

CHARACTERISATION AND MANAGEMENT OF SUSTAINABLE SMALL-SCALE FISHERIES: A CASE STUDY ON PRINCES' ISLANDS, SEA OF MARMARA

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Abstract: According to Food and Agriculture Organization of the United Nations, small-scale fisheries and its sustainable development is a significant issue on nutrition, food security, sustainable livelihoods and poverty alleviation, especially in developing countries. Despite these important contributions, the problems that affect the sustainable development of small-scale fisheries could not be well understood. Small-scale fisheries which is a profession, livelihood and lifestyle for millions of people is needed a designed management to ensure its continuity in a healthy ecosystem regarding to sustainability. Due to this characteristic of small-scale fisheries performing locally, have a great importance in order to make the regional management models. The Princes' Islands include four large (Büyükada, Heybeliada, Burgazada and Kınalıada) and five small (Sedef Adası, Yassıada, Sivriada, Kaşık Adası and Tavşan Adası) islands located in the northern part of the Sea of Marmara. Among them, Büyükada, Heybeliada, Kınalıada and Burgazada have settled population live in. This study aimed to summarize the main issues of small-scale fisheries in Princes' Islands in terms of sustainability.

Keywords: Small-scale fisheries (SSF), sustainable fisheries, Princes' Islands, Sea of Marmara, artificial reefs.

I. INTRODUCTION

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 [1]. According to FAO [2], 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. The sector needs better governance, designed to ensure a healthy ecosystem while enhancing fishers' well-being [3].

Istanbul Islands or Princes' Islands in the Sea of Marmara are different from each other and have also different socio-economic, socio-cultural and socio-spatial structure [4]. Defining the features of an island as such its closure to outside, self-restraint, and time standstill make it antithetical "exterior" to "external world" [5]. On the other hand, Princes' Islands, connected to a big metropole like Istanbul, are a metropole-linked district that has continued to be a part of the metropolis and has remained partially isolated over the years with various changes. Due to this partial isolation, the fishing is already carried out by the settled-public of the Princes' Islands in accordance with the definition of FAO's small-scale fishery, as well as the active connection with a large city like Istanbul, are affected by strong factors such as maritime traffic, environmental pollution and population increase [1].

Princes' Islands are archipelago and located in the north-east of the Sea of Marmara, 4-8 km from the Anatolian coast of Istanbul and along the coast from

Bostancı to Kartal. The Sea of Marmara -an intra-continental marine basin- forms a gateway and a special ecosystem connected to the Black Sea via the Bosphorus and the Aegean Sea through the Strait of Dardanelles between the Mediterranean Sea and the Black Sea. There are a total of 9 islands which of 5 are regularly and permanent settlement, close to the southern opening width of Bosphorus and named Büyükada, Heybeliada, Burgazada, Kınalıada, Sedef Island, Yassıada, Sivriada, Tavşan Island and Kaşık Island, respectively (Fig. 1).

Among them there are settlements only in Büyükada, Heybeliada, Burgazada, Kınalıada and Sedef Island, and except Sedef Island there are fishermen cooperatives in the others. The issues of small-scale fisheries carried out in Prince's Islands have not been addressed hitherto. There has been one study concerned on the structure of SSF in terms of fishing gears, fishing boats, catch composition, target and by catch species ratios examined by Göktürk and Deniz [1] and another study on coastal fishing gears used in the islands has been reported by Akyol and Ceyhan [6].

The Princes' Islands have a rich biodiversity and hosted for many species, especially those of species have commercially importance. There is an important sheltering, nutrition, spawning and nursery area with its marine habitats for migrants and settled species. Naturally, the Princes' Islands are also important fishing ground with all these features in terms of small-scale fisheries. SSF is an activity of more than 1000 years from the Byzantine period to the present day, and it is an important source of livelihood for the people of the islands. From this point of view we have chosen The Princes' Islands as a study area because of all these features and the issues of small-

scale fisheries have been tried to be summarized and the sustainability of fishing activities discussed.

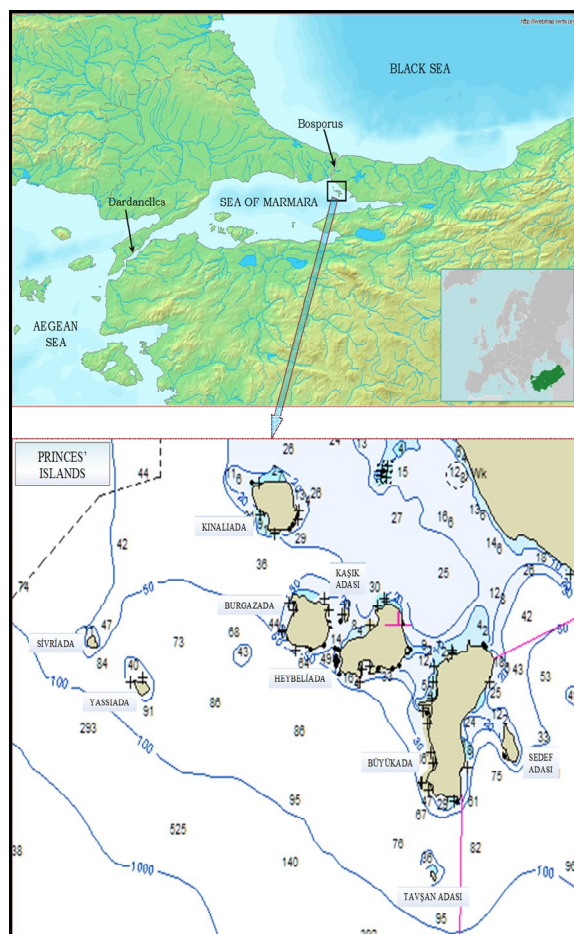


Fig.1. Sea of Marmara and Princes' Islands.

II. DETAILS EXPERIMENTAL

During the study, designing the field research, face-to-face interviews with licenced fishermen those who continued fishing in the islands, including collected surveys and made observations in the region were evaluated in order to understand the issues of small-scale fisheries carried out in the islands. This study was conducted between 2014 and 2015 in fishing seasons.

III. RESULTS AND DISCUSSION

3.1. Short description of small scale fisheries in Princes' Islands

Various types of fishing lines and nets are used in the region where the bottom structure is rocky, sandy and muddy depending on the type of fisheries season and type of fish species. Specific fishing gears which are locally developed specific to fish species and called the fish names such as bluefish tandem hook, bluefish longline and sand smelt encircling net are used by fishermen to capture of target fish species. It can be seen that captured fish species having economic value in the Princes' Islands are listed in Table 1.

Table 1: List of the captured commercial fish species in Princes' Islands.

Pelagic species	
Common name	Scientific name
Bluefish	<i>Pomatomus saltatrix</i> , (Linnaeus, 1766)
Atlantic bonito	<i>Sarda sarda</i> , (Bloch, 1793)
Atlantic horse mackerel	<i>Trachurus trachurus</i> , (Linnaeus, 1758)
Mediterranean horse mackerel	<i>Trachurus mediterraneus</i> , (Steindachner, 1868)
Picarel	<i>Spicara smaris</i> , (Linnaeus, 1758)
Blotched picarel	<i>Spicara maena</i> , (Linnaeus, 1758)
Big-scale sand smelt	<i>Atherina boyeri</i> , Risso, 1810
Mediterranean sand smelt	<i>Atherina hepsetus</i> , Linnaeus, 1758
Garfish	<i>Belone belone</i> , (Linnaeus, 1761)
Herrings, shads, sardines fish i.e.	Clupeidae species i.e. <i>Sprattus sprattus</i> , (Linnaeus, 1758)
European sprat	<i>Alosa fallax</i> , (Lacepède, 1803)
Twaite shad	
Demersal species	
Common name	Scientific name
European hake	<i>Merluccius merluccius</i> , (Linnaeus, 1758)
Turbot	<i>Scophthalmus maximus</i> , (Linnaeus, 1758)
Surmullet	<i>Mullus surmuletus</i> , Linnaeus, 1758
Red mullet	<i>Mullus barbatus</i> , Linnaeus, 1758
Whiting	<i>Merlangius merlangus</i> , (Linnaeus, 1758)
Common sole	<i>Solea solea</i> , (Linnaeus, 1758)
European flounder	<i>Platichthys flesus</i> , (Linnaeus, 1758)
Angler	<i>Lophius piscatorius</i> , Linnaeus, 1758
Black scorpionfish	<i>Scorpaena porcus</i> , Linnaeus, 1758
Small red scorpionfish	<i>Scorpaena notata</i> , Rafinesque, 1810
Sea robins fish i.e.	Triglidae species i.e. <i>Chelidonichthys lucerna</i> , (Linnaeus, 1758)
Tub gurnard	<i>Chelidonichthys cuculus</i> , (Linnaeus, 1758)
Red gurnard	
Grey gurnard	<i>Eutrigla gurnardus</i> , (Linnaeus, 1758)

The species, mentioned in Table 1, which are bluefish, sand smelt, surmullet, red mullet, European flounder, turbot and garfish are caught as target species which are named for species-specific fishing gears (sand smelt net, bluefish trammel net, bluefish

longline and European flounder/turbot trammel net etc.) while others are captured by-catch species as a natural resulting of fisheries. The percentage distributions of fishing gears used in SSF and called local names according to their included in FAO general fishing gear classification are shown in Fig 2. The fishing operation time in hours spent in a day using fishing gears which are called by its local names are summarized in Figure 3. There are still caught by traditional spear fishing in the Islands, with the only percentage of 0.1% (not shown in Fig. 3) and captured fish are sold to islands or mainland restaurants. However it is also made for sportive purposes by tourists coming to the island and especially those who have summer houses in the summer season.

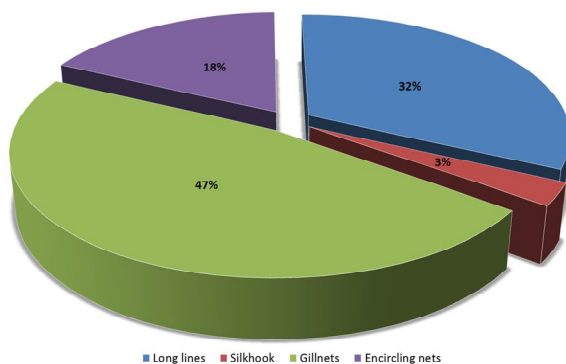


Fig.2. Distribution of fishing gears used in Princes' Islands.

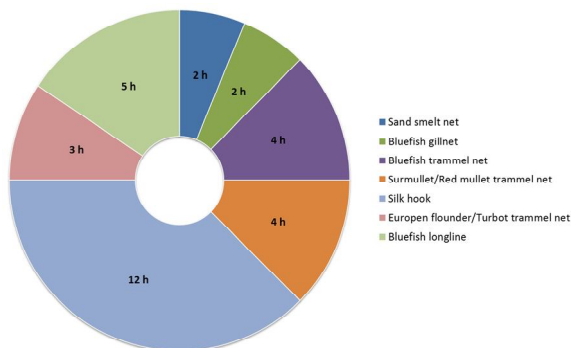


Fig.3. Fishing operation time in a day (in hours).

The engine power distribution of the boats used in fishery is shown in Fig. 4 and the boat size distribution is shown in Fig. 5. There are worked 2 people in 13% and 1 person in 87% of boats, generally these employees are also the boat owners and their annual expenses distribution in a season are shown in Figure 6. Among these expenses, the largest ratio is for fishing nets with the percentage of 34 after fuel cost expenses because the fishermen have lost a lot of nets at the fisheries season. Their loss is due to damaging the nets by dolphins for feeding purposes, tangling of the nets on the rocks because of the bad weather conditions or drifting entangled propeller, and destroying the nets by purse-seiners while they are conducting fishing operations by not seeing the nets that have been caught in the same fishing

grounds. Distributions of the net lost are also summarized in Figure 7.

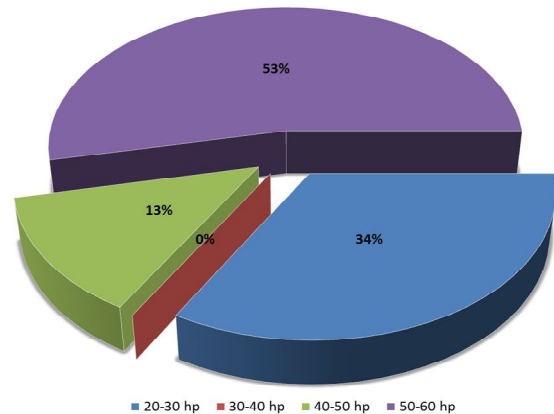


Fig.4. Engine power distribution of boats.

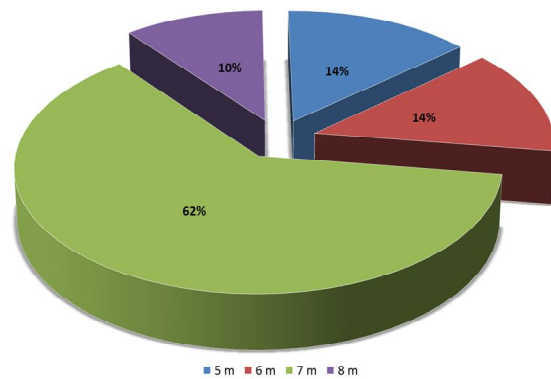


Fig.5. Distribution of fishing boat size.

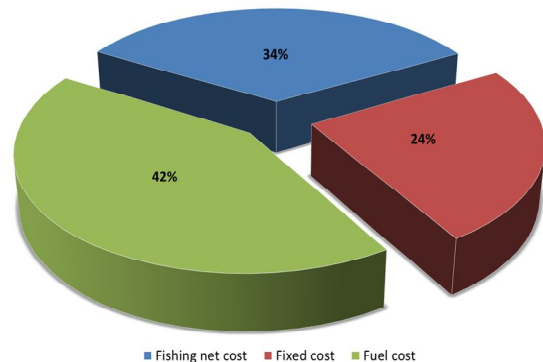


Fig.6. Distribution of annual expenses.

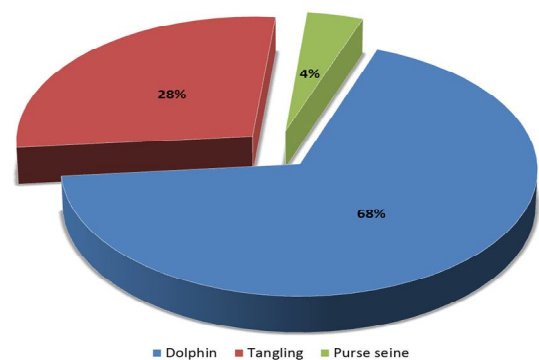


Fig.7. Distribution of the net lost.

3.2. Current issues of small scale fisheries

In the historical process, the Princes' Islands have a population dynamics that has migrated and emigrated for centuries, and has been referred to as the favourite holiday place for the people living in Istanbul from the 19th century to the present day. Therefore, there is a continuous dynamic change in the fisheries structure, and the problems of small scale fisheries also change accordingly. The main current issues of SSF fishermen in the Islands are tried to be summarized as below:

1. Habitat destruction: Among the major problems of fishermen in the islands are the inability to protect fishing grounds due to the destruction of marine habitat, and therefore the failure of fishery of commercial species. One of the problems causing this habitat destruction in the Islands is ghost fishing, which is caused by purse seine nets. Although some purse-seiners are prohibited to catch in shallow waters they destroy fishing grounds. In addition, demersal trawling continues illegal fisheries despite being prohibited in the entire Sea of Marmara. These issues naturally damage the resident fish stocks around the Islands and reduce the SSF effort.

2. Fishing ground competition: There is a seasonal competition between large scale and other small scale fishermen who come from the mainland due to the fact that use the same fishing grounds and this situation lead to not adequate fishing activities for the fishermen live in the Islands.

3. Fishing gear losses: The main reasons of fishing gear losses are dolphins engaging in depredation activities for feeding purpose cause damage to fishing gear and hard to repair damages in nets; tangling nets with undesirable causes (bad weather conditions, sticking of propellers of yacht or recreational boats); destroying or damaging to the nets of small scale fishermen by purse-seiners without seeing and taking away the nets by illegal trawlers. Some of these damages can be repaired and nets become usable again so fishermen are often forced to rebuild a fishing gear. These fishermen, who are already low income, are in the process of making fishing gear and repairing, which causes extra cost and labour loss.

4. Environmental pollution: Due to the change and deterioration of environmental parameters, some types of fished species have been reduced or left the habitat as a result of decreased fished species abundance and thus low income decreased. For example, Atlantic mackerel and chup mackerel fisheries have been a high income in the past years and no longer can be caught. So some fishing gears used in the fisheries of this kind of species are no longer used because they do not provide the desired fishing efficiency.

5. Financial difficulties: Many of fishermen left fisheries selling their boats because they cannot catch enough fish to their livelihood and increase in

fishing costs such as fishing nets and fuel oil. Those who continue fishing in the current situation prefer not to use crew on the boat to reduce the cost.

CONCLUSIONS

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 [3]. Fishing has been an important source of livelihood for the majority of the population settled in the 1900s, when Istanbul is not so crowded yet, the construction industry is not so concentrated, and the transportation between the islands and the mainland is not as intense and easy as it is today. For many years the diversity and abundance of fish for the Islands has provided an important economic source. Over time, due to the increase in the binding with the mainland and the rise of different business facilities for the island's people and the consequent reduction of the composition of the various factors of income from the fishery, it negatively affected the sustainability of SSF in the islands. Göktürk and Deniz [1] have reported that the total catches of the commercial species in the last decade reduced, the size of the boat has become smaller and some fishing gear have no longer used. In the presented study according to our negotiations, fishermen emphasized that they were eager to continue their profession but they had to leave fisheries due to the growing economic problems in the face of rapid development. The government should provide promoting opportunities for fishermen in this region to ensure the continuation of their fishing activities for centuries. In order to improve SSF Artificial reef which is a human made underwater structure should be used in fisheries management to provide new habitats, increase number and biomass of depleted fishery resources, restore habitats, prevent from illegal fishery, reduce fishing pressure on the fish stock and possibly decrease deterioration of habitats as applied in the world. From this point of view, in order to ensure the sustainability of SSF in the island, data should be regularly collected to give more emphasis to monitoring studies and more comprehensive studies should be done.

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