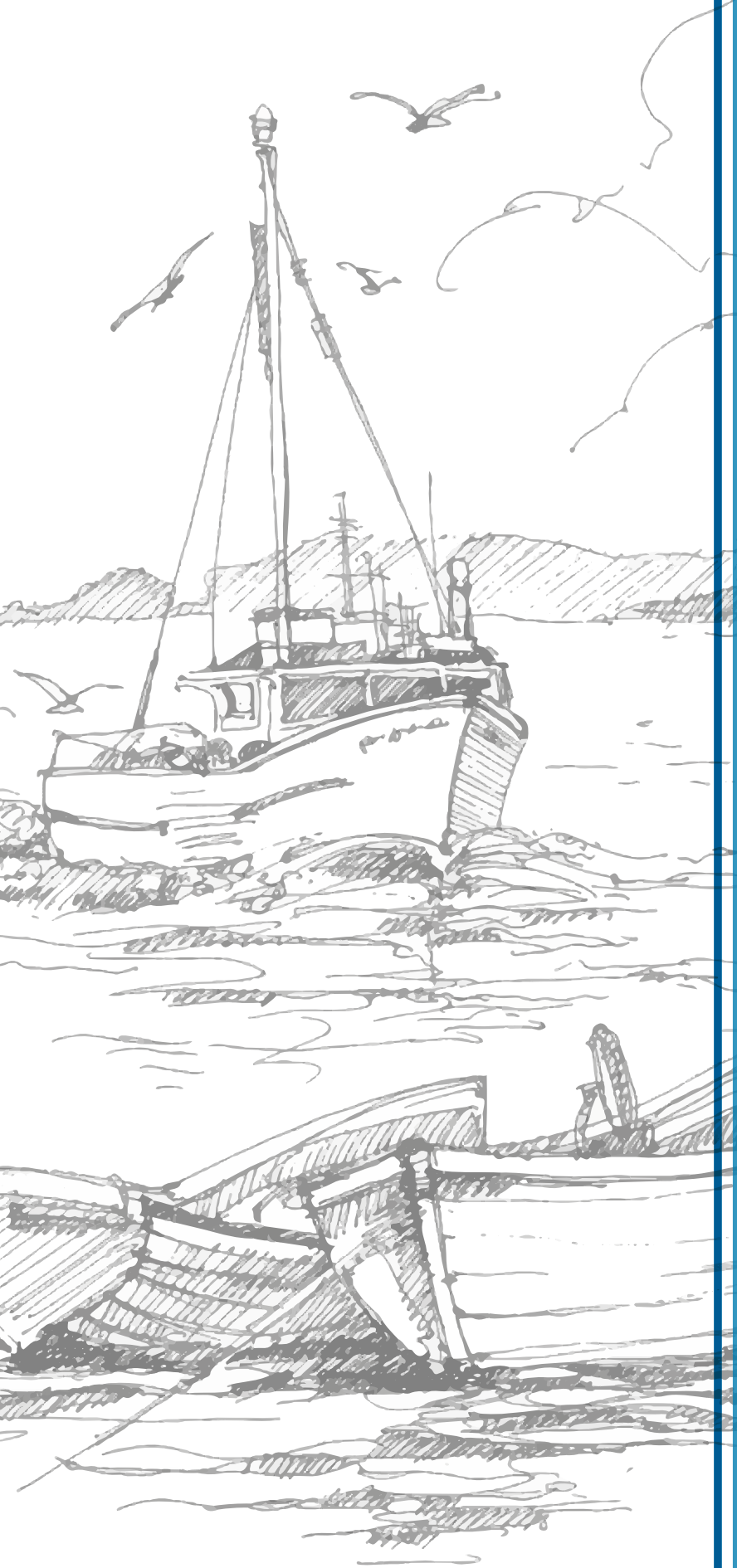

# The Fishing Sector in Greece

## Social and Economic Dimension


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Scientific Editing
in English version
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ELGO - DIMITRA
HELLENIC AGRICULTURAL ORGANIZATION - DIMITRA

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# Foreword

Fishing in Greece has an important history and contributes to the economy and employment, constituting a key pillar of the national economy. The extensive coastline, the numerous islands, the rich biodiversity and the great maritime heritage are factors that define and shape the role of Greek fisheries.

Fishing is undoubtedly important as it supports the economic development of the country's island and coastal regions. In parallel, the fishing sector contributes to food security, poverty reduction, and the strengthening of social cohesion. Moreover, it promotes sustainable management of local communities' natural resources and preserves the country's cultural heritage.

The aim of this publication is to present the main structural characteristics of the fishing sector in Greece, the development of the fishing fleet and, above all, its social and economic role. In particular, it presents the factors affecting the economic viability of Greek fisheries, the challenges the sector faces, and how these could be addressed. In addition, the publication seeks to investigate whether Greek fisheries can be family-run or business-oriented and to highlight their respective benefits. It then analyses the human capital employed in the fisheries sector, the problems faced by fishers, and their training and information-sharing needs. Finally, it presents opportunities for the sustainable development of the fisheries sector.

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# Brief Presentation

The Greek fleet, of almost 14,000 vessels, is the largest in the EU, with a share of 19%, and the second largest fleet in terms of active vessels in the Mediterranean region. Its total tonnage is 66 thousand GT, and its total power is 391 thousand KW. It is also important to emphasize that 94% of the Greek vessels are up to 12 metres in length with a low fishing capacity which should be considered in fisheries management.

Despite the fact that employment in fisheries has declined significantly, its contribution to national employment is still important since the sector occupies more than 18,000 people, corresponding to 14,528 in terms of Full Time Equivalents (FTE). It is also noteworthy that employment in the sector is related to island and coastal areas, which usually present limited alternative employment opportunities.

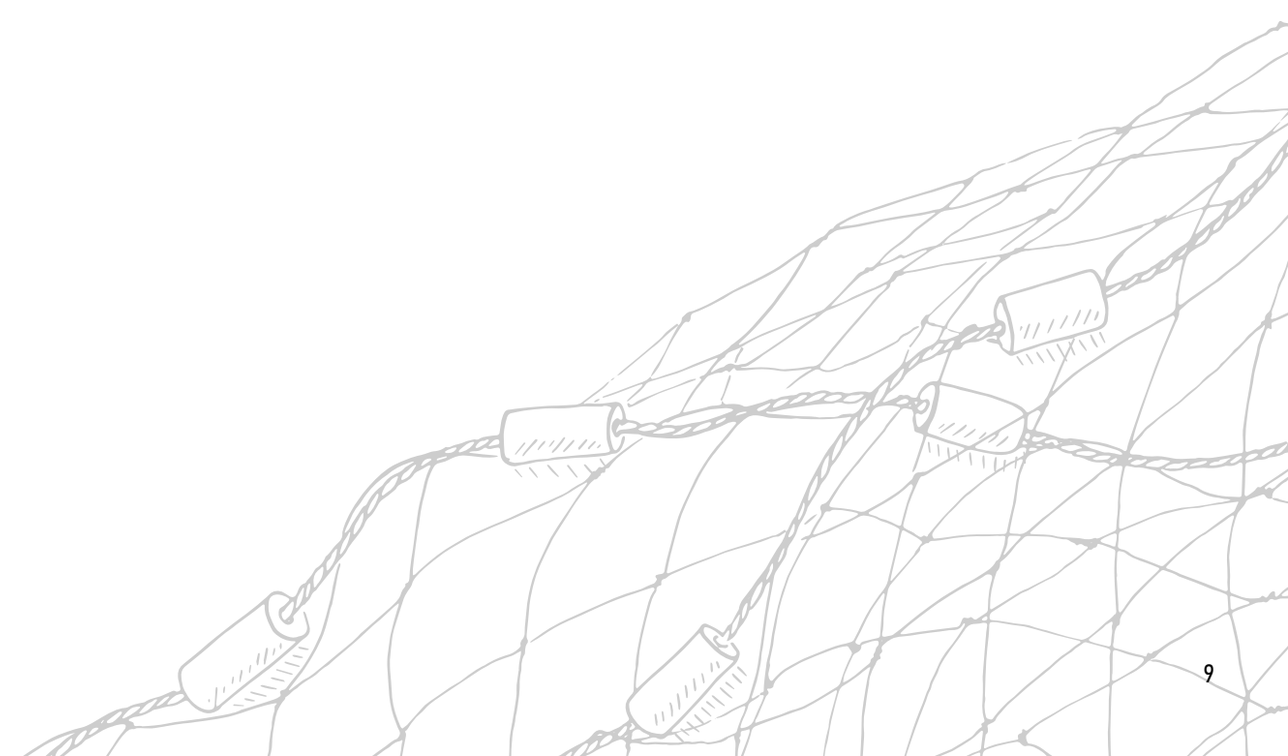
A wide range of structural weaknesses related to the human capital employed in fisheries can be highlighted. The workforce is older and less educated, and young people are reluctant to enter the sector. The problem of succession is particularly acute and further aggravated by the lack of capital and education, which hinder generational renewal. In addition, multiple changes in the institutional framework result in stakeholders' inability to comprehend and comply with regulatory provisions.

The economic analysis of the sector shows that the economic efficiency of the Greek fleet displays considerable fluctuations within segments. Some segments of the fleet have improved their financial position compared to others with low economic results. Economic efficiency improved after the period of the economic crisis, which coincided with the reduction in energy costs due to the lower oil price in the previous period but also with a reduction in the active fleet. However, nowadays, the repercussions of the COVID-19 pandemic, as well as the new energy crisis due to the war in Ukraine, have negatively affected the profitability of the sector. The main factors determining economic efficiency are associated with the selling price of fishery products, the expenses (mainly energy cost), the stock status, as well as the balance between fishing capacity and fishing opportunities. Innovation adoption regarding fishing gear and changes in fishing techniques could lead to lower operating costs and overall improved economic results.



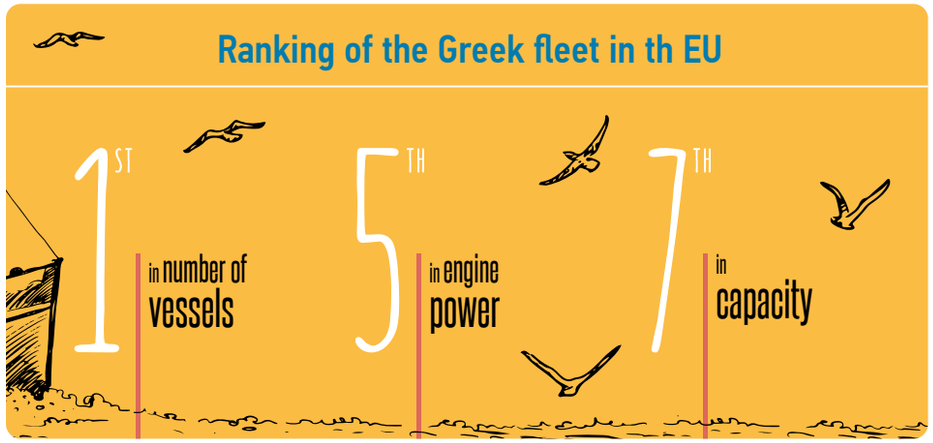
In addition, it is important to point out that the sector is experiencing problems related to conflicts between different groups, such as small-scale and large-scale fishers, professional and recreational fishers, as well as fishers and other economic groups. Dealing with these conflicts requires communication, cooperation and well-defined rules and regulations. Furthermore, several issues regarding the efficient organization of the value chain and the proper management of fish stocks can be identified. Finally, pressing matters relating to climate change, environmental degradation, and competition in the marine environment require immediate attention.

At the same time, the forthcoming implementation of new policies decided at the EU level, such as the Green Deal, the Biodiversity Strategy, the digital transformation and the circular economy, create opportunities for the sector. Their proper exploitation and effective implementation could have a positive contribution to the sustainability and development of Greek fisheries. Human capital improvement, dissemination of knowledge, adoption of new technologies, and compliance with rules and procedures, combined with cooperation, can help shape the future of Greek fisheries.



# The Greek Fleet

As a traditional naval force, Greece has developed a large fishing fleet, the largest in the EU in terms of number of vessels. As a result, marine fisheries have historically played an important role in the social and economic life of the island and coastal regions, still constituting an excellent source of income and employment. Although its contribution to the Gross Domestic Product[1] is estimated to be only 0.17%, fisheries are considered an integral part of the life of coastal and island communities.

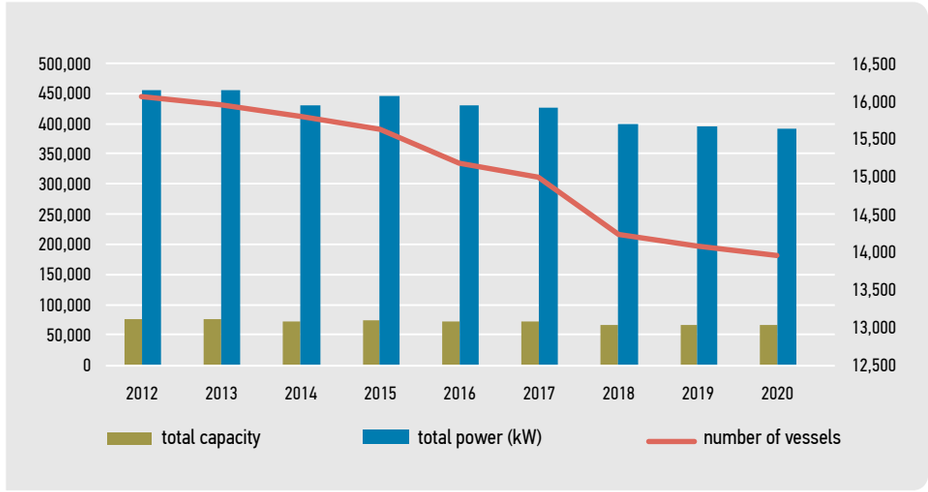



In recent years, the size of the Greek marine fishing fleet has been on a constant downward trend (in terms of number of vessels, total power and capacity) (see Figure 1). The Common Fisheries Policy, through the measure of permanent cessation of fishing activities, supported financially by the Operational Fisheries Programmes and the ageing of the fishers' population, have played an important role in this decline. However, the Greek fleet remains the most populous at the EU level and is ranked second after Tunisia in the Mediterranean region in terms of the number of active vessels (see Map 1 and Figure 2).

[1] The percentage is obtained from the ratio: (Gross Value Added of marine fisheries/Total Gross Value Added = €273,816,703 / €158,849,000,000). The numerator is derived from data of the socio-economic data report on the maritime fleet for the year 2019 (AGRERI, 2021), while the denominator is derived from the available Hellenic Statistical Authority (ELSTAT) data for the same year (2019).

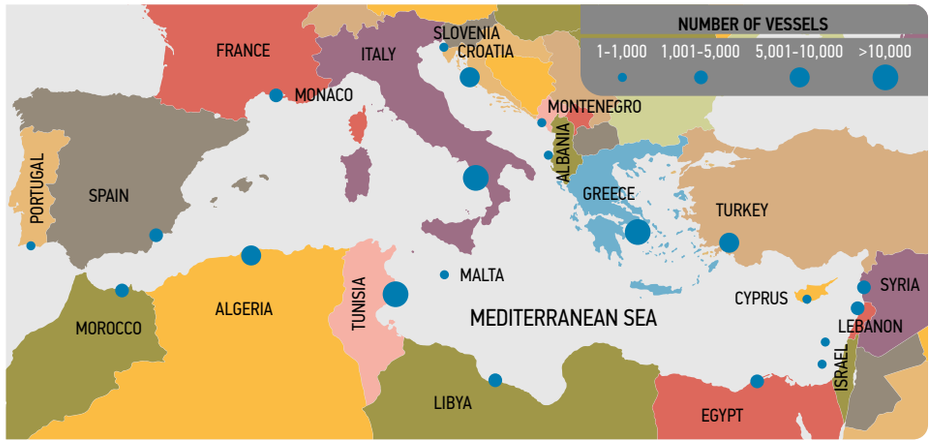


Figure 1
Evolution of a) number of vessels, b) tonnage (GT) and c) power (kW), 2012-2020




Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

Map 1
Active fleet size by country in the Mediterranean Sea




Source: FAO, 2022. Elaboration: AGRERI

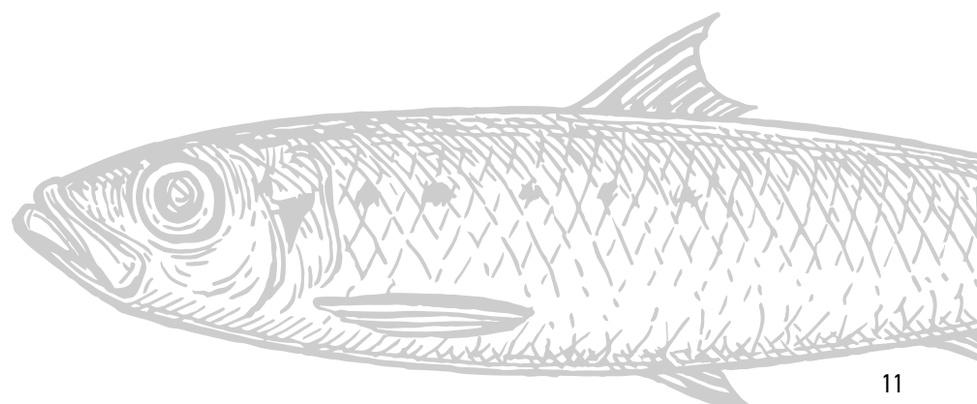
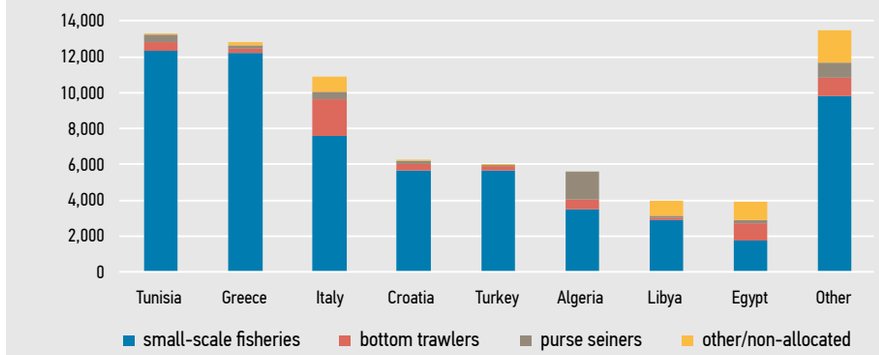


Figure 2
Active vessels by fleet category of the most important Mediterranean countries, 2020




Source: FAO, 2022. Elaboration: AGRERI

Figures 3 and 4 show the age and length distribution of the fishing vessels, respectively. It is clear from these graphs that the Greek fleet is, to a considerable extent, old and dominated by small-scale fishing vessels. Indeed, the majority of the fishing fleet (94.5%) consists of small vessels with length of less than 12 metres, that engage in multispecies and polyvalent gear fishery in the coastal zone. Out of the remaining (larger) fishing vessels, only 239 are purse seiners (PS) (1.70% of total vessels) targeting pelagic species, while 250 vessels are bottom trawlers (DTS) (1.78% of total vessels), primarily targeting demersal species.

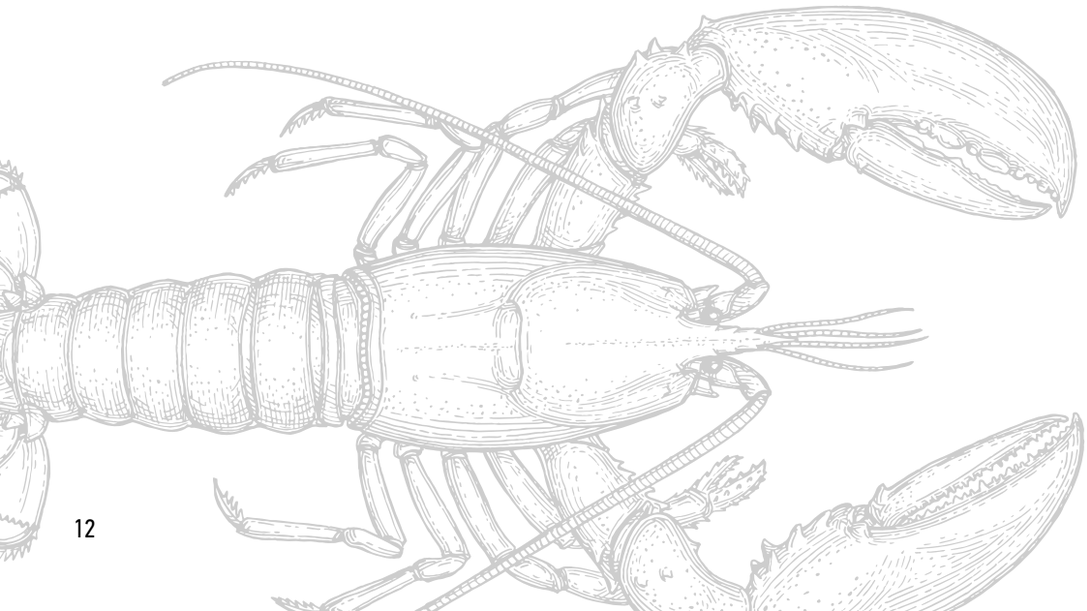
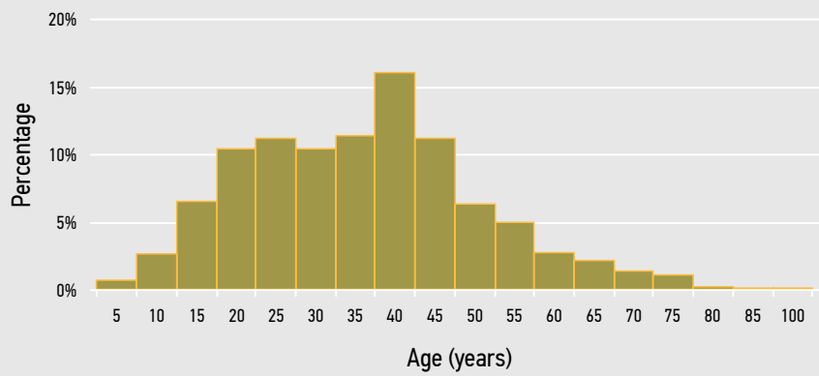


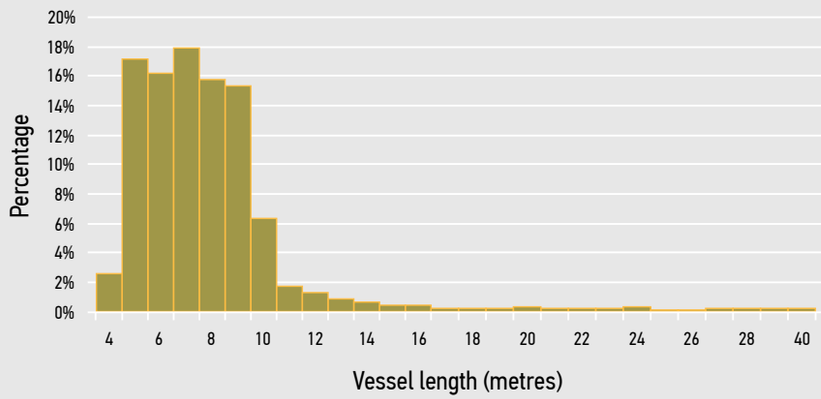


Figure 3
Age distribution of fishing vessels




Source: Data extracted from https://webgate.ec.europa.eu/fleet-europa/search_en, elaborated by authors

Figure 4
Length distribution of fishing vessels




Source: Data extracted from https://webgate.ec.europa.eu/fleet-europa/search_en, elaborated by authors

# Fleet Structure

Table 1 presents the basic structural characteristics of the Greek fleet, by segment, based on vessel length and the main fishing gear used (with reference to active vessels). The data in the table shows that the majority of small-scale fishing vessels use nets and, to a lesser extent, longlines. In large-scale fishery, vessels are relatively evenly distributed between purse seiners and bottom trawlers. It is worth noting that bottom trawlers are significantly larger in size and have more GT/kW, while purse seiners are on average 2.5 years newer than bottom trawlers.

Table 1
Characteristics of the active fleet by fishing gear category (classification of vessels by main gear used), 2020

| Fleet segment | Number of active vessels | GT | kW | Average vessel age | Average vessel length |
|---|---|---|---|---|---|
| **Small-scale fisheries*** | **10,848** | **21,701** | **201,633** | **32.7** | **6.8** |
| Nets | 7,587 | 15,070 | 137,664 | 31.9 | 6.8 |
| Longlines | 2,807 | 5,429 | 50,801 | 34.0 | 6.6 |
| Traps/Pots | 323 | 596 | 7,076 | 30.0 | 7.2 |
| **Other** | 131 | 606 | 6,092 | 52.7 | 9.3 |
| **Large-scale fisheries** | **661** | **35,066** | **122,660** | **28.6** | **20.6** |
| Purse seiners | 211 | 8,546 | 35,424 | 28.8 | 22.0 |
| Bottom trawlers | 217 | 22,950 | 67,393 | 30.7 | 25.6 |
| **Other** (Passive gears) | 233 | 3,570 | 19,843 | 26.4 | 13.9 |
| **TOTAL** | **11,509** | **56,767** | **324,293** | **32.4** | **7.6** |

Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

* According to Article 26(1) of Council Regulation (EC) No 1198/2006 of 27 July 2006 on the European Fisheries Fund, «small-scale coastal fishing» means fishing carried out by fishing vessels of less than 12 meters overall length which do not use towed gears such as purse seiners, bottom trawlers and gillnets.



# Fishing Effort

The structural changes in the fisheries sector, evident also by the decline in the number of vessels over time, have not left either employment or fishing effort in the sector unaffected. Figures 5a and 5b show the downward trend in fishing effort, expressed in terms of total days at sea and of energy consumption. The energy cost, directly related to fishing effort, is an important part of the expenditure in marine fisheries since it is estimated that for every euro of catch, approximately €0.15 of fuel is consumed. It is worth noting that this figure has been decreasing in recent years, due to the general fall in fuel prices and some fishers' effort to cut down fuel consumption as part of their strategy to reduce input costs. Of course, the current energy crisis is expected to bring about (at least temporarily) a new increase in energy cost.

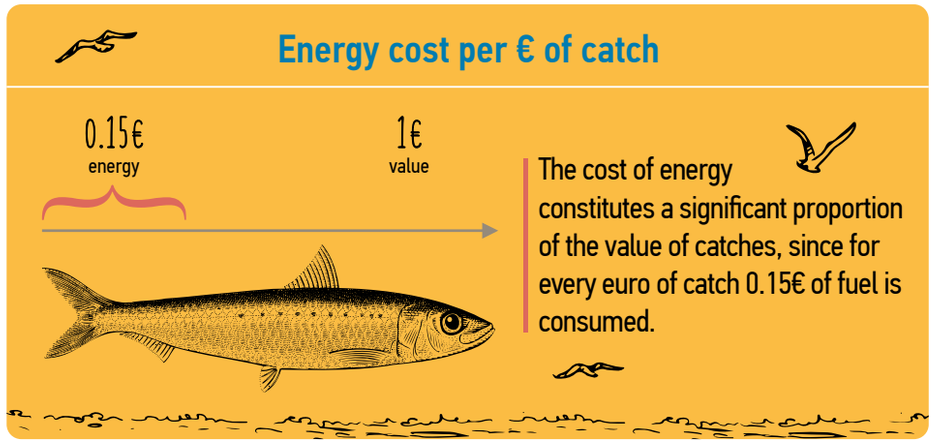
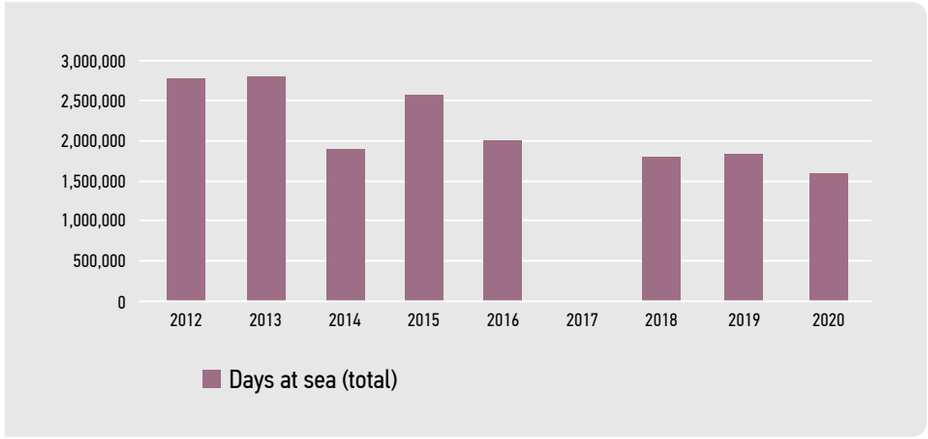
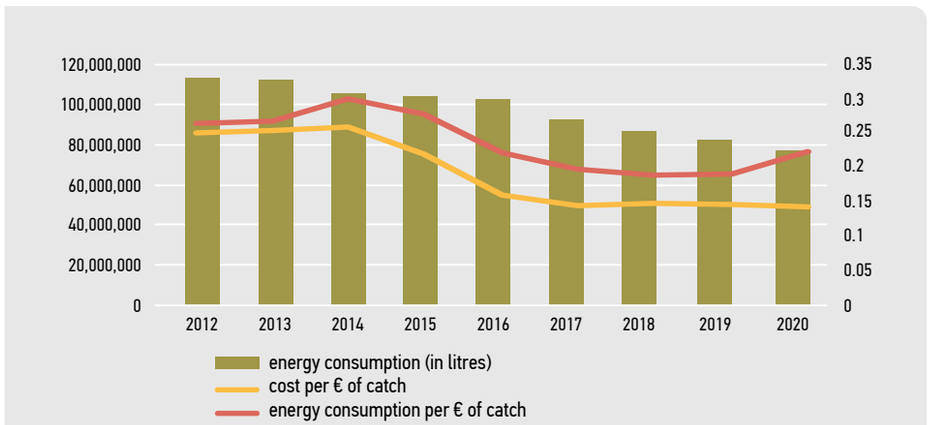



Figure 5
Evolution over time of:
a) fishing effort (days at sea)

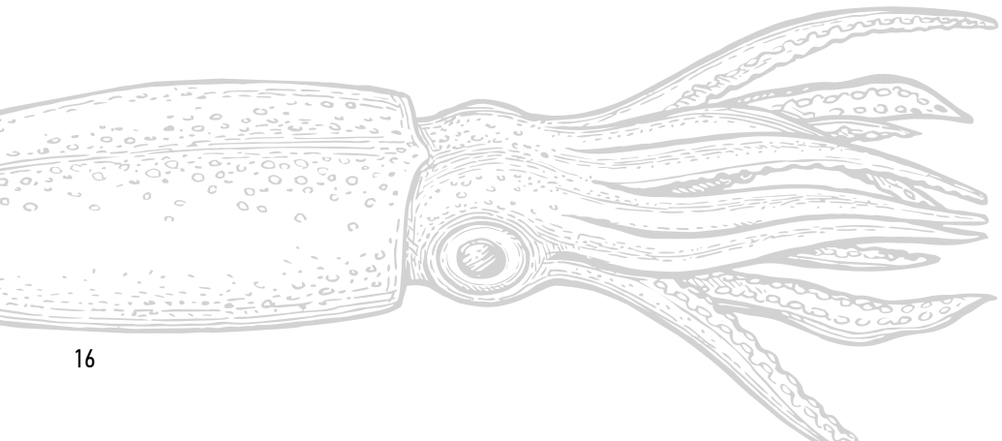



Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

b) energy consumption and costs per € of catch




Source: Data from the Greek National Fisheries Data Collection Framework 2022.
Elaboration: AGRERI

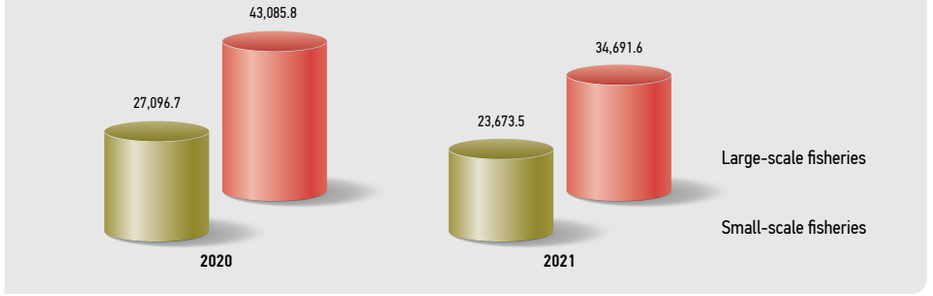




# Landings and Revenues

According to the latest ELSTAT report (ELSTAT, 2022), the total quantities of fish caught in 2021 amounted to approximately 58 thousand tonnes, showing a significant decrease of 16.8% compared to the previous year (approximately 70 thousand tonnes) (see Table 2), mainly due to the pandemic. In addition, the quantities caught are primarily from large-scale fisheries, accounting for 60% to 62% of total fish caught, depending on the year (see Figure 6).

Figure 6
Catches of large-scale and small-scale fisheries, 2020-2021




Source: ELSTAT, 2022

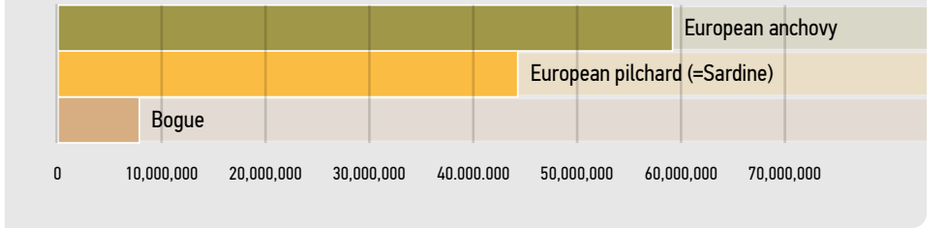
Table 2
Quantities of catches of large-scale and small-scale Greek fisheries, by main species, in tonnes (in descending order of quantities caught)

| Species of catches | 2018 | 2019 | 2020 | 2021 | Change (2021-2020) |
|---|---|---|---|---|---|
| Fish | 62,065 | 67,108 | 55,885 | 45,833 | -18% |
| Cephalopods | 6,692 | 7,303 | 6,950 | 5,587 | -19.6% |
| Crustaceans | 6,920 | 6,307 | 6,448 | 6,394 | -0.8% |
| Shellfish | 829 | 1,202 | 899 | 551 | -38.7% |
| **TOTAL** | **76,506** | **81,920** | **70,182** | **58,365** | **-16.8%** |

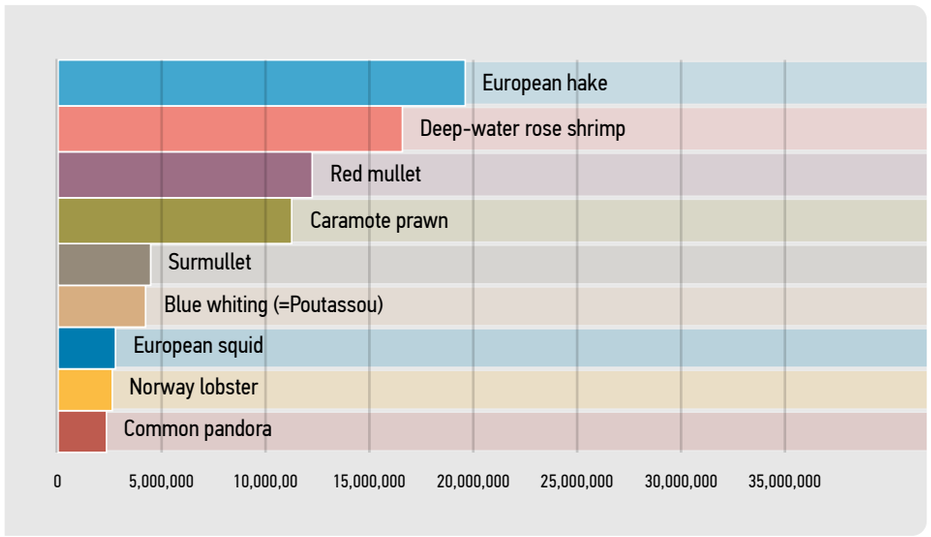
Source: ELSTAT, 2022

The main species, which contribute a total of 80% of the value of landings for purse seiners, bottom trawlers and small-scale fisheries, are presented in Figure 7 which highlights the multispecies selectivity of fisheries in Greece. With the exception of purse seiners, which focus mainly on two species (anchovy/sardine), bottom trawlers and small-scale vessels derive their income from catching a wide variety of species (80% of the value of landings comes from 10 species in the case of bottom trawlers and 12 species in the case of small-scale fisheries).

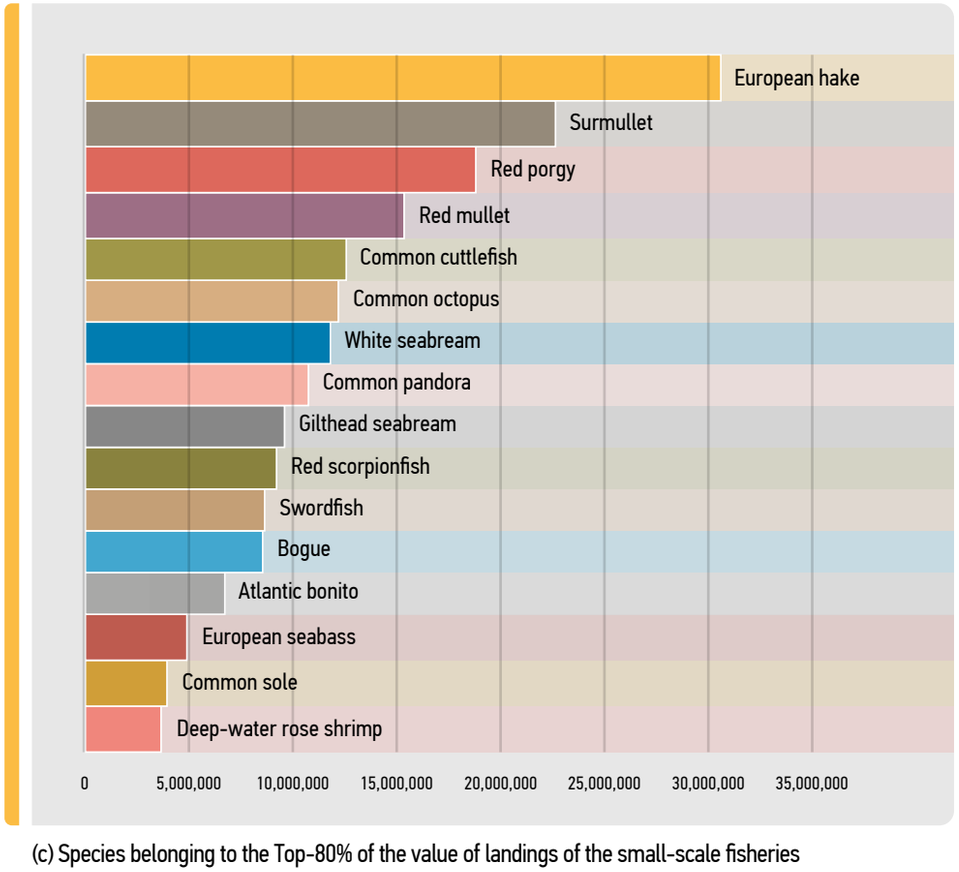
Figure 7
Species belonging to the Top-80% of the value of landings of
a) purse seiners, b) bottom trawlers, c) small-scale fisheries for the year 2020 in Greece




(a) Species belonging to the Top-80% of the value of landings of purse seiners

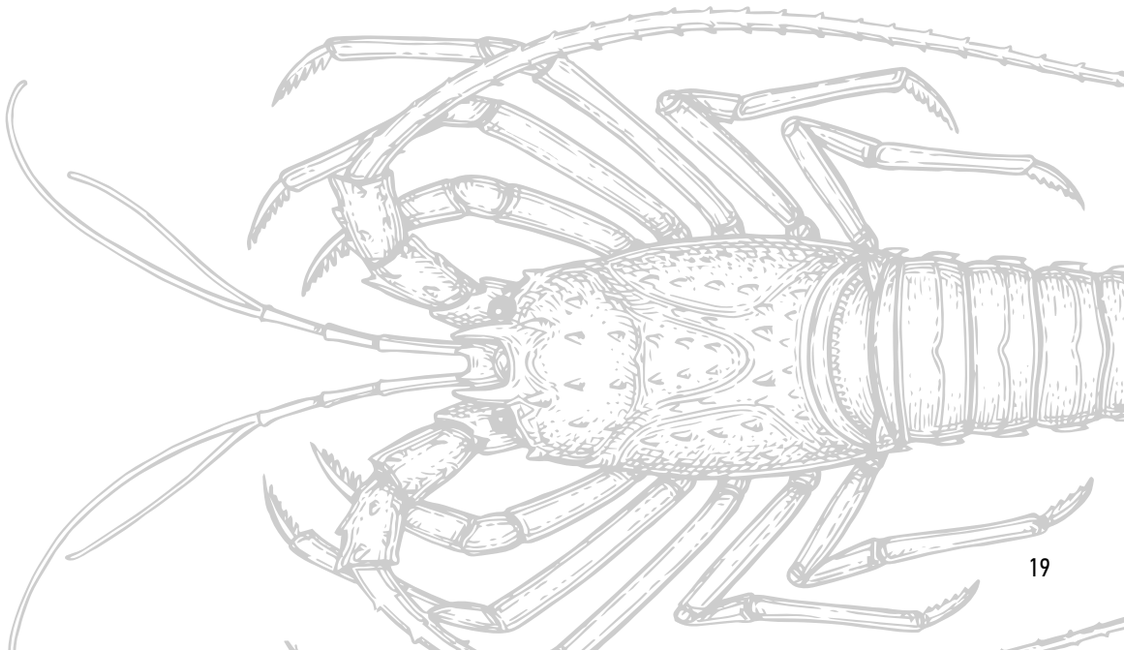



(b) Species belonging to the Top-80% of the value of landings of the bottom trawlers




(c) Species belonging to the Top-80% of the value of landings of the small-scale fisheries

Source: STECF Annual Economic Report Database, 2021



# The Spatial Dimension of Fisheries in Greece

The spatial distribution of the quantities caught is shown in the box below, according to ELSTAT data (ELSTAT, 2022). The figure shows that approximately 45% of the fish quantities are caught in the region of Northern Greece.

## Allocation of quantities of catches, by fishing area (2021)

1. Thermaikos Gulf and Gulf of Chalkidiki **24.6%**
2. Strymonikos Gulf, Gulf of Kavala, coasts of Thasos and Thracian Sea **21.0%**
3. Gulfs of South and North Evia, Eastern coasts of Evia, area of Sporades islands and Pagasitikos Gulf **14.9%**
4. Argolikos and Saronikos Gulfs **10.1%**
5. Area of the islands of Lesvos, Chios, Samos and Ikaria **7.0%**
6. Coasts of the islands of Kefalonia, Zakynthos and Patraikos Gulf **5.8%**
7. Area of the Dodecanese islands **5.0%**
8. Area of the Cyclades islands **4.4%**
9. Coasts of Epirus and Corfu island & Amvrakikos Gulf and the coasts of Lefkada island **2.8%**
10. Area of Crete island **2.3%**
11. Other Areas **2.3%**

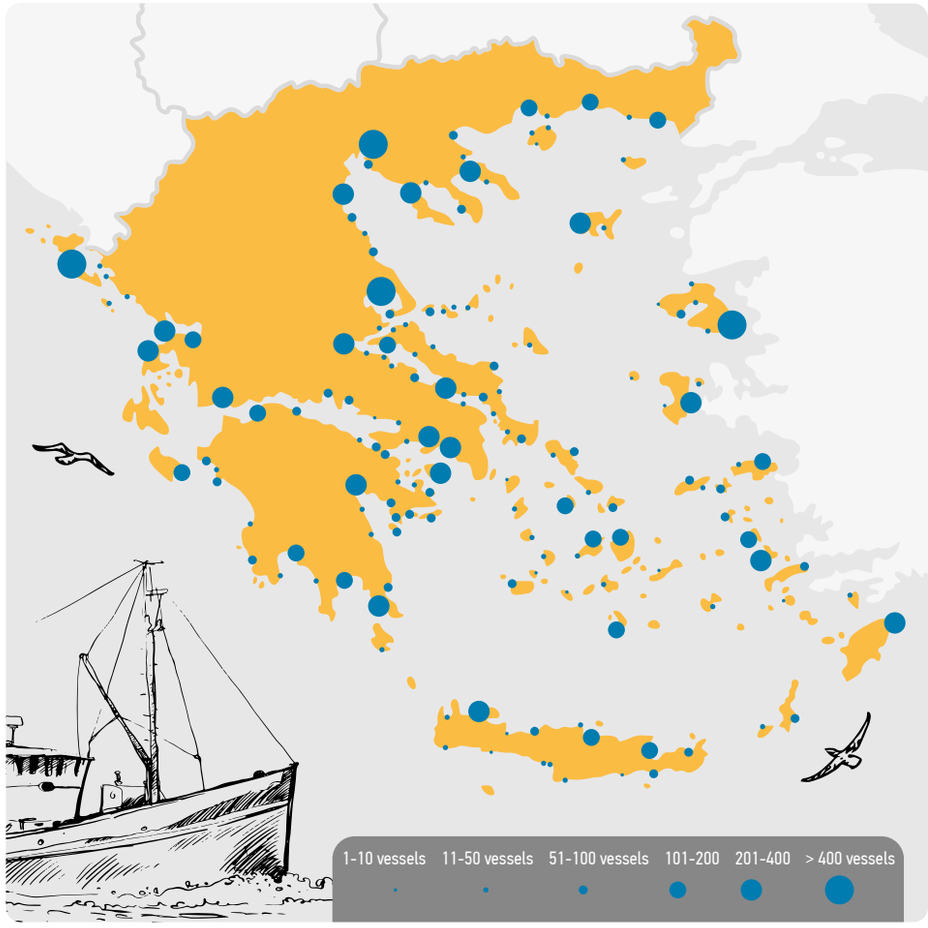
Regarding the spatial distribution of fishing gear in marine fisheries, the various gears do not exhibit the same presence and capacity in all coastal and island areas of Greece.



In summary:

- Bottom trawlers and purse seiners are found in the Aegean Sea at a rate of more than 80%.
- Based on their port of registration, 2/3 of the bottom trawlers and purse seiners are located in the North Aegean, the Saronikos Gulf and Evia.
- Small-scale fishing vessels are more dispersed than the large-scale fishing vessels (see Map 2), although about two thirds of them are located in the Aegean Sea.
- Only 10% of ports have more than 100 small-scale fishing vessels

Map 2
Distribution of small-scale fishing vessels by port in Greece, 2019

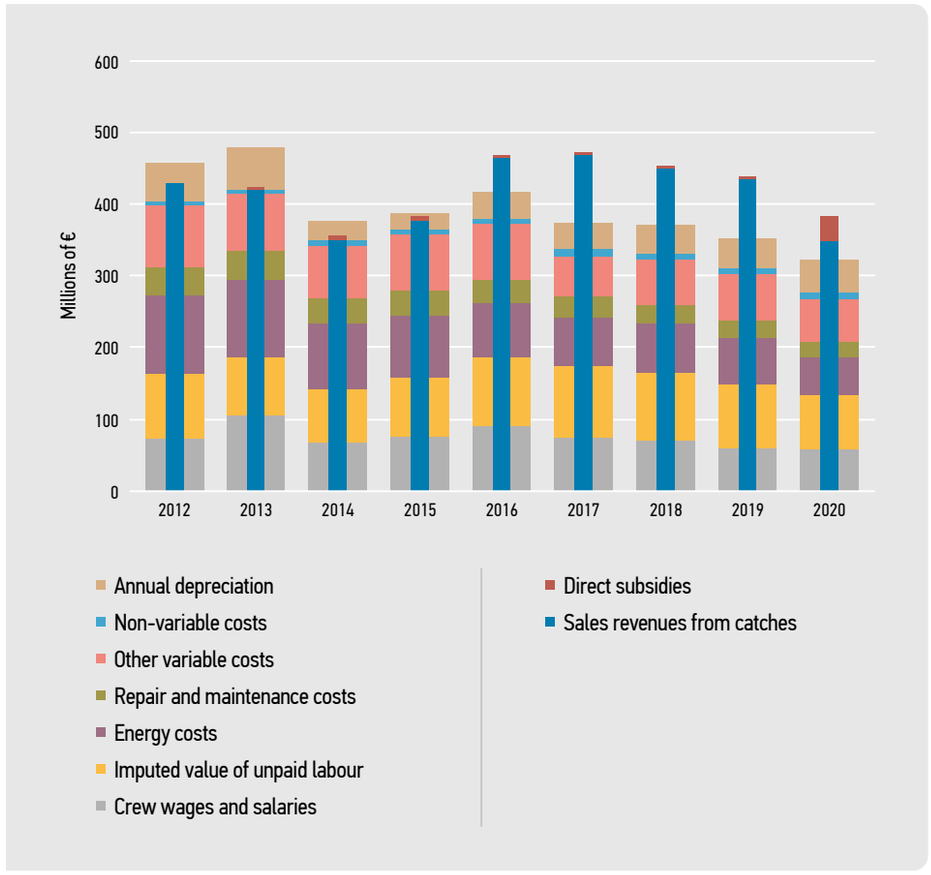



Source : http://www.oikoskopio.gr/map/

# Revenues and costs

Revenues from marine fisheries occur almost exclusively from the sale of landings, as direct subsidies constitute a very small percentage of the total revenues (mainly oil duty refunds) (see Figure 8). The significance of direct subsidies has temporarily increased during the last two years, due to the subsidies related to the effects of the pandemic (see Figure 8).

Figure 8
Revenues and costs in fisheries

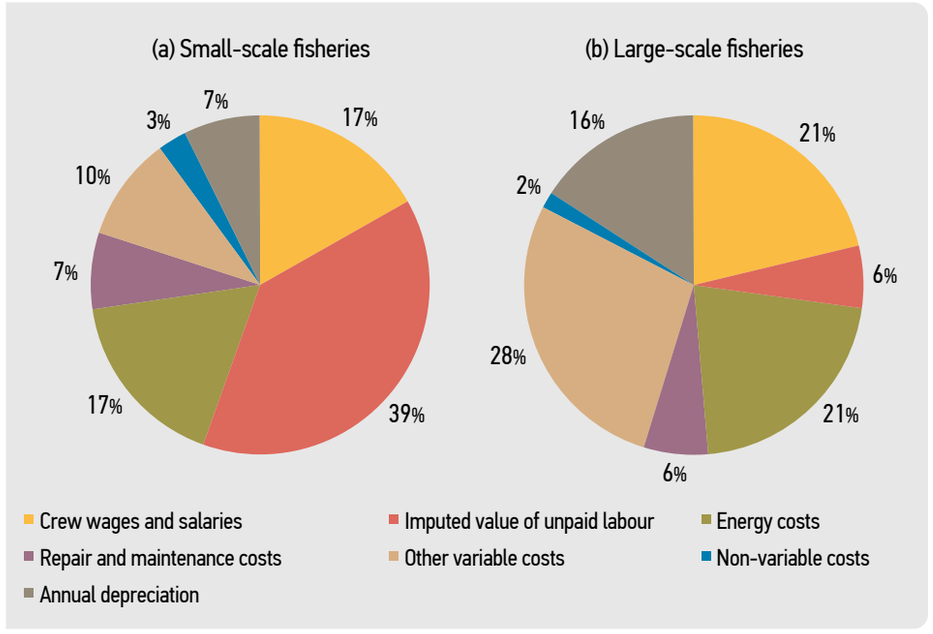



Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

As far as costs are concerned, seven different categories can be distinguished. The most important expenditure for the Greek fleet is the imputed value of unpaid labour with a participation rate of aproximately 25% in total costs, followed by energy cost and other variable costs which exhibit a roughly similar participation rate in total expenditure (about 18%). Crew wages and salaries, participate with an additional 17% in total costs. Annual depreciation is also an important part of total costs (aprox. 12%), followed by repair and maintenance costs and variable costs.

As shown in Figures 9a and 9b, the structure of costs varies between small- and large-scale fisheries, especially regarding the role of wages and unpaid labour. In particular, small-scale fisheries are significantly more labour-intensive, with unpaid labour covering most of the labour requirements. Moreover, other variable costs and annual depreciation costs vary considerably among small-scale and large-scale fisheries.

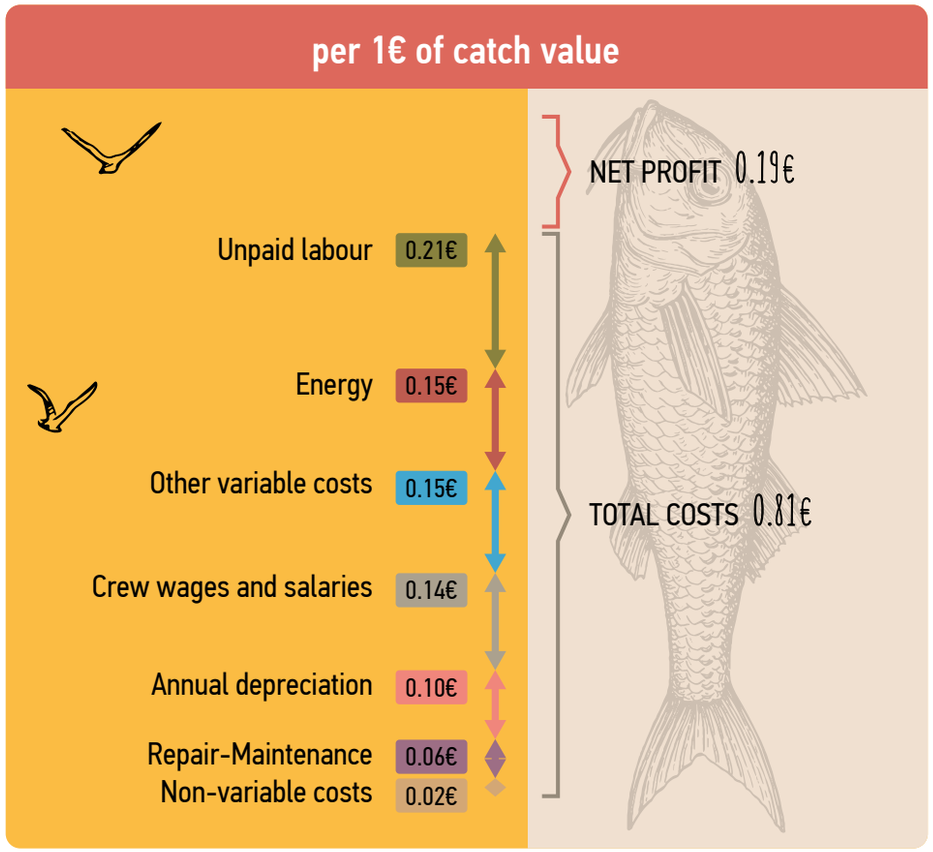
Figure 9
Cost structure in a) Small-scale fisheries and b) Large-scale fisheries, 2020




Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

# Economic results

The schematic representation below shows the costs and net profits per 1€ of catch, based on the data for the year 2019. What emerges from the figure is that the fishers' net profit, estimated as revenues minus total costs, is 0.19€ per 1€ of catch.




The following page presents some key economic results for the fishing sector and separately for small-scale and large-scale fisheries (years 2019 and 2020). The results for 2020 are mainly presented to highlight the economic challenge posed by the pandemic, while the 2019 data provide a more typical insight into the sector without the negative effects of the pandemic.



Table 3
Economic results of small- and large-scale fisheries

| | 2019 | | | 2020 | | |
|---|---|---|---|---|---|---|
| | Total | Small-Scale Fisheries | Large-Scale Fisheries | Total | Small-Scale Fisheries | Large-Scale Fisheries |
| **Economic results (€ million)** | | | | | | |
| Gross value added | 274 | 135 | 139 | 240 | 95 | 145 |
| Gross profit | 125 | 23 | 102 | 105 | -6 | 112 |
| Net profit | 83 | 5 | 78 | 59 | -30 | 89 |
| Profit & remuneration of imputed value of labour | 173 | 89 | 84 | 135 | 41 | 94 |
| **Economic indicators** | | | | | | |
| Net profit margin (%) | 19.0 | 2.2 | 36.1 | 15.4 | -17.4 | 42.6 |
| Gross profit margin (%) | 28.6 | 10.6 | 47.0 | 27.5 | -3.7 | 53.4 |
| Gross value added/Revenues | 0.63 | 0.61 | 0.64 | 0.63 | 0.55 | 0.69 |
| Net profit margin and remuneration of imputed value of labour (%) | 39.7 | 40.4 | 38.9 | 35.4 | 23.7 | 45.0 |

Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI

For 2019, the Gross Value Added of the marine fisheries sector amounts to € 274 million, with almost equal participation rates of small- and large-scale fisheries. The fishing sector shows a net profit of € 83 million. If the remuneration of imputed value of labour is added to this net profit, it is becoming evident that the sector can provide a significant income (€ 173 million) and favorable living conditions to the sector's employees.

For 2019, most financial indicators are positive. With regard to large-scale fishing, it is worth noting that despite the fact that it corresponds to far fewer vessels, it employs around 20% of the sector's employees and generates around 50% of total turnover. The financial indicators of large-scale fisheries appear improved in relation to the fleet as a whole, indicating that this is a more business-oriented type of fisheries compared to small-scale fisheries. Furthermore, these indicators show that large-scale fisheries demonstrate a great dynamism and resilience that significantly enhance

the economic viability of the sector. It can be therefore noted that small-scale and large-scale fisheries, although they differ significantly in terms of their characteristics, create an important developmental dipole in the coastal and island regions of the country (Mantziaris et al., 2020).

In addition, Tables 4 and 5 present some of the key economic results for the marine fishing vessels, broken down by their main fishing gear for the years 2019 and 2020, respectively

Table 4
Main economic results by fleet segment based on the main fishing gear, 2019

| 2019 | | | |
|---|---|---|---|
| Fleet segment | Gross value added | Net Profit | Net profit & remuneration of imputed value of labour |
| Nets | 108.0 | 19.6 | 79.1 |
| Longlines | 28.5 | -12.0 | 11.1 |
| Traps/Pots | 6.7 | 1.3 | 4.5 |
| Purse seiners | 69.2 | 45.5 | 47.1 |
| Bottom trawlers | 58.7 | 35.3 | 36.7 |

Source: Data from the Greek National Fisheries Data Collection Framework 2021. Elaboration: AGRERI

Table 5
Main economic results by fleet segment based on the main fishing gear, 2020

| 2020 | | | |
|---|---|---|---|
| Fleet segment | Gross value added | Net Profit | Net profit & remuneration of imputed value of labour |
| Nets | 67.8 | -20.9 | 30.5 |
| Longlines | 27.5 | -7.0 | 12.2 |
| Traps/Pots | 8.0 | 3.5 | 5.9 |
| Purse seiners | 66.0 | 44.8 | 46.3 |
| Bottom trawlers | 58.7 | 35.3 | 36.7 |

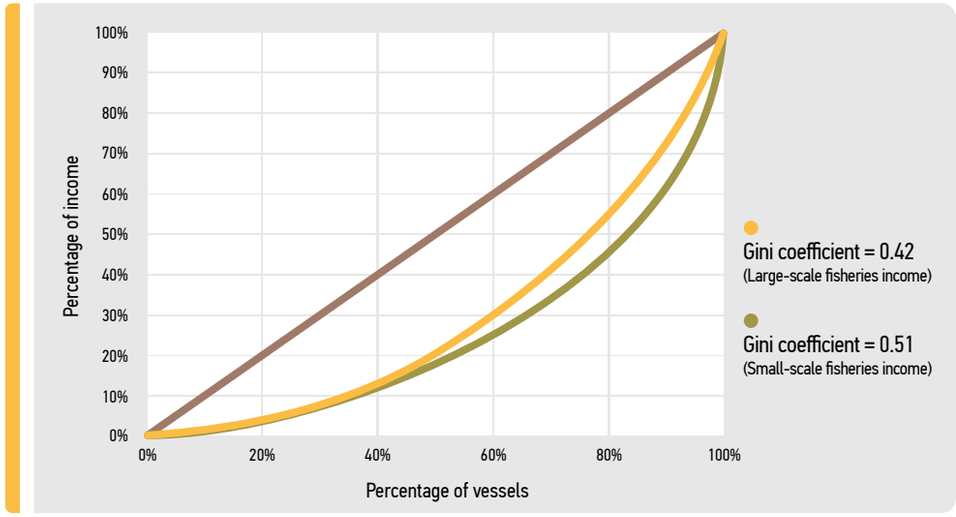
Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI



For 2020, the economic results reveal the impact of the Covid-19 pandemic, mainly on small-scale fisheries, nets and longlines.

Significant findings are also obtained by calculating the Gini coefficient and the Lorenz curve. As the curve moves away from the diagonal (brown line) and as the value of the Gini coefficient increases, the inequality of income distribution widens. Results indicate that small-scale fisheries show a significantly higher degree of income inequality than large-scale fisheries. For example, the Lorenz curve shows that 80% of the vessels in small-scale fisheries accumulate less than 50% of the income (around 45%). In the case of the large-scale fisheries, the corresponding figure is around 60%.

Figure 10
Lorenz curve and Gini coefficient for Small- and Large-Scale Fisheries income, 2019



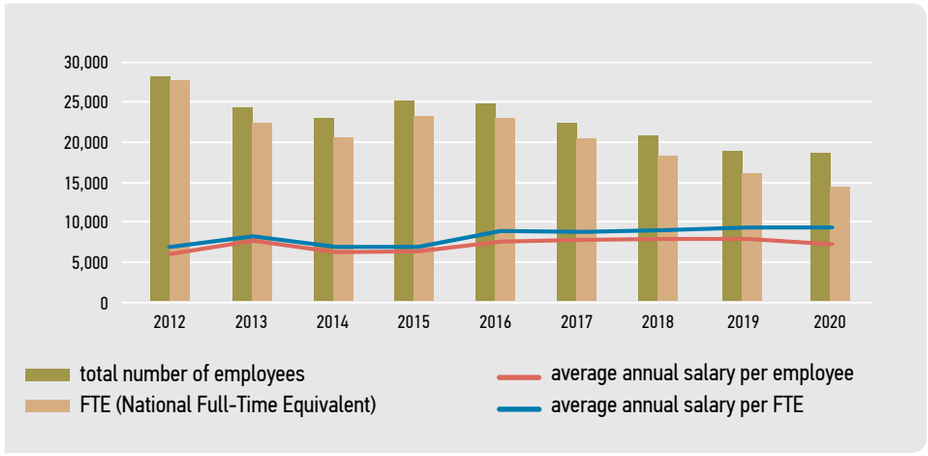

Many reasons may contribute to this result, such as the broadened (but local) distribution network for small-scale fishery products (restaurants, hotels, retailers and individual consumers). On the other hand, in the case of large-scale fisheries, the distribution channel can be considered quite restrictive since almost all the catches end up in fish auctions, resulting in no significant margins for price differentiation and hence, in no significant income differentiation between fisheries enterprises.

# Social Dimension of Marine Fisheries

## Employment

As already mentioned, the structural changes in the fisheries sector have had a negative impact on its employment, as shown in Figure 11. Of course, it is worth noting that the average wage per employee has a slightly positive trend. Moreover, we note the significant degree of under-employment in the sector, as the total FTEs are significantly lower than the total number of employees.

Figure 11
Evolution of employment and average annual wage over time




Source: Data from the Greek National Fisheries Data Collection Framework 2022. Elaboration: AGRERI



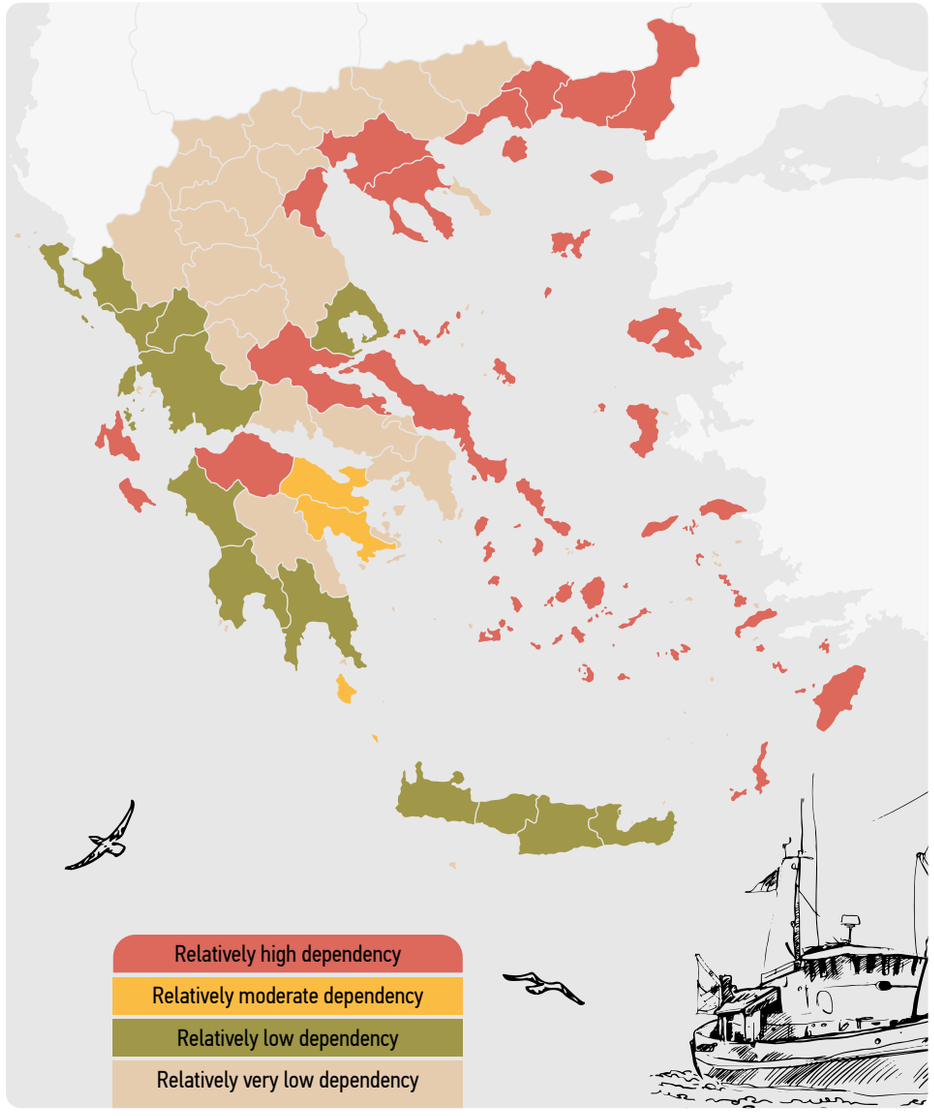
## Regional dimension and employment

In Greece, there is a strong differentiation in the degree of dependency on fisheries among the regional units. As shown in Map 3 and in the corresponding analysis (see methodology for calculating the degree of dependency on fisheries), there are areas that stand out in terms of the number of people employed in fisheries and the Gross Value Added (GVA) derived from fishing due to the significant quantities caught.

The group of regional units included in the fishing area of the Strymonikos Gulf, Gulf of Kavala, coasts of Thasos and Thracian Sea shows by far the highest dependency on fisheries, with an index estimated at 2.24%, followed by the area of the islands of Lesvos, Chios, Samos and Ikaria with a dependency index of 1.36%. The area of the Cyclades islands follows with a dependency index of 1.29%, while the Gulf of Evia, Eastern coasts of Evia and Sporades islands present a dependency index of 1.22%. The areas of Dodecanese islands; Thermaikos Gulf and Gulf of Chalkidiki; the coasts of the islands of Kefalonia, Zakynthos and the Patraikos Gulf exhibit dependency indexes of 0.77%, 0.73% and 0.65%, respectively. The regional units contained in Argolikos and Saronikos Gulfs and in the Gulf of Corinth show a comparatively moderate degree of dependency on fisheries (0.43% and 0.41%, respectively). For the regional units where dependency on fisheries is considered relatively low according to the defined threshold of the dependency index (<0.39%), the ranking of fishing areas is as follows: Coasts of Epirus and Corfu island (0.2%); Laconikos Gulf (0.17%); Amvrakikos Gulf and coasts of Lefkada island (0.12%); Crete island area (0.11%); Pagasitikos Gulf (0.1%); and Kyparissiakos and Messiniakos Gulfs (0.03%).

The ranking of the regional units included in the fishing areas according to the degree of dependency on fishing constitutes a guideline for conducting more specialized research, focusing on those areas that are comparatively more dependent on fishing in order to design and implement targeted policies aiming at the sustainability of fishing enterprises and local communities.

Map 3
Comparative degree of regional units' dependency on fisheries




**Relatively very low dependency:** Dependency index < 0.03%
**Relatively low dependency:** 0.03% ≤ Dependency index < 0.39%
**Relatively moderate dependency:** 0.39% ≤ Dependency index ≤ 0.49%
**Relatively high dependency:** Dependency index > 0.49%



## Methodology for calculating the degree of dependency on fisheries

In order to determine the comparative degree of dependency of the regions on fisheries in Greece, the ratio of employment in fisheries to total employment in the region under study and the ratio of the Gross Value Added (GVA) from fisheries to the total GVA of the region under study can been used as criteria, either individually or combined (Tzanatos et al, 2005; Macfadyen et al., 2011; Natale et al., 2013). For the purposes of this analysis, both criteria have been used and equal significance weights have been be assigned to them (w1=w2=0.5).

**Index of dependency on fishing of regional units within a fishing area**

$$= w1 \frac{\text{Employed in fisheries (fishing area)}}{\text{Total employment in the regional units within the fishing area}}$$

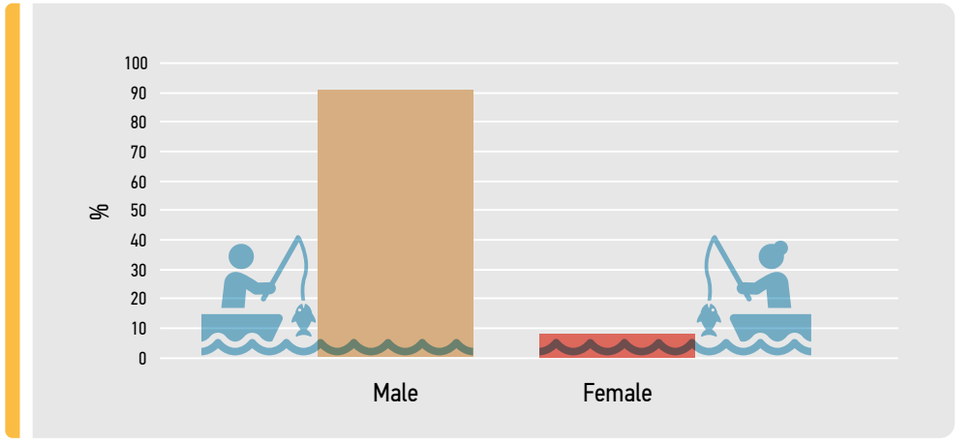
$$+ w2 \frac{\text{Fishing GVA (fishing area)}}{\text{Total GVA of regional units within the fishing area}}$$

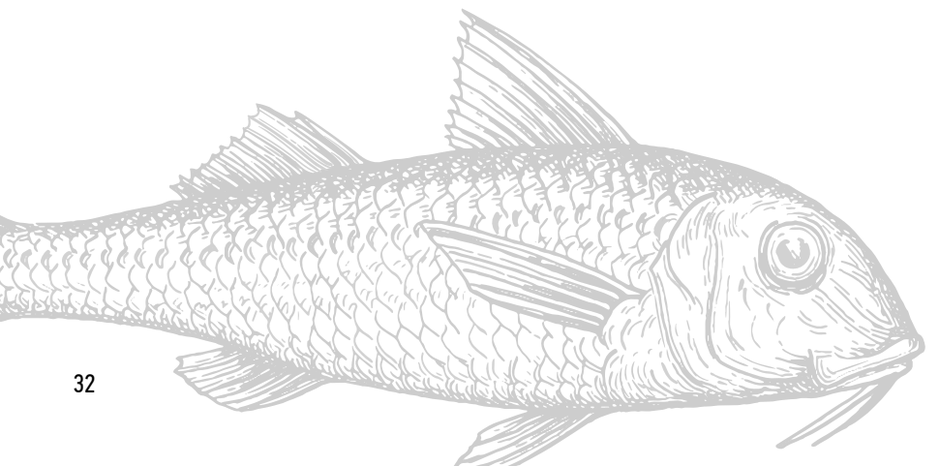
The data that have been utilized to estimate employment in fisheries and the GVA per fishing area through forecasting indexes originate from secondary sources and, specifically, from the Hellenic Statistical Authority (ELSTAT).

# Social characteristics of the employees

## Gender

Marine fisheries are male-dominated (91% of fishing employees). Women are usually underemployed in fishing, contributing fewer hours to the fishing activity. However, the role of women, though not accurately illustrated in official statistics, is very important since their contribution often concerns on-shore activities (e.g. direct sale of catches, preparation of fishing gears, processing of fisheries-related obligations) (Liontakis et al., 2020). This is to a considerable extent part of the general phenomenon of pluriactivity of Greek rural households. In this context, women, apart from the household chores, are often engaged in economic activities – fisheries-related or not (e.g., agricultural activities, renting tourist accommodation, taverns, etc.).

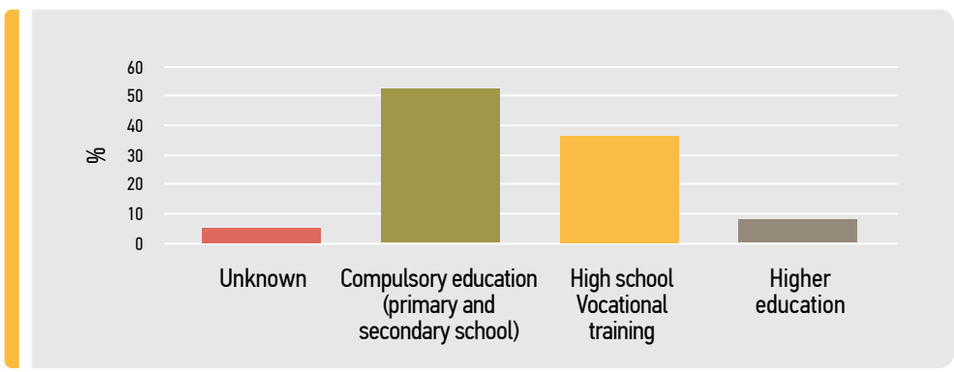




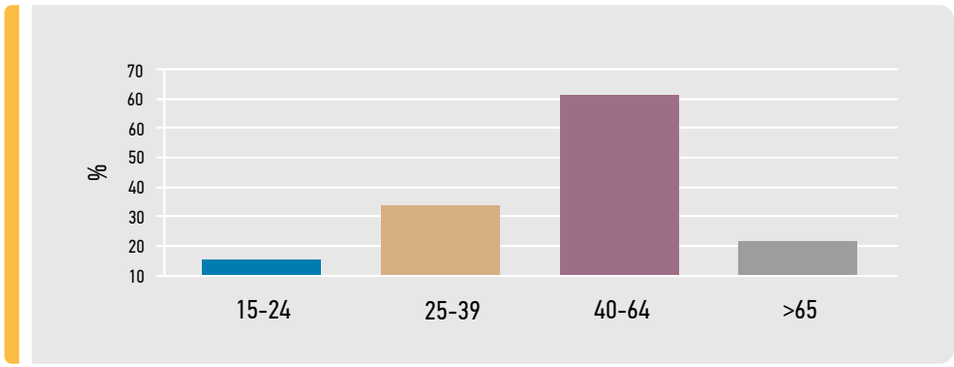
## Education level

The majority of fishers are primary or secondary school graduates, while close to 10% are higher education graduates. In the case of small-scale fisheries, the level of education is significantly higher than large-scale fisheries since the latter is characterised by the presence of foreign fishers who usually have only basic/compulsory education.



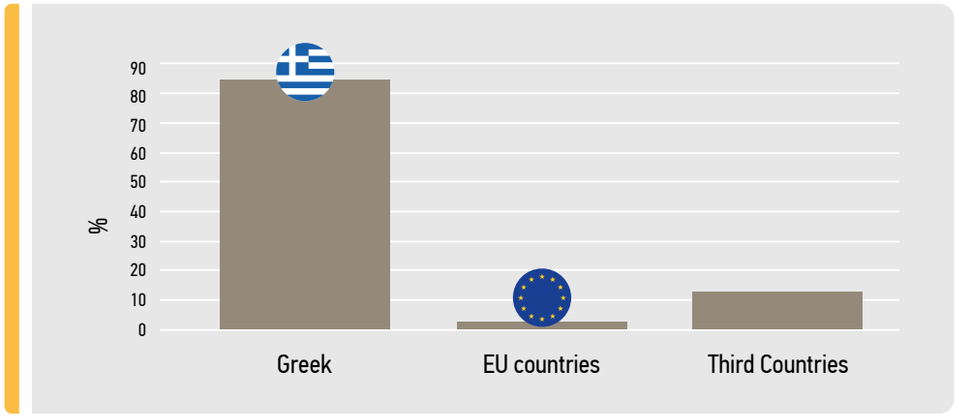

## Age

The majority of fishers are over 40 years old, while a significant proportion are over 65 years old (Mantziaris et al., 2020). It is worth noting that the population engaged in large-scale fisheries is comparatively younger, which relates to the higher level of hired labour demand, compared to the small-scale fisheries.



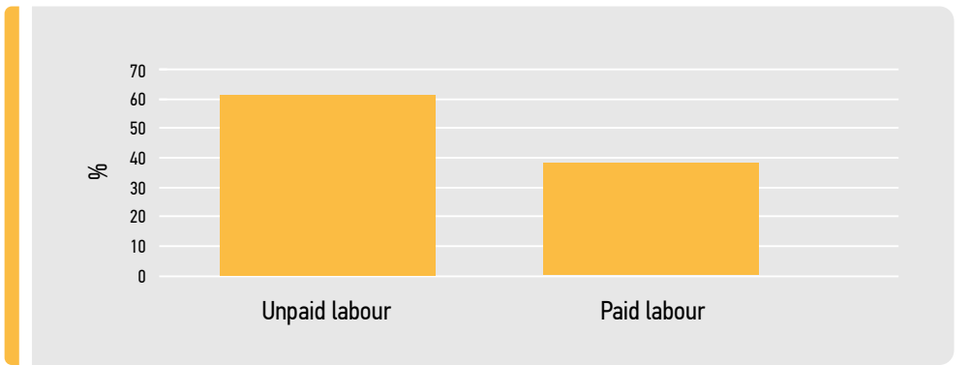
## Nationality

Regarding the nationality of the employees, the majority are Greeks (84.4%), followed by nationalities of countries outside the European Union with a percentage of 14% (mainly Egyptians) (Mantziaris et al., 2020). The latter are predominantly employed in large-scale fisheries.




## Paid Labour

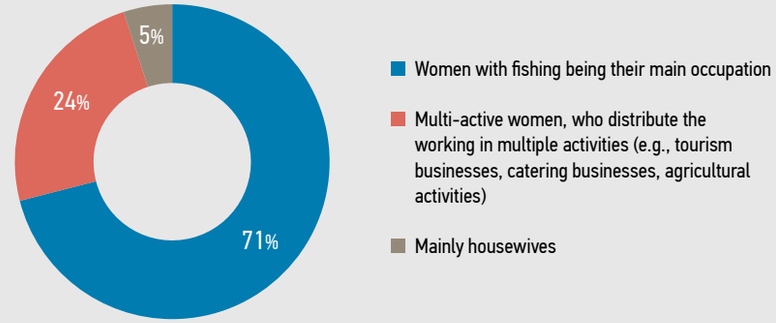
Small-scale fisheries rely mainly on the work of the vessel owner and family members. On the contrary, large-scale fisheries are characterised by a more 'entrepreneurial' model of fishing activity, that relies more on hired labour (Mantziaris et al., 2020). This is the main reason why unpaid (imputed) labour concerns a very significant proportion of workers in small-scale fisheries and essentially refers to work carried out by members of the (broader) family.






# The role of women

The contribution of women to small-scale fisheries is nowadays recognised and has attracted the interest of the research community. As part of the National Data Collection Programme, AGRERI collects demographic data as well as data concerning the labour hours, the labour type and wages of women working in fisheries. The analysis of this data has shown that women in marine fisheries can be divided into three main categories:

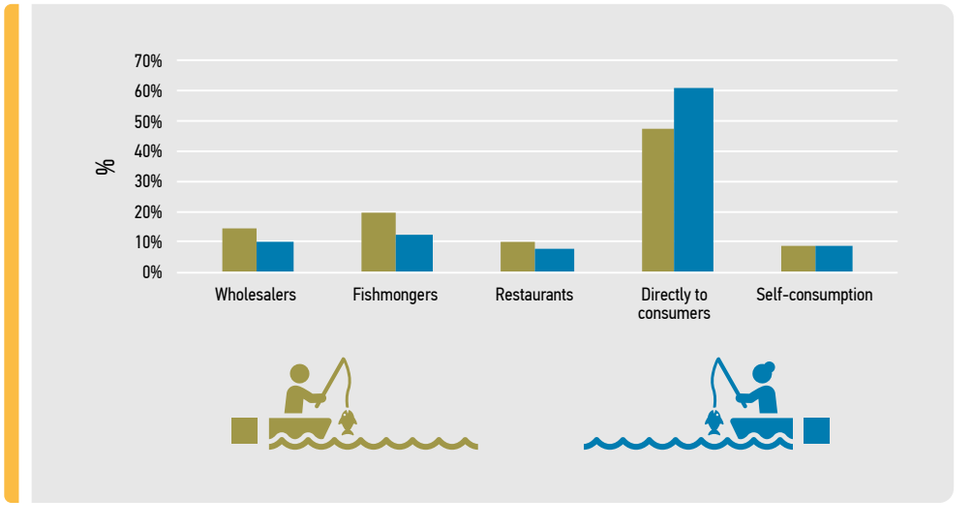



Women are mainly employed on shore (70%) as opposed to men who are mainly employed on board. In most cases the work of women is unpaid (imputed family work).

**Some of the common jobs for women in fisheries include:**

- Preparation of fishing gears
- Disentangle fish from nets
- Selling the catch
- Vessel cleaning
- Administration work / Paperwork

Finally, a very important finding is that the presence of women in the crew is often linked to increased direct sales to consumers, which has a positive impact on revenues and consequently on economic results.



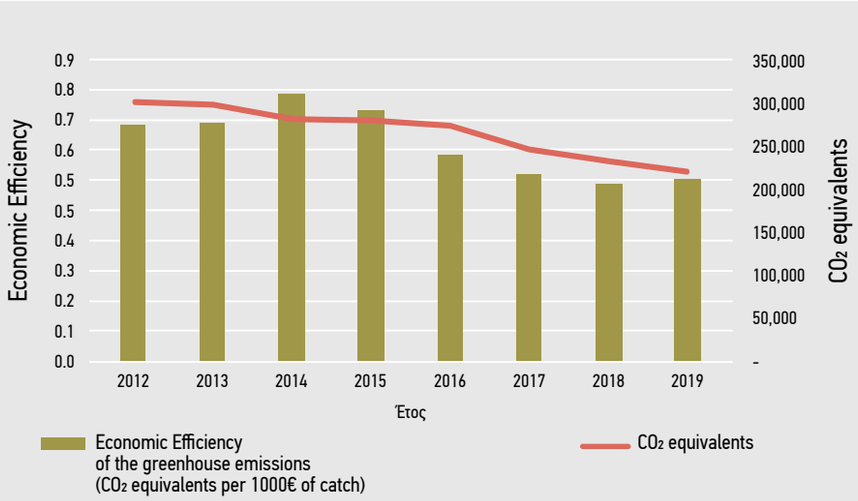



## Greenhouse gas emissions

According to an EU report (European Commission, 2022), the EU's fisheries (and aquaculture) sectors, despite their particularly significant growth in recent years (41.5% increase in Gross Production Value (GPV)), show very little increase in GHG emissions in terms of $CO_2$ equivalents (+0.5%). This indicates an extremely significant reduction in GPV per unit of $CO_2$ equivalents.

Using the data obtained from the National Fisheries Data Collection Programme, the emissions in terms of $CO_2$ equivalents of the fisheries sector separately (excluding the aquaculture sector) are shown in Figure 12. Furthermore, the evolution of the economic efficiency of these emissions ($CO_2$ equivalents required to land 1000 € of fish) is also presented. The graph indicates that in recent years there has been a reduction in greenhouse gas emissions. However, due to the greater reduction in the value of landings, this has ultimately led to a reduction in economic efficiency.

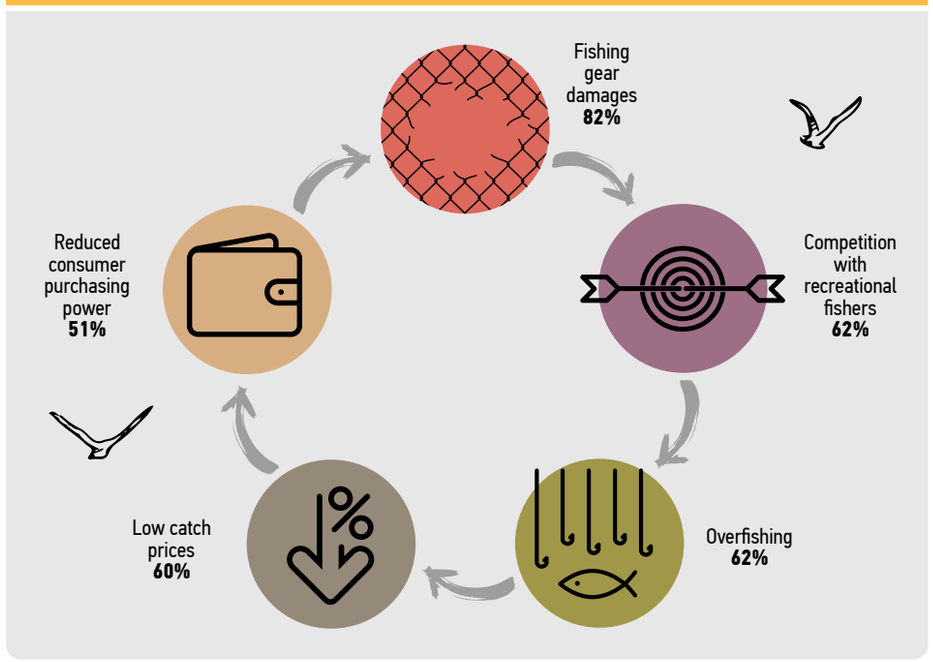
Figure 12
Evolution of greenhouse gas emissions (in $CO_2$ equivalents) in fisheries and their economic efficiency, 2012-2019



# Small-scale fisheries:
## Specificities and structural problems

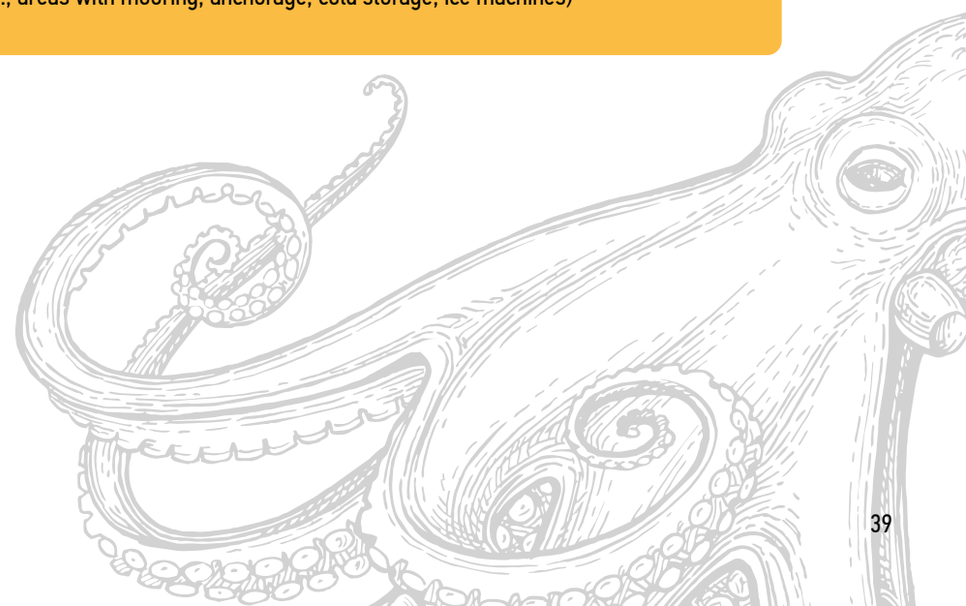
The Box below presents the 5 most common problems of small-scale fisheries reported by fishers in a complementary survey conducted by AGRERI during the collection of socio-economic data on marine fisheries. The results highlight the intensity of the problem of fishing gear damage by protected species (e.g., seals, dolphins) and by alien species (e.g., silver-cheeked toadfish), which is reported by 82% of respondents. Furthermore, 62% of the respondents emphasize as significant problem the competition from recreational fishers and the decline in fish stocks due to overfishing. In addition, market issues are considered important by fishers, in particular the reduced price of fishery products and the decrease in demand due to the limited purchasing power of consumers. Finally, although not included among the most frequent issues reported by the surveyed small-scale fishers, it is worth mentioning that many of them highlighted the lack of incentives for young fishers to enter the profession.

### The 5 main problems facing small-scale fishers




### Important structural problems and specificities of coastal fisheries

- Limited human capital (aged staff with low education)
- Low succession rate
- Inability to adopt innovations
- Lack of training infrastructure
- Need for income diversification (e.g., fishing tourism)
- Large number of low-capacity, ageing vessels with obsolete equipment and outdated technology
- Lack of cooperative culture
- Low bargaining power
- High administrative costs of monitoring, control and surveillance
- Inability to access remote markets and often production and marketing chains
- Reduced liquidity
- Low entrepreneurship
- High inactivity
- Uncertain income
- Lack of infrastructure (e.g., areas with mooring, anchorage, cold storage, ice machines)



# Family-run or business-oriented fisheries?

The research question posed is whether small-scale fisheries can be a socially worthy fishing activity model, given the more competitive model of large-scale fisheries, based on socio-economic and environmental criteria[2].

In Greece, the majority of fishing vessels are small-scale (94%). Small-scale fisheries represent 52% of the country's value of landings (€ 221 million) and 93% of the days at sea. Furthermore, small-scale fishing contributes 81% to the total national employment of the sector (16,042 people). The majority of the employed crew regards unpaid labour, consisting mainly of members of the vessel owners' families. Therefore, the contribution of small-scale fisheries to local employment as well as to the social and economic sustainability of coastal communities is very important.

The mapping of the segments of the Greek fishing fleet according to the fishing activity model is carried out by classifying them into two groups, either family-run or business-oriented, using a pair of indicators based on employment variables:

1/ Percentage of full-time equivalents (FTE) by fleet segment

2/ Percentage of paid labour by fleet segment

If 1/ >60% and 2/ >60% then the fleet segment is classified as business-oriented, otherwise it is classified as family-run

The societal value per ton of landings and per fleet segment is then estimated:

**Societal value = Private profit - Societal cost**

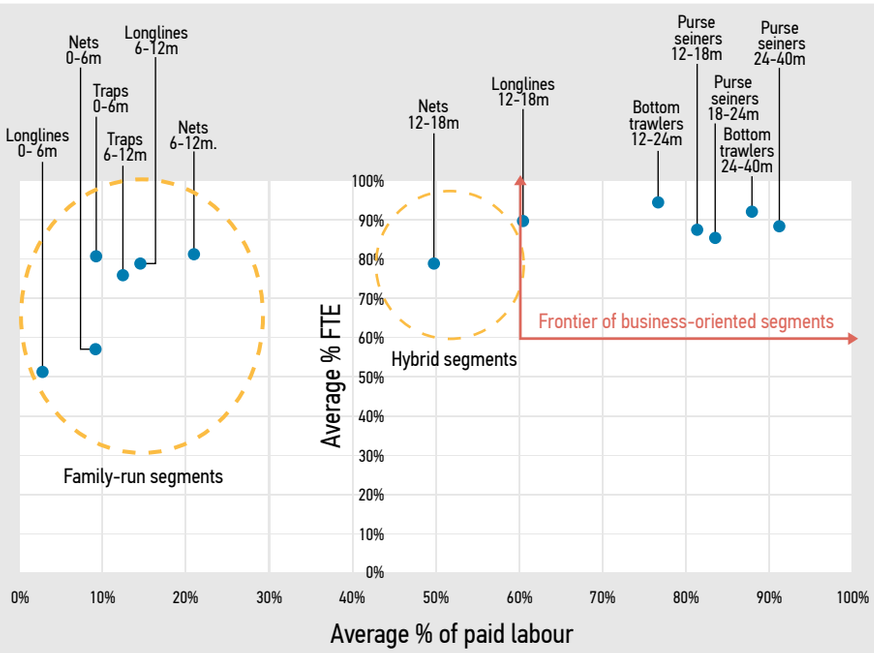
Where Societal Cost = Societal Cost of Greenhouse Gas Emissions + Subsidies related to production activity

[2] This is a summary of the publication Mantziaris, S., Liontakis, A., Valakas, G., & Tzouramani, I. (2021). Family-run or business-oriented fisheries? Integrating socioeconomic and environmental aspects to assess the societal impact. Marine Policy, 131, 104591. https://doi.org/10.1016/j.marpol.2021.104591



Based on their position in Figure 13, three separate cluster groups can be identified. The first includes the segments using Trawlers and Purse seiners. It is located in the upper right-hand part of the graph and, therefore, it is considered to contain the business-oriented segments of the fleet. On the other hand, a cluster of segments belonging to small-scale fisheries (vessels < 12 m in length) appears in the left-hand part of the graph. This cluster represents the family-run fisheries model. Finally, a third small cluster appears which includes only two fleet segments and is located between the other two clusters. The fleet segments included in this cluster contain relatively large (12-18 m) fishing vessels using passive gear. Although these fleet segments are fairly close to the boundaries of the business-oriented segments, they are at the same time significantly different from the other two depicted clusters. For this reason, we consider this cluster to be a "hybrid" of the other two and exclude it from the rest of the analysis. In any case, these segments represent only 2% of the national fishing fleet and, therefore, excluding this cluster from the cost-benefit analysis cannot significantly affect the results.

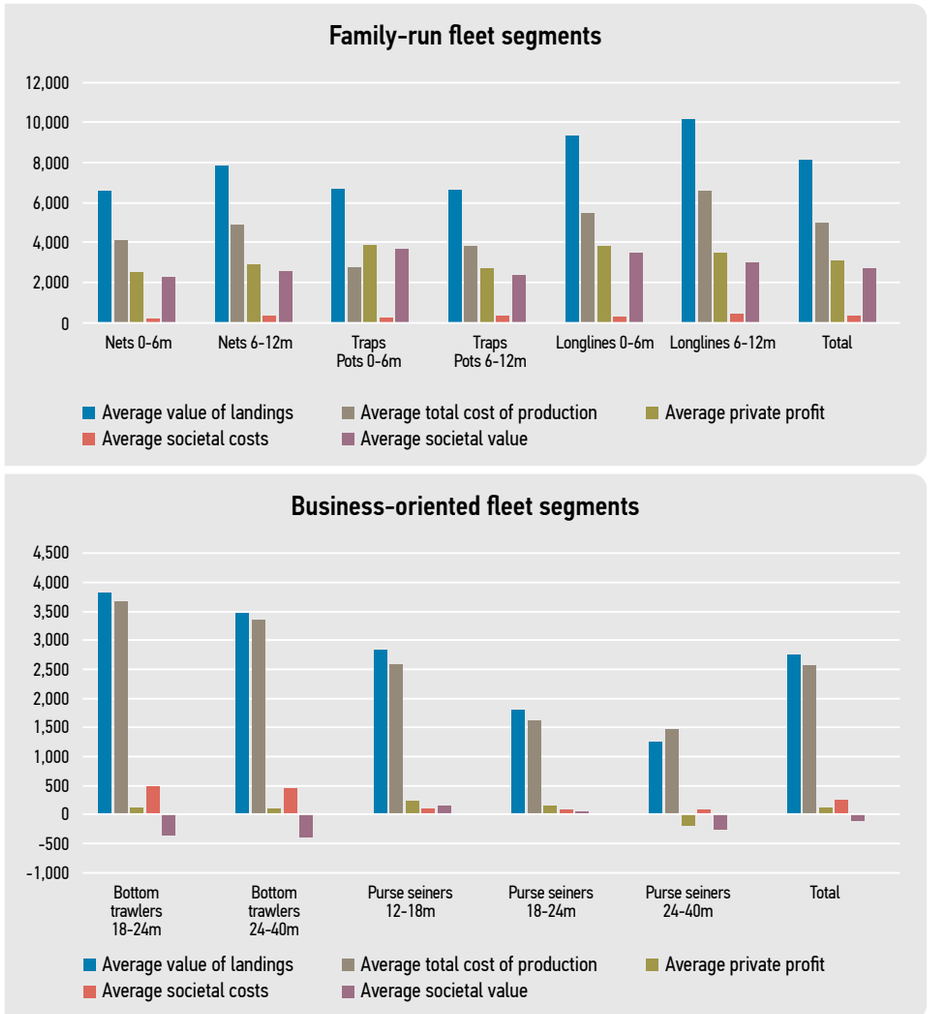
Figure 13
Clustering of fleet segments per fishing activity model



We note that overall, the segments that are characterized as family-run achieve a much higher average societal value per ton (2,745 €) than the business-oriented segments (-129.14 €) (see also Figure 14).

This significant deviation is due to the different distribution channels. In particular, the family-run segments channel their catches directly to consumers, restaurants and fishmongers. In this way, family-run segments avoid intermediaries and ensure high selling prices. On the contrary, the business-oriented segments channel their catches almost exclusively to fish auctions whose bargaining power is significant.

Figure 14
Main parameters of cost-benefit analysis by fleet segment



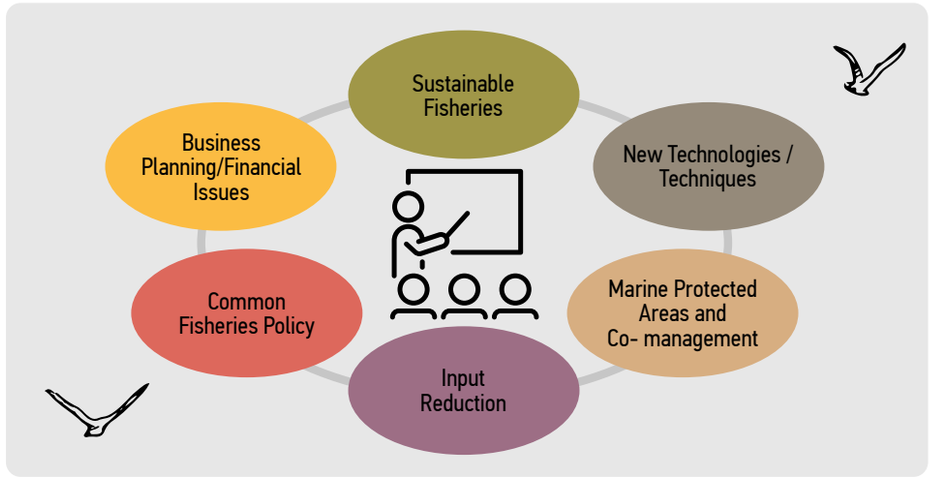

The family-run fishing activity model can be considered more profitable for society. This result reinforces the role of small-scale fisheries and emphasizes their social worth. Family-based fishing is the backbone of Greek fisheries and a key source of income for local communities. It strengthens social cohesion, especially for remote and isolated areas in rural Greece.

Therefore, at the policy level, emphasis should be placed on improving the infrastructure that can promote family-run fishing activity, and on creating added value by encouraging vertical expansion of family businesses, through for example, the establishment of small-scale processing units for fishery products. In this way, the societal value created by fishing activity could be enhanced and a positive impact on the local economy could be achieved. Undoubtedly, the creation of policy initiatives for the development of fisheries tourism can also provide an additional source of income for the local communities engaged in small- scale fisheries and could, in this way, further increase the societal value of the family-run model of activity. However, at a policy level, priority should be given to family-run fisheries, especially in less-favoured areas where the maintenance of community cohesion is a key issue. Otherwise, neglecting the role of the family-run fishing model may lead to further abandonment of the sector and consequently to the economic, social and cultural decline of these areas.

On the other hand, the business-oriented model, despite its comparatively smaller share in terms of the number of vessels in the Greek fishing fleet, provides, among other things, a significant amount of landings, especially in the country's large urban centres. The two models of fishing activity should, therefore, complement each other.

# Training needs and objectives of fishers

When collecting socio-economic data for the marine fisheries sector, fishers were also asked to report their intention to participate in training seminars and to select from a list of potential topics the ones they considered most important. Only 50% of the respondents intend to participate in training seminars. As expected, sustainable fishing is the topic with the highest preference among the respondents, while the use of new/innovative techniques, new technologies, and input reduction methods seem to capture the interest of fishers. In addition, policy issues such as marine protected areas and the Common Fisheries Policy were popular topics among respondents. Finally, among the most popular answers, economic issues such as business planning and introduction to basic economic concepts were also among the most popular answers.

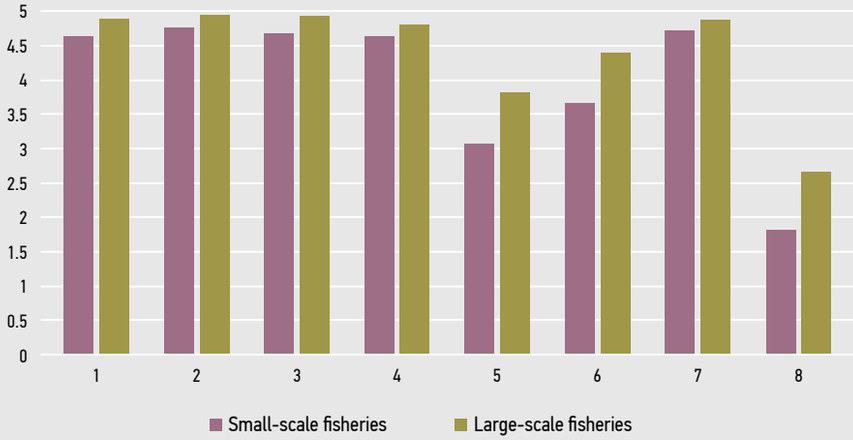



It is worth noting that both similarities and differences can be identified among small-scale and large-scale fishers. Both of the above consider training topics related to sustainable fishing and the introduction of new technologies and techniques to be the most important. However, large-scale fishers show a significantly higher interest in the topic 'Economics of fishing enterprises/Business planning of fishing enterprises' which is ranked third in terms of their preference, while on the other hand the same topic came last in small-scale fishers' preferences. This finding suggests that large-scale fishers are more business-oriented.



Regarding the fishers' objectives, it was found that both categories (i.e., small-scale and large-scale fishers) put almost equal emphasis on issues related to profit maximisation, provision of high quality products to consumers, quality of life of the household, protection of the marine environment and safety conditions on board. However, large-scale fishers place greater emphasis on objectives related to innovation (e.g., use of new technologies), investment regarding fishing activity and expansion of activities (e.g., through the processing of the catches). The differentiation observed for these objectives suggests the tendency of large-scale fisheries towards a more entrepreneurial profile. It is worth noting that the latter three objectives are considered to be less important than the five mentioned above, with the objective relating to the expansion of activities coming last, reflecting the negative factor of the unfavourable economic environment.

Figure 15
Objectives of small-scale and large-scale fishers




1. To maximise the profit from my fishing activity
2. To provide consumers with high-quality products
3. To maintain and improve the quality of life of my family
4. To ensure that the impact on the environment is minimal
5. To be innovative
6. To invest in my fishing activity
7. To maximize the safety conditions on my vessel
8. To expand the activities of my business

# Fisheries and the Effects of the External Environment - PESTLE analysis

Using the PESTLE analysis, a strategic analysis tool, an assessment of the impact of the external environment on the fisheries sector was carried out. The main goal of the analysis is to identify the main points that require regulation-intervention as regards to external factors. The political, economic, social, technological, environmental and legal factors that affect the fisheries sector and influence its long-term sustainability have been identified.

| | |
|---|---|
| **P** **Political factors** | - Measures to promote the modernisation of the fishing fleet<br>- Measures to support fishers during the pandemic<br>- Designing more nationally oriented support instruments<br>- Designing policies to mitigate climate change<br>- Financing of measures regarding training and the entrance of young fishers into the sector |
| **E** **Economic factors** | - Economic efficiency of small-scale fisheries due to an expanded distribution channel<br>- Significant degree of dependency of small-scale fisheries on tourism flows<br>- Low bargaining power in large-scale fisheries<br>- Limited number of small processing plants for fishery products<br>- Adverse macroeconomic environment |
| **S** **Social factors** | - Positive impact of the role of women in the development of the sector<br>- Human resources in fisheries science<br>- Reduced level of social sustainability<br>- Increased international interest in fishing tourism<br>- Decreased tourism flows due to the pandemic<br>- Consumers shift to long-life products due to the pandemic |
| **T** **Technological factors** | - Partnership between scientific bodies and private parties for the development of innovative fishing technologies<br>- Partnership between scientific bodies, organisations, fishers and private individuals for the implementation of innovative fisheries management systems<br>- Limited technology transfer actions from the laboratory to the industry |
| **L** **Legal factors** | - Special fishing licenses<br>- Advanced monitoring systems<br>- Efforts towards International Governance in the Mediterranean region |
| **E** **Environmental factors** | - Rich biodiversity of the Greek seas<br>- Seasonality of species<br>- Climate change |

## Political factors

***Measures to promote the modernisation of the fishing fleet***

Under the Common Fisheries Policy (CFP), measures directly linked to the fishers are promoted, which aim at fleet modernisation, safety and added value. In particular, under the Operational Programme for Fisheries and Sea (OPFS) 2014-2020, fishing vessels were financed for their modernization through supporting investments, which ensure a higher level of hygiene, safety and energy efficiency (Measure 3.1.8: "Health and safety" and Measure 4.1.20: "Energy efficiency and climate change mitigation, on-board investments, energy efficiency audits and systems, exploring the contribution of alternative propulsion systems and hull design"). Fishing vessels were also financed under Measure 3.1.22: 'Added value, product quality and use of unwanted catches', which is expected to improve the added value and quality of catches, but also to rationalize the disposal of unwanted catches through eligible on-board investments.

***Measures to support fishers during the pandemic***

The role of policy is of major importance when it comes to mitigating the effects of the pandemic, as fishers are supported by the following direct financial support measures: the granting of "de minimis" aid and the "temporary cessation of fishing activities as a result of the Covid-19 outbreak".

***Designing more nationally oriented support instruments***

Although the Common Fisheries Policy is based on a set of principles and values that apply to all Member States, it also provides considerable flexibility to them regarding the design and implementation of appropriate measures and tools tailored to the specific needs of their social, economic and natural environment.

***Designing policies to mitigate climate change***
The EU's strategy to mitigate climate change is reflected in the Green Deal. To this end, the Green Deal provides for the financing of environmentally beneficial actions, for all economic activities taking place in the EU.

***Financing of measures regarding training and the entrance of young fishers into the sector***
The new European Maritime, Fisheries and Aquaculture Fund (EMFAF) 2021-2027 provides for the financing of actions related to the acquisition of skills and training and the entrance of young fishers (<40 years old) into the sector.

## Economic Factors

***Economic efficiency of small-scale fisheries due to an expanded distribution channel***
A particularly strong factor in achieving favorable economic results is the existence of an expanded distribution channel for small-scale fishery products, consisting of restaurants, hotels, retailers, and individual consumers. This strengthens the bargaining power of fishers and also has a positive effect on economic risk management.

***Significant degree of dependency of small-scale fisheries on tourism flows***
As stated above, small-scale fisheries are supported by a wide distribution channel. However, the demand and distribution of small-scale fishery products is highly affected by a volatile and sensitive factor, which is tourism, making the latter vital for their sustainability.

***Low bargaining power in large-scale fisheries***
In the case of large-scale fisheries, the alternative distribution channels are limited since almost all landings end up in fish auctions. This, in combination with the vulnerability of the products and, therefore, the short "post-harvest" life of the landings results in low bargaining power for large-scale fishers, negatively impacting economic results.



***Limited number of small processing plants for fishery products***
A weakness of the Greek fisheries sector is the limited number of processing units managed by fishers and their families, resulting in a lack of added value for fishery products.

***Adverse macroeconomic environment***
The post-crisis Greek economy, the reduced purchasing power of households and the high cost of borrowing, ultimately act as a disincentive for fishers to undertake investments, putting at risk the viability and growth of the sector.

## Social Factors

***Positive impact of the role of women in the development of the sector***
The role of women could be described as a cornerstone both for achieving economic efficiency in small-scale fisheries and for increasing the added value of fishery products. In particular, the positive impact of the presence of women employees on economic results is documented by a relevant scientific publication (Liontakis et al., 2020). The Women's Cooperative of Kalymnos "Panagia Ipapanti" (Kalymnos Sea Food), which was formed by the wives and daughters of the island's fishermen with the aim of processing fish for the production of a wide range of standardised dishes, poses an excellent example of how women can add value to fishery products.

***Human resources in fisheries science***
The human resources of the relevant university departments and research institutes are characterised by a high level of scientific expertise and contribute significantly to the sustainability and modernisation of the sector.

***Reduced level of social sustainability***
The lack of basic infrastructure in the countryside (e.g., regarding education and health) is an important factor in the internal and external migration of human capital, that undermines the development of the

sector, the social sustainability and social reproduction, resulting in remote areas of our country being threatened with economic and social deconstruction.

***Increased international interest in fishing tourism***
There is an increasing international interest in fishing tourism (Liontakis and Vassilopoulou, 2022; Kyvelou and Ierapetritis, 2020). The development of fishing tourism could increase the added value of fishery products, enhance the income of fishers, and, at a social level, increase the degree of extroversion of both fishers and their families.

***Decreased tourism flows due to the pandemic***
The reduction in tourism flows due to the pandemic has led to reduced demand for fishery products, particularly from the catering sector, from hotels and individual consumers-tourists, which in turn affected small-scale fisheries severely.

***Consumers shift to long-life products due to the pandemic***
The shift of consumers to long-life products due to the pandemic, negatively affects large-scale fisheries as the bulk of landings end up in urban centres.

## Technological factors

***Partnership between scientific bodies and private parties for the development of innovative fishing technologies***
The partnership between scientific bodies and private parties to develop innovative fishing technologies is a ray of hope for reversing the technological backwardness of the sector. A typical example is the improvement of the trawler fishing gear, which was funded under the OPFS 2007-13 and implemented by a partnership among fishers, the HCMR and a private net manufacturer.

***Partnership between scientific bodies, organisations, fishers and private individuals for the implementation of innovative fisheries management systems***
Promising results regarding the technological development of the sector can be expected through partnerships between scientific bodies, organisations, fishers and private individuals for the implementation of innovative integrated fisheries management systems of high socio-economic and environmental importance. Such examples are the Simian prawn management system, which was funded under the OPFS 2007-13 and the fishing activity according to the Marine Stewardship Council (MSC) standard.

***Limited technology transfer actions from the laboratory to the industry***
Apart from some noteworthy initiatives within the framework of the OPFS, actions to integrate innovation and encourage technology transfer from the laboratory to the industry can be considered limited.

## Legal Factors

To achieve the objectives of the CFP, a number of measures have been put in place, such as[3] :

***Special fishing licences***
Special fishing licences for small and large pelagic species, which manage access to waters and resources and set the conditions for the sustainable practice of fishing activities.

***Advanced monitoring systems***
The EU Fisheries control system imposes new and extends existing measures, such as the obligation for professional fishers to have a Vessel Monitoring System (VMS).

***Efforts towards International Governance in the Mediterranean region***
The new European Maritime, Fisheries and Aquaculture Fund (EMFAF) 2021-2027 creates a new priority to strengthen international ocean governance towards safer, better and more protected seas and oceans under sustainable management.

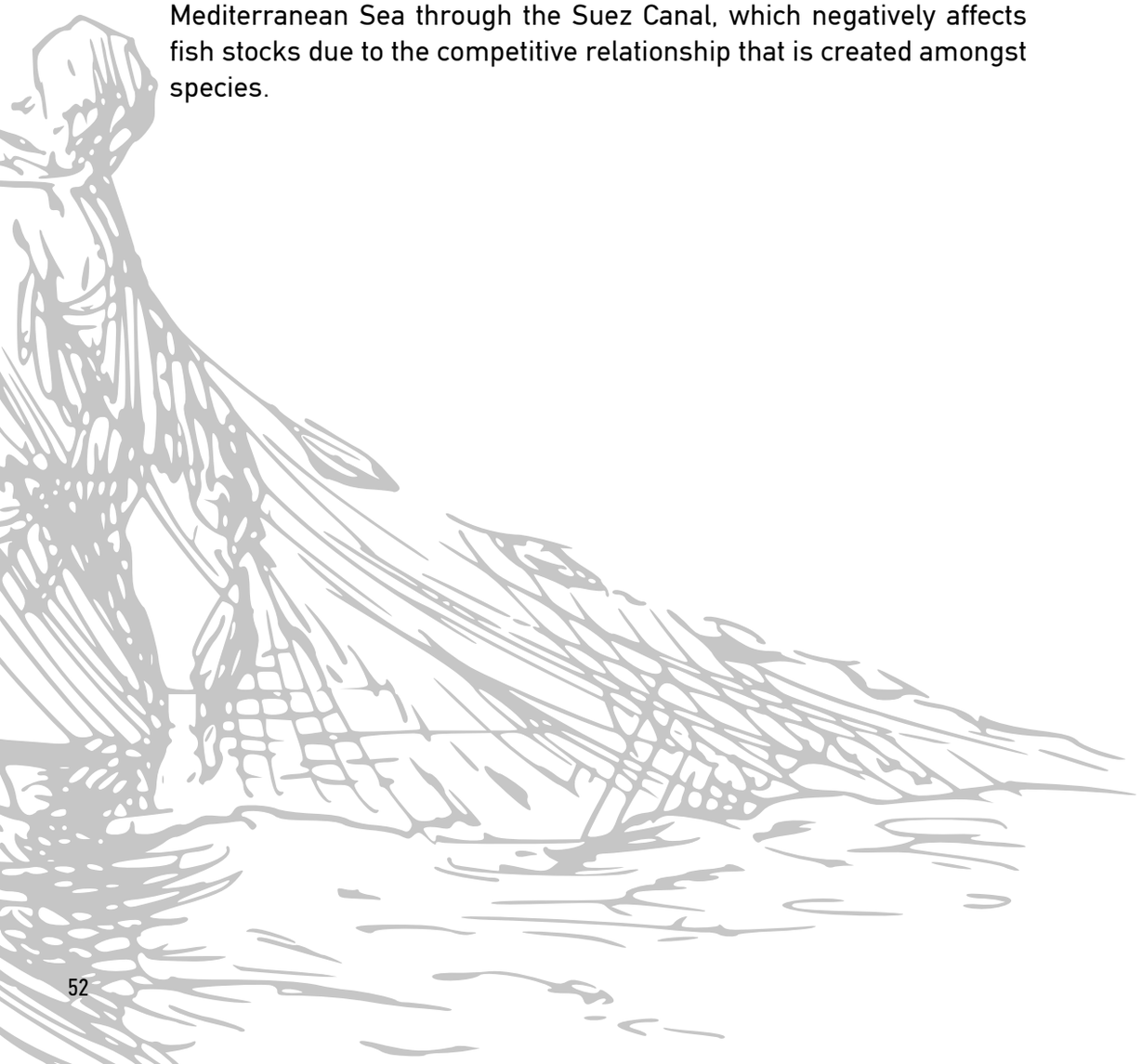
[3] http://www.alieia.minagric.gr/node/11

## Environmental factors

***Rich biodiversity of the Greek seas***
The rich biodiversity of the Greek seas provides a comparative advantage to the country's fishing sector.

***Seasonality of species***
The seasonal nature of the species limits fishing activity to specific periods, especially for vessels using towed gear.

***Climate change***
Climate change has resulted in the migration of alien species into the Mediterranean Sea through the Suez Canal, which negatively affects fish stocks due to the competitive relationship that is created amongst species.





# Challenges, Opportunities and Prospects of the Fisheries Sector

Looking into the future, the fishing sector in Greece will meet many challenges and opportunities.

**Controversies**

In recent years, there have been **controversies** with other stakeholders operating at sea or in island and coastal local communities. This phenomenon may be further aggravated since, according to the May 2021 Communication of the EU Directorate for Fisheries (DG MARE), sea-related activities are expanding to new emerging sectors. There is a strong controversy among small-scale and large-scale fishers and those involved in protecting the natural environment over how it is managed. In addition, strong competition among fisheries and tourism can be identified since they claim the same marine space. Effective management and resolution of issues among stakeholders in neighbouring regions necessitate the principles of open communication, mutual cooperation, established rule-making and careful monitoring.

**Market Opportunities**

Today, there is a strong consumer interest in sustainable, local, authentic and environmentally friendly products. The exploitation of these **new market opportunities** that are emerging is crucial for the fisheries sector. Utilizing short value chains, certification, labelling and innovative ways of promotion and marketing could enhance the added value of fishery products. At the same time, characteristics such as 'local', 'unique' and 'fresh' can be highlighted to increase consumer satisfaction and enhance the competitiveness of the sector. In order to take advantage of these market challenges, cooperation between fishers and other sectors, such as tourism and manufacturing, is necessary for the development of new perspectives at local and regional level. The diversification of products and activities related to the sea and the potential for expanding to new activities, such as fishing tourism or linking tourism with the fishing heritage and the landscape, can contribute to strengthening local development. The creation of local economic clusters may, therefore, positively contribute to the development of coastal and island regions.

**Human Capital**

In addition, new fisheries activities would help **attract young people** to the sector, creating multiple benefits. Training and appropriate incentives could encourage the improvement of human capital involved in fisheries and would tackle the ageing problem the sector faces. Enabling the human capital, creating new roles for fishers and encouraging the utilization of their knowledge and experience could lead to further benefits for the sector and the fishing communities. In particular, they could take up new roles, such as "guardians of the sea", through their supervision and knowledge of local conditions, and they could report problems they identify in order for the right decisions to be taken promptly. They could also be rewarded for participating in actions related to the protection of the marine environment from plastics and litter, as well as ghost nets, by activating actions in the circular economy. Therefore, improving human capital is of great importance and requires information sharing, cooperation and training for all those involved in the fisheries value chain.

**Governance**

Another major challenge facing the industry is the actions required to adapt and modernise the **legal framework** and to understand and effectively implement the relevant regulatory provisions. In this context, it is necessary to effectively implement and harmonise multiple environmental treaties - such as the protection of marine areas - and the new framework of strategic objectives defined through the Blue Growth Strategy, the Biodiversity Strategy and the Green Deal, circular economy, climate neutrality, zero pollution, Farm to Fork Strategy and digitalisation. Lastly, competition for fishing grounds, together with nature protection and economic development, require priorities and cooperation from all stakeholders in the sector.

**Environment & Climate Change**

**Environmental degradation and climate change** are extremely important challenges that require immediate action. The pollution of the aquatic environment by other uses, contamination by microplastics, the strong threat of invasion by 'alien species' and the increase in water temperature is bound to have a significant impact on biodiversity.



**Research & Innovation**

The adoption of good practices resulting from **research and innovation** is crucial. Market opportunities should be exploited to improve the sustainability and competitiveness of the sector. Furthermore, a key ally for the development of Greek fisheries is the potential to use technologies to protect fish stocks and marine environment and reduce carbon emissions. The use of innovative gears and new technologies that help selectivity and reduce discards, as well as the adoption of responsible fishing practices that respect the environment and marine habitats, will enhance sustainable stock management and contribute to higher profitability by reducing operating costs. Investments in digital technologies and modern methods will bring multiple benefits and contribute to the sector's sustainability. Using the measures under the European Maritime, Fisheries and Aquaculture Fund (EMFAF) 2021-2027 Programme for the implementation of development investments will positively contribute to the sector's technical and economic efficiency. The application of control and monitoring of fishing effort in small-scale fisheries will also contribute to the improvement and sustainability of fish stocks.

To conclude, the fisheries sector plays an important socio-economic role in Greece. People, Knowledge, Technology, Rules and Procedures, Communication and Cooperation are the key factors for the future of sustainable fisheries.

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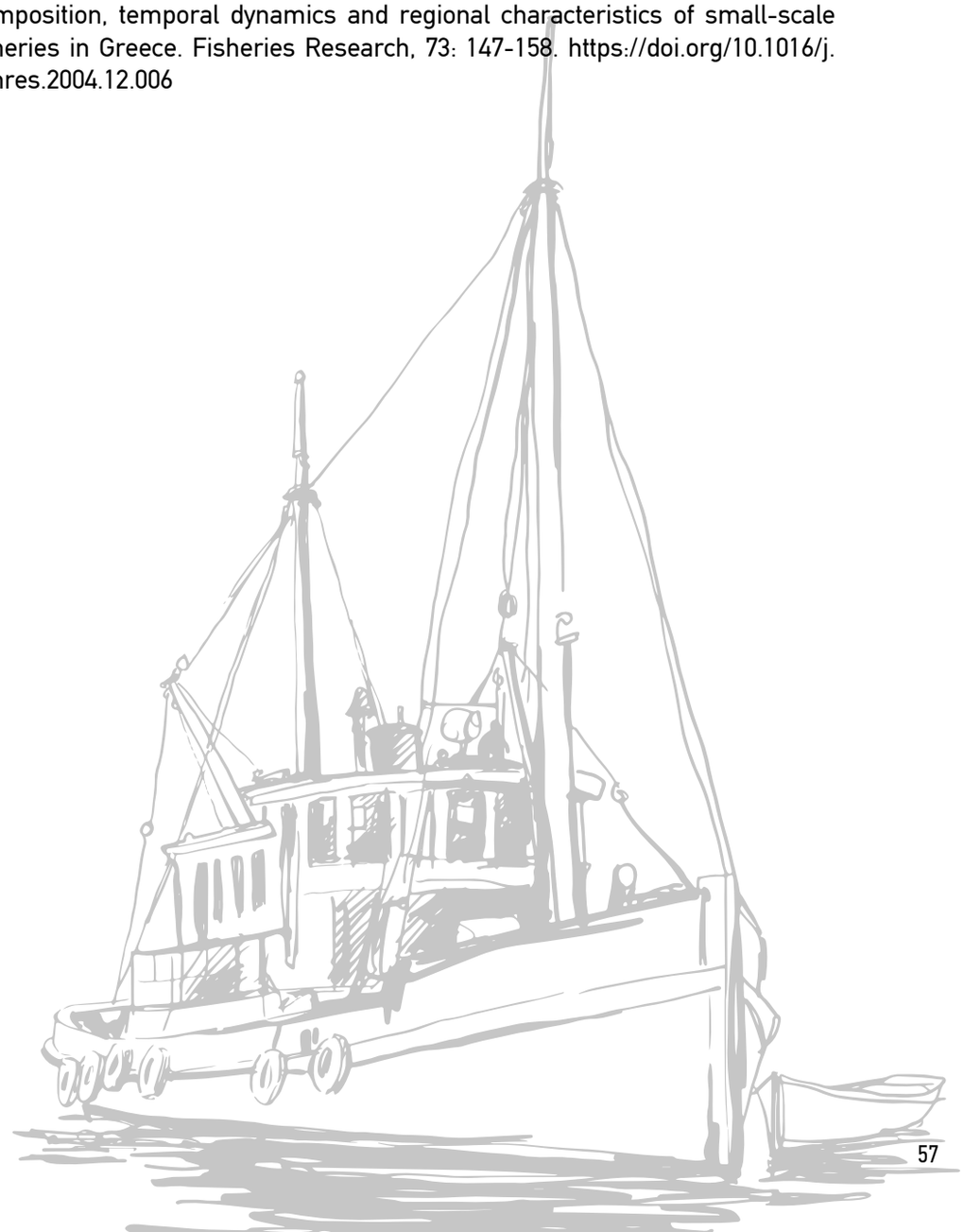

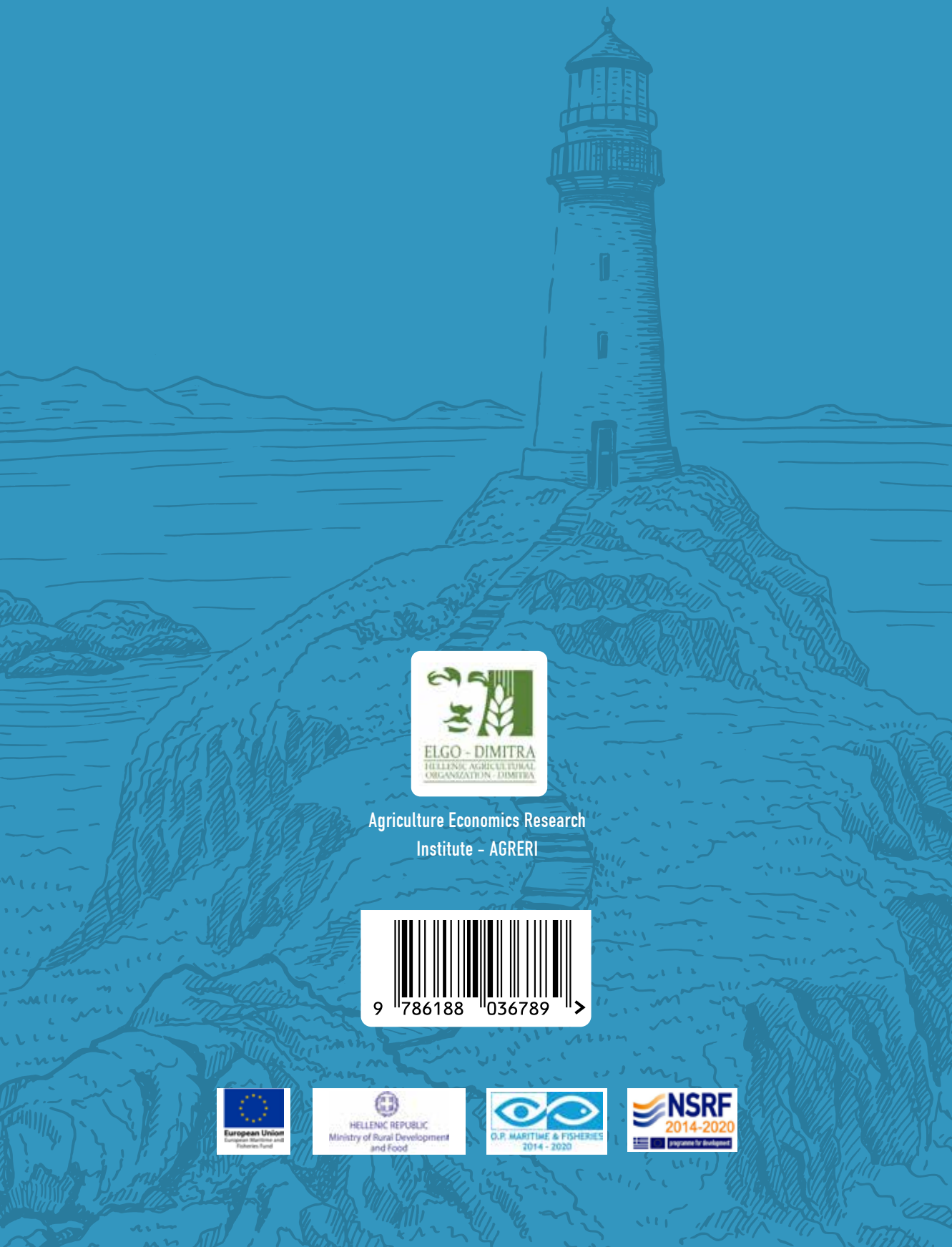

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