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RECONSTRUCTION OF MARINE FISHERIES CATCHES FOR THE REPUBLIC OF MALTA (1950-2010)

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ABSTRACT

Malta is an archipelago of the Central Mediterranean whose largest island is Malta proper, with an area of 246 km². The reconstructed total catches for Malta's marine fisheries, including large-scale and small-scale commercial fisheries, subsistence, and recreational sectors, as well as major discards were estimated for the period 1950-2010, and increased from around 1,200 t·year⁻¹ in the 1950s to 1,500 t·year⁻¹ in the 2000s. This estimated total catch is almost 1.5 times the official landings reported by Malta and submitted to the FAO. This discrepancy between reported and estimated total catches can be explained mainly by the considerable catches of recreational fisheries which are unreported. It should be noted that some species of tuna and tuna-like fishes, but also marlins and billfishes are not considered in this study as these are being reconstructed separately by ocean basin. This study underlines the necessity to improve the Maltese fisheries statistical system by taking into account non-commercial catches, especially those taken by the recreational sector. However it has to be noted that to a certain extent the Maltese fisheries statistical system does include procedures in order to account for 'unmonitored' commercial landings, and in this respect Malta is to be commended for taking such a proactive approach to estimating what otherwise would have remained unreported catches.

INTRODUCTION

The Republic of Malta, hereon called Malta, is an archipelago located in the centre of the Mediterranean basin, which consists of 3 main inhabited islands, i.e., Malta proper, with a land area of 246 km², Gozo with 67 km² and Comino with 3 km², plus a few limestone islets and rocks (Schembri 1993; Goodwin 2002). Malta has a total area of 316 km² and is situated 96 km south of Sicily, off the east coast of Tunisia and the north coast of Libya, at a Latitude of 35°48'28" - 36°05'00" N and a Longitude of 14°11'04" - 14°34'37" E (Schembri 1993; Sultana 1998).

Malta has a shelf area (to 200 m depth) of around 7,500 km² in a theoretical Exclusive Economic Zone (EEZ) of around 55,000 km² (www.seaaroundus.org ; IUCN 2011; Sacchi 2011). As with many Mediterranean countries, Malta does not have an official EEZ (www.seaaroundus.org). However, for fishery purposes, Malta has managed, since 1971, an Exclusive Fishing Zone (EFZ) extending 25 nm from its baselines and covering a surface area of around 12,000 km². This zone was redefined in 2004 as a Fisheries Management Zone (FMZ) (Council Regulation EC 2004).

The climate is typically Mediterranean and mild, with dry and hot summers and wet winters. However, rainfall is variable from year to year (Schembri 1997). Valletta, the capital of Malta was founded in 1566 on the Sciberras peninsula, part of Malta proper (Blouet 1972). The Maltese islands have been colonized since the Neolithic (8000-3500 BC). Because of its strategic location, the history of Malta has been marked by the impacts from many civilizations: Phoenician, Greek, Roman, Kabyl, Arab, English, French etc. (Blouet 1972; Godechot 1981). A 2012 census estimated the Maltese population at 418,400 (www.worldbank.org), and more than 90% resides in Malta proper (Malta Statistics Office 2011).

Until the beginning of the 19th century, and because of the wars at that period, the economy of Malta was very developed, with cotton, tobacco and shipyard as economic pillars. The ensuing period of (relative) peace caused an economic crisis lasting until the opening of the Suez Canal in 1869. This re-established the Mediterranean basin as a major trade route, and launched an economic boom for Malta, which re-acquired a strategic position (Godechot 1981).

Independence from British colonial rule came in 1964. Independence led to another adaptation of the economy, which is now structured around the manufacturing and tourism sectors (Godechot 1981). In 2004, Malta was recognized as a full member of the European Union. Malta is endowed with limited natural resources. Thus, most food, raw materials and industrial supplies have to be imported (Government of Malta 2002). Its soils are mostly infertile and it has very limited freshwater resources (Owen 1969; Government of Malta 2002). However, the exploitation of limestone, which is abundant in Malta, plays a crucial role in the Maltese economy, especially in the building industry (Government of Malta 2002). Principally because of its climate and its cultural and historical heritage, tourism represents one of the most important economic sectors in modern-day Malta. Also important is still its strategic position in the Mediterranean basin and its excellent natural harbors (Owen 1969; Goodwin 2002; Government of Malta 2002).

Maltese fishing industry

The Maltese fisheries are principally of typical Mediterranean artisanal type i.e., multi-species and multi-gear fisheries, with fishers switching from one gear to another several times a year, according to the fishing season (European Commission 2013). Despite being an archipelago with limited terrestrial resources, fishing does not play a big role in the economy of the country, representing only 0.1% of the Gross Domestic Product (GDP) of Malta. Fisheries do not generate much income or employment (Government of Malta 2002; European Commission 2013). Historically, the sea around Malta was more important for trading than for fishing, so the fishing industry has never been significant (Blouet 1972; Goodwin 2002). Therefore, information on the fisheries of Malta is relatively sparse but Chircop (2010) suggests this is a consequence of the neglect of this sector by historians and not due to the insignificance of this sector. Indeed, fishing seems to play an important role in the culture and traditions of the Maltese population (Randon 1995).

The dolphinfish (*Coryphaena hippurus*), locally known as '*Lampuki*', is considered as the emblematic fish and have been fished at least since the Roman era. It is the most sought-after species by Maltese fishers, especially during a season devoted to this species, and which represents a cultural and festive celebration, not only for fishers but for the Maltese in general (Goodwin 2002; Department of Fisheries and Aquaculture 2013b). Furthermore, fishing contributes to the tourism industry, since high quality food and colorful traditional fishing boats represent a very important attraction for local and international tourists. Then, Maltese fishers generally seek high quality and variety of fish products (FAO 2005; Camilleri 2006). To meet the increasing demand for seafood by the inhabitants, the Maltese government imports frozen and canned fish products (FAO 2005). Actually, the *per capita* consumption of fresh fish products in Malta is estimated at a paltry 6.6 kg· year⁻¹ (European Commission 2013).

METHODS

Available data for reported landings were collected by taxon and year from the Food and Agriculture Organization (FAO) Fishstat database as well as national Maltese fishing reports. Both datasets match each other rather well, except for 1985 and for the period from 2007 to 2010. In 1985, an unexplained peak in the FAO data was noticed due to an apparent exaggerated increase of all the catch amounts of each taxon. For the period 2007-2010, the FAO data were higher than the national data, but with the same trend. We assume that this represents catches taken by Maltese boats that were landed outside of Malta. Overall, however, national data have a better taxonomic breakdown than the FAO data. Therefore, the reported data baseline used here consists of the FAO data for 2000-2010, and national data for 1950-1999.

We excluded catches of the following species from present consideration: blue fin tuna (*Thunnus thynnus*), albacore tuna (*Thunnus alalunga*), little tunny (*Euthynnus alletteratus*), tuna-like fishes, marlins/sailfishes/billfishes (Istiophoridae) including the Mediterranean spearfish, and swordfish (Xiphiidae), as catches of these large pelagic taxa are being reconstructed separately by ocean basin for the whole world.

To estimate unreported catches and discards, we used information from government sources, independent studies and surveys, local experts and grey literature, and followed the general catch reconstruction approach outlined in Zeller *et al.* (2007). In Malta, most of the commercial catch is channelled through the central fish market in Valletta, which is also the location where the fisheries statistics are collected. During the 1950s, the Department of Fisheries decided to add 25% to the monthly catch estimates based on the market survey in order to account for any landings which bypassed the main fish market, such as direct sales to hotels, restaurants and consumers, and which represent the 'unreported' component of commercial catches. In 2005, a specific sampling program was initiated within the framework of the European Fisheries data collection program (EC 1639/2001) in order to properly estimate the unreported component of commercial catches, which concluded that the previously assumed 25% add-on is indeed representative (Malta National Data Collection Program 2005-2013). Thus, notionally 'unreported' commercial catches are actually included in official reported data through the 25% add-on component.

Large-scale and small-scale fisheries

For a long time, Malta did not have a clear definition of the difference between large-scale commercial fishing (here defined as 'industrial') and small-scale commercial fishing (termed 'artisanal'). In 1995, the General Fisheries Council for the Mediterranean (GFCM), with the purpose of regional standardisation, decided to establish a minimum length limit of 15 meters for industrial vessels (de Leiva *et al.* 1998). However, following the European data collection program (EC 1639/2001, EC 93/2010) the Maltese Department of Fisheries and Aquaculture (2013a) set the minimum length limit for large-scale vessels to 12 meters, and we retained this definition. Thus, small-scale fisheries of Malta involves vessels whose length is less than 12 meters. However, in line with Martín (2012), all trawlers, irrespective of size, are considered an industrial gear. Currently, the Maltese fishing fleet is composed of 959 artisanal and 75 industrial vessels *i.e.*, for a total of 1034 fishing vessels, 93% are small scale and only 7% are large-scale (Department of Fisheries and Aquaculture 2013a).

Industrial vessels consist of trawlers and off-shore longliners, while the rest, mainly multipurpose vessel, are artisanal, including gear types such as small long-line, trammel and drift nets, traps and surround-nets (Lampara) and these boats are locally known as luzzu and kajjik (de Leiva *et al.* 1998; Coppola 1999).

The Maltese fishing fleet is also classified into full-time and part-time vessels (Dimech *et al.*, 2009). The full-time vessels, 39% of the total, are mostly operated by full-time fishers to whom fishing is the only source of livelihood and who usually own more than one vessel, *i.e.*, at least one large-scale and one small-scale vessel (de Leiva *et al.* 1998; Gruppetta 2002; Department of Fisheries and Aquaculture 2013a). This duality of vessels and fishing sectors is explained by the seasonality of fishing in Malta. Thus, having two types of vessels is a way for full-time fishers to fish off-shore (larger vessel, industrial) during the milder summer season and inshore, near the coast (smaller vessel, artisanal) during the winter season. The crew of a full-time vessel is on average 3 full-time fishers or more when the trip lasts more than two days (de Leiva *et al.* 1998, Dimech *et al.*, 2009). On the other hand, 61% of the commercial fleet is composed of part-time fishers who generally contribute less to the fishing industry (de Leiva *et al.* 1998; Gruppetta 2002; Department of Fisheries and Aquaculture 2013a).

Before 1975, large-scale commercial fishing did not really exist (Dimech 2008), thus, all of the reported landings prior to that date were treated as entirely artisanal (*i.e.*, small-scale commercial). In 1975, the

government of Malta, with the assistance of the FAO and the United Nations Development Program, introduced 5 trawlers that became active in 1976 (Rosman 1977; FAO 1978). Initially, these trawlers were not

very successful and the industrial fisheries catches represented only 1% of the annual catch in 1976, and reached 5% in 1990. However, the large-scale sector has gained momentum with the increase in the number of trawlers to 24 units by 2000. By 2009, trawlers accounted for around 72% of the total annual fish production. Conversely, the small-scale commercial (artisanal) sector accounted for the remainder of the reported data, i.e., 100% from 1950-1975, 99% in 1976, decreasing to 95% by 1990, and to 28% by 2009.

To estimate the annual catch of the large-scale and the small-scale fisheries for the period 1950-2010, an interpolation was performed between these percentages in 1976, 1990 and 2009, which we then later multiplied by the reconstructed commercial catch of each year of the study period.

Taxonomic disaggregation

To improve the taxonomic composition of the reported data as assigned to large- and small-scale commercial sectors, we utilised percentages derived from a sector-specific taxonomic breakdown made for the year 2009. The data for 2009 were taken as representative of the data collected since 2005 by Malta separately for artisanal and industrial catches. For the period 1976-1999, we assumed that the relative catch composition of the industrial sector was the same as in 2009. The small-scale components were thereafter derived by subtraction:

Thus, we consider (A) industrial catch of species *i* in 2009; (B) total industrial catch in 2009; and (C) the proportion of the catch of species *i* relative to the total industrial catch in 2009. Thus

$$C_{i,2009} = A_{i,2009}/B_{2009}$$

(D) Total industrial catch in year *n* ($1976 < n < 1999$); and (E) industrial catch of species *i* in year *n*

$$E_{i,n} = D_n * C_{i,2009}$$

(F) Total catch of species *i* in year *n*; and (G) artisanal catch of species *i* in year *n*

$$G_{i,n} = F_{i,n} - E_{i,n}$$

For the period 2000-2010, we used the artisanal/industrial split that we performed for the year 2009 for each species according to it being caught by artisanal and/or industrial fleets. Then we applied the following for each year:

(H) industrial/artisanal catch of species *ii* according to the initial split; (I) industrial/artisanal total catch according to the initial split; (J) industrial/artisanal total catch amount according to the interpolation; (H') industrial/artisanal catch of species *ii* according to the interpolation. Then:

$$H' = J/I * H$$

Recreational fisheries

Recreational fishing is well developed in Malta and is organised into different organisations and associations in different Maltese port cities, and which are part of the largest amateur fishing club in Malta “Federazzjoni Ghaqda Dilettanti tas-Sajd” (European Commission 2013). This sector can be divided into three types depending on vessel registration:

(i) The most important group includes vessels on the national fishing fleet register of the Department of Fisheries, which are registered as non-commercial. The main gear used by this class of vessels is trolling lines (Malta Centre for Fisheries Sciences 2006a).

(ii) A second group are small recreational vessels registered with the Ministry of Transport and using sport fishing gears that do not require a license. The main activities of this group are trolling, bottom fishing, swordfish fishing and other small-scale fishing ones (Malta Centre for Fisheries Sciences 2006; Department of Fisheries and Aquaculture 2013a) .

(iii) The third group consist of shore-based anglers, who do not require any registration (Malta Centre for Fisheries Sciences 2006).

In 2013, the number of recreational vessels was estimated at 1915 vessels, which represents 65% of the total fishing fleet, compared to only 37% (i.e., 833 recreational vessels) of the total fishing fleet in 2005 (Department of Fisheries and Aquaculture 2013b; European Commission 2013). In Malta, recreational catches cannot be marketed (European Commission 2013).

The reconstruction of the recreational catches is based on a pilot study report following a national fisheries data collection program launched by the Malta Centre for Fisheries Sciences in 2005 (EC 1639/2001, EC 93/2010). This study aimed to identify the activities within the recreational fishing sector and to estimate catches and effort exerted for that year (Malta Centre for Fisheries Sciences 2006). This study showed that total catches from recreational fishing were $1291 \text{ kg}\cdot\text{day}^{-1}$ in 2005, which is equivalent to $471 \text{ t}\cdot\text{year}^{-1}$. The number of recreational boats in 2005 was around 833 (European Commission 2013), which means that for 2005 the recreational catch rate was $0.566 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$.

We assumed that, in 1950, only 50 recreational boats were operating, with a vessel catch rate equivalent to twice the vessel catch rate of 2005 (i.e., $1.13 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$) to account for healthier stocks allowing higher catch rates. We also made the assumption that the number of recreational vessels increased to 150 units by 1980 and doubled by 1990 to 300 recreational vessels, the year that marked the start of a boom of recreational vessels in Malta. We interpolated the number of recreational vessels between 1950, 1980 and 1990. For all years between 1950 and 1990, we applied the vessel catch rate as in 1950 (i.e., $1.13 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$).

We then made the assumption that in 2010, the number of recreational vessels was equivalent to 60% of the number of recreational vessels in 2013 (Department of Fisheries and Aquaculture 2013b; European Commission 2013) and that the 2005 vessel catch rate of $0.566 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$ was decreasing by 5% per year after 2005. We interpolated the vessel catch rate from 1990 ($1.13 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$) to the 2005 value ($0.566 \text{ t}\cdot\text{vessel}^{-1}\cdot\text{year}^{-1}$).

We then calculated the proportion of each taxon according to their recreational catch amounts in 2005 and multiplied this proportion by the recreational catch estimated for each year. Note that there is no significant catch and release in Malta, only rarely for very small fishes and juveniles, which were here neglected.

Subsistence catches

Subsistence catches represent the small-scale non-commercial fishing sector, i.e., the amount of fish fishers retain for their own and crew/family consumption. This amount is higher in small-scale commercial fisheries than in large-scale commercial fisheries. We assumed it was equivalent to 20% of the total artisanal catch between 1950 and the mid-1970s, after which it decreased to 10% by 1979 and remained stable thereafter. The amount of subsistence catch (self- and crew-consumption) in the large-scale fishery was set as equivalent to about 1% of the landings per year and did not exist until 1976 when the trawlers began their activities.

To taxonomically assign subsistence catches, we assumed that it has the same composition as the reported commercial catches, except at the family level.

Discards

Discards in the small-scale fishery were estimated based on the European data collection framework that suggested it is equivalent to 5% of the artisanal landings per year (Malta Centre for Fisheries Sciences 2006a). The estimation of the industrial discards is based on Kelleher (2005), which lists discards of trawlers in the Mediterranean and Black Seas as averaging 45% of the total catch.

We considered three main types of discards:

Juvenile porgies (Family Sparidae, e.g., *Diplodus* spp.), wrasses (Labridae) and gobies (Gobiidae), but also small groupers (*Epinephelus* spp., *Serranus scriba*), moray eel (*Murena helena*) and damselfish (*Chromis chromis*);

Species that are not consumed, such as pelagic stingray (*Pteroplatytrygon violacea*), ocean sunfish (*Mola mola*), stingrays (*Dasyatis* spp.), devil fish (*Mobula mobular*), rabbitfish (*Chimaera monstrosa*), longspine snipefish (*Macrorhamphosus scolopax*), boarfish (*Capros aper*) and small species of the Gobidae family ; and

Species whose size is under the minimum legal landing size, such as the small-spotted catshark (*Scyliorhinus canicula*), greater forkbeard (*Phycis blennoides*), shrimps (*Pandalus* spp.), Norway lobster (*Nephrops norvegicus*), hake (*Merluccius merluccius*), blackbelly rosefish (*Helicolenus dactylopterus*), thornback ray (*Raja clavata*) and longnosed skate (*Dipturus oxyrinchus*) (Department of Fisheries and Aquaculture 2013a).

We then classified the species according to the types of gears into artisanal and/or industrial catches. The first group was all targeted by artisanal gears, while in the second, some were artisanal and others industrial. The third group concerns only the trawlers. Then, for the two first groups, we assumed the proportion of each taxon was relative to its importance in the reported landings. The estimation of the discards per year of each species was made through the multiplication of the proportion of each species by the annual artisanal or industrial discards amount. For the third group, the discards for each of the species is equivalent to 1% of its reported catch amount.

RESULTS AND DISCUSSION

The reconstructed total catch increased from around 1,280 t•year⁻¹ in 1950 (978 t reported) to a first peak of 1,900 t•year⁻¹ in 1963 (1,442 t reported), before beginning a steady but variable decline to the all-time low of 840 t•year⁻¹ in the early 1990s (417 t reported), followed by a consistent increase to an all-time peak catch of 2,200 t•year⁻¹ in 2010 (1,241 t reported; Figure 2a). Note that these data exclude all catches of large pelagic fishes, i.e., tunas and billfishes, which are dealt with in a separate reconstruction for the Mediterranean. Hence, the reconstructed total catches were 1.5 times the reported baseline data from 1950-2010.

The main components of the reconstructed catches were artisanal (small-scale commercial) landings (61%), recreational catches (18%), subsistence catches (10%), and industrial landings (6%), while discards (artisanal and industrial) accounted for around 6% of reconstructed total catches (Figure 2a). The unreported catches grew strongly after 1991, and were more or less equivalent to the landings reported by FAO on behalf of Malta over the last few decades. Unreported catches were driven almost exclusively by the growth in the recreational sector (Figure 2a). Discards, however, are also playing an increasing role in the unreported catches in the last few years, mainly due to the rapid growth in the industrial trawl fishery.

The catch composition suggested that the most caught taxon is dolphinfish (*Coryphaena hippurus*), followed by mackerels and bogue (*Boops boops*, Figure 2b). Pilot fish and octopuses were the other major taxa caught in Malta.

Our reconstruction of Malta's total catches from 1950 to 2010 combines the reported landings (industrial and artisanal) along with our best estimates of unreported recreational and subsistence catches, as well as estimates of unreported artisanal and industrial discards. It should be noted that some of these estimates may not be statistically precise, but they represent a more accurate picture of the total catch volume than omitting these components entirely (which is the default result of not reporting on existing but unmonitored components).

There are some commercial catches that could be deemed 'unreported' in the officially monitored data, i.e., fishes sold directly to hotels, restaurants and consumers and not channelled through the central fish market in Valletta, from where the fisheries statistics are collected. However, the monitoring agency (Department of Fisheries) does account for these catches through a percentage add-on to the monthly production as derived through the monitoring of the central fish market (Department of Fisheries pers. comm.). Thus, the final reported data of Malta does include a best estimate of 'unmonitored' commercial landings. Malta is to be commended for taking such a proactive approach to estimating what otherwise would have remained unreported catches.

Conclusions

The reconstructed total catches for Malta from Malta's EEZ by sector (Figure 2a) and by major taxa (Figure 2b) as derived here do include estimates of unreported catches by the Maltese fishing industry. The sectors which had the highest contribution to the total catch were artisanal landings (61%) and the recreational sector (18%), followed by subsistence catches (10%), industrial landings (6%) and discards of both industrial (3%) and artisanal sectors (3%). However, by 2010, the industrial sector represented 43% of the total catches compared to 12% for the artisanal sector. This illustrated the substantial growth of the industrial sector over the last few decades. It should be noted also that the catches of the recreational fisheries are very important. This is due to the fact that Malta is a major touristic destination, and recreational fishing is gaining a lot of popularity, also among the local population. In 2010, the catch of recreational fishers represented 23% of total catches.

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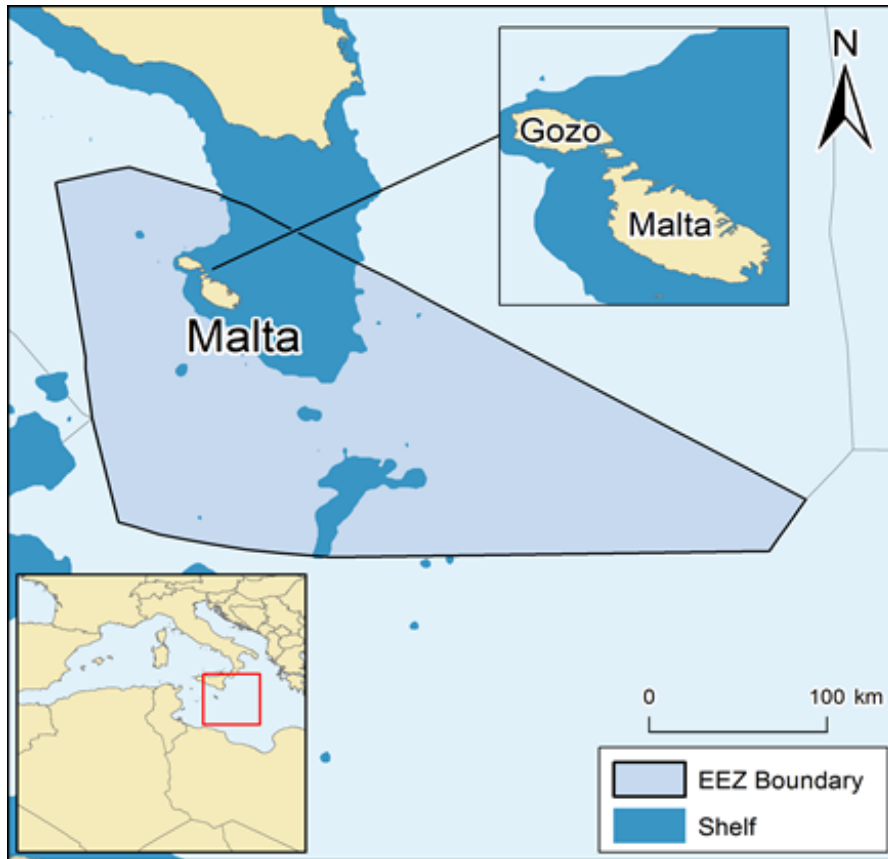


Figure 1. Map of the Republic of Malta, its shelf (to 200 m depth) and Exclusive Economic Zone-equivalent waters (EEZ), showing the major islands, Malta and Gozo, as well as the islet Comino.

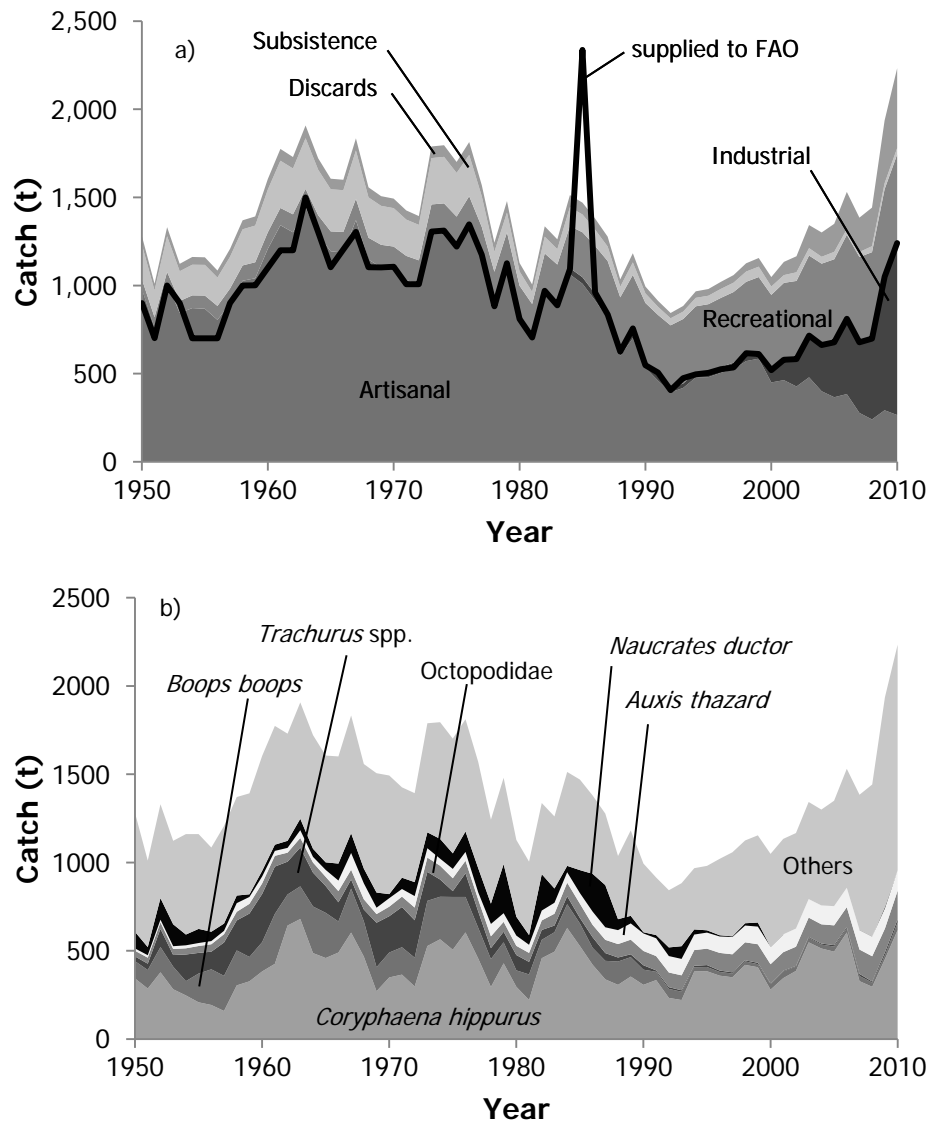


Figure 2. Reconstructed total catches for Malta by a) fisheries sector, plus discards, for 1950-2010. Landings reported by FAO on behalf of Malta are overlaid as line graph. Note that the unexplained peak of 1987 was corrected here; and b) by main taxonomic group; note the 'others' category includes 155 additional taxonomic groups (see Appendix Table 2).

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

Year	FAO landings	Reconstructed total catch	Artisanal	Industrial	Recreational	Subsistence	Discards
1950	900	1,280	978	-	57	196	49
1951	701	1,010	760	-	60	152	38
1952	1,000	1,331	1,013	-	64	203	51
1953	900	1,123	844	-	68	169	42
1954	700	1,162	872	-	72	174	44
1955	700	1,160	868	-	75	174	43
1956	700	1,085	805	-	79	161	40
1957	900	1,208	900	-	83	180	45
1958	1,000	1,370	1,027	-	87	205	51
1959	1,001	1,392	1,041	-	91	208	52
1960	1,100	1,604	1,208	-	94	242	60
1961	1,200	1,775	1,342	-	98	268	67
1962	1,200	1,729	1,302	-	102	260	65
1963	1,500	1,908	1,442	-	106	288	72
1964	1,303	1,722	1,290	-	109	258	65
1965	1,104	1,606	1,194	-	113	239	60
1966	1,204	1,600	1,187	-	117	237	59
1967	1,304	1,835	1,371	-	121	274	69
1968	1,104	1,557	1,147	-	124	229	57
1969	1,103	1,507	1,103	-	128	221	55
1970	1,106	1,493	1,089	-	132	218	54
1971	1,007	1,426	1,032	-	136	206	52
1972	1,007	1,394	1,003	-	140	201	50
1973	1,306	1,789	1,317	-	143	263	66
1974	1,312	1,796	1,319	-	147	264	66
1975	1,221	1,701	1,240	-	151	248	62
1976	1,347	1,814	1,338	14	155	234	73
1977	1,174	1,569	1,162	12	158	174	63
1978	882	1,243	902	14	162	113	52
1979	1,126	1,479	1,115	21	166	112	65
1980	810	1,128	812	17	170	81	48
1981	705	1,006	691	17	187	69	42
1982	970	1,336	952	26	204	95	59
1983	887	1,262	871	27	221	87	56
1984	1,094	1,513	1,063	36	238	107	69
1985	2,337	1,470	1,010	37	255	101	67
1986	960	1,380	915	38	272	92	63
1987	835	1,277	815	35	289	82	56
1988	625	1,035	601	27	305	60	42
1989	757	1,183	701	37	322	71	52
1990	548	994	534	28	339	54	39
1991	506	913	460	25	348	46	34
1992	406	844	394	23	357	40	30
1993	474	884	419	25	366	42	32
1994	496	967	478	29	375	48	37
1995	504	980	480	31	383	48	38
1996	525	1,021	505	33	392	51	40
1997	535	1,059	526	36	401	53	43
1998	616	1,126	571	40	410	58	47
1999	611	1,156	585	44	419	59	49
2000	520	1,048	450	70	427	47	54
2001	579	1,134	463	116	436	44	75
2002	582	1,166	427	154	445	49	91
2003	716	1,343	479	237	454	42	131
2004	662	1,301	400	262	462	39	138
2005	678	1,350	366	312	471	42	159
2006	811	1,531	384	426	478	32	211
2007	678	1,385	277	401	484	28	195
2008	699	1,442	240	459	490	34	219
2009	1,050	1,936	292	757	497	34	356
2010	1,241	2,233	265	976	503	36	453

Appendix Table A2. Reconstructed total catch (in tonnes) by major taxonomic categories for Malta, 1950-2010. 'Others' contain 155 additional taxonomic groups.

Year	<i>Coryphaena hippurus</i>	<i>Boops boops</i>	<i>Trachurus spp.</i>	Octopodidae	<i>Auxis thazard</i>	<i>Naucrates ductor</i>	Others
1950	343	98	27	32	13	94	673
1951	286	105	36	34	14	46	490
1952	378	143	103	37	15	122	532
1953	282	128	66	34	16	124	473
1954	247	81	151	35	17	61	569
1955	208	163	117	39	17	80	537
1956	193	202	100	42	18	53	477
1957	159	199	189	47	19	41	553
1958	304	198	170	49	49	43	558
1959	327	138	246	55	39	15	572
1960	383	166	273	60	39	32	651
1961	426	283	268	61	28	35	673
1962	643	176	186	51	27	40	607
1963	680	185	220	54	44	65	659
1964	487	264	192	57	32	46	644
1965	459	256	152	52	39	43	605
1966	490	176	109	63	60	96	607
1967	603	249	52	55	95	112	667
1968	467	200	67	58	90	84	592
1969	271	136	252	49	36	86	676
1970	349	141	206	54	48	23	672
1971	365	155	228	59	43	64	512
1972	298	163	212	72	65	79	504
1973	527	256	164	81	53	90	618
1974	565	241	98	78	40	112	661
1975	506	299	33	73	53	88	650
1976	604	201	134	71	50	116	636
1977	456	174	93	67	41	137	602
1978	295	158	62	67	70	115	476
1979	429	119	60	56	49	278	489
1980	296	93	87	52	58	107	435
1981	221	145	71	51	46	55	416
1982	458	104	56	54	56	206	403
1983	495	110	38	67	62	81	408
1984	629	135	45	77	59	36	532
1985	527	128	31	81	60	130	513
1986	421	96	60	70	75	214	444
1987	338	105	44	75	71	239	405
1988	307	132	23	76	79	62	358
1989	354	110	16	83	92	43	484
1990	307	86	25	81	99	7	389
1991	334	47	8	81	101	18	326
1992	233	51	10	83	93	49	324
1993	221	47	8	85	93	72	357
1994	383	24	8	89	88	29	347
1995	384	24	11	93	91	13	365
1996	359	21	8	100	93	7	433
1997	350	21	7	102	98	4	476
1998	420	20	6	102	95	13	469
1999	407	17	8	105	100	23	494
2000	280	31	4	109	99	0	526
2001	345	38	4	105	101	0	541
2002	386	24	4	109	103	0	541
2003	548	26	5	109	105	0	550
2004	513	22	6	109	107	0	543
2005	495	29	8	112	109	0	597
2006	604	24	7	112	110	0	674
2007	328	29	12	138	112	0	765
2008	296	24	6	143	113	0	860
2009	453	22	16	135	115	7	1,188
2010	617	43	18	162	116	0	1,278