Fisheries Centre

The University of British Columbia

Working Paper Series

Working Paper #2015 - 13

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Year: 2015

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RECONSTRUCTION OF TOTAL MARINE FISHERIES CATCH FOR ANTIGUA AND BARBUDA (1950 -2010)

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ABSTRACT

Antigua & Barbuda are islands located in the Caribbean Sea. Most of the fishing in these islands is done for local consumption and is important for food security. Antigua & Barbuda's fishery sector contributes approximately 1.5% to the country's GDP and is of economic importance especially during slow periods of tourism, the country's principle economic sector. The fisheries of these islands are small-scale, targeting primarily reef and demersal species and consists of three main sectors: artisanal, subsistence and recreational. The accuracy and comprehensiveness of statistical data on fisheries landings between the 1950s and 1990 has been subject to practical limitations of data collection and of some historical fisheries records as a result of Hurricane damage. Accurate catch data are fundamental for effective scientific analysis on the state of fisheries stocks. Therefore, a review of all available fisheries literature on Antigua & Barbuda was undertaken in order to provide an improved estimate of total marine fisheries catches for the islands. Antigua & Barbuda's total reconstructed fisheries catches for the period 1950-2010 were estimated to be almost 138,900 t, which is 67% higher than the reported landings of 83,374 t as presented by the FAO on behalf of Antigua & Barbuda. The reconstructed catches presented in this report should be considered minimum estimates as there were several data limitations.

INTRODUCTION

Antigua & Barbuda are islands located at 17° 7 north latitude and 61° 51 west longitude, between the Caribbean Sea and Atlantic Ocean (Figure 1). Antigua is a volcanic island with scattered hills, whilst Barbuda is a low-lying coral island. The islands have a tropical climate with an average year round temperature of 27 °C and a Hurricane season that lasts from July to November.

Originally populated with Amerindians from South America, the first permanent Europeans residents were the English who arrived in 1632 (Kras 2008). Today, the majority of people on the islands are descendants of African slaves brought to the islands for the sugar trade in the 1700s. Most of the population lives on Antigua, the larger of the two islands (280 km²). The sugar trade, the main source of income for Antigua in the past, has since been replaced by tourism as the islands are well known for their resorts, and claim to have 365 beaches; one for each day of the year.
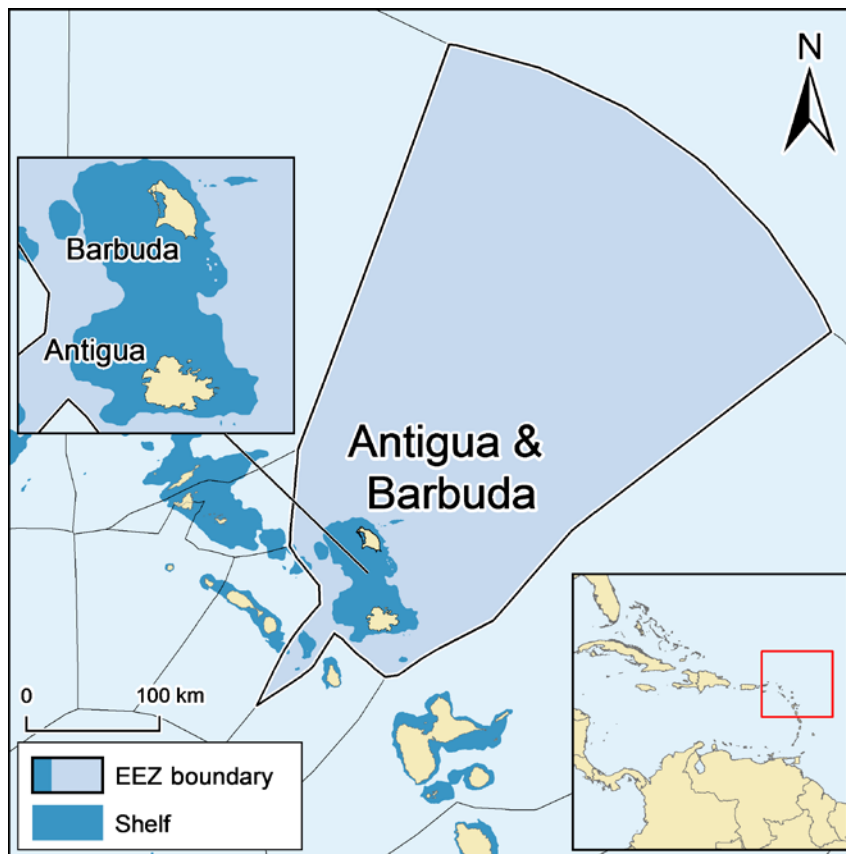
Figure 1: Map of Antigua and Barbuda with its Exclusive Economic Zone (EEZ)

Antigua has a deeply indented coastline surrounded by bank reefs, patch reefs and fringing reefs, except on the west and south coasts. On Barbuda, reefs are found along most of the coastline. In 1982, Antigua & Barbuda established itself as an archipelagic state with an EEZ of approximately 108,000 km^2 (www.seaaroundus.org). It is estimated that Antigua & Barbuda has a total shelf area of around 3,700 km^2, one of the largest in the Eastern Caribbean.

Antigua & Barbuda's fishery sector contributes approximately 1.5% to the country's GDP and is considered a 'safety-net' for when there is a downturn in other more significant economic sectors such as tourism and construction (Horsford 2004). The fishery is small-scale in nature, targeting primarily reef and demersal species. It consists of three main sectors: artisanal (small-scale, commercial), subsistence (non-commercial, primary driver is sustenance) and recreational (non-commercial, primary driver is pleasure). In 1955, a boat mechanization programme was initiated and led to a rapid increase in catches. However, during the 1960s fish landings levelled off and even declined; this was possibly due to the slow repayments of the loans that

were given in the 1950s and 1960s, and a lack of improvement in fishing methods and landing facilities to support increased catches (Vidaeus 1970). Since the 1970s, the fishing fleet of Antigua & Barbuda has undergone significant modernisation. Most of the wooden dories that dominated the sector in the seventies have been gradually replaced by modern fibreglass launches and pirogues (Horsford 2004). However, traditional gears persist and traps or 'fish pots' are the dominant (51-60%) fishing gear in use on both islands (Horsford 2004). Gill nets, troll lines, hand lines and long lines (in Antigua only) are other fishing gears utilised.

The islands' extensive fishing grounds support the commercial fisheries of demersal and reef species such as Caribbean spiny lobster (*Panulirus argus*), queen conch (*Strombus gigas*), snappers (Lutjanidae), groupers (Serranidae), parrotfish (Scaridae), grunts (Haemulidae) and surgeonfish (Acanthuridae). A small pelagic fishery also operates, targeting mackerels and jacks (Scombridae), barracuda (Sphyraenidae) and tuna (*Thunnus* spp.) (Carr and Heyman 2008). However, Caribbean spiny lobster and queen conch are the major economic earners for the islands. It is estimated that 50-60% of the lobsters landed in Antigua and as much as 80% of that landed in Barbuda is exported to Martinique and Guadeloupe (Luckhurst and Marshalleck 1995). There are records of conch being exported to the French islands in the 1970s until mid-1990s (Horsford 2004), but today all conch landed are consumed domestically (Luckhurst and Marshalleck 1995). Historically, there has been little exploitation of pelagic species (Joseph 1984); and even in present times coastal and large pelagics are still considered to be only moderately-exploited and under-exploited, respectively (Horsford 2009).

About 40 private sports fishing vessels are involved in recreational fishing and target large pelagic species ((Horsford 2010). These sport fishing vessels are 6.0-17.5 metres in length, and use rod and reel and handlines (FAO 2002). Data collection for this sector is limited and the contribution of the sport fishery has not been evaluated to date (Horsford 2010). The Antigua Sport Fishing Club hosts 3 events annually: the Antigua & Barbuda Sports Fishing Tournament, which has been held each May since 1966 (http://www.antiguanice.com/v2/client.php?id=571&whatson=2435; accessed April, 2013), 'Best in the West' tournament held each November and the Francis Nunes Jr. Fishing tournament and seafood festival

which began in 2007 (http://www.antiguabarbudasportfishing.com/tournaments.php?page=FrancisNunes; accessed April, 2013). The annual international billfish tournament attracts 30-40 entrants from other Caribbean islands. Some artisanal fishers also engage in opportunistic targeting of the large pelagic species by trolling to and from the traps on the outer banks. Blue marlin (*Makaira nigricans*) is the most targeted species, however the landings usually include: yellowfin tuna (*Thunnus albacares*), wahoo (*Acanthocybium solandri*), dolphinfish (*Coryphaena hippurus*), king mackerel (*Scomberomorus cavalla*), cero mackerel (*Scomberomorus regalis*), Atlantic Spanish mackerel (*Scomberomorus maculatus*), Atlantic sailfish (*Istiophorus albicans*), blackfin tuna (*Thunnus atlanticus*), skipjack tuna (*Katsuwonus pelamis*), and little tunny (*Euthynnus alletteratus*).

As is the case in many countries in the Caribbean, fish is a staple source of protein in Antigua & Barbuda (Olsen *et al.* 1984). There are three small-scale fish processors in Antigua, one of which exports fin-fish to the US and Canada, and lobster to the French islands. There is generally a shortage of fresh fish in Antigua (Brownell 1978) and the islands are net importers of seafood (FAO Fishery Country Profiles; http://www.fao.org/fishery/facp/ATG/en; accessed April, 2013). From 1960 to 1968, approximately 430 t of seafood products were imported into Antigua & Barbuda each year (Vidaeus 1970). Imports include salted and cured fish products to satisfy traditional local tastes, as well as frozen fish and seafood products for the tourism sector.

Impact of hurricanes

The geographic location and low-lying nature of small islands in the Eastern Caribbean make them highly vulnerable to the hurricanes and tropical storms that frequent the region. Artisanal fisheries have suffered major setbacks when boats, fishing gear, landing sites and marine ecosystems were physically damaged by the storm surge, high winds and heavy rains that are associated with tropical cyclones. During the period covered by this study, 1950-2010, Antigua & Barbuda were impacted directly and indirectly by no less than a dozen hurricanes. A significant loss to the fisheries sector has been the loss of fisheries records; following Hurricane Luis in 1995, when many of the Fisheries Divisions' documents had to be disposed of as a result of water damage (Horsford I., pers. comm., Fisheries Division March 2013).

The accuracy and comprehensiveness of statistical data on landings between 1950 and 1990 is subject to practical limitations of data collection (Vidaeus 1970). The Fisheries Division only started to formalize its data collection programme in 1995 under CFRAMP. Prior to that, the now-defunct OECS Fishery Unit occasionally provided assistance regarding advice on data collection, focusing primarily on harmonizing fisheries policy and legislation within the OECS (Horsford I., pers. comm., Fisheries Division March 2013).

To address the challenges that are common to monitoring artisanal fisheries, the Fisheries Division of Antigua & Barbuda uses a random sampling method at fish landing sites and the public fish market (FAO 2004). The Trip Interview Program (TIP) and Licensing and Registration System (LRS) captures catch, effort and biological data. TIP and LRS are used in conjunction to calculate catch per unit effort by vessel length class, to which raising factors are applied in order to estimate annual fisheries landings (Horsford 2004). Accurate catch data are fundamental for effective scientific analysis on the state of fisheries stocks. A review of all available fisheries literature on Antigua & Barbuda was undertaken in order to (1) provide an improved estimate of total marine fisheries catches for Antigua & Barbuda for the time period 1950-2010, and (2) improve the taxonomic detail of the reported and unreported catch.

METHODS

Human population, number of fishers and tourists

Human population statistics (Figure 2) were taken from Vidaeus (1970) for 1960-1967; from GeoHive[1] for 1970, 1975, 1980 and 1984, and from World Bank for 1992-2010. A linear interpolation was used to derive population values for years with missing data.

Data on the number of tourist arrivals were taken from Bryden (1973) for 1960-1964 and from the Caribbean Tourism Organisation for 1977-2010. Assuming tourism began in 1950, we used direct linear interpolation to estimate tourist population in Antigua & Barbuda from 1950-2010.

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[1] GeoHive population statistics: www.geohive.com
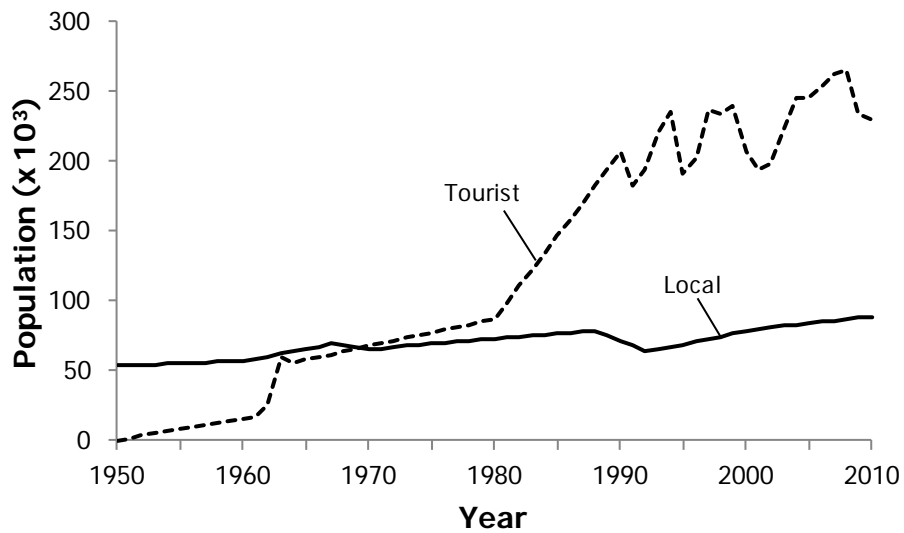
Figure 2. Human population data for Antigua & Barbuda showing a) total local population and b) stop-over tourists.

Catches satisfying local demand

Using catch data from eight landing sites, as reported by the Fisheries Division (Vidaeus 1970) for the period 1954-1969, we applied a raising factor of 2 to estimate total fish catches from all 20 landing sites. Linear interpolation was used to estimate total fish catches between 1969 and the next anchor point which was for the year 1979 (Joseph 1984); between anchor points for the 4 years from 1995-1999 (Horsford 2002) and between the final anchor points from 2001-2003 (Horsford 2004). However, interpolations of wide gaps in data resulted in an underestimation for some years (1973-1978 and 1983-1988), suggesting that landings may have been over-reported to FAO for those years. Acknowledging that data recorded in the literature may not completely account for total fish landings in Antigua & Barbuda due to inadequate data collection (IICA 1997) and in order to adjust underestimated values, a raising factor of 1.5 and 1.3 were used for the aforementioned periods, respectively. These raising factors represent the average ratio of FAO data:interpolated values for the 5 years preceding each data gap. Thereafter, it was assumed that the FAO records from 2004-2010 were representative of artisanal catches and no raising factor was applied to these years, since the Antigua & Barbuda Fisheries Division applies a raising factor to calculate landings from census data (Horsford 2004).

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Conch and lobster

Queen conch (*Strombus gigas*) is considered the second most valuable species (price per unit weight), after spiny lobster, harvested by fishers in Antigua & Barbuda. During the early 1970s, conch were gathered by free divers in shallow waters, but by 1978 shallow areas had been depleted, thus SCUBA became the more common method of collecting to depths of 30 m. The fishing effort from 1995-1999 for the commercial fleet was estimated as 144 days·year^{-1}·boat^{-1} for 5 boats for a total of 720 boat-days of effort per year (Tewfik *et al.* 2001). As of 1997, conch exports have ceased due to the stringent harmonised food safety regulations for Member States of the European Union, which include marine gastropods such as the queen conch. Prior to 1997, as much as 23.5% of the conch landings were exported to the French territories in the region.

Using a conch consumption rate of 1.8 kg·person^{-1}·year^{-1} from the Anguilla Household Survey (Jones 1985), local consumption for Antigua & Barbuda was calculated for 1950-1986. Since approximately 24% of landed conch was exported to French territories during that time (Horsford 2004), we assumed our estimate of local consumption accounted for only 76% of total conch catches for that period. Thus, by deduction we calculated 100% of conch catches for this period. From 1987 onwards, FAO data were accepted, and it was assumed to comprise total conch landings, both for domestic use and export.

We assumed that the sum of reconstructed finfish catches and reconstructed conch catches accounted for 90% of total annual fisheries catches, based on Brownell (1978) who states that 10% of total annual landings in Antigua & Barbuda is lobster. By deduction, we estimated lobster landings for the islands for the period 1950-2010. For a few years there were small discrepancies between our estimated amounts of lobster and the FAO value of lobster. In these years we accepted the FAO value as our 10% estimate is only a rough estimate. For three years this discrepancy was larger. In this case the FAO data presents a slight decline, whereas our estimate plummets only to rebound up to a similar level of the FAO. This appears to be an artefact of a decline in the total catch for those years and therefore we accept the FAO catch for lobster in these years as well.

A regional nutrition survey by Adams (1992) provided a *per capita* fresh fish consumption rate which was combined with human population data for Antigua & Barbuda to independently reconstruct the likely total local demand for fresh fish from 1950 to 2010. It was assumed that for those years in which demand exceeded interpolated estimations, the difference was likely subsistence catches. Where necessary, adjustments were made to the difference between demand and artisanal catches by determining the trend in the artisanal:subsistence ratio, and using this ratio to determine subsistence as a percentage of artisanal catches.

Catches satisfying tourist demand

In many parts of the world, fishers have regular customers, such as hotels and restaurants, whom they supply directly with fresh seafood catches. In Antigua & Barbuda, hotels and restaurants buy an estimated 10 percent of landed catch, while the remainder is either sold locally or exported (FAO Fishery Country Profiles; http://www.fao.org/fishery/facp/ATG/en; accessed April, 2013). Thus, seafood supplying the tourist market through hotels and restaurants, were reconstructed separately. The most commonly consumed seafood species reported by restaurants surveyed in Antigua are dolphinfish, red snapper, lobster and shrimp. While queen conch is fairly popular, it usually appears on the a la carte or appetizer menu (Georges and Day 2010).

Annual tourist population data were combined with data on the average length of stay, being approximately 5 days according to the Caribbean Tourism Organisation. Taken together with inferences about the frequency of seafood consumption (i.e., one serving of seafood per day) and a typical serving proportion of 250 g (round weight), we applied the following equation to estimate tourist seafood demand annually:

$$Tourist\ seafood\ demand = tourist\ days\ x\ average\ serving\ x\ servings/day$$

Using this calculation, we were able to reconstruct small-scale catches provided directly to the tourist market from 1950 to 2010.

Recreational fishery

Recreational fishers are primarily sports fishing vessels that operate mainly on weekends and holidays (FAO Fishery Country Profiles; http://www.fao.org/fishery/facp/ATG/en; accessed April, 2013). These operators are subject to the same regulations as commercial fishers, however, capture data are rarely recorded as part of the Fisheries Division statistics. Data collection for this sector is difficult and severely limited, since it is often gathered only at tournaments, or when censuses are done. Recreational catch is usually sold directly to restaurants, hotels, supermarkets and housewives. There is no specific national management strategy for the large pelagic species at present. Thus, catches from this sector were reconstructed independently.

According to a global recreational study (Cisneros-Montemayor and Sumaila 2010), the proportion of recreational fishers in Antigua & Barbuda in 2003 was 0.23%. Since sport fishing is associated with tourism (Campos and Muñoz-Roure 1986), we assumed all of these fishers were tourists. We applied this rate to the tourist population as a constant from 2000 to 2010. For the year 1950, we assumed a participation rate of 0.11% (half that of the later time period). Linearly interpolating between these two rates, we derived recreational fishing participation rates of the tourist population for the time period 1950-2010. Assuming tourists are likely to participate in just one fishing tour during their stay on the island, and assuming a conservative catch of 4.5 kg·tourist^{-1}·year^{-1}, we were able to estimate catches from this sector.

Taxonomic breakdown

Detailed data on catch composition have been reported since 2001. Using available data, the average percentage contribution for each fish species was calculated for the period 2001-2010 (Table 1). Lobster and conch were not included in this breakdown, as they are caught in quantities that are large enough to merit a separate catch reconstruction.

Table 1. Average catch composition of finfish, 2001-2010, in Antigua & Barbuda.

Taxon	Percentage composition	
	1950	2001-2010
Snappers, jobfishes nei	25.63%	19.21%
Groupers, seabasses nei	24.79%	19.52%
Grunts, sweetlips nei	17.67%	13.97%
Parrotfishes nei	17.04%	13.03%
Surgeonfishes nei	4.89%	11.47%
Triggerfishes, durgons nei	1.89%	4.72%
Boxfishes nei	1.60%	3.44%
Carangids nei	1.51%	3.39%
Marine fishes nei	1.10%	2.19%
Squirrelfishes nei	0.99%	2.29%
Sharks, rays, skates, etc. nei	0.82%	1.90%
Tuna-like fishes nei	0.55%	1.17%
Porgies, seabreams nei	0.53%	1.28%
Barracudas nei	0.36%	0.85%
Angelfishes nei	0.23%	0.69%
Sea chubs nei	0.20%	0.42%
Filefishes, leatherjackets nei	0.17%	0.46%
Batwing coral crab	0.01%	0.01%
Spanish slipper lobster	0.01%	0.01%

Catch composition has not changed much since the 1990s (Horsford I., pers. comm., April 2013), therefore species composition for 1950-2000 were adjusted based on anecdotal evidence of what species appeared to be more frequently or less frequently caught in the past, and on the development of the fishing boats and gear. Therefore, for 1950 the percentages for serranids, haemulids and lutjanids were increased by 50% compared to the 2001-2010 average (Table 1). Tunas, squirrel fish, box fish, triggerfish, angelfish and barracuda were decreased by 50% and other less significant species were raised or lowered by 5% according to their popularity among locals as these species are not commercially distributed (Table 1). Molluscs such as cockles (Cardiidae family) and whelks (*Cittarium pica*) are collected on a very small scale and generally consumed at home; however cockles are served at a few tourist restaurants. There are no data on quantity collected, therefore based on anecdotal evidence, it was assumed that the catch is comparable to that of other small crustaceans such as the batwing coral crab. Taxonomic break-down for the period 1950-2001 was calculated by interpolating between the adjusted figures for 1950 and the recorded data for 2001 (Table 1).
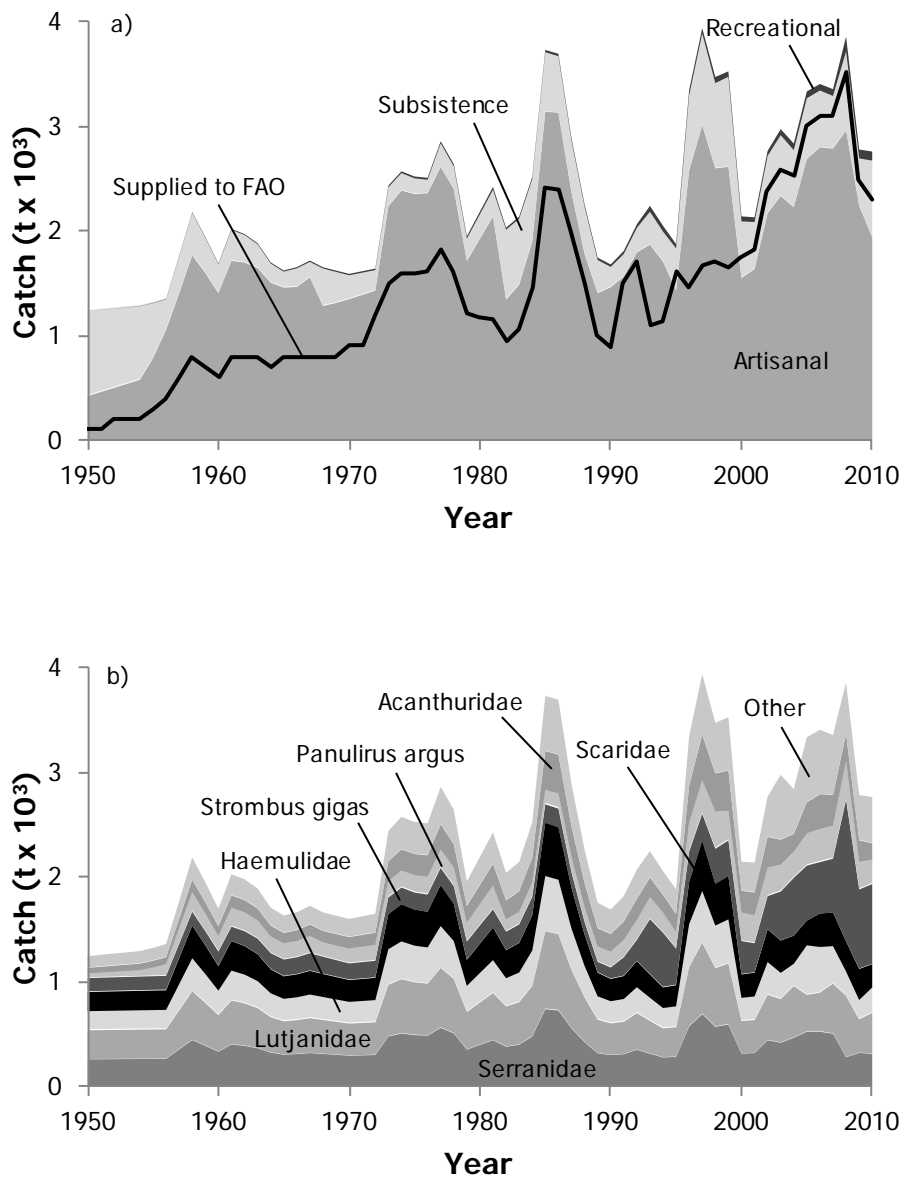
Antigua & Barbuda's total reconstructed fisheries catches for the period 1950-2010 were estimated to be almost 139,000 t, which is 67% higher than the reported catch of 83, 374 t as presented by the FAO on behalf of Antigua & Barbuda. Total unreported catches for the period 1950-2010 were estimated at around 55,500 t, with average annual unreported catches of 910 t·year^{-1} (Figure 3a).

Reconstructed small-scale catches from the artisanal sector amounted to around 111,000 tonnes over the full time period. Artisanal catches have generally increased from 1950 to 2010 with peak catches in 1985-1986 (3,100 t·year^{-1}), 1996-1999 (2,700 t·year^{-1}) and 2008 (3,000 t). Reconstructed catches from the subsistence sector in Antigua & Barbuda totalled over 25,800 t for the period 1950-2010. During the same time period, total tourist seafood consumption totalled over 9,200 t.

Estimated values for subsistence harvests during the 1950s were higher than the reconstructed values for artisanal landings. This would be expected, given the higher reliance on subsistence fishing compared to market-based fish trade during the early years. As tourist-visits to the island increased, there was a decline in the relative proportion of subsistence catches.

Significant declines in landings are observed in 1989, 1995 and 2000 (Figure 3a); which corresponds to hurricane impacts which damaged fishing grounds, equipment and infrastructure (http://environmentdivision.info/?q=node/82, access April, 2013).

Figure 3. Total reconstructed catch for Antigua and Barbuda, 1950-2010, a) by sector, with data submitted to FAO overlaid as a line graph; and b) by major taxa. 'Other' represents 15 additional taxonomic categories.

Lobster catches were not reported by FAO prior to 1961, whereas reconstructed landings for lobster from 1950-1960 equalled over 1,100 tonnes (Figure 3b). Total reconstructed lobster catches for the period 1950-2010 were estimated to be over 11,000 t, compared to 7,480 t reported to the FAO for Antigua & Barbuda. Over the last 2001-2010 decade, reconstructed catches were comparable to data reported to FAO. Overall, lobster contributed 8% of the total reconstructed catch.

Catches of conch were not reported by FAO until 1987. Based on reconstructed data, almost 5,700 t of conch was caught between 1950 and 1986, and total reconstructed catches of conch for Antigua & Barbuda were slightly over 15,500 t (Figure 3b), i.e. 60% higher than the 9,830 t presented by FAO for the study period. Overall, conch contributed 11% of total reconstructed catch.

Fisheries catches of Antigua & Barbuda were dominated by catches of reef species, primarily groupers and snappers (18% each, Figure 3b). Catches of grunts (Haemulidae, 13%) and parrotfish (Scaridae, 12%) were also significant. Surgeonfish (Acanthuridae) comprised approximately 8% of total catches and other smaller reef fish such as triggerfishes (Balistidae), boxfishes (Ostraciidae), carangids (Carangidae) and squirrelfishes (Holocentrinae) each made up 2-3% of total catches. Pelagic fish such as tuna and barracuda were less than 1% of catches. The remainder of catches comprised broad categories of marine species and molluscs.

DISCUSSION

Artisanal catches in Antigua & Barbuda have shown a general increase since 1950. A comparison of annual catches of FAO and reconstructed catches of this study showed greatest differences between 1958-1962, 1981, 1993 and 1996-1999

The overall increase in fish catches over the years reflects the results of boat mechanization programmes of the mid-1950s and 1970s. While Antigua & Barbuda's fisheries sector is considered a safety-net during down turns in other economic sectors, (i.e. the majority of fishers have other employment as opposed to be solely dedicated to fishing), catches appear to have increased during each decade of the study period. This increase is likely due to increasing demand on fisheries resources to supply consumer demands.

Near-shore species have consistently been the target of the majority of fishers over the past 60 years. Apart from recreational fishing, pelagic species such as dolphinfish (*Coryphaena hippurus)* and tuna are not targeted by Antiguan fishers, although they are popular among the tourist population. Although pelagic species are considered to be locally underexploited, their popularity among tourists for consumption and sports fishing warrants better record keeping and management of this sector. Given the trans-boundary

nature of most large pelagic species, regional stock and exploitation considerations will also need to be considered.

The reconstructed catches presented in this report should be considered minimum estimates, as there are several data limitations. These are associated with the recreational fishery, illegal foreign catches, limited data on fishing effort and a high level of species aggregation. The importance of Antigua & Barbuda's fisheries resources to its GDP, but especially its food security, warrants a management regime that will ensure its long-term sustainability. Pelagic, conch and lobster fisheries are considered to be sustainable at current levels of fishing effort (Horsford 2009), however, there is still reason for concern over these as well as near-shore fisheries. Declines in average fish size and catch of the shallow shelf and reef fishery indicate that it is being over-exploited (Horsford 2002). Sedimentation and poor boating practises are degrading the quality of coastal waters and damaging marine habitats; over-extraction and harmful fishing practices are increasing threats to seagrass beds and coral reefs, and has resulted in a decline in the variety and number of reef species of fish (Francis 2010). Furthermore, as the islands' local and tourist populations continue to expand, so will the demands on fishery resources. This reconstruction of catches for Antigua & Barbuda's fisheries can be viewed as an improvement of the data submitted to the FAO in terms of both total catch and taxonomic resolution. Further improvements can be made as data become available.

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Appendix Table A1. Total reconstructed catch vs. FAO landings for Antigua and Barbuda, 1950-2010, as well as catch by sector.

Year	FAO landings	Total reconstructed catch	Artisanal	Subsistence	Recreational
1950	100	1,240	430	813	0
1951	100	1,250	470	786	0
1952	200	1,270	510	759	1
1953	200	1,280	540	732	1
1954	200	1,290	580	704	2
1955	300	1,320	790	528	2
1956	400	1,360	1,060	292	3
1957	600	1,770	1,410	353	4
1958	800	2,180	1,770	404	6
1959	700	1,950	1,600	338	6
1960	600	1,690	1,410	275	6
1961	800	2,020	1,720	296	8
1962	800	1,980	1,700	263	9
1963	800	1,890	1,650	226	9
1964	700	1,710	1,510	184	10
1965	800	1,630	1,460	154	10
1966	800	1,660	1,470	179	11
1967	800	1,720	1,560	148	12
1968	800	1,660	1,290	359	11
1969	800	1,630	1,320	298	12
1970	900	1,600	1,350	230	13
1971	900	1,620	1,400	213	14
1972	1,200	1,650	1,440	197	15
1973	1,500	2,440	2,240	181	16
1974	1,590	2,570	2,390	164	17
1975	1,601	2,520	2,360	148	18
1976	1,613	2,510	2,370	126	19
1977	1,821	2,860	2,620	222	20
1978	1,620	2,640	2,410	213	21
1979	1,219	1,950	1,720	214	22
1980	1,171	2,190	1,930	234	25
1981	1,157	2,420	2,140	253	27
1982	950	2,040	1,350	668	19
1983	1,063	2,140	1,490	630	20
1984	1,465	2,520	1,900	595	22
1985	2,407	3,730	3,140	562	22
1986	2,400	3,690	3,140	532	24
1987	2,000	2,890	2,370	492	23
1988	1,500	2,260	1,790	449	22
1989	1,000	1,750	1,410	318	22
1990	885	1,690	1,470	196	23
1991	1,498	1,820	1,570	214	29
1992	1,712	2,070	1,800	233	34
1993	1,097	2,240	1,870	314	56
1994	1,145	2,050	1,710	286	55
1995	1,610	1,880	1,440	404	41
1996	1,463	3,350	2,580	713	51
1997	1,665	3,940	3,020	868	52
1998	1,708	3,470	2,600	808	59
1999	1,660	3,530	2,620	855	52
2000	1,754	2,140	1,560	541	48
2001	1,824	2,140	1,640	448	45
2002	2,374	2,770	2,170	546	48
2003	2,587	2,980	2,340	577	57
2004	2,527	2,840	2,230	541	64
2005	2,999	3,330	2,690	575	65
2006	3,092	3,410	2,800	538	62
2007	3,092	3,360	2,790	498	64
2008	3,521	3,860	2,970	747	144
2009	2,490	2,780	2,250	448	85
2010	2,293	2,760	1,950	730	86

Appendix Table A2. Total reconstructed catch for Antigua and Barbuda, 1950-2010, by major taxa. 'Other' represents 15 additional taxonomic categories.

Year	Serranidae	Lutjanidae	Haemulidae	Scaridae	*Strombus gigas*	*Panulirus argus*	Acanthuridae	Other
1950	264	273	188	181	126	49	52	106
1951	265	274	189	182	127	54	54	109
1952	266	274	189	183	128	58	56	111
1953	267	275	190	183	129	62	59	113
1954	268	275	191	184	130	66	61	116
1955	269	276	191	185	130	88	63	118
1956	269	276	192	185	131	116	66	121
1957	359	367	256	247	132	153	90	164
1958	449	459	320	309	133	191	116	208
1959	394	403	281	271	134	173	105	186
1960	337	343	240	232	135	153	93	162
1961	406	414	289	280	136	185	115	199
1962	393	400	280	270	140	184	114	195
1963	370	376	264	255	146	178	111	187
1964	328	333	234	226	151	164	101	168
1965	309	313	220	213	156	159	98	161
1966	315	318	224	217	159	160	102	167
1967	324	328	231	223	164	170	108	175
1968	316	319	225	218	161	141	108	173
1969	308	310	219	212	157	144	108	171
1970	299	301	213	206	153	147	107	169
1971	303	304	215	208	156	152	111	173
1972	306	307	218	211	158	156	115	178
1973	484	484	345	333	160	160	186	286
1974	511	511	364	352	162	164	201	306
1975	497	496	354	342	165	169	200	302
1976	491	489	349	338	166	173	202	303
1977	566	563	403	390	168	177	238	354
1978	514	510	366	354	169	181	221	327
1979	357	354	254	246	171	186	157	230
1980	402	399	287	278	173	208	181	263
1981	448	443	319	309	174	230	205	297
1982	384	380	274	265	175	120	180	259
1983	405	399	288	279	177	126	193	276
1984	482	475	343	333	178	140	235	334
1985	744	731	530	514	180	137	369	523
1986	732	718	521	505	182	143	370	521
1987	561	549	399	387	150	150	289	405
1988	429	420	306	297	120	147	226	314
1989	322	315	229	223	100	151	173	239
1990	305	297	217	211	104	157	167	229
1991	313	305	223	217	175	170	174	239
1992	355	345	253	245	201	195	201	274
1993	318	308	226	220	525	215	183	249
1994	282	273	201	195	518	198	165	224
1995	288	278	205	199	345	162	172	231
1996	580	558	412	401	293	279	352	472
1997	697	670	496	482	263	322	431	575
1998	575	552	409	398	338	357	362	480
1999	597	572	425	414	345	284	382	506
2000	319	305	227	221	315	275	208	274
2001	324	309	231	225	278	272	215	282
2002	446	427	318	309	319	276	291	383
2003	423	410	255	305	469	260	236	617
2004	471	486	218	266	554	252	167	425
2005	529	344	476	235	528	309	295	618
2006	529	365	440	317	494	318	330	612
2007	509	471	361	320	517	318	291	569
2008	284	578	238	285	1,357	366	260	488
2009	326	315	191	293	758	265	204	429
2010	317	386	248	220	764	235	155	437