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(French Caribbean, 1950-2010)**

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**RECONSTRUCTION OF MARINE FISHERIES CATCHES FOR ST. BARTHÉLÉMY AND ST. MARTIN
(FRENCH CARIBBEAN, 1950-2010)**

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ABSTRACT

Catch statistics from the fisheries in the Exclusive Economic Zones of the French Caribbean islands of Saint Barthélemy and Saint Martin were improved for the 1950-2010 time-period using a catch reconstruction approach. This produced an estimate of total fisheries catches for all artisanal, recreational and subsistence sectors - including associated discards - of 5.4 times the data officially reported¹ to the Food and Agriculture Organization of the United Nations on both islands. Molluscs were the most important taxonomic group, with helmet shells (Cassidae) and pink conch (*Lobatus gigas*) contributing 7% of the catch each on both St. Martin and St. Barthélemy. Grunts (Haemulidae), red hind (*Epinephelus guttatus*) and silk snapper (*Lutjanus vivanus*) were also important. The artisanal landings were the major component (47% in each case) within the Exclusive Economic Zones (EEZs), while the subsistence sector was also important with just over 40% of the share on each island. Recreational fishing made up over 7% on both islands and discards associated with the artisanal sector contributed almost 4% to each. Although fishing effort seems to be low, catches increased across the time period, although over-exploitation appears to have been prevented by the presence of ciguatera in fishes across the Anguillan plateau.

INTRODUCTION

France has four overseas territories in the Caribbean: Martinique, Guadeloupe, St. Barthélemy ('St. Barts') and St. Martin. These two last islands are located in the Lesser Antilles, north west of Guadeloupe, on a submarine plateau called the Anguilla Bank (MacRae 2011). Both islands are volcanic and their respective land areas represent 54 km² for St. Martin and 21 km² for St. Barts (Figure 1). They are characterised by beaches, hills and peaks, but also salt ponds for St. Martin (Nash 2008). Both islands encompass French territory, but St. Martin is shared with the Netherlands, whose part, located in the south, is called St. Maarten. An agreement on the definition of the maritime areas for these two islands was concluded in 1997,² which allowed St. Barts and St. Martin to benefit from over 4,000 km² and 1,000 km² of EEZ, respectively.³

The marine habitats are mainly composed of coral reefs, sea grass beds, rocky shores and mangroves (MacRae 2011). During the 1990s, three marine parks were established, two on St. Martin^{4,5} and one on

¹ Includes catches reported independently from 2007-2010, as well as those catches which were included in those reported by Guadeloupe from 1950-2006 and were deemed to be taken from Saint Barthélemy and Saint Martin's waters.

² Décret n°97-938 du 8 Octobre 1997, JO du 15 Octobre 1997, p. 14968

³ <http://www.shom.fr>

⁴ <http://www.naturefoundationsxm.org>

⁵ <http://reservenaturelle-saint-martin.com/>

St. Barts⁶ (Blanchet *et al.* 2002). The whole Antilles area is subject to major cyclonic disturbance which can cause severe damage to the local marine ecosystems (Blanchet *et al.* 2002).

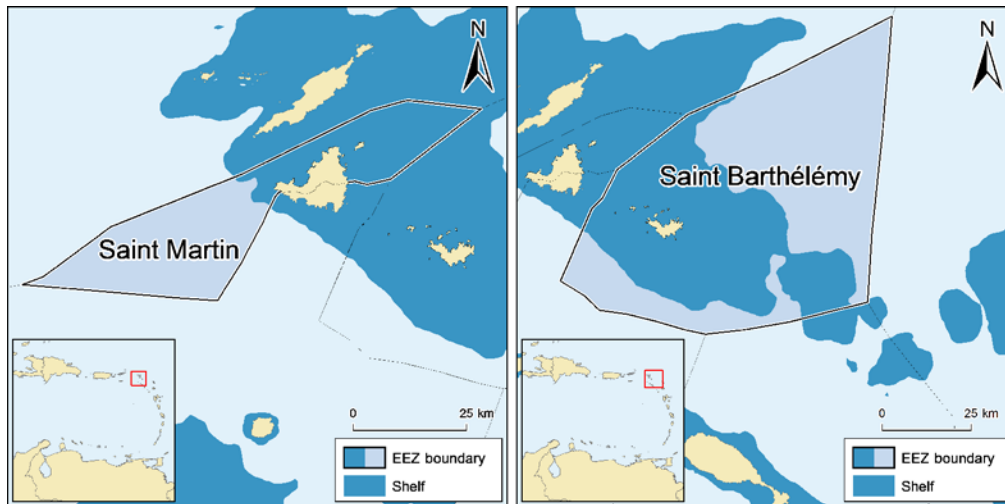


Figure 1. St. Martin and St. Barthélemy and their Exclusive Economic Zones.

In the 1950s, fisheries were not organized in the Antilles but exploited by the local inhabitants with small boats and gear constructed by the fishers themselves (Belloc 1950). They would use fish traps made of wood or metallic screen, seines, straight nets, lines and sometimes explosives and poisonous plants. Despite the richness of the surrounding waters, the local population lacked fresh fish, and imported salted and canned fish. However, in the smaller islands, such as St. Barts and St. Martin, catches surpassed local consumption (Belloc 1950) and was actually shipped to Martinique in the mid-century (Blanchet *et al.* 2002).

On the Dutch side of St. Martin (i.e., Sint Maarten), agriculture remained the most important economic activity until around 1960, when tourism expanded with developments in air transport, and today, most employment on the island is related to tourism (MacRae 2011). Still, the demand for fresh fish is reported to be high and most of the fish sold are demersal species (Bervoets 2010).

In the 1970s, a coastal fishing plan was prepared in Martinique and Guadeloupe to develop fishing outside of the traditional boats' range through modern fishing units (i.e., a push for spatial expansion). However, the most favorable areas were the shallow banks around St. Barts and St. Martin where ciguatera poisoning due to the ingestion of fish contaminated by toxic algae (*Gambierdiscus toxicus*) (Bourdeau 1989) was acute (Lorance 1989). Ciguatera poisoning can be severe for human's health and hence constitute an obstacle to marine resources exploitation (Bourdeau 1989).

Munro and Blok (2005) stated that fishing effort within French waters seem to be very low and that St. Martin is a major local importer of seafood.

In 2008, 24 fishing vessels were registered in St. Barts (10 coastal, 14 mixed) and 12 in St. Martin (2 coastal, 8 mixed and 2 large), but it appears that vessels from the French Antilles mostly fish around St. Barts (Guyader *et al.* 2011).

Unfortunately, no catch statistics were maintained for these islands (Belloc 1950; Munro and Blok 2005) and, although the fisheries of Martinique and Guadeloupe had been reconstructed previously (Frotté *et al.*

⁶ <http://reservenaturellestbarth.com/en>

2009a, 2009b), they did not include the fisheries from St. Barts and St. Martin. Thus, the present report focuses on reconstructing the marine fisheries catches of St. Barts and the French part of St. Martin for the 1950-2010 period.

This report attempts to reconstruct catches from all sectors on both St. Barts and St. Martin. Catches that may otherwise be missed by official reporting, including major discards are also reconstructed according to methods outlined in Zeller *et al.* (2007).

Reconstructing historical catches may require assumptions when data are limited, but this is justified by the unacceptability of the alternative, i.e., accepting zero catches for 'no data' situations (Pauly 1998).

METHODS

Baseline

Official catch data were obtained from FAO FishStat (2011). However, prior to 2011, landings data for St. Martin and St. Barts had not been reported separately. In the 2011 dataset, the catch data for the islands were displayed from 2007 onward. By comparing Guadeloupe FAO data obtained in 2010 and 2011, it appeared that in 2011, St. Barts and St. Martin catches had been taken out of Guadeloupe catch data. Indeed, St. Barts and St. Martin became a French '*Collectivité d'Outre Mer*' (Overseas Collectivity) in 2007, but the fishing boats were still associated with the maritime district of Pointe-à-Pitre, Guadeloupe, in 2008 (Guyader *et al.* 2011). Therefore, for both St. Martin and St. Barts, we used the 2007 ratio of island catch/Guadeloupe catch and applied them to the Guadeloupe catches from 1950 to 2006 to reconstruct an assumed reported landings baseline time series for both islands. All catches were reported as 'marine fishes nei'.

Catches of large pelagics (bonito, *Sarda sarda*; cero, *Scomberomorus regalis* and blackfin tuna, *Thunnus atlanticus*), are reconstructed separately by the *Sea Around Us* and were therefore excluded from the FAO total before calculating the St. Martin/St. Barts estimates.

Artisanal catch

Overall, the fisheries in these two French islands seem to be exclusively artisanal (Battaglia *et al.* 1989) and no information was found on any French industrial fishery occurring in the area. Therefore, we assigned all of the baseline catch to the artisanal sector.

Bervoets (2010) reports that in 2010, commercial fishing contributed \$666,680 to the value of the coral reefs in Dutch Sint Maarten. At the same time, locals stated that the value of non-commercial fish caught and sold was \$1,946,350, approximately 2.9 times larger. We assumed that there was a similar situation on the north of the island in St. Martin and, whilst recognizing that value of fish sold is not a direct proxy for the quantity caught, we conservatively applied a rate of 1.5 to the baseline to account for unreported catches being marketed. We also assumed the same rate for St. Barts.

Initially, the reconstructed catch trend on both islands showed a dramatic increase with catches doubling in a single year between 1976 and 1977. This was adjusted to better reflect realistic catches by interpolating between the artisanal totals in 1974 and 1979.

Catch composition

In the 1950s, fishers already used various types of fishing gear (lines, traps and nets) and appeared to be excellent swimmers and divers. They would usually catch spiny lobsters (*Panulirus argus*), conch (Strombidae), helmet shells (Cassidae), tunas (skipjack tuna [locally also called 'arctic bonito'], Bluefin

tuna) and common dolphin fish (*Coryphaena hippurus*), but no catch estimates were available (Belloc 1950).

In the late 1980s, Lorange (1989) documented the most typical fish families caught by net, trap and longline. Net catches were mainly composed of sharks, parrotfish (Scaridae), grunts (Haemulidae), groupers (Serranidae), jacks (Carangidae) and sometimes triggerfish (*Balistes vetula*), while traps usually caught marine crustaceans, snappers (Lutjanidae), grunts and groupers (Lorange 1989; Guyader *et al.* 2011). Longlines caught mostly groupers (mainly *Epinephelus guttatus* and sometimes *Epinephelus morio*), snappers (*Lutjanus vivanus*, *Etelis oculatus*, *Pristipomoides macropthalmus*) and a few jacks (*Seriola* spp.) (Lorange 1989; Guyader *et al.* 2011). Based on this information, we built the taxonomic breakdown by gear.

In more recent studies performed in Dutch Sint Maarten, commercially targeted and commonly available species were reported to be groupers, snappers (*Lutjanus campechanus*, *Ocyurus chrysurus*), butterfish, yellowtail, jacks, hinds and grunts, but the most commercialized species would be Caribbean spiny lobster (*Panulirus argus*), queen conch (*Lobatus gigas*), wahoo (*Acanthocybium solandri*), tunas (*Thunnus* spp.) and bigeye scad (*Selar crumenophthalmus*) (Bervoets 2010; MacRae 2011).

Lorange (1989) also documented species most commonly found in traps and nets from his experimental study. These species, along with those reported by MacRae (2011) and Bervoets (2010), were used to complete the taxonomic breakdown based on the most representative families by gear type.

Over time, similar taxa were reported; thus we applied the same taxonomic breakdown for the whole study period.

Traps are documented to be the most prevalent gear used by fishers (Belloc 1950; Lorange 1989), but the most productive gear are reported to be nets (e.g., seines; Belloc 1950). Therefore, we allocated $\frac{1}{3}$ rd of the catch from St. Barts and St. Martin to nets, $\frac{1}{6}$ th to divers and $\frac{1}{4}$ th to both longlines and traps. The catch was then allocated equally among the taxa listed in the taxonomic breakdown by gear.

Discards

Kelleher (2005) mentioned that discards are negligible in the Caribbean aside from shrimp trawls. However, all fishing techniques allow catch of ciguatoxic species and 20% of the trap and net catches is reported to be discarded; longline's discards seem to be more variable (Lorange 1989). In order to account for likely high post-release survival rates of trap caught fish, for all artisanal catch (except for catch collected by divers), we added 10% of this amount and allocated it to discard.

Recreational catches

Recreational fishing within the Caribbean targets a range of large pelagic species, and the region also attracts a multitude of international anglers wishing to target the large migratory tunas and billfishes.⁷

In Dutch Sint Maarten, recreational fishing takes place through casual shore fishing and sport fishing whose species targeted are marlin, tuna, wahoo, sailfish and other large pelagics (MacRae 2011). Queen conch is also reported to be a species of interest for recreational fishers, but legislation from 2002 allowed only professional to collect the marine mollusc (Anon. 2012). Dolphinfish are targeted throughout the Western Central Atlantic region by recreational fishers (Mahon 1999).

⁷ <http://clmeproject.org/casestud2.html>

As 15% of the local population in Sint Maarten engages in some form of recreational fishing (Bervoets 2010), we applied the same percentages to the population estimated through data found for St. Barts and St. Martin. Population data were available from INSEE for 1967, 1974, 1982, 1990, 1999 and 2010; we interpolated population data between those years and from 1950 to 1966, we used the trend of the population growth from 1967 to 1980. Assuming that each person involved in recreational fishing would catch 20 kilos per year, we estimated the amount potentially caught by recreational fishers for each year and then equally allocated this amount among the families of the targeted taxa.

Subsistence catches

In Dutch Sint Maarten, fish for consumption is valued relatively high compared to that of local sales from non-commercial catches, for with Bervoets (2010) reported a figure 2.9 times higher. This is not a direct proxy on the quantity of fish caught for subsistence, but indicates the level of importance the sector has. To be conservative, we halved the figure and applied a rate of 1.5 to the estimated total artisanal catch on each island.

RESULTS

St. Barthélemy

Reconstructed removals for St. Barts between 1950 and 2010 were 5.4 times the data we deemed reported for St. Barts through extraction from the reported FAO catch of Guadeloupe over the same time period. Artisanal and subsistence landings were most important, with 46.5% and 41.9% of the catch respectively. Recreational catches made up 7.7% and discards from the artisanal fishery contributed 3.9% (Figure 2a).

Catches grew throughout the time period, from around 30 t in 1950 to around 270 t in 2010. The growth was relatively steady between 1950 and 1973, then the rate increased sharply, with catches quickly doubling from around 100 t in 1973 to 200 t in 1979. Catches continued to grow after this, but at a much slower rate, plateauing at 280 t·year⁻¹ for the 2000s.

Molluscs were the most important taxonomic group in the catch, with helmet shells (Cassidae) and pink conch (*Lobatus gigas*) the most dominant taxa, making up 7.4% each (Figure 2b). Grunts (Haemulidae; 5.8%), red hind (*Epinephelus guttatus*; 5.7%) and silk snapper (*Lutjanus vivanus*; 4.8%) were also important. Twenty-nine identified taxonomic groups made up the remaining 69.2% of the catch (Figure 2b).

St. Martin

The reconstructed total catch for 1950-2010 in St. Martin was 5.4 times the data deemed reported for St. Martin through extraction from the reported FAO catch of Guadeloupe over the same time period (Figure 3a). The artisanal landings contributed 46.7%, with subsistence fisheries making up 42.1%. Recreational fishing contributed 7.3%, whilst discards from the artisanal fishery made up a further 3.9%.

The catch trend was very similar to St. Barts, gradually rising to the mid-1970s, before almost doubling in a relatively short time span and afterwards continuing to rise, with a reduced rate until plateauing in the 2000s. Annual catches overall grew from 110 t in 1950 to 1,100 t in 2010.

Again, marine molluscs were the largest part of the catch, with helmet shells and pink conch both contributing just over 7.4%. Grunts made up 5.7%, with red hind and silk snapper adding 5.7% and 4.7%, respectively (Figure 3b).

DISCUSSION

The catch reconstructions completed for St. Barts and St. Martin allow for a more comprehensive view of the development of their fisheries since 1950. Both reconstructions suggest total catches that are 5.4 times the data we derived as likely reported for these islands to the FAO. This is largely due to substantial under-reported artisanal catches and unreported subsistence catches, as also noted by Bervoets (2010). Discards are also higher than they might be expected in similar Caribbean islands, due to the presence of ciguatoxic species that are deemed unsuited for human consumption.

The rapid increase in catches in the mid-1970s observable in the reconstructed data is an artefact of the reported FAO data, which the artisanal baseline was based on. The FAO data for 1977 shows a dramatic increase in the reporting of 'marine fishes nei', although such a grouping unfortunately makes it extremely difficult to determine the source. It may be a reporting error, though the level of catch was sustained afterwards. Thus, it more likely suggests an increase in effort, which coincides with the fishing investment plan that was organized in Guadeloupe and Martinique in the mid-1970s. (In the reconstruction, the rapid increase from 1976-1977 was replaced by a smooth increase from 1974-1979. Note also that the FAO data was reported as catch from Guadeloupe, due to the administration of the French Caribbean at the time, and it is impossible to say where exactly the increase came from and to what extent the investment in expanding fishing effort was extended to St. Barts and St. Martin).

Catches allocated to St. Barts and St. Martin in the reconstruction for the 2000s are small compared to those for Guadeloupe, but this is consistent with Munro and Blok (2005) who argue that fishing effort within French waters appears to be very low and that St. Martin is a major local importer of seafood. Battaglia *et al.* (1989) also mention that the Anguilla plateau, which surrounds both St. Barts and St. Martin, is relatively lightly exploited by local fishers even though its resources have been targeted by fishers from Guadeloupe for a long time (Blanchet *et al.* 2002). Algae proliferation (*Dictyota* spp.) around both islands since the 1980s (Blanchet *et al.* 2002) may also affect reef catches, and no area within the Anguilla plateau seemed to be free from ciguatera (Lorance 1989).

That the catch levels throughout the latter part of the time period are sustained is consistent with observations in the 1980s that suggested no signs of over-exploitation (Lorance 1989). Indeed, it seems very likely that the ciguatera phenomenon prevents fishers from overexploiting potentially toxic species. That said, Nassau grouper (*Epinephelus striatus*) was documented as one of the most frequently caught species in the late 1980s (Lorance 1989), whereas it seems to be rarely caught nowadays (Tadzio Bervoets, pers. comm.) and marine molluscs, i.e., queen conch are reported to be threatened (Anon. 2012).

Inevitably, due to the lack of comprehensive catch data, the reconstructions have been based on several assumptions; however, we have attempted to be conservative throughout.

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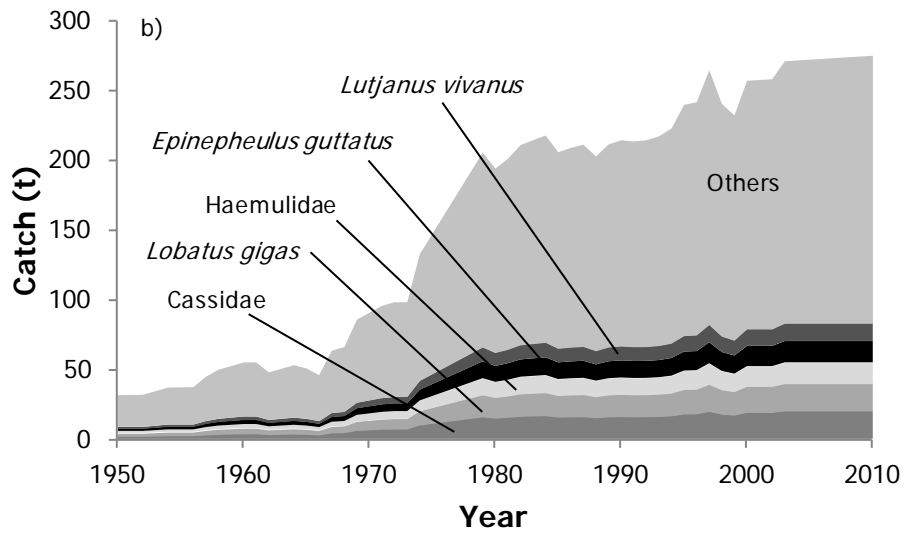
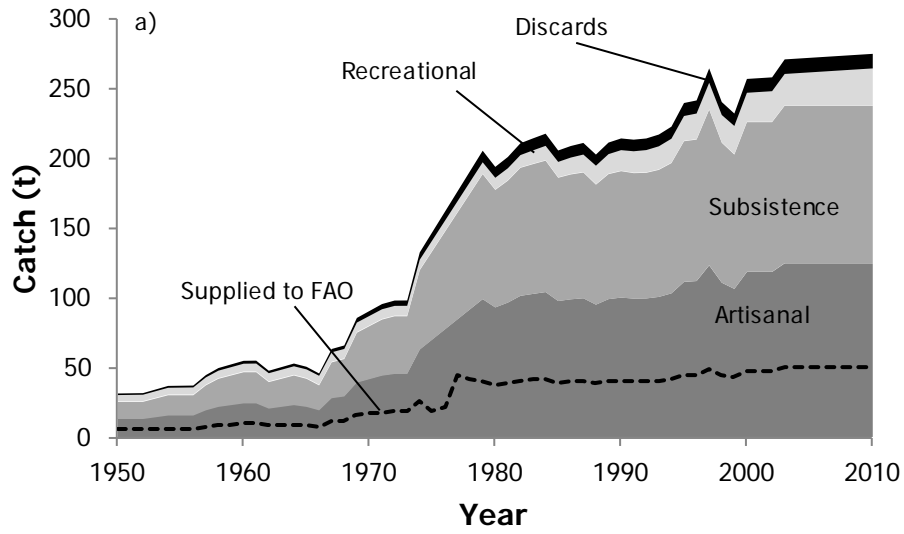


Figure 2. Reconstructed catches of St. Barthélemy for 1950-2010, by a) fishing sector plus discards. Note that data reported to FAO, as derived from Guadeloupe data are overlaid as line graph; and b) by taxon. 'Others' represents 29 additional taxonomic categories.

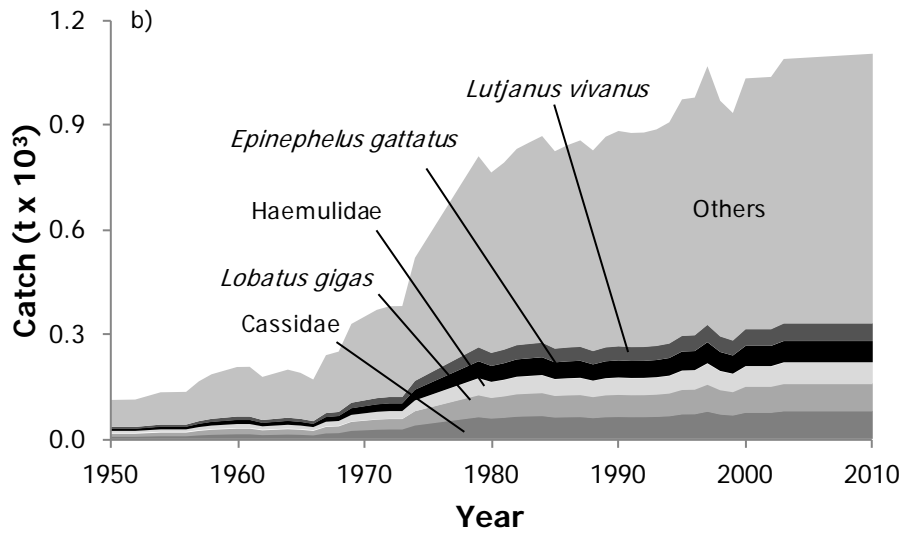
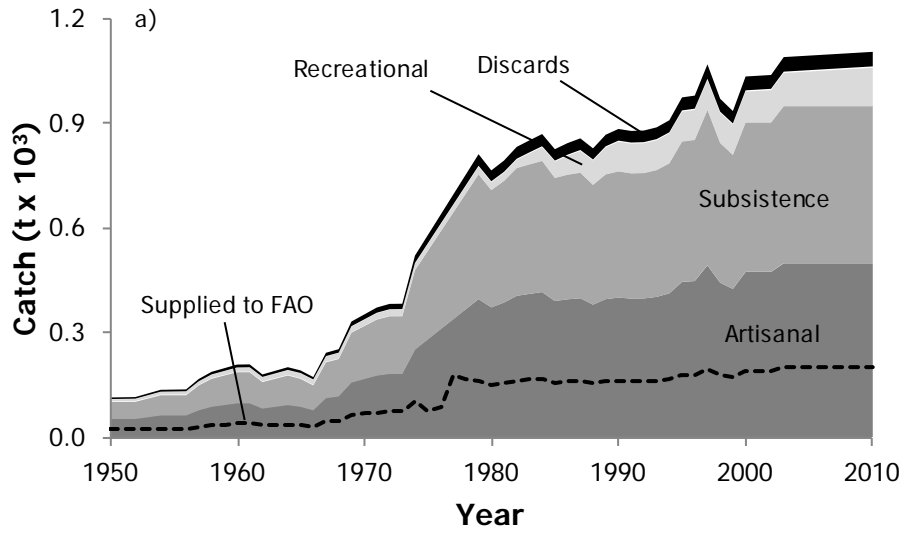


Figure 3. Reconstructed catches of St. Martin for 1950-2010, by a) fishing sector plus discards. Note that data reported to FAO, as derived from Guadeloupe data are overlaid as line graph; and b) by taxon. 'Others' represents 29 additional taxonomic categories.