Research Article

Development of sustainable small-scale fisheries management in Turkey

Abstract

Turkish coastlines is an important fishing ground for small and large scale fisheries due to having rich marine biodiversity since it is surrounded by four different characteristic seas i.e. Black Sea, Sea of Marmara, Aegean Sea and Mediterranean Sea from north to south. Small-scale fisheries have been performed along the Turkish coasts for a long time and provide an important source of livelihood for the people. Especially in developing countries it enables some significant contributions such as nutrition, food security, sustainable livelihoods and poverty alleviation. Since the importance of sustaining small-scale fisheries is being increasingly recognized characteristics of small-scale fisheries have a great importance in order to make the regional sustainable management models due to its various local applications. This paper suggests that a framework known as the livelihoods approach can help bring a fuller understanding of small scale fishery. In this context, it has been examined and evaluated using official data and our field observations concerning on small-scale fisheries sustainability in Turkey. The paper also have discussed to set out some preliminary conclusions about the management of small scale fisheries from a livelihoods perspective including long term and current practices in order to develop regarding sustainable small-scale fisheries.

Keywords: Small-scale fisheries, Sustainability, Turkey

Didem Gokturk, Tomris Deniz
Department of Fisheries Technology, Istanbul University, Turkey

Correspondence: Didem Göktürk, Istanbul University, Faculty of Fisheries, Department of Fisheries Technology, Turkey, Tel: +90212 455 57 00/16431; Fax: +90212 514 03 79; Email didemgokturk@gmail.com

Introduction

Fisheries, in simple terms, can be described as catching and evaluation of all kinds of living organisms by various methods in aquatic ecosystems.[1] Since the Upper Palaeolithic,[2] continued fishing activities with artisanal fisheries from that day to this, have reached the modern fishing environment using electronic equipment, equipment and information technology.[1] Small scale fisheries (SSF) are fishing activity that carried out by fishing vessels of an overall length of less than 12 m in the coastal area. In general, fishery products are put on market after seasonal, full-time or part-time works in local and internal markets.[3,4] According to Food and Agriculture Organization of the United Nations (FAO), SSF make an important contribution to nutrition, food security, sustainable livelihoods and poverty alleviation -especially in developing countries. Despite this significant contribution, the issues constraining the sustainable development of small-scale fisheries remain poorly understood.[5]

For many species which have known as commercially importance are welcomed in Turkish coasts. One of the most important economic activities is fishery in Turkey due to rich marine biodiversity of the Turkish coastlines surrounded by different characteristic seas which are the Black Sea, Sea of Marmara, Aegean Sea and Mediterranean Sea. Those of these seas - from north to south- are important fishing ground for small and large scale fisheries. In this context, the marine habitats of Turkish coasts provide a significant sheltering, nutrition, spawning and nursery area for migrants and settled species. SSF is an important source of livelihood for the people. In other words, small-scale fisheries known more than 1000 years is of commercial importance role along the Turkish coasts. In this study, the past and present situation of SSF, which has been performed in Turkey for many years, has been tried to be summarized by combining with the official data and field study observations, and the administrative issuers have been examined.

Materials and methods

The data of small scale fisheries which were discussed and evaluated in this study was obtained from Republic of Turkey Ministry of Food, Agriculture and Livestock, Turkish Statistical Institute (TurkStat)[6] and FAO statistics. In other respects, some field research results which are face-to-face interviews, including collected surveys and made observations in the some selected region were evaluated in order to understand the issues of small-scale fisheries carried out in the Turkish coasts (Figure 1) between 2005-2015 fishing seasons.

Figure 1 Turkish coastlines and surrounding seas.

Results and discussion

General view of SSF in Turkey

The structure of SSF maintained on the coastlines of Turkey surrounded by seas with different oceanographic characteristics

also shows many differences directly from each other. Therefore, depending on the species distribution, abundance and habitats, fishing gears and fishing methods used in SSF as well as the catch amount of products are characteristically different from each other. Even in different regions of the water body not far from each other, having different characteristics of fishing gears are used in the same species catching. The most captured commercial fish species for SSF in the Turkish coasts are summarized according to the landing area in Table 1.

Table 1 The most captured commercial fish species by SSF in Turkish coasts according to the landing area

Region	Pelagic species	Demersal species
Black Sea	Anchovy, Sprat, Sand smelt, Annular bream, Horse mackerel, Scad, Brown mearge, Picarel, Grey mullet, Chup mackerel, Sea bass, Blue fish, Atlantic bonito, Pilchard, Twaite shad, Mackerel, Gar fish	European hake, Red mullet, Common sole, Black scorpion fish, Turbot, Red gurnard, Small-scalled, Whiting, Striped red
Sea of Marmara	Anchovy, Sprat, Sea bream, Sand smelt, European barracuda, Annular bream, Horse mackerel, Scad, Brown mearge, Picarel, Two bandedbream, Grey mullet, Chup mackerel, Bogue, Sea bass, Blue fish, Saddled seabream, Striped bream, Corb, Atlantic bonito, Pilchard, Sauppe, Twaite shad, Mackerel, Gar fish	European hake, Red mullet, Common sole, Angler fish, Shore rockling, Black scorpion fish, Turbot, Red gurnard, Trigla lineate, Waker, Small-scalled, Whiting, Striped red
Aegean Sea	Anchovy, Leer fish, Greater amberjack, Albacore, Sprat, Sea bream, Common seabream, Meagre, Sand smelt, Painted comber, European barracuda, Annular bream, Horse mackerel, Scad, Brown mearge, Picarel, Two bandedbream, Grey mullet, Chup mackerel, Bogue, Sea bass, Blue fish, Saddled seabream, Striped bream, Striped seabream, Corb, Atlantic bonito, Large-eye dentex, Pilchard, Black sea bream, Sauppe, Dentex, Twaite shad, Blue spatled bream, Mackerel, Gar fish, Saury	European hake, Red mullet, Goldband goatfish, Common sole, Angler fish, Shore rockling, Black scorpion fish, Red gurnard, Trigla lineate, Waker, Small-scalled, Whiting, Striped red
Mediterranean Sea	Leer fish, Greater amberjack, Albacore, Sea bream, Common seabream, Meagre, Sand smelt, Painted comber, European barracuda, Annular bream, Horse mackerel, Scad, Brown mearge, Picarel, Two bandedbream, Grey mullet, Chup mackerel, Bogue, Sea bass, Blue fish, Saddled seabream, Striped bream, Striped seabream, Corb, Atlantic bonito, Large-eye dentex, Pilchard, Black sea bream, Sauppe, Dentex, Twaite shad, Blue spatled bream, Mackerel, Gar fish, Saury	European hake, Red mullet, Goldband goatfish, Common sole, Angler fish, Shore rockling, Black scorpion fish, Red gurnard, Trigla lineate, Waker, Small-scalled, Whiting, Striped red

According to TurkStat data, boat size was classified as four different length class from 1967 to 2004 (Figure 2) and then the records have been started to be kept as shown in Figure 3 which have include nine different length class from 2005 to 2015. Besides the

fishing gear classifications of the boats were made simply between 1967 and 2012 (Figure 4). A detailed classification has been also made for fishing gear since 2013 according to the TurkStat data (Figure 5).
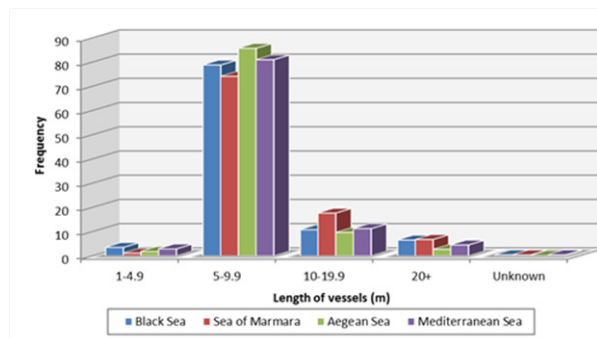

Figure 2 Boat size distribution between 1967 and 2004 according to the landing areas.
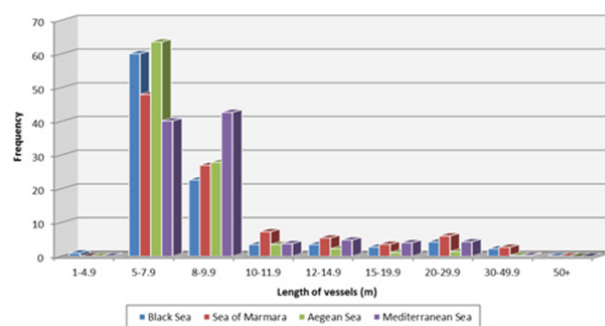

Figure 3 Boat size distribution between 2005 and 2015 according to the landing areas.

There are 14340 fishing vessels which are composed of more than 85 % below 12 meters and mostly made of wood licensed in Turkey according to year of 2015 government statistics. Passive gears such as gillnets, hook and lines, or pots and traps are mostly used for small-scale fisheries. However mobile gears such as dredges and beam trawls are performed by vessels over 8 m in length. Taking into consideration of operating type of the licenced vessels, the most recent distributions of fishing gears based on SSF in 2015 are shown in Figure 6.

Various types of fishing lines and nets are used in the Turkish coasts where the bottom structure is rocky, sandy, muddy, seagrass etc. depending on the type of fisheries season and type of fish species. All of the pelagic and demersal fish species given in Table 1 are caught as target or by-catch using of gillnets which are called by specific regional names and have different equipment.
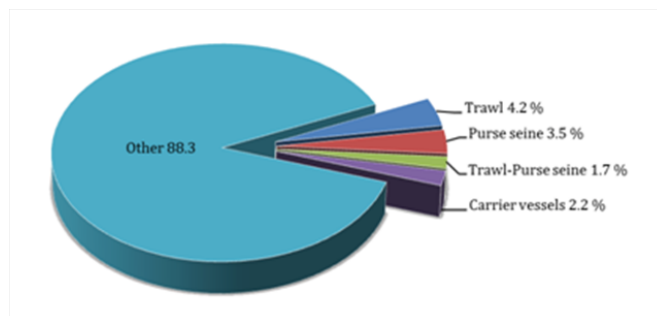

Figure 4 Distribution of fishing gear classifications between 1967 and 2012.
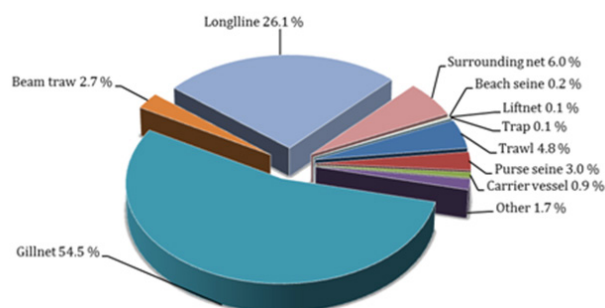
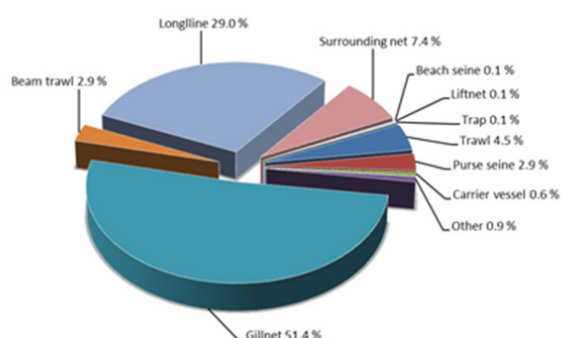**Figure 5** Distribution of fishing gear classifications between 2013 and 2015.

Figure 6 Distribution of fishing gears based on SSF.

Missing data on SSF in Turkey

Fishery management within an ecological framework requires information on fish resources, their environment, fleets, markets, and policies.[7,8,9] Environmental and water parameters, pollution level, Catch per unit effort (CPUE), cost-benefit analysis, impact of fishing on season, lunar periods, size of crafts and/or type of gears, etc., are needed to understand and evaluate Maximum sustainable yield (MSY) and to embark on development of sustainable SSF Management on local, regional and national level. It is an important requirement that the fishery and associated supplementary data required for the development of the SSF or the situation within the country's fishery are kept in order, detailed and reliable and easily accessible. Many of the data are needed to organize and regulate sustainable SSF management in Turkey in order to understand and its development since the most of data are missing and not kept regularly. For example, the most basic data such as the fishing time per day, the amount of fish caught alone, and the number of employees on the boat is not recorded in detail as well as CPUE calculation and therefore need to be known for the MSY calculation. All these calculations could not be made due to lack of reliable data.

Field observations

In the current study, we have summarized the following common issues performed with the examination for different regions and different periods including sociologically observations for the SSF structure in which are not kept adequate, useful and reliable data by the government.

Fishing time

Although the spending time varies during the day depending on the type of fishing gear used and the species being caught there is no record of how long a small scale fishery has been performed. So the fishing effort associated with SSF cannot be calculated when requested. However, the min-max and the average values of the results obtained from the field studies in the need of time spent working within a day for the fisherman have been calculated following. For gillnets min: 2 h max: 12 h and the average is 4 h (in some areas 24 h depending on the fish abundance), for lines min: 4 h max: 10 h and the average is 5 h (in some areas for silk hook 12 h), and for beach seine, the average is 2-4 hours. However, fishermen can capture the fish that provides their livelihood over a period of time by spending less time in the past, but now they need to stay in the sea for a longer time.

Fishing gear losses and damages

In particular, one of the main reasons for the losses in gillnets is depredation the nets by marine mammals for feeding purposes and therefore they become unusable in most cases. However, this loss is actually bidirectional. Because, in some cases, these sea mammals such as dolphins and monk seals become entangled in the nets so they die or suffer from injuries. Also large fish species make the same damage to the nets for feeding purposes. Another important reason for the loss is the use of different fishing gear in the same landing area. Especially, during the fishing operations close to the coastline which have been prohibited by the regulations depending on the area are performed by purse seiners and trawlers so they get entangling the small scale fishermen's nets and dragging them away. As a result of this act, either the nets are completely lost or become useless. Besides, nets, hooks, lines, long lines and traps are also damaged by some other factors such as getting stuck in bottom, bad weather conditions, sticking of propellers of yacht or recreational boats. Some of damages of fishing gears can be repaired for re-used by the fishermen so they are forced to rebuild a fishing gear. Making a new fishing gear or repairing for low income fishermen causes extra cost as well as labour loss.

Fishing ground destruction and fish stock depletion

In Turkey, a combination of overfishing, pollution, climate changes and the invasion of alien species due to the pressures exerted by mankind have affected the marine biodiversity also fish stocks. One of the major problems of SSF fishermen in Turkey is inadequate protection of fishing grounds due to the marine habitat destructions, and hence this caused to the failure of catch amount of commercial species. Key reasons of marine habitats destruction in Turkey may be summarized such as eutrophication, coastal area development, shipping, unsustainable fisheries practices, illegal destructive fishing activity and inadequate protection. Among these, illegal fishing activity is the most effective reason for habitat destruction accordingly fishing ground. Some purse-seiners and trawlers destroy fishing grounds even though; there is a prohibition for fishing in shallow waters. In addition, illegal trawl fisheries are kept despite of the prohibition in the entire Sea of Marmara and some other restricted areas. These issues naturally cause to damage the resident fish stocks around the fishing grounds and reduce the SSF effort. Changing of environmental parameters lead to reduce some fish species and leave from the habitat. For example, in the Princes' Islands, Sea of Marmara, Atlantic mackerel and chup mackerel have been widely fished with a high income in the past but there is no longer able to be caught adequately.

Financial difficulties

Reducing the amount of commercial fish species cause to decrease income for the fishermen. Recently, many of small scale fishermen

need to sell their boats or quit fishing because of the lack of catch amount of fish. Therefore they cannot earn enough money for their livelihood and cost of fishing equipment as well as fuel oil. On the other hand, the fishermen who continue fishing occupation under these circumstances prefer to use the minimum crew reducing the cost. Besides the fishermen do some extra jobs to maintain their livelihood. In accordance with our negotiations during our field studies, it can be observed that most of fishermen are willing to continue their profession but concerning of growing economic problems they do not know how long can it be lasted.

Conclusion

Fisheries management is the most important issue concerning on sustainable development of fisheries.[10,11] Within fisheries management and development policy, the importance of sustaining small-scale fisheries is being increasingly recognized.[12,13,14] Small-scale fishing is an occupation, a source of livelihood and a way of life for millions of people around the world. It also contributes food security, economic growth and development to communities and nations.[15] Republic of Turkey Ministry of Food, Agriculture and Livestock is the main state organisation responsible for fisheries administration, regulation, protection, promotion and technical assistance and all fisheries activities are based on the Fisheries Law No. 1380, enacted in 1971. Fishing regulations are based on minimum mesh size, minimum landing size or weight, closed area and terms for specified fishing gears and vessels, closed season, ban on catch to some species, gear restriction for identified species, gear or fishing method restrictions and some restrictions concerning pollutants.[1] An important aspect of small-scale fisheries is that they target most of the priority species listed by the GFCM. Many times small-scale fleets capture those species which are evaluated by the scientific working groups on demersal and small pelagic species of the GFCM Sub Committee for Stock Assessment. Regardless, these captures are in many cases not included in the assessments because they are not reported in the national statistical systems.[16] Having attempted to highlight the current approaches to fisheries management and development, it can be concluded by following some suggestions on sustainable SSF management and development in Turkey. The SSF data which includes daily catch amounts obtained from the boats should be regularly collected and recorded statistically using logbooks comprising discard and by-catch data. Continuous monitoring studies during the fishing periods should be performed to give more significant data and more extensive studies should be done for the sustainable management of SSF. Therefore, these monitoring activities will also provide a beneficial contribution for maintaining and sustainability of the ecological balance. Since there is no specific regulations concerning on SSF management in Turkey the government should increase supporting opportunities for fishermen. Besides as mentioned here regarding SSF issues there is needed to make new regulation for management of SSF concerning on sustainable development of fisheries regarding fisheries management.

To ensure the sustainable development of SSF in Turkey and to identify appropriate management strategies, especially in terms of livelihood, the first necessary requirement is establishing and using a system that will collect reliably and regularly data about the SSF. With the help of these records which will be kept afterwards, taking into account the annual income-expenditure of the fishermen whose livelihood is SSF, it will be a positive step to introduce legal regulations that will enable them to continue the fishermen professions identified as having economic difficulties during that season and to provide financial support/assistance so that they can continue to supply nutrition with SSF. These data will also be used by researchers

in calculations such as CPUE, MSY, stock assessment to provide a basis for future predictions and precautions. Apart from this, in order to protect SSF fishing areas and to improve the stocks of the economic species that are caught through them and to ensure their sustainability, the implementation of additional restructuring and conservation strategies in existing regulations will be an effective measure both in terms of ecosystem and fisheries management. Although the legal boundaries of trawl and purse seine fisheries are precisely defined by legal regulations, it is known that illegal fishing continues with these fishing gears and prohibited areas, and that the fishing activities result in damage to the SSF fishermen so this loss is also the loss of money due to the loss or major damage of the fishing gears. In addition, these illegal fishing activities cause damage to fish stocks in that area, thus causing the amount of fish caught by SSF fishermen to decrease, which again means financial loss. In order to minimize the loss of these financial losses, illegal fisheries can be avoided and it is necessary to increase regional surveillance and punitive sanctions.

Acknowledgements

Conflicts of interest

None.

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