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the 'Heart of West Africa', 1950 to 2010**

Dyhia Belhabib, Viviane Kutoub, and Daniel Pauly

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Email: d.belhabib@fisheries.ubc.ca

THE MARINE FISHERIES OF TOGO, THE 'HEART OF WEST AFRICA', 1950 TO 2010

Dyhia Belhabib[a], Viviane Kutoub[b], and Daniel Pauly[a]

[a] *Sea Around Us, Fisheries Centre, University of British Columbia*
2202 Main Mall, Vancouver, V6T 1Z4, Canada
[2]USAID, Dakar, Senegal

d.belhabib@fisheries.ubc.ca; koutubviviane@gmail.com; d.pauly@fisheries.ubc.ca

ABSTRACT

Fisheries catches in the Togolese Exclusive Economic Zone were reconstructed including small scale marine and lagoon fisheries, commercial large scale fisheries, illegal foreign fisheries and discards by both the domestic and foreign sectors. In the last two decades, total domestic catches showed a decrease, contrary to the positive trend observed in the data supplied to FAO. Moreover, with a total of 2.3 million tonnes compared to 560,000 tonnes between 1950 and 2010, domestic catches were 4.1 times the catch supplied to FAO. This study also shows higher foreign fisheries removals than what is officially reported, with the foreign legal and illegal catch representing almost a quarter of the total reconstructed catch. These catches are masked by the reflagging practices of Togo and the lack of fisheries monitoring and enforcement, which illustrates a general *laisser faire* in the Togolese fisheries policy, and threatens poverty alleviation strategies and food security within local communities trapped between the over-exploitation of fisheries and the anticipated effects of climate change.

Introduction

Togo, a small West African country stretching 600 km from the edge of the Sahel in the North to the coast of the Gulf of Guinea in the South, where it has a width of 56 km, consequently has an extremely small Exclusive Economic Zone (EEZ), and an even smaller shelf (Figure 1).

Unmonitored, nor controlled, freshwater and coastal lagoon fisheries of Togo generate relatively high yields but remain largely understudied. Marine fisheries, which generate apparent higher yields, are given more importance in the few studies that are available for Togo. In fact, these fisheries, similar to those of Benin, are mostly mentioned *en passant* in reviews of the Gulf of Guinea fisheries (Écoutin *et al.* 1993; Guiffre 1993; Horemans 1993, 1994, 1995).

Here, we try to overcome this by assembling all the information that we could obtain on the Togolese fisheries and particularly on their catches since 1950, using 'grey literature' gathered during short stay in that country (DP: Oct. 1971), as well as from the more recent peer-reviewed and report literature, both on and offline, with particular emphasis to colonial and 'development' sources in German and French.

Togo, was known under various names highlighting a rich historical past. Its coast used as a slave trading platform earned Togo the name of 'Slave Coast'; as a German colony from 1884 to 1918, it became 'Togoland', before it was transferred to France as part of the French colonial empire in West Africa, to finally gain independence in 1960.

However, the ties which Togo retained to Germany where instrumental for the decade-long marine fisheries development project initiated in the mid-1960s, which brought industrial fishing, specifically bottom trawling, onto the Togolese shelf (Karger and und Steinberg 1969).

This development was meant to complement the existing small-fisheries, but these were soon seen as competitors to the trawl fisheries, if mainly because their beach seines and other gear tended to exploit the juvenile stages of species potentially exploitable as adults further offshore by the newly supplied trawler (Beck 1974, 1977). These dynamics still exists, in Togo and elsewhere, though as rather typical competition between foreign trawlers and local small-scale fishers (Pauly 2006), the implantation of a locally-based industrial fishery having failed. These dynamics, and the foreign element that they entail, are also the reason why the catches of the marine fisheries of Togo, despite their small size, are difficult to disaggregate into subsectors.

METHODS

The majors sources of information used here are peer reviewed and grey literature along with media reports; the data they contained we analyzed using the catch reconstruction methods in (Zeller *et al.* 2007), which, in the main, consists of:

1) Using the available catch estimate as 'anchor points', between which linear interpolations were used to provide preliminary catch estimates for years without data;
2) Using demographic data to extrapolate estimates of small-scale fisher numbers (incl. beach seine operators) to years for which such estimates were lacking; and
3) Generally: provide (conservative) estimates where there was evidence of a non-zero catch.

The procedure used for the various subsectors was a follows:

Small-scale fisheries

Small scale fisheries include two major sectors, subsistence fisheries operated in (brackish-water) coastal lagoons (freshwater fisheries are not considered here), and marine artisanal fisheries conducted from beaches (beach seines and set nets) or by pirogues.

Lagoon subsistence fisheries

The statistics on lagoon fisheries are included in the continental water component, and the fisheries are not monitored (FAO 2007). Thus the catch data supplied to FAO pertains mostly to freshwater species. Most lagoon fishery catches in Togo are for personal consumption and are not marketed (Laë 1992), which differs from neighboring Ghana, where the catch of lagoon fishers are mostly sold (Pauly 1976). They are operated by mostly occasional and seasonal fishers who practice agriculture at the same time (Laë 1992). Therefore, this fishery is considered a subsistence fishery. Coastal lagoons in Togo, as elsewhere along the gulf of Guinea are exploited either traditionally or by means of extensive ranching systems called *acadjas*.

- Traditional fishing

The mapping by Weigel (1985) for Lac Togo, which despite its name is a coastal lagoon, in 1960 revealed 19 villages over a total of 37, where 700 pirogues are active operated by 2.5 fishers at average (de Surgy 1966; Bama 1984). Considering a total of 37 villages and 5,300 permanent fishers (Alsopp 1966), i.e., 51 pirogues per villages and 143 fishers, the remaining 18 villages not covered by Weigel (1985) would shelter 2,574 fishers and 918 additional pirogues in 1960. Thus the total number of fishers for 1960 is estimated at 4,324 fishers. These numbers are conservative because they do not include part time and seasonal fishers, and children (de Surgy 1966). For 1978, Dioury (1983) estimated the number of pirogues at 2,000, with 2.5 fisher per pirogue (Bama 1984), i.e., a total of 5,000 fishers. Laë (1992) reported a total number of 1,800 fishers in 1984 for 33 villages, i.e., 2,372 fishers in 37 villages in total. The number of pirogues was estimated at 1,000 in1985 (Weigel 1985), 1,100 in 1989 (Sedzro and Kusiaku 1999), 793 in 2007

(IRD 2011) and assumed constant thereafter. Assuming a constant number of fishers per pirogue at 2.5, we estimated the number of fishers at 2,500 in 1985, 2,750 in 1989, 1,586 in 2007 onwards, then we performed a series of linear interpolations to complete the time series. The CPUE per fisher declined from 1.7 t·year^{-1}·fisher^{-1} in the mid-1960s to 0.53 t·year^{-1}·fisher^{-1} in the mid-1980s (Laë 1997). Given the strong decline in lagoon catches and the over-exploitation already reported in the 1960s (de Surgy 1966), we assumed the CPUE in 1950 was 20% higher than in 1965 (2.05 t·year^{-1}·fisher^{-1}). Pérez-Ruzafa and Marcos (2012) estimated a CPUE of 0.59 t·year^{-1}·fisher^{-1} in 2012. Thus we interpolated linearly CPUE estimates and multiplied these by the total number of fishers to estimate the traditional lagoon catch in Togo from 1950 to 2010.

- *Acadja* catches

Acadjas are extensive ranching techniques that rely on wild fish being concentrated in "dense masses of branches planted in the muddy bottom" (Welcomme 1972), in which they find shelter and food. *Acadjas* were introduced in Togo in the mid-1950s (King 1993), and because of their uncontrolled proliferation, which created conflicts between traditional fishers and fishers using this new technique, and also because of the deforestation they induce, they were prohibited in 1975 (Weigel 1985). However, the higher productivity (Kapetsky 1981) and the lack of control is undoubtedly encouraging an illegal use that is still common in Togolese lagoons (SOFRECO 2011). Weigel (1985) estimated a total number of 133 *acajda* systems in Togo of 0.7 ha each and a productivity of 5 t·ha^{-1}·year^{-1} from 1969 to 1972. The resulting catch would be the product of the number of *acadja* systems, the average surface and the productivity, i.e., 451 t·year^{-1} from 1969 to 1972. We assumed catches induced by *acadjas* in 2010 were half the catch of 1972, i.e., 226 in one hand because of the unenforced prohibition but mostly because of over-exploitation and pollution. We interpolated catches from 0 t·year^{-1} in 1954 right before the introduction of the *Acadja* technique to Togo, to 451 t·year^{-1} in 1969 and then from 541 t·year^{-1} in 1972 to 226 t·year^{-1} in 2010.

Traditional lagoon and *acadja* catches are overwhelmingly dominated by the blackchin tilapia *Saratherodon melanotheron* and the Guinean tilapia *Tilapia guineensis* (50-70%), the rest consisting of a near equal mix of coastal marine and continental (freshwater) species (Laë 1994). We applied the species disaggregation provided by Laë (1994) to traditional and acadja lagoon catches (Table x).

Artisanal marine fishery

- Land based fishing

Coastal population data was extracted from the Center for International Earth Science Information Network (CIESIN 2012) for 1990, 2000 and 2010 (Table 2) within a range of 10 km of the coast from, and total population data was extracted from Populstat (www.populstat.info [2012]) and the Worldbank (www.worldbank.org [2012]) databases from 1950 to 2010 (Table 2). We estimated the proportion of coastal population over the total population at 19% for 1990, 2000 and 2010. We assumed this rate was constant from 1950 to 2010, and thus could estimate the annual coastal population in Togo (Table 2). In 1965, fishers used 345 cast nets the majority of which were operated by individual land-based fishers (80%), 135 beach seines, half of which uses at average 30 fishers on land and 36 handlines (de Surgy 1966). Thus the total number of land-based fishers in 1965 was estimated at 2,334 permanent land based fishers, and 2,000 seasonal land-based fishers (de Surgy 1966) working 42% less (Laë 1992), which translates to 1,164 permanent working fishers. The total number of land based fishers is the sum of the two categories (3,170 in 1965). This number represented 1.08% of the coastal population in 1965. Using the same method, based on the data by IRD (2011), 208 handlines, 2,146 nets of which we conservatively assumed 20% were operated from land by individual fishers, 62 beach seines, i.e., 930 land based fishers. Thus the total number of land-based fishers for 2010 was estimated at 1,567, i.e., 0.14% of the coastal population. We assumed the rate was constant from 1950 to 1965

and interpolated from 1.08% in 1965 to 0.14% in 2010. Then we applied these rates to the coastal population data per year and estimated the number of artisanal land-based fishers from 1950 to 2010 (Table 2). We assumed the CPUE per fishers working on a pirogue was similar to the CPUE of a land based fisher since the two categories operate in similar areas and use similar gears. The number of fishers per pirogue increased from an average of 4.75 in the 1950s and 1960s (de Surgy 1966) to 8.43 fishers per pirogue in 2010 based on the estimates of the number of pirogues and the number of pirogue based fishers by (IRD 2011). We performed a linear interpolation and estimated the land based catch as the product of the CPUE per fishers, i.e., CPUE per pirogue (estimated in artisanal fishing above) divided by the number of fishers per pirogue, and the total number of land based fishers.

A detailed analysis of the catch composition of the beach seine catch in 1973 was presented by (Beck 1974, 1976), documenting a catch consisting of most of the groups making up the "shallow water" community, dominated by croakers (Family Sciaenidae; Longhurst and Pauly 1987, p151). We used this description to break down land based catches onto taxonomic groups (Table 3)

- Pirogue fishing

The number of pirogues was documented since 1962, and remained relatively constant since then (Table 4). We assumed conservatively that the number of pirogues was 20% lower in 1950 than in 1962 (Table 4), since evidence suggests the number of pirogues increased slightly to 'chase' sardinella and sardine stocks going further from the coast, migration caused by industrialization and over-exploitation of coastal areas (Welcomme 1972). Thereafter, we interpolated the number of pirogues between the anchor points from 1950 to 2010 (Table 4). As for the catch per unit of effort, in 1978, based on a catch of 12,003 $t \cdot year^{-1}$ and an effort of 346 pirogues (Amégavie 1979), we estimated a CPUE of 34.69 $t \cdot year^{-1} \cdot boat^{-1}$. Because of the over-exploitation pattern of coastal areas in Togo, constrained by a higher motorization rate in 2010, we assumed the CPUE in 2010 was 10% lower than the CPUE in the mid-1970s. Similarly in 1950, because of a consequent lower motorization (0%) (Welcomme 1972), we assumed the CPUE in 1950 was 20% lower than in 1983. We then interpolated linearly from 27.75 $t \cdot year^{-1} \cdot boat^{-1}$ in 1950 to 34.69 $t \cdot year^{-1} \cdot boat^{-1}$ in 1978, and then to 31.22 $t \cdot year^{-1} \cdot boat^{-1}$ in 2010. Thereafter, we multiplied the yearly number of pirogues by the corresponding CPUE to estimate the pirogue based marine artisanal catches in Togo from 1950 to 2010.

We applied a species disaggregation using the 1991-1995 catch data from Denke (1997) converted to rates, then averaged (Table 5) and then applied on the artisanal catches from 1950 to 2010.

Recreational fisheries

While growing in Togo, V.K did not observe significant recreational fishing activities; however a few recreational fishing clubs were created by expats, notably during the last 16 years. Three clubs were documented, the first in 1997, the second in 2004 and the third in 2007 (FAO 2007)[1]. These clubs often sell their catches to restaurants. We assumed that the number of fishers per club was 20, i.e., that they was a total of 20 fishers in 1997, 40 fishers in 2004 and 60 fishers in 2007. We extrapolated the trend and estimated the number of recreational fishers at 68 for 2010. We assumed the number of trips to be 4 per month (i.e., one day per week end) during six months of the year corresponding to the dry season (24 $trips \cdot fisher^{-1} \cdot year^{-1}$). We estimated the CPUE based on four YouTube videos posted by recreational fishers/clubs from Togo, which showed the species caught and the number of recreational fishers (5). We approximated the weight for each species, then estimated the mean CPUE as 13.6 $kg \cdot fisher^{-1} \cdot trip^{-1}$. We multiplied the number of fishers by the number of trips and the CPUEs and obtained a catch of 6.5 $t \cdot year^{-1}$ for 1997, 13.1 for 2004, 19.6 for 2007 and 22.2 for 2010. We interpolated linearly assuming recreational fishing began after the last *coup d'état* in 1967, which was followed by a certain political stability. We obtained the species breakdown by averaging the total catch by species by the total for all species (by all fishers), i.e., 515 of wahoo (*Acanthocybium solandri*), 21% of groupers (Fam. Serranidae), 7% of

Carangidae, 7% of Muraenidae, 7% of dolphinfish (*Coryphaena hippurus*) and 7% of other species.

Large-scale fisheries

Industrial

Industrial fishing in Togo is conducted by visibly reflagged fleets to Togo (mostly), vessels under joint ventures, and vessels operating under agreements. Thus here, the 'Togolese' fleet is comprised of ostensibly Togolese vessels, i.e., vessels whose origin we couldn't trace. The number of industrial vessels in Togo was reported by different sources (Table 6), and the origin of vessels was reported in a few instances (Table 6); thus using these numbers, we performed a series of linear interpolation and completed the effort time series per country of origin, the difference between the total number of industrial vessels as documented by the literature and the sum of the interpolated effort per country of origin, is in the category other origin (Table 6). The CPUE was estimated by Beck (1976) at 235 $t \cdot year^{-1} \cdot boat^{-1}$ in 1973 and we assumed this CPUE was constant since the introduction of industrial fishing to Togo in 1965. In the 2000s, vessels were larger, with 1,416 GRT (www.grosstonnage.com) on average compared to around 200 GRT in the 1970s (Beck 1976), i.e., increased by a factor of 7. We assumed the CPUE increased proportionally however at a lower extent given evidence of over-exploitation, i.e., by a factor of 5, resulting in a CPUE of 1,175 $t \cdot year^{-1} \cdot boat^{-1}$. We performed a linear interpolation to complete the CPUE time series and multiplied the CPUEs by the estimated effort per country.
The catch composition of trawlers (Table 7) provided by Beck (1977) is dominated by species of the shallow water Haemulidae-dominated community (reaching down to about 40 m) and represented by the bigeye grunt *Brachydeuterus auritus* and of the species from bellow the thermocline, i.e., the species of the Sparidae community (Longhurst and Pauly 1987). While pelagic catches were assumed to include 70% of Sardinella and 30% of other unidentified taxonomic groups, since seiners in Togo target mostly sardinellas (Bama 1984).

Discards

To estimate discards by the domestic fleet, we used the average discard rate between the neighbouring Ghana and Benin, i.e., 0.9% of landed catches (Kelleher 2005). This low rate is explained by the use of bycatch for 'African mix', a popular fishmeal in West Africa; thus the low-value bycatch is landed and transformed. Using the same source, we estimated an average discard rate of 14.9% of the landed catch between Spain (30%), Ghana (1.3%), Greece (32.8%), Cyprus (0.1%), and Guinea (0.5%), which we applied on the catch by each foreign country operating in Togo.

Discarded species include mostly undersized commercial species and other species not identified. Therefore, we applied the same species disaggregation than for the trawl catches.

Illegal industrial fisheries

Illegal catches are catches by unauthorized foreign vessels in the Togolese EEZ. MRAG (2005) estimated the IUU[1] catch as 32% of the total catch in Togo in the 2000s, consequently we interpolated from zero in 1985 prior the declaration of the EEZ to 32% of the total catch (47% of the reconstructed catch) from 2005 to 2010. We then applied these rates to the reconstructed catch including industrial and small-scale marine catches. We then applied the same species disaggregation as for the legal fishery, assuming the same countries' contributions. Although rates of illegal fishing were documented, countries responsible for illegal fishing in Togolese waters were not always identified. In two instances, we found media reports of trawlers as being "mostly

[1] Add definition of IUU

from Asia" (Anon. 2012a), China based in Ghana and Ghanaian canoes operating illegally (Anon. 2012b). Ghanaian canoes, although known to be artisanal in nature due to their size, travel long distances for fishing[2]. Therefore, we assumed illegal catches to be 70% Chinese (more efficient industrial vessels) and 30% by Ghanaian canoes, which are here considered 'industrial' because they operate internationally. We then applied the same species disaggregation than for industrial legal fleets.

RESULTS

Small-scale catches

Small-scale catches, including artisanal marine and subsistence lagoon catches, totalled 2.24 million tonnes between 1950 and 2010. Catches increased slightly from 33,200 t in 1950 to a peak of 48,700t in 1975, and then decreased to less than 19,700 t in 2010 (Figure 2).

Artisanal catches

Artisanal catches increased from 24,816 t in 1950 to a peak of 43,100 t in the 1975 and then decreased again to be at 18,600 t in 2010, their historical minimum (Figure 3). Artisanal marine catches totalled 1.97 million tonnes between 1950 and 2010, of which over half (56%) was generated by marine land-based fisheries, i.e., 1.1 million tonnes (Figure 3). Land based fisheries represented over 60% of the total artisanal marine catch between the 1950s and the late 1970s, then declined to represent 32% of the total artisanal marine catch in 2010 (Figure 3).

Lagoon subsistence fisheries

Lagoon catches totalled 271,000 tonnes between 1950 and 2010 (Figure 4a), which is the equivalent of 14% of the artisanal marine catch. Lagoon catches, mostly tilapias (Figure 4b) and considered here subsistence, increased slightly from 8,400 t in 1950, to around 9,100 t in 1963 of which 300 t were generated in the *acadja* systems. Lagoon catches declined rapidly to 2,000t in 1983 with the *acadja* systems contributing to around 400 t, the kept on decreasing but with a lower slope to 1,100 t in 2010 when the catch generated by the *acadja* systems was estimated at 230 t (Figure 4).

Recreational catches

Recreational catches were estimated at 287 t between 1950 and 2010. Recreational catches increased from zero in 1967 to 22 t in 2010 and included mostly wahoo, carangids and groupers (Figure 5).

Industrial catches

Domestic catches

Industrial domestic catch for Togo was estimated at 101,496 t between 1966, when the domestic industrial fishery was launched and 2010. Of these catches, 81% were captured by the pelagic fleet (81,925 tonnes) (Figure 6). Industrial catches by Togo increased rapidly since their introduction from zero in 1965 to 6,100 t in 1982, then decreased to less than 1,200 t in 2010 (Figure 6).

[2] Given the definitions built in the database of the *Sea Around Us*, Ghanean Fanti canoes are labelled as 'industrial' because they operate outside their own national waters, i.e., Ghana's EEZ.

Foreign trawl catches

Foreign catches started at low levels when the trawl fishery was introduced by Germany in Togo in the mid-1960s, 540 t·year^{-1}, and picked up in 1978 with the increase in the number of trawlers (Figure 7). Catches increased thereafter, to reach at average 15,000 t·year^{-1} in the early 1990s, and then increased rapidly with the introduction of the agreement between Togo and China in the 2000s to a historical maximum catch of around 41,000 t in 2010, of which a quarter was Chinese (Figure 7). Of a total industrial trawl catch estimated at 678,000 tonnes between 1950 and 2010, 13.7% was Spanish, 36.4% was Chinese, 9.6% was Greek, 20.9% was caught by the neighbouring Ghana, 7.8% by Italy, 5% by Guinea, 2.2% by Cyprus, 1% by Germany in the 1970s, and the remaining by other countries including Portugal and Russia (Figure 7).

Discards

Discard were estimated at 38,500 tonnes between 1950 and 2010. Discards by the trawl fleet increased following the same pattern than industrial trawl catches increasing from 70 t in 1965, when industrial fishing begun, to a historical maximum of around 2,300 t in 2010 (Figure 8), twice, the Togolese domestic industrial catch.

Illegal catches

Illegal catches increased from zero in 1985 at the declaration of the Togolese EEZ –unregulated catches already considered in legal catches – to a peak of –20,300 t in 2005, then decreased slightly to about 19,300 t in 2010 (Figure 9). Illegal catches totalled around 289,500 tonnes in less than 30 years which was the slightly higher than the legal (but not all reported) industrial catch.

Total catches

The total marine extractions from the Togolese EEZ were here estimated at over 3 million tonnes between 1950 and 2010 including 2.3 million tonnes from domestic catch and 678,000 tonnes from foreign and visible reflagged vessels. This is compared to the total of 563,400 tonnes supplied to the FAO on behalf of Togo during the same period (Figure 10). Total domestic catches increased from around 33,200 t in 1950 compared to 1,900 t supplied to FAO, to a peak of 51,600 t in 1979, eleven times the catch supplied to FAO, then gradually decreased to be 20,900 t in 2010, compared to 20,000 reported to the FAO (Figure 10). Although this is slightly lower than the data supplied to the FAO, the latter includes catches by foreign vessels landed in Togo, which when considered as domestic resulted in higher catches comparatively to the landing data supplied to the FAO. Foreign (reflagged, joint venture and under agreement) catches increased from 540 t in 1965 to 5,436 t in 1979, the increased constantly to 41,533 t in 2010 (Figure 10).

DISCUSSION

The present report presents a historical overview of the Togolese fisheries catch for the last 61 years. It shows reconstructed catches 4 times higher than the figures supplied to the FAO by Togo, with over 3 million tonnes reconstructed compared to 563,000 tonnes supplied to FAO. Artisanal catches represented the bulk (72%) of the reconstructed catch. The pirogue-based artisanal fisheries, dominated by Ghanaian migrant fishers, were driving the variation of domestic catches, also strongly influenced by the political history of Togo. A few examples of inter-annual variations could be related to political-historical events in Togo, like the *coup d'état* of 1963 when, because of the prevailing insecurity, artisanal fishing effort and consequently catches declined. The 'Aliens Compliance Order' decree by the government of Ghana in 1969 - forcing all immigrants without proper documentation to leave Ghanaian towards Togo and other neighbouring countries (Bump 2006) - certainly generated an increase in artisanal fishing in Togo, reflected in an increase in artisanal catches in 1970. Another example is provided by the sharp decline in the artisanal catch in the mid-1970s, when the 'Togoland Liberation Movement' and the 'National Liberation Movement for Western Togoland' were seeking separation from

Ghana, and threatened it with a guerilla war. This has contributed to increasing insecurity of migrant fishers notably from Ghana, and thus reduced artisanal fishing and catches.

Subsistence lagoon catches represented 10% of the total reconstructed catch. Although subsistence catches do not seem to be high, they contribute towards supplying around 20% of the Togolese population with around 8 kg per capita per year. This further highlights the importance of small-scale fisheries, forgotten by official data, to coastal populations and for food security. Indeed, Togo has been struggling to meet its fish protein demand, with around 65% of the fish supply supplied by imports (FAO FishStat).

On the other hand, the large scale sectors, including industrial legal fisheries and illegal fisheries generated only 8% and 9% of the catch respectively, and discarded 1% of the total catch. The industrial sectors, particularly the foreign fleets show a sharp increase, which contrasts with the pronounced decline of the small-scale fisheries. This further highlights the negative link between industrial (trawl) sectors and small-scale fisheries and questions the validity of exclusive 'artisanal fishing zones' in a country where monitoring is barely existent. This adds to the problems of subsistence fishers and poor communities where fishing remains the last resort for poverty alleviation, especially because agriculture is facing increasing climatic challenges (Njock and Westlund 2010).

The decrease in the domestic catch has been compensated by the reflagging practices of Togo since the late 1970s, keeping the total catch in the Togolese EEZ relatively constant since then at an average of around 48,000 $t \cdot year^{-1} \pm 2,000$ $t \cdot year^{-1}$ despite the increasing effort, particularly by the industrial fleet. This trend is very different from the increasing catch trend shown by the data supplied to FAO, and is explained by an over-exploitation by both the lagoon fisheries (de Surgy 1966; Weigel 1985; Laë 1992) and the artisanal and demersal fisheries (FAO 2006). Since the mid-1970s, droughts constitute another aspect of the decline in the Togolese fishery, because they increase the pressure by farmers who are shifting their activities to fishing, a pattern occurring in many countries (Pauly 2006).

The decrease of domestic industrial catches is due to the collapse of the industrial companies launched in the early 1970s, and the common reflagging practices of Togo here considered in the foreign segment of industrial catches. The so-called 'Togolese fleet' includes vessels from Guinea and Cyprus, vessels from Spain, Italy, China, Ghana, Portugal and Germany in the earlier time periods. Herein, catches by France, Switzerland and other unknown countries where not included, meaning our reconstruction is a conservative, but realistic estimate of catches in Togolese waters. Rather than investing in a truly Togolese fleet, Togo - a Flag of Convenience (FoC) country and also 'a cheap registry that does not require VMS (EJF 2012) - offers the Togolese flag to an increasing number of foreign fleets, and gains a fairly high compensation when doing so (Österblom *et al.* 2010). For example during the last decade, 7 to 15 vessels flagged to Togo (mostly of Spanish origin) were operating in the area covered by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) area illegally and in Australian, Malaysian and French waters (Gianni and Simpson 2005). And thus, as Real (2013) points out, with a lack of control over these 'domesticated' fleets from the EU, Togo was recently classified in the EU blacklist of the countries fishing irresponsibly

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REFERENCES

Alsopp WHL (1966) Rapport au Gouvernement du Togo sur le développement et l'organisation de l'industrie des pêches. 2148, FAO, Rome. 19 p.

Amégavie K (1979) Rapport sur la pêche togolaise. *In* COPACE (ed.) Rapport du groupe de travail spécial sur l'évaluation des stocks démersaux du secteur Côte d'Ivoire - Zaïre. COPACE, Rome.

Amégavie K (1986) Les pêches démersale du Togo. p. 200 *In* FAO (ed.) Report of the CECAF Ad hoc working group on the demersal and shrimp resources of the central gulf of Guinea division (34.3.5). FAO, Rome.

Anon. (2010) Togo marine fisheries. Stop Illegal Fishing. 2 p. Available at: www.stopillegalfishing.com/togo.php [Accessed: 1/06/2012].

Anon. (2012a) 5ème Conférence ministérielle du CPCO à Lomé. Le Togo et ses voisins s'attaquent enfin à la pêche illicite. L'Union pour la patrie 558(14 Decembre 2012): 3.

Anon. (2012b) Pendant que le pays disait manquer de moyens, le Togo averti par la Commission européenne contre la pêche pirate. L'Union pour la patrie 551(20 Novembre 2012): 4.

Bama BB (1984) Contribution à l'étude de la pêche maritime au Togo. University of Université de Dakar, Faculté de Médecine et de Pharmacie, Dakar. 134 p.

Beck VU (1974) Bestandskundliche untersuchungen an einigen fischarten der grundschleppnetzfischerei auf dem schelf vor Togo (Westafrica). Universität Hamburg, Hamburg. [Stock assessments of some fish species caught by the bottom trawl fishey on the shelf of Togo; Institut for Aquatic and FisherHydology and Master's thesis, Hamburg University],126 p.

Beck VU (1976) Die Zuammensetzung der Eträge aus der küstenfischerei Togos. 25, Institut fur hydrobiologie und fischereiwissenschaft der Universität Hamburg, Hamburg. [Composition of the landings of the coastal fisheries of Togo; in German with English abstract], 37-45 p.

Bump M (2006) Country profiles. Ghana: Searching for opportunities at home abroad. Institute for the Study of International Migration, Georgetown University Georgetown. Available at: http://www.migrationinformation.org/USFocus/display.cfm?ID=381 [Accessed: 02/05/2013].

CIESIN (2012) National Aggregates of Geospatial Data Collection: Population, Landscape, And Climate Estimates, Version 3 (PLACE III). NASA Socioeconomic Data and Applications Center (SEDAC), Palisades, NY. Available at: http://sedac.ciesin.columbia.edu/data/set/nagdc-population-landscape-climate-estimates-v3 [Accessed: 29/10/2012].

de Surgy A (1966) La pêche traditionnelle sur le littoral Evhé et Mina (de l'embouchure de la Volta au Dahomey). Groupes de Chercheurs Africanistes, Paris. 157 p.

Denke A (1997) Enquête cadre et socio-economique sur la pêche artisanale maritime au Togo. 102, DIPA, Cotonou. 96 p.

Dioury F (1983) Monographie de la pêche dans douze pays riverains d'Afrique de l'Ouest, de la Mauritanie au Benin, Bruxelles: s.n. . 409 p.

Écoutin JM, Delaunay K and Konan J (1993) Les pêches artisanales maritimes. pp. 537-549 *In* Le Loeuff P, Marchal E and Amon Kothias JP (eds.), Environnement et ressources aquatiques de Côte-d'Ivoire. IRD.

EJF (2012) Pirate fishing exposed: the fisght against illegal fishing in West Africa abd the EU. Environmental Justice Foundation, London. 32 p.

FAO (2006) Report of the fourth Session of the scientific sub-committee. FAO Fisheries Report 800, Food and Agriculture Organization, Rome. 52 p.

FAO (2007) Togo fishery country profile. FAO, Rome. 2 p.

Gianni M and Simpson W (2005) The changing nature of high seas fishing: How flags of convenience provide cover for illegal, unreported and unregulated fishing. Australian Department of Agriculture, Fisheries and Forestry, International Transport Workers' Federation, and WWF International, Canberra, Australia. 83 p.

Guiffre P (1993) Togo : Pêche, l'espoir des eaux interieures. Marchés tropicaux et méditerranéens 1993(2498): 2371-2372.
Horemans B (1993) La situation de la pêche artisanale en Afrique de l'Ouest en 1992. Rapport technique 47, FAO, Cotonou. 36 p.
Horemans B (1994) La situation de la pêche artisanale en Afrique de l'Ouest en 1992. Rapport technique 54, FAO, Cotonou. 39 p.
Horemans B (1995) The state of artisanal fisheries in West Africa in 1994. Technical Report 69, FAO, Cotonou. 39 p.
IRD (2011) Atelier régional de formation et d'harmonisation des méthodes de collecte des données statistiques des pêches dans les états membres de l'UEMOA. IRD, Cotonou. 26 p.
Kapetsky JM (1981) Some considerations for the management of coastal lagoon and estuarine fisheries. Technical paper 218, FAO, Rome. 47 p.
Karger S and und Steinberg W (1969) Heckfischkutter für Togo. Fischerblatt 7(6): 94-98 [Fish trawler with the trawl at the back].
Kelleher K (2005) Discards in the world's marine fisheries. An update. 470, FAO, Rome. 131 p.
King HR (1993) Aquaculture development and environmental issues in Africa. pp. 116-124 *In* Pullin RSV, Rosenthal H and Maclean JL (eds.), Environment and aquaculture in developing countries. ICLARM, Manila, Philippines.
Laë R (1992) Les pêcheries artisanales lagunaires ouest-africaines : échantillonnage et dynamique de la ressource et de l'exploitation. University of ORSTOM, Université de Bretagne Occidentale : Brest, Paris. 205 p.
Laë R (1994) Évolution des peuplements (poissons et crustacés) dans une lagune tropicale, le lac Togo, soumise à un régime alternatif de fermeture et d'ouverture du cordon lagunaire. Aquatic Living Resources 7(03): 165-179.
Laë R (1997) Does overfishing lead to a decrease in catches and yields? An example of two West African coastal lagoons. Fisheries Management and Ecology 4(2): 149-164.
Longhurst A and Pauly D (1987) Ecology of the tropical oceans. Academic Press, San Diego. 407 p.
MRAG (2005) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries. Final report, MRAG, London. 176 p.
Njock J-C and Westlund L (2010) Migration, resource management and global change: Experiences from fishing communities in West and Central Africa. Marine Policy 34(4): 752-760.
Oceana (2011) European trawlers are destroying the oceans. Oceana. 77 p.
Österblom H, Sumaila UR, Bodin Ö, Hentati Sundberg J and Press AJ (2010) Adapting to Regional Enforcement: Fishing Down the Governance Index. PLoS ONE 5(9): e12832.
Pauly D (1976) The biology, fishery and potential for aquaculture of Tilapia melanotheron in a small West African lagoon. Aquaculture 7(1): 33-49.
Pauly D (2006) Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. MAST 4(2): 7-22.
Pérez-Ruzafa A and Marcos C (2012) Fisheries in coastal lagoons: An assumed but poorly researched aspect of the ecology and functioning of coastal lagoons. Estuarine, Coastal and Shelf Science 110(0): 15-31.
Real N (2013) Parliament approves blacklist of countries fishing irresponsibly. Fish Information and Services. Available at: http://www.fis.com/fis/worldnews/worldnews.asp?monthyear&day=24&id=60349&l=e&special&ndb=1+target [Accessed: 02/05/2013].
Sedzro KM and Kusiaku YKJ (1999) Les pêches togolaises: COURS ACP-UE sur la gestion des pêches et de la biodiversité, Dakar, Sénégal, du 12 au 23 avril 1999. ACP-EU. 12 p.
Segniagbeto G and Waerebeek KV (2010) A note on the occurrence and status of cetaceans in Togo. SC/62/SM11, IWC, Agadir, Morocco. 8 p.
SOFRECO (2011) Formulation d'un document de politique sectorielle sur la pêche et l'aquaculture et préparation d'un plan d'aménagement des pêcheries du lac du barrage de Nangbeto, Togo. Proposition d'une politique sectorielle sur la pêche et l'aquaculture, Togo. European Union, Brussels. 58 p.

Weigel JY (1985) L'aménagement traditionnel de quelques lagunes du golfe de Guinée (Côte d'Ivoire, Ghana, Togo, Benin). FAO circulaire sur les pêches 790, FAO, Rome. 31 p.
Welcomme RL (1972) An evaluation of the acadja method of fishing as practised in the coastal lagoons of Dahomey (West Africa). Journal of Fish Biology 4(1): 39-55.
Zeller D, Booth S, Davis G and Pauly D (2007) Re-estimation of small-scale fishery catches for U.S. flag-associated island areas in the western Pacific: the last 50 years. Fishery Bulletin 105(2): 266-277.

Table 1. Species composition of lagoon catches

Scientific name	Common name	%
Clarias gariepinus	North African catfish	2.3
Heterotis niloticus	African bonytongue	0.5
Parachanna obscura	African snakehead	0.8
Hepsetus odoe	Kafue pike	0.2
Schilbe mystus	African butter catfish	0.1
Pellonula leonensis	Smalltoothed pellonula	0.4
Chrysichthys spp.	Bagrid catfishes	14.0
Gerres spp.	Silver biddies	1.4
Hemichromis fasciatus	Banded jewelfish	1.3
Sarotherodon melanotheron	Blackchin tilapia	57.9
Tilapia guineensis	Guinean tilapia	7.6
Ethmalosa fimbriata	Bonga shad	1.2
Liza falcipinnis	Sicklefin mullet	1.9
Pomadasys jubelini	Sompat grunt	0.1
Elops lacerta	West African ladyfish	0.4
Polydactylus quadrifilis	Giant African threadfin	0.1
Callinectes amnicola	Bigfisted swimcrab	7.6
Farfantepenaeus notialis	Southern pink shrimp	2.1

Table 2. Total population, coastal population and land based fishers estimates in Togo. Interpolations are italicized.

Year	Total population (x 10^3)	Coastal population (x 10^3)	Land based fishers as percentage of Coastal population (%)	Number of land based fishers
1950	1,212	230	1.08	2,488
1951	1,241	236	1.08	2,548
1952	1,267	241	1.08	2,601
1953	1,291	245	1.08	2,650
1954	1,316	250	1.08	2,702
1955	1,343	255	1.08	2,757
1956	1,372	261	1.08	2,816
1957	1,404	267	1.08	2,882
1958	1,437	273	1.08	2,950
1959	1,450	276	1.08	2,977
1960	1,444	274	1.08	2,964
1961	1,482	282	1.08	3,042
1962	1,520	289	1.08	3,120
1963	1,613	306	1.08	3,311
1964	1,655	314	1.08	3,397
1965	1,704	324	1.08	3,498
1966	1,760	334	*1.06*	3,540
1967	1,822	346	*1.04*	3,592
1968	1,889	359	*1.02*	3,649
1969	1,955	371	*1.00*	3,698
1970	1,962	373	*0.97*	3,633
1971	2,013	382	*0.95*	3,648
1972	2,066	393	*0.93*	3,661
1973	2,119	403	*0.91*	3,671
1974	2,174	413	*0.89*	3,680
1975	2,231	424	*0.87*	3,687
1976	2,289	435	*0.85*	3,692
1977	2,348	446	*0.83*	3,694
1978	2,409	458	*0.81*	3,694
1979	2,473	470	*0.79*	3,693
1980	2,554	485	*0.77*	3,713
1981	2,615	497	*0.74*	3,697
1982	2,770	526	*0.72*	3,806
1983	2,890	549	*0.70*	3,856
1984	2,960	562	*0.68*	3,831
1985	3,028	575	*0.66*	3,799
1986	3,144	597	*0.64*	3,819
1987	3,248	617	*0.62*	3,816
1988	3,381	642	*0.60*	3,837
1989	3,507	666	*0.58*	3,841
1990	3,638	694	*0.56*	3,855
1991	3,761	717	*0.53*	3,834
1992	3,899	744	*0.51*	3,819
1993	4,026	768	*0.49*	3,783
1994	4,010	765	*0.47*	3,607
1995	4,085	779	*0.45*	3,511
1996	4,230	807	*0.43*	3,467
1997	4,345	829	*0.41*	3,387
1998	4,458	850	*0.39*	3,297
1999	4,567	871	*0.37*	3,195
2000	5,019	951	*0.35*	3,290
2001	5,153	977	*0.32*	3,174
2002	5,051	958	*0.30*	2,910
2003	5,170	980	*0.28*	2,773
2004	5,288	1,003	*0.26*	2,626
2005	5,408	1,025	*0.24*	2,471
2006	5,530	1,048	*0.22*	2,307
2007	5,653	1,072	*0.20*	2,133
2008	5,777	1,095	*0.18*	1,951
2009	5,902	1,119	*0.16*	1,758
2010	6,028	1,143	0.14	1,567

Table 3. taxonomic composition of the beach seine (land-based) fishery (Beck 1976)

Scientific name	Common name	%
Albula vulpes	Bonefish	0.1
Ilisha africana	West African ilisha	1.4
Sardinella rouxi	Yellowtail sardinella	5.1
Sardinella aurita	Round sardinella	0.9
Sardinella maderensis	Madeiran sardinella	40.7
Engraulis encrasicolus	European anchovy	4.3
Lagocephalus laevigatus	Smooth puffer	0.1
Hemirhamphus balao	Balao halfbeak	1.4
Sphyraena afra	Guinean barracuda	4.8
Galeoides decadactylus	Lesser African threadfin	3.6
Lutjanus fulgens	Golden African snapper	0.1
Pomadasys jubelini	Sompat grunt	0.1
Brachydeutrerus auritus	Bigeye grunt	16.2
Gerres melanopterus	Flagfin mojarra	1.0
Pteroscion peli	Boe drum	0.2
Pseudotolithus senegalensis	Cassava croaker	0.3
Trachinotus ovatus	Pompano	0.1
Uraspis secunda	Cottonmouth jack	<0.1
Decapterus punctatus	Round scad	1.1
Selar crumenophtalmus	Bigeye scad	1.2
Caranx hippos	Crevalle jack	0.2
Caranx crysos	Caranx crysos	2.2
Caranx senegalus	Senegal jack	0.2
Chloroscombrus chrysurus	Atlantic bumper	11.2
Vomer setapinnis	Atlantic moonfish	2.4
Pseudupeneus prayensis	West African goatfish	0.2
Sparus ehrenbergi	Pagrus caeruleostictus	0.1
Orcynopsis unicolor	Plain bonito	0.5
Solea spp.	Soles	0.1
Cephalopoda	Cephalopods	0.1
Panaeus spp.	Shrimps	0.1

Table 4. Anchor points of artisanal pirogues and the corresponding CPUE, italics indicate interpolations. Data were interpolated for the missing year.

Year	Number of Pirogues	Motorized (%)	Reference	CPUE ($t \cdot year^{-1} \cdot boat^{-1}$)
1950	370[a]	-	-	27.75[b]
1962	463	-	Alsopp (1966)	*30.74*
1966	255	23	Amégavie (1979)	*31.73*
1967	388	16	Amégavie (1979)	*31.98*
1968	386	24	Amégavie (1979)	*32.23*
1969	416	24	Amégavie (1979)	*32.47*
1970	237	41	Amégavie (1979)	*32.72*
1971	545	24	Amégavie (1979)	*32.97*
1972	559	28	Amégavie (1979)	*33.22*
1973	550	31	Amégavie (1979)	*33.47*
1974	540	41	Amégavie (1979)	*33.71*
1975	603	42	Amégavie (1979)	*33.97*
1976	218	62	Amégavie (1979)	*34.21*
1977	409	79	Amégavie (1979)	*34.46*
1978	346	85	Amégavie (1979)	*34.69*[c]
1979	603	70	Dioury (1983), Bama (1984)	*34.60*
1992	510		Horemans (1994)	*33.19*
1996	403	45	Sedzro and Kusiaku (1999)	*32.75*
2002	407	40	Segniagbeto and Waerebeek (2010)	*32.10*
2003	400		Anon. (2010)	*31.99*
2007	407		IRD (2011)	*31.56*
2010	407		Assumed constant	31.22[d]

a) assumed to be 20% lower than the number of pirogues in 1962, year of first survey;
b) assumed to be 20% of the CPUE in 1978;
c) based on the estimate of the catch and effort by Amégavie (1979);
d) assumed to be 10% lower than the CPUE in 1978;

Table 5. Catch composition of the artisanal pirogue fishery in Togo

Scientific name	English name	Local name	%
Engraulis encrasicolus	Anchovy	Anchois	68.41
Sardinella spp.	Sardinella	Sardinelle	5.75
Sardinella maderensis	Madeiran sardinella	Hareng	2.38
Scomber japonicus	Chub mackerel	Maquereau	1.50
Carangidae	Jacks and pompanos	Chinchard	1.90
Caranx hippos	Crevealle jack	Carangue	4.85
Euthynnus alletteratus	Little tunny	Bonite	2.66
Pagellus bellottii	Red pandora	Pageot	1.21
Ilisha africana	West African ilisha	Rasoir	0.84
Sphyraena spp.	barracuda	Brochet	0.64
Selene dorsalis	African moonfish	Vomer	0.06
Tylosurus crocodilus crocodilus	Hound needlefish	Orphie	0.28
Boops boops	Bogue	Bogue	0.29
Galeoides decadactylus	Lesser African threadfin	Hormose	0.29
Drepane africana	African sicklefish	Disque	0.05
Trichiurus lepturus	Largehead hairtail	Ceinture	0.04
Dactylopterus volitans	Flying gunard	Poisson volant	1.29
Hemiramphus balao	Balao halfbeak	Demi-bec	0.01
Elops lacerta	West African ladyfish	Faux mulet	0.04
Pseudotolithus	Croakers	Bar	0.47
Xiphias gladius	Swordfish	Espadon	0.13
Brachydeuterus auritus	Bigeye grunt	Friture	0.42
Centrophorus granulosus	Gulper shark	Requin	0.08
Scombridae	Tunas	Thon	0.34
Lutjanus spp.	Lutjanus	Lutjanus	1.03
Dentex spp.	Dentex	Dorade rose	1.23
Lethrinus atlanticus	Atlantic emperor	Dorade grise	0.11
Epinephelus	Grouper	Merou	0.45
Pomadasys jubelini	Sompat grunt	Pristipoma	0.03
Coryphaena equiselis	Pompano dolphinfish	Cameleon	0.03
Palinurus spp.	Spiny lobster	Langouste	0.01
Panaeus spp.	Shrimps	Crevette	0.01
Umbrina spp.	Drums	Ombrine	0.02
Raja spp.	Rays	Raie	0.08
Polydactylus quadrifilis	Giant African threadfin	Capitaine	0.09
Balistes capriscus	Grey triggerfish	Baliste	0.02
seudupeneus prayensis	West African goatfish	Rouget	0.03
Solea spp.	Sole	Sole	0.04
Psettodes belcheri	Spottail spiny turbot	Turbot	<0.01
Sepia spp.	Cuttlefish	Seiche	0.12
Dentex macrophthalmus	Large-eye dentex	Gros yeux	0.01
Carlarius heudelotii	Smoothmouth sea catfish	Poisson chat	<0.01
Paraconger notialis	Guinean conger	Congre	<0.01
Lagocephalus laevigatus	Smooth puffer	Peroquet	0.01
Marine fishes not identified	Marine fishes not identified	Divers	2.74

Table 6. Number of pelagic and demersal fishing vessels in Togo by country of origin. Interpolation are indicated in italics.

		Country of origin										Pelagic	Source
Year	Total	Togo	Germany	Greece	Italy	Cyprus	Spain	Guinea	Ghana	Other[a, b]	China	Togo	
1950-1964	0	0	0	0	0	0	0	0	0	0	0	0	
1965	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	**0**	Beck (1974)
1966	*2*	0	*2*	0	0	0	0	0	0	0	0	*1*	
1967	*2*	0	*2*	0	0	0	0	0	0	0	0	*1*	
1968	*2*	0	*2*	0	0	0	0	0	0	0	0	*2*	
1969	*2*	0	*2*	0	0	0	0	0	0	0	0	*3*	
1970	*2*	0	*2*	0	0	0	0	0	0	0	0	*3*	
1971	*2*	0	*2*	0	0	0	0	0	0	0	0	*4*	
1972	*2*	0	*2*	0	0	0	0	0	0	0	0	*4*	
1973	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	*5*	Beck (1976)
1974	*2*	0	*2*	0	0	0	0	0	0	0	0	*6*	
1975	*2*	0	*2*	0	0	0	0	0	0	0	0	*6*	
1976	**7**	***0***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	0	**7**	Bama (1984)
1977	**4**	***0***	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	0	**10**	Dioury (1983), Bama (1984)
1978	**10**	***1***	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**7**	0	**11**	Bama (1984)
1979	**12**	***1***	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**8**	0	**11**	Dioury (1983)
1980	**2**	***1***	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	0	**4**	Bama (1984)
1981	**3**	***1***	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	0	**13**	Bama (1984)
1982	**7**	***1***	**0**	**1**	**0**	**0**	**0**	**0**	**4**	**1**	0	**11**	Dioury (1983), Amégavie (1986)
1983	**5**	**2**	**0**	**2**	**0**	**1**	*0*	*0*	*4*	**0**	0	**4**	Amégavie (1986)
1984	**1**	**1**	**0**	**3**	**0**	*1*	*1*	*0*	*4*	**0**	0	*4*	Amégavie (1986)
1985	**4**	**1**	**0**	**3**	**1**	***1***	***1***	***0***	***3***	**0**	0	*4*	Amégavie (1986)
1986	4	1	0	3	1	*1*	*2*	*0*	*3*	**0**	0	*4*	
1987	5	1	0	3	1	*1*	*2*	*0*	*3*	**0**	0	*3*	
1988	5	0	0	2	1	*1*	*2*	*0*	*3*	**0**	0	*3*	
1989	5	0	0	2	1	*1*	*3*	*0*	*3*	**0**	0	*3*	
1990	6	0	0	2	2	*1*	*3*	*1*	*3*	**0**	0	*3*	
1991	6	0	0	2	2	*1*	*4*	*1*	*3*	**0**	0	*3*	
1992	**6**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*3*	Oceana (2011)
1993	**7**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*3*	Oceana (2011)
1994	**7**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*2*	Oceana (2011)
1995	**7**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*2*	Oceana (2011)
1996	**8**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*2*	Oceana (2011)
1997	**8**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*2*	Oceana (2011)
1998	**9**	**0**	**0**	**2**	**2**	*1*	**4**	*1*	*2*	**0**	0	*2*	Oceana (2011)
1999	**9**	**1**	**0**	**2**	**2**	**0**	**4**	*1*	*1*	**0**	0	*2*	Segniagbeto and Waerebeek (2010) , Oceana (2011)
2000	*9*	**1**	**0**	**2**	**2**	**0**	**4**	*1*	*1*	**0**	0	*1*	Oceana (2011)
2001	*10*	1[c]	0	2	2[c]	0	4[c]	*1*	*1*	**0**	0	*1*	
2002	*10*	1[c]	0	2	2[c]	0	4[c]	*1*	*1*	**0**	0	*1*	
2003	*11*	1[c]	0	2	2[c]	0	4[c]	*1*	*1*	**0**	0	*1*	
2004	*11*	1[c]	0	2	2[c]	0	4[c]	*2*	*1*	**0**	4[c]	*1*	
2005	*12*	1[c]	0	2	2[c]	0	4[c]	*2*	*1*	**0**	4[c]	*1*	
2006	*12*	1[c]	0	2	2[c]	0	4[c]	*2*	*0*	**1**	4[c]	*1*	
2007	*13*	1[c]	0	2	2[c]	0	4[c]	*2*	*0*	**1**	4[c]	*0*	
2008	*13*	1[c]	0	2	2[c]	0	4[c]	*2*	*0*	**2**	4[c]	*0*	
2009	*13*	1[c]	0	2	2[c]	0	4[c]	*2*	*0*	**2**	4[c]	*0*	
2010	**14**	**1**	**0**	**2**	**2**	**0**	**4**[c]	**2**	**0**	**3**	**4**[c]	**0**	IRD (2011), SOFRECO (2011)

a) France and Switzerland are among the unidentified flags

b) Represents the difference between the sum of trawlers and the total provided by the literature. When the estimated total number of trawlers was higher than the estimate given by the literature, we assumed these vessels were simply not reported by the literature since a number of trawlers using the Togolese flag in the Togolese EEZ were not reported by the literature (Segniagbeto and Waerebeek 2010)

c) assumed constant

Table 7. Catch composition of the industrial trawl fishery in Togo (Beck 1976)

Scientific name	Common name	%
Pagellus coupei	Red pandora	10
Dentex spp.	Dentex	10
Lethrinus atlanticus	Atlantic emperor	10
Brachydeuterus auritus	Bigeye grunt	29
Trachurus trecae	Cunene horse mackerel	2
Caranx hippos	Crevalle jack	4
Chloroscombrus chrysurus	Atlantic bumper	2
Pseudupeneus prayensis	West African goatfish	7
Epinephelus aeneus	White grouper	3
Pomadasys jubelini	Sompat grunt	2
Pseudotolithus spp.	Croakers	2
Marine fishes not identified	Marine fishes not identified	20

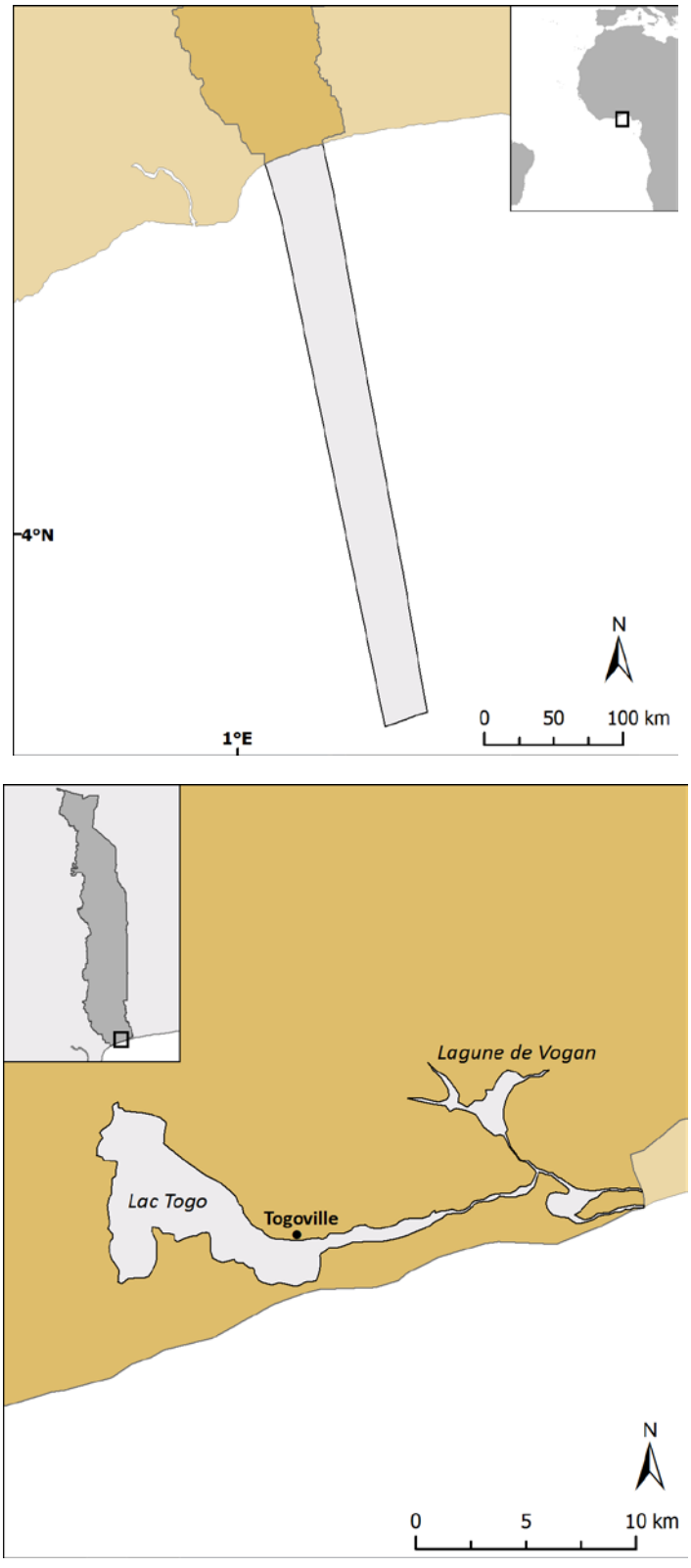

Figure 1. a) Map of Togo showing the Exclusive Economic Zone of Togo, and b) showing the coastal lagoons of Togo.

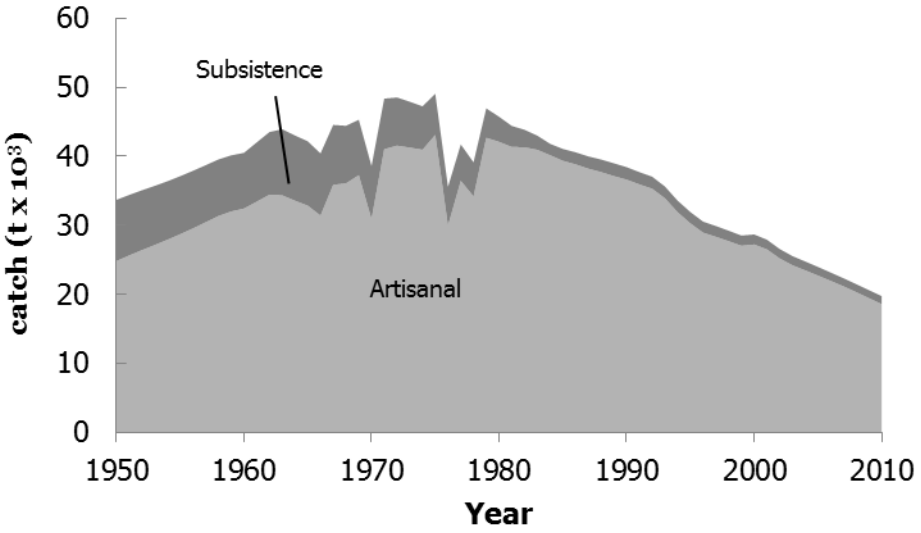

Figure 2. Estimated small scale catches for Togo, 1950-2010

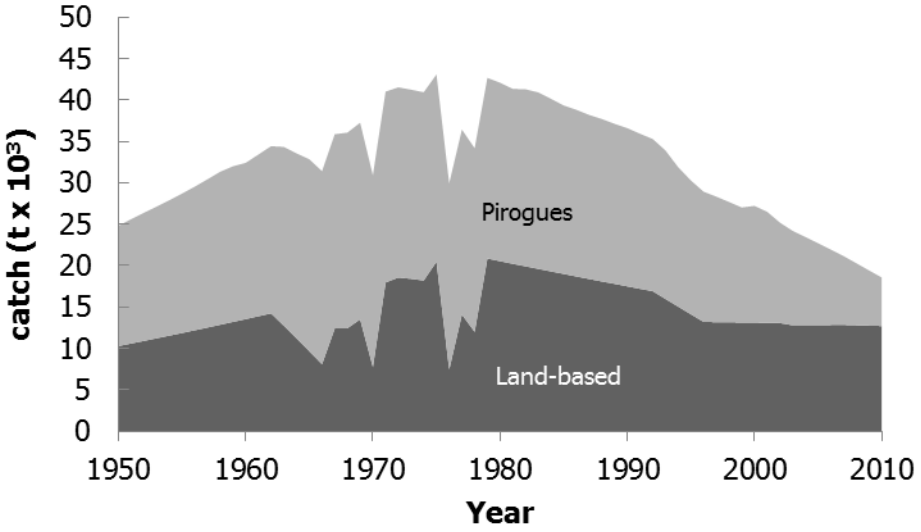

Figure 3. Estimated artisanal catches for Togo, 1950-2010

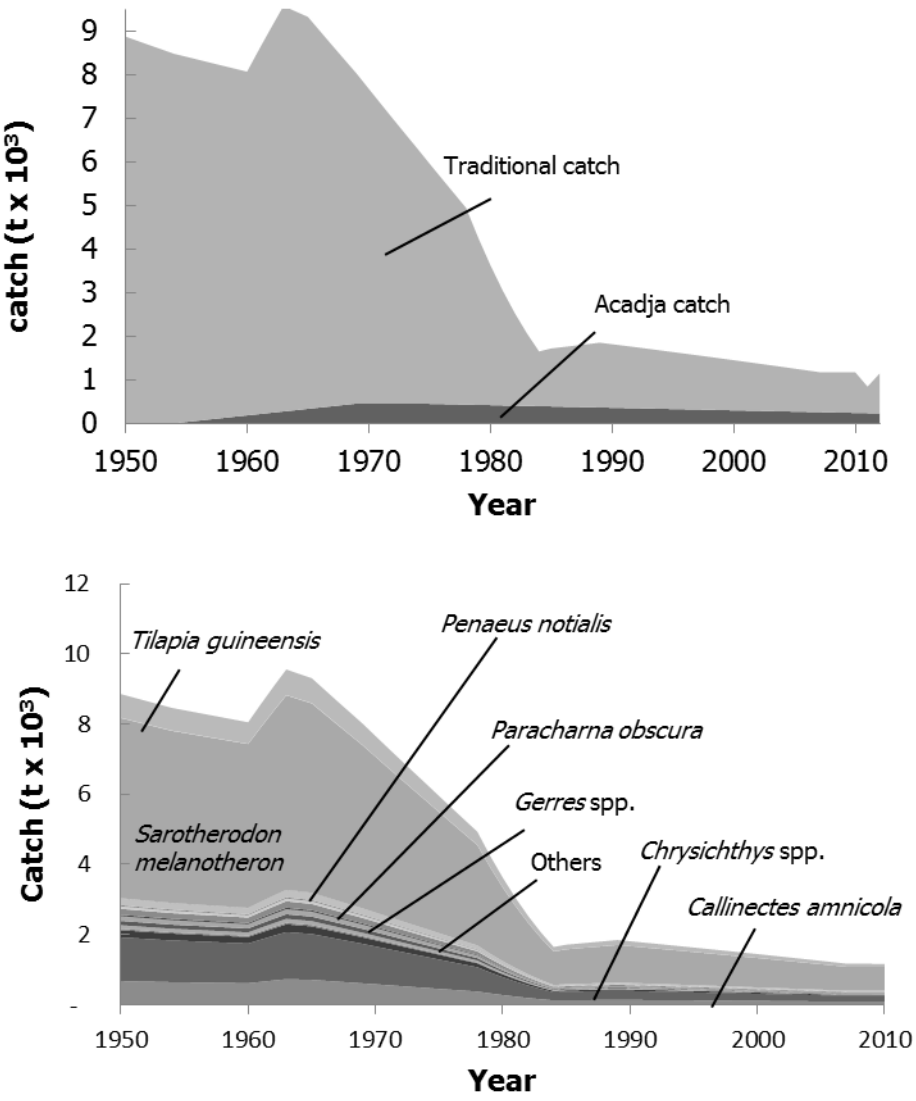

Figure 4. Estimated subsistence lagoon catches for Togo (a) by sector and (b) by major taxonomic group, 1950-2010

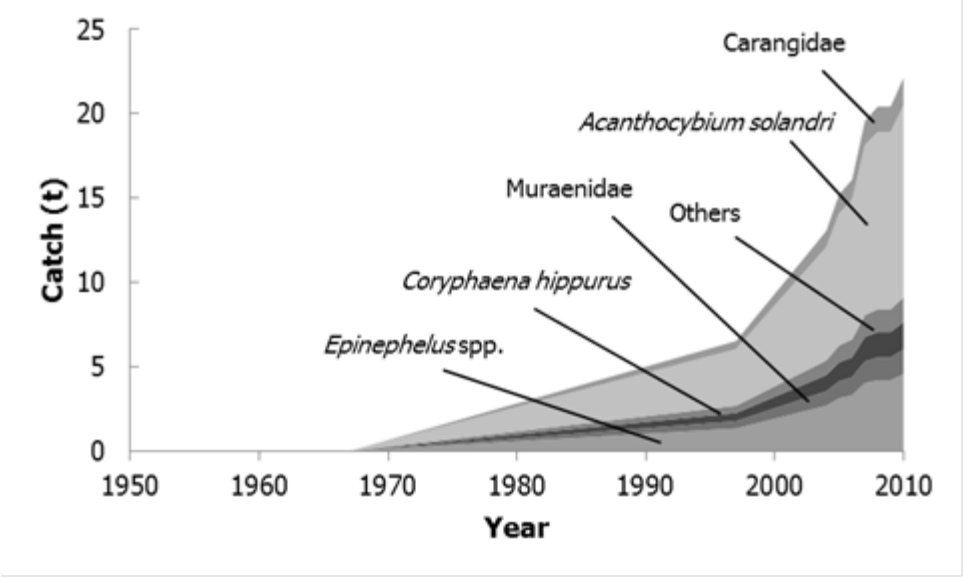

Figure 5. Estimated recreational catches for Togo, 1950-2010

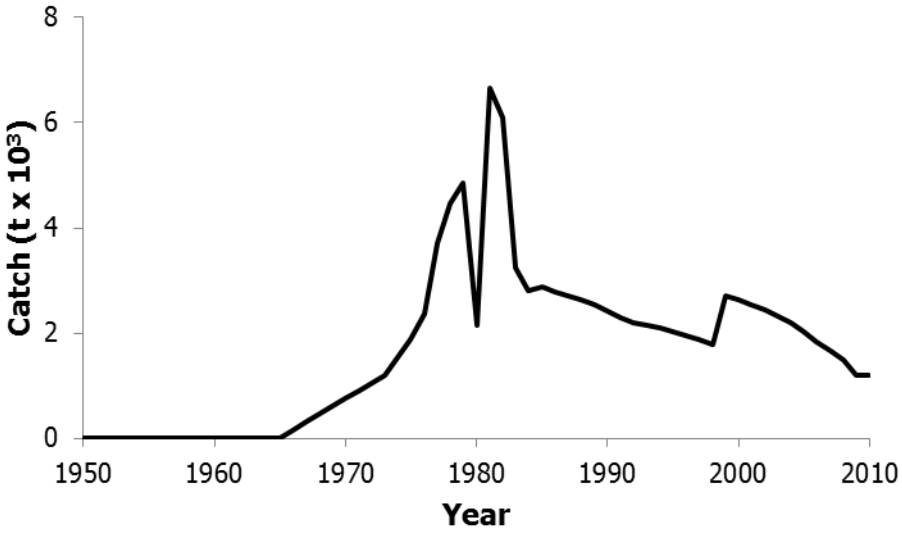

Figure 6: Reconstructed total domestic industrial catch in Togo EEZ, 1950-2010.

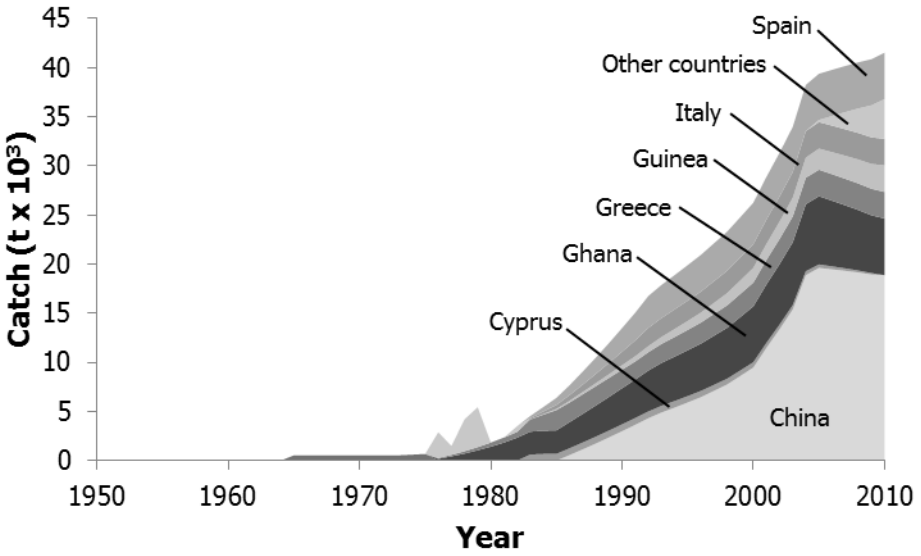

Figure 7. Reconstructed total foreign industrial catch in Togo EEZ, 1950-2010.

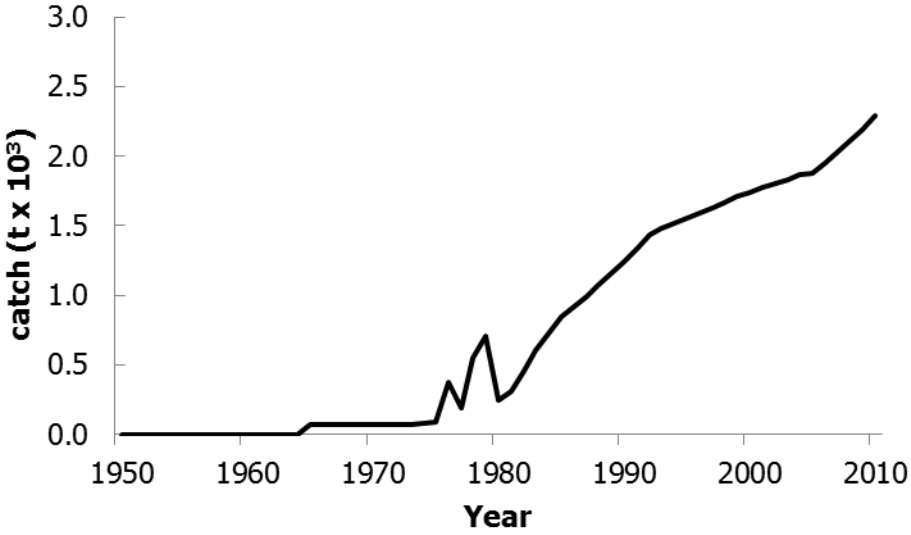

Figure 8. Estimated industrial discards in Togo EEZ, 1950-2010

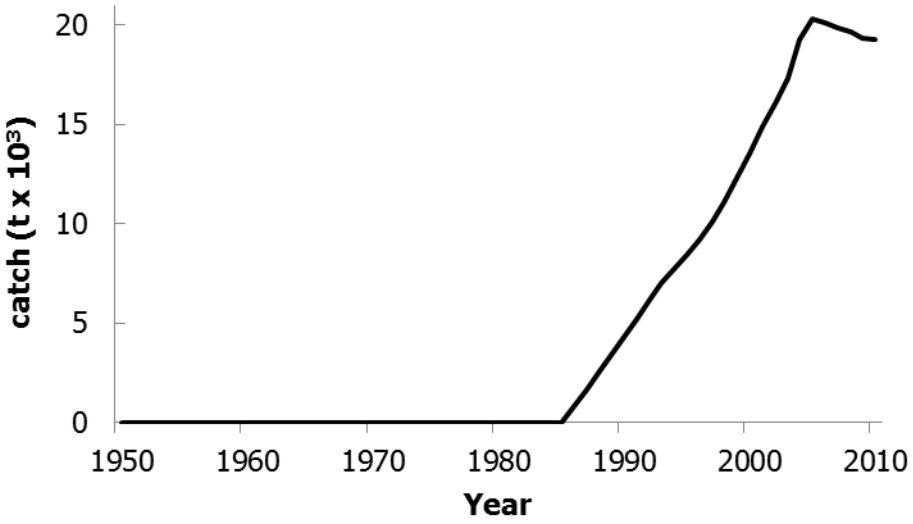

Figure 9. Estimated illegal catches by the foreign fleet from Togo EEZ, 1950-2010

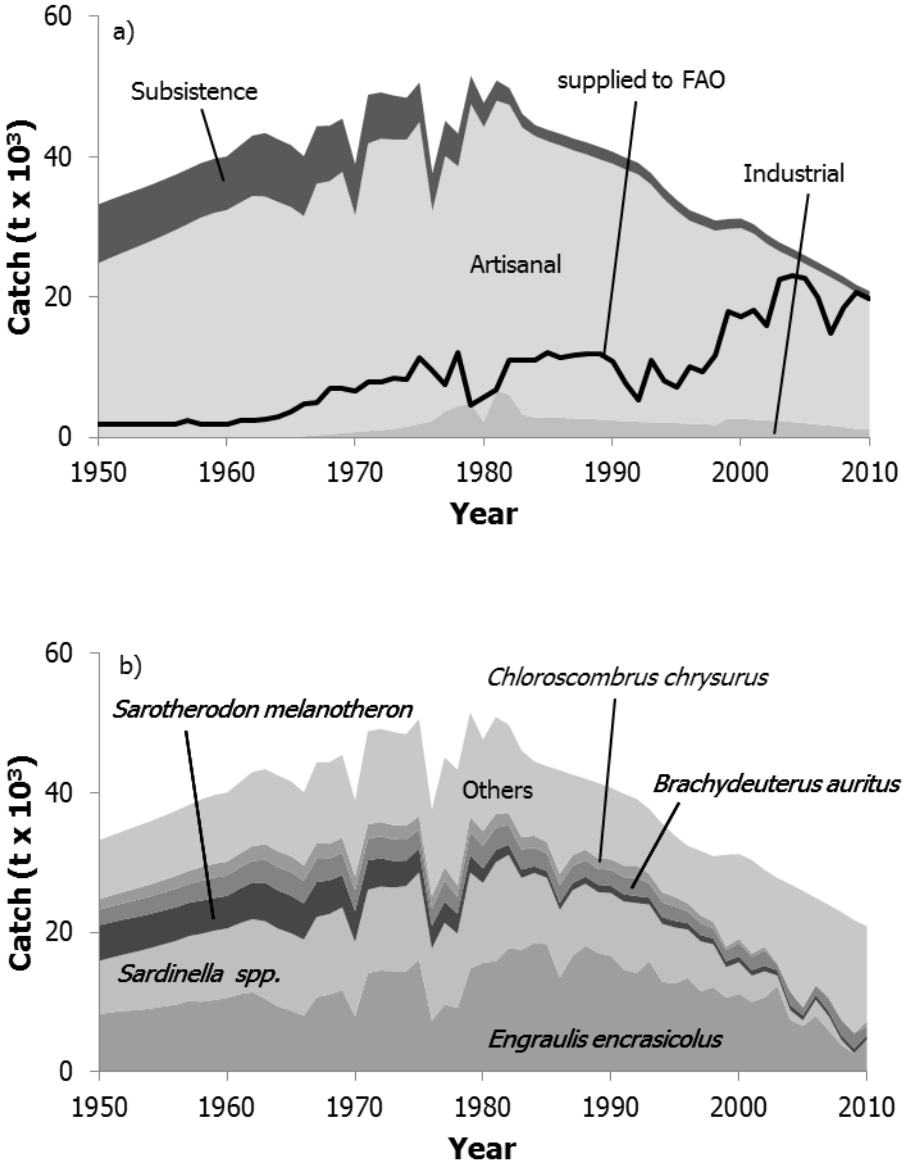

Figure 10. Reconstructed total catch for Togo for 1950 to 2010, by a) sector, with official reported data overlaid as line graph, and b) by major taxa, with 'Others' consisting of 103 additional taxonomic categories.

Appendix Table A1: FAO landings vs. reconstructed total catch (in tonnes), and catch by sector with discards shown separately for Togo, 1950-2010.

Year	FAO landings	Reconstructed total catch	Industrial	Artisanal	Subsistence	Recreational	Discards
1950	1,900	33,200		24,800	8,400		
1951	1,900	33,900		25,600	8,310		
1952	1,900	34,600		26,400	8,210		
1953	1,800	35,300		27,100	8,120		
1954	1,800	35,900		27,900	8,030		
1955	1,900	36,700		28,700	7,960		
1956	1,900	37,400		29,500	7,900		
1957	2,300	38,300		30,400	7,830		
1958	1,800	39,100		31,300	7,770		
1959	1,800	39,700		32,000	7,700		
1960	1,900	40,100		32,400	7,640		
1961	2,300	41,500		33,400	8,130		
1962	2,300	43,000		34,400	8,600		
1963	2,500	43,400		34,300	9,060		
1964	3,000	42,500		33,600	8,950		
1965	3,700	41,700		32,900	8,830		
1966	4,800	40,100	156	31,400	8,520		
1967	5,000	44,400	305	35,900	8,210		
1968	7,000	44,400	455	36,100	7,900	0	
1969	7,001	45,500	604	37,300	7,600	0	
1970	6,614	38,900	754	30,900	7,270	1	
1971	7,923	48,900	903	41,000	6,940	1	
1972	7,944	49,200	1,053	41,500	6,610	1	
1973	8,334	48,700	1,203	41,300	6,290	1	
1974	8,151	48,400	1,527	40,900	5,970	2	
1975	11,421	50,600	1,889	43,100	5,640	2	
1976	9,471	37,600	2,357	29,900	5,320	2	1
1977	7,497	45,100	3,696	36,400	5,000	2	1
1978	12,014	43,300	4,452	34,200	4,680	2	2
1979	4,597	51,600	4,861	42,700	4,030	3	2
1980	5,634	47,700	2,148	42,100	3,430	3	3
1981	6,826	50,900	6,660	41,300	2,890	3	4
1982	11,031	49,800	6,095	41,300	2,400	3	5
1983	11,058	46,100	3,230	40,900	1,950	3	10
1984	11,048	44,500	2,809	40,200	1,560	4	5
1985	12,045	43,800	2,867	39,300	1,620	4	5
1986	11,325	43,300	2,771	38,800	1,660	4	4
1987	11,676	42,600	2,709	38,200	1,690	4	4
1988	11,956	42,100	2,629	37,700	1,720	5	3
1989	11,946	41,400	2,531	37,100	1,750	5	2
1990	10,880	40,700	2,414	36,600	1,720	5	1
1991	7,605	39,900	2,280	35,900	1,680	5	0
1992	5,252	39,200	2,198	35,300	1,650	5	
1993	10,965	37,700	2,151	33,900	1,620	6	
1994	8,054	35,600	2,095	31,900	1,580	6	
1995	7,206	33,900	2,029	30,300	1,550	6	
1996	10,101	32,400	1,954	28,900	1,510	6	
1997	9,293	31,700	1,869	28,300	1,480	7	
1998	11,659	30,900	1,775	27,700	1,440	7	
1999	17,926	31,100	2,696	27,000	1,410	8	9
2000	17,279	31,200	2,614	27,200	1,370	9	9
2001	18,165	30,400	2,522	26,500	1,330	10	10
2002	15,947	28,900	2,421	25,200	1,300	11	10
2003	22,487	27,800	2,311	24,200	1,260	12	10
2004	23,013	26,900	2,192	23,500	1,220	13	11
2005	22,745	25,900	2,011	22,700	1,190	15	11
2006	19,879	24,900	1,830	21,900	1,150	16	11
2007	14,905	23,900	1,650	21,200	1,110	20	11
2008	18,500	22,900	1,469	20,300	1,110	20	11
2009	20,604	21,700	1,175	19,400	1,110	20	11
2010	19,729	20,900	1,175	18,600	1,100	22	11

Appendix TableA2: Reconstructed total catch (in tonnes) by major taxa, for Togo, 1950-2010. Others contain 104 additional taxonomic categories.

Year	*Engraulis encrasicolus*	*Sardinella* spp.	*Sarotherodon melanotheron*	*Brachydeuterus auritus*	*Chloroscombrus chrysurus*	Others
1950	8,270	7,620	5,140	2,210	1,500	8,470
1951	8,510	7,870	5,080	2,290	1,560	8,620
1952	8,740	8,100	5,020	2,370	1,610	8,760
1953	8,810	8,450	4,970	2,450	1,660	8,910
1954	9,050	8,690	4,910	2,520	1,710	9,050
1955	9,360	8,900	4,870	2,590	1,760	9,180
1956	9,600	9,160	4,830	2,680	1,820	9,350
1957	10,130	9,320	4,790	2,730	1,850	9,430
1958	10,040	9,760	4,750	2,870	1,950	9,730
1959	10,290	9,940	4,710	2,930	1,990	9,860
1960	10,590	9,970	4,670	2,930	1,990	9,900
1961	11,130	10,180	4,970	3,000	2,040	10,230
1962	11,400	10,510	5,260	3,110	2,110	10,640
1963	10,440	11,130	5,540	3,290	2,240	10,750
1964	9,360	11,150	5,470	3,340	2,280	10,910
1965	8,750	11,120	5,400	3,370	2,300	10,740
1966	8,040	10,920	5,210	3,230	2,210	10,480
1967	10,670	11,530	5,020	3,320	2,260	11,580
1968	11,080	11,560	4,830	3,130	2,130	11,700
1969	11,740	11,850	4,650	3,170	2,160	11,900
1970	7,920	10,660	4,440	2,970	2,040	10,880
1971	14,160	11,940	4,240	3,070	2,080	13,370
1972	14,510	12,070	4,040	3,170	2,080	13,330
1973	14,430	12,000	3,850	3,070	2,040	13,360
1974	14,410	12,240	3,650	3,010	2,040	13,080
1975	16,130	12,470	3,450	2,760	1,860	13,960
1976	7,340	10,320	3,250	2,530	1,720	12,450
1977	9,600	11,760	3,060	2,960	1,990	15,760
1978	9,150	10,670	2,860	2,430	1,620	16,590
1979	14,780	13,810	2,470	3,320	2,190	15,010
1980	15,640	11,430	2,100	3,250	2,100	13,160
1981	15,840	14,220	1,770	3,210	1,990	13,890
1982	17,730	13,390	1,470	2,790	1,770	12,660
1983	17,500	10,310	1,190	2,900	1,770	12,460
1984	18,460	10,060	950	2,700	1,710	10,660
1985	18,320	9,490	990	2,540	1,590	10,900
1986	13,500	9,730	1,010	2,550	1,610	14,870
1987	16,650	9,390	1,030	2,450	1,550	11,530
1988	18,070	8,900	1,050	2,340	1,510	10,200
1989	17,040	8,730	1,070	2,260	1,470	10,840
1990	16,620	9,000	1,050	2,310	1,510	10,250
1991	14,670	9,760	1,030	2,480	1,650	10,310
1992	14,150	10,040	1,010	2,620	1,750	9,580
1993	15,880	8,110	990	2,060	1,360	9,300
1994	12,890	8,320	970	2,130	1,410	9,860
1995	12,670	8,020	950	2,060	1,380	8,790
1996	13,460	6,930	920	1,690	1,150	8,250
1997	11,560	7,160	900	1,690	1,140	9,240
1998	12,110	6,150	880	1,400	940	9,430
1999	10,630	4,370	860	1,540	550	13,200
2000	11,170	4,540	840	1,900	600	12,170
2001	10,020	3,760	820	1,860	500	13,430
2002	10,670	3,730	790	2,210	520	11,010
2003	12,300	1,490	770	820	120	12,300
2004	7,420	1,400	750	1,900	50	15,380
2005	6,560	800	730	1,110	30	16,710
2006	8,020	2,290	700	1,310	120	12,500
2007	5,970	2,020	680	1,790	300	13,190
2008	3,820	740	680	2,150	100	15,410
2009	2,620	30	680	2,210	0	16,210
2010	4,600	20	680	1,210	730	13,640