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SOCIO-ECONOMIC ANALYSIS OF THE LEBANESE FISHING FLEET

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SOCIO-ECONOMIC ANALYSIS OF THE LEBANESE FISHING FLEET

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The conclusions and recommendations given in this and in other documents in the *Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean* series are those considered appropriate at the time of preparation. They may be modified in the light of further knowledge gained in subsequent stages of the Project. The designations employed and the presentation of material in this publication do not imply the expression of any opinion on the part of FAO or donors concerning the legal status of any country, territory, city or area, or concerning the determination of its frontiers or boundaries.

Preface

The Project "Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean - EastMed is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by Greece, Italy and EC.

The Eastern Mediterranean countries have for long lacked a cooperation framework as created for other areas of the Mediterranean, namely the FAO sub-regional projects AdriaMed, MedSudMed, CopeMed II and ArtFiMed. This made it more difficult for some countries in the region to participate fully in international and regional initiatives for cooperation on fishery research and management. Following the very encouraging experience of technical and institutional assistance provided to countries by the other FAO sub-regional Projects,

EastMed

was born to support the development of regional cooperation and the further development of multidisciplinary expertise necessary to formulate appropriate management measures under the FAO Code of Conduct for Responsible Fisheries and the principles of the Ecosystem Approach to Fisheries (EAF) to ensure rational, responsible and participative fisheries management.

The project's **longer-term objective** is to contribute to the sustainable management of marine fisheries in the Eastern Mediterranean, and thereby to contribute to supporting national economies and protecting the livelihoods of those involved in the fisheries sector.

The project's **immediate objective** is to support and improve the capacity of national fishery departments in the sub-region to increase their scientific and technical information base for fisheries management and to develop coordinated and participative fisheries management plans in the Eastern Mediterranean sub-region.

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ABSTRACT

This study was implemented after the EastMed 2nd co-ordination meeting on the 5-6th April, Antalya, Turkey (EastMed 2012), where the participants agreed to have a preliminary assessment of the economic situation of the Lebanese fisheries sector. In order to undertake such an assessment an economic survey based on direct interviews was conducted from March to May 2012. The study was split up into two phases. In the first phase the information on the technical characteristics of the most recent fleet was obtained. This was then followed by the second and main phase which included the socio-economic sample survey and the socio-economic analysis. The licensed fishing fleet of 2011 was stratified according to the GFCM task I fleet segmentation, after which the population of vessels was randomly sampled and direct interviews based on a questionnaire were conducted. The results showed that in general the Lebanese fishing fleet is making a profit of about 24% of the revenue which is comparable to other fleets in the Mediterranean of similar characteristics. It is a family based fishery, where the owners of the vessels, are directly involved in the fishing activity, with the assistance of family members, there is a non aging fishers' population, and a low level of education. The income per fisher-owner (7,400 USD) and fisher (3,000 USD) is 20% and 70% respectively less than the national GDP per capita, furthermore a fisher earns about 25% less than the minimum wage of the country. In this respect the fishers in Lebanon are present in both the lower-middle class (fisher-owners) and the lower class (fisher), where the latter are part of the poorest section of society. The auction market is the main channel used to sell the product, however the whole value chain should be studied in more detail. The salaries of the fishers should be increased by increasing the revenue and this can be accomplished either by increasing the prices or the quantity of production. The latter seems to be a more plausible solution and can be achieved by improving the sustainable exploitation of the stocks and exploring the possibility to exploit new fishing grounds such as the deep water grounds (> 200 m) and offshore waters for large pelagic species.

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REPORTOF THE SOCIO-ECONOMIC ANALYSIS OF THE LEBANESE FISHING FLEET

LEBANON
MARCH - MAY 2012

1. Introduction

1.1 Executive Summary

Management of the Lebanese fisheries requires a considerable amount of scientific advice which is necessary in order to manage the sector based on science and knowledge. This study tried to address that gap by analysing the current situation of the fisheries sector from the economic perspective with some basic information on the social characteristics of the fishers, mainly that of the fishing vessel owners. After having a good background of the Lebanese fisheries sector by gathering all the information available a sampling survey was conducted in order to investigate the main economic characteristics (costs and revenue) of the unit of production which is the fishing vessel. The economic data from the sample of fishing vessel was collected by interviewing the owner or skipper depending on the availability of one or the other. Taking the occasion of the interview some social characteristics were also collected. In total 389 owners/skippers were interviewed which represented 27% of the total fleet. The results show that the Lebanese fleet is clearly small scale artisanal in nature and that the number of licensed vessels in 2011 was 1,460. The most typical gears encountered are the usual passive gears, such as fixed nets, longlines and purse seiners. More than 75% of the vessels are registered in the Northern part of Lebanon which also includes Beirut.

The backbone of the sector in terms of fleet capacity, activity and employment is based the vessels from 6-12 m. All the fleet landed an estimated 4,850 t with a value of 26.98 Million USD in 2011. The fishing industry generated a net profit of 6.4 million USD, representing a profit of 24% which is comparable to other Mediterranean countries. The average price per kg of the production in Lebanon was 5.6 $/kg which is relatively high compared to the European prices (6.1 $/kg). The auction market is the most important channel for the sale of the production. The revenue of the fleet provided an annual salary of about 3,000 USD per fisher to about 3229 fishers. Considering that about 45% of the fishers are also owners their revenue also includes the net profit, which is on average 4,400 USD per vessel per year. This results in an overall gross income of 7,400 USD per fisher who is also an owner (fisher-owner). The income per fisher-owner is about 20% lower than the national GDP per capita, however a fisher which is not an owner earns about 70% less than the GDP per capita and about 45% less than the minimum wage of the country. The results shows that the fishing community in Lebanon is considerably poor, and that they don`t pay any social security for pensions. Appropriate action should be taken in order to improve the livelihood conditions of this part of society.

The social characteristics show that in general the owner of the vessel is engaged in fishing activities and that fishing in their main source of income. The average age of the skipper was 48 and that of the fishers was 35, which are both comparable to other Mediterranean countries, The fishers have a lower educational level than their children, which however have the minimum educational level as obliged by law.

FISHERY / BENEFITS	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m
Revenues (value of landings)	$$ 4.6 million	$$$$$$$ 19.3 million	$$ 2.9 million
Number of fishers employed	513	2,312	403
Annual catch for human consumption	528 tons	2,210 tons	2,112 tons
Salary per crew	$$ 3,261	$$ 3,143	$ 2,210
Annual fuel oil consumption	641,840 l	3,414,205 l	306,869 l
Catch per tonne of fuel consumed	= 0.8 t	= 0.6 t	= 6.9 t
Catch per Unit of Effort (CPUE)	9.8 Kg /day	10.2 Kg/day	206.6 Kg/day

Summary figure showing some of the main results of the survey

The study suggests several ways on how the salary of the fishers could be increase in Lebanon, both from the social, economic and the efficient harvesting of the resources. The suggestions include to explore the possibility to support the fishers through social security contributions, to increase the added value of the product; to increasing the quantity of production by adjusting the fishing effort in order to fish at the Maximum Sustainable Yield (MSY) or one of its proxies, to test the possibility to use Fish Aggregating Devices (FADs) and to explore the possibility to shift part of the fleet to new fishing grounds, in deeper and offshore waters.

Future studies could be conducted on a regular basis in order to have a more sound economic performance analysis, since this would allow the comparison of the economic indicators through time, with the possibility to run a bio-economic model which would provide information on the sustainability of the fishery. One also needs to address the question to why do fishers continue to be involved in this sector and not move to other sectors with better income? Furthermore in order to have a better picture of the market dynamics and the whole value chain a specific survey should be conducted. All this information is essential if Lebanon intends to improve the management of the Lebanese fishing industry in line with the FAO code of conduct for responsible fisheries.

1.2 Overview

The purpose of this study is to give a first insight into the socio-economic situation of Lebanese fishing fleet. This study was implemented after the EastMed 2nd co-ordination meeting on the 5-6th April, Antalya, Turkey (EastMed 2012), where the participants agreed to have a preliminary assessment of the economic situation of the Lebanese fisheries sector. In order to undertake such an assessment an economic survey based on direct interviews with the fishers was conducted from March to May 2012.

One problem that the management of the fisheries sector in Lebanon faces is the lack of concrete fishing fleet data. In this respect before conducting the study the authors recognised the need to obtain the officially licensed fleet which could carry out fishing activities. This was necessary so that the population of fishing vessels could be defined since without a definition of the fishing fleet or population of fishing vessels, a sampling survey could not be implemented. Hence the study was split into two phases, the first phase in which the information on the most recent fleet was obtained. This was then followed by the second and main phase which included the socio-economic sample survey.

For the first phase the population of vessels was derived from the licensing system in Lebanon, however at the start of the study the fishing licenses in Lebanon were not in electronic format but only available on hard copy. First the reference year was decided to be 2011 after which the existing licenses for 2011 were entered into a database so that the population of fishing vessels was available in order to undertake the socio-economic survey.

During the second and main phase a sampling plan was implemented in order to achieve the estimation of all the socio-economic variables for fleet segments according to the GFCM Task I fleet segmentation. The technique of stratified random sampling without replacement was used with direct interviews based on a questionnaire.

From the survey, it was possible to calculate socio-economic indicators which were then compared between fleet segments and with values of other countries. It was possible to give a general overview of the socio-economic situation of the sector, to point out the main problems, and to propose any solutions. The evaluation of these indicators can also be used to give management advice to the Ministry in order to improve the socio-economic conditions of people involved in fisheries.

The results, acquired knowledge and experience during this survey, could also be used in future socio-economic data collection surveys and served as a general capacity building exercise in data collection for the country.

1.3 Agriculture and fisheries' socio-economic context in Lebanon

Lebanon is a small (10,452 km^2) upper-middle income country, with a GDP per capita of USD 9,904 (World Bank; see table 1). Its population is estimated at 4-4.6 million, of which 88 percent is urban (FAO 2006). The average family size is 4.8 individuals, with significant regional and social disparity, and 11 percent of the families having more than eight members. About one-half of the population is concentrated in Beirut and its suburb. The rest of the population is distributed in the five other districts.

Table 1. Socio-economic indicators. Lebanon (Source: Author based on The World Bank; UNDP; IDAL; UNFPA PDS Programme)

Characteristics	**2011**
Total population	4.259 millions
Median age	30.4 years
Total labour force (TLF)	1.481 million
Income level	Upper middle income
GDP per capita (USD)	9,904
Agriculture as % of GDP	6.24 %
Official minimum wage per month (USD)	330
Average household size	4.27

Table 2 shows the main socio-economic characteristics of the Mediterranean countries, and one can notice that the basin is characterized in demographic terms by a large population in many of the countries from both its northern and southern shores and a high urban population rate. Lebanon ranks 12 out of 21 in the Mediterranean in terms of GDP.

In the table the Human Development Index (HDI) is reported which was introduced as an alternative indicator to conventional measures of national development, such as level of income and the rate of economic growth. The HDI represents a push for a broader definition of well-being and provides a composite measure of three basic dimensions of human development: health, education and income. Lebanon's HDI is 0.739, which gives the country a rank of 71 out of 187 countries with comparable data, and 12 out of 21 in the Mediterranean, and just below average. The HDI of Arab States as a region increased from 0.444 in 1980 to 0.641 today, placing Lebanon above the regional average.

The socio-demographic context is marked by important and interconnected phenomena such as rapid urbanization, mass emigration to foreign countries, a large number of immigrant workers and the Palestinian refugees whom the latter live in 12 refugee camps throughout the country. Before the turmoil that happened in the country during these last 5 years, Lebanon was still struggling to recover from about two decades of devastating civil war (1975-1990) and Israeli occupation (1977-2000). As a result of the 15-year civil war, the country's infrastructure and the physical assets of all principal sectors were destroyed or severely damaged; the administration and public institutions were severely affected; a quarter of the population was displaced; and one-fifth left the country, mainly professionals and skilled workers looking for better opportunities. For all those reasons, the income level in 1991 was one-third of what it was in 1975.

Lebanon is characterized by a service-oriented economy with a weak agriculture sector. During the 1990's the predominant position of the services sector in the economy was accentuated. Between 1994 and 2004, the contribution of this sector increased from 61 to 72 percent of the GDP. Major sub-sectors are commerce, tourism and financial services. The industry and manufacturing sector account for 21 percent of the GDP. The great majority of the industrial enterprises are of small and medium size and, according to a 1998 industrial survey the food industry is the most important component (23 percent of the industrial enterprises, and almost 26 percent of the total industrial output).

Table 2. Socio-economic indicators, 2011. Mediterranean area (Source: Author based on The World Bank; UNDP)

COUNTRY	Population (millions)	GDP (billion USD)	GDP per Capita (USD)	Agriculture as % of GDP	HDI
ALBANIA	3.2	12.9	4,029.7	20	0.739
ALGERIA	35.9	188.7	5,244.0	7	0.696
BOSNIA HERZEGOVINA	3.7	19.1	4,820.0	9	0.733
CROATIA	4.4	63.9	14,488.3	5	0.796
CYPRUS	1.1	24.7	30,670.3	2 (2008)	0.840
EGYPT	82.5	229.5	2,780.9	14	0.644
FRANCE	65.4	2,773.0	42,377.4	2 (2009)	0.884
GREECE	11.3	298.7	26,427.2		0.861
ISRAEL	7.8	242.9	31,282.3		0.888
ITALY	60.8	2,195.0	36,115.7	2 (2010)	0.874
LEBANON	4.3	42.2	9,904.0	6	0.739
LIBYA	6.4	62.4 (2009)	5,330.8	2 (2008)	0.760
MALTA	0.419	8.9	21210.0	2 (2010)	0.832
MONTENEGRO	0.632	4.5	7,197.1	10	0.771
MOROCCO	32.3	100.2	3,053.5	15	0.582
SLOVENIA	2.1	49.5	24,141.9	2 (2010)	0.884
SPAIN	46.2	1,491.0	32,244.2	3	0.878
SYRIA	20.8	59.2 (2010)	2,892.8 (2010)	23 (2009)	0.632
TUNISIA	10.7	45.9	4,296.9	8	0.698
TURKEY	73.6	773.1	10,498.3	9	0.699
WEST BANK & GAZA STRIP	3.9 (2010)	5.7	1,924 (West Bank) 876 (Gaza)	5	0.641
TOTAL	**477.451**	**8,691.0**			

In this context, the agriculture and fisheries production sector play a minor role in the economy. In 2011, it contributed to about 6 percent of the GDP (World Bank), meeting an estimated 30 % of the domestic food demand and it has been constant in the past ten years (Fig 1). Marine capture fisheries compromise about 0.06 % of GDP (this study). Agriculture employed a small part of the labour force, which most of them not being Lebanese. However, regional variations are important: in the Bekaa and in south Lebanon agriculture remains the principal activity for an important segment of the population, while fisheries is more important in the Northern part of the country especially in Tripoli.

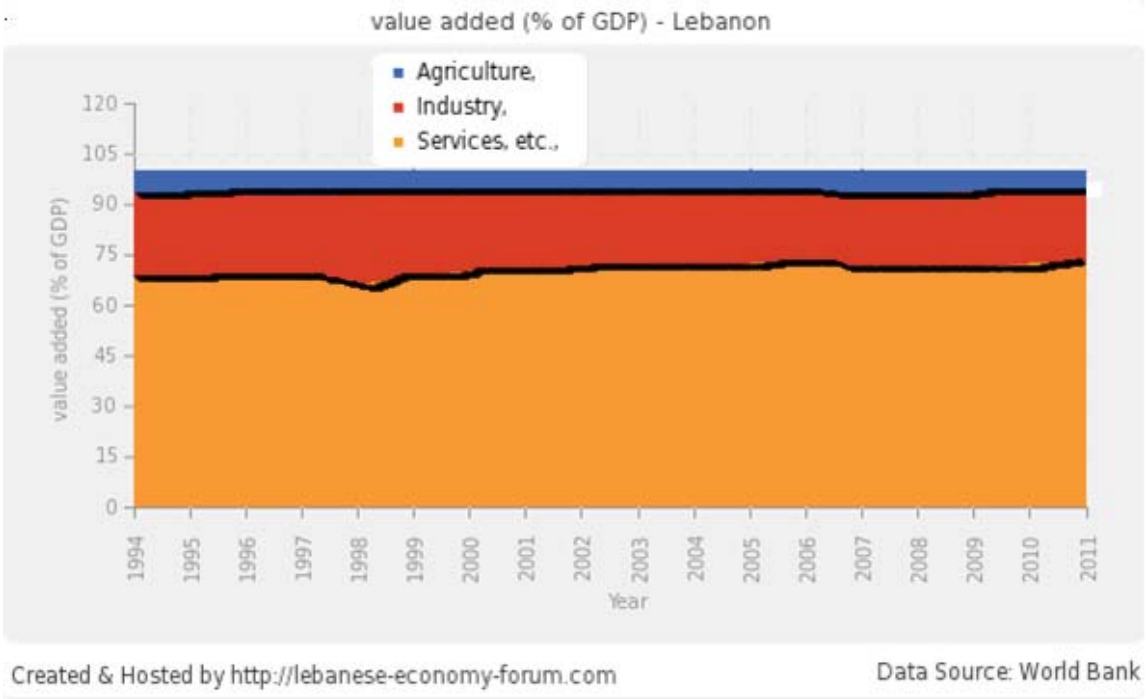


Fig 1. Value added as % of GDP from 1994-2011 in Lebanon (World Bank)

The fishing community suffered enormously from the effect of the July war in 2006, both directly as a result of hostile action and indirectly from loss of income caused by the conflict and its after effects. The fishing port of Ouzaii in south Beirut was attacked with missiles and 328 boats, their gears, and infrastructure were destroyed. The auction hall and all other buildings were also demolished. In the north of the country the fishermen's cooperative in the port of Aabde was damaged during an attack on a military observation post immediately behind the port. The Jiyyeh power plant fuel depots on the coast south of Beirut was attacked in 2006, releasing over 15,000 tonne of fuel oil into the sea, which led to a two-week fire while the released fuel oil, which ultimately stretched to 200 km, was being carried north by prevailing winds and currents. The coastline over this distance was exposed to fuel oil contamination as remnants of burnt fuel and the heavier fractions either hit the coast or sank in a 500 m strip while the lighter fractions continued north. Some areas around Beirut and immediately to the north were particularly heavily impacted, blocking harbours and fouling vessels and gear as well as mooring lines. The pollution was reported to be extended even to Tripoli and up to Syria. The oil also made the fishing vessels inoperable as the floating oil blocked cooling water intakes resulting in engine damage. These direct effects caused economic losses due to the need for replacement of fishing gear and cleaning of boats. Due to the lack of economic data in fisheries sector before and after the war, a precise estimation of these losses was not done.

The associated indirect impact of the need to clean harbours and shorelines and the possible longer term environmental damage was felt for a long time. The indirect impact of the war is much more serious than the immediate damage. It ranges from loss of income to present and future difficulties in marketing their products. The outbreak of war meant that fishing was not possible either during the conflict or during the economic air and sea blockade. The follow on effect was loss of income for those involved in fish marketing, specialized fish restaurants and a range of people providing services to the fishing industry. In addition, the nature of fishing operations meant that a considerable quantity of fishing gear was set at the time when the war broke out. It was not possible to recover this gear and it was lost. Just as it became possible to resume fishing, it became apparent that there was growing resistance to fish consumption from Lebanese consumers because of perceived food safety related to the oil pollution.

1.4 The Lebanese fishing fleet

The Lebanese fishing fleet is composed of small scale artisanal vessels less than 12 m in length and typical of many Mediterranean countries (Brême., 2004; Majdalani., 2004; Carpentieri & Colloca., 2005; Majdalani., 2005; Martin *et al*., 2006; Lelli *et al*., 2006; PescaMed., 2011; Sacchi & Dimech., 2011).

According to Majdalani (2004), in 2002, in Lebanon there were 2,662 registered fishing vessels. The licensing system in Lebanon works in such a way that a fishing vessel is registered with the Ministry of Public Works and Transport, after which when a vessel intends to carryout fishing activities, a fishing licence is issued from the Ministry of Agriculture. The fishing licence is issued once a vessel exits a port during the first time in a particular year, in order to conduct fishing activities. This means that the licence is issued once per year. If the vessel intends to carry out fishing activities in the following year, the Ministry of Agriculture issues a new licence for the particular year when the vessel exits port for the first time during that year. In this respect during 2003 out of the 2,662 vessels registered with the Ministry of Public Works and Transport, 1,948 vessels were given a fishing licence by the Ministry of Agriculture (Majdalani 2004), which in effect was the officially licensed active Lebanese fishing fleet in 2003.

In 2004 the Ministry of Agriculture with the support of the FAO Medfisis project conducted a census of the Lebanese fishing vessels. One of the objectives of the census was to determine the total amount of vessels which could potentially conduct fishing activities. The results of the census confirmed the 2003 data, showing that the fishing fleet was made up of 2,662 operational fishing vessels along Lebanese coast. The average gross tonnage of the boats and the average power were 2.52 t (Majdalani, 2005) and 22.68 hp respectively, with 71% of the vessels having an engine power less than 30 hp (Majdalani, 2005). The bulk of the traditional fleet is constructed of wood (78%). Most of the vessels (92%) are motorized, usually with inboard diesel engines of 20 to 50 hp (often a truck engine).

Since 2004 there has not been any update on the population of vessels of the Lebanese fishing fleet, neither in the form of a census nor in an updated figure of the number of fishing licences issued by the Ministry of Agriculture. For the latter Majdalani 2004 highlights the problems in obtaining computerised information on the fishing licences which are issued every year as difficult, time consuming and a poor cost/benefit exercise.

In this respect the latest computerised information that exists was the census conducted in 2004. However with the support of the EastMed project in 2012 and 2013 a web based licensing system is being developed for Lebanon so that licences could be updated regularly by electronic means and the data of every year could be stored and used for future use.

1.4 The fishing gears and equipment

The fishing techniques are mostly based on passive gears such as gillnets, trammel nets, longlines, purse seine nets and lampara nets (Sacchi & Dimech 2011). Fishing operations, with the exception of longlines, are mostly carried out at depths of up to 50 m. Most of the gillnets and trammel nets have small mesh sizes. These gillnets represented more than 50 % of the fishing gears used in most part of Lebanese fishing harbours (e.g. Sour, Saïda, Ouzaii, Dora, Qalamoun, Tripoli, Aabdeh).

The different gillnets are classified (Brême, 2004; Lelli, 2006) into 3 main categories; small meshes from 26 to 36 mm stretched meshes, middle size gillnet with stretched meshes from 48 to 120 mm and large meshes gillnets with 140 to 180 mm stretched mesh.

With respect to the fishing gears and their technical characteristics there are very limited number of gear regulations and restrictions in the Lebanese fisheries legislation. The legislation concerns the size of the gear and the mesh and the practices of bottom trawling, static and surface nets and surrounding gears for small pelagic fishes.

Only few vessels have a Global Positioning System (GPS), while the rest have very limited navigational or safety equipment, with 20% of the vessels having small electronic fish finders (Majdalani 2004; Sacchi & Dimech 2011). Although the construction of the vessels is quite good, they are not built to face rough seas, fish in offshore waters and are not equipped to keep the catch in good conditions, for example they lack facilities for ice packaging (Sacchi & Dimech 2011). The fleet is built almost exclusively for small scale and inshore activity, with some vessels equipped with old low quality echo sounders to detect fish. Their net winches are not fitted to haul gillnets deeper than 50 m, without the risk of damage or loss of the gear (Sacchi & Dimech 2011).

1.5 The production

The marine capture fisheries production in Lebanon in the last 10 years was around 3,500 tons per year (table 3). The data was derived from the FAO Fisheries and Aquaculture Department. From 2006 onwards the production has remained constant at 3,541 tons, but this is due to the fact that Lebanon has stopped sending data to FAO. Hence this data series does not give a true picture of the Lebanese fisheries production, since it is extremely unlikely that the fisheries production has been constant for at least 5 years.

Table 3. Marine fisheries production in Lebanon, with official source from the FAO Fisheries and Aquaculture Department.

Source	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
FAO Fisheries Department	3650	3673	3613	3601	3523	3541	3541	3541	3541	3541	3541

This data series also shows that there is an inefficient data collection system for landing data. In Lebanon no catch assessment surveys were conducted for the past 30 years which cover the entire coast of Lebanon. This is a major shortfall in estimating the fisheries production. This was also noted by Sacchi & Dimech 2011 in that all the information about nature of the catch is based on sporadic observations.

However since 2006 a data collection system has been undertaken and is currently ongoing, by the University of Balamand in the Northern part of Lebanon. During this data collection catch (annual landings) and effort (fleet data and days at sea) disaggregated by gear in North Lebanon are being collected. The data shows that the most important commercial species in Lebanese waters are *Spicara* sp. (probably *Spicara maena*), red Pandora (*Pagrus* spp.), bogue (*Boops boops*) and the small carangid *Caranx crysos* (EastMed 2011). The Northern part of Lebanon compromises the main fishing port of Tripoli, which harbours 38.7% of the fishing vessels and accounts for 38% of the total production (Majdalani 2004).

1.6 Status of the stocks

In the Mediterranean catches have decreased by 15% since 2007 (FAO 2012). In general, the Mediterranean and Black Sea had 33 percent of assessed stocks fully exploited, 50 percent overexploited, and the remaining 17 percent non-fully exploited in 2009 (FAO 2012). All hake (*Merluccius merluccius*) and red mullet (*Mullus barbatus*) stocks are considered overexploited, as are probably also the main stocks of sole and most seabreams. The main stocks of small pelagic fish (sardine and anchovy) are assessed as either fully exploited or overexploited.

For the stocks exploited by Lebanon, formal stock assessments have not been conducted. The only available literature in Lebanon are publications on the fisheries biology of some of the species, and the few studies who described the state of the stocks only do so marginally. The most important study done so far (Bariche *et al*., 2006) is on the small pelagic fishery, which constitutes two thirds of the Lebanese landings. This fishery is based on 4 main species including *Engraulis encrasicolus*, *Sardina pilchardus*, *Sardinella aurita* and *Scomber japonicus*. Bariche *et al*., 2006 concluded that most of the landed fishes were juveniles and the length frequency distributions showed that the dominant sizes ranged between 6 and 8 cm total length with the harvested fish smaller than the minimum size fished in neighbouring Mediterranean countries. The study concluded that the Lebanese purse seine fishery targets 0 age-class juvenile of many fishes in the nurseries, which is against sustainable fishing practices and has a potential impact on pelagic fish communities in the eastern Mediterranean.

A recent study (Sacchi & Dimech., 2011) has also highlighted the presence of juvenile fish in the landings and that most of the fishing gears use small mesh and hook sizes which target juvenile fish. Due to the excessive employment of small mesh size and the restricted fishing area to 6 nautical miles from the coast the presence of small sized fishes and juveniles is a common phenomenon in the catch. This could be a signal of growth overexploitation, however the status of the stocks should be properly determined by a stock assessment.

The fishing practices targeting juvenile fishes are partially driven by the market since it favours the smallest fishes, which are consumed whole and without gutting far (Bariche *et al*., 2006; Sacchi & Dimech., 2011).

Furthermore all the effort of the fleet is concentrated within the 6 nautical miles with higher percentage within the 3 nautical miles. This has lead to a high fishing pressure on the coastal fisheries resources within the 3 and 6 nautical miles (Bariche *et al*., 2006; Sacchi & Dimech., 2011; Colloca & Lelli 2012).

The status of the fish stocks beyond the 6 nautical miles is not known, but they can be considered as virgin stocks since fishing does not take place beyond the 6 nautical miles, due to two main reasons. It is illegal in Lebanon to fish beyond the 6 nautical mile limit, and this is heavily controlled by the Lebanese army and the fishing vessels are not equipped to fish beyond the 6 nautical miles (Sacchi & Dimech., 2011).

However a recent study was conducted in order to have a preliminary idea of the situation of stocks beyond the 6 nautical miles. Colloca & Lelli 2012 started to evaluate the potentiality of offshore fishing grounds for local artisanal fishery, in which a short survey was carried out in the area between Tyre and Naqoura (South Lebanon), using both monofilament gillnets to target hake (*Merluccius merluccius*) and Spanish traps designed to catch the striped soldier shrimp (*Plesionika edwardsii*). In the offshore sampling stations, hake was the most abundant species in the catch with CPUE up to 6.6 kg/km net day. Hake specimens ranged between 25.5 and 57.5 cm with a high occurrence of mature females. The traps for the soldier shrimps returned mean CPUEs of 210-310 g/trap/day, which is higher than those obtained in other parts

of the Mediterranean. The results of the survey, even if preliminary, showed the occurrence of potentially exploitable resources on the Lebanese upper slope. However further surveys are required to gather quantitative data on the spatio-temporal distribution of hake and striped soldier shrimp offshore the Lebanese coasts and to identify the most suitable fishing periods and areas. One must take the results of this study with care since the number of stations conducted is too low, and many more replicate stations spread throughout the Lebanese waters must be conducted in order to have an accurate estimation of the resources. Nonetheless the insights obtained during the study shows that fisheries resources exist in deeper waters. In 2012 and 2013 these surveys are currently being continued and extended to the whole Lebanese coast by the Centre for National Research (CNRS), in Lebanon.

Both the studies of Sacchi & Dimech 2011 and Colloca & Lelli 2012, suggest to shift part of the fishing pressure from coastal waters to offshore deeper waters and beyond the 6 nautical miles, in order to reduce the fishing pressure on the coastal stocks and redistribute it onto the deep water stocks.

1.7 Trade import, export, per capita consumption

According to figures published by the Lebanese customs administration combined with the figures produced by this study, Lebanon imports 78% of the consumed seafood products (table 4). The export versus import is negligible (about 0.4%), which means that the domestic production accounts for about 22% of the seafood products consumed in the country, makes the country highly dependent on the import. The average value of the seafood import was 4.2 $/Kg, while the average value of the animal products in general was 3.0 $/Kg.

Table 4. The imported and exported seafood product for the 2011 Source: The Lebanese Customs Administration

	IMPORT			**EXPORT**		
	1000 $	**m LBP**	**Ton**	**1000 $**	**m LBP**	**Ton**
Fish - fresh or processed	64,800	97,719	17,607	1,104	1,664	82
Crustacean - fresh or processed	16,370	24,686	1,923	48	72	6
Molluscs - fresh or processed	2,675	4,034	570	10	16	2
TOTAL	83,845	126,439	20,100	1,162	1,752	90

Taking into consideration these figures and combining them with the estimated landings data and the total population from this study, the apparent per capita seafood consumption in 2011 was 6.03 Kg, which is about one third of the average figure for the Mediterranean in 2005.

Table 5. The apparent per capita seafood consumption in the Mediterranean area (Source: FAO food balance sheet).

Country Group	**Year**	**Kg per capita**
EU Mediterranean countries	2005	32.0
Non EU Mediterranean countries	2005	10.9
Total Mediterraneancountries	2005	18.4
World	2005	16.4
Lebanon	2011	6.03

The figure below shows the domestic supply of seafood product in 2011 in Lebanon. The flow leads to the apparent seafood per capita consumption.

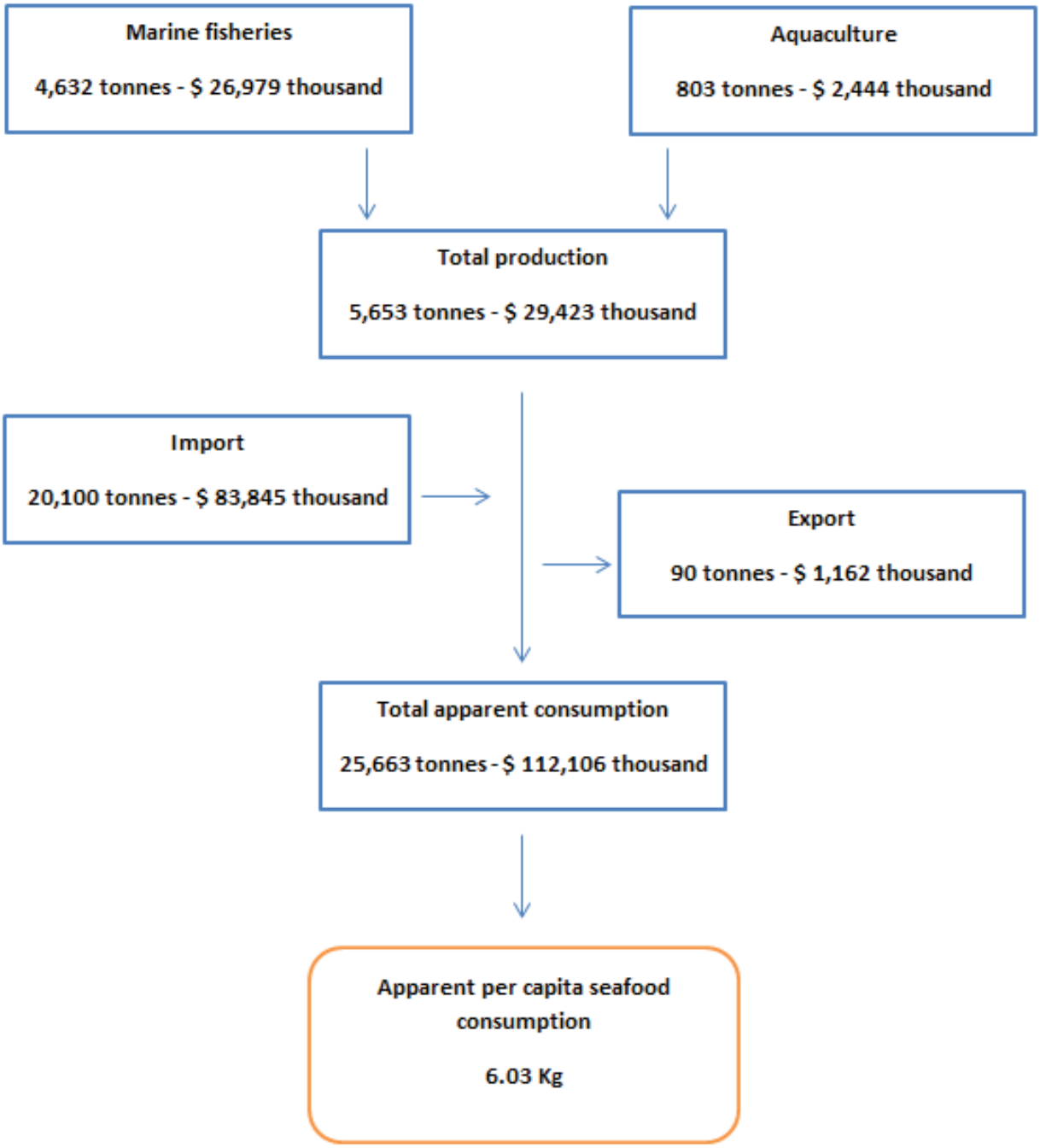


Fig 2. Flow of the avilability of seafood products in Lebanon in 2011 from the marine fisheres, aquaculture, imports, exports, leading also to the apparaent per capita consumption (Source: Author based on the Lebanese Customs Administration, The World Bank and the present study).

1.8 Fish marketing

Accordingly to DFW (2010), the local cooperatives of fishermen are responsible, in part, for the marketing of the fish. The most part of landing sites have at least one local cooperative. At major landing sites, fish are being marketed by auctions. The government has no involvement in setting up the fish auction markets and does not interfere in setting the price during the auction process. The government only supports the infrastructure of the harbours (Majdalani 2004; PescaMed 2011).

The fish production is marketed, besides auctions, on port stalls, by licensed and/or unlicensed shops and fish stalls, directly by fishermen, as well as by street vendors. There is no data on fish processing, however some small containers with ice are used for fish preservation. (DFW, 2010).

In 2005 there were fish halls for sorting, packing, selling and icing fish at 16 port/landing sites along the Lebanese coast. There were fish auctions at the ports of Dora, Ouzaii, Saida, Tripoli and Sour. With respect to cold storage facilities, seven fish halls were equipped with chill rooms/refrigerators and twelve with ice (PescaMed 2011). The ice was mainly present as crushed, being ready made from commercial suppliers. No fish hall had iceboxes for sale to fishermen, processors, and households, thus, fishermen had to resort to buy such items from local vendors. Only the ports of Qalamoun, Saida, and Naqoura Ports were equipped with ice crusher machines (Majdalani 2004; PescaMed2011).

1.9 Employment and fisher's organizations

It was estimated that in the mid 1990s there were around 4000 traditional small-scale fishermen distributed all over the Lebanese coast (PescaMed 2011). Data on full-time and part-time fishers are not available. The 2004/2005 census showed that there are a minimum of 4,475 fishermen operating in the fishing fleet; while the usual number is 6,480. This number increases to 9,575 fishermen during peak season (Majdalani 2005).

The average annual income of the fishermen, in 1998, was equivalent to US $800 (PescaMed 2011). These fishermen are difficulties with access to loans and credits, therefore they prefer to rely on the fish sellers for their loans and credits (PescaMed 2011). Fishing supports about 30,000 fishermen (IUCN/Green Line, 2006). This figure seems extremely high, but could include the families of the fishermen.

Practically (99.9%) of all the fishermen are Lebanese and 86% having a fishermen's license. Fifty percent of the fishermen are less than 45 years old. About 79% of vessels only have one owner and 80 % of the owners are operators (Majdalani 2005).

The average manpower engaged during the fishing operations is of the order of 6,500 commercial fishermen. The fishing community is organized into 29 cooperatives and 5 syndicates, but cooperative membership covers only some 43% of those involved in the industry. Most of the cooperatives are based in their respective port, however with more than one cooperative in some of the larger cities (Majdalani 2005). The greatest part of the fishers is found in the northern region of Lebanon, mostly due to the larger continental shelf and hence larger available fishing grounds. There is neither a contract of employment in Lebanon nor any social security cover, which could protect them in case of disability, loss of employment and retirement. Salaries are generally low, with approximately 20,000 LL (ca. 13 USD) per day and per crewman for a crew of three men and one captain and mostly depending on the fish prices (PescaMed 2011).

2. Materials and Methods

2.1 Fishing fleet data for 2011

The socio-economic survey was conducted on 2011 as the reference year. The population was defined as the licensed Lebanese fishing fleet in 2011. In this respect the authors first needed to gather the data on the licensed fishing fleet in 2011.

This was essential since the fleet data was required so that the stratification and sample size could be determined. Some parameters were required in order to estimate some socio-economic variables, for example age of the vessel in order to estimate the depreciation costs. The details on how the socio-economic parameters were calculated are explained further in sections 2.2.3 and 2.3.1.

The data on the licensed vessels for 2011 existed in hard copy only. The copies consisted of carbon copy sheets which were stored in the port offices of the Ministry of Agriculture. In this respect in January/February 2012 the copies of the licenses were gathered and collected in the central office of the Ministry of Agriculture in Beirut. A simple Excel sheet was prepared in which the data in the copies of the licenses could be entered. The Excel sheet was prepared in such a way as to have the necessary information to have the population of fishing vessels and other information that was necessary to conduct the interview, such as owners name, and fisherman's ID. The following information was gathered from the licence and entered in the excel template:

i) Vessel name
ii) Vessel registration number
iii) Net Tonnage (NT)
iv) Length overall (LOA)
v) Width
vi) Depth
vii) Engine make
viii) Horse power (hp)
ix) Owner's name
x) Skipper
xi) Skipper residence place
xii) Fisherman`s ID
xiii) Crew number
xiv) Fishing gears

With respect to the fishing gears, the licence is given for the fishing vessel and the gears with witch the vessels can fish. It was assumed that the first gear listed in the license was the main gear of the vessel. This assumption was taken after consultation with some fishermen in several ports, which pointed out that they list their main fishing gear first in the licence and then list the other gears without any preference. All the vessels belonging to the fleet are motorized, either with inboard or outboard engine.

Another assumption which was taken was that all the fishing fleet was motorized, either with inboard or outboard engines. This was necessary since not all of the vessels registered the engine on the license.

2.1.1 Quality check and stratification of the fleet

The license data was first checked for errors in order to improve its quality. Duplicate records and ones with missing fields were deleted.

The fleet data was then compared to the data gathered by the FAO MedFisis project and the Lebanese fleet data from the Ministry of Public Works and Transport. This was done in order to gather information which was not in the licence, including year of construction and GT of the vessel.

These fields were then added to the licence data in order to have the complete data necessary for the sampling survey and subsequent data analysis.

The fishing fleet was classified and stratified according to the GFCM task I fleet segmentation. The minimum geographical disaggregation level was decided to be the entire coast of Lebanon, which means that only one geographical stratum would be present. The next disaggregation criterion was based on the technical and dimensional characteristic of the vessels, which was basically the GFCM fleet segmentation. Finally only three strata were identified which included minor gear with engine < 6 m, minor gear with engine 6 – 12 m, and purse seine 6 – 12 m.

A small number of vessels, which were greater than 12 m, but less than 16 m, were clustered with the minor gear with engine 6 – 12 m when their main gear was not purse seine, and with purse seine 6 – 12 m, when their main gear was purse seine (table 6). Purse seine vessels which were less than 6 m were also clustered with the segment purse seine 6 – 12 m.

Table 6. Shows the fleet segments together with the number of vessels per segment, including the vessels which were clustered.

Fleet segment	LOA Class	No. Vessels		Final fleet segment
Minor gear with engine < 6 m	<6	355		Minor gear with engine < 6 m
Minor gear with engine < - 12 m	>=6 <12 >=12 <24	21 1024	Clustered	Minor gear with engine < - 12 m
Purse Seine 12 - 24 m	>=12 <24	9	Clustered	Purse Seine 6 - 12 m
Purse Seine 6 - 12 m	<6 >=6 <12	6 45		
Total fleet		1460		

Apart from the GFCM Fleet segmentation and based on the main gear, each vessel was classified according to the GFCM Task 1 Statistical Matrix[1].

[1] RECOMMENDATION GFCM/33/2009/3, ANNEX 3

2.2 Sample survey

2.2.1. Sampling design

The sampling survey involves the collection of data from a sample of the target population rather than all individuals in the target population. The key advantage of the sample survey is that less data need to be collected and analysed. The method is therefore more cost effective compared to the census, were the data from all the individuals of the target population are collected.

The multivariate sampling survey for the collection of socio-economic data was done to estimate the socio-economic variables. The sampling unit was the single licensed fishing vessel and this unit was selected from the licensed fishing fleet data collected during the first part of this study, with the reference year being 2011. The technique of stratified random sampling without replacement (Sabatella E., & Franquesa R., 2003) was used whereby the sample size was selected randomly from the stratified total population. Sampling was stratified due to the fact that the fishing vessels of the fleet are divided into homogenous groups or segments based on suitable variables and independent samples are then taken from each of these segments. Following this process, each sampling unit was chosen, such that each sampling unit has the same probability of being chosen during the sampling process and avoiding the possibility to be chosen more than once. The sample was randomly chosen from the stratified population of fishing vessel (table 7), which was derived from the licenses data.

Table 7. Fleet and number of vessel per strata

Segment	Length classes	No. Vessels
Minor gear with engine	< 6 m	355
Minor gear with engine	6 - 12 m	1,045
Purse Seine	6 - 12 m	60
Total fleet		1,460

The sample size was determined in order to have a large sample and that to minimize as much as possible the variance. This was the first survey carried out in Lebanon so the appropriate sample size could not be determined *a priori*. The planned coverage rate was about 30 %, for the segments minor gear with engine and 50% for the purse seiners since the population was very low (60 vessels). This yielded a total sample size of 457 vessels, constituting overall 31 % of the fleet (table 8).

Table 8. Sampling – planned sample and coverage rate

Segment	Length classes	No. Vessels	Planned Coverage rate (%)	Planned sample
Minor gear with engine	< 6 m	355	30	107
Minor gear with engine	< - 12 m	1,045	31	320
Purse Seine	6 - 12 m	60	50	30
Total fleet		1,460	31	457

Table 9. Number of sample per port

Port	No. Vessels	Minor gear with engine < 6 m	Minor gear with engine 6 < - 12 m	Purse Seine 6 - 12 m	Tot sample (No. Vessels)
BEIRUT	347	55	48	1	104
CHEKKA	10		4		4
JBEIL	57	5	8		13
JOUNIEH	93	9	19		28
SAIDA	271	17	66	13	96
SOUR	71		18		18
TRIPOLI	611	21	157	16	194
Total fleet	1,460	107	320	30	457

2.2.2. Questionnaire survey and training course

The questionnaire was designed to evaluate the socio-economic circumstances (costs and revenue) and activity of fishing vessels. The selected vessels were surveyed by means of direct interviews in April/May 2012. Technical data on the fleet, such as vessel length, weight and power, age, and demographic data on vessel owners were obtained from the licensing database, the fleet database of the Ministry of Public Works and Transport and the MedFisis data (Majdalani 2005).

In order to undertake the questionnaire survey, a training course over two days was held in Beirut, which was attended by officers from the Department of Fisheries and Wildlife, within the Ministry of Agriculture and data collectors of the same authority from several port offices. The EastMed National Focal Point assisted the trainer and translated the course from English to Arabic. The first day of the training course started with an explanation of the basic concepts in sample based data collection, with a description of the sampling design, the stratification and segmentation scheme, the geographical stratum, the temporal stratum, the vessel and gear strata, the population and sample size.

The course described how the fishing fleet was classified according to the GFCM task 1 Statistical Matrix, providing the definitions of fishing gears, size classes and fleet segments. The trainer described how the random sample is selected with a simple Excel function and describing how an unbiased random selection of individuals is important so that the sample represents the population. The sampling was carried out by the technique of simple random sampling without replacement. Following this process, each individual is chosen randomly, such that each individual has the same probability of being chosen during the sampling process, avoiding the possibility to be chosen more than once. Conceptually, simple random sampling is the simplest of the probability sampling techniques.

During the course several points were discussed including the scheme and the goals of the survey, the questionnaire that will be used to gather the data, the detail of each variable of the questionnaire, the methodology that should be followed for the data entry in the Excel sheets, the methodologies to check the quality of the data and the approach that could be followed by the data collectors to interview the fishers.

The second day of the training course was done in the field. The questionnaire was tested directly with the fishermen and the interviewers were assisted and trained constantly. Being a test, the data collectors, assisted by the trainer, were in charge to select the fishers to be interviewed and to conduct the interviews. After the interview, the preliminary results were analyzed by the trainer, looking into the quality of the answers, pointing out any problems and

suggesting ways on how to improve the way to conduct the interview (in particular the approach with the fishers).

The trainer described how the most sensitive and difficult parameter to collect was the income. If this question is put at the start of the questionnaire it could create an un-trustful atmosphere with the fishers. Therefore such a question was inserted at the end of the questionnaire as daily information. The annual amount of the fishing days was asked at the beginning of the questionnaire and from a simple multiplication of the average daily landings by the annual fishing days provided the estimation of the income. At the end of the interview this also served as a useful indicator to cross check the costs and expenditures.

After the training course the questionnaire was updated and finalised and the data collectors started collecting the data the following days and during the next month.

2.2.3. Definition of variables

The following is a detailed list that defines the socio-economic parameters that have been collected for the purpose of a basic economic evaluation per fleet segment:

A) Economic Variables

Value of landings (revenue): value of landed product calculated on the basis of the ex-vessel (first sale) price of the product.

Energy cost: the total energy cost of the vessel. This is generally obtained by multiplying the average annual cost of fuel (petrol, diesel, oil) per litre by the total amount of litres used.

Maintenance costs: costs of maintenance and repair to the vessel and gears.

Operational costs: all the purchased inputs (good and services) related directly or indirectly to fishing effort. It means the bait, the food consumed during the fishing operation as well as the purchasing of components of the assets (gear or vessel) but if they don't improve the lifetime of the asset itself (consumed within the given year).

Commercial costs: the costs related to the selling of the production of the vessel, which include fish market or wholesaler's commission, transportation of the production, purchasing of the ice, purchasing of boxes and packages.

Fixed costs: the costs not directly connected with operational activities (effort and catch/landings), which include book keeping, vessel insurance, legal expenses, bank expenses, annual quota for fishers associations, dock expenses, renewal of fishing licenses (Ministry of Public Works &Transport and Ministry of Agriculture).

Percentage value of the crew share: the mean percentage the crew receives from the revenue. From this percentage the share of the crew in terms of salary was calculated.

Employment: the number of employees working on the vessel both on a part-time and full-time basis.

The depreciation, interest (opportunity cost) and invested capital have been estimated according to the PIM methodology (Perpetual Inventory method; IREPA *et al*., 2006). PIM proposes to determine the aggregate value of the tangible capital goods used in the current year by aggregation of the value of all vintages (year classes). Such aggregation can be based either

on historical, current or constant prices. Once the value of the capital goods in a given benchmark year has been determined, the capital value of each subsequent year is calculated by adding investments of that year (gross capital formation), revaluing the existing stock and subtracting value of capital goods taken out of operation. The capital costs (depreciation and interest) are then calculated, using proper depreciation schedule and interest rate.

The macro-economic approach, which values capital at replacement (current) prices and accounts for opportunity costs was usedand prices indices derived from the survey have been used to run the model (IREPA *et al*., 2006).

Depreciation: annual depreciation of the vessel, engine, electronic equipment and other equipment. The following annual depreciation rate has been used for the different components of the vessel:

- Hull – 7%
- Engine – 25%
- Electronics – 50%
- Other equipments – 35%

An average service life has to be determined for each type of assets. The following service lives are generally accepted for macro-economic analysis:

- Hull – 25 years
- Engine – 10 years
- Electronics – 5 years
- Other equipments – 7 years

Interest: the opportunity costs of the capital. This means that the interest on government bonds (as an alternative to investment in fishing) should be applied to the net capital stock (replacement value less aggregate depreciation). For this study an 8.24% yield (Banque du Liban) of a 10 year Lebanese government bond has been used.

Invested capital: the replacement value of the vessel was used. This was obtained by the PIM model using the value of one unit of capacity, in our case length, obtained from the survey.

The used share in total investments of hull, engine, electronics and other equipment has been estimated on the basis of a survey conducted in Italy for the same category of vessels (IREPA *et al*., 2006). The following rates for the share in total investment have been used:

- Hull – 35%
- Engine – 38%
- Electronics – 10%
- Other equipment – 17%

B) Commercial variables – channels for the production marketing

Auction: percentage of volume of landings sold through the auction fish market.

Wholesaler: percentage of volume of landings sold through the wholesaler or the middleman.

Direct to the fishmonger: percentage of volume of landings sold directly to the fishmonger.

Direct to the retail market: percentage of volume of landings sold directly to the final customer.

Direct to the restaurant: percentage of volume of landings sold directly to the restaurant.

Other: percentage of volume of landings sold through others channels.

C) Social variables

Although the statistical unit was the fishing vessel, the actual person to be interviewed was the owner of the vessel which in Lebanon, in the majority of the cases, was also the skipper. This was chosen as the interviewee since the person could give more reliable and detailed information. Although interviewing only the owner did not allow in gathering all the information about the social profile of all the crew, the information on the social characteristic of the owner gave a good picture of the social situation of the fishers in Lebanon. The following variables were collected:

Owner engaged in the vessel: percentage of owners participating on the onboard fishing activities.

Age of the skipper: the age of the skipper who managed the boat for most part of the time along the year.

Age of the fishers: age of each fisher engaged in the fishing activities.

Educational level of the skipper: educational level of the skipper engaged in the fishing activities, ranging from illiterate, elementary, intermediary, secondary, college.

Educational level of the fishers: educational level of each fisher engaged in the fishing activities, ranging from illiterate, elementary, intermediary, secondary, college.

Household size of the skipper: number of people living in the same household.

Age of the skipper's children: age of each child living in the household.

Educational level of the skipper's children: level of education of each child of the skipper ranging from illiterate, elementary, intermediary, secondary, college.

Household members of the skipper engaged in fishing activity: the number of household members who work on board the fishing vessel during the fishing activity.

2.3 Data analysis

2.3.1. Calculation of indicators

The socio-economic indicators were calculated as defined in table 10 and include selected indicators which are intended to assess the state of the fisheries industry and the social and economic sustainability. Furthermore an environmental indicator has been calculated to investigate the fuel efficiency of fish capture.

Table 10. List of calculated indicators

Indicator	Definition
Employment per vessel (FT+PT)	total number of members employed on board
Employment per vessel (PT)	number of members employed on board on a part-time basis
Landings per crew (ton)	average production in terms of weight of landings for each member employed on board
Revenue per crew	average production in terms of market value for each member employed on board
Crew/LOA	average crew member employed on board for each unit of capacity (LOA)
Salary per crew	Earnings of the crew members, including a skipper-owner. It is an important indicator for the economic attractiveness of the profession
Gross cash flow	revenues minus all operating costs, excluding capital costs (revenues – (energy costs + crew share + maintenance costs + operational costs + commercial costs + fixed costs). Can be considered the main indicator for the feasibility of the survival of fishing companies or establishments in the short run
Net profit	revenues minus all costs, including capital costs (revenues – (energy costs + crew share + maintenance costs + operational costs + commercial costs + fixed costs + depreciation + interests)
Gross value added	revenues minus all expenses except crew share costs (revenues – (energy costs + maintenance costs + operational costs + commercial costs + fixed costs + depreciation + interests)
Break-even revenues	vessel costs (maintenance + fixed) + depreciation + interests + (energy costs + operational costs + commercial costs + Crew Share)/(1-Net profit/revenues). It represents the point at which costs and revenues are equal
Added Value/Revenue	percentage of revenues which is directed to salary, profit, opportunity cost and depreciation
Gross Operative Margin/Revenue	percentage of revenues which is directed to profit, opportunity cost and depreciation
ROS (Return on Sale)	percentage of revenues which is directed to profit and opportunity cost
ROI (Return on Investment)	percent ratio of net profit plus the opportunity cost in relation with the investment
Net Profit per vessel	average net profit of each vessel

Indicator	Definition
Landings per vessel	average production of each vessel in terms of weight of landings
Landings per LOA	average production in terms of weight of landings for each capacity unit (LOA) of the vessels
CPUE	average production of each effort unit (fishing days/No. of vessel) in terms of weight of landings
Revenue per vessel	average production of each vessel in terms of market value
Revenue per LOA	average production in terms of market value for each capacity unit (LOA) of the vessels.
RPUE	average production in terms of market value for each day at sea
Average price	average market price of landings
Energy cost per vessel	average energy cost of each vessel
Energy cost per day	average energy cost of each fishing day
Fuel consumption per vessel	average energy consumption of each vessel
Fuel consumption per day	average energy consumption of each fishing day
Maintenance cost per vessel	average maintenance cost of each vessel
Fuel efficiency of seafood landing	volume of fuel needed to land one kg of seafood

Due to the lack of a time series of data, and since this is the first time that such an analysis was conducted in Lebanon, although all the selected indicators were calculated, only a fraction of them was finally used for the socio-economic analysis which include the following:

- Employment per vessel (FT+PT)
- Employment per vessel (PT)
- Salary per crew
- Gross cash flow
- Net profit
- Gross value added
- Break-even revenues
- Added Value/Revenue
- ROI (Return on Investment)
- Net Profit per vessel
- CPUE
- Revenue per vessel
- Average price
- Energy cost per vessel
- Energy cost per day
- Fuel consumption per vessel
- Fuel consumption per day
- Fuel efficiency of seafood landing

2.3.2. Estimations from the sample to the total population per stratum

The estimated parameters from the sample were raised to total population per segment. This was done by attributing a weighting factor to the segment and then raised the data to the total number of vessels within the segment. The following formula was used to raise the sample to the total stratum:

$$\hat{Y} = \sum_{i=1}^{n} y_i p_i = \sum_{i=1}^{n} y_i \frac{N}{n} = \sum_{i=1}^{n} N \frac{y_i}{n} = N \sum_{i=1}^{n} \frac{y_i}{n} = N\bar{y}$$

Where **N** is the population of the stratum,

n is the sampled population of the stratum

$\mathbf{p_i}$ = N/n is the weighting factor of the sample,

$\overline{y}$ is the mean of the parameter of the stratum

2.3.3. Quality Check of the data - sampling and non-sampling errors

The phase of controlling and correcting the data consists in identifying and treating errors present in the data gathered in the survey, with the aim of guaranteeing a final result with a good level of quality.

Sampling errors occur when not all the population is sampled, but only a part of it (the sample). In this study since previous data was not available, procedures to estimate the optimal sample size (e.g. Bethel.,1989), could not be used. These procedures depend on a known estimation of variance, which in this case was not available. The sampling error diminishes with the increase in sample size, becoming zero (no error), if a census is conducted. However this will not in general be true for the non-sampling error.

Non-sampling errors are those which are directly connected to the elementary data and are revealed as the difference between the value y_i of the variable Y, observed in the i-th unit, and the real value Y_i. These are not directly affected by an increase in sample size.

In general, in every survey, for every sampling unit, responses are gathered from a fixed number of questions. Errors may occur during the survey of a sample, in our case the fishing vessel (or interviewee) in that, nor partial responses to the questions may be given. Furthermore responses may not only be partial or missing but also where the value of an answer to a question does not correspond to the reality, actually observed in the sample (accuracy). The methods of quality control and determination of errors aim to identify these errors.

In general, the checking procedure of the survey in question can be considered as interactive graphic micro-editing of the univariate type. The term interaction refers to the fact that, in the procedure of the determination of errors, there are not only automatic phases but also phases which require human intervention to investigate the situation and to evaluate the effective presence of the error. The control is mainly of the univariate type because the variables are

checked individually and only in rare cases are suspected relationships existing among them checked.

During the various phases wide use is made of graphic tools (e.g. box plots, scatter plots) to visibly identify outliers or errors. The data gathered is based on strata (stratification based on fishing techniques, length of the vessel), within which the sampling units can be considered very homogenous. Normally for each of these sets of data, a suitable range of values are calculated, however in our case we were much more flexible with the outliers. In the presence of outliers or errors, these are checked individually for all the sampling units per stratum. Thus the sampling units, which are considered to have errors are identified and corrected during data input and/or data mining, but this was rarely done in our case.

The quality check of the data can be conducted at various levels of aggregation, but in our case the quality check was done only at a stratum level. Usually a range of values for the quality control of the data is based on an observation of historical time series of data, which however in our case did not exist, except for landing data. In this case the quality check was done based on data which exist for similar strata in other Mediterranean countries, however we took into consideration the economic situation and standard of living in Lebanon.

The procedures to check the quality of the data were done for daily costs (so, for example: other operational costs / days, crew share / day, energy costs /days) and the ratio between costs and revenues (other operational costs / revenues, personnel costs /revenues, energy costs / revenues, and so on).

2.3.4. Quality indicators (standard error, variance, and coefficient of variation)

The first simple quality indicator used to determine the spread of the data was the standard error (S.E.), which is a measure of the spread of the mean.

The standard error was calculated as follows using the software package SPSS:

$$SE_{\bar{x}} = \frac{S}{\sqrt{n}}$$

Where:

s is the sample standard deviation

n is the size (number of observations) of the sample

In order to have a more accurate indication of the quality of the data the variance and Coefficient of Variation (C.V.), was calculated.

The estimation of variance for every parameter within each stratum was calculated using a correction factor for finite populations as follows:

$$\hat{v}(\hat{Y}) = \frac{N^2}{n}\left(1 - \frac{n}{N}\right)\underbrace{\frac{\sum_{i=1}^{n}(y_i - \bar{y})}{n-1}}_{VAR\ in\ excel}$$

From the estimation of variance the Coefficient of Variation (C.V.) was used to determine the quality of the data. The C.V. per variable per stratum was estimated using the following formula:

$$\widehat{cv}(\hat{Y}) = \frac{\sqrt{\hat{v}(\hat{y})}}{\hat{Y}}$$

2.3.5. Comparisons of the mean by fleet segment

For the mean variables per fleet segment any differences between the three fleet segments were analysed by one-way analysis of variance (ANOVA) at the 95% confidence limits. This was important to determine if the values obtained per fleet segment were statistically different from each other. The Dunnett's pair wise multiple comparisons test at the 95% confidence level was used to detect difference between two individual fleet segments once a difference was detected with ANOVA.

For the social characteristics ANOVA was also used to test for differences among the fleet segments. The responses on the educational level were based on a five-point Likert scale, which was converted to numerical scores from 5 (College education) to 1 (illiterate). To test for significant positive or negative deviations from the neutral score, the numerical scores were tested using the one sample t-test for each category analysed.

Statistical computations and graphical representations of the results were carried out using several statistical programs, Microsoft Access 2007 to store the data, Microsoft Excel 2007, to compute basic calculations and SPSS (Statistical Package for Social Sciences) version 17.0, to compute basic statistical analysis.

3. Results

3.1. Fishing Fleet data for 2011

3.1.1 Quality check

The licensing data were entered into electronic format in one month. During the data entry some errors were present in the license itself, and these were corrected. For some of the licenses not all the data fields were present since they were either not available, not legible, or totally absent from the original documents. An attempt was made to correct the legibility problems by going back to the issuing outposts and having the fisheries officer who filled in the licence to read their own hand writing but this was not very successful since the copies available were carbon copies.

After the data entry was completed the licenses data were checked for errors. The first step was to check that all the vessels had a correct vessel registration number. One vessel had no vessel registration number but only information on LOA and gears. This vessel was deleted from the fleet. Fourty vessels (registration numbers), had duplicate data so the duplicate records were deleted.

In order to retrieve the data which existed in the fleet from the MedFisis 2004 and the Ministry of Public Works and Transport, the registration number was standardized across the three fleet datasets. This was done so that information on the year of construction and GT of the vessel could be retrieved, which was not available in the collected licensing data. Once the vessel registration number was standardised among the three fleets, these were cross checked using Microsoft Access and the information on the year of construction and GT were retrieved, mostly from the dataset of the Ministry of Public Works and Transport. This data was then added to the fleet obtained from the licences.

For the GT more than 40% of the vessels did not have this information, so it was not used for further analysis. This was not a major problem, since LOA was used as the main technical characteristic of the vessels during future analysis.

For the year of construction, about 20% of the vessels did not have this information. For the vessels which did not have data on the year of construction, this parameter was calculated based on the mean value of the fleet segment by gear and LOA.

Errors in the port code were checked and all the data on port code were standardized with the code used in the database of the Ministry of Public Works and Transport .

For the other variables collected in the licenses, two vessels did not have data on LOA. These vessels were considered as having an LOA < 6 m, since their engine horsepower (hp) was less than 30. One vessel had a non-numeric value for hp and hence the value was deleted.

Overall the number of records received was 1501, and after deleting the 40 duplicate records and the one vessel with missing registration number, the resultant fleet consisted of 1460 vessels.

3.1.2 Stratification of the fleet

The resulting fishing fleet consisted of 1,460 commercial fishing vessels. The most part (85%) of the fishing fleet is found in three main ports (Fig 3), with 42% of the fleet capacity concentrated in Tripoli while only the 23% operates in the southern part of the country. Only 24% of the total fleet is operating from Beirut. No relevant differences exist in the average technical characteristics of the vessels among the different ports.

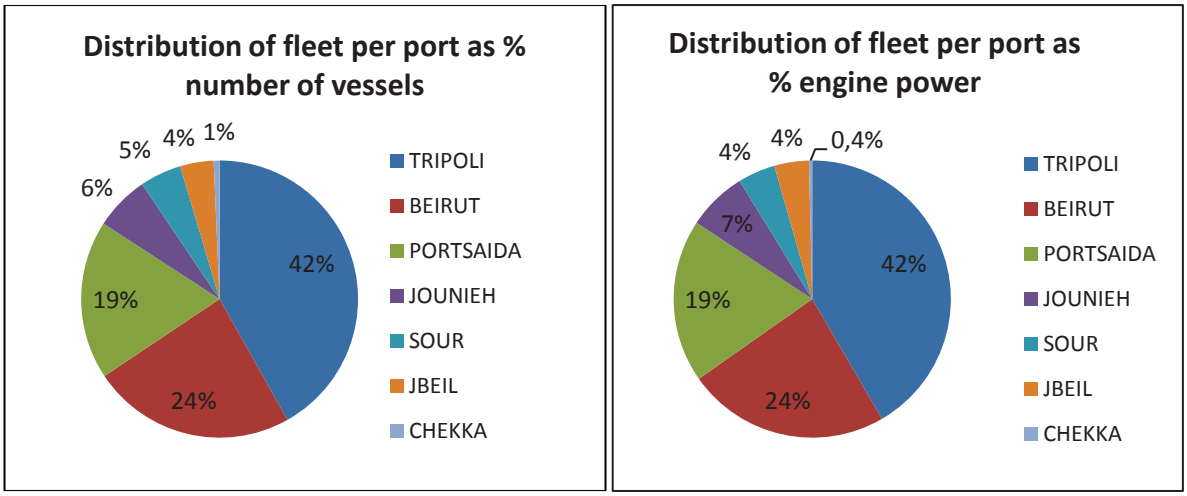


Fig 3. Geographivcal distribution of the fleet

Table 11 shows the number of vessels observed by their main fishing gear as reported in the licenses. The most important gears are longlines, followed by trammel nets and hand lines & trolling lines. They account to more than 80 % of the fishing gears. Handlines & trolling and pots and traps account for about 50% as accessory gears. Surrounding nets (purse seine and lampara) were represented with 60 vessels (4%) as a main gear with another 23 vessels having surrounding nets as accessory gears. Two vessels had pound and fyke nets as accessory gears. The 'other gears' was made up of the accessory vessels used during purse seining operations.

Table 11. Number of vessels by main gear according to the 2011 licenses.

Main Gear	**No. of vessel**	**Percentage (%)**
Longlines	488	33
Trammel Net	444	30
Hand Lines & Trolling Lines	309	21
Pots and Traps	95	7
Set Gillnet	55	4
Purse Seine	48	3
Lampara Nets	12	1
Other gears	8	1
Combined Gillnets / Trammel Nets	1	<1
Total	**1,460**	**100**

With respect to the Harbor Master of registration, the most important one in terms of number of vessels is Tripoli (41.8%), followed by Beirut (23.8%) and Saida (18.6%). The other 4 Harbor Masters account for 15.8% of the number of vessels (table 12).

No vessels were licensed as beach seine, boat seine and trawlers.

Table 12. Number of vessels by main gear and port of registration according to the 2011 licenses.

Main Gear	Registration port							
	Tripoli	Beirut	Saida	Jounieh	Jbeil	Sour	Chekka	Total
Longlines	59	229	79	59	39	21	2	488
Trammel Net	247	26	116	11	4	34	6	444
Hand Lines & Trolling Lines	146	74	45	23	12	7	2	309
Pots and Traps	87	4	1		1	2		95
Set Gillnet	31	6	10		1	7		55
Purse Seine	26	3	19					48
Lampara Nets	12							12
Other gears	3	4	1					8
Combined Gillnets/ Trammel Nets		1						1
Total	611	347	271	93	57	71	10	1460

Using the information on the gear and the length overall (LOA) of the vessels, the fleet was characterised and segmented according to the GFCM Task 1 fleet segmentation. The following main segments were identified:

i) Minor gear with engine < 6 m
ii) Minor gear with engine 6 - 12 m
iii) Purse seine 6 - 12 m

The fleet segments, minor gear with engine were made up of the fishing gears listed in Table 12, (except purse seine). These two segments use various passive gears and can be considered as polyvalent vessels. A relatively small number of vessels did not fit into the fleet segmentation, due to their slightly higher LOA. Twenty one vessels which had passive gears had a LOA between 12 – 16 m. Since the number of vessels was small these vessels were included in the fleet segment Minor gear with engine 6 - 12 m.

The fleet segment Purse Seine 6 – 12 m was composed of vessels using purse seines and lampara nets. Nine purse seine vessels were also larger than 12 m with their LOA ranging between 12 – 15.3 m. These vessels were also included in the fleet segment Purse Seine 6 - 12 m, for the purposes of this pilot study. The resultant fleet segmentation according to the GFCM task I segmentation is shown in table 13.

Table 13. The segmentation of the Lebanese fishing fleet according to the GFCM Task 1 fleet segmentation.

GFCM Fleet Segment	LOA Class	Total
Minor gear with engine	< 6 m	355
	6 - 12 m	1045
Purse Seine	6 - 12 m	60
Total		1460

It is clear that the Lebanese fleet in 2011 is artisanal small scale. The main part of the fleet (76%) is composed of vessels ranging from 6 – 12 m in length and is responsible for the main characteristics of the Lebanese fishing fleet.

3.1.3 Other information gathered from the licenses

Apart from the information necessary to classify and segment the fleet, other information was gathered from the licenses, which is also relevant for the purposes of this study. Information on crew was collected and it is shown in Table 14. The crew reported in the licence was defined as all the persons working on the vessel on average in the specific year, and it includes the captain. When one considers the type and size of the vessels the numbers seem high especially for the vessels less than 6 m in length.

Table 14. Number of crew as reported in the licence

GFCM Fleet Segment	LOA Class	Number of Crew	Mean Number of crew per vessel
Minor gear with engine	< 6 m	1,245	3.5
	6 - 12 m	3,966	3.8
Purse Seine	6 - 12 m	219	3.7
Total		5,430	3.7

While gathering the information on the commercial fishing vessels, the recreational licenses were also encountered, since they were stored together. In this respect 534 recreational fishing licenses and 229 underwater recreational fishing licenses were given in 2011.

3.2. Questionnaire Survey

3.2.1 Quality check

The planned sample was composed by 457 vessels, corresponded to 31% of the total fleet, with differences in the percentage accordingly with the segments. The non-response rate was 14% and consequently the final coverage rate was of 27% (Table 15). It can be considered a good sampling rate considering that this was a fisheries socio-economic survey and that such a survey was done for the first time in the country. This adequate sampling rate was further confirmed after calculating the coefficient of variation for the variables collected which was quite good (see section 3.2.8).

Some typing errors which were encountered were correct, with the avoidance of the correction of some anomalous figures. The total remuneration of the crew (crew share) was estimated using the mean share of revenues devoted to the crew, as obtained by the survey.

Table 15. Table showing the population, planned sampling, non responses and final coverage rate.

Fleet Segment	LOA	Population	Planned sample	Non responses	Achieved sample	Non response rate (%)	Coverage rate (%)
Minor gear with engine	< 6 m	355	107	17	90	16	25
Minor gear with engine	6 - 12 m	1045	320	50	270	16	26
Purse Seine	6 - 12 m	60	30	1	29	3	48
Total Fleet		**1,460**	457	61	389	15	27

3.2.2 General characteristics of the fleet and its activity

The Lebanese authorized fishing fleet for 2011 consisted of 1,460 vessels, with a total engine power of 43,000 hp. The average length of the vessel was 7.3 m long with 29.7 hp, an average age of 22 years and a crew of 2-3 fishers. The fleet presents the typical characteristics of the Mediterranean small scale fisheries: highly diversified with a broad range of fishing gears and target species.

Table 16 shows the main results obtained from the analysis of the fleet. The greatest proportion in terms of both number of vessels (71.6%) and horse power (75.1%) is found in the fleet segment minor gear with engine 6-12 m. This fleet segment also accounted for the largest effort in fishing days (77.2%), fuel consumption (78.2%) and employment (71.6%). The purse seiners had the largest horse power and average length of the fleet, having also the most recent vessels in terms of age.

The output of the fleet amounted to 4,850 tons of seafood. With respect to the landings both the segments minor gear with engine 6-12 m and the purse seiners had the largest volume of landings with 45.6% and 43.5% respectively. As expected the efficiency (CPUE) of the purse seiners is very high. The distinction of the landings by species was not within the aims of this survey, however the large contribution of the purse seiners is due to the small pelagic species which represent one of the main group of species landed at national level.

The total value of landings was 26.98 million dollars. The main segments in terms of value of production are the segments composed of minor gears, which targeting high value species account for the 89% of the total. Although the volume of landings is similar in the fleet segments minor gear with engine 6-12 m and the purse seiners, there is a considerable difference in the value of landings, which were 71.9% and 10.9% respectively. These values show that the economic value per ton of fish of the segment minor gear with engine is about six times higher than that of the purse seiners.

In terms of gross productivity per vessel, considering the annual yield per vessel, the best performance was carried out by the purse seiners which on average produce revenues of US dollars 49,000. The average price per fleet segment for the segments, minor gear with engine < 6 m, minor gear with engine 6 – 12 m, and purse seine, were in US dollars 8.8, 8.8 and 1.4 respectively.

In 2011 the Lebanese authorized fishing fleet spent a total of around 281,000 fishing days. As established by the national law, the vessels couldn’t spend more than 24 h continually at sea. For that reason the total fishing days match with the total days at sea. The total amount of fuel consumed was 4,363 thousand litres. From all the three segments, the purse seiners had the highest mean fuel consumption per vessel.

With respect to the consumption of fuel and production, the data show that on average it takes about 0.9 litres of fuel to land 1 kg of seafood. The best yield is performed by the purse seiners with an average value of 0.1 litres per 1 kg of production. The worst yield is performed by the minor gear 6 – 12 m with a value of 1.5 litres of fuel per 1 kg of seafood production.

It is clear that the fleet segment minor gear with engine 6-12 m employs the largest amount of crew, both total and part-timers. The purse seiners seem to work exclusively with full-time fishers, since the part-time employment was negligible. The owner of the vessel is also engaged in the fishing activities in most of the vessels (88%), generally as skipper. For the 81% of the vessels owner, the fishing activity represents also the main income generator.

Considering the revenues per crew member, the best performance is obtained by the smaller LOA class segment, the minor gear < 6 m, with 9000 dollars per fisher.

Table 16. Total and mean characteristics of the Lebanese fishing fleet in 2011 according to the GFCM Task 1 fleet segmentation. Values for number of vessels, engine power (hp), length overall (m), fishing days, fuel consumption (1000 L), volume of landings (t), value of landings (1000 USD) and employment onboard. The values in parenthesis show the standard error of the mean. Differences between fleet segments were tested using one-way ANOVA. Bold P values indicate significant differences between the fleet segments.

Fleet characteristics	Minor gear with engine < 6 m	Minor gear with engine 6 - 12 m	Purse Seine 6 - 12 m	Total fleet	ANOVA P value
Capacity					
Number of vessels	355	1,045	60	1,460	
Total engine power (hp)	7,261	32,531	3,538	43,330	
Total length overall (m)	1,750	8,386	584	10,720	
Mean technical characteristics of the vessels					
Mean power (hp)	22.0 (±0.93)	31.4 (±1.04)	62.1 (±9.17)	30.5 (±0.89)	**< 0.05**
Mean length (m)	4.9 (±0.04)	8.0 (±0.05)	9.7 (±0.29)	7.3 (±0.05)	**< 0.05**
Mean vessel age	20.8 (±0.61)	23.1 (±0.38)	17.0 (±0.99)	22.3 (±0.31)	**< 0.05**
Total Landings					
Volume of landings (tons)	528	2,210	2,112	4,850	
Value of landings (1000 $)	4,632	19,398	2,949	26,979	
Mean landing variables per vessel in 2011					
Mean landings (tons)	1.5 (± 0.16)	2.1 ± 0.14)	35.2 (±8.12)	3.3 (±0.26)	**< 0.05**
Mean landings (1000 $)	13.1 (± 1.9)	18.6 (± 1.10)	49.2 (± 8.59)	18.5 (±0.82)	**< 0.05**
Total Effort					
Fishing days	53,822	217,244	10,221	281,287	
Fuel consumption (1000 L)	642	3,414	307	4,363	
Mean effort variables per vessel					
Mean fishing days	152 (±11)	208 (±5)	170 (±16)	192 (±4)	**< 0.05**
Mean Fuel consumption (1000 L)	1.81 (±0.18)	3.27 (±0.16)	5.11 (±0.56)	3.07 (±0.13)	**< 0.05**
Total Crew or Employment					
Employment on board (Total)	513	2,312	403	3,229	
Employment on board (PT)	355	1,145	2	1,502	
Mean employment variables per vessel					
Mean Employment on board (Total)	1.45 (± 0.08)	2.21 (±0.06)	6.72 (±0.89)	2.40 (±0.05)	**< 0.05**
Mean Employment on board (Part Time)	1.00 (± 0.00)	1.10 (± 0.02)	0.04 (± 0.03)	0.57 (± 0.01)	**< 0.05**

3.2.3 Economic performance – Total fleet

In 2011 the total marine capture fisheries production of Lebanon can be estimated at 4.9 thousand tons of seafood corresponded to an overall turn-over of approximately $27 million (Table 17). The sector employed some 3,200 people, working on board 1,460 vessels. The total costs of the fleet were $20.5 million. This amount consisted of $9.8 million in salary, $ 4.1 million in energy costs, $2 million in commercial costs, $1.8 million in operational costs, $1.3 million in maintenance costs, $0.078 million in fixed costs. Furthermore $1.4 million of capital cost (depreciation and opportunity costs) were estimated.

The crew share represented 48% of the total costs, while energy costs were 20%. These two main categories of costs represented respectively the 36% and the 15% of the gross revenues. The estimated invested capital was $13.4 million.

Table 17. Economic performance of the Lebanese fishing fleet in 2011

Total fleet			
Variable	**Value**		**Average per Vessel**
Revenues			
Value of landings (1000$)	26,979		18.5
Employment			
Employment on board (Total)	3,229		2.2
Costs (000$)		***As % of Revenues***	
Energy costs	4,159	15%	2.8
Maintenance costs	1,295	5%	0.9
Operational costs	1,784	7%	1.2
Commercial costs	1,969	7%	1.3
Fixed costs	78	0%	0.1
Crew share (salary)	9,834	36%	6.7
Total operating costs	19,119	71%	13.1
Depreciation	1,207	4%	0.8
Interest (opportunity costs)	197	1%	0.1
Economic performance			
Gross cash flow (1000$)	7,860	29%	5.4
Net profit (1000$)	6,455	24%	4.4
Gross value added (1000$)	17,694	66%	12.1
Return on investment (ROI)	50%		
Break-even revenue	26,106	103%	17.9
Salary per crew (1000$)			3.0
Capacity			
Volume of landings (1000t)	4,850		3.3
Fleet - number of vessels	1,460		
Invested capital (1000$)	13,410	50%	9.2

All the economic indicators showed a good profitability for the sector (Table 17). Gross cash flow is a good short term indicator in fisheries. Positive gross cash flow means that the vessel is capable of paying for all of its operational costs. Net profit can be viewed as a measure of the return to vessel owner's equity. The gross value added is the value of landings minus the cost paid to other (supplying) industries. The remaining amount is the reward for labour and capital, employed in fisheries. The fleet generated a gross cash flow of $7.8 million, a net profit of $6.4 million and the gross value added was $18 million.

The ratio between net profit and revenues was 24% and the ROI was 50% of the overall turnover. The break-even revenue, that represents a level of production at which all costs are covered, was reached at $26.1 million. The revenues against the break-even revenue were the 103%.

On average the vessels generated an overall turnover of $18.5 thousand, a net profit of $4.4 thousand and sustained $13.1 thousand of operating costs. It reached the break-even revenue at $17.9 thousand. The depreciated value of a vessel was estimated $9.2 thousand, while the average salary per fisher was $3 thousand.

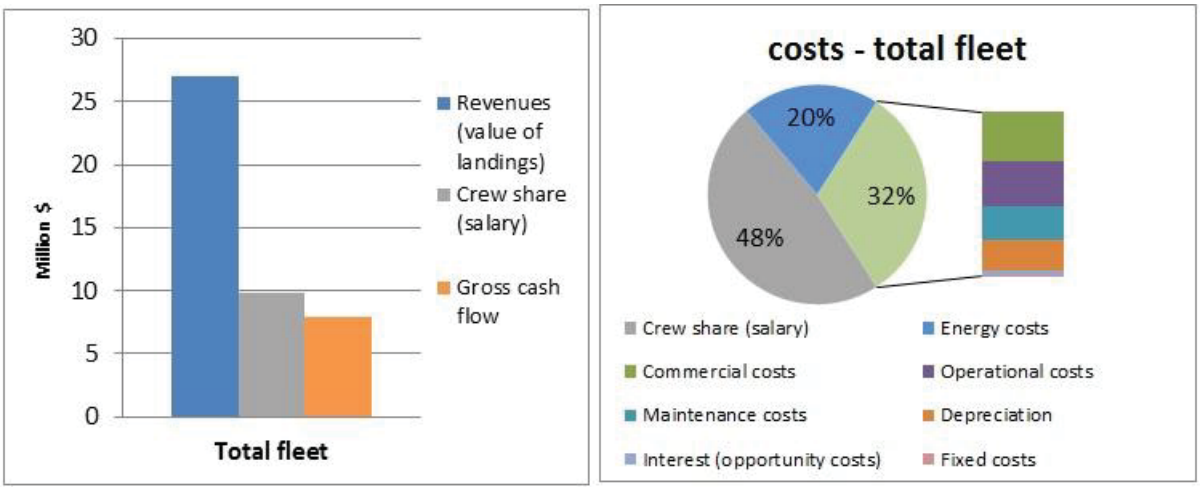


Fig 4. Economic indicators and detailed costs of the Lebanese fishing fleet in 2011

3.2.4 Economic performance by fleet segment

3.2.4.1 Minor gear with engine < 6 m

The total amount of revenues generated by the segment was $4.6 million, representing the 17% of the national production.

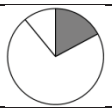
The total costs were $3.4 million of which $3.2 million were operating costs and $0.25 million were capital costs (depreciation and opportunity).

The crew salaries represented 49% of the total costs, while energy costs were 22%. The two main categories of costs represented respectively the 36% and the 16% of the gross revenues. The estimated invested capital was $2.4 million.

In terms of profitability the segments registered good performances, the best among the analyzed segments. It generated a gross cash flow of $1.5 million, a net profit of $1.2 million and the gross value added was $3.1 million.

The net profit was the 26% of the revenues and the ROI was 63% and the break-even revenue was reached at $4.5 million. The revenue against the break-even revenue was 104%. On average the vessels generated an overall turnover of $13.0 thousand, a net profit of $3.4 thousand and sustained $8.9 thousand of operative costs. It reached the break-even revenue at $12.6 thousand. The depreciated value of a vessel was estimated $5.7 thousand, while the average salary per fisher was $3.3 thousand.

Table 18. Economic performance of the minor gear with engine < 6 m segment in 2011

Minor gear with engine < 6 m	**Share in national value** 		**Average per vessel**
Revenues			
Value of landings (1000$)	4,632		13.0
Costs (000$)		***As % of Revenues***	
Energy costs	763	*16%*	2.1
Maintenance costs	173	*4%*	0.5
Operational costs	293	*6%*	0.8
Commercial costs	248	*5%*	0.7
Fixed costs	19	*0%*	0.1
Crew share (salary)	1,674	*36%*	4.7
Total operating costs	*3,170*	*68%*	*8.9*
Depreciation	192	*4%*	0.5
Interest (opportunity costs)	63	*1%*	0.2
Economic performance indicators			
Gross cash flow (1000$)	1,462	*32%*	4.1
Net profit (1000$)	1,207	*26%*	3.4
Gross value added (1000$)	3,136	*68%*	8.8
Return on investment (ROI)	63%		
Break-even revenue	4,474	104%	12.6
Salary per crew (1000$)			3.3
Capacity indicators			
Volume of landings (1000t)	528		1.5
Fleet - number of vessels	355		
Invested capital (1000$)	2,022	*44%*	5.7

3.2.4.2 Minor gear with engine 6 - 12 m

The segment generated the highest gross revenue both in absolute and in relative terms. The total amount of revenues generated by the segment was $19.6 million, representing the 72% of the national value production.

The total costs were $14.3 million of which $13.2 million were operating costs and $1.1 million were capital costs (depreciation and opportunity).

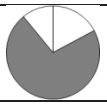
The crew salaries represented 49% of the total costs, while energy costs were 21%. The two main categories of costs represented respectively 37% and 16% of the gross revenues. The estimated invested capital was $10.5 million.

They generated a gross cash flow of $5.5 million, a net profit of $4.5 million and the gross value added was $12.8 million.

The net profit was the 23% of the revenues and the ROI was 44% and the break-even revenue was reached at $18.0 million. The revenue against the break-even revenue was 103%. In terms of profitability it showed a satisfactory performance, even though slightly lower compared to the other two segments.

On average, the vessels generated an overall turnover of $18.6 thousand, a net profit of $4.3 thousand and sustained $13.3 thousand of operative costs. It reached the break-even revenue at $18.0 thousand. The depreciated value of a vessel was estimated $10.0 thousand, while the average salary per fisher was $3.1 thousand.

Table 19. Economic performance of the minor gear with engine 6 - 12 m segment in 2011

Minor gear with engine 6 - 12 m	**Share in national value** 		**Average per vessel**
Revenues			
Value of landings (1000$)	19,398		18.6
Costs (000$)		***As % of Revenues***	
Energy costs	3,130	16%	3.0
Maintenance costs	1,002	5%	1.0
Operational costs	1,044	5%	1.0
Commercial costs	1,341	7%	1.3
Fixed costs	55	0%	0.1
Crew share (salary)	7,269	37%	7.0
Total operating costs	13,840	71%	13.2
Depreciation	942	5%	0.9
Interest (opportunity costs)	123	1%	0.1
Economic performance indicators			
Gross cash flow (1000$)	5,558	29%	5.3
Net profit (1000$)	4,493	23%	4.3
Gross value added (1000$)	12,826	66%	12.3
Return on investment (ROI)	44%		
Break-even revenue	18,759	103%	18.0
Salary per crew (1000$)			3.1
Capacity indicators			
Volume of landings (1000t)	2,210		2.1
Fleet - number of vessels	1,045		
Invested capital (1000$)	10,461	54%	10.0

3.2.4.3 Purse seine 6 - 12 m

The total amount of revenues generated by the segment was $2.9 million, representing the 11% of the national value production.

The total costs were $2.2 million of which $2.1 million were operating costs and $0.9 million were capital costs (depreciation and opportunity).

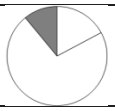
The crew salaries represented 41% of the total costs, while energy costs were 12%. The two main category of costs represented respectively 30% and 9% of the gross revenues. The estimated invested capital was $0.9 million.

The segment generated a gross cash flow of $0.8 million, a net profit of $0.8 million and the gross value added was $1.7 million.

The net profit was the 26% of the revenues and the ROI was 83% and the break-even revenue was reached at $2.9 million. The revenue against the break-even revenue was 102%. In terms of profitability it showed a satisfactory performance, even though slightly lower compared to the other two segments.

On average, the vessels generated an overall turnover of $49.2 thousand, a net profit of $12.6 thousand and sustained $35.2 thousand of operative costs. It reached the break-even revenue at $48.0 thousand. The depreciated value of a vessel was estimated $15.4 thousand, while the average salary per fisher was $2.2 thousand.

Table 20. Economic performance of the Purse seine 6 - 12 m segment in 2011

Purse seine 6 - 12 m	**Share in national value** 		**Average per vessel**
Revenues			
Value of landings (1000$)	2,949		49.2
Costs (000$)		***As % of Revenues***	
Energy costs	267	9%	4.4
Maintenance costs	120	4%	2.0
Operational costs	447	15%	7.5
Commercial costs	381	13%	6.3
Fixed costs	3	0%	0.1
Crew share (salary)	891	30%	14.9
Total operating costs	2,109	72%	35.2
Depreciation	74	2%	1.2
Interest (opportunity costs)	11	0%	0.2
Economic performance indicators			
Gross cash flow (1000$)	840	28%	14.0
Net profit (1000$)	755	26%	12.6
Gross value added (1000$)	1,731	59%	28.9
Return on investment (ROI)	83%		
Break-even revenue	2,878	102%	48.0
Salary per crew			2.2
Capacity indicators			
Volume of landings (1000t)	2,112		35.2
Fleet - number of vessels	60		
Invested capital (1000$)	927	31%	15.4

3.2.5 Comparison between economic performance of the three fleet segments

The results from the three main fleet segments were compared so that the main similarities and differences could be determined. Figure 5 shows the costs and crew share and for these variables the analysis of variance identified significant differences between all the three fleet segments ($P < 0.05$). As expect for the fixed costs there were no significant differences ($P < 0.05$). For the energy costs the purse seiners had statistically significant ($P < 0.05$) higher costs (except fixed costs), and total crew's share. The segments minor gear with engine < 6 m and the minor gear with engine 6 - 12 m did not have significantly different ($P < 0.05$) energy costs, operational costs, commercial costs and total crew's share which show that their costs are more similar to each other than the purse seiners.

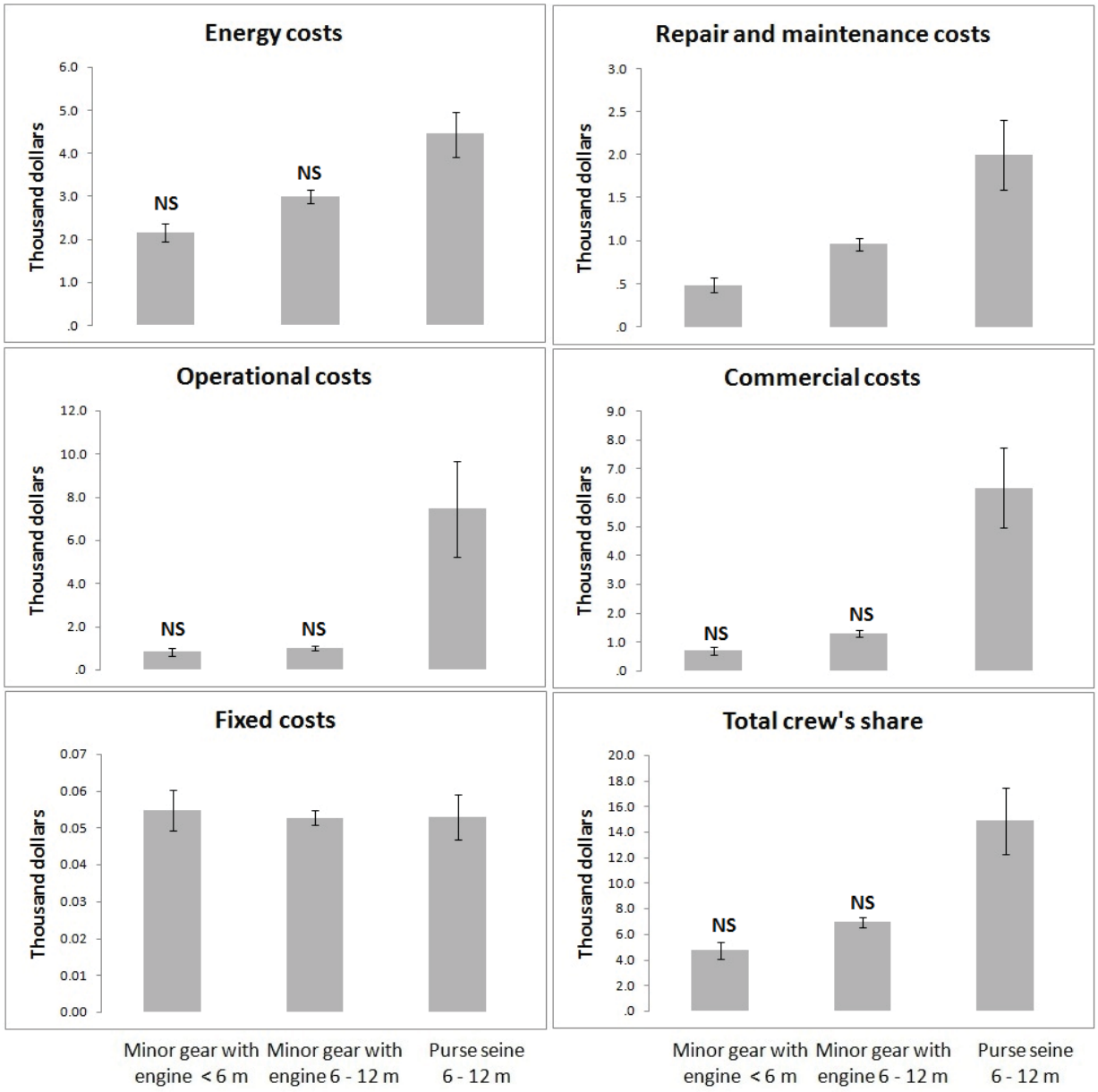


Fig 5. Differences in the various costs and total crew's share between the three fleet segments. The errors bars show the standard error of the mean. Values labelled with **NS** show that the fleet segments are **N**ot **S**ignificantly different from each other ($P < 0.05$). Note that Fixed costs were not significantly different from each other (ANOVA $P < 0.05$).

The results from the economic indicators (Fig 6) show that gross cash flow, net profit, gross value added and break even revenues were significantly different from each other ($P < 0.05$). In general the purse seiners were responsible for the differences observed. The indicators ROI and salary per crew were not significantly different ($P < 0.05$), which although the purse seiners generate a higher cash flow, net profit etc., the ROI is not significantly higher and this is due to the high crew costs.

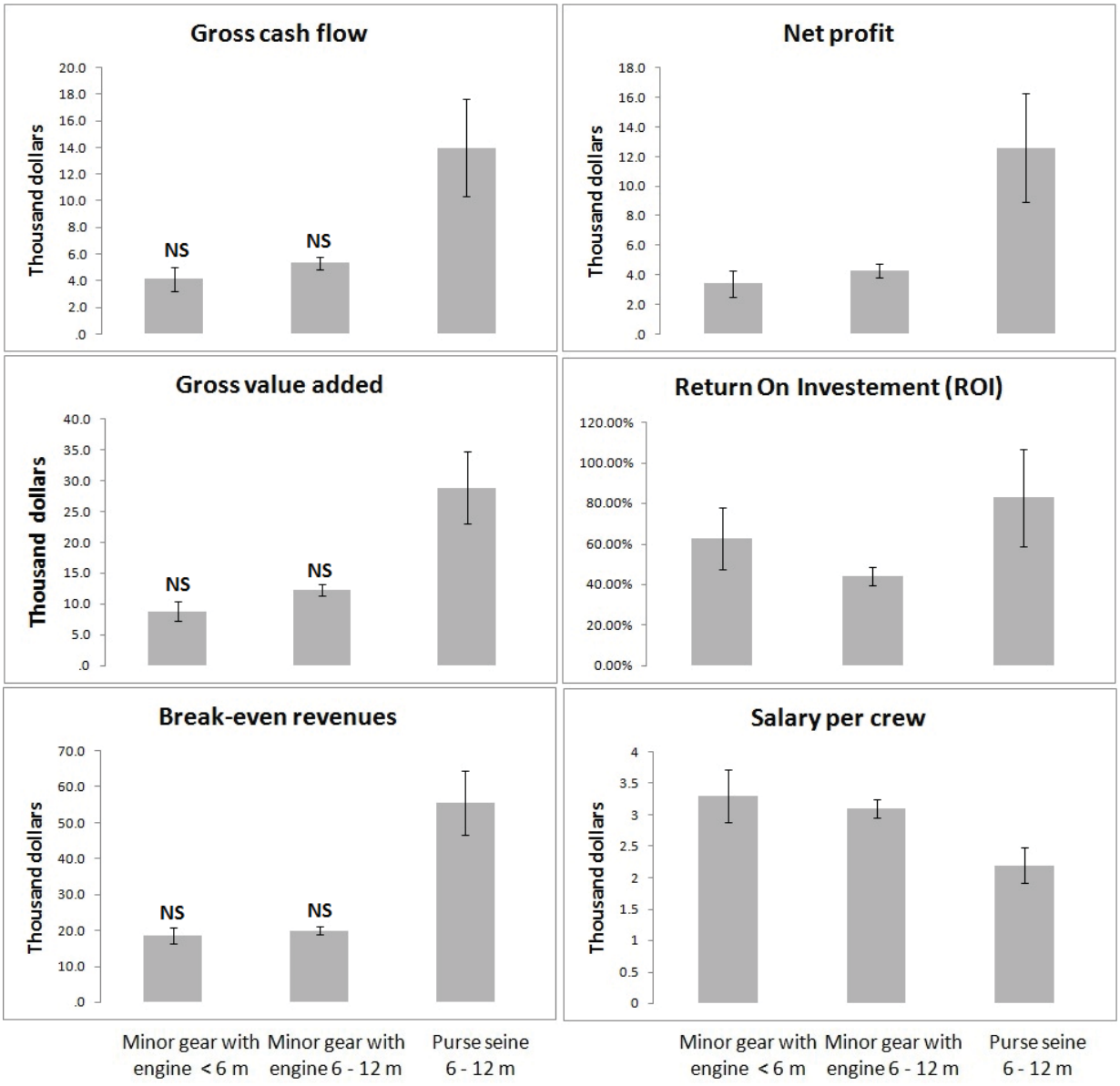


Fig 6. Differences in the economic indicators between the three fleet segments. The errors bars show the standard error of the mean. Values labelled with **NS** show that the fleet segments are **N**ot **S**ignificantly different from each other following the multiple comparison test ($P < 0.05$). Note that ROI and Salary per crew were not significantly different from each other (ANOVA $P< 0.05$).

3.2.6 First sale (ex-vessel) market dynamics

The aim of this part of the survey was to gather information on the channels for the first sale of the seafood production landed by the national fleet. This phase constitute the first step of the general seafood supply chain which is composed also by the processing, marketing, distribution and the relationships among them. The results could also constitute a solid baseline for a future value chain analysis aiming to the understanding on how the seafood value is actually distributed over the chain that start from the vessel to arrive to the final consumer.

In Lebanon 67% of the first-sales occur through indirect sales, while 23% through a direct transaction (Table 21). From the indirect sales, 64% pass through the auction markets and 3% through the wholesalers. The transaction costs (commission) were estimated at 7.1% of the gross value of the production that is channelled through the indirect sales. The entire flow of the first sale dynamics is shown in Figure 7.

For the direct sales 16% pass though the fishmongers, while the other 7% are sold directly to the final consumer. Ten percent of the production was sold using 'other' channels, and in most cases they were related to self-consumption.

The analysis by fleet segment shows that the purse seiners which are the biggest and most productive vessels sold most part of their production (86%) through indirect sales, 84% of which through auctions and 4% through wholesalers. This was expected, since the high volume of the small pelagic species landed has a relatively high perishability. Direct transaction to fishmongers was only 11% of the production. The retail market and sale to restaurants was not used at all to sell the production by such a category of vessels.

On the other hand the fleet segment minor gear < 6 m, the indirect sales accounted for 56%, of which the auction markets represented the 51%. Direct transaction accounted for 32% of the production, representing the largest percentage among the different fleet segments.

The segment minor gear 6 - 12 m segment sold 69% of the production through the indirect transaction channels, mostly (66%) through the auction market;17% was sold through the fishmongers and only 4% directly to the final consumer.

The ANOVA results show that there is a statistically significant difference ($P < 0.05$) between the percentage sold to the auction and directly to the retail market. The main difference was due to the purse seiners in which the sale dynamics are different from the other fleet segments. For the other market channels no significant differences were detected ($P < 0.05$).

Table 21. Percentage distribution of the first sale by type of transaction and fleet segment, including the results of the ANOVA. The bold figures show significance differences.

	Minor gear with engine < 6 m	**Minor gear with engine 6 - 12 m**	**Purse Seine 6 - 12 m**	**Total fleet**	**ANOVA P Value**
Seafood-marketing channels					
Auction (%)	51 (±5)	66 (±2)	82 (±5)	64 (±2)	**< 0.05**
Wholesaler (%)	5 (±2)	3 (±1)	4 (±3)	3 (±1)	0.626
Directly to fishmonger (%)	15 (±3)	17 (±2)	11 (±4)	16 (±2)	0.721
Directly to retail market (%)	17 (±3)	4 (±1)	0	7 (±1)	**< 0.05**
Directly to restaurant (%)	0.3 (±0.5)	0	0	0.05 (±0.09)	N/A
Other (%)	11 (±3)	10 (±2)	3(±2)	10 (±<5)	0.201
Seafood -marketing commissions					
Fish market or Wholesaler's commission (% of gross value)	6.9 (±0.1)	7.3 (±0.8)	6.7 (±0.5)	7.1 (±0.1)	0.104

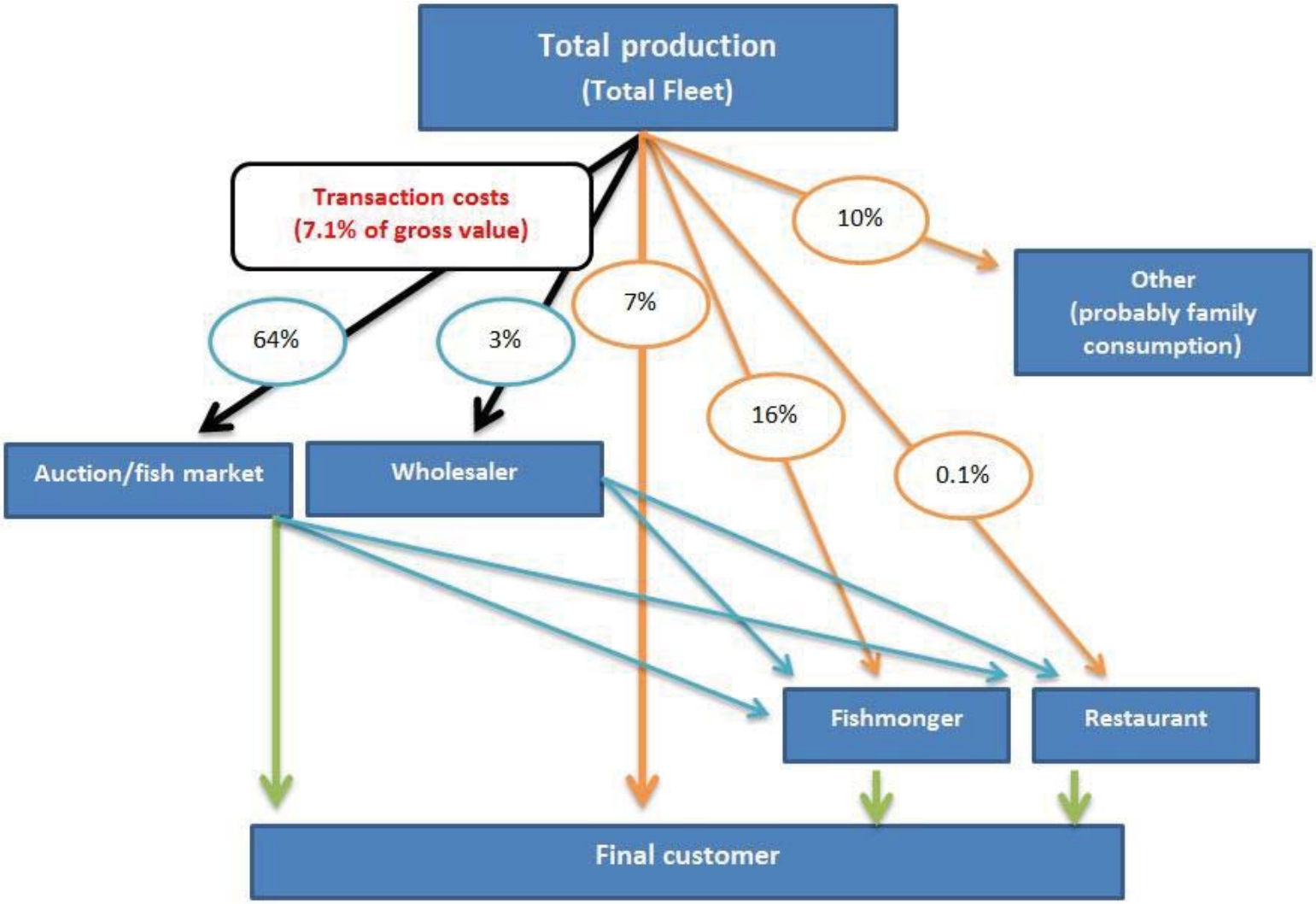


Fig7. Figure showing the main first sale market (ex-vessel) channels for the production in Lebanon.

3.2.7 Social characteristics of the fishers

The analysis of the ownership of the vessels revealed that 88% of owners operated their own vessel, and for 81% of vessel owners fishing activities were their main income generator (Table 22).

The examination of the percentage per fleet segment showed that substantial differences exist among the fleet segments. The percentage of owners engaged in the fishing vessels are 94% for the smallest segment (minor gear < 6m) and 80% for the bigger and most productive class of vessels, the purse seiners. Fishing resulted as the main income generator for 92% of the owners of purse seiner, as expected for the segment that produced the main net income per vessel.

Table 22. Results of the social characteristics of the skipper and fishers by fleet segment, including the results of the ANOVA. The bold figures show significance differences.

	Minor gear with engine < 6 m	**Minor gear with engine 6 - 12 m**	**Purse Seine 6 - 12 m**	**Total fleet**	**ANOVA P Value**
Ownership %					
Owner engaged in the vessel (%)	94 (±1.5)	87 (±1.4)	80 (±1.3)	88 (±1.4)	0.148
Fishing as main income generator (%)	82 (±1.8)	80 (±1.7)	92 (±2.0)	81 (±1.8)	0.317
Skipper – average values					
Age (yr)	49.1 (±1.7)	47.7 (±0.8)	46.1 (±2.1)	47.9 (±0.7)	0.589
Household size (n)	4.0 (±0.24)	4.9 (±0.16)	7.1 (±0.8)	4.9 (±0.14)	**< 0.05**
Household members engaged in fishing (n)	1.0 (±0.01)	1.2 (±0.03)	2.1 (±0.4)	1.2 (±0.04)	**< 0.05**
Average age of the children (n)	17.9 (±1.6)	16.8 (±0.7)	16.5 (±1.6)	17 (±0.61)	0.242
Fishers					
Age (yr)	35.1 (±2.3)	37.5 (±1.0)	33.3 (±2.3)	36.8 (±0.8)	0.737

The average age of the skipper was 47.9 years old, while the average age of the skippers' children was 18.1 years old. The analysis of the data per fleet segment showed that there were no significant differences ($P < 0.05$) of skippers' age among the different segments, the range varied between 46.1 years old for the purse seiner and 49.1 years old for the minor gears < 6 m. The comparison between the different segments showed that younger fishers belonged to the purse seiner segment. The average age of such segment was 33.3 years old, while for the minor gear < 6 m was 35.1 and for the minor gear 6-12 m was 37.5, however the difference between the ages was not statistically significant ($P < 0.05$). The average age of the children didn't show any significant differences (ANOVA $P < 0.05$) among the segments: the range varied between 19.7 years old of the purse seiner and 17.6 years old of the minor gear 6-12 m.

The comparison of the individual profile of the skipper and fishers showed, as expected, that the skipper were significantly older ($P < 0.05$) than ordinary fishers by 38%: 47.9 years old against 34.9 years old respectively.

The average household size was significantly different among fleet segments ($P < 0.05$) and for the total fleet it was composed by 4.9 people, while 1.2 of them were engaged in the fishing activity. The purse seiners' skippers had a household size of 7.1 while it was 4.9 for the minor gear 6-12 m and 4.0 and for the minor gear < 6 m. The number of household members engaged in fishing had a similar proportion as the household size in that there were 2.1 for the purse seine, 1.2 for the minor gear 6 - 12 m and 1.0 for the minor gear < 6 m. It is interesting to note the evident positive correlation between the net profit of the vessel and the household size ($r = 0.82$) were the latter increase with an increase in profit.

The educational level was converted into a 5 point Likert Scale and the results are illustrated in figure 8. The educational level which is compulsory in Lebanon is until the end of the elementary school (Likert scale 2, Fig 8). The educational level of both the skippers and the children were significantly higher ($P < 0.05$) than what is compulsory in the country (more than 2). With respect to the fishers the educational level was not significantly different ($P < 0.05$) from what is obliged by law.

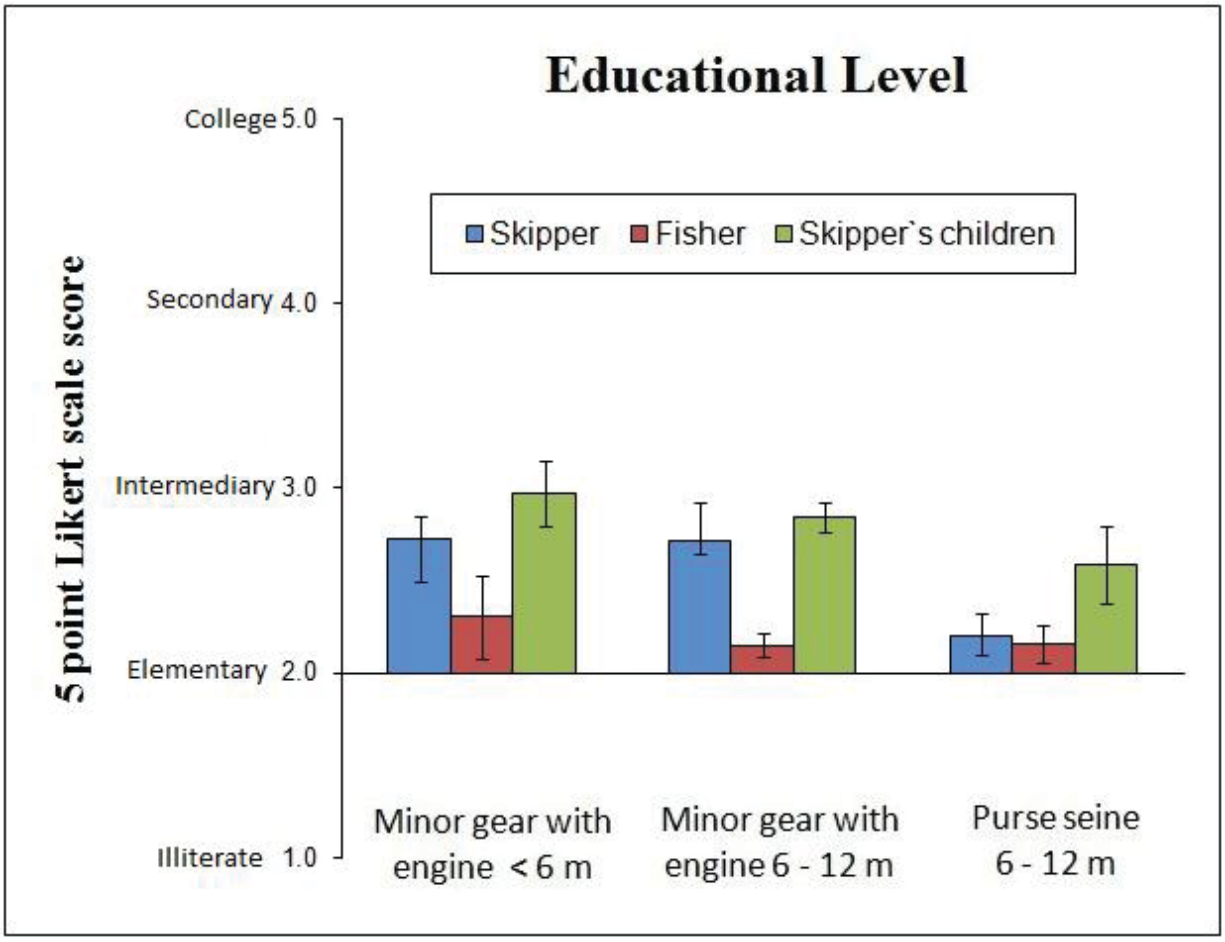


Fig 8. Educational level of the skippers, fishers and the skippers children, per fleet segment indicated on a five-point Likert-scale from 1 = Illiterate; 2 = Elementary; 3 = Intermediary; 4 = Secondary; 5 = College. A score of 2 (elementary) is the educational level obliged by law. The error bars show the standard error.

The educational level was not different between the segments, for all of them it was in the elementary range ($P < 0.05$). The educational level of the children decreased with the increase in the household size ($r = 0.99$). The lowest educational level was that of the children of a purse seiner's skipper, which was between elementary and intermediate, however the ANOVA test did not detect any significant differences between the education levels of the children.

The educational level showed as the skipper of the segments minor gear with engine had an educational level higher by about 20% compared to the fisher ($P < 0.05$).

3.2.8 Quality indicators Coefficient of Variation.

The values for the co-efficient of variation are shown in table 23. In general the coefficient of variation was very low for all the variables measured. This shows that the statistical quality of the data is extremely good. In general a CV of 20% can be considered acceptable, 12.5% as good and 2.5 % excellent (EC No 949/2008; EC 93/2010). When the CV was higher than 20%, it is was mainly due to a low number of responses. For example in the sale of the fish directly to the restaurant, since in this case fishers do not use this channel to sell fish, and hence a low response rate and high CV was obtained. A N/A in the table indicates that the CV could not be calculated since there was either 1 or less than 1 response.

Table 23. Table showing the CV (%) of the variables collected.

	Coefficient of Variation (%)			
Economic variables	**Minor gear with engine < 6 m**	**Minor gear with engine 6 - 12 m**	**Purse Seine 6 - 12 m**	**Total fleet**
Revenues (value of landings)	12%	5%	13%	4%
Energy costs	9%	4%	8%	4%
Maintenance costs	16%	7%	15%	6%
Operational costs	20%	8%	21%	6%
Commercial costs	16%	8%	16%	6%
Fixed costs	9%	3%	8%	3%
Crew share	12%	5%	13%	4%
Employment on board (FT+PT)	4%	2%	9%	2%
Employment on board (PT)	0%	1%	67%	1%
Effort (fishing days)	6%	2%	7%	2%
Volume of landings (ton)	9%	6%	17%	8%
Social variables				
Owner engaged in the vessel	1.6%	1.6%	1.6%	1.6%
Fishing as main income generator	2.2%	2.2%	2.2%	2.2%
Age skipper	2.5%	1.5%	3.0%	1.2%
Age fisher	3.0%	2.0%	4.6%	1.6%
Educational level skipper	3.3%	6.4%	3.9%	4.7%
Educational level fisher	4.0%	2.3%	4.5%	1.9%
Household size skipper	4.3%	2.6%	7.6%	2.2%
Age children skipper	5.2%	3.0%	6.7%	2.5%
Educational level children skipper	3.8%	2.3%	5.7%	1.9%
Household members engaged in fishing (Sk)	1.1%	2.1%	13.0%	1.8%
Sale of fish auction	8.9%	3.8%	6.3%	3.3%
Sale of fish_wholesaler	41.6%	32.6%	66.5%	24.6%
Sale of fish direct fishmonger	21.5%	11.6%	38.2%	10.0%
Sale of fish direct retail	20.2%	24.4%	N/A	15.6%
Sale of fish direct restaurant	164.8%	N/A	N/A	164.8%
Sale of fish other	26.2%	15.6%	83.1%	13.3%
Fishmarket/wholesale commission	1.4%	1.1%	7.0%	0.9%

4. Discussion

4.1 Fleet licensing data

The results show that the Lebanese fleet is clearly small scale artisanal in nature and that the number of licensed vessels is 1,460. The value obtained is about 45% less than what had been reported in previous surveys, such as the MedFisis survey in 2004 which reported the presence of 2,662 vessels along the coast. The reason for this discrepancy may be that either there are a number of vessels which do not renew their fishing licence with the Ministry of Agriculture, or did not fish at all in 2011. The problem is that it is extremely difficult to understand how much exactly these vessels are. However the phenomenon that unlicensed vessels which are engaged in commercial fishing exists throughout the world, and are considered as illegal vessels, but eventually states usually collect fisheries statistics based on the licensed or legal fleet. This makes the data collected within this survey comparable to the data collected in other countries.

The most typical gears encountered were the usual passive gears, such as fixed nets and longlines, which are very common in artisanal small scale fisheries. The aim of the current study was not to distinguish between the geographical location of the fishing vessels, but to collect information throughout the country, however it is interesting to note that more than 40% of the vessels reside in Tripoli (North Lebanon), and about 75% of all the fleet is registered in ports in the northern part of Lebanon which for the purposes of this study also included Beirut.

The segmentation of the fleet according to the GFCM task 1 fleet segmentation, was quite simple in that just 3 fleet segments were observed, when other countries could have more than 20 fleet segment (e.g. Italy). This means that management could specially focus on these segments, which are very similar in structure and they all operate in one GSA.

No trawling licences were given in 2011, making Lebanon the only Mediterranean country with no trawling licences. Furthermore trawling is banned within 6 nautical miles from the coast.

From the licenses, the data on the registered crew seemed extremely high, when compared with other Mediterranean countries. For example for a vessel less than 6 m in length the number of crew was 3.5. This anomaly was in fact confirmed when the questionnaire data was collected which showed that for example for a vessel less than 6 m the crew size was 1.4. Another important consideration was that the mean crew reported in the licence of the purse seiners was similar to the vessels less than 6 m and much lower than what was reported in the questionnaire. This shows that the information on crew in the present licence is unreliable. In this respect the questionnaire data on the crew was used for the socio-economic indicators which depended on the crew data such as salary per crew, employment on-board etc.

Ancillary information which is not directly linked with this study was also gathered from the licensing data including data on the number of recreational licenses and underwater fishing.

Hopefully with the new licensing database fleet the data on the licensed fishing vessels will be updated every year and possibly with an increased enforcement any vessels which did not update their licence in 2011 could be recorded in the future. In order to continue the time series from 2011 onwards, the 2012 licensing data should also, at least be entered into Excel. If possible in order to extend the time series as much as possible data prior to 2011 should also be digitalised.

4.2 Characteristics of the fleet

The backbone of the sector in terms of fleet capacity, activity and employment is based on one segment, minor gear with engine 6-12 m. In terms of volume (kg) and value ($) of the production, this segment also has the highest values, however the purse seiner segment, although relatively small (60 vessels) have also a high production in terms of total volume, and highest as catch per day, or efficiency. As a matter of fact by far the highest value of landings per vessel is that of the purse seiners. As expected, this is a typical characteristic of small pelagic fleets. This result came out of the survey since data on the production by fleet segment was lacking in Lebanon.

Management and development in terms of labour conditions, health and safety, fisheries facilities, market, etc, should be focused on the fleet segment minor gear with engine 6- 12 m, since it has been clearly shown that this segment is the most important, encompassing about3/4 of the fleet capacity, employment and effort. This is a relative advantage in Lebanon in that management measures can be applied to a specific segment and has a major impact on the fishery in general. However the other two segments, with different specificities and characteristics, would indirectly get strong benefits from any improvement of the fleet and working conditions.

In this respect the vessels in this segment (but also the others), are quite old (more than 20 years). Effort should be devoted to improve the fishing vessels in terms of working conditions, seaworthiness, maintaining of the product on board and accordingly their economic efficiency. But at the same time maintaining the type of fishing activity, that is small scale artisanal with passive gears.

The landings data obtained (4,850 t) are higher than those reported officially in GFCM and FAO (3,541 t in 2010). There may be two reasons for this discrepancy. The first one is that this survey was conducted as a one off annual survey so the landings data has not been collected with the best methodology. Landings data should be collected every month with a greater temporal stratification, including possibly a higher segmentation for the fishing gears and by species.

However another probably more plausible reason is that until now the official data reported in GFCM and FAO, has been constant for at least 6 years (see table 3) and this is highly unlikely to represent the true picture. The data obtained by this one off survey, would be considered as reliable by data collection methods for agricultural statistics. Although the data collection has some shortfalls due to the temporal stratification, the study gave a first indicative landing data of the country based a methodology with a sound sampling design and statistical procedures.

One other consideration is that the landing data could also be underestimated since if the fleet is actually more than the 1,460 vessels the total annual landings would be higher.

With respect to the value of landings when one considers the GDP of Lebanon, and that it is a developing country, in general the average price per kg of the production in Lebanon (5.6 $/kg) is relatively high compared to the European prices (6.1 $/kg). The high price is driven by a high unbalance between demand and supply, in which most of the demand is supplied by imports (~80%). This keeps the price relatively high, and as a result the capture fisheries production is not processed and is mostly commercialised fresh.

With respect to the fishing effort when comparing the two segments minor gear with engine, the larger vessels, (> 6 m) have about 30% higher fishing days, which shows that these vessels can fish in more adverse weather conditions. This leads to the larger vessels to have an

economic advantage on the smaller vessels, since they have higher fishing opportunities due to their size and their greater versatility of employment of fishing gears along the year. Accordingly, the capital invested in the larger fishing vessels can be utilised more generating more revenues.

Although the purse seiners have on average a higher size (9.7 m) than the minor gear with engine 6-12 (8.0 m), the fishing activity is lower since this type of vessels fish a stock which is highly seasonal.

The purse seiners are the vessels which mostly consume energy; however from the environmental and food security point of view they are the most efficient vessels, since they produce the highest production per litre of fuel. For example the purse seiners use 0.1 L to generate 1 kg of fish while the minor gear with engine 6 - 12 m uses 1.5 L.

The segment which had the highest number of fishing days, had the highest number of part-timers involved in the fishery. The purse seiners on the other hand employed a larger crew per vessel than the other segments, due to manpower needed in order to operate the purse seine nets, the accessory vessels and the high volume of production, with its subsequent handling. Usually in these types of vessels the turnover of crew is high, but this could not be determined from this survey.

4.3 Economic performance of the fleet

In all the three segments, the fishing industry generated a net profit of 6.4 million dollars, representing a profit of 24% of total revenues and 36% of the gross value added (GVA), indicating that more than half (56%) of the GVA is destined to the remuneration of the labour factor, which is considered a reasonable amount for a labour intensive activity such as small scale fishing. With respect to the net profit, in other Mediterranean countries for example the small scale fisheries of Spain, Italy and France, generate a profit of 10.9%, 22.8% and 23.8% respectively (EU Economic report 2010). Relative to these Mediterranean countries the small scale fishery in Lebanon is performing in a comparable way and can be considered as adequately profitable. Unfortunately data on non-European Mediterranean countries was not found with which Lebanon could be compared.

When considering the separate fleet segments the best performing segment in terms of net profit per vessel are the purse seiners, however, it produced the lowest salary both annual and on a daily basis. This means that the segment although it is the most profitable for the owner, it is the least attractive for the labour force due to its low remuneration. On the contrary the fleet segment minor gear with engine < 6 m had the lowest net profit per vessel and the highest salary both on an annual and daily basis. The other segment is somewhere in between, so from the socio-economic perspective taking into consideration the situation of both the owner and the labour force the segment minor with engine 6 – 12 m is the most balanced.

4.4 Ex-vessel market dynamics

The auction market is the most important channel for the ex-vessel sale of fish. In Beirut, there is a large auction market which is logistically in a good location (centre of the country), and hence it is ideal to commercialise the fisheries products and can reach a large population which is concentrated in the city.

The fish auction markets in Lebanon can be considered as a sellers' market where the demand exceeds the supply, and as a result high prices result from this excess of demand over supply. One might think that it is better to sell directly to the consumer, but it is not always the case. Although there is a commission in the auction market, the price may be raised due to competition among buyers, and hence a better revenue for the fishers. The auction market is also preferred since large quantities of fish can be sold, which is more difficult in a retail market. This system of selling through the auction can also have an indirect effect in effecting the price in the other marketing channels. For example once a fish obtains a price at the auction market the price will be used as a reference in other market channels. Probably all the catch that is sold through the auction markets obtains higher price compared to direct selling.

Accordingly, to the data gathered, the production of purse seiners play a dominant role in the fish auction markets (82% of the total production) and the ex-vessel sale of its production differs from that of the production of the minor gear segments. The purse seiners normally work overnight and land the product early in the morning. Due to the high perishability of such a landing product, the fishers need a place to sell their catch as soon as possible.

No seafood value chain analysis have been conducted in the country. An understanding of how the value is distributed along the chain, from the vessel to the final consumer, is very important in order to suggest actions aiming to enhance the sector and the livelihood of its stakeholders. For this purpose, the information on the ex-vessel market dynamics could represent the first step of a general seafood value chain analysis.

4.5 Socio-economic characteristics of the fishers

The social characteristics show that in general the owner of the vessel is engaged in fishing activities which is typical of small scale fisheries and that most of the owners use fishing as their main income generator. The average age of the skipper was 48, which is comparable to other Mediterranean countries, for example in Malta the average age was 46 (Dimech *et al*., 2009). The age of the fishers is about 30% less with an average age of 35. In this respect in Lebanon it doesn`t appear that there is an ageing problem of the fishers workforce.

Education in Lebanon is compulsory until the end of the elementary school, it is available to all Lebanese students, and is attended by nearly 95 percent of school-age children. However, compulsory education has not been fully implemented by Lebanese authorities, especially in urban slums and remote rural areas. The literacy rate was 88.4 percent in 1997 (CAS). Lebanese students are not allowed to enter formal technical education before the age 12, which is the age limit of obligatory education. The results from this study show that the fishers have a lower educational level than what it is obliged by law. For the children on average they have the minimum educational level as obliged by law, with the purse seine segment, having the lowest level.

The results of the performance of the fleet shows that the fisheries sector in Lebanon is making a turnover of 27 million dollars in 2011 which can generate a salary of 3,000 dollars per fisher per year to about 3229 fishers. The salary is also directly depended on the revenue, since it is not fixed but a share or a percentage of the income. Considering that about 45% of the fishers are also owners their revenue also includes the net profit, which is on average 4,400 dollars per vessel. This results in an overall gross income of 7,400 dollars per fisher who is also an owner (fisher-owner). One needs also to consider that most of the crew involved in the fishing activities belong to the family of the owner, usually children, so the overall income of the family is also higher. The data shows that 1.2 household members are involved in the fishing activities so the overall gross income of one family with a fisher-owner and household members involved in fishing is about 11,000 dollars per year.

The income per fisher-owner is lower than the national GDP per capita of 9,904 USD (World Bank). This shows that a fisher-owner in Lebanon earns lower than the average range of a salary of the country. Furthermore a fisher which is not an owner earns on average 3000 USD, which is much less than the average GDP per capita, and this constitutes 55% of the fishers in Lebanon. The minimum annual wage in Lebanon is 5,400 USD (Bureau of Democracy), so a fisher who is not an owner earns about 45% less than the minimum wage. Social security, social costs and pension contributions, were nil in the questionnaire and only one vessel declared a crew member’s insurance of 66 dollars. One has also to consider that the salary is also biased since it does not include any social contributions that are a form of deferred compensation. This is important in order to have a retirement plan which is an arrangement to provide fishers with an income during retirement when they are no longer earning a steady income from the fishing activity.

Taking into consideration all these results the fishers in Lebanon can be split up into two socio-economic categories, where the fisher-owners could be considered as part of the Lebanese lower-middle class whereas the fishers which are not owners can be considered as part of the lower class. The middle class is defined as having a reasonable amount of discretionary income, so that people do not live from hand to mouth as the poor do, and defined it as beginning at the point where people have roughly a third of their income left for discretionary spending after paying for basic food and shelter. This allows people to buy consumer goods, improve their health care, and provide for their children's education (Parker J 2009).

5. Conclusions and Recommendations

In general the Lebanese fishing fleet is making a profit of about 24% of the revenue which is comparable to other fleets in the Mediterranean of similar characteristics; that is small scale artisanal fisheries, using mostly passive gears. It is a family based fishery, where the owners of the vessels, are directly involved in the fishing activity, with the assistance of family members. The education level is low for the fishers, but their children have a minimum level of education as obliged by the Lebanese law. This means that the level of education for this social class is increasing by time, since the fishers' children have a better education level than their parents.

The income per fisher-owner is about 20% lower than the national GDP per capita, however a fisher which is not an owner earns about70% less than the GDP per capita and about 45% less than the minimum wage of the country. In this respect the fishers in Lebanon are present in both the lower-middle class (fisher-owners) and the lower class, where the latter are part of the poorest section of society. This shows that the fishing community in Lebanon is considerably poor and that appropriate action should be taken in order to improve the livelihood conditions of this part of society. Furthermore one needs to address the question to why do fishers continue to be involved in this sector and not move to other sectors with better income?

Furthermore all the fishers including the owners do not contribute part of their salary for social security and pension contributions and neither for a personal insurance. It is very important and strongly recommended to have a retirement plan which is an arrangement to provide fishers with an income during retirement when they are no longer earning a steady income from the fishing activity.

With respect to the market dynamics, the auction market is the main and the best channel used to sell the product. The auction market if well managed would keep prices high, could improve the hygienic conditions of the product and simplify the inspection and control activities. More effort should be devoted to develop the auction markets in Lebanon.

One of the associated indirect impact of the war in 2006 to the fisheries sector was a growing resistance to fish consumption from Lebanese consumers because of perceived food safety concerns following the oil spill. To overcome to this issue, more quality control on the safety of the seafood has to be done, and the this should be advertised to the consumers by specific campaigns.

One needs to considering the relatively low salaries and the way they are administered to the fishers (share);the salaries should be increased and become closer to the GDP per capita of the country. In order to achieve this, the fishing vessels need to increase the revenues. This can be accomplished by two main ways, either to increase the prices or increase the quantity of production. The former would be more difficult to achieve since the prices are already relatively high. However for some species, the price could be increased, but this would depend on the appreciation of the consumer of specific products. An increase in the added value of the product by post harvest processing could also be considered as an option, which however would need a focused marketing campaign since the population in Lebanon is used to eating fresh as opposed to processed fisheries products. This is particularly recommended for the small pelagic species. At this stage the information on the prices per species is not available, and hence any specific recommendation about this option is not possible. One other option which could also be considered in order to improve the economic situation of the fishers is to support them through some sort of social security measures by the Government but this would only solve the problem on a short term.

The option to increase the production rests on two solutions for Lebanon. The first is to improve the sustainable exploitation of the stocks, to achieve the theoretical Maximum Sustainable Yield (MSY) and/or Maximum Economic Yield (MEY) or one of their proxies (e.g. F_{MSY}, $F_{0.1}$.,F_{MEY}., etc). In order to improve the exploitation of the fisheries resources, biological data should be collected for some indicator species, and combined with the socio-economic data, the appropriate models could be run to determine the status of the stocks. Then the appropriate management action could be taken to improve the status of exploitation.

The second option is to exploit new fishing grounds and species such as the deep water grounds (> 200 m) and offshore waters for large pelagic species. These species are highly appreciated in the Mediterranean area and would add new production in the Lebanese market. The deep water and large pelagic species also have the advantage to fetch relatively high prices on the international market. In order to have more information on the status of these resources, surveys have to be conducted, for the different types of stocks.

Another way how to increase the production of pelagic species is also to utilise Fish Aggregating Devices (FADs). These are widely used in the Mediterranean to congregate pelagic species, most notably *Coryphaena hippurus* (dolphin fish), *Naucrates ductor* (pilot fish), *Seriola dumerili* (amberjack) and other similar pelagic species. The use of FADs in specific seasons could be used to shift the fishing effort from the currently exploited demersal species on these pelagic species. This however would require experimental fishing with FADs in order to determine their suitability in attracting pelagic fish in good quantities that could be harvested.

As it stands the fishery in Lebanon, although it generates a profit, further improvement could be made in the development of better safety conditions at sea and better hygienic conditions for the product, as has been also highlighted by other studies (Sacchi & Dimech., 2011).

Furthermore the artisanal fleet could be developed to increase the production and hence the value of the fishery if knowledge on the status of the stocks is known and the expansion to new fishing grounds, such as those in deeper waters and beyond the 6 nautical miles is possible (Sacchi & Dimech., 2011; Colloca & Lelli 2012).

Following the discussion the following summary recommendations came out from this study:

i) to arrange for the fishers to have a retirement plan;

ii) to develop the auction markets in Lebanon;

iii) to better understand the market dynamics and the distribution of the value along the chain;

iv) to increase the quality control on the safety of the seafood;

v) to explore the possibility to support the fishers through social security contributions;

vi) to increase the salary of the fishers; by

vii) increasing the added value of the product, in particular for the small pelagic species; or

viii) increasing the quantity of production; by

ix) monitoring the status of the stocks by collecting catch, effort, and biological data and then conduct formal stock assessment for some indicator species, and adjust the fishing effort to obtain the Maximum Sustainable Yield (MSY) or one of its proxies;

x) to test the possibility to use Fish Aggregating Devices (FADs) to increase production; and

xi) explore the possibility to shift part of the fleet to of new fishing grounds, in deeper and offshore waters; by

xii) the development of a modern artisanal fishing vessel which apart from improving the working conditions, would also facilitate the exploitation of new fishing grounds.

Further Needs

The conclusions and recommendations from this study have to be taken with care since the data collected so far only represents one year. Data should be collected for the economic part annually and tri-annually for the social part. In order to conduct a more sound economic performance analysis, at least a time series of 3 years should be collected. This would also allow the comparison of the economic indicators through time, with the possibility to run a bio-economic model which would provide information on the sustainability of the fishery. In this respect within the FAO EastMed project the same survey is being undertaken in 2013 for the 2012 economic data. One also needs to address the question to why do fishers continue to be involved in this sector and not move to other sectors with better income? Furthermore in order to have a better picture of the market dynamics and the whole value chain a specific survey should be conducted. All this information is essential if Lebanon intends to improve the management of the Lebanese fishing industry in line with the FAO code of conduct for responsible fisheries.

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ANNEXES

Annex I List of persons involved in the survey

Mr. Samir Majdalani – Supervisor
Head of Department of Fisheries & Wildlife at Ministry of Agriculture; EastMed National Focal Point

Mr. Mr. Dahej El Mokdad – Supervisor
Head of Department of Fisheries & Wildlife at Ministry of Agriculture; EastMed National Focal Point

Mr. Imad Lahoud – data entry/data quality
Officer in the Department of Fisheries & Wildlife at Ministry of Agriculture

Mr. Hussein Zuaiter – data collector/data entry
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture

Mr. Bahij Mezher – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture

Mr. Abdul-Qader Yihia – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture

Mr. Charbel Nammour – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture

Mr. Wissam Wazne – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Samer Jawhar – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Ali Nassar – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Ibrahim Younes – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Chadi Saikaly – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Elie Maalouf – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Mr. Hussein Nassar – data collector
Ranger in the Department of Fisheries & Wildlife at Ministry of Agriculture:

Ms. Marie Louise Hayek – FAO Lebanon administrator
Programme Clerk FAO representation in Lebanon

Annex II Agenda of the training course

Program of Work - Training Course on socio-economic data collection in Lebanon

11 - 16 March 2012

Dr. Dario Pinello FAO EastMed Consultant Socio-Economist

Sunday 11th March Travel to Beirut from Athens

Monday 12th March

Morning/Afternoon Training Course on socio-economic data collection. During the course the questionnaire will be explained and including all the variables to be collected.

Tuesday 13th March

Morning/Afternoon Follow-up by EastMed staff of questionnaire survey in the field.

Wednesday 14th March

Morning/Afternoon Follow-up by EastMed staff of questionnaire survey in the field.

Thursday 15th March

Morning Follow-up by EastMed staff of questionnaire survey in the field.

Afternoon Debriefing with FAOR

Friday 16th March Travel to Athens

The sessions are intended for the data collectors and the supervisor of the survey.

N.B. The FAO EastMed staff should be accompanied at all times by the focal point of the project. A car and a driver will be needed for the entire visit in order to travel from one town to another.

Annex III Terms of Reference

Terms of reference for a Training Course on socio-economic data collection in Lebanon

Lebanon 12 - 16 March 2012

BACKGROUND

During the EastMed 2nd co-ordination meeting on the 5-6th April, Antalya, Turkey the participants agreed to improve the existing licensing system in Lebanon and to start a pilot phase for data collection, which will start with a preliminary assessment of the economic situation of the fisheries sector. In order to undertake such an assessment an economic survey based on direct interviews with the fishers will be conducted. However before conducting the survey first the population of vessels has to be defined. The population of vessels can be derived from the licensing system, however at the moment the fishing licenses in Lebanon are not computerised but are only available on hard copy. In this respect the existing licenses for the year 2011 have to be entered into a database so that the fishing vessels population is available in order to undertake the socio-economic survey.

The sampling frame for the collection of socio-economic data for the year 2011 will be based on the licensed fishing vessels. A sampling plan will be implemented in order to achieve the estimation of all the socio-economic variables for fleet segments according to the GFCM Task I fleet segmentation. The technique of stratified random sampling will be used whereby a sample size of about 15% will be selected randomly from the total population per each fleet segment. Direct interviews based on questionnaires will be used to gather the data needed.

OBJECTIVES

The objectives will be:

- Describe the scheme and the goals of the survey;
- Introduce and describe the questionnaire that will be used to gather the data;
- Describe in detail each variable of the questionnaire;
- Describe the methodology that should be followed for the data entry in the excel sheets;
- Describe the approach that could be followed by the data collectors to interview the fishermen;
- Describe the methodology should be followed by the supervisor to check and to validate the questionnaires;
- Follow up of the survey in the field.

Annex IV Questionnaire

Lebanese Republic Ministry of Agriculture Department of Fisheries & Wildlife	EastMed Project مشروع ايستمد	FAO منظمة الفاو	الجمهورية اللبنانية وزارة الزراعة دائرة الصيد المائي والبري
	Socio-Economic Questionnaire for Marine Fishing Sector استمارة دراسة اقتصادية-اجتماعية لقطاع صيد الأسماك البحري		

Vessel Code رقم تسجيل الزورق			Name of Vessel اسم الزورق
Date of interview تاريخ اجراء المقابلة			
Name of interviewer اسم الباحث			
Name of interviewee اسم المستقتى			Tel. Number رقم الهاتف
Owner مالك	Partner شريك	% Partnership نسبة الشراكة %	Skipper رئيس
Reference period الفترة المرجعية			01/01/2011 - 31/12/2011

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات	UNIT الوحدة
A – Effort الجهد	Fishing days (total per year) مجموع ايام العمل في السنة	Number (ANNUAL) يوم سنويا
	Fishing hours (daily average on 24-hours basis) معدل ساعات العمل اليومي خلال 24 ساعة	Number (DAILY) ساعة يوميا
	Main gear used (main income generator) معدات الصيد الاساسية (اكبر مردود)	Name of the gear الاسم

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات				Skipper الربان	Fisher1 صيد 1	Fisher2 صيد 2	Fisher3 صيد 3	Fisher4 صيد 4	Fisher5 صيد 5
B - Socio/ Demographic اجتماعية/سكانية	Vessel ownership (Is the owner engaged on the vessel?) هل مالك الزورق يعمل على الزورق	YES نعم	NO كلا							
	Is fishing your main income generator? هل مدخولكم الاساسي هو من صيد الاسماك؟	YES نعم	NO كلا							
	Engaged crew per vessel (daily average) عدد البحارة على الزورق	Total Number العدد الاجمالي								
		Part Time دوام جزئي (Nr) عدد	Full Time دوام كامل (Nr) عدد							
	Age of the crew عمر البحارة	Number (one figure for each crew member) عدد								
	Education level of the crew مستوى البحارة التعليمي 0 امّي 1 ابتدائي 2 متوسط 3 ثانوي 4 جامعي	Number (one figure for each crew member) عدد								
	Household size حجم العائلة	Number (skipper) عدد (رئيس)								
	Number of wives عدد الزوجات	Number (skipper) عدد (رئيس)								
	Age of the children اعمار الاولاد والبنات	Number (skipper) عدد (رئيس)		Child 1						
				Child 2						
				Child 3						
				Child 4						
				Child 5						
				Child 6						
				Child7						
				Child8						
				Child9						
				Child10						

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات			Skipper الربان	Fisher1 صيد 1	Fisher2 صيد 2	Fisher3 صيد 3	Fisher4 صيد 4	Fisher5 صيد 5
B - Socio/ Demographic اجتماعية/سكانية	Education level of the children مستوى الاولاد التعليمي 0 اقي 1 ابتدائي 2 متوسط 3 ثانوي 4 جامعي	Number (skipper) عدد (رئيس)	Child 1						
			Child 2						
			Child 3						
			Child 4						
			Child 5						
			Child 6						
			Child7						
			Child8						
			Child9						
			Child10						
	Household members engaged in fishing عدد افراد العائلة الذين يعملون في الصيد	Number (skipper) عدد (رئيس)							

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات	Annual Amount القيمة السنوية
C – Economic/commercial (sale of fish) اقتصادية/تجارية (بيع السمك)	Auction المزاد	%
	Wholesaler تاجر الجملة	%
	Direct_Fishmonger البيع المباشر - سمكة	%
	Direct_Retail البيع المباشر - مفرق	%
	Direct_Restaurant البيع الباشر - مطعم	%
	Other مختلف	%
	Total	100%

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات	VARIABLE DESCRIPTION			Annual Amount القيمة السنوية
D- Detailed description of Economic/costs variables **الوصف التفصيلي للمعطيات الاقتصادية/الكلفة**	Energy cost كلفة الطاقة	Fuel costs كلفة المازوت/البنزين	Diesel المازوت	Gasoline البنزين	LL ليرة لبنانية
		Fuel consumption (liters)			l
		Lubricants costs كلفة الزيوت			LL ليرة لبنانية
	Crew share حصة البحارة	Remuneration مدخول البحارة	Lump sum دخل مقطوع	% share حصة %	LL ليرة لبنانية
		Social security, social costs and pension contributions الضمان الاجتماعي / الكلفة الاجتماعية / نهاية الخدمة			LL ليرة لبنانية
		Crewmembers insurance التامين على البحارة			LL ليرة لبنانية
	Repair and maintenance costs الصيانة والتصليحات	Maintenance and repairs to vessel صيانة وتصليح الزورق			LL ليرة لبنانية
		Maintenance and repairs to gear صيانة وتصليح معدات الصيد			LL ليرة لبنانية
		Other repair and maintenance costs كلفة الصيانة والتصليحات الاخرى			LL ليرة لبنانية
	Other operational costs الكلفة العملانية الاخرى	Purchasing ropes, hooks, and warps شراء حبال وصنانير			LL ليرة لبنانية
		Purchasing food شراء الطعام			LL ليرة لبنانية
		Purchasing bait شراء الطعم			LL ليرة لبنانية
		Purchasing other consumable materials شراء المواد الاستهلاكية الاخرى			LL ليرة لبنانية
		Other operational costs الكلفة العملانية الاخرى			LL ليرة لبنانية
	Commercial costs الكلفة التجارية	Fishmarket or Wholesaler's commission كومسيون المزاد او بائع الجملة	% of gross value % من القيمة الاجمالية		LL ليرة لبنانية
		Transportation of the fishing production (from vessel to place of selling) كلفة نقل الاسماك الى اماكن البيع			LL ليرة لبنانية
		Purchasing ice كلفة شراء الثلج			LL ليرة لبنانية
		Purchasing boxes and packages كلفة شراء الصناديق او اوعية التعبئة			LL ليرة لبنانية
		Other commercial costs الكافة التجارية الاخرى			LL ليرة لبنانية

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات	VARIABLE DESCRIPTION	Annual Amount القيمة السنوية
D- Detailed description of Economic/costs variables **الوصف التفصيلي للمعطيات الاقتصادية/الكلفة**	Fixed costs الكلفة الثابتة	Book-keeping مسك الدفاتر/الحسابات	LL ليرة لبنانية
		Vessel insurance تأمين الزورق	LL ليرة لبنانية
		Legal expenses الكلفة القانونية	LL ليرة لبنانية
		Bank expenses كلفة المصرف	LL ليرة لبنانية
		Banking interests فوائد القروض	LL ليرة لبنانية
		Annual quota fishermen associations الكلفة السنوية للتعاونية/النقابة	LL ليرة لبنانية
		Dock expenses (water, electricity) كلفة رسوم الزورق في المرفأ (مثل الماء والكهرباء)	LL ليرة لبنانية
		Fishing license renewal كلفة تجديد رخصة الصيد	LL ليرة لبنانية
		Costs of ministry of Transport كلفة وزارة النقل	LL ليرة لبنانية
		Other fixed costs الكلفة الثابتة الاخرى	LL ليرة لبنانية
	Investments in physical capital كلفة الاستثمار في الاصول الثابتة	Purchasing engine كلفة شراء محرك	LL ليرة لبنانية
		Purchasing fishing gears كلفة شراء معدات الصيد	LL ليرة لبنانية
		Purchasing equipment (mechanical, hydraulic, electrical equipment) كلفة معدات الاخرى هيدروليكية/ميكانيكية/كهربائية	LL ليرة لبنانية
		Other investments كلفة استثمارية اخرى	LL ليرة لبنانية
		Current value of vessel القيمة الحالية للزورق	LL ليرة لبنانية

***All costs should be considered as 'Gross costs'**

VARIABLE GROUP تصنيف المعطيات	VARIABLE المعطيات	Average Daily Amount
E – Landings كمية الصيد	Live weight of daily landing (the average catch of one fishing day)	Kg كلغ
	Gross value of daily landing (the average value of one fishing day)	LL ليرة لبنانية

F- Comments of Fishermen ملاحظات الصيادين

Signature of Interviewee

توقيع المستفتى

Annex V Summary of the data obtained

Table 1. Economic variables and indicators obtained per fleet segment (USD)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue (1000$)				
Value of landings	4,632	19,398	2,949	26,979
Employment				
Employment on board (Total)	513	2,312	403	3,229
Employment on board (PT)	355	1,145	2	1,502
Costs (1000$)				
Energy costs	763	3,130	267	4,159
Maintenance costs	173	1,002	120	1,295
Operational costs	293	1,044	447	1,784
Commercial costs	248	1,341	381	1,969
Fixed costs	19	55	3	78
Crew share (salary)	1,674	7,269	891	9,834
Total operating costs	*3,170*	*13,840*	*2,109*	*19,119*
Depreciation	192	942	74	1,207
Interest (opportunity costs)	63	123	11	197
Economic performance (1000$)				
Gross cash flow	1,462	5,558	840	7,860
Net profit	1,207	4,493	755	6,455
Gross value added	3,136	12,826	1,731	17,694
Return on Investment (ROI)	63%	44%	83%	50%
Break-even revenues	4,474	18,759	2,878	26,106
Salary per crew member	3.3	3.1	2.2	3.0
Capacity				
Volume of landings (ton)	528	2,210	2,112	4,850
Effort (fishing days)	53,822	217,244	10,221	281,287
Fleet - number of vessels	355	1,045	60	1,460
Fleet - total HP	7,261	32,531	3,538	43,330
Fleet - total LOA	1,750	8,386	584	10,720
Invested capital (1000$)	2,022	15,769	927	13,410

Table 2. Economic variables and indicators – Average per vessel (USD)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue (1000$)				
Value of landings	13.0	18.6	49.2	18.5
Employment				
Employment on board (Total)	1.4	2.2	6.7	2.2
Employment on board (PT)	1.0	1.1	0.0	1.0
Costs (1000$)				
Energy costs	2.1	3.0	4.4	2.8
Maintenance costs	0.5	1.0	2.0	0.9
Operational costs	0.8	1.0	7.5	1.2
Commercial costs	0.7	1.3	6.3	1.3
Fixed costs	0.1	0.1	0.1	0.1
Crew share (salary)	4.7	7.0	14.9	6.7
Total operating costs	*8.9*	*13.2*	*35.2*	*13.1*
Depreciation	0.5	0.9	1.2	0.8
Interest (opportunity costs)	0.2	0.1	0.2	0.1
Economic performance (1000$)				
Gross cash flow	4.1	5.3	14.0	5.4
Net profit	3.4	4.3	12.6	4.4
Gross value added	8.8	12.3	28.9	12.1
Return on Investment (ROI)	63%	44%	83%	50%
Break-even revenues	12.6	18.0	48.0	17.9
Salary per crew member	3.3	3.1	2.2	3.0
Capacity				
Volume of landings (ton)	1.5	2.1	35.2	3.3
Effort (fishing days)	152	208	170	193
Fleet - number of vessels	355	1,045	60	1,460
Fleet - total HP	20.5	31.1	59.0	29.7
Fleet - total LOA	4.9	8.0	9.7	7.3
Invested capital (1000$)	5.7	10.0	15.4	9.2

Table 3. Economic variables and indicators – Average per day (USD)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue ($)				
Value of landings	86.1	89.3	288.6	95.9
Employment				
Employment on board (Total)	1.4	2.2	6.7	2.2
Employment on board (PT)	1.0	1.1	0.0	1.0
Costs ($)				
Energy costs	14.2	14.4	26.1	14.8
Maintenance costs	3.2	4.6	11.7	4.6
Operational costs	5.4	4.8	43.8	6.3
Commercial costs	4.6	6.2	37.2	7.0
Fixed costs	0.4	0.3	0.3	0.3
Crew share (salary)	31.1	33.5	87.2	35.0
Total operating costs	*58.9*	*63.7*	*206.4*	*68.0*
Depreciation	3.6	4.3	7.2	4.3
Interest (opportunity costs)	1.2	0.6	1.1	0.7
Economic performance ($)				
Gross cash flow	27.2	25.6	82.2	27.9
Net profit	22.4	20.7	73.9	22.9
Gross value added	58.3	59.0	169.4	62.9
Return on Investment (ROI)				
Break-even revenues	83	86	282	93
Salary per crew member	21.5	15.1	13.0	15.8
Capacity				
Volume of landings (Kg)	9.8	10.2	206.6	17.2
Effort (fishing days)				
Fleet - number of vessels				
Fleet - total HP				
Fleet - total LOA				
Invested capital ($)				

Table 4. Economic variables and indicators obtained per fleet segment (LBP)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue (mLBP)				
Value of landings	6,983	29,243	4,446	40,671
Employment				
Employment on board (Total)	513	2,312	403	3,229
Employment on board (PT)	355	1,145	2	1,502
Costs (mLBP)				
Energy costs	1,150	4,718	402	6,270
Maintenance costs	261	1,510	181	1,952
Operational costs	441	1,574	674	2,690
Commercial costs	373	2,022	574	2,969
Fixed costs	29	83	5	117
Crew share (salary)	2,524	10,957	1,344	14,825
Total operating costs	*4,778*	*20,864*	*3,180*	*28,822*
Depreciation	289	1,420	111	1,820
Interest (opportunity costs)	96	185	17	298
Economic performance (mLBP)				
Gross cash flow	2,204	8,378	1,266	11,849
Net profit	1,819	6,774	1,138	9,731
Gross value added	4,728	19,336	2,610	26,674
Return on Investment (ROI)	63%	44%	83%	50%
Break-even revenues	6,745	28,279	4,338	39,355
Salary per crew member	4.9	4.7	3.3	4.6
Capacity				
Volume of landings (Kg)	528	2,210	2,112	4,850
Effort (fishing days)	53,822	217,244	10,221	281,287
Fleet - number of vessels	355	1,045	60	1,460
Fleet - total HP	7,261	32,531	3,538	43,330
Fleet - total LOA	1,750	8,386	584	10,720
Invested capital (mLBP)	3,049	15,769	1,397	20,215

Table 5. Economic variables and indicators – Average per vessel (LBP)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue (1000LBP)				
Value of landings	19,669	27,983	74,098	27,857
Employment				
Employment on board (Total)	1.4	2.2	6.7	2.2
Employment on board (PT)	1.0	1.1	0.0	1.0
Costs (1000LBP)				
Energy costs	3,240	4,515	6,702	4,295
Maintenance costs	734	1,445	3,014	1,337
Operational costs	1,243	1,506	11,241	1,842
Commercial costs	1,052	1,935	9,563	2,033
Fixed costs	83	79	80	80
Crew share (salary)	7,109	10,486	22,392	10,154
Total operating costs	*13,460*	*19,966*	*52,992*	*19,741*
Depreciation	815	1,359	1,850	1,247
Interest (opportunity costs)	269	177	288	204
Economic performance (1000LBP)				
Gross cash flow	6,209	8,017	21,106	8,116
Net profit	5,125	6,482	18,969	6,665
Gross value added	13,318	18,503	43,499	18,270
Return on Investment (ROI)	63%	44%	83%	50%
Break-even revenues	19,000	27,061	72,298	26,955
Salary per crew member	4,916	4,739	3,332	4,591
Capacity				
Volume of landings (Kg)	1.5	2.1	35.2	3.3
Effort (fishing days)	152	208	170	193
Fleet - number of vessels	355	1,045	60	1,460
Fleet - total HP	20.5	31.1	59.0	29.7
Fleet - total LOA	4.9	8.0	9.7	7.3
Invested capital (1000LBP)	8,588	15,090	23,283	13,846

Table 6. Economic variables and indicators – Average per day (LBP)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Revenue (LBP)				
Value of landings	129,736	134,608	434,990	144,590
Employment				
Employment on board (Total)	1.4	2.2	6.7	2.2
Employment on board (PT)	1.0	1.1	0.0	1.0
Costs (LBP)				
Energy costs	21,370	21,718	39,342	22,292
Maintenance costs	4,841	6,953	17,692	6,939
Operational costs	8,201	7,245	65,989	9,562
Commercial costs	6,936	9,305	56,141	10,554
Fixed costs	544	382	468	416
Crew share (salary)	46,890	50,438	131,454	52,703
Total operating costs	*88,781*	*96,042*	*311,086*	*102,466*
Depreciation	5,374	6,535	10,858	6,470
Interest (opportunity costs)	1,776	850	1,688	1,058
Economic performance (LBP)				
Gross cash flow	40,955	38,566	123,903	42,124
Net profit	33,805	31,180	111,357	34,596
Gross value added	87,845	89,004	255,357	94,827
Return on Investment (ROI)				
Break-even revenues	125,319	130,170	424,424	139,909
Salary per crew member	32,424	22,793	19,562	23,830
Capacity				
Volume of landings (Kg)	9.8	10.2	206.6	17.2
Effort (fishing days)				
Fleet - number of vessels				
Fleet - total HP				
Fleet - total LOA				
Invested capital ($)				

Composition of the national fleet, 2011

Table 7. National fleet, composition by size and age, 2011

Size class	Number	HP (1000)	Age class	Number	HP (1000)
<5 m	166	3.3	2010-2011	18	0.6
5 - 5.99 m	195	4.0	2008-2009	35	1.4
6 - 6.99 m	278	5.3	2006-2007	27	0.9
7 - 7.99 m	323	8.9	2004-2005	36	1.4
8 - 8.99 m	197	6.4	2002-2003	63	2.7
9 - 9.99 m	159	5.5	2000-2001	56	2.0
10 - 10.99 m	84	4.4	1998-1999	76	2.9
11 - 11.99 m	30	3.3	1996-1997	86	3.0
>10.99 m	28	2.2	older	1,063	28.4
Total	1,460	43.3	Total	1,460	43.3

Table 8. Minor gear with engine < 6 m, composition by size and age, 2011

Size class	Number	HP	Age class	Number	HP
<5 m	165	3,281	2010-2011	6	160
5 - 5.99 m	190	3,980	2008-2009	9	230
6 - 6.99 m			2006-2007	10	315
7 - 7.99 m			2004-2005	13	367
8 - 8.99 m			2002-2003	11	230
9 - 9.99 m			2000-2001	10	281
10 - 10.99 m			1998-1999	21	642
11 - 11.99 m			1996-1997	21	549
>10.99 m			older	254	4,487
Total	355	7,261	Total	20	7.261

Table 9. Minor gear with engine 6 - 12 m, composition by size and age, 2011

Size class	Number	HP	Age class	Number	HP
<5 m			2010-2011	11	352
5 - 5.99 m			2008-2009	24	1,063
6 - 6.99 m	277	5,278	2006-2007	16	545
7 - 7.99 m	318	8,825	2004-2005	21	989
8 - 8.99 m	190	6,268	2002-2003	46	1,746
9 - 9.99 m	148	5,082	2000-2001	44	1,552
10 - 10.99 m	71	3,474	1998-1999	49	1,567
11 - 11.99 m	21	2,187	1996-1997	59	2,084
>10.99 m	20	1,418	older	775	22,634
Total	1,045	32,531	Total	1,045	32,530

Table 10. Purse Seine 6 - 12 m, composition by size and age, 2011

Size class	Number	HP	Age class	Number	HP
<5 m	1		2010-2011	1	125
5 - 5.99 m	5	25	2008-2009	2	80
6 - 6.99 m	1	0	2006-2007	1	22
7 - 7.99 m	5	109	2004-2005	2	60
8 - 8.99 m	7	178	2002-2003	6	739
9 - 9.99 m	11	445	2000-2001	2	170
10 - 10.99 m	13	912	1998-1999	6	644
11 - 11.99 m	9	1,098	1996-1997	6	380
>10.99 m	8	771	older	34	1,318
Total	60	3,538	Total	60	3,538

Economic variables showing the mean values, the standard error and the coefficient of variation (CV). These were calculated using a modified formula for small populations as described in the methodology (section 2.3.4)

Table 11. Statistical quality parameters (USD)

Variable	Mean value ($)	Standard error ($)	Coefficient of variation
Minor gear with engine < 6 m			
Revenues (value of landings)	13,048	1,630	12%
Employment on board (FT+PT)	1.45	0.06	4%
Employment on board (PT)	1.00	0.00	0%
Energy costs	2,149	184	9%
Maintenance costs	487	76	16%
Operational costs	825	162	20%
Commercial costs	698	114	16%
Fixed costs	55	5	9%
Crew share	4,716	589	12%
Effort (fishing days)	152	10	6%
Volume of landings (ton)	1,488	141	9%
Minor gear with engine 6 - 12 m			
Revenues (value of landings)	18,563	945	5%
Employment on board (FT+PT)	2.21	0.05	2%
Employment on board (PT)	1.10	0.02	1%
Energy costs	2,995	133	4%
Maintenance costs	959	66	7%
Operational costs	999	77	8%
Commercial costs	1,283	100	8%
Fixed costs	53	2	3%
Crew share	6,956	354	5%
Effort (fishing days)	208	4	2%
Volume of landings (ton)	2,115	117	6%
Purse Seine 6 - 12 m			
Revenues (value of landings)	49,153	6,175	13%
Employment on board (FT+PT)	6.72	0.59	9%
Employment on board (PT)	0.04	0.03	67%
Energy costs	4,446	375	8%
Maintenance costs	1,999	291	15%
Operational costs	7,457	1,596	21%
Commercial costs	6,344	1,005	16%
Fixed costs	53	4	8%
Crew share	14,854	1,866	13%
Effort (fishing days)	170	12	7%
Volume of landings (ton)	35,194	5,840	17%
National fleet			
Revenues (value of landings)	18,479	824	4%
Employment on board (FT+PT)	2.21	0.05	2%
Employment on board (PT)	1.03	0.01	1%
Energy costs	2,849	106	4%
Maintenance costs	887	52	6%
Operational costs	1,222	94	6%
Commercial costs	1,349	87	6%
Fixed costs	53	2	3%
Crew share	6,736	301	4%
Effort (fishing days)	192	4	2%
Volume of landings (ton)	3,322	256	8%

Table 12. Statistical quality parameters (LBP)

Variable	Mean value in 2011 (LBP)	Standard error (LBP)	Coefficient of variation
Minor gear with engine < 6 m			
Revenues (value of landings)	19,669,444	2,457,281	12%
Employment on board (FT+PT)	1.45	0.06	4%
Employment on board (PT)	1.00	0.00	0%
Energy costs	3,239,883	277,456	9%
Maintenance costs	733,889	113,978	16%
Operational costs	1,243,333	244,893	20%
Commercial costs	1,051,533	172,137	16%
Fixed costs	82,500	7,277	9%
Crew share	7,109,099	888,132	12%
Effort (fishing days)	152	10	6%
Volume of landings (ton)	1,488	141	9%
Minor gear with engine 6 - 12 m			
Revenues (value of landings)	27,983,456	1,424,533	5%
Employment on board (FT+PT)	2.21	0.05	2%
Employment on board (PT)	1.10	0.02	1%
Energy costs	4,514,981	200,036	4%
Maintenance costs	1,445,389	100,087	7%
Operational costs	1,506,056	115,864	8%
Commercial costs	1,934,507	150,782	8%
Fixed costs	79,478	2,701	3%
Crew share	10,485,598	533,782	5%
Effort (fishing days)	208	4	2%
Volume of landings (ton)	2,115	117	6%
Purse Seine 6 - 12 m			
Revenues (value of landings)	74,098,276	9,308,582	13%
Employment on board (FT+PT)	6.72	0.59	9%
Employment on board (PT)	0.04	0.03	67%
Energy costs	6,701,746	564,966	8%
Maintenance costs	3,013,793	438,747	15%
Operational costs	11,240,897	2,405,731	21%
Commercial costs	9,563,276	1,514,442	16%
Fixed costs	79,759	6,676	8%
Crew share	22,392,499	2,813,054	13%
Effort (fishing days)	170	12	7%
Volume of landings (ton)	35,194	5,840	17%
National fleet			
Revenues (value of landings)	27,857,028	1,242,154	4%
Employment on board (FT+PT)	2.40	0.05	2%
Employment on board (PT)	0.57	0.01	1%
Energy costs	4,294,808	159,968	4%
Maintenance costs	1,336,842	78,899	6%
Operational costs	1,842,236	142,118	6%
Commercial costs	2,033,323	131,426	6%
Fixed costs	80,224	2,635	3%
Crew share	10,153,925	453,835	4%
Effort (fishing days)	192	4	2%
Volume of landings (ton)	3,322	256	8%

The suite of socio-economic indicators which were calculated in US dollars and Lebanese pounds

Table 13. Socio-economic indicators (USD)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Employment per vessel (FT+PT)	1.4	2.2	6.7	2.2
Employment per vessel (PT)	1.0	1.1	0.0	1.0
Landings per crew (ton)	1.0	1.0	5.2	1.5
Revenue per crew - (1000$)	9.0	8.4	7.3	8.4
Crew/LOA	0.3	0.3	0.7	0.3
Salary per crew (1000$)	3.3	3.1	2.2	3.0
Added Value/Revenue	68%	66%	59%	66%
Gross Operative Margin/Revenue	32%	29%	28%	29%
ROS (Return on Sale)	27%	24%	26%	25%
ROI (Return on Investment) (%)	63%	44%	83%	50%
Net Profit per vessel (1000$)	3.4	4.3	12.6	4.4
Landings per vessel (ton)	1.5	2.1	35.2	3.3
Landings per LOA (ton)	0.3	0.3	3.6	0.5
CPUE (kg)	9.8	10.2	206.6	17.2
Revenue per vessel (1000$)	13.0	18.6	49.2	18.5
Revenue per LOA (1000$)	2.6	2.3	5.1	2.5
RPUE ($)	86.1	89.3	288.6	95.9
Average price - ($/Kg)	8.8	8.8	1.4	5.6
Energy cost per vessel - (1000$)	2.1	3.0	4.4	2.8
Energy cost per day - (1000$)	0.014	0.014	0.026	0.015
Fuelconsumption per vessel (000l)	1.8	3.3	5.1	3.0
Fuel consumption per day (l)	11.9	15.7	30.0	15.5
Maintenance cost per vessel - (1000$)	0.5	1.0	2.0	0.9
Fuel efficiency (litre of fuel per Kg of landed seafood)	1.2	1.5	0.1	0.9

Table 14. Socio-economic indicators (LBP)

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Employment per vessel (FT+PT)	1.4	2.2	6.7	2.2
Employment per vessel (PT)	1.0	1.1	0.0	1.0
Landings per crew (ton)	1.0	1.0	5.2	1.5
Revenue per crew - (1000LBP)	13,601	12,646	11,027	12,596
Crew/LOA	0.3	0.3	0.7	0.3
Salary per crew (1000LBP)	4,916	4,739	3,332	4,591
Added Value/Revenue	68%	66%	59%	66%
Gross Operative Margin/Revenue	32%	29%	28%	29%
ROS (Return on Sale)	27%	24%	26%	25%
ROI (Return on Investment) (%)	0.6	0.4	0.8	0.5
Net Profit per vessel (1000LBP)	5,125	6,482	18,969	6,665
Landings per vessel (ton)	1.5	2.1	35.2	3.3
Landings per LOA (ton)	0.3	0.3	3.6	0.5
CPUE (kg)	9.8	10.2	206.6	17.2
Revenue per vessel (1000LBP)	19,669	27,983	74,098	27,857
Revenue per LOA (1000LBP)	3,989	3,487	7,618	3,794
RPUE (LBP)	129,736	134,608	434,990	144,590
Average price - (LBP/Kg)	13,223	13,233	2,105	8,387
Energy cost per vessel (1000LBP)	3,240	4,515	6,702	4,295
Energy cost per day (1000LBP)	21	22	39	22
Fuelconsumption per vessel (000l)	1.8	3.3	5.1	3.0
Fuel consumption per day (l)	11.9	15.7	30.0	15.5
Maintenance cost per vessel (1000LBP)	734	1,445	3,014	1,337
Fuel efficiency (litre of fuel per Kg of landed seafood)	1.2	1.5	0.1	0.9

Market and social variables showing the mean values with the coefficient of variation (CV)

Table 15. Statistical quality of the social variables

Variable	Mean value in 2011	Standard error	Coefficient of variation
Minor gear with engine < 6 m			
Owner engaged in the vessel (%)	94%	2.2%	2.4%
Fishing as main income generator (%)	82%	3.6%	4.4%
Average age of the skipper	49.1	1.23	2.5%
Educational level of the skipper*	2.7	0.09	3.3%
Household size of the skipper	4.0	0.18	4.3%
Number of wives of the skipper	0.8	0.04	4.4%
Average age of the children (skipper)	19.3	1.00	5.2%
Educational level of the children (skipper) *	3.1	0.12	3.8%
Household members engaged in fishing (skipper)	1.0	0.01	1.1%
Average age of the fishers	35.5	1.07	3.0%
Educational level of the fishers*	2.3	0.09	4.0%
Minor gear with engine 6 - 12 m			
Owner engaged in the vessel (%)	87%	1.8%	2.1%
Fishing as main income generator (%)	80%	2.1%	2.7%
Average age of the skipper	47.7	0.70	1.5%
Educational level of the skipper*	2.7	0.17	6.4%
Household size of the skipper	4.9	0.13	2.6%
Number of wives of the skipper	0.9	0.02	2.2%
Average age of the children (skipper)	17.6	0.53	3.0%
Educational level of the children (skipper) *	2.9	0.07	2.3%
Household members engaged in fishing (skipper)	1.2	0.02	2.1%
Average age of the fishers	36.8	0.72	2.0%
Educational level of the fishers*	2.2	0.05	2.3%
Purse Seine 6 - 12 m			
Owner engaged in the vessel (%)	80%	5.4%	6.8%
Fishing as main income generator (%)	92%	3.7%	4.0%
Average age of the skipper	46.1	1.40	3.0%
Educational level of the skipper*	2.2	0.09	3.9%
Household size of the skipper	7.1	0.54	7.6%
Number of wives of the skipper	0.9	0.04	4.0%
Average age of the children (skipper)	19.7	1.33	6.7%
Educational level of the children (skipper) *	2.5	0.14	5.7%
Household members engaged in fishing (skipper)	2.1	0.27	13.0%
Average age of the fishers	30.7	1.42	4.6%
Educational level of the fishers*	2.1	0.09	4.5%
National fleet			
Owner engaged in the vessel (%)	88%	1.4%	1.6%
Fishing as main income generator (%)	81%	1.8%	2.2%
Average age of the skipper	47.9	0.58	1.2%
Educational level of the skipper*	2.7	0.13	4.7%
Household size of the skipper	4.9	0.11	2.2%
Number of wives of the skipper	0.9	0.02	1.9%
Average age of the children (skipper)	18.1	0.46	2.5%
Educational level of the children (skipper) *	2.9	0.05	1.9%
Household members engaged in fishing (skipper)	1.2	0.02	1.8%
Average age of the fishers	34.9	0.56	1.6%
Educational level of the fishers*	2.2	0.04	1.9%

*Indicated on a five-point Likert-scale from 1 = Illiterate; 2 = Elementary; 3 = Intermediary; 4 = Secondary; 5 = College

Table 16. Social variables

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Ownership				
Owner engaged in the vessel (%)	94%	87%	80%	88%
Fishing as main income generator (%)	82%	80%	92%	81%
Skipper				
Average age of the skipper	49.1	47.7	46.1	47.9
Educational level of the skipper*	2.7	2.7	2.2	2.7
Household size of the skipper	4.0	4.9	7.1	4.9
Number of wives of the skipper	0.8	0.9	0.9	0.9
Average age of the children (skipper)	19.3	17.6	19.7	18.1
Educational level of the children (skipper)*	3.1	2.9	2.5	2.9
Household members engaged in fishing (skipper)	1.0	1.2	2.1	1.2
Fishers				
Average age of the fishers	35.5	36.8	30.7	34.9
Educational level of the fishers*	2.3	2.2	2.1	2.2

*Indicated on a five-point Likert-scale from 1 = Illiterate; 2 = Elementary; 3 = Intermediary; 4 = Secondary; 5 = College

Table 17. Ex-Vessel (first sale) marketing variables

	Minor gear < 6 m	Minor gear 6 - 12 m	Purse Seine 6 - 12 m	Total fleet
Seafood-marketing channels				
Auction (%)	51%	66%	82%	64%
Wholesaler (%)	5%	3%	4%	3%
Directly to fishmonger (%)	15%	17%	11%	16%
Directly to retail market (%)	17%	4%	0%	7%
Directly to restaurant (%)	0.3%	0.0%	0.0%	0.1%
Other (%)	11%	10%	3%	10%
Seafood-marketing commissions				
Fish market or Wholesaler's commission (% of gross value of the product)	6.9%	7.3%	6.7%	7.2%

Table 18. Statistical quality of the ex-vessel marketing variables

Variable	Mean value in 2011	Standard error	Coefficient of variation
Minor gear with engine < 6 m			
Auction (%)	51%	4.6%	8.9%
Wholesaler (%)	5%	1.9%	41.6%
Directly to fishmonger (%)	15%	3.3%	21.5%
Directly to retail market (%)	17%	3.4%	20.2%
Directly to restaurant (%)	0.3%	0.5%	164.8%
Other (%)	11%	2.9%	26.2%
Fish market or Wholesaler's commission (% of gross value)	6.9%	0.001	1.4%
Minor gear with engine 6 - 12 m			
Auction (%)	66%	2.5%	3.8%
Wholesaler (%)	3%	0.8%	32.6%
Directly to fishmonger (%)	17%	2.0%	11.6%
Directly to retail market (%)	4%	1.1%	24.4%
Directly to restaurant (%)	0.0%		
Other (%)	10%	1.6%	15.6%
Fish market or Wholesaler's commission (% of gross value)	7.3%	0.001	1.1%
Purse Seine 6 - 12 m			
Auction (%)	82%	5.2%	6.3%
Wholesaler (%)	4%	2.7%	66.5%
Directly to fishmonger (%)	11%	4.3%	38.2%
Directly to retail market (%)	0.0%		
Directly to restaurant (%)	0.0%		
Other (%)	3%	2.2%	83.1%
Fish market or Wholesaler's commission (% of gross value)	6.7%	0.005	7.0%
National fleet			
Auction (%)	64%	2.2%	3.3%
Wholesaler (%)	3%	0.7%	24.6%
Directly to fishmonger (%)	16%	1.6%	10.0%
Directly to retail market (%)	7%	1.0%	15.6%
Directly to restaurant (%)	0.1%	0.1%	164.8%
Other (%)	10%	1.3%	13.3%
Fish market or Wholesaler's commission (% of gross value)	7.2%	0.001	0.9%

Beneficiary countries

Countries with waters included in the GFCM
Geographical Sub-Areas (GSAs) 19-20 and 22-28

Donors

Greece

- Ministry of Foreign Affairs
- Ministry of Rural Development and Food

Italy

- Ministry of Agriculture Food and Forestry Policies

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- Directorate General of Maritime Affairs and Fisheries (DG-MARE)

Hellenic Ministry of Foreign Affairs

Hellenic Ministry of Rural Development and Food

ITALIAN MINISTRY OF AGRICULTURE, FOOD AND FORESTRY POLICIES

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