Fisheries Centre

The University of British Columbia

Working Paper Series

Working Paper #2015 - 80

Reconstruction of Syria's fisheries catches from 1950-2010: Signs of overexploitation

Aylin Ulman, Adib Saad, Kyrstn Zylich, Daniel Pauly and Dirk Zeller

Year: 2015

Email: a.ulman@fisheries.ubc.ca

Reconstruction of Syria's fisheries catches from 1950-2010: Signs of overexploitation

Aylin Ulman[a], Adib Saad[b], Kyrstn Zylich[a], Daniel Pauly[a], Dirk Zeller[a]

[a] *Sea Around Us, Fisheries Centre, University of British Columbia, 2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada*
[b] President of Syrian National Committee for Oceanography, *Tishreen University, Faculty of Agriculture, P.O. BOX; 1408, Lattakia, Syria*

a.ulman@fisheries.ubc.ca (corresponding author)*; adibsaad@scs-net.org; k.zylich@fisheries.ubc.ca; d.pauly@fisheries.ubc.ca; d.zeller@fisheries.ubc.ca*

ABSTRACT

Syria's total marine fisheries catches were estimated for the 1950-2010 time period using a reconstruction approach which accounted for all fisheries removals, including unreported commercial landings, discards, and recreational and subsistence catches. All unreported estimates were added to the official data, as reported by the Syrian Arab Republic to the United Nation's Food and Agriculture Organization (FAO). Total reconstructed catch for 1950-2010 was around 170,000 t, which is 78% more than the amount reported by Syria to the FAO as their national catch. The unreported components added over 74,000 t of unreported catches, of which 38,600 t were artisanal landings, 16,000 t industrial landings, over 4,000 t recreational catches, 3,000 t subsistence catches and around 12,000 t were discards. Syria's fisheries are dominated by artisanal (i.e., small-scale commercial) catches (67%), despite a substantial contribution of industrial fisheries since the 1990s. Accounting for all fishery removals (including discards) is critical to a better understanding of fisheries resource use in an ecosystem setting, which should assist in improving resource management.

INTRODUCTION

Fisheries have been providing coastal populations with nutritional resources for millennia; however, with the onset of industrialization in the last century, these resources have generally been exploited faster than they can regenerate (Pauly *et al.* 2002). Global fish catches increased throughout the 1960s and 1970s, mostly due to increased sophistication of fishing vessels and global spatial expansion (Swartz *et al.* 2010), peaked in the late 1980s (Watson and Pauly 2001), and thereafter began a slow decline, which continues to this day. It is important for countries to understand the history of their fisheries resource exploitation, to provide a baseline for understanding the future potential of these resources.

The Syrian Arab Republic, here referred to as 'Syria', became a charter member of the United Nations in 1945 and achieved independence from France in 1946. Syria's population, which was 3.5 million in 1950, increased to 21 million by 2010,[1] the majority of which lives in a narrow strip of land between the Mediterranean Sea and the coastal mountain range. The coastline is interspersed with cities, towns and villages, all within 5-10 km of each other (Jony and Rees 2005). The population density is thus highest along the coast, with 405 people·km^{-2} in Latakia and 370 people·km^{-2} in Tartous (UNEP 2009).

Syria borders the Levantine Basin of the eastern Mediterranean Sea, which extends from southern Turkey to Egypt (Figure 1). The continental shelf is narrow (1-10 nautical miles wide) and measures approximately 960 km^2 (www.seaaroundus.org), while Syria's Exclusive Economic Zone (EEZ) measures approximately 10,000 km^2 (www.seaaroundus.org).

Fisheries catches in the eastern Mediterranean are much lower than the western Mediterranean due to lower nutrient availability and the absence of a mixing mechanism such as upwelling. The Nile River had traditionally been the main source of nutrient input into the eastern Mediterranean, but since the construction of the Aswan Dam in Egypt, only a fraction of the previous nutrient-rich discharge reaches the Mediterranean; hence, pelagic catches in Syria were noticeably reduced from the late 1960s onwards due to the Aswan Dam completion (FAO 2004).

[1] www.indexmundi.com/syria/population.html

The productivity of Syrian marine waters is low in comparison with neighboring Turkish and Lebanese waters (Kelleher 1996; Saad 1996), suggesting overexploitation. Further evidence of overexploitation is the high proportion of juvenile fish in the landings, thus likely representing both growth and recruitment overfishing (Ricker 1975; Pauly 1984).

Seafood consumption is low in the country, estimated to be approximately 1 kg·person^{-1}·year^{-1} (Kelleher 1996). This low rate is attributable to the scarcity of the resource, combined with high fish prices, as luxury hotels and the affluent portion of the population drive up the prices. Economically, the fisheries sector in Syria could be considered negligible, as it accounts for less than 0.002% of the Gross National Product (Kelleher 1996).

Syria has not ratified the United Nations Convention on the Law of the Sea (UNCLOS), along with Turkey and Israel in the Mediterranean (Cacaud 2005). In 1981, Syria claimed a 35-mile territorial sea which was not recognized by international law, and was replaced by the 12 nautical mile territorial sea in 2003. Although Syria has not signed the convention, they have declared an Exclusive Economic Zone (EEZ), via customary international law (Commission 2011).

The Food and Agriculture Organization of the United Nations (FAO) reports marine fishery landings (www.fao.org/fishery/statistics/en) supplied to them by each member country in the form of time-series data from 1950 to the present, which are used to derive global trends (e.g., FAO 2010, 2014). However, the data provided to FAO are not inclusive of total fishery removals, as they do not, or only partially, account for small-scale commercial and non-commercial catches in many countries (Zeller *et al.* 2011; Abudaya *et al.* 2013; Zeller *et al.* 2014). The objective of this study is to provide a comprehensive estimate of total Syrian marine fishery removals through a catch reconstruction technique described in Zeller *et al.* (2007). This paper deals exclusively with marine wild capture fisheries.

Syria's fisheries

The data reported by FAO on behalf of Syria reported annual marine landings averaging about 750 t·year^{-1} in the 1950s, increasing to 1,000 t·year^{-1} in the 1960s, and 1,110 t·year^{-1} in the 1970s and mid-1980s.

Landings then started to increase from 1,500 t in 1987 to a peak of almost 3,700 t in 2005. The last part of this increase was due to the introduction of an additional two dozen trawlers in 1994, which found new grounds to exploit (i.e., spatial expansion; Swartz *et al.* 2010), and not due to healthier fish biomass (Saad 1996).

Here, Syria's fisheries were divided into four sectors: 1) industrial (large-scale commercial); 2) artisanal (small-scale commercial); 3) subsistence (small-scale non-commercial); and 4) recreational. The only vessels pertaining to the industrial sector are bottom trawlers, which range from 10-27 m in length (Margetts 1968; Saad 1996, 2010). The majority of fishing vessels belong to the artisanal sector, which also includes approximately 14 small-sized purse seiners which have been in operation since the 1950s (A. Saad, pers. obs.). The subsistence and recreational sectors are thought to be small in Syria with low catches and catch rates.

The annual Catch Per Unit of Effort (CPUE), in $t \cdot boat^{-1} \cdot fishing\ day^{-1}$, declined steadily beginning in the mid-1980s, with another substantial decrease in 1995 (Kelleher 1996). The first phase of decline may have been attributable to the establishment of two Syrian dams (Al thawra and Tishreen), which prevented nutrients from entering the sea, and the second decline was likely due to the addition of about two dozen trawlers to the industrial fleet. From 1986 to 1998, the steady increase in fishing effort allowed catch levels to appear stable (Kelleher 1996).

The government of Syria viewed the decline in CPUE to be reflective of overfishing and has since imposed management measures such as the restriction of fleet capacity to protect Syrian marine resources from further degradation (Marttin *et al.* 2006). However, taxonomic clarity in collected data has never been a priority, making species- and stock-specific trends difficult to interpret. Most of the continental shelf area of Syria is rocky, leaving less than a quarter of the shelf suitable for trawling with a steep slope, restricting the space available for fishing (A. Saad, pers. obs.). Therefore, the small area suitable for trawling (an area of approximately 30 km^2 off Latakia-Jeble) has been fished repeatedly over the last few decades, and has long been considered over-exploited.

Industrial fisheries

Bottom trawlers were banned from operating in coastal waters (e.g., within 12 nm) in summer months since 1966 for conservation purposes (Margetts 1968), but this was not deemed sufficient to protect the spawning seasons of the main targeted demersal taxa such as red mullet (*Mullus barbatus*), grey mullet (*Mugil cephalus*) and seabream (Sparidae), most of which spawn later in the year.

Three new state-owned, 100 tonnes steel trawlers were added to the fishing fleet in 1977 by the General Establishment of Fisheries, based out of Latakia (Villegas 1983). Due to the low selectivity of the fine mesh size used, large quantities of undesirable fish and unmarketable sizes were caught (Saad 1996). These trawlers caught between 300-500 $kg \cdot day^{-1}$, and were banned from operating in territorial waters as of 2005 (Ministerial Decision n0:15/ T, dated: 19/4/2004, Saad 2010) due to a rapid decline in European hake (*Merluccius merluccius*) landings. Reported hake landings peaked in 1997 at 300 t and declined by about 75% by the late 2000s (FAO Fishstat data, 2012).

In 1994, licensing was made available to the public for the first time to bottom trawl for hake, just 1-5 nautical miles outside of Syria's territorial sea,[2] where bottom trawling was allowed. Prior to this, bottom trawlers were solely restricted to the government and fishery co-operative organizations. Initially in 1994, there were 14 new 'offshore' bottom trawlers (Kelleher 1996) which had increased to 24 by 2007 (A. Saad, pers. obs.), and had a combined catch of 1,500-2,000 t annually in the late 2000s (A. Saad, unpublished data). The encouragement of this 'new' fishing fleet was based on incorrect assumptions regarding the productivity of the offshore waters (Kelleher 1996).

Artisanal fisheries

Feluccas are the standard artisanal fishing vessel and have small diesel engines ranging from 5-20 hp (Villegas 1983; Saad 1996). There were 1,000 fishers and 200 fishing vessels in 1955, which increased to about 500 vessels by 1960 (Margetts 1968), and continued to increase steadily after that. By 1996, the

[2] In Syria, these 'new' trawling grounds lie just outside their territorial sea and are referred to as the 'distant water fleet', but will be referred to here as the 'offshore industrial fleet'.

government began to restrict entry of new artisanal boats, and capped the total number of operational artisanal vessels at 1,850 (A. Saad, pers. obs.).

A variety of fishing gears are used in this mixed-species fishery, including trammel nets for bottom fishing, longlines (Villegas 1983), gill nets, shore seines, cast nets, feathered troll lines, small purse seines, bottom-set nets and handlines (Saad 1996). The artisanal fishery, like the industrial, also commonly uses small mesh sizes. The two most important taxa targeted by this sector are hake and red mullet, which together represent 45% to total artisanal catches (Marttin *et al.* 2006).

The purse-seine fleet is considered part of the artisanal sector due to vessel lengths under 12 m, and targets small pelagics such as round sardinella (*Sardinella aurita*). Approximately 16 purse seines have been in operation since 1950 (A. Saad, pers. obs.). Each of these vessels operates for 7-12 hours per day, 8-12 days per month, five months per year, and catch between 500-800 $kg \cdot trip^{-1}$ (A. Saad, pers. obs.). These vessels use a mesh size of 14 mm (Kelleher 1996), and hence are responsible for catching substantial amounts of juvenile fish. Even in the early period, the average length of most demersal fish landings were reported to be "very small" in size (Margetts 1968).

Artisanal catches have been much harder to track until a sub-sampling procedure was initiated in 2004, since this sector is large and varies greatly with locality (Saad 1996).

Recreational fisheries

In Syria, a license is required to fish recreationally either from the boat or the shore (Gaudin and De Young 2007). The recreational fishing sector is limited to angling, and is to use a maximum of three hooks per fishing line. In 2006, 148 marine recreational licenses were issued (A. Saad, pers. obs.).

METHODS

The reconstruction of total fisheries catches of Syria for the 1950-2010 time period was undertaken following the approach in Zeller *et al.* (2007).

Catch statistics

Data reported by the Food and Agriculture Organization (FAO) Fishstat database on behalf of Syria were used as the reported baseline data from 1950-2010. The officially reported data are an estimation of landings based on sales records from some of the larger fish markets (A. Saad, pers. obs.). Therefore, catches either utilized without sale (e.g., consumed directly) or sold at locations other than the main markets, along with discards are missing from the official data.

Fishery statistics started being collected monthly from fish market managers in April 1965 (Margetts 1968). Data collection has been constrained due to the large number of unmonitored landing sites, the large number of artisanal fishers, catches being landed at all hours, and the wide range of sites where fish are sold (Margetts 1968), which includes many pre-arranged direct sales to regular buyers, such as hotels, which thus falls outside the enumeration system.

Taxonomic breakdown of reported data

Landings data supplied by Syria to the FAO consist of highly aggregated taxonomic groups; from 1950-1972, all catches were represented as one miscellaneous marine fish category (i.e., 'marine fishes nei'), despite fish being sold in the market by species. From 1973-1999, the taxonomic resolution improved and data were separated into 14 taxa; from 2000-2010, the breakdown improved again, finally covering a total of 34 marine taxa.

See Tables (1, 2 and 3) for details on the FAO taxonomic categories that were subdivided, the final species composition, years applied, and the references used to determine the composition. For example, to disaggregate the tonnage of FAO's umbrella 'marine fishes nei' category to individual taxa that were assigned to the artisanal sector, an average percentage of occurrence was taken from the taxonomically more refined FAO landings data from 1976-1978, and then applied to the 'marine fishes nei' landings data for 1950-1971. This average breakdown was modified in order to account for a few important taxa which were not reported during these years (Table 1). To disaggregate the artisanal 'marine fishes nei' catches for the years 1972-1975, the crustaceans were removed from the taxonomic breakdown in Table (1) and

the percentages renormalized. This was done as 'marine crustaceans nei' are reported by the FAO starting in 1972 and thus are already accounted for during these years (see Table 2 for disaggregation of this category). Also note that in the FAO reported data from 1976-1978, there was still a 'marine fishes nei' category which was further disaggregated to account for two fish commonly caught in Syrian waters but not represented in their own categories in the reported catch data: 90% was allocated to represent leerfish (*Lichia amia*), and 10% was allocated to represent dolphinfish (*Coryphaena hippurus*), both of which have been common in pelagic catches (Saad 1996). These species were also incorporated into the artisanal reported breakdown for 1950-1971 and were used to breakdown the entire 'marine fishes nei' category from 1979-2010. The 1976-1978 time period was chosen as a reference period, because after 1978, a declining catch trend began for most species and hence that time period was considered less representative of the catches for 1950-1975.

To assign reported FAO 'marine fishes nei' catches to more detailed individual taxa for the industrial sector, for 1950 to 1966, a taxonomic composition was derived from Farina (1957; Table 3). Data were only used from the first trawl survey hauls of Zone B from Farina (1957); the 'resumed hauls' of Zone B were excluded because the operating depths were greater than the usual trawling grounds. Zone B explored the latitudes 35°-36° N which are located within Syrian waters, between Baniyas and Latakia where normal trawling operations were conducted (Farina 1957). 'Marine fishes nei' reported industrial catches for 1969-1976 were disaggregated using the same breakdown as for 'demersal percomorphs nei' (Table 2).

Fishing sector allocation

The data reported by FAO on behalf of Syria were allocated to either industrial (large-scale commercial) or artisanal (small-scale commercial) fishing sectors by first separating bottom trawl catches (considered industrial) from the rest of the data. To do this, the number of operational trawlers was first multiplied by their annual catch rates (Table 4, see below for details) to derive estimated average total annual trawler catches, from 1950-2010.

In addition to the traditional smaller trawlers operating in the waters of Syria since the early 1950s (Table 4, but note that trawling operations were suspended from 1967-1968 so no catches were assigned to the industrial sector during this period), there were 17 larger offshore trawlers being introduced in 1994 (Kelleher 1996), with a catch of 2 t·vessel^{-1}·trip^{-1}, operating three trips·month^{-1} for 12 months·year^{-1} (Saad 1996). This resulted in a combined catch of 1,350 t·year^{-1} (i.e., 79.4 t·trawler^{-1}·year^{-1}), which was used as the estimate of total offshore trawler catch for 1994-2005. The number of offshore trawlers increased to 22 in 2006-2007 and trawler catch was estimated at 1,746 t·year^{-1}. In late 2007, the number of offshore trawlers increased once more to 24 trawlers, with a catch rate of approximately 96 t·vessel^{-1}·year^{-1} (for the two new trawlers only), resulting in a total trawl catch of 1,938 t (A. Saad, pers. obs.).

We assumed conservatively that catches by the smaller trawlers (Table 4) were included in reported data. However, as not all catches taken by the offshore trawlers were accounted for in official data (A. Saad, pers. obs.), we assumed that 500 t·year^{-1} of reported data were allocated as reported large-scale catches for 1994-2004 (i.e., small coastal and large offshore trawlers combined), which increased to 1,000 t·year^{-1} from 2005-2010 (A. Saad, pers. obs.). The remaining trawler catches (deemed unreported) will be discussed below. The industrial reported catches were allocated the same taxonomic composition as the data reported by FAO, except in the case of 'demersal percomorphs nei' and 'marine fishes nei' which were further disaggregated (see above; see Tables 2 and 3).

Reported artisanal catches were calculated by subtracting the above derived reported large-scale catches from the total catches reported by FAO on behalf of Syria.

Unreported landings

Beginning in 2004, the captains of some trawlers, and between 10-20% of the artisanal sector were surveyed (A. Saad, unpubl. data; Table 5), and as of 2008 the small-scale pelagic seiners were included in the survey.

These estimates of total Syrian marine catches were averaged to 6,200 t·year^{-1} for 2008-2009, which was used as an anchor point to derive unreported catch amounts. Since the number of offshore trawlers

increased between 1994-2010, the catches of these trawlers (Table 4) were subtracted from the survey-derived estimated 2008-2009 anchor point of 6,200 $t \cdot year^{-1}$ before being applied to the period between 1950-1993 (before the introduction of offshore trawlers) to obtain a percentage of unreported catches. The period after the introduction of the new 'offshore fleet' was adjusted according to their annual catches.

Thus, for 1950-1993, total unreported landings were in the order of 53% of reported catches. This declined slightly to 52% for 1994-2005, dropped to 31% for 2006, increased again to 47% for 2007, jumped to 96% for 2008-2009, and finally equalled 98% for 2010. These are total unreported commercial catches.

Unreported industrial landings

The likely unreported industrial (large-scale) catches were obtained through subtraction of the reported industrial catches (as assigned in the section 'Fishing sector allocation') from the estimated total industrial catches as derived via Table (4). The same taxonomic breakdown used for 'demersal percomorphs nei' was applied to unreported large-scale catches (Table 2).

Unreported artisanal landings

First, the percentages from the 'Unreported landings' section above were multiplied by the FAO reported data to determine unreported catches for the 1950-2010 period. Next, the industrial unreported catch amounts from 1994-2010 (as derived above) were subtracted from the total unreported catches to determine unreported artisanal catches. A slightly modified version of the breakdown applied to disaggregate the reported FAO data allocated to the artisanal sector (Table 1), was used to breakdown the unreported artisanal catches by taxa from 1950-1978 (Table 6). Beginning in 1979, the same reported individual catch percentages as the FAO reported data were used.

Lamendour (1983) mentioned that three to four times per year, higher than average sardine catches are taken, and consequently, the artisanal fishers are then unable to find buyers for their landings; thus the

unsold fish (around 8-10 t), is used to fertilize agricultural crops. These catches have likely gone unreported (since the fish are not sold through the monitored markets), and have been calculated from 1950 to 2010 by multiplying 3.5 occasions·year^{-1} by an average of 9 t. These catches were added to the unreported artisanal catches.

Recreational and subsistence catches

Recreational fishing is defined here as fishing primarily for pleasure without the intention for commercial sale. Subsistence fishing is defined here as catch for self- or family-consumption, as fish prices are high in Syria.[3] Since the reported data only include commercial sectors, the amount of fish caught for pleasure and/or self-consumption has gone unreported.

To conservatively account for recreational and subsistence catches, 5% of total reported and unreported commercial landings (A. Saad, pers. obs.) were assumed to equate to the combined recreational/subsistence catches. Of this, 80% was estimated to represent the subsistence sector in 1950, and 20% the recreational sector. In 2010, the opposite was assumed, with 20% being subsistence, and 80% recreational. Percentages were interpolated for intervening years. The taxa allocated to these catches were red mullet (Mullidae, 40%); bonito (*Sarda sarda*, 30%); common pandora (*Pagellus erythrinus*, 20%); and seabream (Sparidae, 10%).

Discards

A 1957 FAO report (Farina 1957) suggested that 60% of total marine catches from two months of commercial trawl surveying were discarded due to being undersized. In another report, in 1983, all fish which were caught under the size of 7 cm in length, and most of the fish under 10 cm in length, were discarded (Villegas 1983), resulting in 30-60% of discards from the commercial trawling sector. Here, for the industrial sector, a 60% discard rate was applied in 1950, which was linearly reduced to 45% by 1983 (i.e., the average from Villegas 1983). It was then assumed that discarding practices continued to decline and the discard rate was set to 20% in 2010.

[3] http://stats.oecd.org/glossary/detail.asp?ID=2600

Species which were reported to be discarded were anglerfish (Lophiidae), angelfish (Pomacanthidae), dogfish (Squalidae) and skates (Rajidae) (Beckman and Farina 1956); these species were assumed to make up 95% of the discards, in equal proportion. The remaining 5% of discards were allocated to target species, specifically European hake (28%), seabreams and porgies (26%), mullets (16%), seabasses and groupers (Serranidae, 13%), rabbitfish (Siganidae, 9%), and European barracuda (*Sphyraena sphyraena*, 8%). This small discard percentage is to represent unmarketable fish as a result of being crushed, bruised, broken or otherwise spoiled from the trawling process.

RESULTS

The reconstructed total marine fisheries catches for Syria for the 1950-2010 period were estimated at almost 170,000 t (Figure 2, Appendix Table 1), gradually increasing from 1,200 $t \cdot year^{-1}$ in the early 1950s to an average of 1,900 $t \cdot year^{-1}$ in the 1970s and 1980s. Catches then increased more sharply from 2,600 t in 1990 to a peak of just over 7,000 t in 2008. Reconstructed catches were 78% higher than the data reported to FAO by Syria (Figure 2a). The majority contributor to reconstructed total catches was the artisanal sector with almost 67%. Industrial, recreational, and subsistence catches contributed 29%, 3% and 2%, respectively (Figure 2a). Discards represented 7% of the total reconstructed catch. The major taxa caught in Syria over the full time period considered here were: European hake (9.7%), round sardinella (6.5%), little tunny (6.2%), European barracuda (6.1%), *Sardinella* spp. (5.9%), Atlantic mackerel (5.8%) and *Diplodus* spp. (4.5%; Figure 2b, Appendix Table 2).

DISCUSSION

The principal reason for the difference between reconstructed catches and reported catches lies in the limitations of the statistical collection methods that have historically been employed in Syria. There is no system in place for the government to monitor landings directly from fishing boats, or for each vessel to be responsible for reporting their marine catches. Instead, fisheries data are collected from (some) fish market sales, with no adjustment mechanism established to reliably raise these estimates to country-wide total catches. This un-adjusted data sampling and reporting scheme results in considerable under-

reporting of actual catches by Syrian fisheries. The survey scheme implemented in 2004 (A. Saad, unpublished data), and the material and methods presented in the present study can provide more comprehensive insights into necessary adjustment factors and sampling improvements that may allow future data for Syria to become more accurate and comprehensive.

Landings data made available to the FAO were presented as highly aggregated taxonomic categories (e.g., 'marine fishes nei'), especially in early time periods. Here, we improved the data taxonomically by further breaking down the categories into more detailed taxonomic levels. The catch data could be further improved if catches were recorded (and reported to FAO, see Marriott 2014) to species, genus or at least family level, so that clearer trends and patterns could be detected. We were not able to determine at what point in the data recording and reporting chain data may have been taxonomically aggregated.

During the mid-late 1980s, catches appeared to remain stable, but this was due to a steady increase in fishing effort. Fish catches have been increasing since the early 1990s (Figure 2a). This increase was due to a spatial expansion and increased effort of the offshore trawling fleet, which was associated with a decline of Catch per Unit of Effort (CPUE), and did not reflect more abundant fish stocks. Spatial expansions have been driving global fisheries, and are an indicator of unsustainable fisheries (Swartz *et al.* 2010). Both the artisanal and industrial fisheries stocks of Syria are thought to be overexploited, and steady increases in fish prices have offset the losses of lower catches (Kelleher 1996). Many artisanal fishers blame the industrial fishers for the reduction in catches; for example, some artisanal fishers have argued that with the introduction of the state-owned GEF trawlers in 1978, coastal fishers had to stop using trammel nets to target red mullet, as these species disappeared from their previous fishing grounds (Villegas 1983). It has also been suggested that the reason bottom trawling was prohibited in territorial waters in 2005 was due to the negative impact these new trawlers were seen to have on hake populations.

The artisanal fisheries are also considered over-exploited due to low catch rates, a high proportion of juvenile fish in the landings, as well as the small profit margins (Kelleher 1996). Fishing is only made economically viable due to the high prices fish obtain in the markets, diesel fuel subsidies, and the nation-wide ban on the importation of fish products (Kelleher 1996).

Given the negative impact that the industrial offshore trawlers have had on target fish stocks, the government should consider decreasing, and eventually phasing out industrial bottom trawling all together. Small-scale fisheries should be prioritized, as a much larger proportion of people depend on them for their livelihoods; they use less fuel and thus have a smaller ecological footprint (Pauly 2006a, 2006b) and also have much lower discard rates (Sumaila *et al.* 2001).

While some management measures, such as entry and gear restrictions, have been successful in limiting effort, other measures such as minimum mesh sizes and closed seasons have proven ineffective due to a lack of effective monitoring and enforcement. The catching of juvenile fish, which may be close to 50% of total catches (Kelleher 1996), should be avoided, as these fish have not had a chance to reproduce. If increasing minimum mesh sizes of nets were rigorously enforced, the catch of juvenile fish could be reduced.

In 2008, the government planned to phase out fuel subsidies over a five year period, as they represented 15-25% of the nation's Gross Domestic Product.[4] This measure was very unpopular and has since stalled. Since fuel constitutes a large portion of cost to fishing vessels, masking the true cost of fishing through fuel subsidies encourages overcapitalization and thus overfishing of the resource (Sumaila *et al.* 2008).

Our reconstructed catch estimate for Syria's marine fisheries provides a first comprehensive baseline account of likely total fishery removals for 1950-2010. This study also supports other observations that the state of the fisheries is indeed declining due to overexploitation, as suggested by the observed increase in effort, declining CPUE and amount of juvenile fish in the catches. More efficient measures are urgently needed, so that Syrians can benefit more from their local fisheries now and into the future.

ACKNOWLEDGEMENTS

We acknowledge the *Sea Around Us*, which is supported by The Pew Charitable Trusts and the Paul G. Allen Family Foundation.

[4] www.iisd.org/gsi/news-item-types/news?page=7

REFERENCES

Abudaya M, Harper S, Ulman A and Zeller D (2013) Correcting mis- and under-reported marine fisheries catches for the Gaza Strip: 1950-2010. Acta Adriatica 54(2): 241-252.

Beckman W and Farina LF (1956) Report to the Government of Syria on the Marine Fisheries.Report No. 516, Food and Agriculture Organization of the United Nations, Rome. 28 p.

Cacaud P (2005) Fisheries laws and regulations in the Mediterranean: a comparative study. Studies and Reviews. General Fisheries Commission for the Mediterranean, FAO, Rome. 40 p.

Commission E (2011) Country report: Syria. Marine Spatial Planning, European Union. 8 p.

FAO (2010) The state of world fisheries and aquaculture. Food and Agriculture Organization of the United Nations, Rome, Italy. 218 p.

FAO (2014) The State of World Fisheries and Aquaculture (SOFIA) 2014. Food and Agriculture Organization, Rome, Italy. 223 p.

Farina LF (1957) Report to the Government of Syria on Marine Fisheries. Food and Agriculture Organization of the United Nations, Rome, Italy. 34 p.

Gaudin C and De Young C (2007) General Fisheries Commission for the Mediterranean (GFCM). Recreational fisheries in the Mediterranean countries: a review of existing legal frameworks 81, Food & Agriculture Organization of the United Nations, Rome. 98 p.

Kelleher MK (1996) Syrian Arab Republic: Preliminary fisheries sector study with paticular reference to policy, planning and management of fisheries. A report prepared for the assistance to artisanal fisheries project TCP/SYR/4552(A), Food and Agriculture Organisation of the United Nations, Rome, Italy.

Lamendour PM (1983) Improvement of Fisheries and Aquaculture Production Project, Syrian Arab Republic Handling, Processing and Marketing of Fish Field Document 3, Food & Agriculture Organization of the United Nations, Rome. 19 p. Available at: http://www.fao.org/docrep/field/003/Q3832E/Q3832E00.htm [Accessed:

Margetts AR (1968) Report to the Government of the Syrian Arab Republic on the development of the research program on marine fishery biology.Rep. FAO/UNDP (TA): 2464, Food and Agricultural Organization of the United Nations. 39 p.

Marriott SP (2014) Appendix: Notes on the completion of FAO Form Fishstat NS1 (National Summary). p. 157 *In* Zylich K, Zeller D, Ang M and Pauly D (eds.), Fisheries catch reconstructions: Islands, Part IV. Fisheries Centre Research Reports 22(2), Fisheries Centre, University of British Columbia, Vancouver (Canada). [Originally published in FishByte-Newsletter of the Network of Tropical Fisheries Scientists, 2(2):7-8 (1984), then edited by the late J.L. Munro].

Marttin F, Barone M, Bizsel C, Fayed S, Hadjistephanou N, Krouma I, Majdalani S, Ozdemir A, Salem A and Vassiliades L (2006) Brief introduction to the Eastern Mediterranean fisheries sector. MedFisis Technical Document No. 6, GCP/INT/918/EC-TCP/INT/2904/TD-6. 85 p.

Pauly D (1984) A mechanism for the juvenile-to-adults transition in fishes. J. Cons. CIEM 41: 280-284.

Pauly D (2006a) Major trends in small-scale marine fisheries, with emphasis on developing countries, and some implications for the social sciences. Maritime Studies (MAST) 4(2): 7-22.

Pauly D (2006b) Rejoinder: Towards Consilience in Small-Scale Fisheries Research. Maritime Studies (MAST) 4(2): 47-51.

Pauly D, Christensen V, Guénette S, Pitcher TJ, Sumaila UR, Walters CJ, Watson R and Zeller D (2002) Toward sustainability in world fisheries. Nature 418: 689-695.
Ricker WE (1975) Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191: 1-382.
Saad A (1996) Biology and life cycles of the small pelagic fish on the coast of Syria; landings and the catch profle for the Syria coastal fleet. Field document, Assistance to Artisanal Fleet Project, FAO. 47 p.
Saad A (2010) The fisheries and aquaculture in Syria, status and development perspective in Syria (in Arabic). Syrian Economic Bulletin, Ed. Economic Technical Team, Prime Ministry, Syria 1(1): 113-136.
Sumaila UR, Liu Y and Tyedmers P (2001) Small versus large-scale fishing operations in the North Atlantic. pp. 28-35 *In* Pitcher T, Sumaila UR and Pauly D (eds.), Fisheries impacts on North Atlantic Ecosystems: Evaluations and policy exploration9 (5). Fisheries Centre, Vancouver, B.C., University of British Columbia.
Sumaila UR, Teh L, Watson R, Tyedmers P and Pauly D (2008) Fuel Price Increase, Subsidies, Overcapacity and Resource Sustainability. ICES Journal of Marine Science 65: 832-840.
Swartz W, Sala E, Tracey S, Watson R and Pauly D (2010) The spatial expansion and ecological footprint of fisheries (1950 to present). PLoS ONE 5(12): e15143.
UNEP (2009) Syria's coastal zone and its desired integrated management proposed vision and policy. UNEP/MAP-METAP SMAP III Project: Promoting awareness and enabling a policy framework for environment and development integration in the Mediterranean with focus on Integrated Coastal Zone Management. 52 p.
Villegas LC (1983) Improvement of Fisheries and Aquaculture Production Project, Syrian Arab Republic. General planning, Statistics and Stock Assessment (Marine Fisheries) Field Document 1, Food & Agriculture Organization of the United Nations, Rome. 19 p. Available at: http://www.fao.org/docrep/field/003/Q3822E/Q3822E00.htm [Accessed:
Watson R and Pauly D (2001) Systematic distortions in world fisheries catch trends. Nature 414: 534-536.
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.
Zeller D, Booth S, Pakhomov E, Swartz W and Pauly D (2011) Arctic fisheries catches in Russia, USA and Canada: Baselines for neglected ecosystems. Polar Biology 34(7): 955-973.
Zeller D, Harper S, Zylich K and Pauly D (2014) Synthesis of under-reported small-scale fisheries catch in Pacific-island waters. Coral Reefs DOI: 10.1007/s00338-014-1219-1.

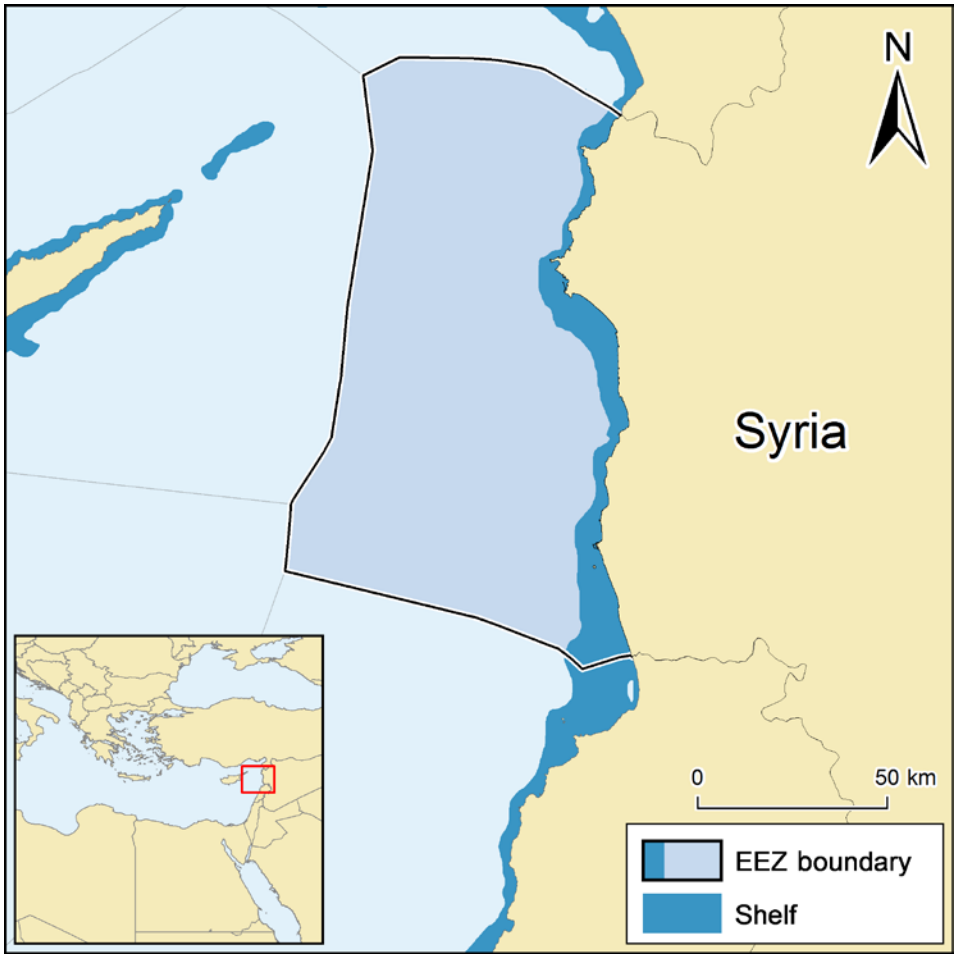

Figure 1. The Exclusive Economic Zone (EEZ) and shelf area (to 200 m depth) of Syria.

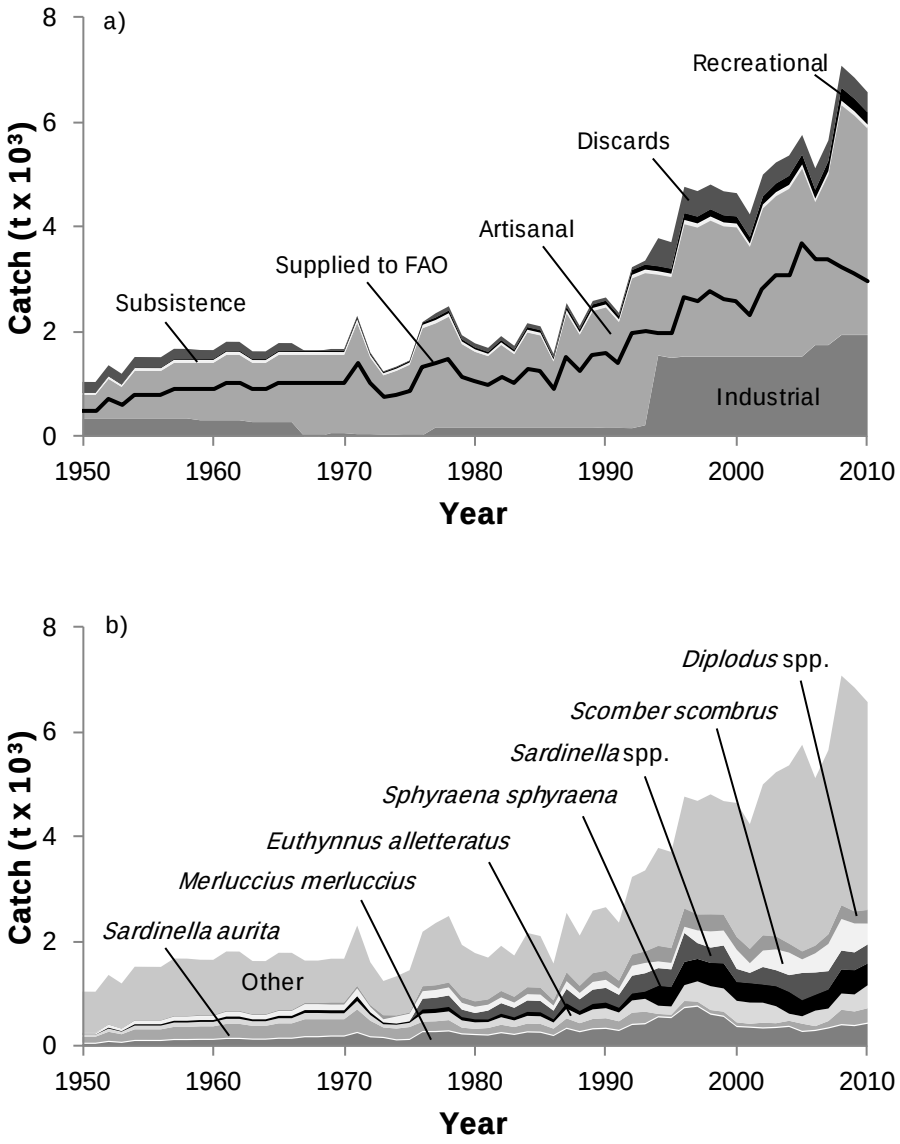

Figure 2. Reconstructed total catches for Syria from 1950-2010, by a) fishing sector plus discards, with data reported by FAO on behalf of Syria overlaid as a black line; and b) main taxa, with 'other' representing 58 additional taxa.

Table 1. Taxon disaggregation percentages for reported artisanal data from the FAO category 'marine fishes nei', for the years 1950-1971.[1]

Common name	Scientific name	%
Round sardinella	*Sardinella aurita*	18.0
European hake	*Merluccius merluccius*	11.0
Little tunny	*Euthynnus alletteratus*	8.0
Red mullets	Mullidae	8.0
Atlantic mackerel	*Scomber scombrus*	7.0
Pandoras nei	*Pagellus* spp.	6.7
Gurnards	*Trigla* spp.	6.0
Barracuda	*Sphyraena sphyraena*	5.0
Leerfish	*Lichia amia*	4.0
Greater amberjack	*Seriola dumerili*	3.0
Groupers and Seabasses	Serranidae	3.0
Sharks and rays	Sharks, rays, chimaeras	3.0
Green tiger prawn	*Penaeus semisulcatus*	2.1
Karuma prawn	*Marsupenaeus japonicus*	2.1
Speckeled shrimp	*Metapenaeus monoceros*	2.1
Atlantic horse mackerel	*Trachurus trachurus*	2.0
Grey mullets	Mugilidae	2.0
Pargo breams nei	*Chrysoblephus* spp.	2.0
Rabbitfish	Siganidae	2.0
Seabreams	*Diplodus* spp.	2.0
Blue crab	*Callinectes sapidus*	0.7
Dolphinfish	*Coryphaena hippurus*	0.3

[1] Derived from reported FAO averages from 1976-1978, with small adjustments in order to account for a few important taxa which were not reported during these years. Also note that a modified version this breakdown (i.e., excluding the crustaceans) was also used for the years 1972-1975. This modification was made as 1972 was the year that 'marine crustaceans nei' began being reported.

Table 2. Taxon disaggregation of aggregated FAO categories (see Tables 1 and 3 for 'marine fishes nei').

Common name	Scientific name	Percentage (%)
'Demersal percomorphs nei'[1]		
European hake	*Merluccius merluccius*	28
Seabreams and porgies	*Diplodus* spp.	26
Mullets	Mugilidae	16
Seabasses and groupers	Serranidae	13
Rabbitfish	Siganidae	9
Barracuda	*Sphyraena sphyraena*	8
'Marine crustaceans nei'[2]		
Green tiger prawn	*Penaeus semisulcatus*	30
Japanese prawn	*Marsupenaeus japonicus*	30
Speckled shrimp	*Metapenaeus monoceros*	30
Blue crab	*Callinectes sapidus*	10
'Marine molluscs nei'[3]		
European flying squid	*Todarodes sagittatus*	40
Common squid	*Loligo* spp.	30
Common cuttlefish	*Sepia officinalis*	20
Common octopus	*Octopus vulgaris*	10
'Sharks, rays, skates, etc. nei'[4]		
Angel shark	*Squatina squatina*	50
Smooth-hound shark	*Mustelus mustelus*	50

[1] Based on Saad (1996).
[2] Based on Beckman and Farina (1956).
[3] Based on trawl surveys (Farina 1957).
[4] Based on GFCM (2012).

Table 3. Taxon disaggregation percentages for the reported industrial 'marine fishes nei' catches, 1950-1966[1].

Common name	Scientific name	%
Yellowstripe goatfish	*Mulloidichthys flavolineatus*	13
Surmullet	*Mullus surmuletus*	12
Lizardfishes	Synodontidae	11
Red mullet	*Mullus barbatus*	11
Common pandora	*Pagellus erythrinus*	6
Bogue	*Boops boops*	5
Piper Gurnard	*Trigla lyra*	5
Smooth-hound	*Mustelus mustelus*	5
Common dentex	*Dentex dentex*	4
European flying squid	*Todarodes sagittatus*	4
Gilthead seabream	*Sparus aurata*	4
Spiny dogfish	*Squalus acathias*	4
Angelshark	*Squatina squatina*	3
Common cuttlefish	*Sepia officinalis*	3
Barracuda	*Sphyraena sphyraena*	2
Comber	*Serranus cabrilla*	2
Guitarfish	Rhinobatidae	2
Common eagle ray	*Myliobatis aquila*	1
Common octopus	*Octopus vulgaris*	1
Penaeus shrimps	*Penaeus* spp.	1
Thornback ray	*Raja clavata*	1

[1]Based on catch composition of trawl surveys from Zone B (Farina 1957).

Table 4. The number of trawlers and their catches including total trawlers catches (t) by year from 1950-2010. Bold numbers indicate data-sourced anchor points.

Year	Number of trawlers	Catches (t)	Small Trawlers	Catches (t)	Offshore Industrial Fleet	Catches (t)	Total Trawler Catches (t)
1950-1954	10	-	-	-	-	-	350
1955	**10**[1]	**-**	-	-	-	-	**350**
1956-1958	10	-	-	-	-	-	350
1959-1962	9	-	-	-	-	-	315
1963-1966	**8**[2]	-	-	-	-	-	280
1967-1968	0	-	**0**	**-**	**-**	**-**	-
1969-1970	2	10	**6**[2]	60	**-**	**-**	70
1971-1972	-	-	5	50	-	-	50
1973-1974	-	-	4	40	-	-	40
1975-1976	-	-	3	30	-	-	30
1977-1989	**3**[3]	138	**2**[4]	40	-	-	178
1990	**3**[3]	**129**	**2**[4]	40	-	-	169
1991	**3**[3]	**130**	**2**[4]	40	-	-	170
1992	**3**[3]	**124**	**2**[4]	**80**[6]	**-**	**-**	164
1993	**3**[3]	**179**	**2**[4]	**80**[6]	**-**	**-**	219
1994	**3**[3]	**157**	**2**[4]	**80**[6]	**17**[5]	**1,350**[6]	1,547
1995	**3**[3]	**112**	**2**[4]	**80**[6]	**17**[5]	**1,350**[6]	1,502
1996-2005	**3**[3]	138	**2**[4]	80	17	1,350	1,528
2006-2007	-	-	-	-	22	1,746	1,746
2008-2010	**-**	**-**	-	-	**24**[6]	**1,938**	**1,938**

[1] Beckman and Farina (1956); Villegas (1983)
[2] Margetts (1968)
[3] True catch amounts were averaged for the 1990-1995 period (Kelleher 1996; Saad 1996)
[4] Villegas (1983); A. Saad (pers. obs.)
[5] Kelleher (1996)
[6] A. Saad (pers. obs.)

Table 5. FAO totals compared to Saad's (unpubl. data) estimates of total catches from 2004-2010.

Year	FAO	Saad
2004	3,077	4,100
2005	3,677	4,600
2006	3,395	4,460
2007	3,381	4,980
2008	3,212	6,300
2009	3,107	6,100
2010	2,956	5,870

Table 6. Taxon disaggregation percentages for unreported artisanal data for the years 1950-1978.

Common name	**Scientific name**	**%**
Round sardinella	*Sardinella aurita*	20.7
European hake	*Merluccius merluccius*	13.0
Red mullets	Mullidae	9.8
Little tunny	*Euthynnus alletteratus*	7.5
Atlantic mackerel	*Scomber scombrus*	6.6
Pandoras nei	*Pagellus* spp.	6.6
Gurnards	*Trigla* spp.	5.7
Barracuda	*Sphyraena sphyraena*	4.6
Leerfish	*Lichia amia*	3.4
Groupers and Seabasses	Serranidae	3.0
Greater amberjack	*Seriola dumerili*	2.8
Sharks and rays	Sharks, rays, chimaeras	2.8
Rabbitfish	Siganidae	2.0
Atlantic horse mackerel	*Trachurus trachurus*	1.9
Pargo breams nei	*Chrysoblephus* spp.	1.9
Green tiger prawn	*Penaeus semisulcatus*	1.8
Karuma prawn	*Marsupenaeus japonicus*	1.8
Speckeled shrimp	*Metapenaeus monoceros*	1.8
Seabreams	*Diplodus* spp.	1.7
Blue crab	*Callinectes sapidus*	0.6

Appendix Table A1. FAO reported landings (t) versus reconstructed total catch (t) for Syria, 1950-2010, and reconstructed catch by sector.

Year	FAO landings	Reconstructed catch	Industrial	Artisanal	Subsistence	Recreational	Discard
1950	500	1,050	350	450	32	8	210
1951	500	1,040	350	450	31	8	208
1952	700	1,360	350	750	43	12	207
1953	600	1,200	350	600	37	11	205
1954	800	1,520	350	900	48	15	204
1955	800	1,520	350	900	47	16	202
1956	800	1,520	350	900	46	16	200
1957	900	1,680	350	1,060	51	19	199
1958	900	1,670	350	1,060	51	20	197
1959	900	1,650	315	1,090	50	20	176
1960	900	1,650	315	1,090	49	21	175
1961	1,000	1,810	315	1,240	54	24	173
1962	1,000	1,810	315	1,240	53	25	172
1963	900	1,630	280	1,130	47	23	151
1964	900	1,630	280	1,130	46	24	150
1965	1,000	1,790	280	1,280	51	27	149
1966	1,000	1,780	280	1,280	50	28	148
1967	1,000	1,640	0	1,560	49	29	0
1968	1,000	1,640	0	1,560	48	30	0
1969	1,000	1,670	70	1,490	48	30	36
1970	1,000	1,670	70	1,490	47	31	36
1971	1,400	2,300	50	2,120	64	45	25
1972	1,000	1,610	50	1,460	44	32	25
1973	745	1,250	40	1,130	33	25	20
1974	800	1,340	40	1,220	35	28	20
1975	876	1,450	30	1,340	38	31	15
1976	1,332	2,190	30	2,040	56	48	14
1977	1,390	2,350	178	1,980	57	51	85
1978	1,477	2,490	178	2,110	59	55	84
1979	1,133	1,940	178	1,590	45	43	83
1980	1,036	1,780	178	1,440	40	40	83
1981	984	1,690	178	1,360	38	39	82
1982	1,123	1,920	178	1,570	42	46	81
1983	1,009	1,730	178	1,400	37	42	80
1984	1,278	2,160	178	1,810	46	54	78
1985	1,242	2,100	178	1,750	43	53	77
1986	917	1,580	178	1,260	32	40	75
1987	1,519	2,550	178	2,180	51	67	74
1988	1,251	2,110	178	1,770	41	56	72
1989	1,547	2,590	178	2,220	49	71	70
1990	1,591	2,650	169	2,300	49	74	65
1991	1,409	2,360	170	2,020	43	67	64
1992	1,954	3,230	164	2,860	57	94	60
1993	2,019	3,360	219	2,900	58	98	78
1994	1,950	3,790	1,547	1,550	56	99	539
1995	1,950	3,710	1,502	1,550	53	99	509
1996	2,670	4,760	1,528	2,530	69	134	504
1997	2,574	4,680	1,528	2,470	66	134	490
1998	2,750	4,810	1,528	2,600	66	140	475
1999	2,600	4,680	1,528	2,490	62	139	461
2000	2,581	4,640	1,528	2,470	60	140	447
2001	2,322	4,240	1,528	2,100	53	129	433
2002	2,823	5,000	1,528	2,830	61	157	419
2003	3,060	5,230	1,528	3,070	62	168	405
2004	3,077	5,360	1,528	3,210	62	175	390
2005	3,677	5,750	1,528	3,590	64	192	376
2006	3,395	5,120	1,746	2,730	54	170	414
2007	3,381	5,650	1,746	3,260	58	193	398
2008	3,212	7,070	1,938	4,390	70	247	423
2009	3,107	6,840	1,938	4,190	64	242	406
2010	2,956	6,570	1,938	3,950	59	235	388

Appendix Table A2. Reconstructed total catch (t) by major taxa in Syria, 1950-2010. The 'Others' grouping includes 58 additional taxa.

Year	*Merluccius merluccius*	*Sardinella aurita*	*Euthynnus alletteratus*	*Sphyraena sphyraena*	*Sardinella* spp.	*Scomber scombrus*	*Diplodus* spp.	Other
1950	54	113	32	28		28	7	784
1951	54	113	32	28		28	7	782
1952	90	171	56	42		49	13	942
1953	72	142	44	35		38	10	860
1954	107	200	68	50		59	16	1,020
1955	107	200	68	50		59	16	1,018
1956	107	200	68	50		59	16	1,017
1957	125	229	80	57		70	19	1,096
1958	125	229	80	57		70	19	1,095
1959	129	235	83	58		72	20	1,057
1960	129	235	83	58		72	20	1,055
1961	146	264	95	66		83	23	1,134
1962	146	264	95	66		83	23	1,133
1963	132	241	86	59		75	20	1,016
1964	132	241	86	59		75	20	1,014
1965	150	270	98	67		85	23	1,093
1966	150	270	98	67		85	23	1,092
1967	179	321	120	74		105	29	810
1968	179	321	120	74		105	29	810
1969	191	308	114	77		100	46	838
1970	191	308	114	77		100	46	837
1971	259	427	164	106		143	52	1,153
1972	177	294	109	72		95	39	821
1973	164	178	59	57		51	81	657
1974	118	204	69	46		125	27	749
1975	127	223	78	51		138	26	810
1976	275	177	155	98	205	135	100	1,043
1977	277	184	160	98	210	140	94	1,192
1978	289	193	168	103	218	147	98	1,271
1979	232	107	136	85	143	120	113	1,000
1980	220	96	122	80	121	110	108	925
1981	210	122	112	71	170	104	105	801
1982	256	139	143	86	202	103	127	863
1983	222	127	125	81	181	92	115	790
1984	270	147	147	96	217	112	137	1,039
1985	264	146	145	96	216	113	136	988
1986	202	119	114	83	165	88	104	706
1987	338	176	188	120	273	142	173	1,137
1988	274	150	156	96	223	113	141	961
1989	328	176	185	121	272	140	173	1,194
1990	338	180	194	124	280	147	178	1,214
1991	298	162	168	109	247	109	157	1,110
1992	412	211	239	145	339	184	218	1,485
1993	425	217	251	150	350	191	224	1,548
1994	556	43	161	392	338	123	302	1,870
1995	543	43	160	385	336	118	288	1,836
1996	732	115	311	450	550	116	354	2,136
1997	760	73	399	433	300	239	309	2,169
1998	609	65	465	449	292	306	330	2,292
1999	566	76	452	488	338	282	310	2,167
2000	373	67	415	371	251	360	249	2,558
2001	360	52	409	383	197	179	277	2,382
2002	345	88	386	360	334	309	295	2,880
2003	355	69	327	396	305	393	252	3,132
2004	375	94	136	433	320	424	176	3,403
2005	279	136	141	325	518	254	156	3,943
2006	298	70	297	317	426	360	151	3,198
2007	345	119	241	376	352	514	188	3,515
2008	406	273	317	468	360	599	266	4,383
2009	390	257	332	471	340	548	234	4,272
2010	436	271	449	422	362	396	263	3,967

Appendix Table A3. List of Syrian marine fishes, by English name, scientific name and Syrian name found in Syrian waters, for incorporation into FishBase (www.fishbase.org).

English name	Scientific name	Syrian name
Angelshark	*Squatina squatina*	Zemezma
Annular seabream	*Diplodus annularis*	Skalline
Assymetrical goatfish	*Upeneus asymmetricus*	Sultani yahoudi
Atlantic horse mackerel	*Trachurus trachurus*	Eseifer
Atlantic lizardfish	*Synodus saurus*	Shkarmie
Atlantic mackerel	*Scomber scombrus*	Skambri
Atlantic pomfret	*Brama brama*	-
Auxillary seabream	*Pagellus acarne*	Salamourra
Bastard grunt	*Pomadasys incisus*	Kostara
Black seabream	*Spondyliosoma antharus*	Al rayes
Blacktip grouper	*Epinephelus alexandrinus*	Lokkos sakhri
Bluespotted seabream	*Pagrus caeruleostictus*	Farfoura (ferride)
Blue whiting	*Micromesistius poutassou*	migrat
Bogue	*Boops boops*	Ghobos
Bonito	*Sarda sarda*	Balamida
Boxlip mullet	*Oedalechilus labeo*	Bouri shelan
Brown comber	*Serranus hepatus*	Diab
Brushtooth lizardfish	*Saurida undosquamis*	Shkarmie
Bullet tuna	*Auxis rochei*	Balamida
Chub mackerel	*Scomber japonicus*	Skambri
Comber	*Serranus cabrilla*	Diab
Common dentex	*Dentex dentex*	Farride (Bassas)
Common dolphinfish	*Coryphaena hippurus*	Lambouka
Common eagle ray	*Myliobatis aquila*	Bahlak
Common guitarfish	*Rhinobatos rhinobatos*	Shelf
Common pandora	*Pagellus erythinus*	Jarbide- om riche
Common seabream	*Pagrus pagrus*	Sarghous
Common two-banded seabream	*Diplodus vulgaris*	Sarghous
Common sole	*Solea solea*	Mousa
Common torpedo	*Torpedo torpedo*	Ra^aad (kahrbaii)
Dolphinfish	*Coryphaena hippurus*	Lambuka
European anchovy	*Engraulis encrasicolus*	Om hanak
European barracuda	*Sphryaena sphryaena*	Sfernae
European hake	*Merluccius merluccius*	merlan
European pilchard	*Sardina pilchardus*	Sardine Kecher
False scad	*Caranx rhonchus*	Eseifer Assoid
Flathead grey mullet	*Mugil cephalus*	Bouri Aftess
Forkbeard	*Phycis phycis*	Kherray
Garfish	*Belone belone*	Arafida
Gilthead seabream	*Sparus aurata*	Kjaj
Goldband goatfish	*Upeneus moluccensis*	Sultani yahoudi
Golden grey mullet	*Liza aurata*	Bouri dehban
Greater amberjack	*Seriola dumerili*	Jarou-Antias
Grey triggerfish	*Balistes capriscus*	Menfakh
Grey wrasse	*Symphodus cinereus*	Omcheffe
Haifa grouper	*Hyporthodus haifensis*	Hanbache
Large-eyed dentex	*Dentex macrophthalmus*	Bahlak
Leerfish	*Lichia amia*	Aerian
Little tunny	*Euthynnus alletteratus*	Balamida Aarida
Madeiran sardinella	*Sardinelle maerensis*	Sardine a'arid
Mediterranean horse mackerel	*Trachurus mediterraneus*	Eseifer
Morocco dentex	*Dentex maroccanus*	Freidneh
Painted comber	*Serranus scriba*	Hadad

Appendix Table A3. List of Syrian marine fishes, by English name, scientific name and Syrian name found in Syrian waters, for incorporation into FishBase (www.fishbase.org).

English name	Scientific name	Syrian name
Parrotfish	*Sparisoma cretense*	Zellkh
Picarel	*Spicara smaris*	Zammour mabroum
Pink dentex	*Dentex gibbosus*	-
Pompano	*Trachinotus ovatus*	Arian (At'out)
Redcoat	*Sargocentron rubrum*	Souri-Naylon
Red mullet	*Mullus barbatus*	Sultani ramli
Red pandora	*Pagellus bellottii*	Jarbide
Redbanded seabream	*Pagrus auriga*	Asfoura
Round sardinella	*Sardinella aurita*	Sardine mabroum
Saddled seabream	*Oblada melanura*	Manouri
Salema	*Sarpa salpa*	Salban
Sand sole	*Pegusa lascaris*	Mousa
Sand steenbras	*Lithognathus mormyrus*	Marmour
Sharpsnout seabream	*Diplodus puntazzo*	Sarghous
Silvery pout	*Gadiculus argenteus argenteus*	-
Skipjack tuna	*Katsuwonus pelanis*	Belamida om Kecher
Smooth-hound shark	*Mustelus mustelus*	Kalb albahr
Spanish mackerel	*Scomberomorus commerson*	Ghazal
Spiny butterfly ray	*Gymnura altavela*	Bakra
Sprat	*Sprattus sprattus*	Sardine
Swordfish	*Xiphias gladius*	Abou monkar
Surmullet	*Mullus surmuletus*	Sultani sakhri
Thicklip grey mullet	*Chelon labrosus*	Bouri chelan
Thinlip grey mullet	*Liza ramada*	Bouri Toubar
Thornback ray	*Raja clavata*	Bakra
Tripletail	*Lobotes surinamensis*	Moista
Twaite shad	*Alosa fallax*	Sardine Kecher
White grouper	*Epinephelus aeneus*	Lokkos ramli
White seabream	*Diplodus sargus*	Sarghous
Yellow-mouth barracuda	*Sphyraena viridensis*	Sfernae
Zebra seabream	*Diplodus cervinus*	Asfoura

Appendix Table A4. List of Syrian marine invertebrates, by English name, scientific name and Syrian name found in Syrian waters, for incorporation into SeaLifeBase (www.sealifebase.org).

English name	Scientific name	Syrian name
Blue crab	*Callinectes sapidus*	Saltaoun azrak
Common cuttlefish	*Sepia officinalis*	Habbar (kalamari)
Common octopus	*Octopus vulgaris*	Akhtabout
European flying squid	*Todarodes sagittatus*	Lolligo
Green tiger prawn	*Penaeus semisulcatus*	Kraides namer akhdar
Japanese prawn	*Penaeus japonicas*	Kraides iabani
Penaeid shrimp	*Penaeus kerathurus*	Kraides malek (Gambri kabeer)
Persian conch	*Strombus persicus*	Mahar faresi
Purple-dye murex	*Murex brandaris*	-
Speckled shrimp	*Metapenaeus monoceros*	Karaides arkat