RECONSTRUCTION OF MARINE FISHERIES CATCHES FOR MARTINIQUE, 1950-2007[1]

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ABSTRACT

Total marine fisheries catches by Martinique were estimated from 1950-2007, and included both commercial landings and subsistence catches. The commercial landings were obtained from the FAO fisheries statistics database and from other reliable sources. Subsistence catch estimates were based on total fisheries catches recorded over a ten year period that included artisanal fisheries catches. Subsistence catch estimates were then converted to *per capita* rates using Martinique's population data and expanded to cover the whole time series. Total reconstructed catches were estimated to be approximately 319,400 t over the study period (1950-2007), which is 32% larger than the catch total of 241,277 t supplied to the FAO. Fisheries in Martinique are predominantly small-scale, with catches either for commercial and/or subsistence purposes. The landings data supplied to the FAO reports mainly commercial landings, which results in an underestimation of actual fish removals from the marine ecosystem. We believe that greater emphasis should be placed on comprehensive reporting of fisheries catches that includes all fisheries sectors.

INTRODUCTION

Martinique is an island located in the eastern Caribbean Sea, between 14° N and 64° W with an area of about 1,100 km² (Figure 1). It is included in the Lesser Antilles group, between Dominica Island to the north and Saint Lucia to the south. The island is one of four that are overseas departments of France, and thus a part of the French Republic and of the European Union (since 1957). Due to its remote location, Martinique relies heavily on imports and support from France. The territory is divided into four urban districts: Fort-de-France, La Trinité, Le Marin and Saint-Pierre. The Exclusive Economic Zone (EEZ) covers over 47,000 km² and is relatively small owing to its proximity to other island states.

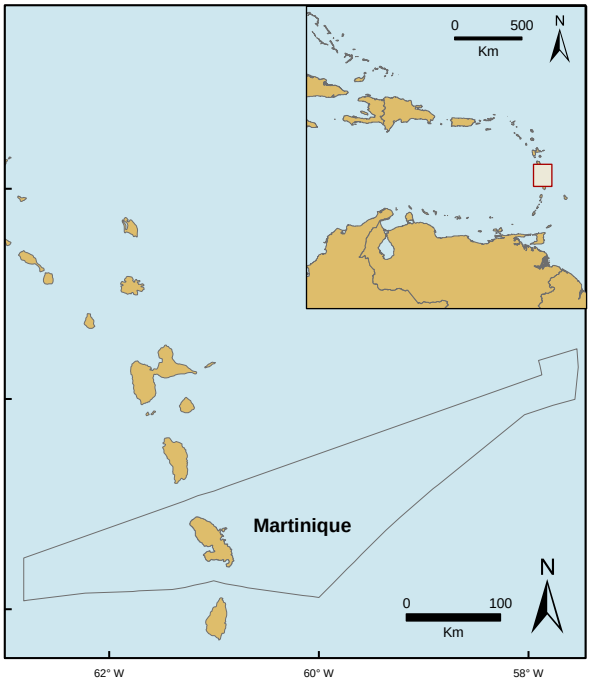

Figure 1. Map of Martinique showing the country's EEZ (solid line) and location within the Caribbean (inset).

The FAO FishStat database, which offers time series data on marine fisheries landings from 1950 to the present, is based on national statistical data supplied by its member countries. Therefore, the quality of the FAO data depends on the capacity of statistical collection within these countries. The FAO data have been the basis of many global fisheries studies (e.g., Pauly *et al.*, 1998) but they

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are, in fact, incomplete (Zeller *et al.*, 2006; 2007). Furthermore, data reported by FAO do not distinguish between fisheries sub-sectors such as commercial vs. subsistence. In addition, Illegal, Unreported and Unregulated (IUU) catches are a concern for fisheries worldwide (Bray, 2000) and presumably also add to total marine fisheries removals by Martinique in the Caribbean Sea

Large pelagic fish account for almost 60% of total reported landings, and often uses fish aggregating devices (FADs) targeting blue marlin (*Makaira nigricans*), yellowfin tuna (*Thunnus albacares*), blackfin tuna (*Thunnus atlanticus*), dolphinfish (*Coryphaena hippurus*) and king mackerel (*Scomberomorus cavalla*). In 2004, the Martinique fishing fleet comprised almost 1,200 registered boats, most of which were less than 12m long with small tonnage and powerful motors. This is largely a non-industrial fleet and operated along the coastline and on FADs (Anon., 2006a). The recreational fishing sector was estimated in 2005 to have 137 fishers who mainly targeted fish in the Labridae and Scaridae families, dolphinfish, crustaceans such as lobster and shellfish such as Conch (Guyader, 2008).

The objective of the present study is to provide an estimate of total marine fisheries catches from 1950 – 2007, to serve as a scientific baseline in the face of climate change and potential threats to food security. Although several studies and reports have been published previously regarding these issues, there has been no comprehensive review of potential historical catches in the region, combining subsistence catches and recreational catches with reported commercial catches, and there has been no specific focus on Martinique.

MATERIALS AND METHODS

Estimates of commercial marine fisheries landings were taken from several reports detailing the weight of fishes caught. While most subsistence catches were not reported, we obtained some data on artisanal fisheries from which we extracted the portion considered to be subsistence catches. Interpolations between anchor points of data were used to estimate fisheries catches via *per capita* catch rates and human population data. Estimates of recreational catches were also added to our reconstruction of marine fisheries catches for Martinique.

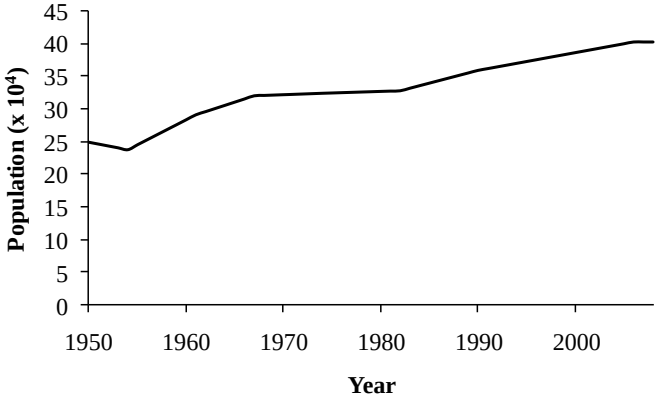

Figure 2. Martinique's human population, 1950-2007.

Human population

Human population data were obtained from the historical population demography website, Populstat (www.populstat.info/). A linear interpolation was done between census years to derive a complete time series of population values from 1950-2007. The population of Martinique in 1950 was estimated to be about 250,000 and in 2007 the population was approximately 403,000 (Figure 2).

Commercial landings

Reported commercial landings consist of fisheries products sold in markets or exported, and these are what the FAO typically reports in their landings statistics on behalf of a particular country. Here, commercial landings data were taken from FAO landings statistics and, when available, from other reputable sources that document fisheries catches (Table 1). For 2007, the FAO commercial catch data from 2007 was carried forward, unaltered.

Table 1. Data sources for Martinique's commercial fisheries catches, 1950-2007.

Date	Source
1950-1969	FAO
1970-1979	Lantz (1988)
1980-1986	Desse (1989)
1987	Lantz (1988)
1988-2007	FAO

Subsistence catches

Estimates of subsistence catches were based on total fisheries catches described by Lantz (1988) for the period 1977-1986, which included both artisanal and commercial fisheries catches. Using the totals

presented in Lantz (1988), we subtracted commercial catches, and the remaining amount was taken as the subsistence catch. These were translated into *per capita* subsistence catch rates using the population for the corresponding year. An average *per capita* rate was calculated for the first five years in the series (1977-1981), and this average was carried backwards in time and multiplied by the population to derive subsistence catch estimates for 1950-1976. This same method was used to derive subsistence catch estimates for the period 1987-2007. For this time period, the average *per capita* rate from 1981-1986 was used and applied to the annual population as a constant rate for the remainder of the time series.

The species composition of the subsistence catches were derived from a study by Gobert (1990) that estimated the overall composition by family or taxon group of demersal catches for Martinique in 1987 and 1988. We adjusted the values slightly by removing sea turtles, which were also excluded from our commercial catch totals. The adjusted proportion for each group (Table 2) was then applied to the total subsistence catch to derive subsistence catch amounts, disaggregated by family or taxon group. These proportions were applied to all years in the time series.

Table 2. Subsistence catch composition (%) for Martinique modified from Gobert (1990).

Family or group	Portion of total catch
Scaridae	13.9
Lutjanidae	10.5
Serranidae	10.1
Haemulidae	8.8
Holocentridae	8.5
Carangidae	5.4
Muraenidae + Congridae	4.8
Mullidae	4.3
Acanthuridae	4.1
Mugilidae	2.6
Squalidae	2.2
Priacanthidae	1.9
Sphyraenidae	0.5
Marine fishes nei	7.2
Lobsters	7.3
Crabs	1.7
Urchins	1.6
Cephalopods	2.4
Gastropods	2.0

Trade data

Trade data for Martinique were available for the period 1962 – 1995. Prior to this, we assumed that trade began in earnest with the end of WWII in 1945, although it is likely that some imports were available during the war, as Martinique allied herself with the French Vichy government until 1943, when Martinique was occupied by the Free French Forces. However, to remain conservative, imports were set to zero in 1944, and then linearly interpolated to the first data point in 1962. Commodity types that were not for human consumption (e.g. fish meal for aquaculture) were excluded from the analysis.

Recreational Catches

Recreational catch estimates were based on a preliminary study by Ifremer (2008), which found that the 2005 recreational fisheries catches in Martinique totaled 412 t, or 1.03 kg·person^{-1}. We assumed that recreational catches were zero in 1950 and then derived our time series through linear interpolation from zero in 1950 to 1.03 kg·person^{-1} in 2005. The 2005 *per capita* recreational fishing rate was carried forward unaltered to 2007. This is likely an underestimate of recreational catches as this fishery sector is likely to increase alongside the tourism industry. Of the total recreational catch approximately 62% were fish, 19% were shellfish and the remaining 19% were crustaceans (Guyader, 2008). These percentages were used throughout the time series to estimate annual tonnage of fish, shellfish and crustaceans caught recreationally.

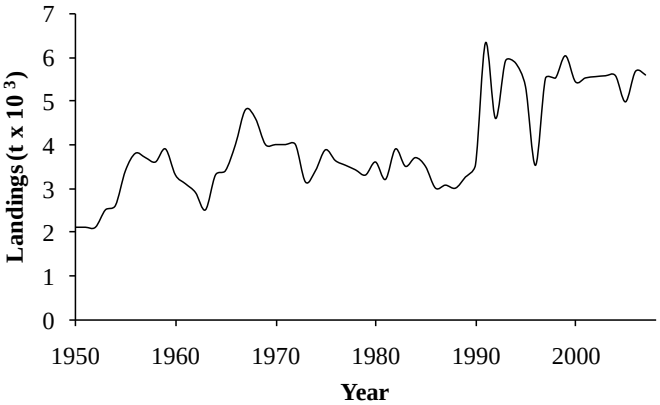

Figure 3. Commercial catches for Martinique, 1950-2007.

Total Reconstructed catch

Total marine fisheries catches for Martinique from 1950-2007 were calculated as the sum of commercial catches provided by FAO and other reliable sources, and subsistence catches, which were estimated using population data and trade statistics.

RESULTS

Commercial landings

In 1950, the commercial landings as supplied to the FAO were reported to be 2,100 t·year^{-1}, and increased to an average of 3,750 t·year^{-1} in the period from 1956-59 (Figure 3). Landings then decreased to 2,500 t·year^{-1} in 1963. By 1967 landings had almost doubled to 4,800 t·year^{-1}, but then decreased to 3,000 t·year^{-1} by 1988. Landings increased again to its highest level in 1991 at almost 6,300 t·year^{-1}. For the remainder of the study period, landings varied considerably, ranging from 6,000 t·year^{-1} to 3,500 t·year^{-1}, with an annual average of 5,300 t·year^{-1}.

Subsistence catches

At the beginning of the time series the subsistence catch was estimated at around 1,000 t·year^{-1} and by the end of the time series averaged around 1,600 t·year^{-1}. Due to the estimation method used, subsistence catches did not vary much year to year except for the late 1970s to the late 1980s when subsistence catches fluctuated considerably (Figure 4).

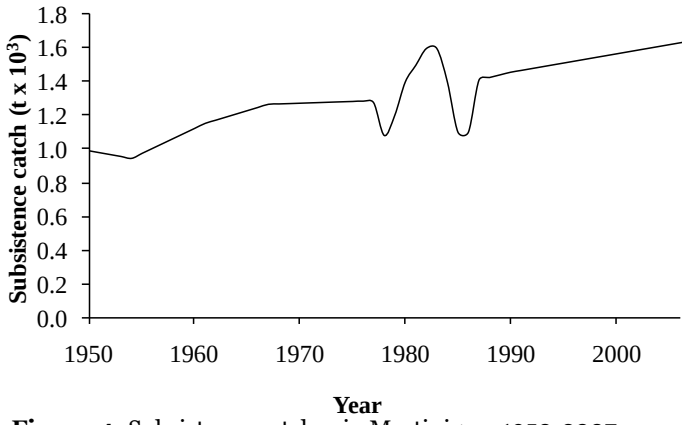

Figure 4. Subsistence catches in Martinique, 1950-2007.

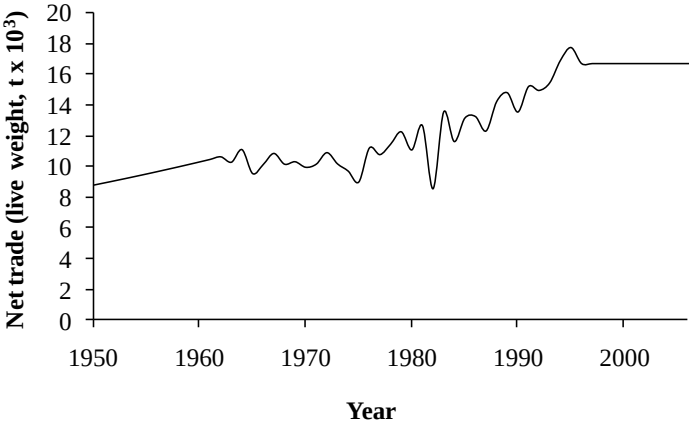

Figure 5. Net trade (imports – exports) in live weight (t) for Martinique, 1950-2007.

Trade data

Martinique imports far more seafood products than it exports, thus it has a large positive net trade balance that supplies some of the seafood consumed by the people of Martinique. The net trade was estimated to be 8,760 t·year^{-1} of imports in 1950, and showed an increasing trend with some variability (Figure 5). The net trade reached a maximum amount of 17,708 t·year^{-1} of imports in 1995.

Recreational Catches

Estimated recreational catches totaled approximately 11,400 t over the period 1950-2007. During this period, we estimated that over 7,000 t of fish were caught recreationally and 2,000 t each of shellfish and crustaceans were taken by the recreational sector.

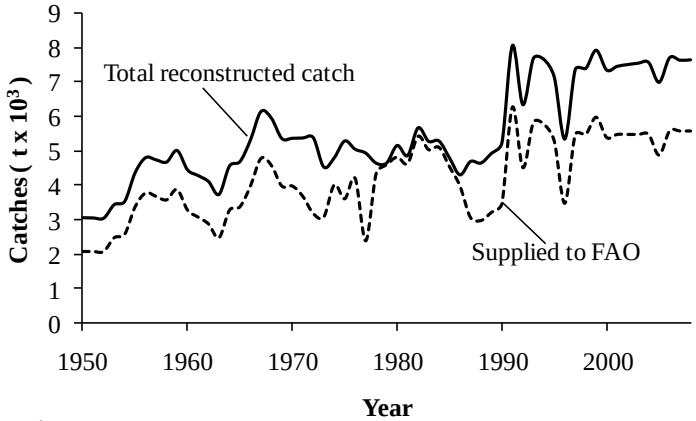

Figure 6. Martinique's total reconstructed catches and total landings as supplied to FAO from 1950-2007.

Total reconstructed catch

The reconstructed catch total was estimated to be 319,400 t for the period 1950-2007 (Figure 6). Total marine fisheries catches were estimated to be approximately 3,088 t·year^{-1} in 1950, and increased to a

peak of approximately 8,000 t·year^{-1} in 1991. Throughout the remainder of the time period total fisheries catches were on average about 7,300 t·year^{-1}, with only limited year to year fluctuations. Seafood consumption rates were relatively stable over the time period considered, with an average *per capita* consumption rate of 53.2 kg·cap^{-1}·year^{-1} (a range of 42.7-65.7 kg·cap^{-1}·year^{-1}). The relative contributions from the various fisheries sectors to the seafood supply remained fairly similar over the time period (Figure 7).

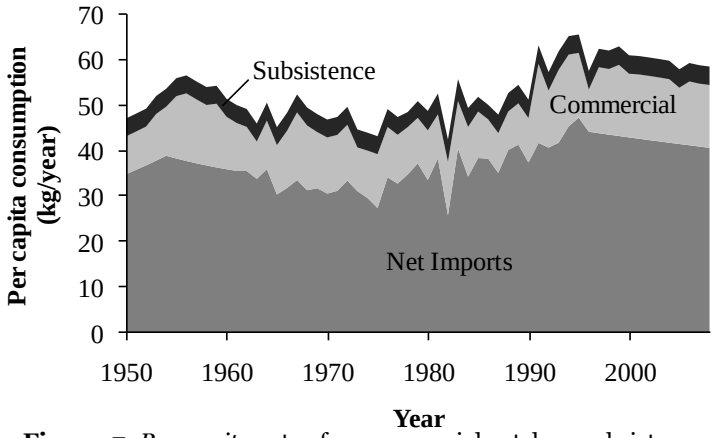

Figure 7. *Per capita* rates for commercial catches, subsistence catches and net trade, which together make up *per capita* consumption for Martinique from 1950-2007.

DISCUSSION

The total reconstructed catch for Martinique for the period 1950-2007 was approximately 319,400 t, compared to the total reported catch as supplied to the FAO of 241,277 t. The reconstructed catch, which included commercial landings and estimates of subsistence and recreational catches, was 34% larger than the total catch reported by the FAO on behalf of Martinique. For the more recent years (2000-2007), the difference was 38%.

Currently, the fisheries statistics that are reported by FAO on behalf of Martinique include only commercial fisheries landings. Our catch reconstruction attempts to account more comprehensively for the total marine fisheries of Martinique by including estimates of subsistence and recreational catches. These estimates are likely underestimates as we used a conservative approach and were only able to account for the additional catches from the subsistence and recreational sectors. Other Illegal, Unreported and Unregulated (IUU) catch components were not estimated but are likely to also add to the total marine fisheries removals by Martinique. A review of the literature presented little information on IUU catch components for the Caribbean Sea region.

Trade data were used in estimating total consumption for Martinique and hence contributed to establishing the total reconstructed catch for Martinique. It illustrates the reliance of Martinique on imports to meet their seafood demand. Martinique and Guadeloupe, both French Overseas Departments, have much higher seafood consumption rates than in other areas of the Caribbean (Anon., 2006b). This may reflect cultural differences and the large number of French tourists that visit Martinique each year (over 503, 000 tourists in 2006, 79% were from France [www.onecaribbean.org/statistics/]). While the high demand for seafood in Martinique is met through substantial imports from elsewhere, they continue to supply a portion of their consumption demand domestically. This report shows that the current method of fisheries reporting for Martinique is incomplete, and that there needs to be more comprehensive reporting which includes subsistence and recreational fishing sectors.

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REFERENCES

Aldrich, R. and Connell, J. (1992) From France's Overseas Frontier: Départements Et Territoires D'outre-mer. Cambridge University Press, 357 p.

Anon. (2006a) Fact sheets – Martinique. European Commission, Fisheries publications, Fact sheets. Available at: http://ec.europa.eu/fisheries/publications/outermost_regions_martinique_en.htm [Accessed October, 2008].

Anon. (2006b). NMFS Per capita consumption. Available at: www.st.nmfs.noaa.gov/st1/fus/fus06/08_perita2006.pdf [Accessed February 2008].

De Miras, C. (1989) La pêcherie martiniquaise : une croissance volontariste en échec, IRD, Cah. Sci. Hum. 25(1-2), 49-65

Desse M. (1989) Bilan des activités halieutiques dans les départements d'outre-mer de la Caraïbe, La pêche maritime no.1328, feb. 1989, 110-115

Gobert, B. (1990) Production relative des pêcheries côtières en Martinique, Aquat. Living Resour. No.3, 181-191

Gobert, B. (1992) The flyingfish of Martinique. p. 21-29. *In*: Oxenford, H.A., Mahon, R., Hunte, W. (eds.) Biology and management options for flying in the eastern Caribbean, Bellairs Research Institute of McGill University, Barbade

Guyader, O. (2008). Presentation at the 61st Gulf and Caribbean Fisheries Institute Conference, Guadeloupe, 2008.

Lantz, F. (1988) Développement de la pêche de grands pélagiques dans les Antilles françaises et organization du marché des produits de la mer, Archimer, archives institutionnelles de l'IFREMER.

Pauly, D., Christensen, V., Dalsgaard, J., Froese, R. and Torres, F. (1998) Fishing down marine food webs. Science 279: 860-863.

Zeller, D., Booth, S., Craig P. and Pauly, D. (2006) Reconstruction of coral reef fisheries catches in American Samoa, 1950-2002. Coral reefs 25: 144-152.

Zeller, D., Booth, S., Davis, G. and Pauly, D. (2007) Re-estimation of small fisheries catches for the U.S. flag-associated island areas in the Western Pacific: The last 50 years. Fishery Bulletin 105(2): 266-277.