets or at the dinner table of an Anguillian home, but in other Caribbean islands, such as Grenada, Dominica, St. Lucia, Trinidad and Tobago and Barbados, Flyingfish is a big fishery. There is potential in Anguilla for it to be developed, as several people have been inquiring about venturing into this fishery; they are present in our waters and some of the targeted species of fish, follow schools of Flyingfish, making them even easier to be caught. However, one of the issues with developing this fishery is the manner in which they are harvested throughout the region. Fishermen in the other islands employ gillnets, scoop nets, chum and FADs to catch Flyingfish, but gillnets are illegal in Anguilla. Fishers in Anguilla would have to devise another strategy to harvest Flyingfish.

### Current regulations & non-binding agreements governing the fishery

No regulations exist in Anguilla, besides the ban on gillnets, which would directly impact this fishery. Regional legislation such as closed seasons, catch limits and licensing procedures exists to guard against over exploitation and unsustainable harvesting. Regional fisheries bodies such as CRFM have also employed non-binding regional management agreements.

### Objectives of the regulations

Sustainable development/use of the fishery, regulate, rebuild stocks and conserve for the future of the Flyingfish fishery.

### Present state of exploitation

In Anguilla there is no Flyingfish fishery, it is therefore underutilized and has lots of room for development. However the species is migratory and if Anguilla is to develop the fishery, its status throughout the region will have to be carefully considered and monitored. In recent times, Barbados, Grenada and some of the other islands have been experiencing rapid declines in landings. In Dominica in the 1990's Flyingfish accounted for more than 28% of the total fishery yields, but by 2013, the fishery accounted for less than 4% of fishery yields.

### Objectives to be achieved in the management of the fishery

- ✚ Sustainable development of the fishery
- ✚ Educate the public on the feeding habits, biology, reproductive traits and behavioural patterns of Flyingfish
- ✚ Encourage the harvesting of Flyingfish for food and as bait fish
- ✚ Improve fish stock data collection and analysis for Flyingfish to be able to set realistic targets

### Management and development measures to be taken

- ✚ Carefully monitor landings of Flyingfish for important stock and biological data
- ✚ Increased data collection and public feedback
- ✚ Share Anguilla data with other Caribbean islands that have Flyingfish fisheries and vice versa to be able to recognize significant trends or comparisons in regional data
- ✚ Promotion of Flyingfish for local consumption and export
- ✚ Public education

### Monitoring, management indicators and reference points

- ✚ A rise in interest by fisherfolk to harvest Flyingfish
- ✚ Collection of landings data on Flyingfish from the various landing sites

### Management limitations

- ✚ Insufficient financial resources for public education and fish catch data collection
- ✚ Fishers may be more interested in higher paying fisheries such as the large pelagics
- ✚ The existing ban on gillnets and the need to be innovative in another method to harvest Flyingfish might discourage fishers from this fishery



**Table 33. Key dimensions for consideration with the management of the Flyingfish fishery.**

---

Biological	Spawning occurs in June in the Eastern Caribbean.
Ecological	Their abundance is seasonal throughout the Eastern Caribbean.
Social	Flyingfish is not harvested in Anguilla.
Economic	Has the potential to generate money as a small scale fishery.

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#### 4.11.3 Eels

Eels, represented by three families in Anguilla (Moray Eels – Muraenidae, Snake Eels – Ophichthidae, and Conger Eels – Congridae) are of minor commercial importance. Most species are too small and/or reclusive to be targeted as a specific fishery, with larger species often considered a pest when hauled in traps, and usually killed by prodding through the trap mesh and left inside as bait once dead. Of these larger species, the most common are the Spotted (*Gymnothorax moringa*), Goldentail (*Gymnothorax miliaris*), and Chain (*Echidna catenata*) Morays. The Green Moray (*Gymnothorax funebris*), the largest of all species, is the most feared Eel, and considered by many as poisonous and so seldom landed, usually being caught as bycatch in fish traps. Some restaurants reportedly sell Eel, although more details are needed to confirm if this is locally sourced Eel or imported.

#### Current regulations & non-binding agreements governing the fishery

The regulations governing fisheries in Anguilla do not specifically address Eel. The existing restriction prohibiting the use of fish trap wire less than 1.5 inches in diameter, may serve to protect small and juvenile Eels that enter fish traps. There are no specific non-binding agreements in the region. Regulations may exist in other Caribbean islands with Eel fisheries.

#### Objectives of the regulations

The objective of the restrictions on gear is to protect juveniles of species.

#### Present state of exploitation

Current exploitation levels are expected to be very low, owing to the fact that Eels are not directly targeted by fishers and are only landed as bycatch.

#### Objectives to be achieved in the management of the fishery

- ✚ Assessment of potential for fishery development
- ✚ Biological studies to determine which toxins, if any, are present in various species of Eels around the island
- ✚ Assessment of population levels and exploitations levels
- ✚ Elevated level of awareness of Eels by the DFMR and general public

#### Management and development measures to be taken

- ✚ Collect fish catch data by (larger) species so that DFMR is able to determine current preferences and exploitation levels
- ✚ Protection of Eel habitats
- ✚ Restrict fishing within Anguilla's Marine Parks
- ✚ Ban fishing on all dive wrecks around the island
- ✚ Outreach activities and capacity building sessions on Eels

### Monitoring, management indicators and reference points

- ✚ By 2020 a five year reliable database of local Eel statistics
- ✚ Stable numbers of Eel in coastal areas
- ✚ Willingness of at least two fishers to undertake trial Eel fishery

### Management limitations

- ✚ DFMR small staff compliment and limited resources makes patrols, data collection and enforcement difficult
- ✚ Government might be unwilling to restrict fishing in certain areas
- ✚ Local taboo on catching and eating Eel, as some people may view it as a sea serpent or poisonous (based on biblical references to serpents)

**Table 34. Key dimensions for consideration with the management of the Eel fishery.**

---

Biological	Long, snake-like fish with an aggressive appearance as they open and close their mouth to circulate water around their gills.
Ecological	Live within reef recesses during the day, usually foraging at night for food. Eels play little role in the maintenance of ecological services aside from a biodiversity and food chain standpoint.
Social	Not thought to be consumed locally. Can inflict a nasty bite if molested.
Economic	Fishers report that while Eels are in fish traps they consume the other trapped fish. Large Green Morays can enhance dive sites as a tourist attraction.

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#### 4.11.4 Echinoderms

Echinoderms, specifically Sea Urchins and Sea Cucumbers, are important fisheries, in various parts of the world, but in Anguilla no active fisheries exist, not even of an artisanal nature. Due to global markets however, investigations from other nations are often made as to the possibility of exporting certain species out of Anguilla waters. For this reason is it important to assess the potential these fisheries have for economic development, together with environmental impacts and other considerations.

##### 4.1.2.1 Sea Urchins

Although many species of Sea Urchin (Class: Echinoidea) exist in Anguillian waters, only one, the West Indian Sea Egg (*Tripneustes ventricosus*), also known as the edible urchin, has the potential for fishery development. The other species, although often with significant ecological importance (for example the Long-Spined Sea Urchin, *Diadema antillarum*) would not be viable to exploit for a number of reasons: Infaunal, reclusive or inaccessible life history, unknown edibility, and an often extremely hazardous array of sharp and/or poisoned spines.

The West Indian Sea Egg on the other hand lives a relatively exposed life on sea grass beds or surrounding rocks, is considered a delicacy and has short, relatively harmless spines. For unknown reasons, this species is not as common in Anguilla as it is in other Caribbean Islands, which is likely the reason why it has not developed as a fishery. The low population numbers are not thought to be due to over-harvesting, as locals and restaurant patrons (including visitors), do not report a taste for West Indian Sea Egg, neither do they consider it 'exotic'.

It is interesting to note that numbers of the West Indian Sea Eggs appear to have increased over recent years, in line with the *Diadema antillarum* recovery that is now happening, albeit in a somewhat patchy manner, since their mass mortality event back in the early 1980's. It is not

clear whether West Indian Sea Eggs underwent a similar mortality (Mahon and Parker 1999), or if populations of both species are in some way interlinked.

Current regulations & non-binding agreements governing the fishery

There are currently no regulations relating to this fishery. Regional regulations vary and include closed seasons (April to August in Barbados), closed areas, restrictions on harvesting using SCUBA gear and a 90mm minimum test diameter size limit without spines (Martinique). All of the islands in the Eastern Caribbean who operate this fishery (Barbados, Grenada, Martinique, St Lucia, St Vincent), have introduced some kind of legislation as reductions in abundance have occurred on a number of occasions as the species are extremely easy to harvest. This can be illustrated by the fact that the first legislation was introduced in Barbados in 1879. Even with this in place continual stock crashes occur that necessitate subsequent moratoriums often lasting for a number of years.

Objectives of the regulations

No regulations exist in Anguilla.

Present state of exploitation

No known exploitation in Anguilla

Objectives to be achieved in the management of the fishery

- ✚ Not currently a fishery
- ✚ Population, ecological and biological studies to assess viability of a fishery

Management and development measures to be taken

- ✚ Studies on the species
- ✚ Public sensitization on their ecological interactions and importance
- ✚ Current populations has to be reassessed to determine if they can maintain a sustainable fishery, so management should not concentrate on promoting this as a fishery suitable for development at the present time

Monitoring, management indicators and reference points

- ✚ Potential population assessment to establish future fishery viability
- ✚ Vigilance in FCDC and surveillance to monitor any new developments

Management limitations

- ✚ Financial and human resources limited to conduct studies
- ✚ Disinterest in the general public especially fishers on sensitization to West Indian Sea Eggs

**Table 35. Key dimensions for consideration with the management of the Sea Urchin fishery.**

---

Biological	Short non-toxic spines.
Ecological	Inhabits shallow areas, both seagrass and rocky habitats. Maintains reef health through grazing on algae.
Social	Not locally eaten. Known locally only generically as the Sea Egg.
Economic	None.

---

#### 4.1.2.2 Sea Cucumbers

Three species of Sea Cucumbers (Class: Holothuroidea) have been confirmed in Anguilla waters: Donkey Dung (*Holothuria mexicana*), Three-Rowed (*Isostichopus badionotus*) and the Furry (*Astichopus multifidus*) Sea Cucumbers. The latter species is considered rare, with *H.mexicana* the most common species on seagrass beds and *I.badionotus* the most common on reef/rocky habitats. There is no active Sea Cucumber fishery in Anguilla, although there have been recent enquiries into the possibility of exporting this resource; therefore there is the potential for future development.

In other parts of the region the three species confirmed in Anguilla are those primarily targeted, although population estimates suggest that in these regions they are far more prolific. For example, in Cuba, *I. badionotus* reached densities of c.8,800 individuals ha<sup>-1</sup> in some areas (Toral-Granda, 2008), which is vastly higher than those estimated in Anguilla. This suggests that populations are not sufficient to support a sustainable local fishery. For example, stock assessments of *H. mexicana*, *I. badionotus* and *A. multifidus* in Bocas del Toro (Mexico) indicated that these species have small population sizes and a high risk of collapse even in the short term (Guzman and Guevara, 2002). This can be illustrated by a case in Panama where conservative values report a total of 750,000 individuals of all three species caught during a 30-day fishing period in 1997.

#### Current regulations & non-binding agreements governing the fishery

There are currently no regulations relating to this fishery. Regional information on the fishery and its regulations are limited. Reported management measures include a total ban due to the fear of stock collapse (Panama) or being permitted only in very select areas (Venezuela). In Cuba an *I.badionotus* only fishery opened in 1999, with the issuing of one licence granted to a Korean company permitting a total allowable catch (TAC) of 320 tonnes (dry weight). During this year over 3 million individuals were caught which led to an almost 85% decline in catch the following season. This led to a closed season during June-October, a minimum landing size of 22-24cm, and a locally assigned TAC to regulate the number of vessels (Toral-Granda, 2008).

#### Objectives of the regulations

No regulations exist in Anguilla.

#### Present state of exploitation

No exploitation known in Anguilla.

#### Objectives to be achieved in the management of the fishery

- ✚ Not currently a fishery
- ✚ Population, ecological and biological studies to assess viability of a fishery

#### Management and development measures to be taken

- ✚ Studies on the species
- ✚ Public sensitization on their ecological interactions and importance
- ✚ Current populations has to be reassessed to determine if they can maintain a sustainable fishery, so management should not concentrate on promoting this as a fishery suitable for development at the present time

### Monitoring, management indicators and reference points

- ✚ Potential population assessment to establish future fishery viability
- ✚ Vigilance in FCDC and surveillance to monitor any new developments

### Management limitations

- ✚ Financial and human resources limited to conduct studies
- ✚ Disinterest in the general public especially fishers on sensitization to Sea Cucumber

**Table 36. Key dimensions for consideration with the management of the Sea Cucumber fishery.**

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Biological	Elongate soft bodied bottom dwellers.
Ecological	Inhabits shallow to deep areas, both seagrass and rocky habitats. Sediment feeders.
Social	Not locally eaten.
Economic	None.

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#### 4.11.5 Sea Turtles

Sea Turtles belong to the subphylum Vertebrata and most are of the Cheloniidae and Demochelidae families. Four species of Sea Turtle have been found in Anguilla waters: Loggerhead *Caretta caretta* (endangered), Green *Chelonia mydas* (endangered), Hawksbill *Eretmochelys imbricata* (critically endangered) and Leatherback *Dermochelys coriacea* (critically endangered). Green and Hawksbill Sea Turtles forage in Anguilla waters and they also nest on the mainland and offshore cay beaches, along with the Leatherbacks. These turtles rely on Anguilla's nearshore habitats to support their foraging and nesting behaviour. Loggerhead Sea Turtles have only occasionally been sighted, and are more likely to be observed offshore, passing through Anguilla's waters on their return from the Eastern Atlantic to the continental shelf of temperate North America.

Based on fishery records from 1688-1730, Jackson *et al.* (1997) estimates that adult Sea Turtle numbers in the Wider Caribbean Region once numbered approximately 6.5 million. Centuries of overharvesting, however, have reduced the regional population to a few thousand individuals (Piniak and Eckert, 2011; Richardson, *et al.*, in review).

#### Current regulations & non-binding agreements governing the fishery

All species of Sea Turtles are protected under the Revised Fisheries Protection Regulations f40-1. According to the Section 17 of the Regulations, no person may take, attempt to take, or cause to take any Turtle. Being in possession of a whole or part of a Turtle, including its meat or eggs, is in contravention of the Act. The prohibition on taking Turtle under these Regulations is valid until 15 December 2020.

The Fisheries Protection Regulations is supported by the Biodiversity and Heritage Conservation Act c.R55 which prohibits the taking, possession, and trafficking of any wildlife species listed within Schedule 1 of the Act (Part 5, Division 2, Sections 31, 32, and 33), including Sea Turtles. Habitat critical to the survival of Sea Turtle species (coral reefs, seagrass beds, beaches, and sand dunes) may also be protected from damage and disturbance under this Act (Part 5, Division 3, Sections 36 through 40). Regulations to support the Biodiversity and Heritage Conservation Act are currently being developed.

Use of Anguilla's land and coastline, including Sea Turtle nesting areas, is governed by the Land Development (Control) Act c.L15, the Beach Control Act c.B20, and the Beach Protection Act c.B25 (with their supporting regulations). Both the Land Development (Control) Act and the Beach Control Act are limited in their extent, in that the latter does not protect all beaches on the mainland and the offshore cays.

As Sea Turtles are listed under Appendix II of the Convention on the Trade in Endangered Species of Wild Fauna and Flora, they are nationally protected under the Trade in Endangered Species Act c.R55. A person may only import Sea Turtles if they have an export permit or re-export certificate issued by the relevant authority in the state of export or re-export. Export of Sea Turtles (or Sea Turtle products) is only permitted if export is not detrimental to the survival of the species, if the species was legally acquired, if an import permit has been issued by the state of import, and, if a live specimen is to be exported, that it will not be injured or its health compromised by shipping.

#### Objectives of the regulations

The moratorium on the harvesting of Sea Turtles and their eggs was instituted as a measure to protect Anguilla's nesting and foraging Sea Turtle populations and to provide an opportunity for natural resource management agencies to collect data regarding population trends.

Relevant legislation and regulations, together with the moratorium, establish a comprehensive complement of structural frameworks that should allow for the protection and recovery of Sea Turtle populations and their critical supporting habitats.

#### Present state of exploitation

The harvesting of Sea Turtles is illegal. Anecdotal evidence and court reports suggest that illegal harvesting does occur by both residents of Anguilla and fishers from neighboring Overseas Territories and Crown Dependencies.

#### Objectives to be achieved in the management of the fishery

- ✚ Protect Anguilla's foraging and nesting Sea Turtle populations
- ✚ Increase foraging and nesting Sea Turtle population numbers
- ✚ Decrease illegal harvesting of foraging and nesting Sea Turtles and their eggs
- ✚ Protect critical habitats used by foraging and nesting Sea Turtles
- ✚ Increase public awareness of the endangered status of Sea Turtles

#### Management and development measures to be taken

Recommendations outlined within the Anguilla Sea Turtle Recovery Action Plan (Richardson *et al.*, in review) should be implemented, including:

- ✚ Identify critical nesting and foraging habitats
  - Maintain a register of Anguillian beaches that support Sea Turtle nesting activity, including species present, distribution and abundance of the reproductive effort and nest fate (hatching success, sources of mortality)
  - Maintain a register of foraging grounds, including species present, habitat utilisation, patterns of residency, and sources of mortality
- ✚ Estimate demographic parameters of nesting and foraging populations



- Maintain a national survey and monitoring programme, based on index nesting and foraging grounds
  - Continue to collect data suitable for estimating population trends and reproductive output, and for measuring recovery
  - Initiate tagging to estimate survival and recruitment at index beaches. Based on information provided within the Anguilla Sea Turtle Recovery Action Plan, it is recommended that tagging of sea turtles should occur both on mainland beaches (Captains Bay, Black Gardens Bay) and offshore cays (Dog Island, Scrub Island and the Prickly Pear cays)
  - Continue to conduct tag and recapture studies to estimate population structure, size-specific growth, and mortality rates at index foraging grounds. Based on information provided within the Anguilla Sea Turtle Recovery Action Plan, it is recommended that such studies continue to occur within the waters from Little Bay to Crocus Bay, Island Harbour to Shoal Bay East, and the Forest to Corito Bay. On the offshore cays studies should be initiated on Dog Island and Prickly Pear Cays and maintained on Scrub Island
  - Maintain index site monitoring (beach and foraging grounds) for at least a decade, and ideally indefinitely as the data will only become more useful to management over time
  - Train members and staff of the ANT and DFMR to conduct regular surveys at index sites
  - Utilise the WIDECAST database management software, including regionally standardised data forms and user manuals, to maintain index site data; this will ensure that any information collected will be compatible with that collected by range States
- ✚ Identify distinct demographic units in Anguilla
    - Collect statistically viable samples of genetic material from reproductive females and/or nest contents
    - Collect a statistically viable sample of genetic material from foraging juveniles in habitats
    - Conduct telemetry studies on inter-nesting habitat use, post nesting movements and migratory corridors
    - Initiate a GPS tracking study of inter-nesting movements of female Sea Turtles
    - Collaborate with WIDECAST experts and other international expertise in the design and implementation of studies involving genetic analysis and biotelemetry
- ✚ Determine sources of mortality to Sea Turtle populations
    - Assess threats, including natural predators, at nesting beaches
    - Assess threats, including diseases and natural factors, at foraging grounds
    - Investigate the origin(s) of pollution at key nesting and foraging sites
    - Determine the extent of the illegal Sea Turtle harvest
    - If possible, survey fishers and coastal communities to estimate the numbers and sizes of discarded carapaces as a measure of the illegal harvest
    - Estimate the extent of incidental capture through interviews, Sea Turtle stranding records, research (for example, duplicating longline or trawl effort under controlled circumstances), logbook records, and/or on-board observers

- Determine the fisheries most responsible for incidental capture; develop and advertise mitigating options (for example, gear alternatives, time and area closures)
- Organize a national stranding network to record Sea Turtle stranding's, and assess sources of mortality (see [www.widecast.org/trauma](http://www.widecast.org/trauma))
- ✚ Strengthen the regulatory framework for management
  - Identify and seek to address any deficiencies or loopholes in the regulatory framework that may be or already is hindering effective management and protection of habitat, including nesting beaches
  - Submit recommendations to the GOA regarding important Sea Turtle habitats for inclusion in Anguilla's Protected Areas networks
  - Consider amending legislation to include a National Lighting Ordinance particularly for nesting beaches
- ✚ Strengthen capacity to enforce Sea Turtle management laws
  - Identify ways in which to improve the mechanisms and capacity for enforcing laws relating to Sea Turtles
  - Identify means of outreach to inform citizens of laws protecting Sea Turtles
  - Identify means of outreach to inform citizens of regulations pertaining to protected areas and especially those that embrace habitats critical to the survival of Sea Turtles
  - Design training courses for public agencies involved in Sea Turtle protection including, but not limited to, ANT, DFMR, planning authorities, representatives of the tourism sector, and fishers
  - Design a training course and engagement programme for, *inter alia*, fishers, restaurant owners, craftspeople, the Anguilla Tourist Board (and its affiliates), police and others who are (or could be) involved in Sea Turtle monitoring
- ✚ Implement a cross-sectorial education and outreach programme
  - Create sector-specific outreach materials (posters, brochures, information packets, public signage) for national display and distribution
  - Seek sponsorship for the development and distribution of outreach materials
  - Involve educators and other stakeholders in the development of educative materials for all ages
  - Establish and maintain the ANT website to feature educational materials, teacher opportunities, and data suitable for classroom study (such as telemetry results)
  - Create an educational programme on Anguillian Sea Turtles and their journeys using, for example, satellite tracking, information technology, and supporting written material

#### Monitoring, management indicators and reference points

- ✚ The effectiveness of management measures will be monitored collaboratively by DFMR and the ANT
- ✚ On-going data collection programmes, site visits, and population, habitat, and policy/regulatory assessment reviews and reports
- ✚ New tracing and spatial mapping studies should also assist in critical habitat identification and sea turtle habitat and population protection
- ✚ A threat assessment should be conducted to ensure that management measures are appropriate



- ✦ Biannual stakeholder meetings should be held to ensure that measures also remain relevant and plans are adaptive
- ✦ The Anguilla Sea Turtle Recovery Action Plan, which establishes a baseline on habitat and species status, will be used as an adaptive management framework as well as the reference point for action and indicators

#### Management limitations

- ✦ Political will. High-level GOA support is needed to move the proposed measures forward and to achieve the outlined objectives
- ✦ Organisational capacity. DFMR has a complement of only five Fisheries Officers and one patrol vessel which make enforcement and data collection difficult, despite a partnership with the ANT which has its own resource (human, financial) constraints
- ✦ Public perception and compliance. Although a moratorium on the harvesting of Sea Turtles and their eggs has been in place since 1995, the tradition of eating Sea Turtle meat is still engrained amongst some locals: a small but vocal group of fishers have called on the GOA to end the moratorium before 2020.
- ✦ Changing attitudes amongst some individuals will be difficult, will require time, and may not always be possible through awareness raising activities. Enforcement of legislation will be required

**Table 37. Key dimensions for consideration with the management of Sea Turtles.**

Biological	Actual population numbers of Anguilla’s Sea Turtles are unknown although anecdotal evidence suggests that numbers have significantly declined after hundreds of years of overexploitation. Sea Turtles have slow growth rates, reach sexual maturity after approximately 20 to 25 years, and have an exceedingly low success rate with less than one out of 1000 hatchlings surviving to reach sexual maturity.
Ecological	Green Sea Turtles use seagrass beds as their foraging grounds, while Hawksbill Sea Turtles depend on coral reefs. Leatherback Sea Turtles are pelagic and feed primarily on Jellyfish. All species nest on beaches: Green and Leatherback Sea Turtles tend to use the open area between the high water mark and the vegetation line as their nesting grounds while Hawksbills prefer nesting under coastal vegetation and along the sand dunes. Sea Turtles are considered keystone species. The presence of foraging and nesting Sea Turtle populations is indicative of healthy coral reefs, seagrass beds, and beaches.
Social	No fishers depend on a Sea Turtle fishery for their livelihoods. Illegal harvesting occurs at a subsistence level.
Economic	The Sea Turtle fishery is illegal and makes no contribution to the local GDP. Few fines have been imposed on individuals who have been caught with Sea Turtle products. Fines may include, however, XCD \$50,000 and/or imprisonment for one year for a first offence or XCD \$250,000 and imprisonment for two years for a second or subsequent offence.

## **5 ON-GOING FISHERIES PROTECTION WORK**

Although each fishery has challenges when it comes to their direct management, DFMR tries to address all sides of the spectrum, therefore, the Department engages in the management and monitoring of indirect stressors. There are a number of activities and management strategies employed by the DFMR aimed towards the protection of fisheries which takes a holistic ecosystem approach to management; they are the three main work activities of DFMR: Coastal Resources Management, Fisheries Management, and Marine Parks Management.

## 5.1 Coastal Resources Management

### 5.1.1 AMMP

The Anguilla Marine Monitoring Programme (AMMP) is an on-going (since 2007) habitat study, conducted annually by the DFMR. It includes a combination of five seagrass beds and ten coral reefs. The AMMP methodology is based on the 2005 Atlantic and Gulf Rapid Reef Assessment methodologies.

The aim of the AMMP is to collect data to be able to make comparisons through time, and use the gathered information to guide policy and coastal developments. AMMP collects data which aids in identifying current issues such as increase in fish population or declines, coral recruitment or losses, and identifies other environmental changes. AMMP surveys usually begin from March/April, with the aim of having all surveys completed by June/July, to avoid coral spawning and warmer sea conditions

The most recent AMMP report showed that the dominant seagrass type was *Thalassia testudinum*, while the reefs were dominated by *Porites astreoides* coral. A comparison between the years 2007-2012, showed that these results have been fairly consistent since monitoring began. However, what had changed significantly was the percentage cover of seagrass at some of the sites, especially at Crocus Bay. Overall coral cover had fluctuated slightly, with the only significant changes occurring from 2008 to 2012. The results also showed that many of the reef sites had great amounts of algae, with turf algae being the most dominant (Gumbs K 2012).

### 5.1.2 Beach monitoring

The Beach Monitoring Programme (BMP) was established in September 1992, it is the DFMR's longest-running programme. It was established within a UNESCO COMAR programme which concentrated on beach and coastal stability in the Lesser Antilles (Gumbs J 2012). BMP is conducted on a quarterly basis. The programme was established with the hope that it would serve to provide basic beach profile data that would allow for well-informed decision making about the use and management of Anguilla's beaches and coastal resources (Gumbs J 2012).

On a quarterly basis, DFMR Officers carefully measure and assess the natural movement (accretion and erosion) of sand on beaches around the island and on the off shore cays. Today a total of 18 beaches are monitored. Barnes Bay, Crocus Bay, Captain's Bay, Cove Bay, Dog Island (main beach), Limestone Bay, Maunday's Bay, Meads Bay, Prickly Pear East, Rendezvous Bay, Sandy Hill Bay, Sandy Island, Savannah/Junk's Hole Bay, Sandy Point, Scrub Island (main beach), Shoal Bay East, Shoal Bay West, and Sile Bay. Results have shown that popular tourist beaches such as Shoal Bay East and West are suffering from high levels of continued erosion. A full report on all results since monitoring began in 1992 is currently being prepared by DFMR and due for completion in 2016.

### 5.1.3 Consultations

When a marine related business application or a physical development project is submitted to the Ministry of Finance, or to the Department of Physical Planning, it is referred to the DFMR for consultation. This is important, as the deliberations by the Land Development Control Committee as to whether or not to grant the project is also based on social and environmental factors, not only on the financial situation. There is no coastal zone unit on the island, but this

relationship works very well, as other Government environmental agencies and associated NGO's are usually involved in the decision making process through such consultations.

## **5.2 Fisheries Protection Management**

### **5.2.1 Policy advice**

DFMR provides policy advice to the Minister responsible for fisheries, the Foreign and Commonwealth Office and, by extension, Executive Council, on matters regarding the management and development of Anguilla's fisheries and other marine resources. Policy advice is usually delivered in the form of briefing papers, oral presentations, or via the drafting of Executive Council Memos (Gumbs J 2012).

### **5.2.2 Licensing**

According to the Fisheries Protection Act, all commercial vessels and commercial fishers must be licensed. DFMR is the issuing Department for the annual licenses. Decisions regarding management, policy, and the development of the fishing industry in Anguilla must be based on sound statistical data, including the numbers of fishers and vessels operating in the industry in general as well as the individual fisheries (e.g. the lobster fishery or conch fishery etc.). This basic information is vital for the production of estimates on the overall fish catch for a particular year and total fish production on an annual basis for the specific fisheries (Gumbs J 2012).

### **5.2.3 FCDC**

The DFMR carries out daily fish catch data collection at the main/busiest fish landing sites (Cove Bay, Island Harbour, and Sandy Ground). Other sites are visited on an ad hoc basis. Such data is essential as it provides information on: catch per unit effort; an understanding of which species are landed species; and variability in stocks. It also provides biological, ecological and economic data which is vital to the GOA in determining if a local fishery is viable as an industry to help boost economic growth and overall GDP. Furthermore, it can also guide coastal developments and in-sea project proposals, through the identification of breeding periods and feeding grounds as well as identification of important roosting areas and migratory paths of sea birds and fish.

### **5.2.4 Sea Turtle monitoring**

The Sea Turtle Monitoring Programme (STMP) began in the summer of 2002 in an effort to revive the Anguilla Sea Turtle Conservation Project, initiated by the ANT in the mid-1990s. While the ANT research focused on nesting beaches and the nesting Sea Turtle populations, DFMR expanded the initiative with the addition of an in-water catch, tagging, and release element (Gumbs J 2012).

As the DFMR continue its efforts to enforce regulations and support the moratorium prohibiting the fishing of Sea Turtles, in-water surveillance and data collection plays key roles. Once a week, the DFMR conducts in-water surveys targeting Hawksbill Turtles, which is carried out in conjunction with Lionfish surveys. Turtles are captured by hand and then tagged using flipper tags and passive integrated transponder tags (PIT). The data collected include: if the Turtle was previously tagged or not; size of the Turtle; location caught and moon phase.

Once a year, DFMR conducts an in water netting exercise to capture Greenback Turtles. This annual tagging involves the community, especially fishers and school children. The same tagging procedures and data collected for the Hawksbill are carried out for Greenbacks.

DFMR occasionally assist ANT with on land patrols for nesting and hatched Turtles. Nesting Turtles are tagged and the recorded data are the same as for the in-water monitoring. During the on land patrols, if necessary, nests may be excavated to determine the number of newly hatched Turtles.

Understanding Turtle populations and getting the public more informed and involved in Turtle conservation will help build stewardship. It will also aid in building resilient ecosystems, for example seagrass beds which are foraging grounds for Greenback Turtles, while undoubtedly strengthening the knowledge of those involved in Turtle management. This in turn helps them to make more informed and credible decisions and hopefully influence policies and decisions towards Sea Turtle conservation and coastal development.

#### 5.2.5 Lionfish monitoring

The current establishment and proliferation of Lionfish in Anguilla, combined with the intrinsically open nature of the ocean, means that the complete eradication of this species is not possible. However, various efforts have been undertaken in areas where the Lionfish have arrived, and as recommended by Albins & Hixon (2008), it would be prudent for affected nations to initiate targeted Lionfish control efforts as soon as possible. Concerted and sustained efforts to reduce densities of Lionfish at key locations, as well as particularly vulnerable or valuable reef areas, may help to mitigate their ecological impacts. Recovering and maintaining healthy populations of potential native predators of Lionfish, such as large Groupers and Sharks, may also help reduce the deleterious effects of these voracious invasive predators.

Following the spread of Lionfish in 2010 to Anguillian waters, the DFMR added the eradication of Lionfish to the field work schedule. Weekly in-water monitoring around the island takes place which is usually tied in to the Turtle survey work. While conducting these surveys, Fisheries Officers swim at a constant pace from an established start point previously established as suitable Lionfish habitat. From there they swim in a staggered line, sometimes over more than 400m, counting all Lionfish sighted. By swimming at a constant speed and timing the surveys, the area covered can be quantified and so Lionfish density established.

Lionfish has also been added to the list of fish species that are recorded during the AMMP surveys cover 200m<sup>2</sup> transect lines or employ timed RDT surveys (Roving Diver Technique) to establish densities. Surveys on wrecks are conducted by divers using SCUBA equipment. Surveyors swim in a circular fashion at a constant speed around the wrecks, then carefully, where possible, enter the wreck and visually survey it for Lionfish. As with most of the other above mentioned methods, surveys are timed so the area covered can be established and Lionfish density calculated.

All surveys are conducted by the DFMR field staff. During these surveys and all other in-water work, once Lionfish are located, capture is attempted using either a speargun or an ELF. In shallow areas this work is conducted using snorkel, fins and mask, but in deeper water, SCUBA is used. The Lionfish are then brought ashore for further data analysis.

In light of the potential impacts the Lionfish can have on Anguilla's reef ecology, as well as public health, and backed by Albins & Hixon (2008) recommendation, a strategic plan was

written by DFMR, in an attempt to manage the threat and inform the public about Lionfish and their current status in Anguilla. A full report on all results since Lionfish first arrived in Anguilla in 2010 is currently being prepared by DFMR and due for completion in 2016.

#### 5.2.6 Conch studies

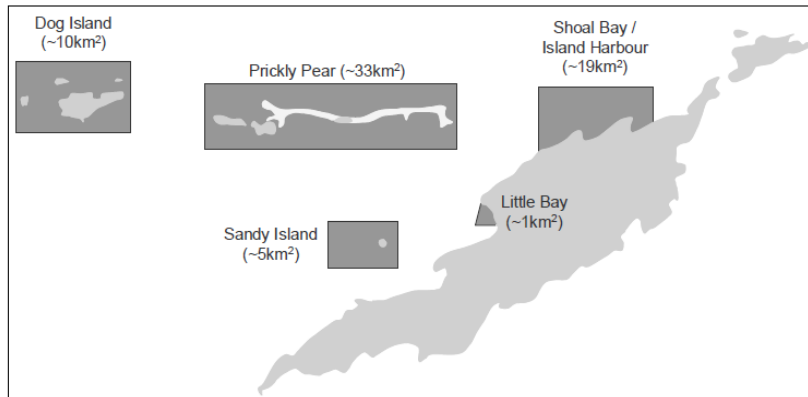
Prior to 2013, there had never been a study done of the Queen Conch stocks in Anguilla waters. In early 2013, DFMR, solicited the services of Mr Martin Degraaf, to assist with designing a methodology for Conch stock assessment, and source technical personnel to conduct training for DFMR staff and assist with research. At the time, Mr Degraaf was doing similar research in the neighbouring Dutch islands, St. Maarten, Saba, and St. Eustatius. Having him assist Anguilla in a similar fashion was important ecologically and economically. The islands proximity means that the stock could be a shared one, and the fact that our second largest fisheries market are those same islands, DFMR wanted to ensure that, data were going to be collected and analysed using the same methodology as our neighbours.

Annually, since 2014, Mr. Degraff organizes for two students from the Van Hall Larenstein University of Applied Science in Leeuwarden the Netherlands, along with Conch research expert, Eric Boman, to come to Anguilla and assist DFMR by conducting Conch stock assessment data to determine their population size, structure and distribution, using underwater videography. Landing data and fishing trips are used for fishery assessment purposes while also allowing a better understanding of Conch reproductive biology. Finally, genetic samples are collected for comparison with samples from neighbouring islands to determine if it is a shared stock.

One of the most valuable uses of such research is that it provides the data necessary to establish reliable, sound scientific sustainable quotas, especially for exportation and in management of the stock(s). As Anguilla recently signed on to CITES, this is the type of research needed to prove to CITES authorities that Anguilla is doing the work that is necessary to issue CITES permits.

### 5.3 Marine Parks Management

In 1982 the Marine Parks Ordinance was enacted providing provision for marine parks to be established in Anguilla waters. It is usually cited that the parks were officially designated in 1993, when the Marine Parks Regulations came into force. At this time however, only one park was listed in this Act, Junks Hole Marine Park, the site where the Spanish Galleon El Buen Consejo sank in 1772. All the other areas were in fact only listed under the Cruising Permits Act as areas with anchoring restrictions. A brief history of Anguilla's Marine Parks can be found in Wynne (2015). The map below illustrates the main areas within the Marine Park System with their exact coordinates listed in Table 38; both taken from the Organization of Eastern Caribbean States 2001 Management Plan for the Marine Parks of Anguilla.



**Figure 4. Five of Anguilla’s marine parks**

**Table 38. Names, broad habitat type and positions of five of Anguilla’s marine parks**

Marine Park	Type	Northern boundary	Southern boundary	Western boundary	Eastern boundary
Dog Island	Offshore island	18°17'17"N	18°16'07"N	63°16'32"W	63°14'00"W
Prickly Pear	Offshore island + barrier reef	18°16'46"N	18°15'24"N	63°12'07"W	63°05'05"W
Sandy Island	Sand banks + reef	18°13'00"N	18°12'06"N	63°08'25"W	63°06'49"W
Shoal Bay/Island Harbour	Coast + reef system	18°16'45"N	18°14'48"N 18°15'42"N	63°03'12"W	63°05'20"W
Little Bay	Coast + seagrass	18°13'54"N	18°13'20"N	63°04'38"W	63°04'09"W

In 2007 an amendment to the Marine Parks Act rectified the situation, listing all the areas in figure 2 as official marine parks, together with the existing Junks Hole Marine Park the Act was revised in 2010 adding an additional area, the Sombrero Island Nature Reserve Marine Park. Under the Cruising Permits Act there is now only one area listed that is not an official marine park i.e. Rendezvous Bay. Aside from Junks Hole Marine Park, the marine parks were established to protect sensitive marine habitats from degradation, for conservation and to increase biodiversity. Nevertheless, the existing legislation is not sufficient and therefore the parks function as what many environmentalists refer to as ‘paper parks.’ Fishing and other marine extractions are allowed within the parks, and around them, there are uncontrolled and unsustainable developments.

Mooring buoys are installed and maintained in the marine parks and red dive mooring buoys are installed and maintained at approximately twenty one dive sites, including seven dive wreck sites by DFMR. Marine parks management is also carried out by DFMR. Although the legislation does not give them the right to do so; but the legislation does not give any other agency jurisdiction over the marine parks. Nevertheless, DFMR has recognized the urgency to have such oversight amended.

In an effort to generate Government revenue, strengthen food security and the resilience of the islands nearshore coastal resources, create refuge and breathing grounds for many fish species, boost visitors’ and locals’ stewardship towards the marine environment, and create zoned areas which could act as safe havens for sea bathers/swimmers, divers and people engaging in other

low impact water sports, the DFMR in August 2015 re-submitted (initial submissions in 2013) a list of legislative amendments for the Marine Parks Act.

As a sister document to this Fisheries Development Plan, DFMR has produced an up-to-date ‘Adaptive Management Plan for Anguilla’s Marine Park System and Associated Fisheries and Shallow Water Habitats’ (Wynne 2015). The idea being that these two documents will work hand-in-hand to formulate the overall strategic plan for DFMR during the next ten years.

## **6 ADAPTATION, RECOVERY AND RESILIENCE TO NATURAL DISASTERS**

The Government of Anguilla and the fisherfolk organization(s) should ensure that action plans are in place, in the event of disasters that can decimate the fish resources, gear and fishing livelihoods. The following actions are proposed:

- ✚ Develop a disaster mitigation and response plan for the fisheries sector
- ✚ Pursue opportunities to provide and improve infrastructure for hurricane protection
- ✚ Review opportunities for hurricane insurance, for fishers and put a system in place

## **7 POTENTIAL COTTAGE INDUSTRIES**

Developing the fishing industry and improving avenues for revenue generation can be done through the creation of fisheries related cottage industries. Such initiatives raise the islands employment and entrepreneurship levels, minimize waste and spoilage, and encourage locals to explore their creativity and business management capabilities. More importantly, they are low budget ventures and so open to a larger percentage of the population.

### **7.1 Value added micro fish processing units**

With a thriving tourism industry and a large fish eating populace, it is surprising that the Anguilla fishing industry does not offer any value added products. As it relates to the fishing industry, a value added product is the transformation or production of fish in such a manner that it enhances its value. It includes, but is not limited to: the processing, scaling, gutting, slicing and either freezing, salt curing, smoking, pickling, vacuum packaging, boxing, crating, canning or bottling and other related preparations, including seasoning or garnishing of fish, and properly labeling it with added visual enhancements to be marketed. Such actions gives added value to the fish and increases its shelf life, whereby it can be sold for a higher price, unlike simply icing and selling the fish as it is landed. It is something that can be done in a very small area (micro processing units), which can create cottage industries and in turn lead to the creation of larger private or government operated fish processing plants.

### **7.2 Fish food processing for agricultural products**

After the processing of fish to create value added products, or after only scaling and gutting, there is a lot of waste organic matter, including scales and gills. This matter can be composted to a form suitable to be applied to plants as nutrient rich fertilizer. Fish fertilizer is easy to make through a hydrolysis process, with the use of a closed bin (small holes are necessary for aeration), allowing the fish waste to compost naturally. Carbon and nitrogen which are key ingredients in fish fertilizers are obtained from mixing fish waste with plant waste (fruits and vegetable scraps, tree barks and leaves etc.). Microorganisms in the bin create heat through the disintegration process of the fish, this pasteurizes the resulting fish compost. Fish food processing only takes up a little bit of backyard space and after three to four months, nutrient rich fish fertilizer is ready to be sold as a cottage industry.

### **7.3 Seamoss farming**

In Caribbean islands such as Grenada, St. Lucia, Antigua, Barbados and Haiti, various species of algae is harvested to make a gelatinous base, commonly referred to as Seamoss. In the region the base is famous for the Seamoss drink, which is rich in carbohydrates. The base can also be used to make jellies for deserts. The islands mentioned above began farming Seamoss because it is a sustainable industry with great economic benefits. Seamoss farms are very easy to establish and manage, requiring only the right ecological settings, in calm sheltered sea water, using only stakes and rope. No one in Anguilla engages in Seamoss farming, but locals do harvest it from the wild. Seamoss farming would encourage alternative employment, sustainable use of natural resources, the establishment of small cottage industries and produce a reliable source of Seamoss.

### **7.4 Aquaponics**

An aquaponic system is the combination of a hydroponic and aquaculture system working as one. Aquaponics is the cultivation of fish and plants in one system. The plants are nourished from the waste water of the fish. Aquaponic systems are favourable because they are simple to set up and maintain and the long term economic gains outweighs initial start-up cost, which sometimes can be expensive because of the required equipment. Aquaponic systems provides alternatives to reliable sources of protein and can relieve fishing pressure. They can also be 100% chemical free operations. Small backyard systems can sustain average size families; and create alternative livelihoods and jobs.

## **8 RECOMMENDATIONS**

Other than the recommendations outlined in the various response and management plans used by DFMR, the following recommendations are proposed:

### **8.1 Develop the DFMR**



The DFMR has been functioning with limited human resources for several years. There is an inadequate level of management and professional staff, this limits the work output. Capacity needs to be built within the Department through formal institutional training, to allow more meaningful research and written reports. Currently there are two management level staff, a Secretary, one Data Officer and six Field Officers.

It is recommended that Field Officers enroll in formal institutional training in a fisheries field, that an enforcement agency be established within the Department (increase in staff by at least four), to avoid Field Officers, who should be engaging in data collection and outreach, from being enforcers of the law. The current combination of roles does not help to strengthen the relationship and trust between fisherfolk and the DFMR, although every effort is made to avoid crossover.

### **Overarching short term goal**

Increase the number of staff at DFMR and ensure that staff members have the educational and technical capacity to execute the Department's mandate.

### **Direct benefits**

-  Stronger and more dependable Department
-  Better managed fisheries



- ✚ Increased moral and sense of belonging in staff

### **Achievement of goal through**

- ✚ Capacity building exercises
- ✚ Achievement of higher level of education through successful completion of university studies etc.

## **8.2 Capacity building/outreach activities**

It is proposed that every year DFMR include in its budget, and write for special project funding to engage the public in marine life education and conduct at least two workshops geared towards building the capacity of fisherfolk in some of the speciality areas that this fisheries development plan seeks to develop; areas such as pelagic fishing, aquaponics and fish processing for agricultural products. Training for fishers in the following areas should be held as often as necessary: emergency response, business planning and money management, navigation and safety at sea, negotiation and conflict resolution skills and the biology and ecology of select species.

Currently at the end of every month, DFMR publishes 'Fisheries Corner' in the Anguillian newspaper. It is an informative article, whereby results/feedback from meetings are disseminated, marine related best practice tips are given, or biological and ecological data about a specific marine organism is shared. DFMR should continue its efforts to educate the public and use mediums such as public meetings and presentations, press releases, newspaper articles, radio programs and activities with children, such as field trips and competitions.

Since 2013, DFMR has been engaging school children in essay and arts and craft competitions during Fishermen's Day week of activities. The idea behind it is to get children involved and informed in what is happening in the fishing industry and how they can play a part in ensuring that the marine environment is protected for them and future generations.

### **Overarching short term goal**

Educate the general public about the importance of the marine environment; change some of the negative and disinterested attitudes, perceptions, and values of people, through education and sensitization to bring about positive change.

### **Direct benefits**

- ✚ More educated, responsible and sensitized public
- ✚ Increased stewardship and community based management of the marine resources
- ✚ Fisherfolk with alternative or additional income through fisheries
- ✚ Better working relationship between fisherfolk and the DFMR

### **Achievement of goal through**

- ✚ Fisherfolk and general public participation and willingness to learn
- ✚ Fisherfolk and general public executing best practices and lessons learnt from the capacity building exercises

## **8.3 Closed areas (MPA)**

Recognizing that the nearshore resources are quickly being depleted, and there is an urgent need to start protecting them, for food security, coastal protection, leisure, snorkelling, diving and to

create safe havens for breeding fish and juvenile fish populations, so that they will be able to sustain the adult fished populations; DFMR proposed in a 2013 list of legislative amendments to ban fishing within the marine parks, with the exception of hook and line fishing. It is highly recommended that the Minister responsible for fisheries ensure that such is amended in the legislation. The amendment would fulfil some of the non-binding agreements that Anguilla has signed on to, bring the island in line with other marine parks in the region and wider world that have strict policies of no-fishing in protected areas.

### **Overarching short term goal**

Ban fishing within the marine parks.

### **Direct benefits**

- ✚ Protection of nearshore habitats, breeding grounds and various marine species juvenile homes
- ✚ Greater awareness of the marine parks
- ✚ Increased stewardship and community management for the marine parks
- ✚ Creation of more and healthier nearshore habitats
- ✚ Increase in nearshore fish populations
- ✚ Greater spill over of fish into the adult fish stocks from the protected areas

### **Achievement of goal through**

- ✚ Political will
- ✚ Amendment of the legislation
- ✚ Increased surveillance and patrols
- ✚ Strong and participatory public outreach sessions and educational activities about the marine parks
- ✚ Provision and encouragement of alternative employment for fishers of the marine parks

## **8.4 Casita Project**

The English translation for casita literally means small house. The DFMR has been exploring the possibility of using these to create small artificial homes for Lobsters. These custom made concrete structures would serve as sanctuaries for juvenile and breeding Lobsters, the idea behind it is not only to create more habitats and consequently increase Lobster stocks, but the structures will also be perfect mediums for coral recruitment and growth.

The areas where the casitas are proposed to be placed are expected to become more aesthetically pleasing and attractive for snorkelers and divers. The DFMR is in the process of writing to several funding agencies to finance the project. If successful, it is recommended that the project be led by Marsha Pardee from Marangel in the Turks and Caicos Islands. The company specialises in artificial reef habitats and coral nurseries. They have conducted extensive work, including casita design and construction in Turks and Caicos Islands and in the Caribbean region.

Placing the casitas within the marine parks (once they become closed areas) would have multiple benefits, including, but not limited to: Relatively easy management; lower probability of poaching; attractive for lobster recruitment if placed close to seagrass beds, the locations would act as ideal 'sources,' to several 'sinks,' i.e. once mature the lobsters should migrate out into the larger captured Lobster fishery and thus increase catches. Overall, the casitas would act as

sanctuaries for juvenile Lobsters. Casitas can have negative impacts, although with proper control and appropriate regulations, all negative side effects can be mitigated.

### **Overarching short term goal**

Provide additional habitat for juvenile Lobsters and increase overall Lobster populations.

### **Direct benefits**

- + Creation of additional habitats for juvenile Lobsters
- + Increase in adult Lobster populations
- + Increase in Lobster landings
- + Increase coral recruitment to specific areas
- + Improvement of nearshore marine ecosystems
- + Raised level of awareness of Lobsters and their niches and associated ecosystems
- + Introduction of community management systems for the Lobster fishery
- + Increased stewardship for the marine environment and Lobsters by locals and visitors

### **Achievement of goal through**

- + Pre-surveys of the proposed locations to assess Lobster populations and coral recruitment, growth, health and diversity prior to casitas introduction
- + Constructing and deployment of one hundred casitas
- + Monthly thorough assessments of casita Lobster populations
- + Increase juvenile Lobster populations at the proposed locations by at least 50%
- + Community buy in to the project, so that they would assist in management

## **8.5 FADs Workshop**

A FAD is a manmade floating object often times constructed of natural material such as coconut/palm tree branches or buoys and/or other floats, using rope and anchored to the ocean floor by concrete blocks or any other sturdy submergible material. They can last for several years. While acting as a refuge juvenile fish, FADs attract larger pelagics predators such as, but not limited to, Flyingfish, Tuna, Mahi mahi and Marlin and form ecosystems of their own. Fishers fish around the FADs using handlines, with select bait to capture choice fish. A FADs workshop is one that has been highly requested by local fishers and recommended in the Fisheries Development Plan.

### **Overarching short term goal**

To teach local fishers about the ecological role that FADs play, share environmental concerns about FADs and how to construct, deploy and use them.

### **Direct benefits**

- + Teach new skills and encourage an exchange of knowledge
- + Teach existing FAD fishers more economical and environmentally friendly ways of constructing and deploying FADs
- + Increase in FAD fishers
- + Improve efficiency; fishers would be able to go directly to a FAD, rather than fish blindly
- + Landings of fish in quantities that would be able to fully utilize a fish processing plant
- + Assist fishers in meeting the needs of the local restaurants for pelagic fish
- + Increased provision of local pelagic fish and less imports

- ✚ Reduce the amount of fuel consumed during fishing trips
- ✚ Reduce instances and the number of fishers involved in nearshore fishing
- ✚ Increased utilization of the islands EFZ
- ✚ It positively impacts the entire fishing community, as the fishery yields fish of higher value
- ✚ Knowledge gained in the workshop can result in significant financial benefits for fishers

### **Achievement of goal through**

- ✚ Successful execution of a FADs workshop
- ✚ Active participation of more than 40% of fisherfolk in the workshop
- ✚ At least 50% of FAD workshop participants (those who never used FADs before) begin FAD fishing as their main fishery within a year of the workshop
- ✚ Use of CRFM 2015 draft Subregional Management Plan for FAD Fisheries in the Caribbean to guide the local FAD fishery

## **9 CONCLUSION**

To be completed after stakeholder sessions

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## 11 APPENDICIES

### 11.1 Stakeholder analysis

#### TO BE CONDUCTED

**Table 39. Summary of issues from community and stakeholder consultations**

Stakeholder (area, group etc.)	Issues/constraints	Long term aspiration
Local fishers		
Government agencies		
Water sport personnel		

Hotels & restaurants

NGOs

Beach vendors

Other

Other

**Table 40. Prioritization matrix for key issues from community and stakeholder consultations.**

Issue	Local fishers	Government agencies	Water sport personnel	Hotels & restaurants	NGOs	Beach vendors	Other	Other	Score
Infrastructure									
Markets									
Quotas									
Pollution									
Zoning									
Marine parks									
Other issues									

## 11.2 Monitoring plan

The table below should be used to analyse each fishery periodically. This would provide feedback which would aid in any required adjustments to the management plans and provide a visual on whether or not the targets/objectives are being met and measure success and failure. The table can be used by decision makers and Government to view progress at a glance.

**Table 41. Monitoring plan for each managed fishery in the Anguilla Fishery Development Plan.**

Fishery	Situation	Inputs	Outputs	Indicators	Monitoring date
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## 11.3 Industrial fishing license forms

The granting of foreign/industrial fishing licenses have been proposed in this Development plan, and was also put forward in the 2013 proposed legislative amendments. A draft of the application form is on the following page.

**FORM 12**  
**[Section 5(3)]**

**FISHERIES PROTECTION REGULATIONS**  
**LOCAL INDUSTRIAL FISHING LICENCE**

LICENCE NO.: LIF \_\_\_\_\_

The vessel and licence Holder names below is hereby licensed in accordance with **section 6(1)(c)** of the Fisheries Protection Regulations for fishing by the holder of a Local Industrial Fisher's Licence within that part of the fishery limits of Anguilla set out below in accordance with the terms and conditions of this licence and subject always to compliance with the provisions of the Fisheries Protection Act and the Fisheries Protection Regulations.

Type of licence:             Industrial

NAME OF VESSEL:

NAME OF THE COMPANY:

NAME OF LICENCE HOLDER:

ADDRESS:

NAME OF CAPTAIN:

VESSEL REGISTRATION NUMBER AND PORT:

RADIO CALL SIGN:

OVERALL LENGTH OF VESSEL:

LICENCE PERIOD:    / /    to    / /

**SPECIAL CONDITIONS:**

Authorised fishing areas: Fishing can only take place from 40nm out from the northern tip of Anguilla

Authorised fishing times: N/A

Authorised fishing operations: Longline (use of nets, fishing guns/spearguns, fish traps/pots **strictly prohibited**)

Authorised target species and quotas: Only legal sized deep water pelagic species listed below

Common name	Scientific or family name	Legal harvest size (fork lengths)cm	Annual quota (lbs) per license
Yellowfin tuna	<i>Thunnus albacares</i>	50	25,000
Albacore tuna	<i>Thunnus alalunga</i>	60	
Bigeye tuna	<i>Thunnus obesus</i>	85	
Skipjack tuna	<i>Katsuwonus pelamis</i>	50	
Blackfin tuna	<i>Thunnus atlanticus</i>	70	
Atlantic Bonito	<i>Sarda sarda</i>	40	
Wahoo	<i>Acanthocybium scolandri</i>	170	
Kingfish	<i>Scomberomorus cavalla</i>	70	
Sailfish	<i>Istiophorus albicans</i>	160	
Swordfish	<i>Xiphias gladius</i>	115	
Marlin	Istiophoridae	250	
Mahi Mahi/Dolphin	<i>Coryphaena hippurus</i>	80	
Diamondback squid	Thysanoteuthidae	30	

Dated this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

Signed: \_\_\_\_\_



### 11.4 Management and Response plans

- ✚ Sea Turtle Action Plan
- ✚ Marine Parks Management Plan
- ✚ Lionfish Response Plan

### 11.5 Anguilla Fisheries Development Action Plan summary

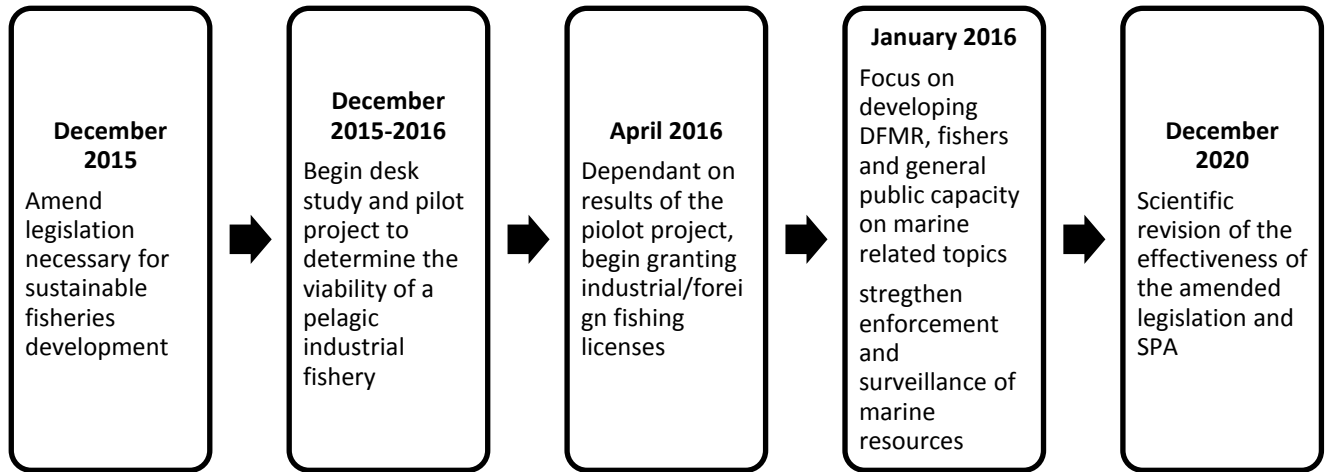


Figure 5. A brief summary, showing only some of the main objectives of Anguilla’s Fisheries Development Action plan

### 11.6 Historic summary of work towards the AFDP

Since the 1970’s there has been the desire for the local Government and overseas development agencies to improve the fishing industry on the island through capacity building, improved technology and access to markets. In return the efforts are/were expected to boost economic growth and raise the standard of living.

Table 42. A summarized time line of when some significant developments occurred and achievements to date, as it relates to written strategic plans on the development of the Anguilla fishing industry.

Year	Event
1980	The Eastern Caribbean Natural area Management Programme (ECNAMP), in collaboration with Caribbean Conservation Association (CCA) and the University of Michigan School of Natural Resources, collaborated with the Government of Anguilla (GOA) to prepare a strategy for marine resources management and development.
1982	Workshop for the development of the strategies designed by ECNAMP, CCA and the GOA “Workshop on Planning for Marine Resources Development”

1986	Canadian International Development Agency (CIDA) Fisheries Specialist visited Anguilla at the request of the GOA, to discuss ways in which the CIDA and Canada could provide assistance in the development of the fishing industry
1987-1988	CIDA proposed a programme of assistance to GOA
1987-1997	Anguilla Fisheries Development Plan drafted by Albert Stephenson
1993	MacAlister et al. study highlighted the unexploited potential of Anguilla EFZ. This led to the 1996 request by GOA to DIFID to investigate the EFZ potential
1995-1996	Anguilla Offshore Fisheries Development Feasibility Study to determine the possibility of longline fishing. By R. Mahon
1997	Technical proposal to DFID for Offshore Development Project. Including retrofitting of vessels for the project
1997	Identification of suitable longline vessel to be retrofitted
1997	DFID agreed to purchase the identified vessel for longline project from Florida 'AXA FISH TEC'
1998	The Fisheries Development Project converted Cleve Webster vessel 'Lucky II' and 'Lady Carlene' owned by Claude Richardson into vessels suitable for longline fishing
1998	DFID AXA FISH TEC project did 31 voyages, caught 19.5 tonnes of fish and made US\$111,945.00 locally in ten months
1998	MacAlister et al. completed the Anguilla Offshore Fisheries Interim Report.
1999	As recommended by the project, the Director of Fisheries, Mr Roland Hodge traveled to the British Virgin Islands to learn about fish processing plants
1999	Completion of the first phase of the Offshore Fisheries Project. Results showed sufficient resources in the Anguillian offshore EFZ to sustain a modest longline fishery
1999	DFID propose the sale of the longline vessel to a company in the private sector
2000	Rainbow Fisheries Purchase the AXA FISH TEC
2001	GOA asked to extend DFID consultation period on the examination of Anguilla offshore fisheries development
2008	Strategic Plan for Management of the Fisheries Sector of Anguilla: 2008 – 2012. Prepared by P.A. Murray for the Department of Fisheries and Marine Resources, Crocus Hill, The Valley, Anguilla
2012	Development of the concept note on the Development of Anguilla Fishing Industry by the former Director of

	Fisheries Mr James Gumbs
2012	Training fishermen in alternative methods of deep sea ‘snappering’ and techniques for catching diamondback squid
2013	Discussions with the British Navy representative about assistance with patrols and training in fisheries enforcement
2013	Dialogue with former Governor Harrison about the development of the fishing industry and assistance with securing funding for a fish processing plant
2014	Proposal for FCO funded desk study submitted
2014	In water conch assessments began. Important for CITES
2014	GOA committed EC\$50,000.00 towards fisheries development
2014-2015	Establishment of the Anguilla Fisherfolk Association (AFFA), geared towards empowering fishers, getting them involved in advocacy and policy development. AFFA secured US\$10,410.00 through CANARI/EU project to strengthen fisherfolk
2015	FADS development workshop proposed to take place. Funded by GOA and FAO
2015	Legislative amendments drafted and submitted to AG Chambers to strengthen fisheries protection and MPA
2015	Revision of the Anguilla 1979 Fisheries Development Plan and development of management plan for the Anguilla Marine Park System

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### **11.7 Anguilla Fisherfolk Association**

The Anguilla Fisherfolk Association (AFFA) is a non-profit organization, established for the purpose of improving the fishing industry on the island, building fisherfolk capacity and lobbying for the wellbeing of fisherfolk and the industry. The association was formed in October 2014. The executive body is comprised of President Aristo Richardson, Secretary/Treasurer Keith Fabian and NGO advisor to AFA Farah Mukhida. The AFFA meets every first and last Saturday of the month.

In 2014 the AFFA submitted a proposal to CANARI for financial assistance to aid in capacity building sessions and outreach activities. They were successful and awarded EC\$27,898.80 in 2015. It is important that DFMR work closely with the AFFA in developing the fishing industry and ensuring that the AFFA is represented at regional meetings of fisherfolk associations.

### 11.7.1 Supplementary figures

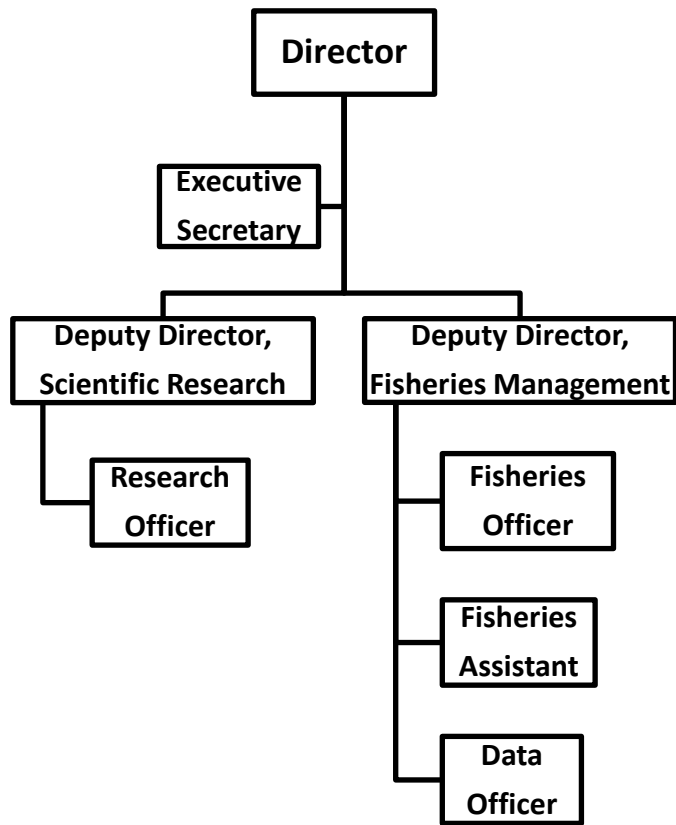


Figure 6. DFMR organisational Structure as of 2015