Sustainable Aquatic Research (2022) 1(3):171-182
DOI: 10.5281/zenodo.7489248
e-ISSN: 2822-4140

SUSTAINABLE AQUATIC RESEARCH
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RESEARCH PAPER

Investigation of artisanal lift net fishing on the Aegean Sea coast of Türkiye

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Citation

Dereli, H., & Erkoç, H. (2022). Investigation of artisanal lift net fishing on the Aegean Sea coast of Türkiye. *Sustainable Aquatic Research, 1*(3), 171-182.

Article History

Received: 23 November 2022
Received in revised form: 08 December 2022
Accepted: 12 December 2022
Available online: 30 December 2022

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Keywords

Lift net
Artisanal fishing
Income
Small scale fisheries
Sustainability
Aegean Sea

Abstract

Lift net/blanket net (çökeltme dalyanı in Turkish), is an artisanal fishing method established on the shores of the Aegean Sea in Türkiye, in which fish that migrate along the coast to feed or breed are caught. In this study, it was aimed to define the lift net fishery and to determine the socio-demographic and socio-economic characteristics and views of fishers on problems. The data were collected through surveys and field observations from April to May 2022 in three stations (Karaburun, Urla and Foça). Twenty-four fishers of the 31 existing lift net fishers were reached and the survey consisting of 41 questions was filled in face-to-face and telephone interviews. There was no significant difference between the stations in terms of age, lift net fishing experience, number of employees, annual income, total annual expense, annual profit, fishing day per year, and duration of fishing operation ($p>0.05$). There were four target species (mullet species, sea bass, sand steenbras and bluefish) in lift net fishing. 14,855 kg of mullet species, 2,390 kg of sea bass, 1,200 kg of sand steenbras and 450 kg of bluefish were caught annually. The annual income of lift net fishers varied between 637 US dollars ($) and 5,242 $, and the mean income was 1,979 ± 1,151 $/year. The mean income (165 $/month) was lower than the minimum wage in 2021 (212 $/month). 26.9% of the fishers were dissatisfied with their income and 69.1% engaged in additional activities such as in agriculture-livestock, gillnet-longline fishery, construction worker, seller in a market, waitstaff, and solid waste collector. The heirs of 15.4% of the fishers will not continue fishing. The biggest problem was SCUBA or skin divers near the lift net. Other reported problems were commercial (gillnet and longline) and recreational fishing near the lift net, the anchoring of private boats near the lift net, the decrease in fish stocks, illegal fishing and marine pollution. The number of lift nets has decreased over the years. The continuity of this artisanal fishing method is considered to be important for the socio-economic sustainability.

Introduction

Artisanal/small-scale fisheries (SSF), defined as fishing without the use of towed fishing gear by fishing vessels of less than 12 m (Anonymous, 2006), provide 40% (37 million tonnes) of total global fisheries and 60 million people work directly at SSF (FAO, 2022a). SSF is very important in terms of employment, social and economic aspects in coastal regions (Karakuş, 2015). Because of this importance, at the "World Summit on Sustainable Development" twenty years ago, such artisanal fisheries methods were accepted as a part of cultural ecology, and their development was encouraged (UN, 2002). The year 2022 was declared as "The International Year of Artisanal Fisheries and Aquaculture" by the United Nations General Assembly, and emphased the sustainability of SSF (FAO, 2022a).

Some problems stand out regarding the sustainability of SSF. One of them is the loss of traditional ecological knowledge of artisanal fishers as traditional low-tech fisheries disappear or are replaced by more mechanized, high-tech fishing. Another problem is the lack of information about coastal fisheries. The monitoring, study and management of coastal fish and fisheries should thus be a priority if a sustainable, integrated use of coastal resources is to be achieved (Lloret et al., 2018).

Some of the aforementioned problems are also valid for the lift nets, which are defined among the small-scale fishing methods by the "Food and Agriculture Organization of the United Nations" and used all over the world (FAO, 2022b). Lift nets in Türkiye in the Eastern Mediterranean Sea are in the group of shore-operated stationary lift nets according to the current classification of FAO (FAO, 2022c). These nets are built on the passageways of fish migrating for feeding and reproduction purposes and catch fish passing over them by lifting (Hoşsucu, 1998). This artisanal fishing method continues to be used in certain regions on the Turkish coasts (Bosphorus, and İzmir coast in the Aegean Sea) and their numbers are decreasing gradually (GDFA, 2022). The technical characteristics and target species of these gears in the two regions differ (Tokaç et al., 2010; Yıldız et al., 2013). The number of the lift nets called "çökeltme ağı/dalyanı" in Turkish and used since the 1960s in the Aegean Sea (on the coast of İzmir) has been decreasing (GDFA, 2022). Gabriel et al. (2005) reported that this type of nets fall under the group of "blanket nets" in the lift nets, and the Turkish name (dalyan) of this equipment is misleading as it bears the same name as the larger pound nets used for tuna. Fishing gears in the blanket net group, which have different sizes and structures than those used in Turkey, are also used in Italy, China, Malaysia, Indonesia, and Sri Lanka (Gabriel et al., 2005).

There are a limited number of studies (Hoşsucu and Kara, 1990; Hoşsucu et al., 2001; Tokaç et al., 2010; Kara and Sağlam, 2017) on lift nets (blanket nets) in the Aegean Sea (on the coast of İzmir). In these studies, the number, structure, and working principle of the fishing gear were stated, but the socio-economic structure and problems of the fishery were not mentioned. Moreover, there was no information on these gears in the literature (Ünal, 2003; Ünal and Franquesa, 2010; Birkan and Öndes, 2020; Ünal and Ulman, 2020), which defines the SSF in the Aegean Sea and especially examines its socioeconomic structure. Filling this gap in the literature is of great importance for the sustainability of artisanal "lift net/blanket net" fishery.

Therefore, in this study, it was aimed to define the lift net fishery in the Aegean Sea (coast of İzmir) and to determine the socio-demographic and socio-economic characteristics and views of fishers on their problems. This is the first study to examine the socio-economic aspects of artisanal lift net fishing.

Materials and Methods

Study area

Three districts (Karaburun, Urla, and Foça) where lift net fishing was carried out in the Aegean Sea (on the coast of İzmir Province) were determined as sampling stations and study areas (Figure 1).

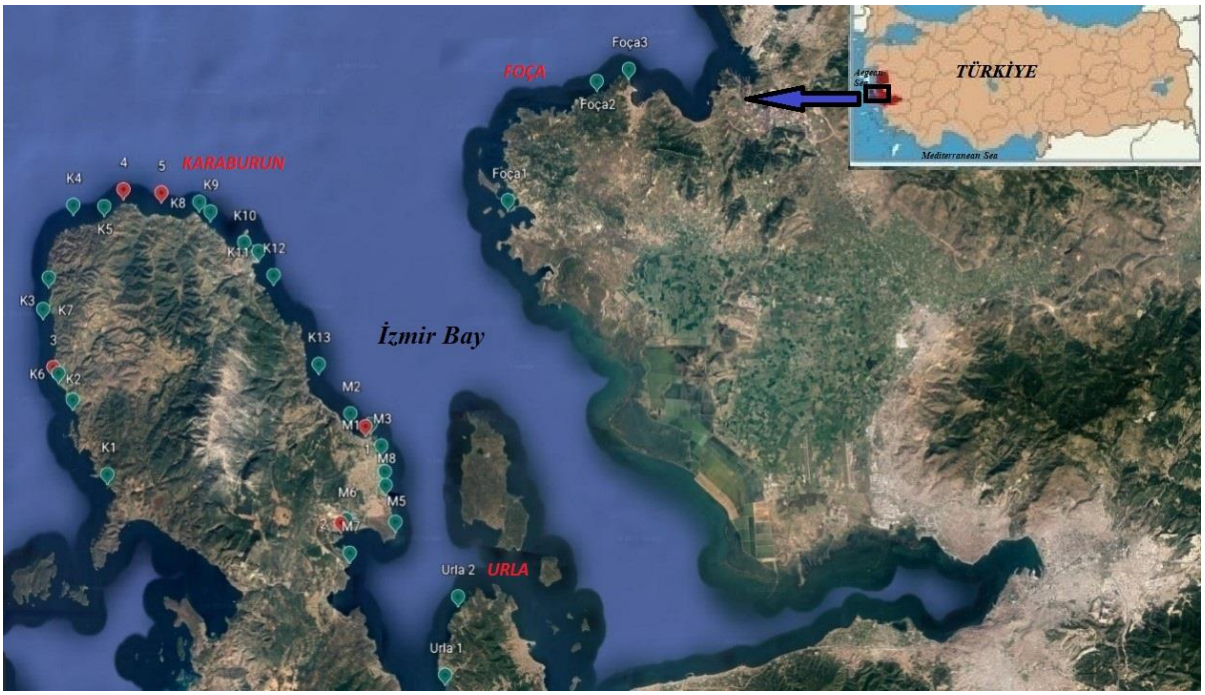

Figure 1. Study area (Karaburun, Urla, and Foça stations) and locations of lift nets. The green dots show surveyed lift nets, and the red dot areas were not surveyed.

Data collection

Data about lift nets and the contact informations of fishers were obtained from the records of the İzmir Provincial Directorate of Agriculture and Forestry, Department of Fisheries. Then, data from lift nets at the three sampling stations were collected through surveys and field observations in April-May 2022. Of the 31 existing lift net fishers, 26 were reached and the survey was filled in face-to-face (19 fishers) and by telephone interviews (7 fishers). In the survey, there were 41 questions about the technical characteristics of the lift nets, the catch, the socio-demographic characteristics of the fishers, and their views on the economic structure and problems. In field studies, waiting for the catch, lifting the net and harvesting the catch, and the stages of the lifnet fishing, were observed.

Data analyses

Data were evaluated in Microsoft Excel and IBM SPSS Statistics 22.0 (IBM Corp., Armonk, New York, USA) statistical package program. The economic data were presented by converting from Turkish Lira (₺) to US dollar ($), taking into account the 2021 year-end ₺-$ exchange rate (13.353 ₺ = 1 $) (CBRT, 2022). The number of units (n), percentage (%), mean±standard deviation ($\bar{x} \pm sd$) were given as descriptive statistics. The normal distribution of the data of numerical variables was evaluated with the Shapiro-Wilk test of normality and Q-Q graphs. Comparisons between groups (stations) were made by Kruskal-Wallis analysis for variables that did not show normal distribution. The Dunn-Bonferroni test as a multiple comparison test was used for the variables not normally distributed. A value of $p<0.05$ was considered statistically significant.

Results

There were a total of 31 lift nets, 26 in Karaburun, 3 in Foça, and 2 in Urla in the Aegean Sea (Izmir coast) according to official records. During the studies, a total of 26 (86.7%) of these fishers, 21 in Karaburun, 3 in Foça, and 2 in Urla, were reached and responded to the survey. 80.8% of the surveys were conducted with fishers in Karaburun, 11.5% in Foça, and 7.7% with Urla lift net fishers. Survey results were given under following subtitles.

1. Socio-demographic structure

Frequency and percentage (%) values related to socio-demographic parameters were presented in Table 1. The majority of lift net fishers are male (92.3%), married (88.5%) and primary school graduates (57.7%). 23.1% of fishers did not have social security. The percentage of fishers who only made lift net fisheries was 30.8%. The rest fishers had additional occupations with lift net fisheries as agriculture-livestock (30.8%), gillnet-longline fishery (19.2%), building worker (7.7%), sellers in a market (3.8%), waitstaff (3.8%), and solid waste collector (3.8%) (Table 1). Descriptive statistics on socio-demographic parameters by stations were presented in Table 2. The mean age of fishers was 63.6 ± 9.54. The ages varied between 61-72 in Foça, 60-68 in Urla, and 42-84 in Karaburun. Lift net fishing experience was between 4-65 years. The range of employees' number was between 2 and 4 (Table 2).

Table 1. Findings on socio-demographic parameters (LNF: Lift net fisheries; Bağkur is a social security organization for artisans and the self-employed)

Parameter		Frequency	(%)
Gender	Male	24	92.3
	Female	2	7.7
Marital status	Married	23	88.5
	Single	3	11.5
Education	Literate	1	3.8
	Primary school	15	57.7
	Secondary school	9	34.6
	High school	1	3.8
Home owner	Yes	19	73.1
	No	7	26.9
Social security	No	6	23.1
	Agricultural insurance	4	15.4
	Social Security Institution (SSI)	4	15.4
	Retired by Bağkur	2	7.7
	Retired by SSI	9	34.6
	Bağkur	1	3.8
Occupation	LNF	8	30.8
	LNF and agriculture-livestock	8	30.8
	LNF and gillnet-longline fishery	5	19.2
	LNF and construction worker	2	7.7
	LNF and seller in a market	1	3.8
	LNF and waitstaff	1	3.8
	LNF and solid waste collector	1	3.8

Table 2. Descriptive statistics on socio-demographic parameters.

		Age	Lift net fishing experience (years)	Number of Employees
Foça	*n*	3	3	3
	Min-max	61-72	25-50	2-2
	x ± sd	67.3 ± 5.69	35.7 ± 12.9	2.0 ± 0.00
Urla	*n*	2	2	2
	Min-max	60-68	30-30	2-2
	x ± sd	64.0 ± 5.66	30.0 ± 0.00	2.0 ± 0.00
Karaburun	*n*	21	21	21
	Min-max	42-84	4-65	2-4
	x ± sd	63.0 ± 10.32	30.6 ± 13.55	2.6 ± 0.60
Total	*n*	26	26	26
	Min-max	42-84	4-65	2-4
	x ± sd	63.6 ± 9.54	31.1 ± 12.77	2.5 ± 0.58

(Min: minimum, Max: maximum, x: mean, sd: standard deviation)

2. Technical characteristics of gear and fishing method

Lift nets are established in coastal areas where the sea floor is flat and clean, and the fish passage and the wave are not much. Lift nets can be used on days when weather conditions are suitable. There is a square or rectangular net, which can be of different sizes, laid on the sea floor. The two corners of this net are connected to the part above the water surface of two galvanized/iron poles driven into the sea, the length of which varies depending on the depth. The other two corners of the net are connected to the watchtower by ropes, which may be of different lengths and are extended along the edge of the net. There are two or three crews in the watchtower, which can be at sea or on land (Figure 2A and 2C) and when the ends of the ropes in the watchtower are released, the net sinks to the sea floor thanks to the sinker weights on its sides.

The fishers in the watchtower wait and observe the passing of the school of fish. Olive oil can also be dripped onto the water surface to smooth it so that the school of fish can be seen more clearly from the watchtower. When a school of fish is seen on the net, the rope in the direction of the school of fish entry into the net is pulled together with the "pull" command of personnel in the watchtower. Small stones are thrown by personnel in the watchtower in the direction of escape of fish so that the fish do not leave the net while the rope is being pulled. Thus, the fish are caught in the net, which is lifted from the sea floor to the surface. Then, descending from the watchtower, the fishers lift the net from a boat and trap the fish in the corner near the poles (Figure 2B). The operation is completed by taking the fish to the boat with the help of a scoop net. Fishing operations can be repeated depending on the availability of fish during the daytime. Findings regarding the structure of lift net were presented in Table 3. Mesh sizes ranged from 16 to 44 mm, with the highest percentage (57.7%) being 25 mm.

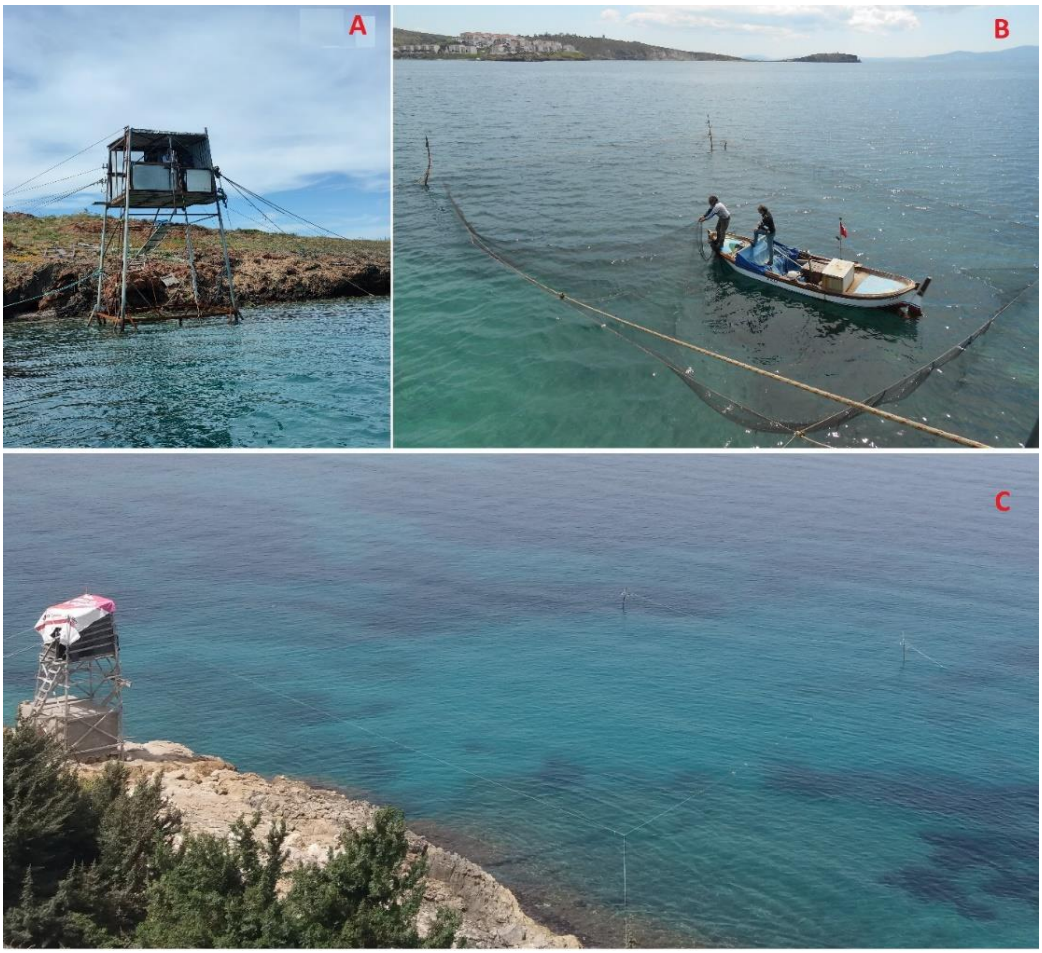

Figure 2. The crew in the watchtower at sea (Foça) (A) and lift the net to trap the caught fish in the corner near the poles (B). Watchtower on land and lift net (Karaburun) (C).

Table 3. Findings regarding the structure of lift net

Parameter		Frequency	%
Watchtower	On land	21	80.8
	At sea	5	19.2
Rope material	Silk	5	19.2
	Nylon	13	50.0
	Silk and nylon	6	23.1
	Polymer	1	3.8
	Silk and hemp	1	3.8
Pole material	Iron	12	46.2
	Galvanized	12	46.2
	Metal	2	7.7
Net Material	Nylon	25	96.2
	Polymer	1	3.8
Net rope thickness	210d/6	20	76.9
(denier)	210d/6 and 210d/9	2	7.7
	210d/3	2	7.7
	210d/9	2	7.7
Mesh size	16 mm	1	3.8
	22 mm	2	7.7
	24 mm	5	19.2
	25 mm	15	57.7
	26 mm	2	7.7
	44 mm	1	3.8

3. Catch

Descriptive statistics of catch and fishery parameters were given in Table 4. It was determined that the daily maximum catch was between 15-250 kg and the mean was 84.8 ± 61.49 kg in a total of 26 lift nets sampled. Based on stations, the highest value (183.3 ± 115.47 kg) in the average daily maximum catch was in Foça, followed by Karaburun (72.9 ± 38.88 kg) and Urla (62.5 ± 67.18 kg), respectively. The duration of the fishing operation varied between 10-60 minutes and took an average of 32.2 minutes. The fishing days per year were in the range of 45-300 days. For fishing days per year for stations, the highest value (146.7 ± 133.17 days) was in Foça, followed by Urla (110.0 ± 56.57 days) and Karaburun (104.5 ± 58.37 days) (Table 4).

Table 4. Descriptive statistics on catch and fishery parameters

Stations		Daily max. catch (kg)	Fishing days per year	Duration of fishing operation (minutes)
Foça	*n*	3	3	3
	Min-max	50-250	60-300	30-60
	x ± sd	183.3 ± 115.47	146.7 ± 133.17	50.0 ± 17.32
Urla	*n*	2	2	2
	Min-max	15-110	70-150	15-30
	x ± sd	62.5 ± 67.18	110.0 ± 56.57	22.5 ± 10.61
Karaburun	*n*	21	21	21
	Min-max	20-150	45-250	10-60
	x ± sd	72.9 ± 38.88	104.5 ± 58.37	30.6 ± 10.53
Total	*n*	26	26	26
	Min-max	15-250	45-300	10-60
	x ± sd	84.8 ± 61.49	109.4 ± 66.80	32.2 ± 12.84

(Min: minimum, Max: maximum, x: mean, sd: standard deviation)

Lift net fishers declared that they caught grey mullet species (*Mugil spp*.), sand steenbras (*Lithognathus mormyrus* Linnaeus, 1758), sea bass (*Dicentrarchus labrax* Linnaeus, 1758) and bluefish (*Pomatomus saltatrix* Linnaeus, 1766). Grey mullet species were caught at all stations and in all months. The highest percentage of grey mullet catch was found in August with 20%. According to the stations, the highest percentages of grey mullet were detected in August (21%) in Karaburun, in August, July, and September (15% each) in Foça, and in August and July (33% each) in Urla. The sand steenbras was caught in May (100%) in Karaburun and in May, June, July, and August (20% each) in Foça. The highest percentage of sand steenbras was detected in May with 33% for the total. The sea bass was also caught at all stations. The highest percentages of sea bass were in December (30%), January (24%), and February (24%) respectively. Bluefish was caught only in Foça, in July, August, and September (33.33%). In line with the survey data, it was calculated that a total of 18.89 tons of fish, including 14.85 tons of mullet, 2.39 tons of sea bass, 1.2 tons of sand steenbras, and 450 kg of bluefish, were caught annually from active lift nets in the coast of Izmir.

4. Economic Structure and Problems

Findings and descriptive statistics regarding the economic parameters were presented in Tables 5 and 6, respectively. 26.9% of the fishers were not satisfied with their income and the heirs of 15.4% will not continue fishing (Table 5).

Table 5. Findings on economic parameters

Parameter		Frequency	%
Will your heir do this fishing?	Yes	22	84.6
	No	4	15.4
Who will continue from the heirs?	Son	16	61.5
	Wife/husband and son	1	3.8
	Daughter	4	15.4
	Brother and son	1	3.8
Are you a member of the cooperative?	Yes	20	76.9
	No	6	23.1
Marketing	Individual and cooperative	2	7.7
	Cooperative	11	42.3
	Individual	11	42.3
	Retail outlet	1	3.8
	Wholesale	1	3.8
Income satisfaction	Not satisfied	7	26.9
	Neutral	17	65.4
	Satisfied	2	7.7

Table 6. Descriptive statistics on economic parameters

Parameter	*n*	*Min-max*	*x* ± *sd*
Installation expense ($)	1	444 – 444	444
Annual clothing expense ($)	11	22 – 185	75 ± 50
Annual fuel expense ($)	4	37 – 554	213 ± 236
Annual boat maintenance and rental expenses ($)	8	37 – 148	72 ± 38
Annual food expense ($)	4	37 – 222	104 ± 83

(*Min*: minimum, *Max*: maximum, *x*: mean, *sd*: standard deviation, $: US dollar)

Descriptive statistics on economic parameters by the stations were given in Table 7. The means of annual income, total annual expense, and annual profit were determined as 1,979 ± 1,151 $; 578 ± 396 $, and 1,390 ± 1,150 $, respectively. The highest mean of annual income (2,171 ± 1,547 $) was in Foça (Table 7).

Table 7. Descriptive statistics on economic parameters by stations

Stations		Annual income ($)	Annual net expense ($)	Total other expenses ($)	Total annual expense ($)	Annual profit ($)
Foça	*n*	3	3	3	3	3
	Min-max	1,011-3,745	94-150	0- 629	150-1,352	524-3,595
	x ± *sd*	2,833 ± 1,578	131 ± 32[a]	222 ± 353	575 ± 673	2,171 ± 1,547
Urla	*n*	2	2	2	2	2
	Min-max	1,498-1,872	150-749	79-112	307-974	524-1,565
	x ± *sd*	1,685 ± 265	449 ± 424[a,b]	96 ± 24	640 ± 471	1,045 ± 736
Karaburun	*n*	21	21	21	21	21
	Min-max	637-5,242	150-749	0-524	150-1,648	337-4,786
	x ± *sd*	1,885 ± 1,130	303 ± 153[b]	135 ± 146	573 ± 373	1,312 ± 1,130
Total	*n*	26	26	26	26	26
	Min-max	637-5,242	94-749	0-629	150-1,648	337-4,786
	x ± *sd*	1,979 ± 1,151	294 ± 176	142 ± 168	578 ± 396	1,390 ± 1,150

(*Min*: minimum, *Max*: maximum, *x*: mean, *sd*: standard deviation, $: US dollar, [a,b]: Letters indicate statistical difference between stations)

Among the problems in lift net fishing, SCUBA and skin divers near the lift net were the most reported problem (26.9%). Other problems were the decrease in fish stocks (15.4%), other commercial fishers (gillnet and longline) and recreational fishers fishing near the lift net (11.5%), difficulties in transferring the right to use (11.5%), the anchoring of private boats near the lift net (7.7%), marine pollution (3.8%), illegal fishing (3.8%), southwestern wind effect (3.8%), and the fishing area close to the road (3.8%).

There was no significant difference between the stations in terms of age, lift net fishing experience, number of employees, annual income, total annual expense, annual profit, fishing day per year, and duration of fishing operation ($p>0.05$). There was a statistical difference between the stations only in terms of annual net expense, and the difference between Foça and Karaburun stations was found significant as a result of the Mann-Whitney U test with Bufferoni correction ($p<0.05$; $p=0.012$).

Discussion

There were a total of 31 lift nets, 26 in Karaburun, 3 in Foça, and 2 in Urla in the Aegean Sea (Izmir coast) according to official records. The number of licensed lift nets was reported as 58 by Kıryatan (1997) and 37 by Şimşek (2014) in previous studies. It was determined that the number of lift nets has decreased over the years. It is thought that the provisions of "not allowing the establishment of new lift net" and “5-year lease on each contract renewal” and "not transferring the leased areas to third parties other than the heir", that have been enforced since 2005 (Anonymous, 2020), are effective in this decrease. In addition, in this study, it was determined that the age range of fishers was 42-84 and there were no young fishers and the heirs of 15.4% of the fishers would not continue fishing. According to these data, it is predicted that the decrease in the number of lift nets may continue over time.

Another factor in the decrease in the number of lift nets is thought to be income dissatisfaction, as 27% of the fishers were not satisfied with their income, and 65.4% were neutral. There was no significant difference between the three stations (Foça, Karaburun and Urla) in terms of annual income, total annual expense and annual profit ($p>0.05$). Fishing was generally carried out during a certain period of the year (May-September), targeting grey mullet, sand steenbras, and bluefish species. The sea bass was targeted in the winter months (December-February). The annual income ranged between $637 and $5,242, mean value was $1,979 ± 1,151/year and $165 /month. This income was lower than the minimum wage in 2021 ($212/month). It has been determined that 69.1% of the lift net fishers had additional occupations due to low income. A similar situation was reported for Aegean Sea SSF by previous studies (Birkan and Öndes, 2020; Ünal and Ulman, 2020). Increased fishing expenditures and decreasing fish stocks in the Aegean Sea resulted in a decrease in the number of active fishers. Therefore, many fishers tended to have additional jobs, and some of them consider to leave fishing (Birkan and Öndes, 2020). Over two-thirds of fishers were pessimistic about their futures, while 40% were willing to quit the profession outright. (Ünal and Ulman, 2020).

During field observations, it was seen that silence before and during the operation, as well as the presence of fish, was important for efficient lift net fishing. Most of the problems reported by the fishers were related to SCUBA and skin divers near the lift net, fishers (gillnet and longline) and recreational fishers fishing near the lift net, the anchoring of private boats near the lift net, and the fishing area close to the road. The ban stipulating that gillnets should not set within 500 meters of the lift nets between 08:00 and 13:00 (Anonymous, 2020), was not implemented or was insufficient. Decrease in fish stocks and

illegal fishing, other main problems detected in this study, have also been reported for Aegean Sea SSF in previous studies (Birkan and Öndes, 2020; Ünal and Ulman, 2020). Specifically, SSF is in jeopardy on the coasts of the Mediterranean Sea because the coastal fisheries are subject to overfishing, as well as illegal, unreported, and unregulated (IUU) fishing (Tzanatos et al., 2013; Ünal et al., 2015).

The lift net structure and fishing method determined in this study were similar to lift nets reported by Tokac et al. (2010) and to blanket nets reported by Gabriel et al. (2005). The mesh size of the majority (57.7%) of the lift nets was 25 mm. Although these nets are not thought to be sufficient for species and size selectivity, it was observed in field studies that many of the fishers released non-market value species and sizes back to the sea during fishing. If all lift net fishers comply with the size limitations specified in the notification regulating commercial fisheries and release juvenile fish and protected species back to the sea, this will contribute to ecosystem sustainability. Therefore, additional training should be given to fishers by the Provincial Directorate of Agriculture and Forestry and cooperatives to be sensitive to this issue. If this optimum situation is achieved, lift nets are in a position to outperform other fishing gears and methods in protecting the ecosystem.

It was determined that four species were caught in this study, but species such as sea bream, white bream, horse mackerel, mackerel, and octopus reported by the previous study (Tokaç et al., 2010) were not mentioned by the lift net fishers and detected in field observations. This situation raises concerns about the stock status of the unmentioned species. The total catch, calculated in this study, constituted 2.25% for grey mullet, 3.20% for sea bass, 3.64% for sand steenbras, and 0.34% for bluefish in the Aegean Sea fishery (TUIK, 2022). Based on these rates, it is thought that lift net fishing, together with the decrease in their number, does not put pressure on the four mentioned species. Yıldız et al. (2013) reported that the continuity of artisanal lift net fishing, which has been used for a long time, should be ensured since mostly commercial-size fish are caught and therefore do not harm the ecosystem.

Conclusions

This study presented the first findings socio-economic parameters and problems of lift net fishing, which is an artisanal fishing method available on the Aegean Sea coast in Türkiye. 26.9% of the fishers were dissatisfied with their income and 69.1% of them engaged in additional activities such as agriculture-livestock, gillnet-longline fishery, contruction worker, sellers in a market, waitstaff, and solid waste collector. The heirs of 15.4% of the fishers will not continue fishing. The biggest problem was SCUBA or skin divers near the lift net. Other reported problems were commercial (gillnet and longline) and recreational fishers fishing near the lift net, the anchoring of private boats near the lift net, the decrease in fish stocks, illegal fishing and marine pollution. The number of lift nets has decreased over the years. It is thought that these findings will provide information to decision-makers for the socio-economic sustainability of lift net fishing, which have the potential to be the least harmful fishing gear for the ecosystem if fishers comply with the rules.

Acknowledgments

We would like to thank the lift net fishers who participated in the survey and the institutions of the Ministry of Agriculture and Forestry (General Directorate of Fisheries and Aquaculture and İzmir Provincial Directorate) for allowing access to official records.

Ethical approval

Ethics approval (dated 26.04.2022) for this study was received from İzmir Katip Çelebi University Science and Engineering Sciences Scientific Research and Publication Ethics Committee.

Data availability statement

The authors declare that data are available from authors upon reasonable request.

Funding organizations

No funding available.

Author Contribution

Hakkı Dereli: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing-original draft, Review and editing.

Hülya Erkoç: Data curation, Formal analysis, Investigation

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