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Effects of the fuel price increase on the Italian fishing fleets

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EFFECTS OF THE FUEL PRICE INCREASE ON THE ITALIAN FISHING FLEETS

Edited by Sabatella Rosaria F.

Authors: Sabatella R.F., Accadia P., Gambino M., Malvarosa L., Paolucci C.

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Introduction

High energy use, one of the elements that has the greatest impact on fishing fleets, both from an environmental point of view (e.g. greenhouse gas emissions) and from an economic point of view, directly affects the profitability of fishing fleets.

For these reasons, the search for less energy-intensive fishing practices has been the focus of numerous studies for several years. Considerable efforts have been made to find innovative technical fuel-saving solutions, including modernisation and renewal of the fishing fleet, investment in gear, replacement of engines, and construction of new hulls in energy-efficient ships (Sala et al., 2011).

Such efforts are driven by the need to reduce the use of fossil fuels to achieve the general objective of the common fisheries policy of minimising effects on marine ecosystems (ambitions described in Article 17 of Regulation [European Union, EU] no. 1380/2013 which provides incentives for fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, such as reduced energy consumption). The European Green Deal also calls for a 90% reduction in greenhouse gas emissions from the transport sector, including fishing operations.

In 2022, the sharp rise in the price of energy once again highlighted the issue of excessive fuel use in the fishing industry, causing strong concerns about the high economic and social impact that this rise is having on the sector. The need, therefore, to introduce less energy-intensive fishing techniques and to promote responsible behaviour among fishermen in fishing operations is combined with the aim of not only achieving a green transition, but also of supporting the economy of the fishing sector. This connection assumes that the negative effects on the environment are minimal when the fleet is economically efficient from an energy point of view (Bastardie, 2022).

The main objective of this study is to evaluate the economic and social impact of the recent increase in energy costs starting in the first months of 2022. In the last 2 years, the Italian fishing sector has been hit by an unprecedented crisis. New management regulations and exogenous factors of extreme importance (pandemic and international political crises) have rapidly changed the operational scenarios and economic results of fishing companies.

The first part of this report contains a description of the fishing sector at the national level by fleet segment and geographical area (Chapter 1); the analysis is enriched by a description of some economic and social performance indicators. Chapter 2 presents an overview of fuel cost trends in recent years as well as their impact on profitability while considering other factors, such as fishing expenses and the rate of inflation. In addition, indicators of the various fleet segments are presented to highlight their relative fuel efficiencies.

Chapter 3 reports the estimates of the expected effects of increases in the price of fuel on the economic performance of the Italian fishing sector. This analysis was conducted by structuring a specific simulation model capable (under certain assumptions) of predicting the probable trend over time in the main socio-economic variables and related performance indicators of the fishing sector.

Finally, Chapter 4 reports an ex-post evaluation of the impact of the COVID-19 pandemic

on the fishing sector during the period 2020–2021, which pays particular attention to the market, prices, and consumer behaviour.

The source of the data, unless otherwise specified, is the EU economic and social data call (https://stecf.jrc.ec.europa.eu/reports/economic) and Nisea (http://www.nisea.eu/dir/wp-content/uploads/2022/10/Rapporto-Nisea-2022.pdf Mipaaft – Italian Work Plan for data collection in the fisheries and aquaculture sectors Reg. EU 2017/1004).

1. Overview of the Italian fishing fleet

The fishery sector was significantly affected by the COVID-19 pandemic in the year 2020. Moreover, the restrictions imposed by the lockdown and the closure of the HORECA sector have profoundly affected fishing activities.

All of these difficulties led to a reduction in annual fishing efforts, which was the main cause of the sector's negative economic performance in 2020.

In 2020, the Italian fishing fleet included 11,942 vessels, of which 10,227 were actively fishing. In addition, there were 9 deepsea (oceanic) fishing vessels, of which 6 are currently active operating in the central-eastern Atlantic Ocean and in the Indian Ocean.

A total of 66% of the fleet comprises small vessels less than 12 metres in length that employ gillnets and other passive fishing methods (Figure 1).

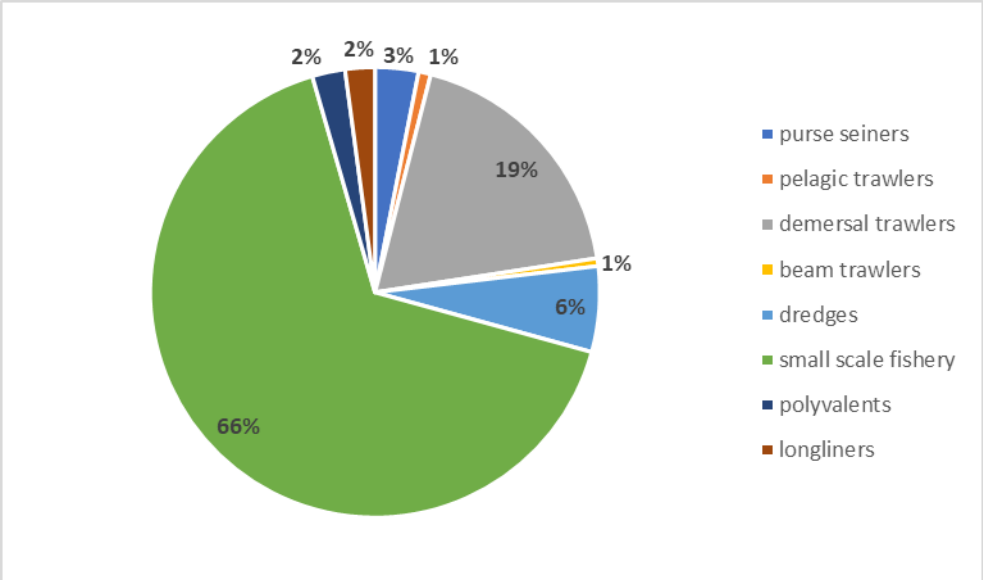


Figure 1 – The relative proportions (number of active vessels in 2020) of each fleet segment in the Italian fleet.

The remaining 34% of the fleet comprises vessels that use other fishing techniques, including demersal trawlers, which represent 19% of the total.

In terms of length classes (Figure 2), 70% of the Italian fleet comprises vessels under 12 metres (50% are between 6 and 12 metres and 20% are under 6 metres); another 20% is represented by vessels between 12 and 18 metres in length (55% of demersal trawlers are in this length class).

In terms of gross tonnage, demersal trawlers represent more than 60% of the entire Italian fleet, with a higher concentration of demersal vessels in the 18–24 metre class (26% of the total) (Figure 3).

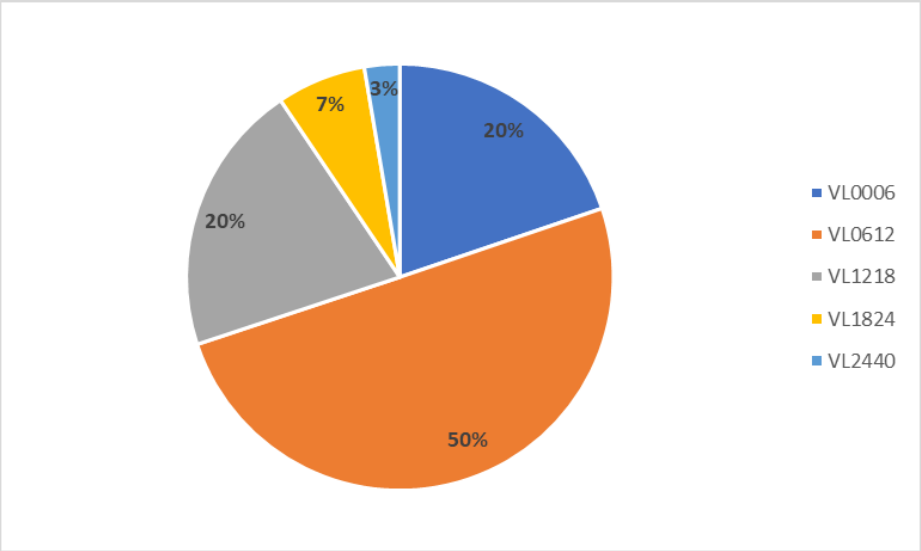


Figure 2 – Distribution of Italian vessels by length class (in 2020)

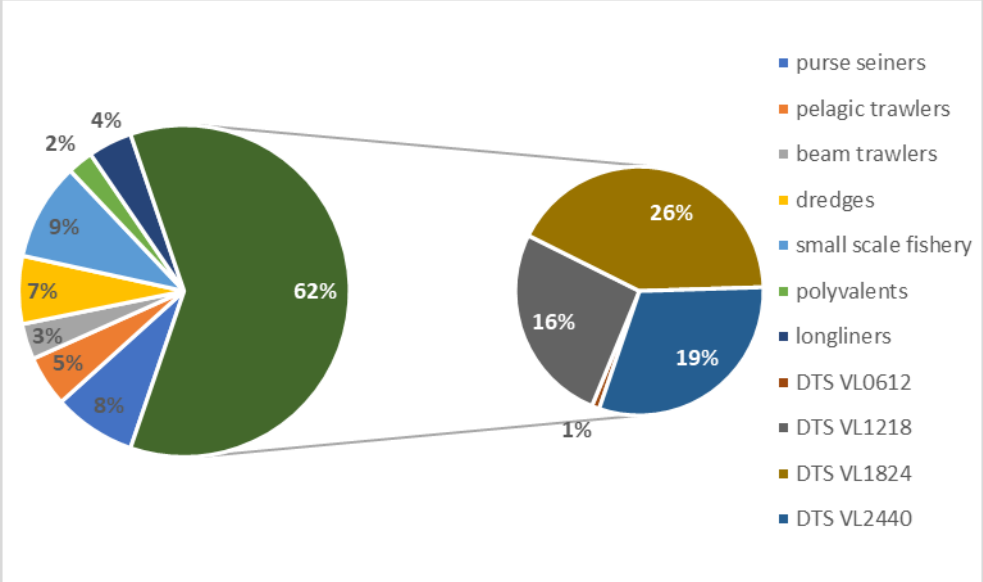


Figure 3 – Fleet distribution by gross tonnage (GT) and details of the demersal trawlers segment by length class (in 2020).

Compared to 2019, there was a slight decrease (-6%) in the number of active vessels; the dynamics between vessels below 12 metres (small-scale coastal fleet, SSCF) and vessels above this length (large-scale fleet, LSF) are almost identical.

Clearly, in absolute value terms, the greatest loss was recorded for the most numerous

segments, namely small fishing and demersal trawling. Specifically, a loss of -103 and -249 vessels, respectively (of which -66 were SSCF and -183 were LSF) (Figure 4).

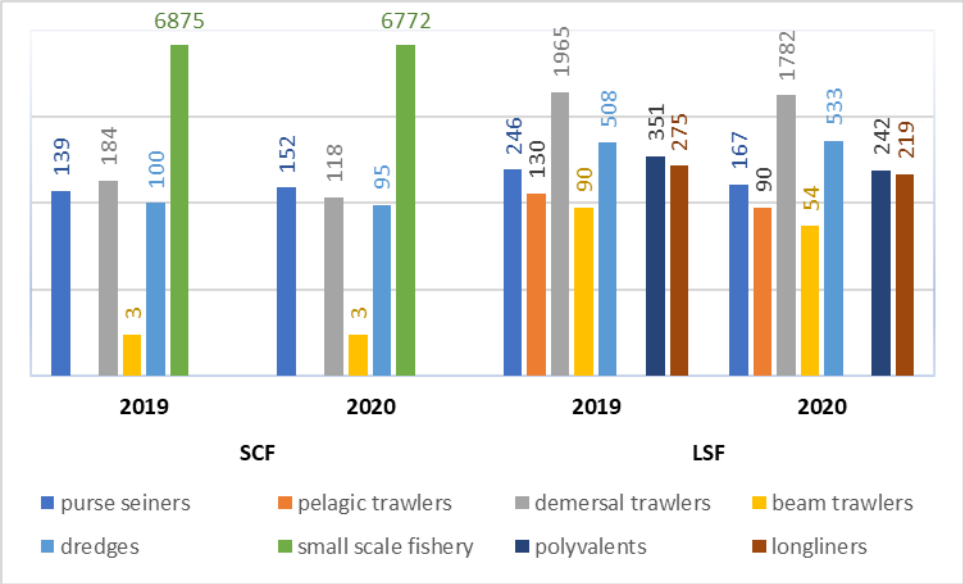


Figure 4 – Variation in the number of vessels in each fleet segment (2019–2020)

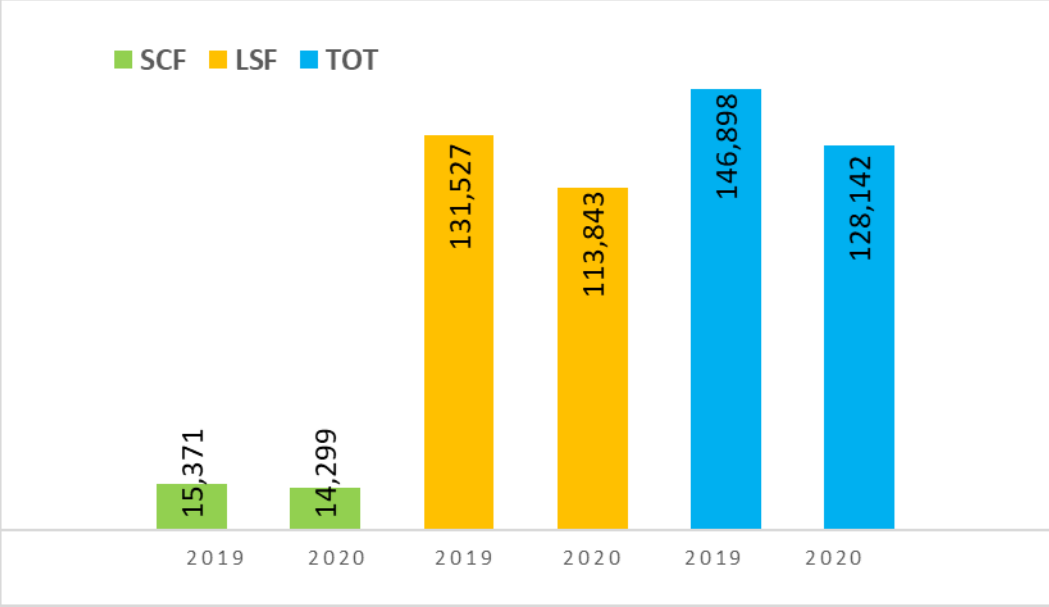


Figure 5 –Variation in the gross tonnage (GT) of the Italian fleet by vessel size (2019–2020).

In terms of gross tonnage, we find the same phenomenon: the Italian active fleet in 2020 decreased by 13% compared to the previous year, a consequence of the COVID-19

pandemic that forced many vessels to cease fishing. The performance of the total active fleet broadly reflects the performance of the large fleet (LSF) (Figure 5).

In 2020, the fleet spent a total of about 990 thousand days at sea. Days at sea show that the measure of effort has decreased by 21% in 2020 compared to 2019 when fishing days were 1.2 million, and by 38% between 2008 and 2020 when fishing days were greater than 1.5 million (Figure 6).

The volume of catches, and therefore the tonnage of fish, decreased by 24% compared to the previous year, going from 180 thousand tonnes in 2019 to 136 thousand tonnes in 2020. The worsening of the production trend is entirely due to the LSF, which recorded a -29% decrease compared to 2019. This is reflected in a decrease in the value of production that is reduced by 27%, with -33% reported for the LSF; 2020 production, therefore, stops at 650 million euros (€), against €890 million in 2019 and €1.2 billion in 2008 (in monetary values discounted to 2020).

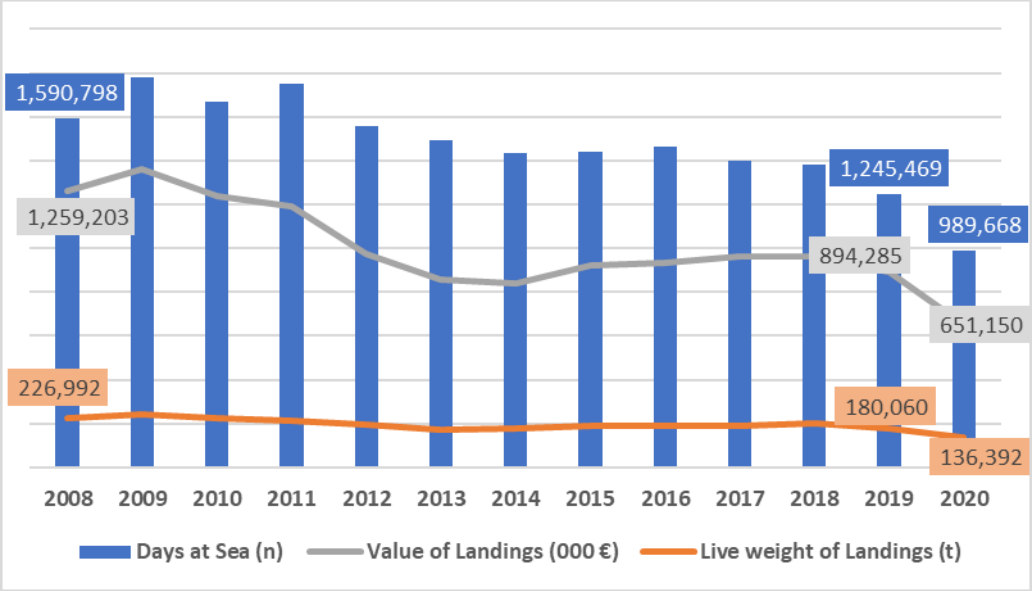


Figure 6 – Trends in fishing activity: days at sea, catch volumes, and value of landings (2008–2020)

The number of employees in 2020 decreased to 21,368 (-12% compared to the previous year, or -2,850 people employed). Comparing the fleet segments in detail (Figure 7), note that the greatest employee decreases were seen in the larger vessels that needed more labour for sorting and processing catches.

Comparing the trend in full-time equivalent (FTE) work (Figure 8) against the number of employees just described, it is possible to see how the FTEs decreased more during the year, demonstrating that not only the number of crew members was reduced, but also that the same workers were employed for fewer hours per week.

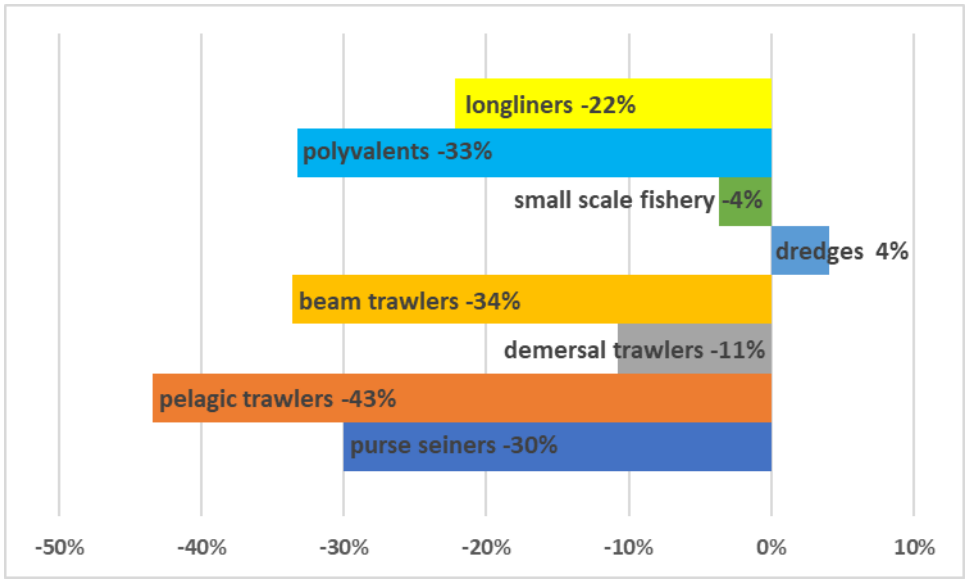


Figure 7– Percentage variation (over 2019–2020) in the number of employees by fleet segment

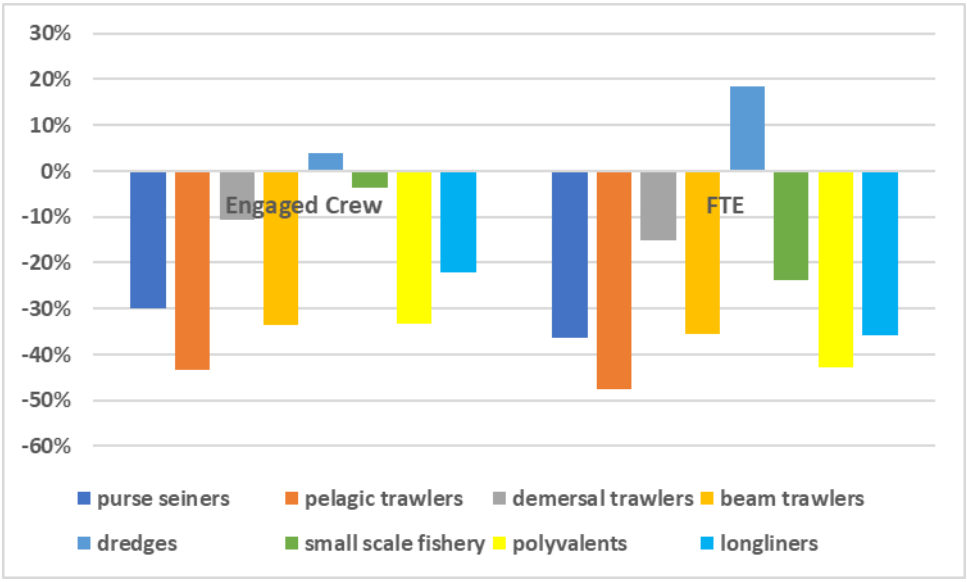


Figure 8 – Comparison of percentage variation (over 2019–2020) in the number of employees and full-time equivalent (FTE) work units by fleet segment.

Table 1 below shows the production values, catches, and number of vessels by fleet segment (Table 1).

Table 1- Volume and value of landings and engaged crew by fleet segments.

Fishing type	Vessel length	Gross value of landings (000 €)	Live weight of landings (t)	Engaged crew (n)	Percentage variation 2019–2020		
					Gross value of landings	Live weight of landings	Engaged crew
Dredges	12-18m	48,580	20,089	1,462	4%	-3%	18%
Demersal trawlers	6–12m	4,213	569	270	-27%	-22%	-18%
	12–18m	111,960	14,883	2,828	-12%	-36%	-42%
	18–24m	112,667	16,270	1,940	-8%	-31%	-34%
	24–40m	79,871	6,667	1,010	-7%	-28%	-40%
Longliners	12–18m	16,414	2,363	646	-23%	4%	-7%
	18–24m	9,956	1,451	231	-18%	22%	-7%
Small-scale fishery	0–6m	29,962	4,090	2,585	-2%	-9%	-7%
	6–12m	120,933	16,766	7,287	-4%	4%	2%
Polyvalents	12–18m	15,308	2,044	673	-33%	-50%	-50%
Purse seiners	6–12m	3,662.84	1,087.21	382.54	-3%	23%	-5%
	12–18m	7,779.66	2,866.42	433.94	-41%	-41%	-47%
	18–24m	6,698.11	2,534.86	338.18	-28%	-43%	-45%
	24–40m	13,885.92	7,636.92	335.44	-50%	-46%	-36%
	>40m	17,559.18	3,989.81	192.00	49%	-37%	41%
Beam trawlers	12–18m	1,555.77	205.52	61.92	-36%	-39%	-43%
	18–24m	5,320.68	859.45	89.12	-21%	-23%	-21%
	24–40m	8,513.45	1,491.67	83.84	-42%	-43%	-42%
Pelagic trawlers	12–18m	7,355.59	6,485.06	114.96	-45%	-74%	-29%
	18–24m	6,636.40	6,501.88	120.97	-58%	-70%	-54%
	24–40m	13,620.07	11,236.95	223.40	-29%	-23%	-10%

1.2 Indicators of economic performance

During 2020, the revenues achieved by the national Italian fleet amounted to €661.8 million; this figure includes the turnover derived from the sale of the product equal to €642.5 million and other revenues, namely the revenues deriving from the use of the vessel for purposes other than commercial fishing (such as fishing tourism, sport fishing, aquaculture support, and cage towing). In 2020, revenues earned from activities other than fisheries were estimated to total around €19.4 million. Compared to 2019, such revenues decreased by 27%, while other revenues remained stable (+1%).

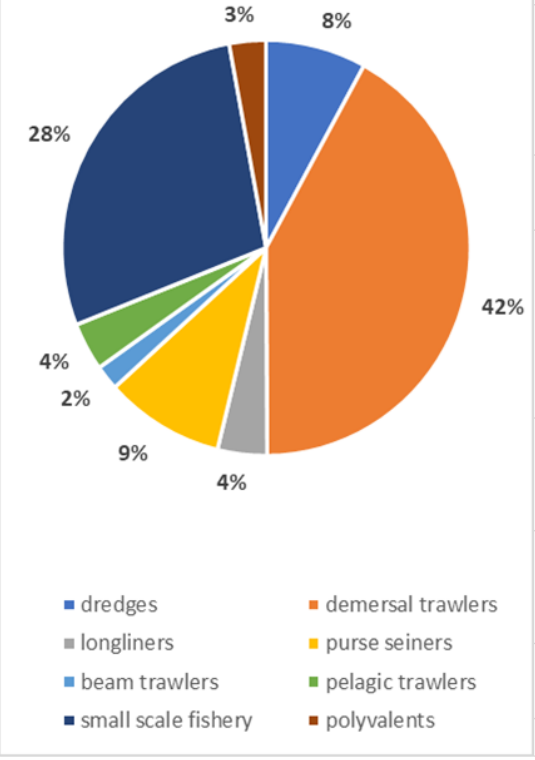
Labour costs in 2020 also decreased by -18% compared to 2019, due to the decrease in work hours (particularly evident in those fleet segments that employ more workers), and vessels have been forced to decrease the number of fishing trips with a consequent reduction in revenue. The national dynamic is influenced by some fleet segments whose average salary per vessel has strongly decreased in 2020 due to the long period of inactivity during the first part of the year, particularly demersal trawlers 12–18 metres (-21%) and 18–24 metres (-5%), purse seiners 18–24 metres (-15%), and passive polyvalents 12–18 metres (-10%) in length.

The difference between revenues and operating costs represents the gross value added of the sector, which in 2020 was €421 million, 25% lower than in 2019, when the result was €560 million. Regarding differences by fleet segment (Figure 9), again the result is clearly determined by the most representative fleet segments, specifically demersal trawling (€174

million), particularly vessels over 12 metres in length and the small fishery (€118 million), which, respectively make up 42% and 28% of the national total.

In 2019, demersal trawling earned €248 million and therefore lost 29% compared to 2019, while the small-scale fishing vessels' earnings remained almost the same as the previous year, closing with a +1% increase (from €117 million in 2019).

Other segments include purse seiners, which lost 37% compared to 2019, and dredgers, which lost 12% of revenue.



		GVA (million EUR)
dredges	VL1218	33.5
demersal trawlers	VL0612	2.3
	VL1218	66.7
	VL1824	59.8
	VL2440	47.6
longliners	VL1218	9.8
	VL1824	6.7
purse seiners	VL0612	2.8
	VL1218	5.8
	VL1824	5.0
	VL2440	10.6
	VL40XX	15.6
beam trawlers	VL1218	0.6
	VL1824	2.5
	VL2440	5.0
pelagic trawlers	VL1218	4.3
	VL1824	3.7
	VL2440	7.7
small scale fishery	VL0006	23.8
	VL0612	94.5
polyvalents	VL1218	12.2

Figure 9 – Percentage distribution and absolute values of GVA by segment and length classes (2020).

Gross profit shows a percentage change (-31%) between 2020 and 2019, going from 303 million to €210 million; while the net profit went from 142 million in 2019 to €55 million for 2020, thus losing 61%. Below is the trend of economic indicators since 2008.

The gross profit margin in 2020 was 32% and substantially in line with the 2019 result, thus indicating a constant operating efficiency of the sector, while the net profit margin, due to very high costs of capital invested compared to the revenues generated by fishing activity, halved from 16% to 8% (Figure 10).

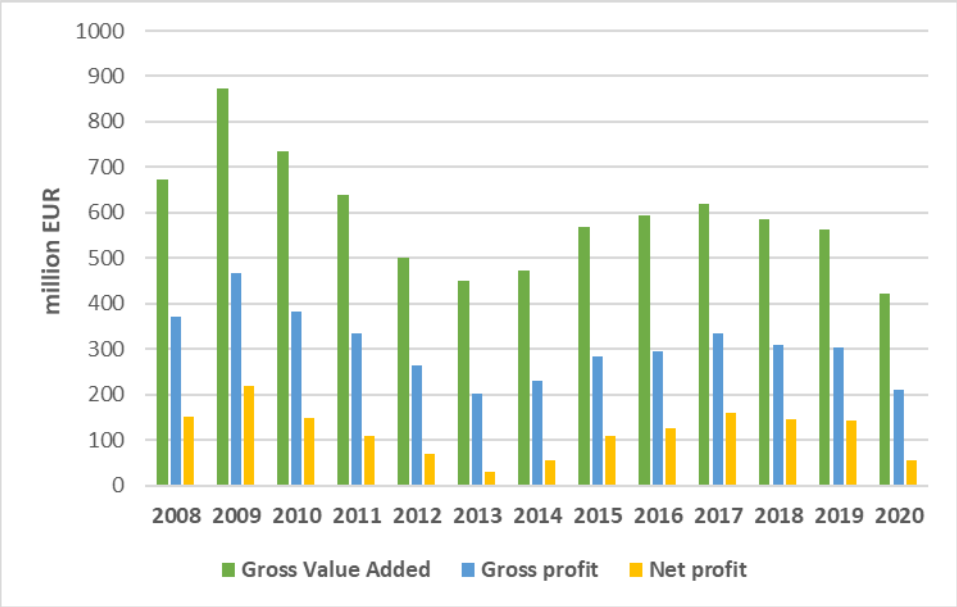


Figure 10 – Performance of GVA, Gross profit, and Net profit (series 2008–2020)

1.3 Economic analysis by GSA

GSA 9 – Ligurian Sea and Northern Tyrrhenian Sea

The GSA 9 fishing area is characterised by the presence of many vessels (in 2020, 1304 active vessels), 74% of the total practice artisanal fishing with passive gear. Trawlers account for 19% of the total number of vessels and 28% of those employed.

During 2020, there was a 30% reduction (Table 2) in fishing days compared to the previous year, compared to a substantially similar number of active fleets and a slightly lower number of employees (-7%).

This resulted in total revenues of €82.3 million (more than half made by trawlers), a reduction of 23% compared to 2019 revenues. The decline in turnover mainly concerned trawlers and purse seiners; the revenue data relating to vessels using passive gear remained stable.

The reduction in fishing days led to a reduction in operating and labour costs, the latter also affected by the decrease in revenue, as it is partly calculated with the so-called "part method".

A breakdown of the total costs incurred in each fleet segment is shown in detail in Figure 11. For demersal trawling, the largest item of expenditure is operating costs, including fuel and maintenance costs. For all other segments, the highest costs are related to the personnel on board.

Table 2 – Main indicators of the national fleet by fleet segment (in the GSA 9)

	Active vessels (n)	Days at sea (n)	Revenue (million €)	Engaged crew (n)
Demersal trawlers	245	34,419	43.6	635
Purse seiners	29	2,524	7.6	257
Small scale fishery	971	63,918	25.4	1,243
Polyvalent vessels	58	4,864	5.7	145
Total	1,304	105,797	82.3	2,282
Variance percentage 2020/2019	-2%	-30%	-23%	-7%

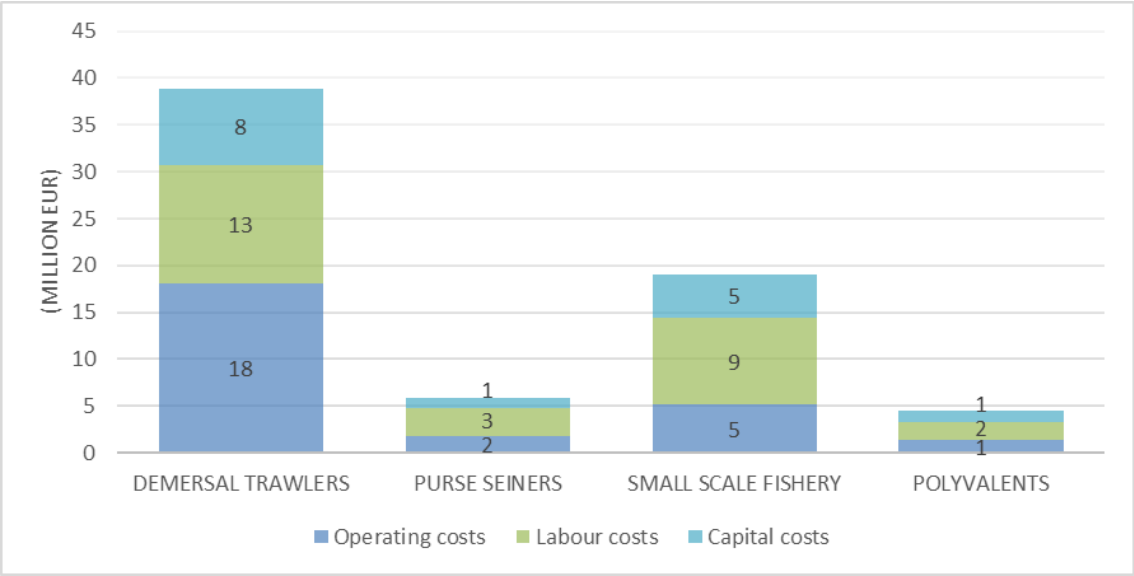


Figure 11 – Operating costs, labour costs, and capital costs; GSA 9 (2020)

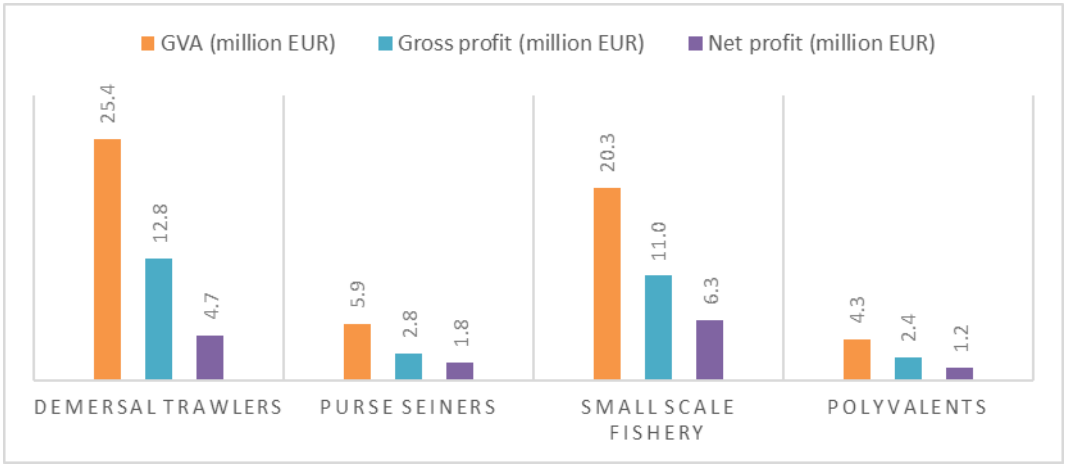


Figure 12 – Gross value added, Gross profit, and Net profit; GSA 9 (2020)

The economic indicators (gross value added, gross profit, and net profit) declined overall; this result is the synthesis of different situations within the various fleet segments. While vessels under 12 metres using passive gear showed a positive trend in economic indicators, demersal trawlers, on the other hand, suffered losses due to a reduction in the tonnage of fish landed. Purse seiners' economic indicators also decreased slightly (Figure 12).

GSA 10 – Central and Southern Tyrrhenian Sea

A total of 76% of the fleet in the GSA 10 zone comprises small vessels with LFT less than 12 metres practicing small-scale coastal fishing techniques. The second most used segment, in terms of the number of active vessels, is the purse seiner, followed by demersal trawlers and longliners, the latter being based in the marinas of northern Sicily.

Revenues during 2020 decreased by 19% due to the reduction in fishing days (-36%) (Table 3). Demersal trawlers recorded the greatest loss (-34%), while the longliners recorded a very slight improvement (+5%). Small-scale fishing vessels recorded a negative result (-9%), but reacted faster to the closures of traditional sales channels.

Employment also fell by 12%; this figure is influenced by the biggest employing segments, demersal trawlers (-17%) and purse seiners (-11%).

Table 3 – Main indicators of the national fleet by fleet segments, GSA 10

	Active vessels (n)	Days at sea (n)	Revenue (million €)	Engaged crew (n)
Demersal trawlers	182	24,459	23.2	554
Purse seiners	221	14,523	33.5	1,008
Small-scale fishery	1,613	120,948	28.6	2,115
Polyvalent vessels	26	956	0.4	72
Longliners	74	5,923	6.3	255
Total	2,116	166,809	92.0	4,005
Variance percentage 2020–2019	-9%	-36%	-19%	-12%

As shown in Figure 13, it is clear that the greatest costs for the demersal trawlers are operational costs, in particular fuel, which represents 40% of the total. For purse seiners and the small-scale fishery, labour was the largest expenditure item: 50% and 43% of the total, respectively.

In 2020, the economic indicators of vessels in GSA 10 all worsened despite the decrease in operating costs. In particular, net profit decreased from €24.4 million to €11.9 million.

This trend covered all fleet segments (Figure 14), with the exception of small-scale fishing vessels and longline vessels. Indeed, there was a substantial loss of profit in 2020, particularly for demersal trawlers.

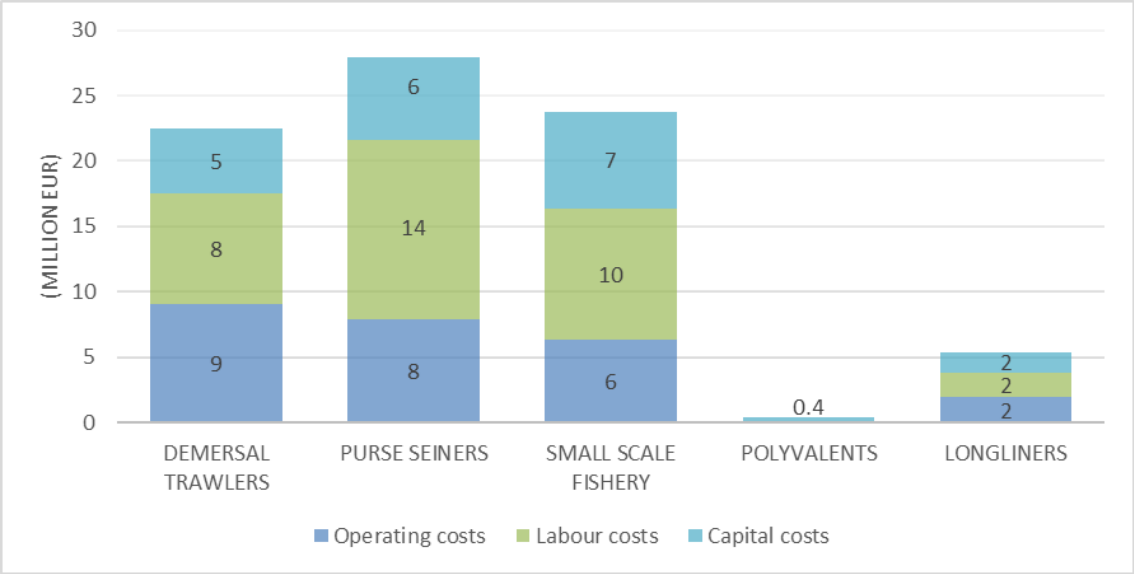


Figure 13 – Operating costs, labour costs, and capital costs; GSA 10 (2020)

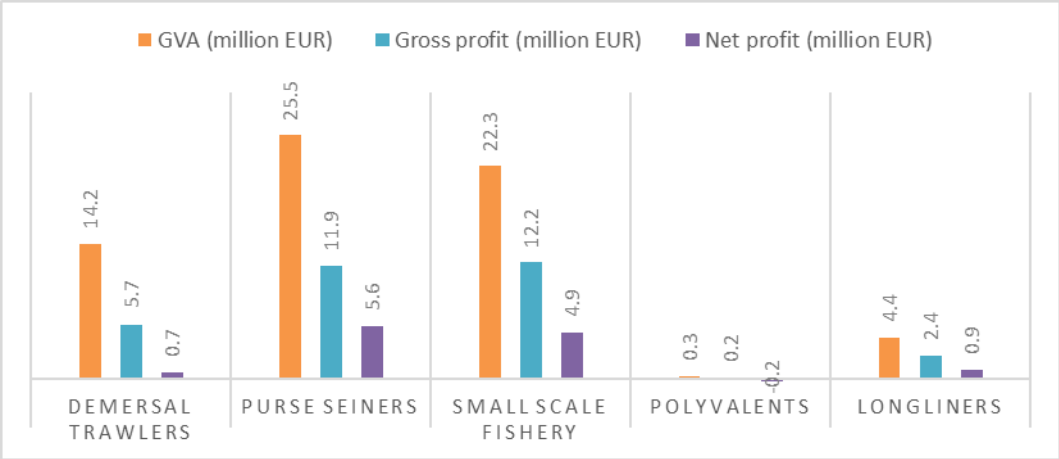


Figure 14 – Gross value added (GVA), Gross profit, and Net profit; GSA 10 (2020)

GSA 11 – Seas of Sardinia

The GSA 11 fleet is characterised by a very large number of vessels that practice artisanal fishing with gillnets and other passive gear (85% of the total).

There are just over 100 demersal trawlers that contribute 46% to the total revenue earned in GSA 11; the almost €21 million earned by small-scale fishing represents 43% of the total.

Similar to the other fishing areas of Italy, the dynamics are repeated, with a reduction of -23% in fishing days in 2020 compared to the previous year (Table 4), which is reflected in

the revenue drop of 26%. More than 70% are employed on small fishing vessels, and the number of employees remains stable.

Table 4 – Main indicators of the national fleet by fleet segments; GSA 11

	Active vessels (n)	Days at sea (n)	Revenues (million €)	Engaged crew (n)
Demersal trawlers	111	13,792	22.0	417
Purse seiners	4	187	0.6	22
Small-scale fishery	1,088	72,751	20.8	1,782
Polyvalent vessels	84	7,019	4.9	214
Total	1,287	93,749	48.3	2,435
Variance percentage 2020–2019	7%	-23%	-26%	-2%

From the detail of the costs per fleet segment (Figure 15) it is clear that for demersal trawlers the greatest expenditure (56%) is attributable to operating costs, and therefore to fuel.

Small-scale fishing vessels, on the other hand, have a cost structure divided equally between the different items, with labour costs slightly higher than other costs (36%).

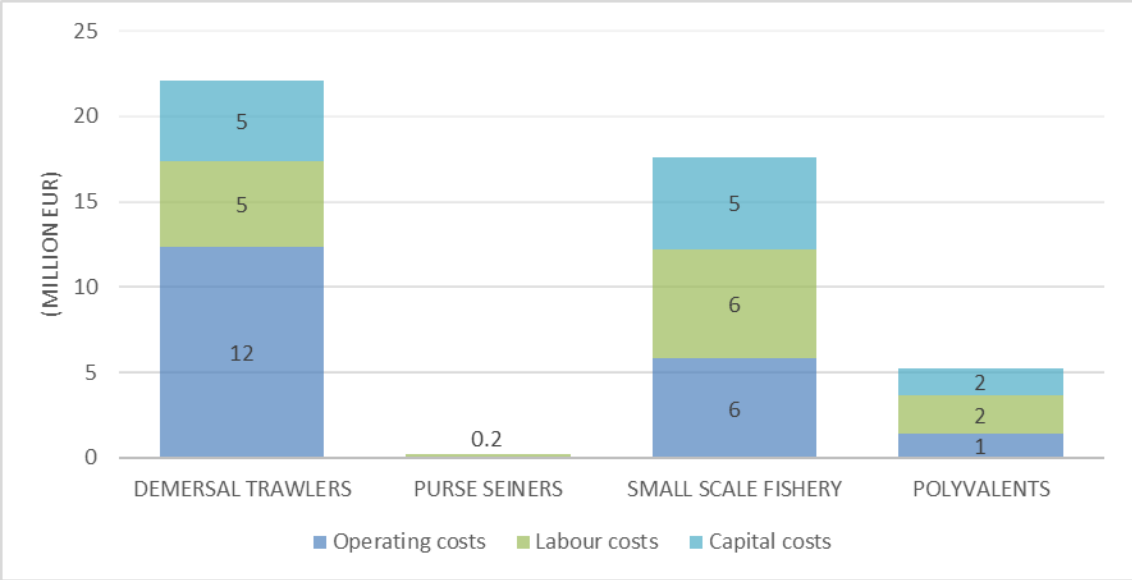


Figure 15 – Operating costs, labour costs, and capital costs; GSA 11 (2020)

During 2020, the main economic indicators (gross value added, gross profit, and net profit) were negative overall, but the most marked decreases were recorded for demersal trawlers (Figure 16) due to the reduction in revenue.

Revenue from small-scale fishing was more stable, as they managed to control losses thanks

to a drop in operating costs.

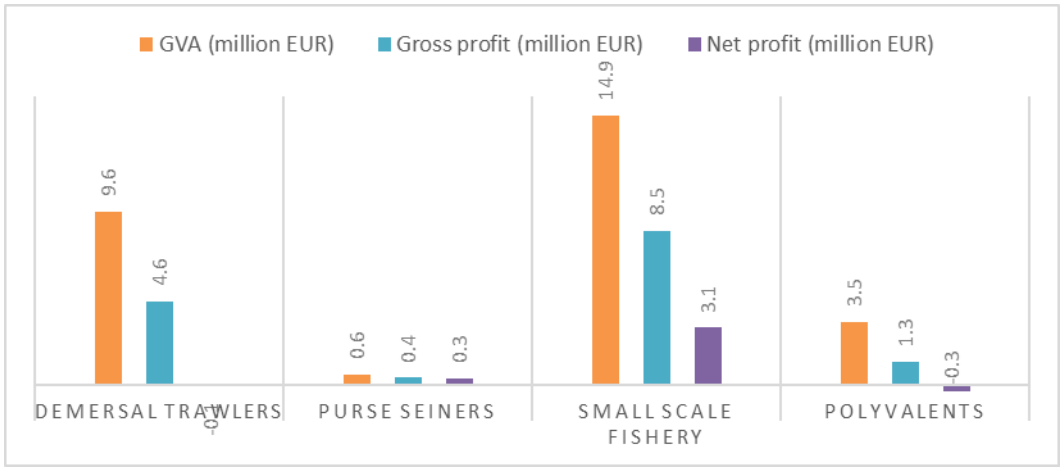


Figure 16 – Gross value added, Gross profit, and Net profit; GSA 11 (2020)

GSA 16 – Strait of Sicily

The GSA 16 zone contains 963 active vessels (Table 5), of which 55% are small-scale fishing vessels and 37% are demersal trawlers.

The total revenue was almost €100 million. In this area, giant red shrimp is targeted, a very valuable species that attracts very high market prices. Moreover, trawlers that target this species earn 74% of the total revenues gained in the entire GSA 16 zone.

Owing to a reduction in fishing days (-24%), there was a 33% decrease in revenue in this geographical area compared to 2019, despite almost the same numbers of vessels and employees. The largest decreases in activity were recorded by purse seiners and trawlers, both demersal and pelagic.

Table 5 – Main indicators of the national fleet by fleet segments; GSA16

	Active vessels (n)	Days at sea (n)	Revenue (million €)	Engaged crew (n)
Demersal trawlers	356	49,469	73.4	1,505
Purse seiners	29	2,005	3.8	217
Pelagic trawlers	8	1,154	1.5	36
Small-scale fishery	527	48,004	14.8	761
Polyvalent vessels	15	1,299	0.7	40
Longliners	28	2,32	4.7	118
Total	963	104,251	98.9	2,678
Variance percentage 2020–2019	-6%	-24%	-33%	-9%

The operating costs of the fleet totalled €38 million, a decrease of 32% compared to 2019; the items that decreased the most were maintenance and fuel costs, which represent almost 40% of the costs of the demersal trawlers (Figure 17).

The analysis of fleet segments also shows that the demersal trawling fleet absorbs 77% of the total costs and 79% of the operating costs of the entire GSA.

The contraction in revenues also led to a 22% decrease in labour costs.

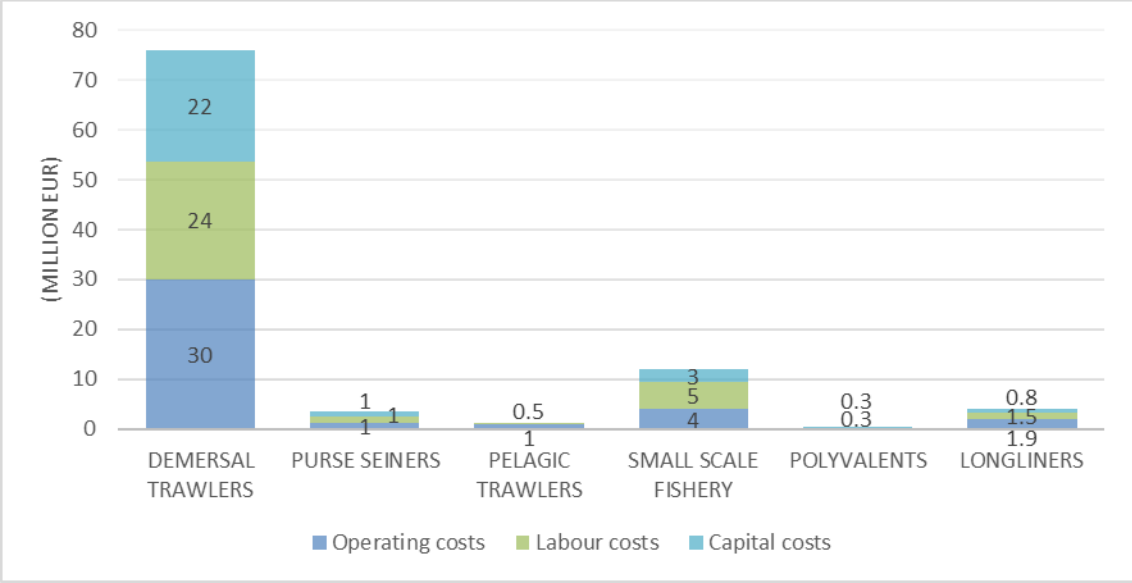


Figure 17 – Operating costs, labour costs, and capital costs; GSA 16 (2020)

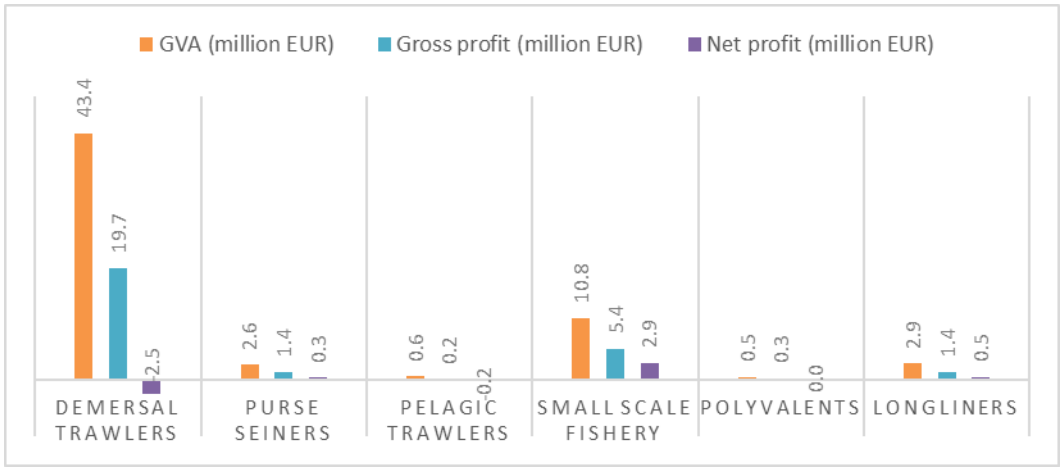


Figure 18 – Gross value added, Gross profit, and Net profit; GSA 16 (2020)

All economic indicators in the sector recorded decreases. The gross value added produced

in 2020 amounted to €60.8 million (about one-third of that in 2019), which reduced labour costs, thereby generating a gross profit of €28.3 million. The net profit due to the increase in capital costs decreased even more substantially, especially for demersal trawlers (Figure 18).

GSA 17 – Northern and Central Adriatic Sea

The GSA 17 fleet consists of 2,377 vessels, of which 49% practice small-scale artisanal fishing. Dredgers (25% of the total) and demersal trawlers (19% of the total) (Table 6) are other large players in the area.

Days at sea decreased by 14% compared to 2019, which was below the national average; nevertheless, revenues fell by 31%.

The decrease in revenues is mainly due to the performance of demersal trawlers (-32%); in fact, the share of revenues of this fleet segment represents almost 40% of the total area, followed by 23% of the dredgers, which lost only 2%. It should be noted that a quarter of the national trawling fleet operates in this GSA, and most of these vessels target small pelagic species and thus more easily produce the highest volumes of landing per unit of effort exerted.

Also noteworthy is the pelagic trawlers' -59% decreased revenues compared to 2019, along with a -40% decrease in the number of employees. This contributed to the -15% decrease seen in revenue for the whole area compared to the previous year.

Table 6 – Main indicators of the national fleet by fleet segments, GSA 17

	Active vessels (n)	Days at sea (n)	Revenues (million €)	Engaged crew (n)
Demersal trawlers	450	57,128	81.8	1,408
Purse seiners	7	527	2.1	39
Pelagic trawlers	69	8,725	23.4	356
Beam trawlers	57	7,317	15.4	235
Dredgers	584	52,698	47.6	1,346
Small-scale fishery	1,176	99,473	35.0	1,482
Polyvalent vessels	34	3,103	5.0	104
Total	2,377	228,971	210.3	4,969
Variance percentage 2020–2019	-8%	-14%	-31%	-15%

The operating costs of the GSA17 fleet were close to €78 million, which was a -34% decrease compared to 2019.

With regard to the internal cost structure, the detailed analysis shows that operating costs account for 46% of the total costs of both demersal and pelagic trawling (Figure 19).

On the other hand, among the dredgers and small-scale fishers, labour costs represent the largest item, amounting to €19 million and €11 million or 51% and 44% of the total costs,

respectively.

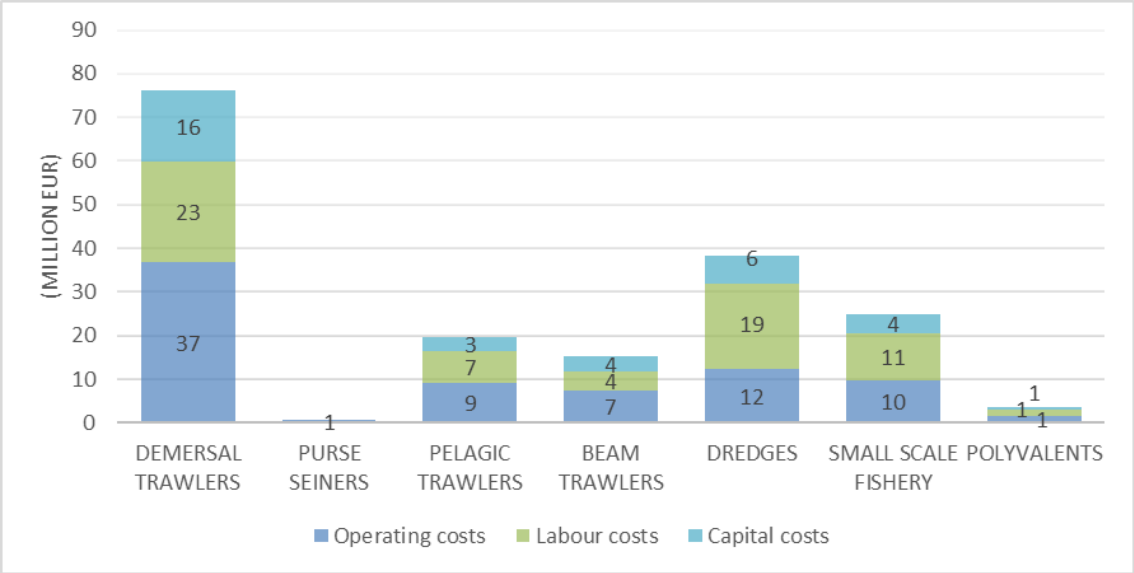


Figure 19 – Operating costs, labour costs and capital costs; GSA 17 (2020)

The fleet recorded a deterioration in economic indicators, mainly due to the contraction in revenues not fully offset by the decrease in costs. During 2020, gross value added stopped at €132.8 million (-29%), gross profit at 65.9 million (-34%), and net profit at €31.2 million (-47%). The negative trend of the demersal trawlers influenced the final result (Figure 20).

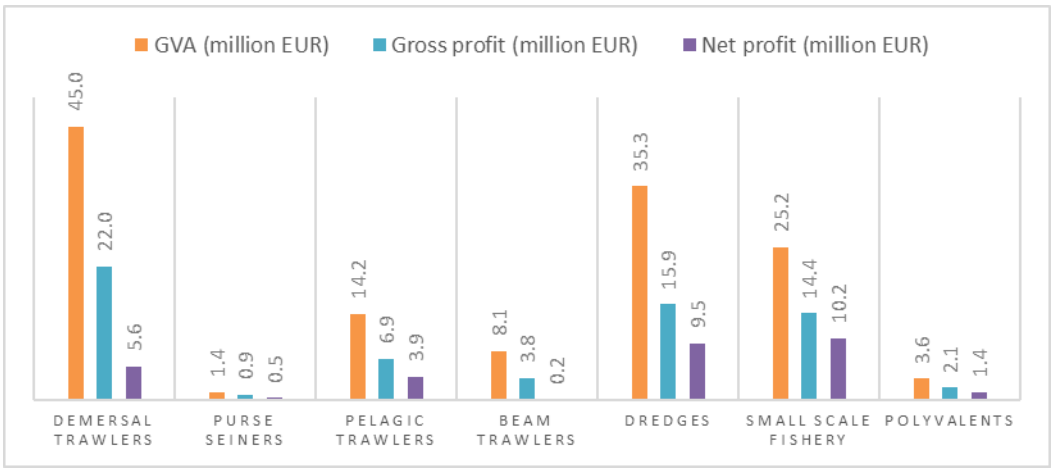


Figure 20 – Gross value added, Gross profit, and Net profit; GSA 17 (2020)

GSA 18 – Southern Adriatic Sea

In GSA 18, the 2020 fleet consisted of about 850 vessels. Artisanal fishing with passive gear (48% of the total) and demersal trawling (42%) were the most commonly employed fishing methods. The fleet during the year remained almost stable, losing only 9% in vessel numbers compared to the previous year (Table 7).

The total fishing effort of GSA 18, calculated using the number of days at sea, was reduced by 19%, obviously due to the performance of the most representative segments; the small-scale fishery worked 52% fewer days than in 2019, while demersal trawlers worked 42% less.

This situation led to a 32% reduction in trawling, which influenced the entire GSA total. It closed 2020 with 24% less revenues than the previous year, in line with the national average (-27%).

The employment level was reduced by 16%, with the two segments with the highest number of employees, demersal trawling (50% of the total) and small-scale fishing (31% of the total), shrinking by 11% and 14%, respectively.

Table 7 – Main indicators of the national fleet by fleet segments; GSA 18

	Active vessels (n)	Days at sea (n)	Revenue (million €)	Engaged crew (n)
Demersal trawlers	355	40,773	45.9	929
Purse seiners	7	708	5.0	67
Pelagic trawlers	13	1,652	2.9	67
Dredgers	43	1,252	1.1	114
Small-scale fishery	405	50,039	11.9	579
Longliners	22	2,389	3.6	99
Total	848	96,882	70.4	1,862
Variance percentage 2020–2019	.9%	-19%	-24%	-16%

Operating costs incurred by the sector decreased overall (-24%) to €40.7 million. In particular, fuel expenditure, which accounts for more than three-quarters of total costs as a result of lower fleet activity and lower diesel prices, was reduced by more than 15%.

Despite this reduction, operating costs in the area remain high, 48% of total costs with peaks of 51% for demersal trawlers and even higher for fuel-efficient segments (pelagic trawlers, 57%).

Small-scale fishing is characterised by higher personnel expenditure (38% of the total costs incurred) but also by relatively high capital costs (41% of the total) (Figure 21).

The gross value-added total in GSA 18 was reduced by 24%: €40 million in 2020 compared to €52 million in 2019. Demersal trawling generated €25.5 million in 2020, which was 28% lower than in the previous year (Figure 22).

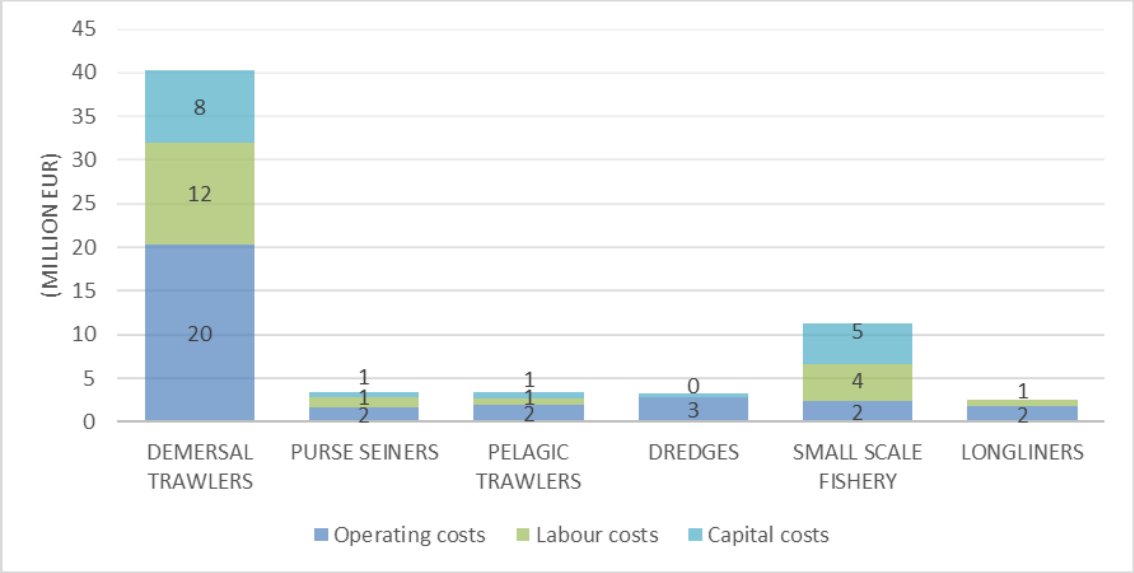


Figure 21 – Operating costs, labour costs, and capital costs; GSA 18 (2020)

Subtracting expenses for work remuneration and the value of capital costs (depreciation €14.2 million and interest €754 thousand), there was a gross profit of €20.5 million and a net profit of €5.5 million, respectively.

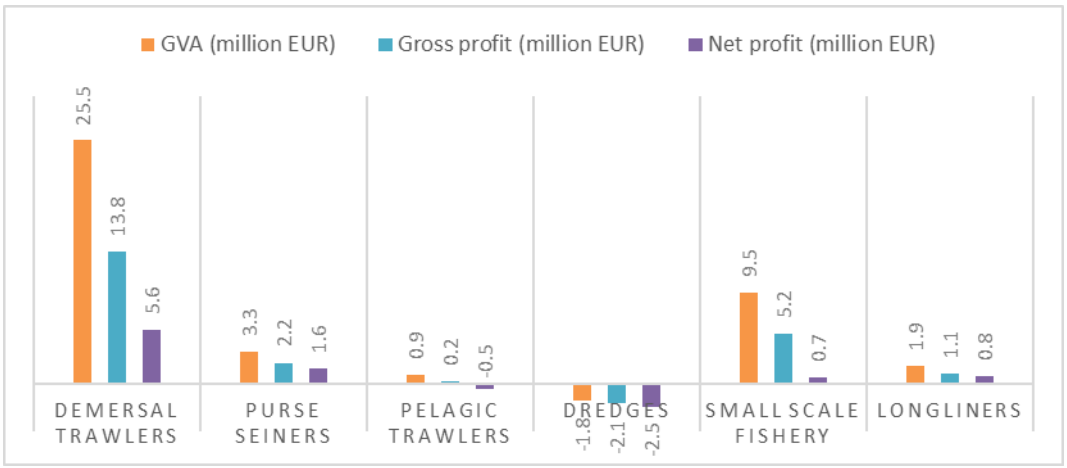


Figure 22 – Gross value added, Gross profit, and Net profit; GSA 18 (2020)

GSA 19 – Western Ionian Sea

The fishing fleet in GSA 19 in 2020 consisted of 1,332 active vessels: 74% doing artisanal fishing and 15% demersal trawling (Table 8).

The number of days of activity at sea during 2020 was about 146,000 and was reduced by

32% compared to 2019. This reduction in fishing days led to an 18% reduction in revenues.

Revenue for the year 2020 was about €60 million (41% from trawlers and 37% from small-scale fishing). Longliners accounted for 7% of the fleet but contributed 20% to total revenues. Longliners experienced a revenue increase of 25% in the year under study, while demersal trawling revenue decreased by 22%.

There was A -14% reduction in the number of employed persons on board; the result was determined by the performance of the demersal trawlers (-13%) and the longliners (-25%). Small-scale fisheries, on the other hand, remained substantially stable at -4% compared to 2019.

Table 8 – Main indicators of the national fleet by fleet segments; GSA 19

	Active vessels (n)	Days at sea (n)	Revenues (million €)	Engaged crew (n)
Demersal trawlers	201	24,441	24.4	600
Purse seiners	22	919	0.6	73
Small-scale fishery	992	110,411	22.3	1,91
Polyvalent vessels	22	1,978	0.5	92
Longliners	95	8,059	11.8	404
Total	1,332	145,808	59.6	3,078
Variance percentage 2020–2019	-8%	-23%	-18%	-14%

Operating costs just exceeded €23 million with a reduction compared to the previous year of -13%.

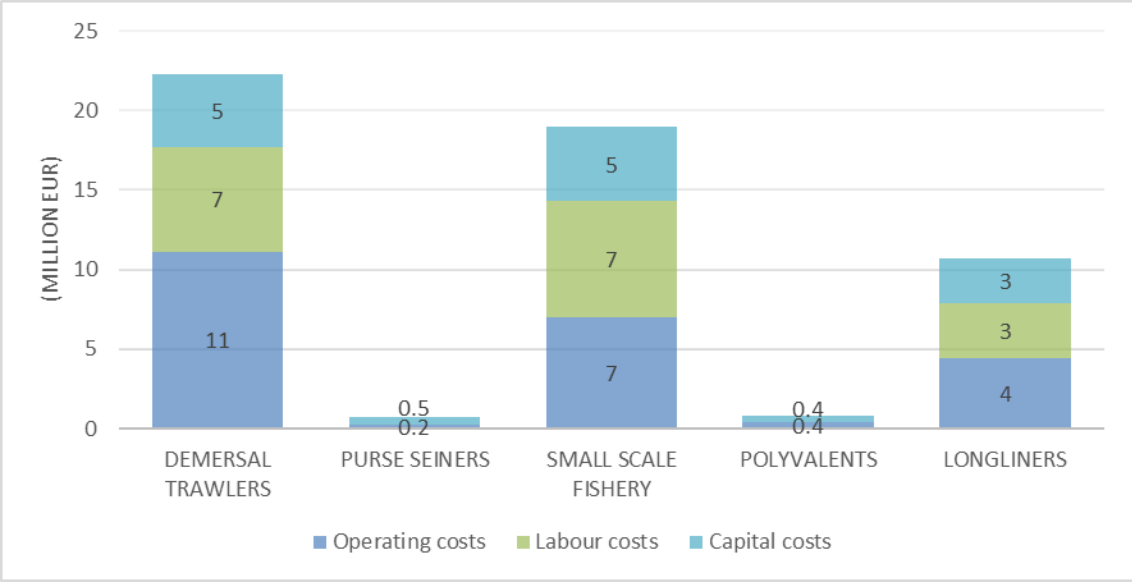


Figure 23 – Operating costs, labour costs, and capital costs; GSA 19 (2020).

The reduction in costs concerned purse seiners and demersal trawlers in particular; for the latter, operating costs represent 50% of the total costs (Figure 23). Compared to 2019, the costs of small-scale fishery have increased (+3% operating costs, +7% labour costs); longliners also saw labour costs rise in 2020, while operating costs remained broadly stable.

The gross value added of GSA 19 showed a reduction of 20% and stood at €36.4 million (€15.3 million, over 40%, from small-scale fishing vessels) (Figure 24).

Taking into account a labour cost of more than €17 million and capital costs that amount to more than €13 million, a gross profit of €19 million and a net profit of about €6 million are achieved.

Compared to 2019, there was a reduction in these items in the income statement, equal to 28% for gross profit and 41% for net profit.

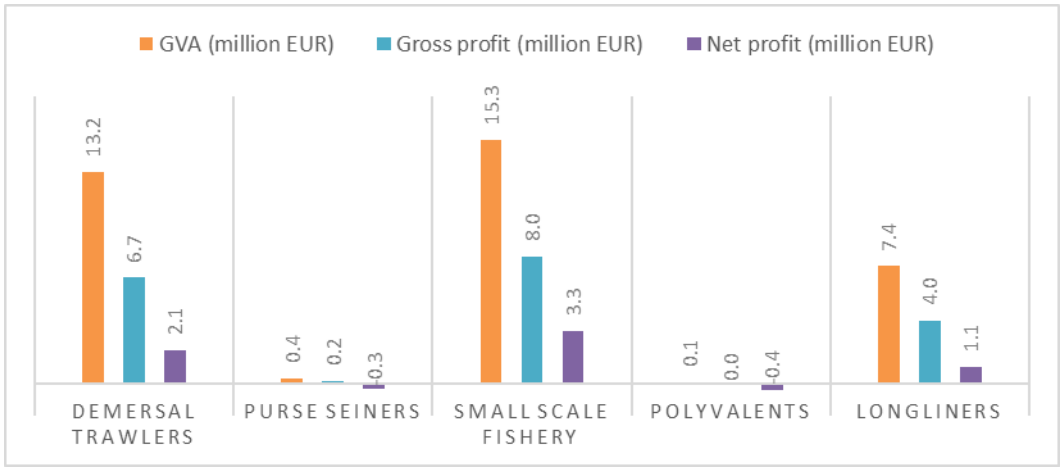


Figure 24 – Gross value added, gross profit, and net profit; GSA 19 (2020)

2. Estimation of energy efficiency indicators

Fuel and labour costs are the main costs of fishing fleets; therefore, the volatility in the price of fuel makes this expense extremely unstable, positively or negatively affecting the profitability of fishing activities in the short and medium term.

As highlighted below, the behaviour of fishermen is strongly influenced by the fuel price, as they react to an increase in fuel prices by reducing fishing days or changing fishing areas and the target species.

This change in behaviour is not always aimed at guaranteeing both the environmental and economic sustainability of fishing. Identifying more efficient production methods could help promote more environmentally sustainable fishing practices. The collection of data on the use of fuel consumption and the analysis of suitable indicators is the first step in identifying the major inefficiencies or more sustainable fishing practices.

An overview of the trend in (rising) fuel costs in recent years and the impact on profitability is presented in this chapter. Indicators will be presented at the level of the fleet segment to highlight the level of efficiency in the use of fuel.

2.1 Trends in fuel cost and impact on profitability

In the period 2008–2020, the cost of fuel averaged 26% of the total costs for the Italian fleet (Stecf, 2022). However, the importance of fuel costs varies significantly between fleet segments, in some cases exceeding 35% for larger trawlers (Figure 25).

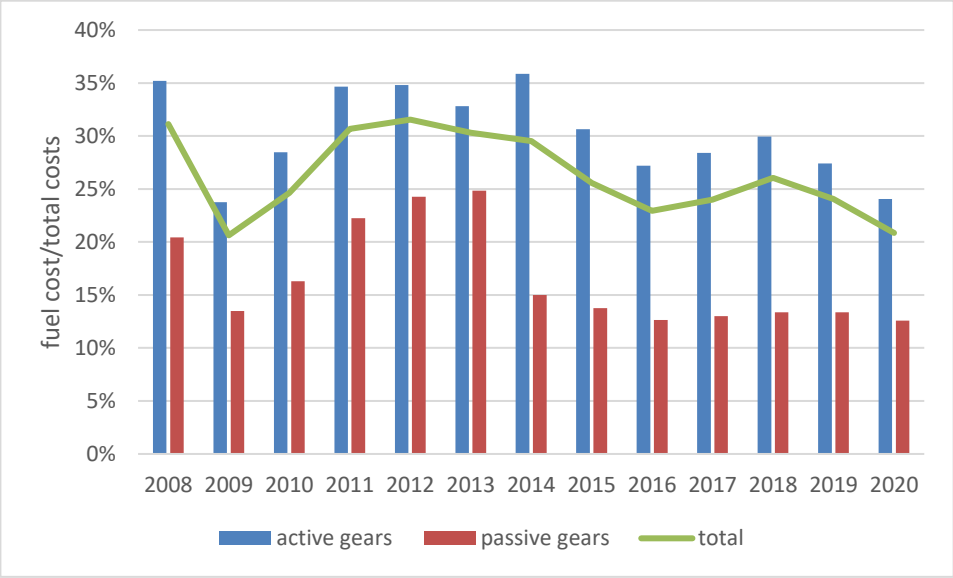


Figure 25 – Fuel costs as a proportion of total costs by type of fishing gear; national fleet (source: STECF, 2022)

The fuel cost's contribution to total costs contracted since 2014, following the decreasing fuel price (Figure 26). The trend in fuel cost and, therefore, the unit price of the raw material, has a direct impact on the level of activity.

The economic performance of fishing fleets largely depends on the fuel price, as a higher fuel price affects the behaviour of fishermen by forcing them to limit their fishing days and, where possible, to change their fishing practices (Guillen, 2016). In the period 2008–2020, increases in fuel cost are compensated by reductions in fishing days (a trend recorded between 2009 and 2014); since 2015, a reduction in fuel price has been followed by an increase (albeit slight) in fishing days (Figure 26). The only exception to this trend was in 2020, a year in which, despite the lowest level of fuel prices ever recorded since 2008, the fishing fleet had to limit fishing activity due to the known operational and logistical problems related to the COVID-19 pandemic.

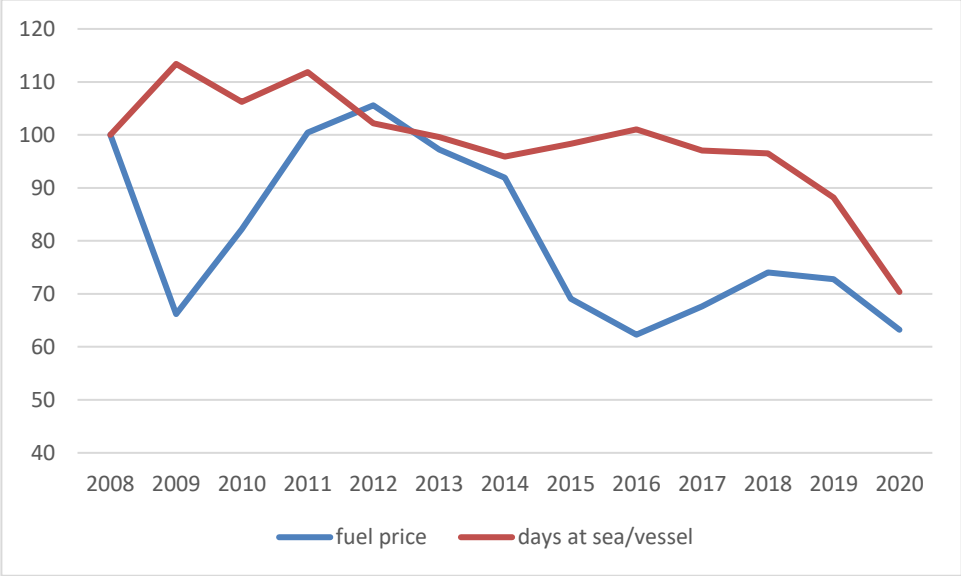


Figure 26 – Fuel price trend and fishing days per vessel; national fleet (source: STECF, 2022).

Because fuel prices are volatile and often vary significantly in the short term, they are often perceived by fishers, governments, and researchers as being the most important factor driving the profitability of the fishing sector (Guillen, 2016).

The underlying problem behind the huge impact that fuel costs have on the fishing sector is that fishermen are unable to pass the cost increases onto consumers by increasing the fish price. As mentioned, the main response of fishermen to the deterioration in economic performance due to the increase in fuel prices is to reduce the number of days spent at sea to limit fuel consumption.

From 2008 to 2020, fuel prices increased more than the first-sale price of the landings among all fleets (Figure 27). In the same period, first-sale prices increased above inflation until 2011 and then remained substantially stable in the following years.

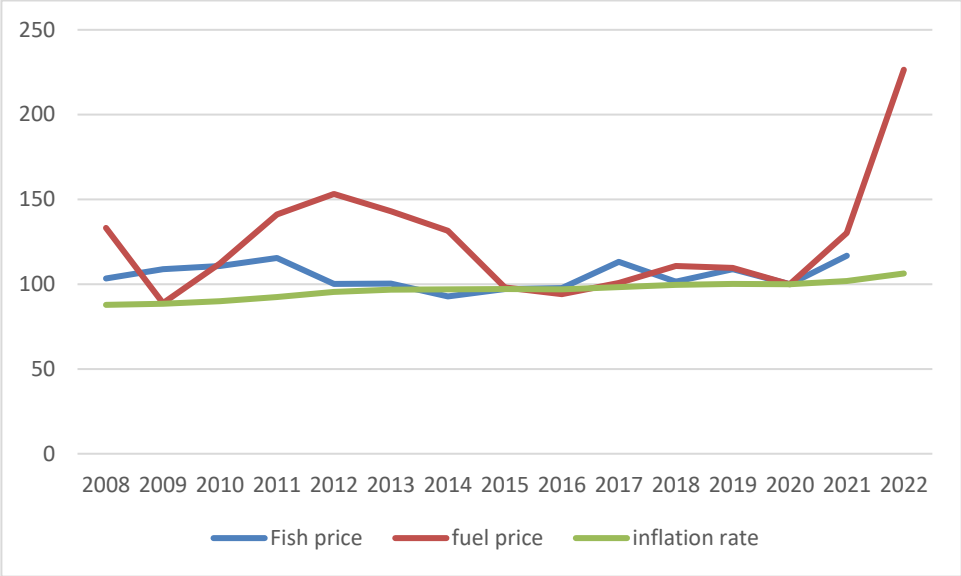


Figure 27 – First-sale price trend, fuel price, and consumer price index; national fleet (source: STECF, 2022, Istat).

In 2021, the expected situation based on forecast data was negative, given that fish price were increasing by 17% and energy costs by 30%. The EU fishing fleet, as a whole is therefore unable to pass the increase in operating costs onto first-sale fish prices. However, other factors also affect the profitability of the sector; in particular, the decrease in real fish prices (nominal prices that increase at a rate lower than inflation), together with low productivity (landings and landings per fishing day that do not increase over time, despite investments in the sector), also leading to poor economic performance. Their trends and variations are not as pronounced as they are for fuel prices, and they often do not receive as much attention from analysts and administrators.

2.2 Fuel use intensity and economic efficiency

The study of the data concerning fuel consumption allows to deepen some fundamental aspects to identify the most efficient production methods.

The analysis is based on two indicators:

1. fuel use intensity (FUI), i.e., the amount of fuel consumed per quantity of fish landed (litre per tonne or litre per euro).
2. fuel use efficiency (FUE): the ratio of fuel costs to revenues, expressed as a percentage (%); the lower the percentage, the greater the efficiency of the vessel (i.e. the less income is used to cover fuel costs).

The amount of fuel used by the fishing fleet is influenced by several factors, in particular the gear used, the distance required to travel to the fishing area, and the target species (for

example, deepsea shrimp or other demersal species). For this reason, the analysis will present the indicators selected first at the national level and, subsequently, by fleet segments (the latter have been selected following the classification of the Italian fleet provided for by the European framework for data collection (DCF; EC, 2017).

Trends in the European fleet

Based on data presented by Member States (STECF, 2022), the results indicate that the EU fleet became more fuel efficient overall from 2008 to 2020 (Figure 28). The amount of fuel consumed per tonne of fish landed has fallen sharply since 2014. With the increase in the volume of landings and the marginal decrease in fuel consumption in 2015, the amount of fuel consumed per tonne landed decreased by 9% compared to 2014, falling below 500 litres per tonne in subsequent years (Figure 28).

Trends in the national fleet

For the Italian fleet, fuel consumption per tonne landed remained substantially stable in the face of a substantial drop in production, which was particularly marked until 2013 and in 2019 and 2020 (Figure 28). The data therefore show a worsening of the indicator relating to fuel use intensity (FUI); in fact, daily fuel consumption has steadily increased since 2014 following the reduction in the unit fuel cost (Figure 29). However, productivity has not increased, and this has led the sector to become more energy-intensive. Indeed, in recent years, there has been a lack of investment aimed at reducing fuel consumption and, in general, more responsible behaviour on the part of fishermen. At the European level, there have been positive results in terms of energy efficiency improvements and consequent positive effects on profitability caused by changes in fishing practices (such as speed limits or the duration of towing the net) in addition to technological improvements to vessels or fishing gear.

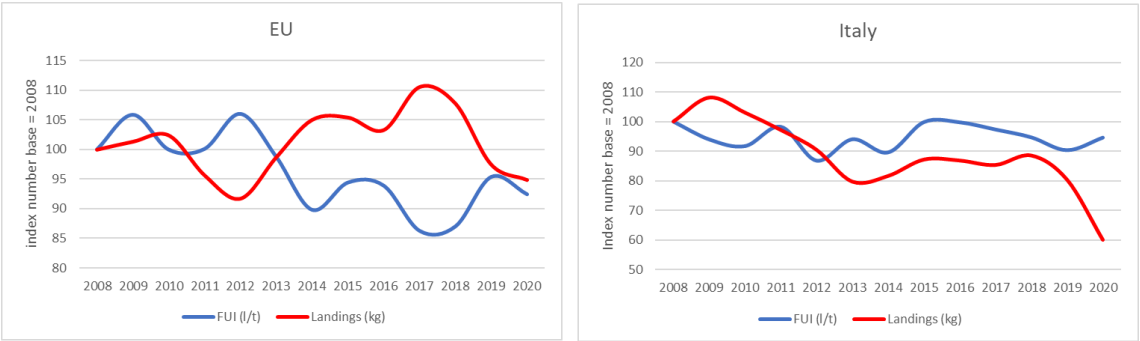


Figure 28 – Trend in fuel use intensity (FUI) and landings for the European fleet and Italian fleet; 2008 to 2020.

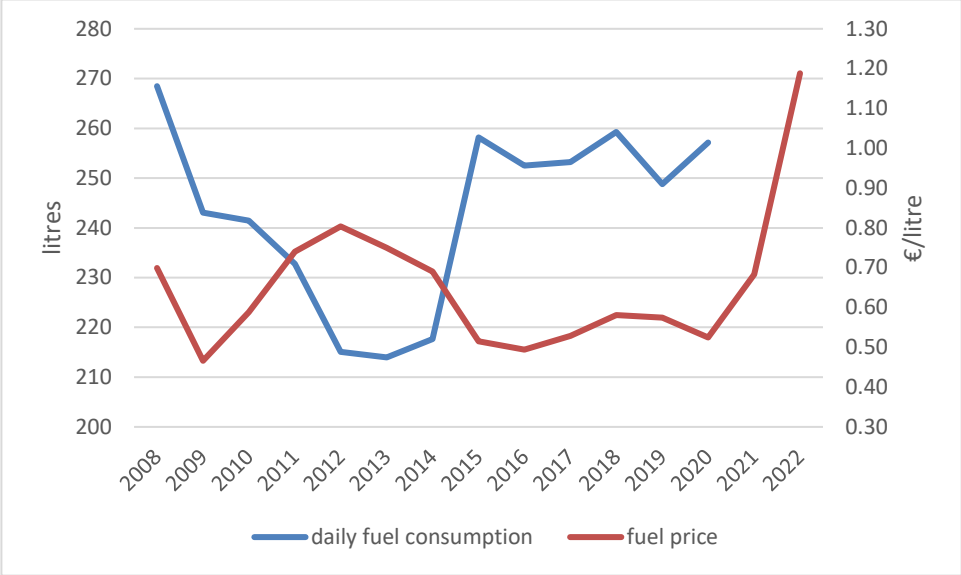


Figure 29 – Trends in daily fuel consumption and fuel price for the Italian fleet from 2008 to 2020.

Fleet segments

As shown in Table 9, trawlers are the most energy-intensive fleet segment. Fuel consumption is estimated at around 2,851 litres per tonne of landings for the 0612 length class to exceed 5,000 litres/tonne for the 2440 segment; fuel consumption is directly related to the size of the vessel, the duration of the trips, and the use of the gear.

Differences are also highlighted in terms of economic efficiency (FUI l/€). The largest segment (2440) includes a fleet dedicated to deepsea shrimp fishing characterised by a high fish price and, therefore, high revenues. For this segment, there is a very high fuel use intensity (5,469 litres/tonne) and an economic efficiency (0.525 €/litre), which is among the highest nationally. The proportion of the fuel cost compared to total revenues is 28% for the length classes 1218 and 1824.

Beam trawlers have high levels of fuel consumption per tonne landed, and their fuel use intensity is high for all size classes (above 3,000 litres/tonne). The proportion of fuel costs in revenues is 23% for the 1824 length class and 27% for the 2440 class.

The purse seiners and pelagic trawlers that mainly fish for anchovies and sardines have low levels of fuel use per ton landed against a very low economic efficiency; the high levels of catches per day of fishing and the lower commercial value of landings explain these data. Specifically, the small purse seiner (0612) is the least efficient, with a consumption of 663 litres per tonne landed, whereas purse seiners between 18 and 24 metres in size are the most efficient (372 litres/tonne). The fuel cost on revenues is less than 15% for the purse seine fleet, and slightly higher for the pelagic trawlers (between 18% and 20% depending on the size class).

The longliners' fuel consumption is high (around 1,700 litres per tonne landed), while their

economic efficiency is low (about 0.28 litres per euro of catch) despite the high commercial value of the target species. The small-scale fishery segment has the lowest fuel cost compared to revenues (10%), but a high fuel use intensity (1,285 litres/tonne) for the 0612 class, the most important for production levels. Low catch levels per fishing day negatively impact FUI.

Finally, hydraulic dredgers have the lowest value of the FUI indicator (371 litres/tonne) nationwide; the short trip durations and the low level of activity in terms of fishing days affect this figure.

Table 9 – Catches and fuel efficiency indicators by fleet segment; 2018–2020 average values.

		Landings (tonne)	FUI (l/t)	FUI (l/€)	FEI (%)
Demersal trawlers	0612	691	2,851	0.379	18%
	1218	25,551	3,142	0.457	28%
	1824	22,644	3,939	0.578	28%
	2440	9,238	5,469	0.525	24%
Beam trawlers	1824	1,076	3,293	0.484	23%
	2440	2,173	3,037	0.523	27%
Purse seiners	0612	1,196	663	0.229	13%
	1218	4,796	565	0.238	15%
	1824	4,243	372	0.150	9%
	2440	10,232	484	0.267	13%
	40XX	3,373	409	0.056	4%
Pelagic trawlers	1218	7,830	412	0.214	18%
	1824	12,237	440	0.303	18%
	2440	13,229	459	0.339	20%
Longliners	1218	2,490	1,781	0.281	14%
	1824	1,549	1,626	0.279	12%
Passive gear vessels	0006	4,530	828	0.109	10%
	0612	17,561	1,285	0.183	10%
	1218	2,465	1,488	0.201	10%
Hydraulic dredgers	1218	17,605	371	0.137	8%

The data presented refer to the average values for each fleet segment; However, it should be noted that each vessel behaves differently despite operating with similar gear (Sala 2022). Operating techniques and distances from fishing areas, as well as the size of the vessels and the characteristics of the hull and equipment, affect fuel consumption. Substantial differences in the fuel use intensity are also highlighted according to the target species.

A recent study (Bastardie, 2022) has shown how the overall efficiency of fuel use reflects the stock situation. When the number of fish available for fishing is low due to overexploitation,

fishers have to spend more effort and fuel fishing to catch a certain amount of product. Therefore, where stocks are not overexploited, fuel consumption is reduced, and company profits increase.

2.3 Fuel use intensity of the European fleet compared to the Italian fleet

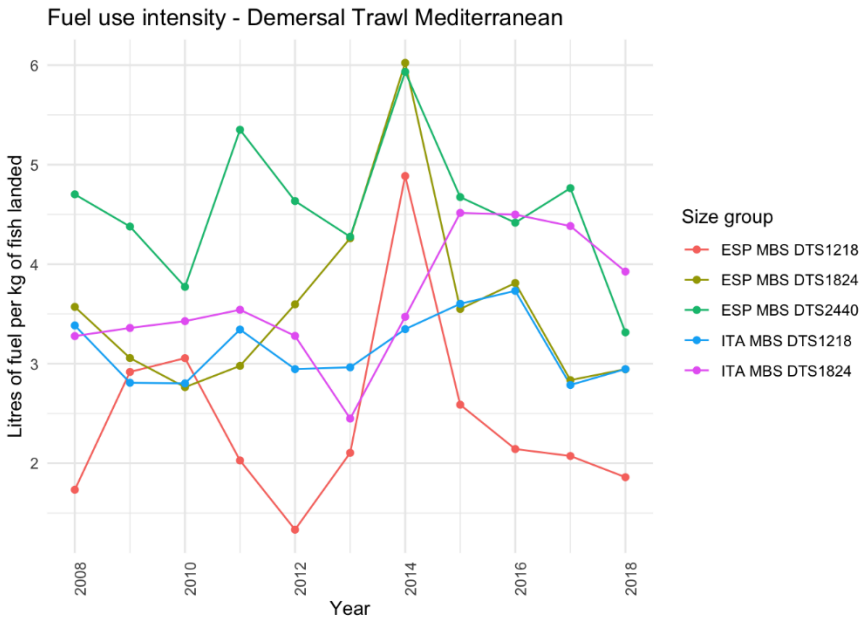
A recent study (Sale, 2022) compared the FUI indicator (litres/tonnes) of some national segments with those of some international fisheries. In general, the relationships found in Italian trawl fisheries between FUI, target species, and gear type reflect those found previously in other regions. This is validated by demersal fisheries generally using considerably more fuel than fisheries targeting pelagic finfish and small pelagic species (Sala, 2022).

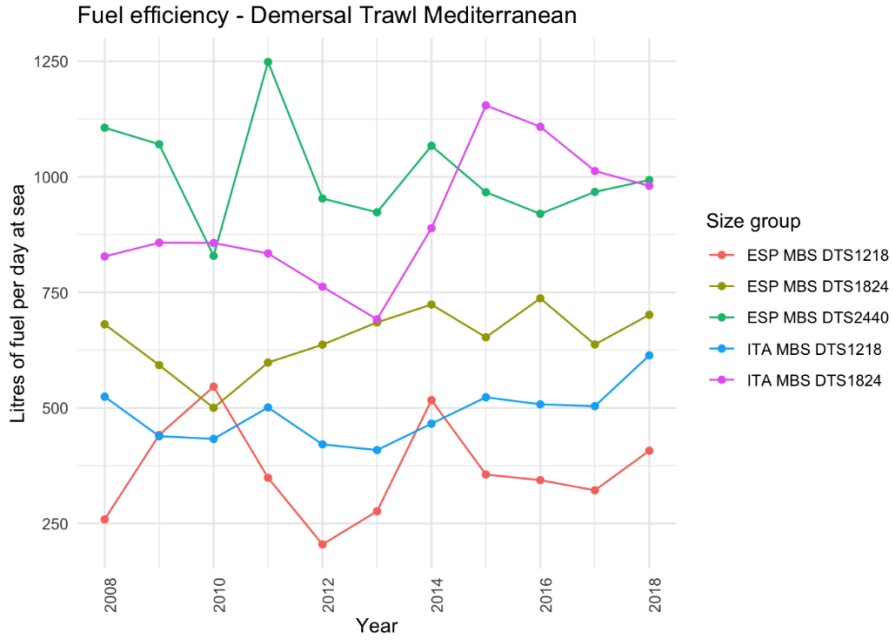
Another study by the European Commission (EC, 2022) evaluated the adaptation and building of resilience to the effects of climate change on fisheries and the reduction of emissions of greenhouse gases from fishing (European Commission, 2022). The objective of the study was to evaluate how and to what extent fishing strategies for rebuilding stocks can help different fisheries improve their energy use and efficiency, decrease those fisheries highly dependent on fuel use, and increase their profitability along with stable yields.

The levels of fuel use intensity (capture [kg], per litre of fuel) of the various fleets operating in EU waters were examined and analysed at the level of aggregate fleet segmentation by analysing data from the data collection framework of the EU (DCF).

Annual fuel use intensity was obtained from the datasets (litres of fuel per kg of fish landed) and fuel efficiency (litres of fuel per day at sea) for EU economic fleet segments by year and fishing activity. In addition, data on catch efficiency (kg of fish landed per day at sea) and catch per metre of fleet size were obtained. All data were sourced from the EU Data Collection Regulation (DCR) and the EU Data Collection Framework (DCF, 2008 onwards). Using these three parameters (fuel use intensity, fuel efficiency, and catch efficiency), we examined how energy consumption varied during the available time period by metier and vessel size at the Member State level.

According to what was reported in the study, the fuel use intensity for trawler segments in the Mediterranean Sea was found to be much higher compared to other areas. In addition, there are many fluctuations in the intensity of fuel use and fuel efficiency. In recent years, the efficiency of catches (kg of catches per fishing day) has increased for all segments, while the intensity of fuel consumption (litre of fuel per kg) shows uneven and fluctuating trends (Figure 30).


Fuel use intensity - Demersal Trawl Mediterranean
Litres of fuel per kg of fish landed
6
5
4
3
2
2008
2010
2012
2014
2016
2018
Year
Size group
ESP MBS DTS1218
ESP MBS DTS1824
ESP MBS DTS2440
ITA MBS DTS1218
ITA MBS DTS1824


Fuel efficiency - Demersal Trawl Mediterranean
Litres of fuel per day at sea
1250
1000
750
500
250
2008
2010
2012
2014
2016
2018
Year
Size group
ESP MBS DTS1218
ESP MBS DTS1824
ESP MBS DTS2440
ITA MBS DTS1218
ITA MBS DTS1824

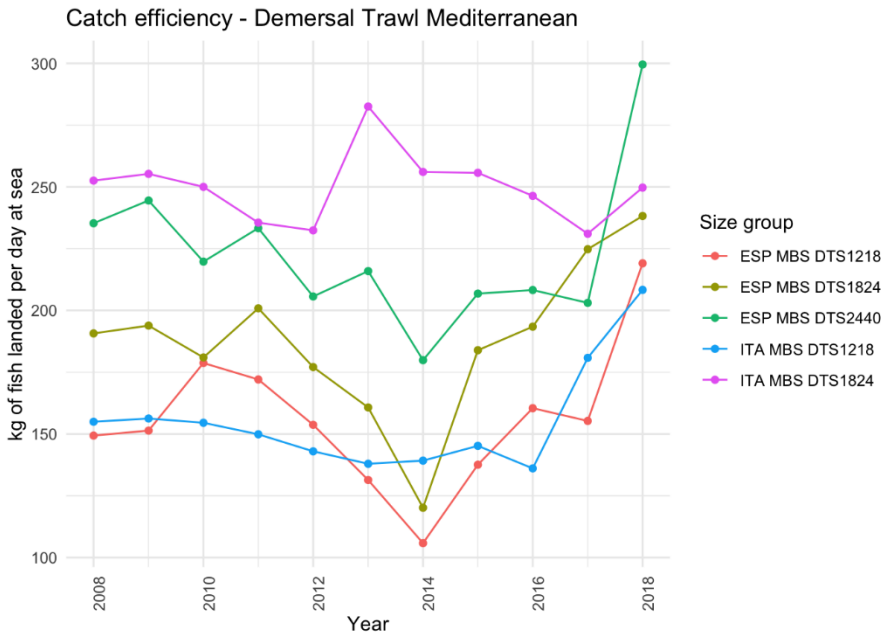


Figure 30 – Fuel intensity for selected demersal trawlers in the Mediterranean Sea*. Extracted from: European Commission, European Climate, Infrastructure and Environment Executive Agency, Bastardie, F., Feary, D., Kell, L., et al., Climate change and the common fisheries policy: adaptation and building resilience to the effects of climate change on fisheries and reducing emissions of greenhouse gases from fishing.*

This unclear trend in fuel intensity cannot be linked to an improvement in biomass status for the main target species. The average F/Fmsy in the central and western Mediterranean has remained well above the target of 1 over this period (STECF 2021a), a stability that confirms the absence of a clear link between resource status and the rate of fuel use (Figure 31).

A specific fuel consumption and capture efficiency profile has been created for each Member State (available online at: https://data.sakana-consultants.com/CINEA_fuel/) to present the differences between fuel consumption indicators for each fishery segment in their commercial fishing fleets.

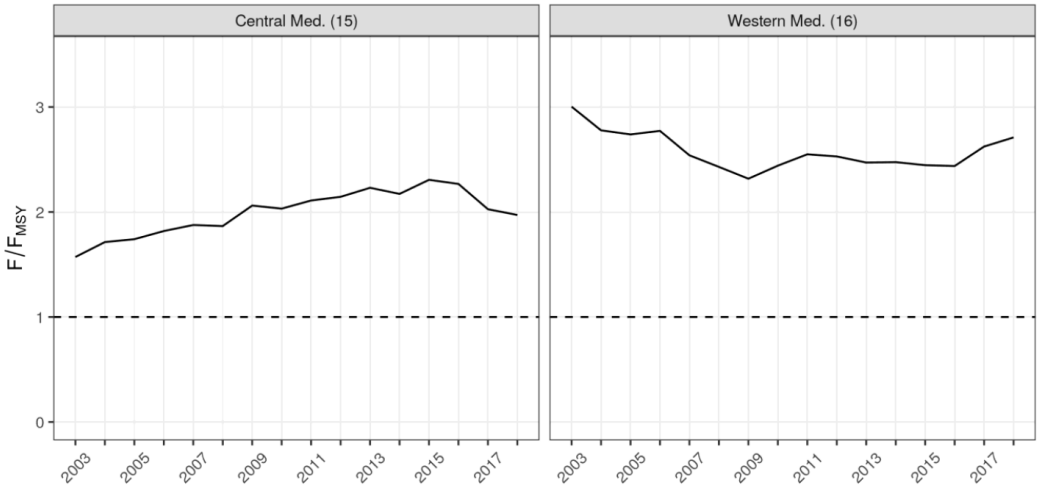


Figure 31 – F/Fmsy trend in the central and western Mediterranean (STECF 2021a, p. 62).

Total Factor Productivity (TFP) methodology

To compare the performance of vessels of different sizes, STECF used the total factor productivity (TFP) methodology (STECF 2020, p. 39 et seq). It is made by producing an estimation of the TFP that summarises all the capital (capital services) and labour productivity into a single number.

Capital and energy are analysed as complementary, as energy consumption is related to the capital invested (i.e. the design of the hull or the power of the engine are related to the fuel required for the operation of the vessel) and can hardly be changed in the short term.

TFP is expressed in relative terms. Production is calculated as the aggregation of labour wages, capital wages, and energy costs. TFP is then interpreted as the ratio between the aggregate output value and the aggregate input value. By analysing the relationship between each parameter, a TFP index was obtained. Small-scale fishing is more efficient in the use of input factors than the large-scale fleet in both areas analysed: the North Atlantic Ocean (NAO) and Mediterranean (MBS). The TFP levels in NAO are larger than in the MBS and the Black Sea, indicating that on average the Mediterranean fleet generates less production per unit of input than the vessels in the North Atlantic (Table 10).

The number of small vessels is decreasing in many EU countries (STECF 2021b) as greater economic efficiency (i.e. greater TFP) does not necessarily translate into a better economic situation if the profit level of individual fishermen is considered too low to stay in business for a long time.

Table 10 – Total factor productivity (TFP) level (average for 2008–2018) in real terms (STECF 2020).

Fishing areas		Target species	TFP
North Atlantic Ocean	Large scale fishery	Demersal	2.05
		Pelagic	2.03
	Small-scale fishery	All the species	4.02
Mediterranean and Black sea	Large scale fishery	Demersal	1.71
		Pelagic	1.80
	Small-scale fishery	All the species	2.12

In conclusion, the analysis identified the following summary points:

- The fuel intensity for trawler fleets in the Mediterranean Sea is much higher than in other areas.
- The TFP index (total factor productivity) is significantly lower in the Mediterranean, indicating that, on average, the Mediterranean fleet generates less production per unit of input than vessels from other areas.
- Small-scale fishing vessels have a higher TFP index than large-scale vessels, and this could be a good reason to look into the possibilities of improving the economic performance of small-scale fishing vessels in the long term, coupled with the use of more efficient technology to reduce energy consumption and costs.

3. Analysis of production costs and evaluation of the impact of the increase in fuel costs through simulation models

This chapter contains estimates of the likely effects of diesel price increases on the economic performance of the Italian fisheries sector. These effects are also estimated by taking into account the expected changes for certain fleet segments on fishing days following the implementation of the new regulatory framework defined at the community level for Mediterranean demersal fisheries.

The assessment of the economic and social impact of the increases in the fuel price was obtained by comparing the situation preceding these increases with that expected for the following years. This analysis was conducted by structuring a specific simulation model capable (under certain assumptions) of predicting the likely trend over time of the main socio-economic variables of the sector and the related performance indicators. A detailed description of the adopted simulation model is given in Annex I.

Simulations have been performed by 21 Italian fishing fleets for which production, activities, and socio-economic data are collected as part of the fisheries data collection programme in support of the Common Fisheries Policy of the European Union. For each simulation, a series of indicators were estimated to evaluate the potential impact of energy price shock on the economic performance of the sector. The main indicators used are fuel cost per vessel, labour cost per employee (a proxy of the average salary paid to each fisher), the value added per vessel, the net profit per vessel, and the CR/BER. The CR/BER (i.e. the ratio between current and break-even revenues) is particularly useful for assessing the economic sustainability of the sector. A detailed description of the indicators is given in Annex I.

In the following paragraphs, results at the national level are provided, highlighting which fishing techniques and vessel length classes are expected to be most sensitive to increases in fuel prices. It follows detailed descriptions by individual fleet segment.

3.1 Impact of energy price shocks at the national level

In 2020, excluding the deep sea oceanic fleet, the Italian fleet totalled 10,227 active vessels, for a turnover of about €642.5 million. In the 2017–2019 period, net profit amounted to €158.7 million per year, on average, equivalent to about €14 thousand per vessel. On average, in the period 2017–2019, the average days at sea per vessel were 121, which went down to 92 in 2020 due to the COVID-19 pandemic.

In the face of fuel price increases, the forecast model estimates the likely impacts for 2021 and 2022. Table 11 shows the estimated values for the main economic variables for these 2 years compared with the average values of the reference period 2017–2019, while Figure 32 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 as well as those expected from 2021 to 2025.

Table 11 – Main economic variables estimated for 2021 and 2022 compared to the reference period (2017–2019 average). Total Italian fleet except oceanic fleet (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	52,405	45,958	32,033
Fuel cost per vessel	17,362	17,831	29,523
Labour cost per employee	10,766	9,722	7,189
Net profit per vessel	14,320	10,710	2,435

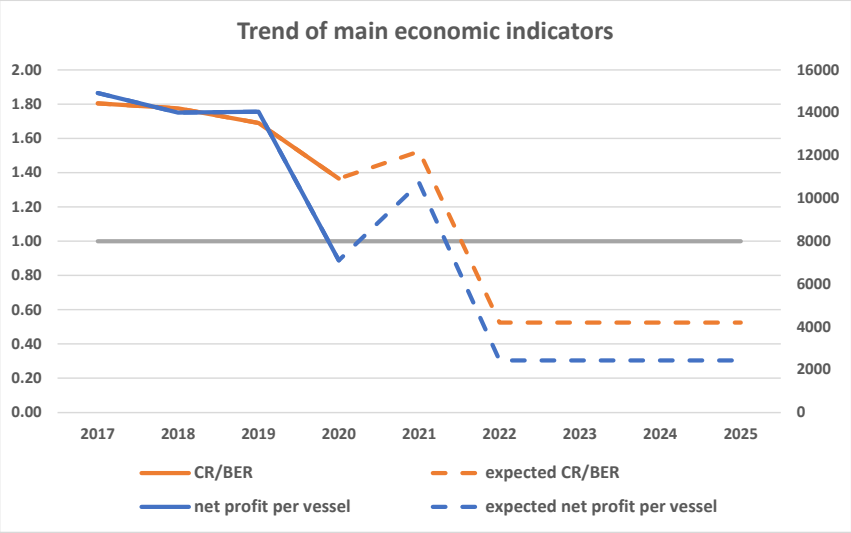


Figure 32 – Trend and forecasts of the main economic indicators Total Italian fleet except oceanic fleet (values in euros).

The fuel cost per vessel, influenced both by the diesel price and the number of fishing days expected for the years of the simulation (assumed equal to the average of the period 2017–2019), shows an increase of 3% for 2021 and 70% for 2022. Labour costs show reductions of 10% and 33%, respectively, in the years 2021 and 2022 compared to the average of the reference period. The reduction (by a third) in average wages during the period 2017–2019 is expected as a result of the sharp increase in diesel prices in 2022. The value added per vessel shows reductions similar to those expected for the labour cost per employee: 12% in 2021 and 39% in 2022, while net profit per vessel reduces even more: -25% in 2021 and -83% in 2022.

The expected sharp contraction in net profit is also shown in Figure 33, where there is also a temporary increase in the indicator in 2021 compared to 2020 as a result of the recovery of fishing days expected after the first negative impact of the COVID-19 pandemic on fishing activity. The CR/BER, which measures the economic sustainability of fishing activity, is also expected to decrease in the simulation years (Figure 33) compared to the 2017–2019 reference period. In particular, the CR/BER is expected to decline from an average value of 1.76 in the base period to 1.52 in 2021 and 0.52 from 2022 onwards. The expected value in

2022, less than 1, indicates that revenues, on average, are not sufficient to cover costs, making fishing unsustainable from an economic point of view. This condition, if prolonged over time, inevitably determines the cessation of fishing activity.

The impact of the energy price shock on fishing activity is manifested in a diversified way, depending on the type of fishing practiced and the size of the vessel. With regard to the type of fishing, Figure 33 shows the number of fleet segments with CR/BER less than 1 in the basic period 2017–2019 and those expected on the basis of the model simulations for 2021 and 2022 for the main seven fishing techniques in Italy: hydraulic dredges (DRB), demersal trawl (DTS), longline (HOK), small-scale coastal fishing (PGP), purse seine (PS), beam trawl (TBB), and pelagic trawl (TM). The same data are shown in Figure 34, but divided by the length classes, which is the dimension that, combined with the fishing technique, defines the fleet segments.

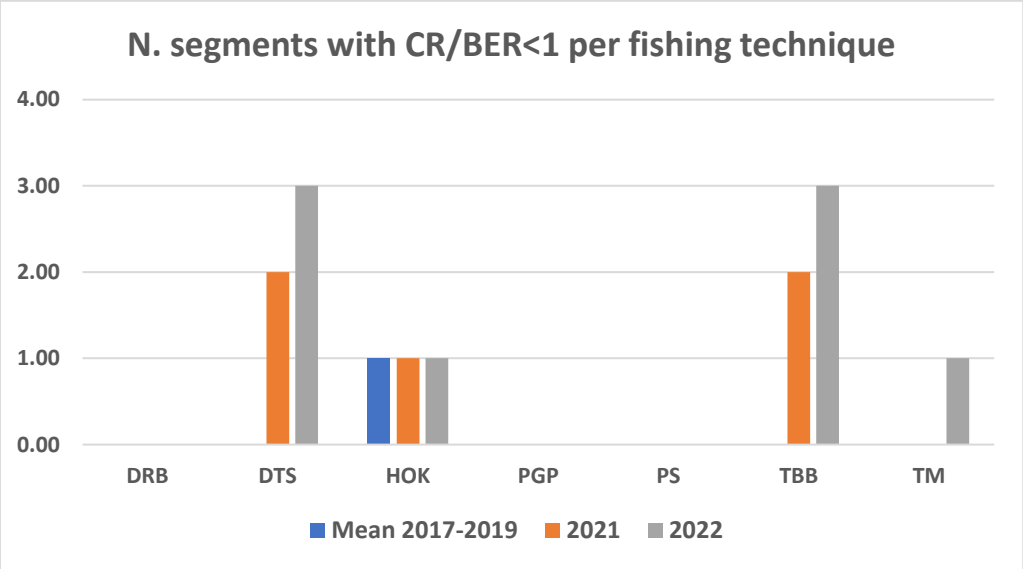


Figure 33 – Fleet segments with CR/BER lower than 1 by main fishing technique and reference periods 2017–2019 and 2021 and 2022.

Both figures show that in the period 2017–2019, only one fleet segment out of 21 was in a condition of economic unsustainability, i.e. with a CR/BER lower than 1. This is the longliner segment between 18 and 24 metres in length (HOK VL1824). All other fleet segments showed average values above 1 for this indicator. In 2021, due to the increase in the diesel price, the number of fleet segments with CR/BER less than 1 is expected to rise to 5, while in 2022, with the further increase in energy costs, it will reach 8. As described in the following paragraphs, the other fleet segments will also be negatively affected by fuel price shock, but they are expected to maintain a level of economic performance sufficient to continue fishing.

As shown in Figure 34, the fishing techniques most affected by the expensive diesel price

would be demersal and beam trawls, for which CR/BER would increase from zero in the reference period to 2 in 2021 and 3 in 2022. Pelagic trawl would also reach a condition of economic unsustainability from 2022 onwards, while the longliner segment maintains the condition of economic unsustainability for all the three periods considered. For dredgers, small-scale fishers, and purse seiners, the deterioration in economic performance as a result of the high diesel price should not threaten economic sustainability.

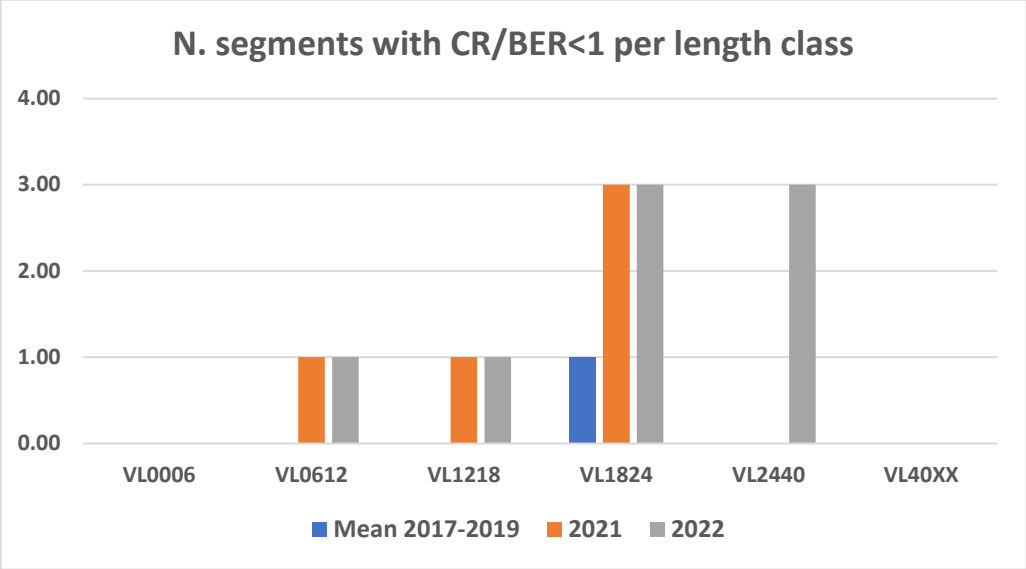


Figure 34 – Fleet segments with CR/BER lower than 1 by main length classes during reference periods 2017–2019, 2021, and 2022.

Figure 34 shows that the segments most affected by the high diesel price are generally those with the largest vessels, with the exception of vessels in the over 40 metres length class that are mainly in the tuna fishery. The fleets included in the length class between 18 and 24 metres with a CR/BER less than 1 are expected to increase from 1 in the reference period to 3 in 2021 and 2022, while the three segments with a vessel length class between 24 and 40 metres are expected to be economically unsustainable from 2022 onwards. Length classes lower than 18 metres show no change, thus maintaining a CR/BER lower than 1.

3.2 Impact of energy price shocks by fleet segment

Fleet segment: dredgers 1218

In 2020, the segment of hydraulic dredgers between 12 and 18 metres in length consisted of 628 active vessels generating a total turnover of about €48.6 million. In the 2017–2019 reference period, net profit amounted to €6.4 million per year, on average, equivalent to about €10 thousand per vessel. On average, in the period 2017–2019, the number of days of

activity per vessel was 68, rising to 86 in 2020.

In the face of the increase in fuel price, the forecast model estimated the likely impacts for 2021 and 2022. Table 12 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 35 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the fuel price of ±20% compared to the estimated price for 2022 is expected.

Table 12 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Dredgers 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	49083	48493	44102
Fuel cost per vessel	5415	5942	10333
Labour cost per employee	10633	10570	9733
Net profit per vessel	9996	9509	7015

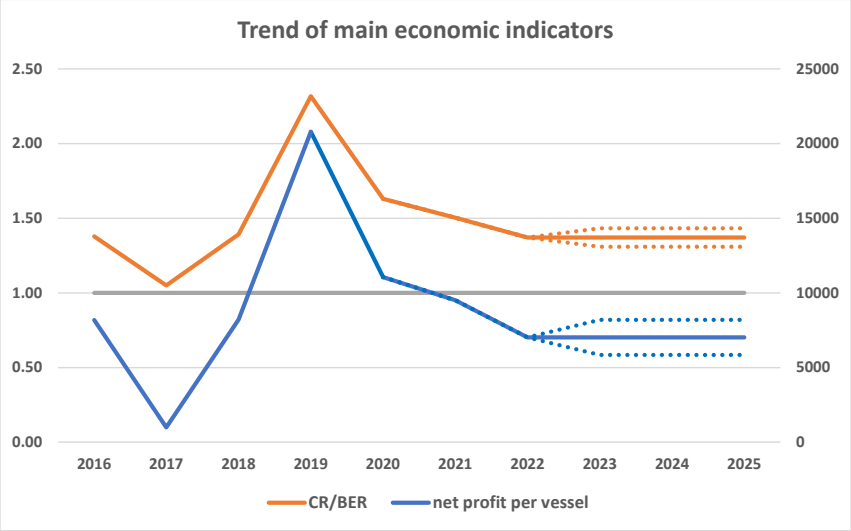


Figure 35 – Trends and forecasts of the main economic indicators (±20% change in the fuel price from 2023). Dredgers 12–18m in length at the national level (values in euros).

The fuel cost per vessel, depending on the fuel price, as well as by the estimated number of fishing days for the years of the simulation, shows an increase of about 10% for 2021 and more than 90% for 2022. The labour cost, which for 2021 shows no particular variations, is expected to decrease by more than 8% in 2022 when the increase in the fuel cost becomes considerable. Value added per vessel also shows a significant reduction (about 10%, for 2022.

Changes in the economic variables described above result in a reduction in net profits per

vessel, which are expected to decline by around 5% in 2021 and 30% in 2022 compared to the average 2017–2019 (Table 12 and Figure 35). The CR/BER, which measures the economic sustainability of fishing activity, is also expected to decline in the simulation years (Figure 35). In particular, the CR/BER is expected to decrease from an average value of around 1.60 in the reference period to 1.37 from 2022 onwards, a value greater than 1 and therefore considered sufficient to ensure the continuity of fishing activity.

Fleet segment: demersal trawlers 0612

In 2020, the trawler segment, with vessels between 6 and 12 metres in length, consisted of 118 active vessels that generated a total turnover of €4.2 million. In the reference period 2017–2019, net profit showed a decreasing trend from €1 million in 2017 to a loss of about €200 thousand in 2019. On average, in the period 2017–2019, the average number of days at sea per vessel was 92, decreasing to 84 in 2020. In the following years, fishing days by vessel are expected to decrease further as a result of effort-reduction management measures concerning the western Mediterranean and the Adriatic in particular. These effort limitations are expected to translate into an average level of 66 days in 2021 and 62 days from 2022 onwards.

As a consequence of the high diesel prices and changes in fishing days, the forecast model estimated the likely impacts for 2021 and 2022. Table 13 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables and Figure 36 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 as well as those expected from 2021 to 2025.

Table 13 –Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Demersal trawlers 6–12m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	24784	18318	11187
Fuel cost per vessel	8542	7820	12788
Labour cost per employee	7400	5136	3550
Net profit per vessel	4051	-303	-4367

The fuel cost per vessel, which is positively influenced by the increase in the fuel price and negatively influenced by the reduction in the number of fishing days resulting from the management measures, shows a reduction of 8% in 2021 and an increase of 50% in 2022. In 2021, the model predicts that the reduction in fishing days will produce a reduction in fuel consumption, which should more than offset the increase in the fuel price. However, in the following year, the larger increase in diesel prices will cause a massive rise in fuel costs.

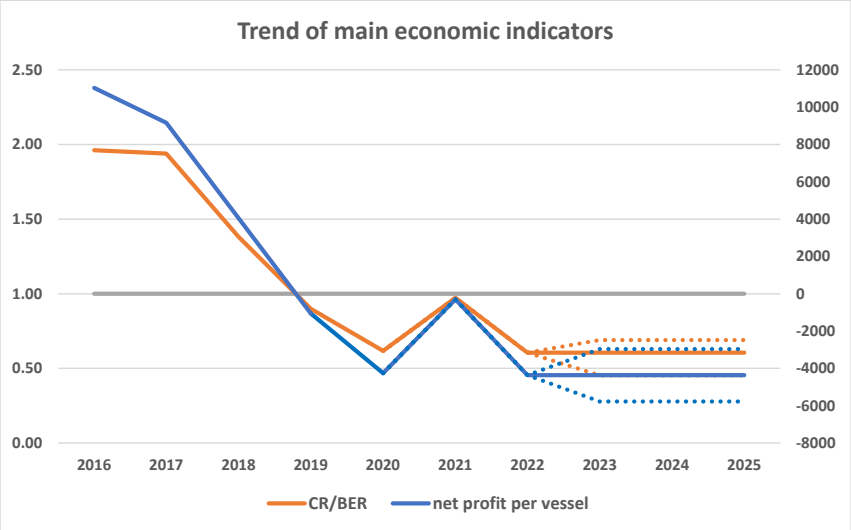


Figure 36 – Trend and forecasts of the main economic indicators (±20% change in the fuel price from 2023). Demersal trawlers 6–12m in length at the national level (values in euros).

Despite the reduction in fuel costs in 2021, labour costs per employee are still expected to decrease by more than 30%. This reduction is due to lower revenue resulting from the limitations on fishing days imposed at the management level. The decrease in labour costs per employee became even more significant from 2022 onwards, exceeding 50% as a result of the increase in fuel costs. Compared to the base period, value added per vessel follows a similar trend to that of labour costs per employee, with expected reductions of 26% in 2021 and 55% in 2022. For net profit, which, compared to value added, also considers other costs, a negative value is expected already in 2021, which is then expected to worsen further in 2022 and result in a record loss of about €4 thousand per vessel (Table 13).

Net profit per vessel in 2021, although reduced compared to the base period 2017–2019, shows higher values compared to 2020 (Figure 36), the year of the COVID-19 outbreak. This is mainly due to significantly lower labour costs in 2021 than in 2020. From 2022, however, the further increase in the fuel price fuel will lead to a significant reduction in profits, bringing them back to the negative values recorded in 2020. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 36), with an increase in 2021 compared to 2020 and the subsequent contraction from 2022 onwards. The CR/BER, which was already lower than 1 in 2019, confirms economic unsustainability with a serious risk of closure of fishing activity for the following years.

Fleet segment: demersal trawlers 1218

In 2020, the trawler segment between 12 and 18 metres in length consisted of 1048 active vessels, with a total turnover of €112 million. In the 2017–2019 reference period, on average, net profit amounted to €46.3 million per year, equivalent to about €39 thousand per vessel.

On average, in the period 2017–2019, the days of activity per vessel were 141, decreasing to 121 in 2020. In subsequent years, fishing days per vessel are expected to increase first slightly to 124 for 2021 and then to decrease to 116 from 2022 onwards. These variations are due to management effort reduction measures affecting the western Mediterranean and the Adriatic in particular.

In the face of rising fuel prices and changes in fishing days, the forecast model estimates the likely impacts for 2021 and 2022. Table 14 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables and Figure 37 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025.

Table 14 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Demersal trawlers 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	98,204	76,450	39,263
Fuel cost per vessel	42,194	44,958	72,450
Labour cost per employee	16,232	13,198	7,921
Net profit per vessel	38,607	25,192	2,413

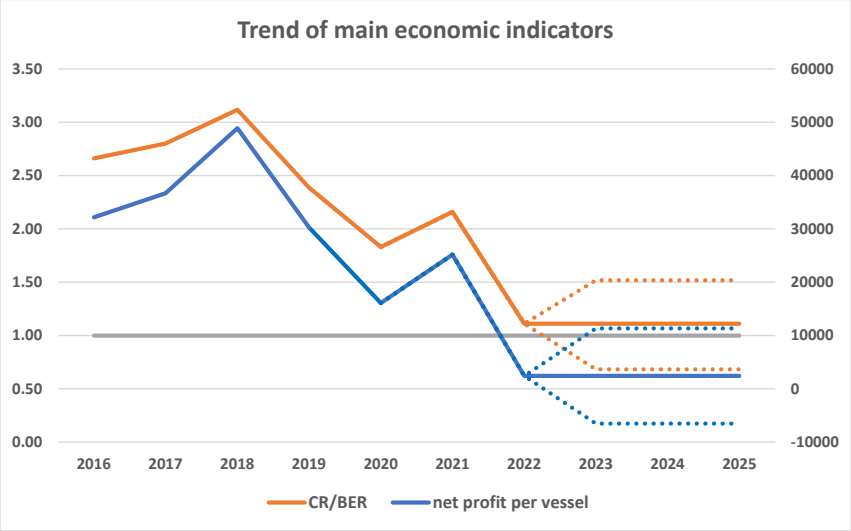


Figure 37 – Trend and forecasts of the main economic indicators (±20% change in the fuel price from 2023). Demersal trawlers 12–18m in length at the national level (values in euros).

The fuel cost per vessel, influenced by both the increase in the fuel price and the expected changes in the number of fishing days, shows an increase of 7% for 2021 and 72% for 2022. Increases in fuel costs will undoubtedly have an impact on labour costs, given the type of

contract in the crew remuneration system. Considering from the simulation model the impact of fuel costs on the calculation of the part, the labour cost per employee is expected to contract by 19% in 2021 and by 51% in 2022. Compared to the reference period, the value added per vessel is also expected to decrease by similar percentages: 22% in 2021 and 60% in 2022. The net profit per vessel, which, compared to the added value, also includes the other costs, is expected to decrease by 35% in 2021 and 94% in 2022, resulting in an economic result close to zero (Table 14).

Net profit per vessel in 2021, although reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 37), the year of the outbreak of the pandemic. This is mainly due to the slight increase in fishing days. From 2022, however, the further increase in the fuel price and the reduction in fishing days would lead to a significant reduction in profits, bringing them to values close to zero. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 37), with an increase in 2021 compared to 2020 and the subsequent contraction from 2022 onwards. The CR/BER, despite the strong contraction of 2022, is still higher than 1, thus highlighting a condition of economic sustainability that is sufficient to guarantee the continuity of fishing activity.

Fleet segment: demersal trawlers 1824

In 2020, the trawler segment between 18 and 24 metres in length consisted of 553 active vessels for a total turnover of €113 million. In the 2017–2019 reference period, on average, net profit amounted to €12.8 million per year, equivalent to about €21 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 171, down to 142 in 2020. In subsequent years, fishing days per vessel are expected to increase first slightly to 147 for 2021 and then to decrease to 137 from 2022 onwards. These variations are due to management effort reduction measures affecting, in particular, the western Mediterranean and the Adriatic.

In the face of rising fuel prices and changes in fishing days, the forecast model estimates the likely impacts for 2021 and 2022. Table 15 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables, and Figure 38 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025.

Table 15 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Demersal trawlers 18–24m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	142,859	105,512	34,123
Fuel cost per vessel	92,703	90,750	145,638
Labour cost per employee	18,065	14,055	6,559
Net profit per vessel	20,742	-1,555	-43,865

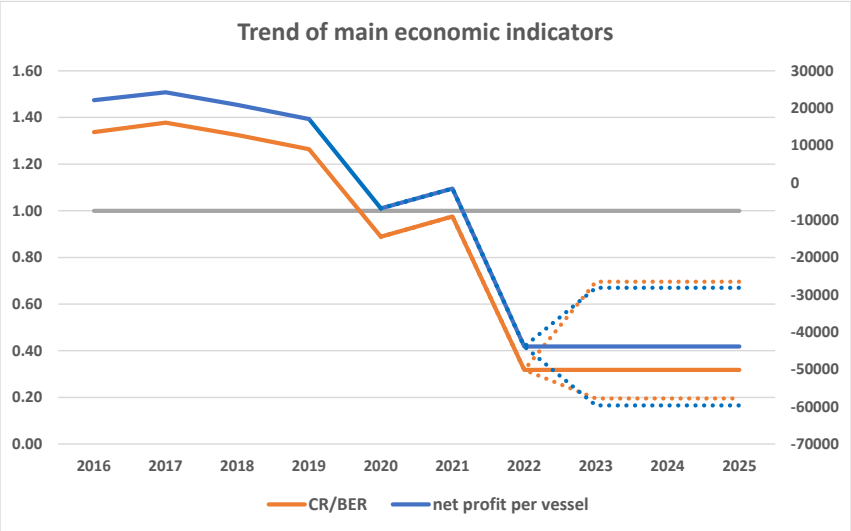


Figure 38 – Trend and forecasts of the main economic indicators (±20% change in the fuel price from 2023). Demersal trawlers 18–24m in length at the national level (values in euros).

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected changes in the number of fishing days as a result of management measures, shows a reduction of 2% for 2021 and an increase of 57% for 2022. Despite the reduction in fuel costs for 2021, the cost of labour per employee is still expected to decrease by more than 20%. This is a reduction that becomes even more significant from 2022 onwards, exceeding 60% due to the further increase in fuel costs. Compared to the base period, value added per vessel follows a similar trend to that of labour costs per employee, with expected reductions of 26% in 2021 and 76% in 2022. For net profit, which, compared to value added, also considers other costs, a negative value is expected already in 2021, and then worsens significantly in 2022 and records a loss of about €44 thousand per vessel (Table 15).

The net profit per vessel in 2021, although already recording a negative value, shows slightly higher values than in 2020 (Figure 38), the year of the beginning of the pandemic. This is mainly due to significantly lower labour costs in 2021 than in 2020. From 2022, the further increase in the fuel price fuel would lead to a further reduction in profits, significantly increasing the number of losses. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 38) with a slight increase in 2021 compared to 2020 and the subsequent contraction from 2022 onwards. The CR/BER, which was less than 1 already in 2020, confirms for the following years the presence of a condition of unsustainability from an economic point of view with a serious risk of closure of fishing activity.

Fleet segment: demersal trawler 2440

In 2020, the trawler segment between 24 and 40 metres in length consisted of 181 active

vessels with a total turnover of €80 million. In the reference period 2017–2019, on average the net profit stood at €13.3 million per year, equivalent to about €77 thousand per vessel. On average in the period 2017–2019, the days of activity per vessel were 191, down to 160 in 2020. In subsequent years, fishing days per vessel are expected to increase to 178 for 2021 and 171 from 2022 onwards. These variations are due to a partial return to the average values prior to the beginning of the pandemic limited by the constraints introduced with the management measures to reduce the effort that concern in particular the western Mediterranean and the Adriatic.

In the face of rising fuel prices and changes in fishing days, the forecast model estimated the likely impacts for 2021 and 2022. Table 16 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables and Figure 39 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025.

Table 16 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Demersal trawlers 24–40m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	347,502	319,248	193,416
Fuel cost per vessel	167,461	164,130	273,849
Labour cost per employee	26,122	24,437	16,091
Net profit per vessel	77,059	59,517	-16,535

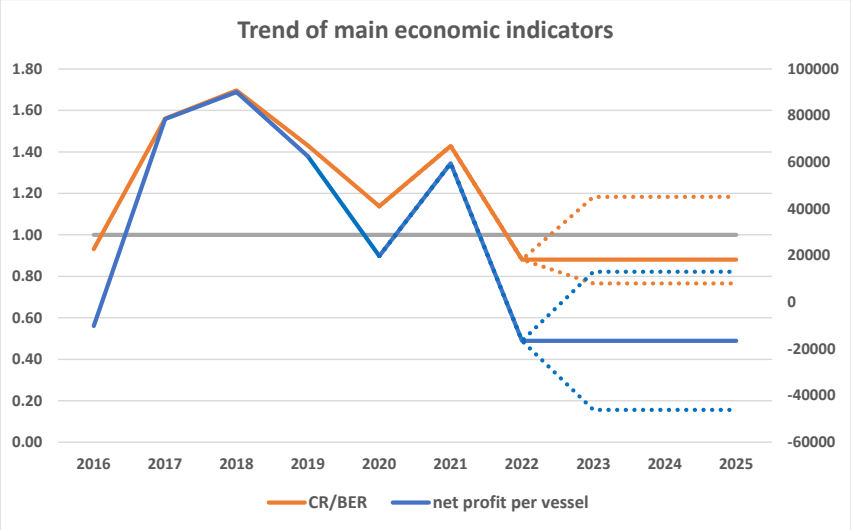


Figure 39 – Trend and forecasts of the main economic indicators (±20% change in the fuel price from 2023). Demersal trawlers 24–40 m in length at the national level (values in euros).

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected changes in the number of fishing days as a result of management measures, shows a reduction of 2% for 2021 and an increase of 64% for 2022. Despite the reduction in fuel costs for 2021, labour costs per employee are still expected to decrease by 6%. A reduction that becomes more significant from 2022 onwards reaching 38% due to the further increase in fuel costs. Compared to the base period, value added per vessel follows a similar trend to that of labour costs per employee with expected reductions of 8% in 2021 and 44% in 2022. For net profit, which compared to value added also includes other costs, a reduction of 23% is expected in 2021, to then worsen considerably and record a loss in 2022 of over €16 thousand per vessel (Table 16).

The trend of net profit per vessel shown in Figure 39 shows a particularly low value in 2020 due to the COVID-19 pandemic which has considerably reduced fishing days, an increase in 2021 following the expected recovery in the days of activity and a subsequent reduction from 2022 onwards due to increases in the fuel price. From 2022, the further increase in the fuel price fuel would result in a rapid change in profits, which would result in losses. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 39) with an increase in 2021 compared to 2020 and the subsequent contraction from 2022 onwards. For the CR/BER, which returned to being above 1 in 2021 after the pandemic crisis of 2020, the simulation model predicts an economic collapse in 2022 due to increases in the fuel price falling back below the threshold value. That value would highlight economic unsustainability with a serious risk of closure of the fishing activity.

Fleet segment: longliners 1218

In 2020, the longliner segment with vessels between 12 and 18 metres in length consisted of 172 active vessels generating a total turnover of about €16.4 million. In the 2017–2019 reference period, net profit amounted to €2.1 million per year on average, equivalent to about €14 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 114, which decreased to 83 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022.

Table 17 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 40 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the fuel price of ±20% compared to the estimated price for 2022.

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected increase in the number of fishing days (which are assumed to return to the average values before the outbreak of the COVID-19 pandemic) shows an increase of about 20% for 2021 and over 100% for 2022. As a result of a more than a doubled fuel cost, labour costs (which are expected to fall by 12% by 2021) are expected to fall by about a third in 2022. Value

added per vessel also shows reductions similar to those expected for labour costs while net profit per vessel is expected to decline by about 30% in 2021 and over 80% in 2022 (Table 17 and Figure 40).

Table 17 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Longliners 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	58,146	50,822	37,955
Fuel cost per vessel	14,626	17,412	30,279
Labour cost per employee	7,066	6,192	4,797
Net profit per vessel	14,024	9,925	2,404

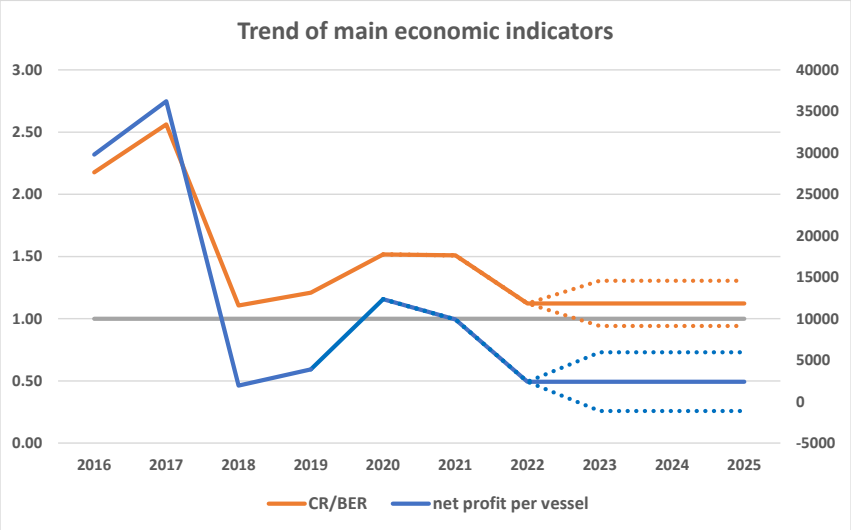


Figure 40 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Longliners 12–18m in length at the national level (values in euros).

The trend in net profit per vessel shown in Figure 40 shows an increase in 2020 compared to the previous 2 years, and then decreases in the following years as a result of increases in the fuel price. The CR/BER, which measures the economic sustainability of fishing activity, is also expected to decline, particularly from 2022 onwards (Figure 40). The CR/BER is expected to decline from an average value of around 1.63 in the base period to 1.12 from 2022; a value greater than 1 and therefore considered sufficient to ensure the continuity of fishing activity.

Fleet segment: longliners 1824

In 2020, the longliner segment of vessels between 18 and 24 metres in length consisted of

47 active vessels generating a total turnover of about €10 million. In the 2017–2019 reference period, net profit showed a decreasing trend from €1.2 million in 2017 to a loss of about €940 thousand in 2019. On average, in the period 2017–2019, the days of activity per vessel were 129, decreasing to 95 in 2020.

In the face of rising fuel prices and decreased fishing days, the forecast model estimated the likely impacts for 2021 and 2022. Table 18 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables. Figure 41 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) from 2023 in the fuel price compared to the estimated price for 2022.

Table 18 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Longliners 18–24m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	13,1087	116,129	84,703
Fuel cost per vessel	33,638	42,527	73,953
Labour cost per employee	10,308	9,488	7,175
Net profit per vessel	898	-6,307	-24,457

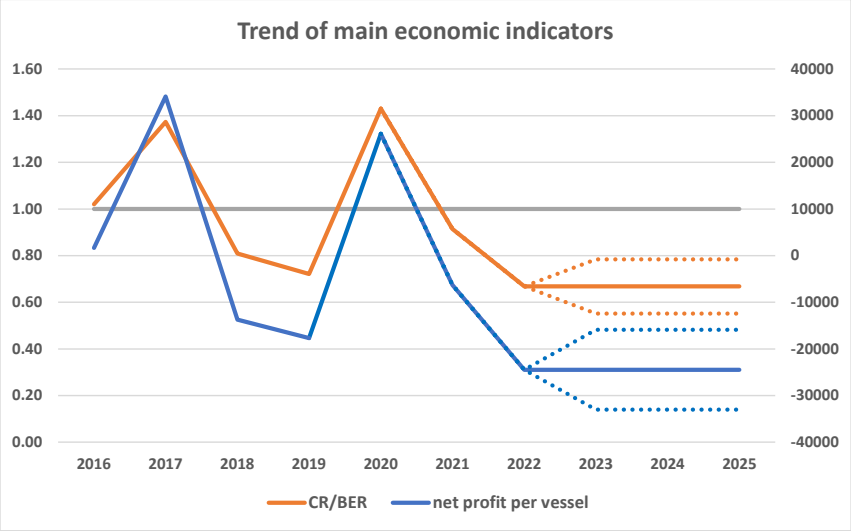


Figure 41 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Longliners 18–24m in length at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing day (which are assumed to return to the average values before the outbreak of the pandemic) shows an increase of 26% for 2021 and 120%

for 2022. As a result of a more than doubled fuel cost, labour costs, which are expected to fall by 8% by 2021, are expected to fall by around 30% in 2022. Value added per vessel also shows reductions similar to those expected for labour costs: -11% in 2021 and -35% in 2022. For net profit, which compared to the added value also considers other costs, a negative value is expected already in 2021, and to then worsen further in 2022 and record a loss of about €24 thousand per vessel (Table 18).

The net profit per vessel, as shown in Figure 41, increased in 2020 compared to the previous 2 years, and then decreased in the following years as a result of increases in the fuel price. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 41) with marked reductions in both 2021 and 2022. The CR/BER, which was lower than 1 already in 2018 and 2019, will return to be lower than 1 from 2021 onwards, highlighting economic unsustainability with a serious risk of closure of fishing activity.

Fleet segment: small-scale fishing fleet 0006

In 2020, the small-scale fleet segment, including vessels less than 6 metres in length, consisted of 2021 active vessels with a total turnover of about €30 million. In the 2017–2019 reference period, net profit amounted to €12.2 million per year, equivalent to about €6 thousand per vessel on average. On average, in the period 2017–2019, the days of activity per vessel were 116, decreasing down to 78 in 2020.

In the face of the fuel price increase, the forecast model has estimated the likely impacts for 2021 and 2022. Table 19 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Moreover, Figure 42 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming that from 2023 there will a range of variation (±20%) in the fuel price compared to the estimated price for 2022.

Table 19 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Small-scale vessels shorter than 6m (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	14,803	14,525	13,120
Fuel cost per vessel	1,624	1,902	3,307
Labour cost per employee	5,015	4,946	4,483
Net profit per vessel	5,709	5,547	4,792

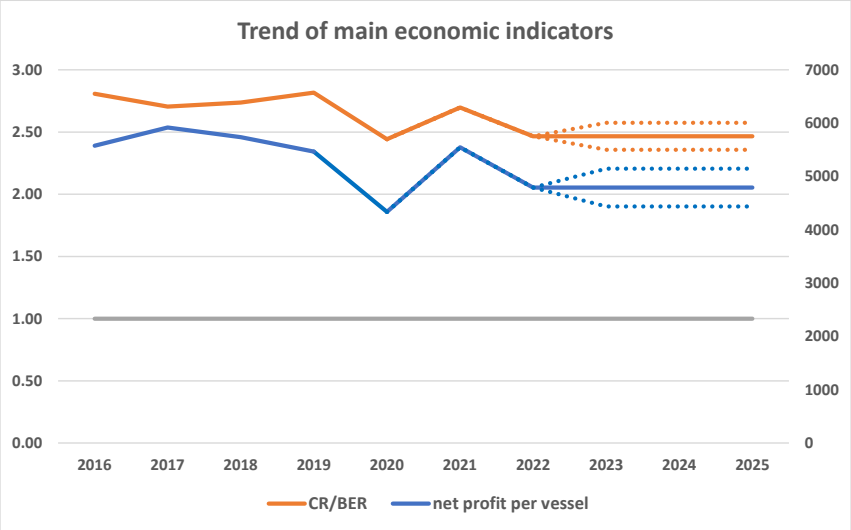


Figure 42 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Small-scale vessels shorter than 6m at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days (which are assumed to return to the average values before the outbreak of the pandemic)—shows an increase of 17% for 2021 and over 100% for 2022. Despite a fuel cost that has more than doubled, labour costs (which for 2021 show no significant changes) are expected to fall by around 10% in 2022. This is clearly linked to the lower proportion of fuel costs versus revenue for smaller vessels. Value added per vessel also shows reductions similar to those expected for labour costs; while net profit per vessel is expected to decline by 3% in 2021 and 16% in 2022 (Table 19 and Figure 42).

The trend in net profit per vessel, as shown in Figure 42, reveals the lowest value in 2020 due to the COVID-19 pandemic that has considerably reduced fishing days, an increase in 2021 following the expected recovery in the days of activity, and a subsequent reduction from 2022 onwards due to increases in the fuel price. The CR/BER, which measures the economic sustainability of fishing activity, is also expected to decline from 2022 onwards (Figure 42). The CR/BER is expected to rise from an average value of around 2.75 in the base period to 2.47 from 2022; a value significantly higher than 1 and therefore considered sufficient to ensure the continuity of fishing activity.

Fleet segment: small-scale fishing fleet 0612

In 2020, the small-scale fleet segment between 6 and 12 metres in length consisted of 4,751 active vessels for a total turnover of about €121 million. In the reference period 2017–2019, the net profit stood at €23.2 million per year, on average, equivalent to about €4,600 per vessel. On average, in the period 2017–2019, the days of activity per vessel were 120, which decreased to 86 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated its likely

impacts during 2021 and 2022. Table 20 shows the estimated values for the years 2021 and 2022, compared to the average values of the base period (2017–2019) for the main economic variables. Figure 43 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 a range of variation (±20%) in the fuel price compared to the estimated price for 2022.

Table 20 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Small-scale vessels 6–12m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	20784	20337	17764
Fuel cost per vessel	3015	3481	6054
Labour cost per employee	6010	5897	5188
Net profit per vessel	4594	4338	2964

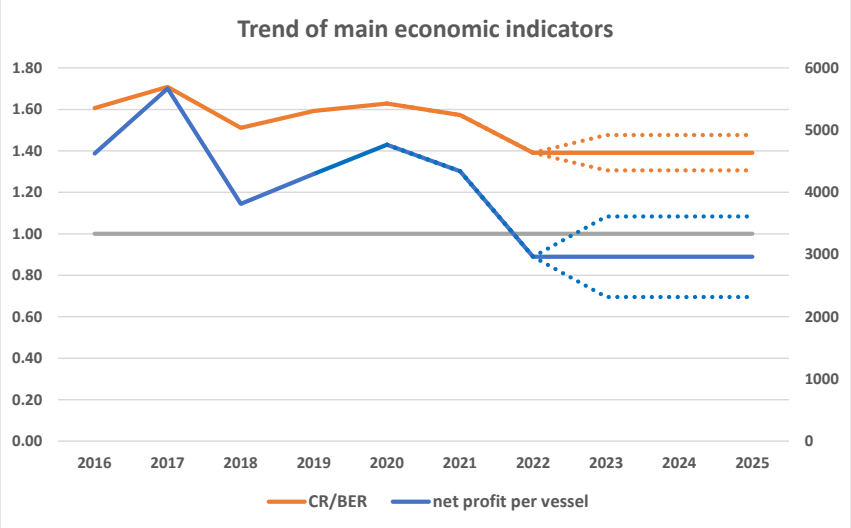


Figure 43 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Small-scale vessels 6–12m in length at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic—shows an increase of 15% for 2021 and over 100% for 2022. Despite a fuel cost that has more than doubled, labour costs are expected to fall by only 2% for 2021 and 14% in 2022. This is clearly linked to the lower effect of fuel costs on revenue for smaller vessels using less energy-intensive fishing techniques. Value added per vessel also shows reductions similar to those expected for labour costs; while net profit per vessel is expected to decline by 6% in 2021 and 35% in 2022 (Table 20 and Figure 43).

The trend of net profit per vessel shown in Figure 43 shows a decreasing trend from 2020 due to increases in the fuel price. The CR/BER, which measures the economic sustainability of fishing activity, is also expected to decline in both 2021 and 2022 and the following years (Figure 43). The CR/BER is expected to rise from an average value of around 1.60 in the base period to 1.39 from 2022; a value greater than 1 and therefore considered sufficient to ensure the continuity of fishing activity.

Fleet segment: small-scale fishing fleet 1218

In 2020, the small-scale fleet segment of less than 6 metres in length consisted of 342 active vessels generating a total turnover of about €15.3 million. In the 2017–2019 reference period, net profit amounted to €3.9 million per year, on average, equivalent to about €11 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 107, decreasing to 80 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022. Table 21 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Moreover, Figure 44 shows the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) from 2023 in the fuel price compared to the estimated price for 2022.

Table 21 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Small-scale vessels 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	59,663	59,882	51,594
Fuel cost per vessel	9,633	11,216	19,505
Labour cost per employee	9,735	9,492	8,290
Net profit per vessel	11,204	11,352	6,601

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic, shows an increase of 16% for 2021 and over 100% for 2022. Despite a more than doubled fuel cost, labour costs are expected to fall by only 2% for 2021 and 15% in 2022. This is clearly linked to the lower incidence of fuel costs on revenue for vessels using less energy-intensive fishing techniques. Value added per vessel and net profit per vessel are also almost unchanged in 2021 compared to the base period; while in 2022 they show reductions of 14% and 41% respectively (Table 21).

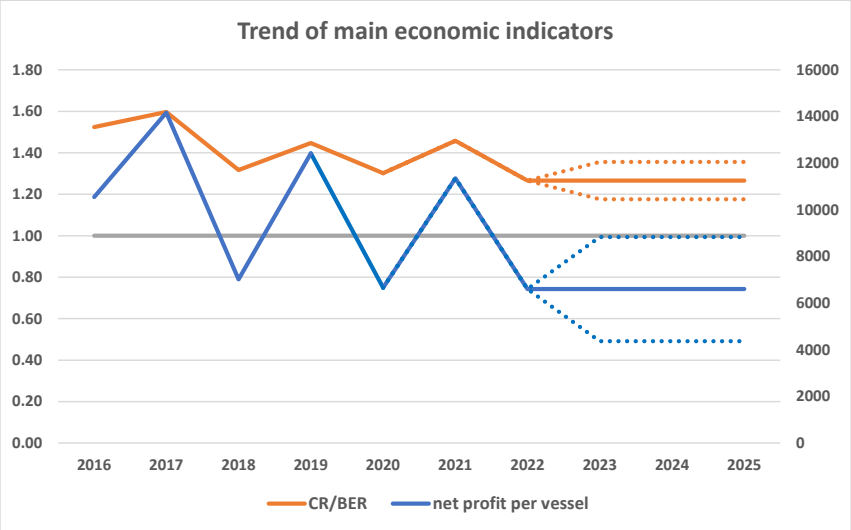


Figure 44 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Small-scale vessels 12–18m in length at the national level (values in euros).

The trend of net profit per vessel shown in Figure 44 shows a very low value in 2020 due to the COVID-19 pandemic that has considerably reduced fishing days, an increase in 2021 following the expected recovery in the days of activity and a subsequent reduction from 2022 onwards due to increases in the fuel price. The CR/BER, which measures the economic sustainability of fishing activity, shows a decreasing trend. In 2021, the model estimates a slight recovery due to the recovery in fishing days after the initial shock linked to the outbreak of the pandemic followed by the reduction in 2022 due to the effect of expensive diesel (Figure 44). The CR/BER is expected to rise from an average value of 1.45 in the base period to 1.27 from 2022 onwards; a value in any case greater than 1 and therefore considered sufficient to ensure the continuity of fishing activity.

Fleet segment: purse seiners 0612

In 2020, the purse seiner segment between 6 and 12 metres in length consisted of 152 active vessels for a total turnover of about €3.7 million. In the reference period 2017–2019, on average the net profit stood at €900 thousand per year, equivalent to about €10 thousand per vessel. On average in the period 2017–2019, the days of activity per vessel were 113, and decreased to 67 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022. Table 22 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables and in Figure 45 the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the diesel price of ±20% compared to the estimated price for 2022.

Table 22 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Purse seiners 6–12m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	25,001	24,040	20,043
Fuel cost per vessel	4,281	5,409	9,405
Labour cost per employee	4,972	4,229	3,570
Net profit per vessel	10,065	9,306	6,840

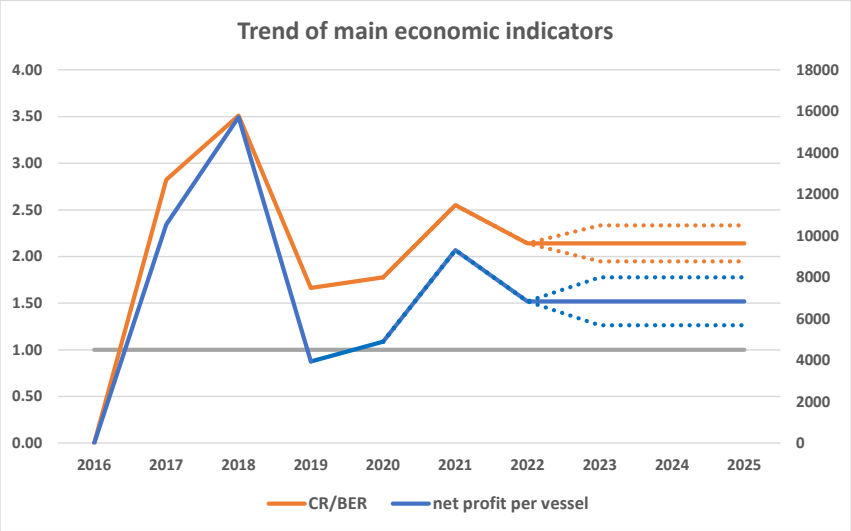


Figure 45 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Purse seiners 6–12m in length at the national level (values in euros).

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic, shows an increase of 26% for 2021 and 120% for 2022. As a result of significant increases in fuel costs, labour costs per employee are expected to reduce by 15% in 2021 and by 28% in 2022. Value added per vessel and net profit per vessel are also expected to decrease compared to the base period by 4% and 8% respectively in 2021 and 20% and 32% respectively in 2022 (Table 22).

Net profit per vessel in 2021 and in the following years, although reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 45). The increased fishing days which are expected after the initial shock linked to the outbreak of the pandemic, more than offset the rise of fuel price. The CR/BER also follows a similar trend of profits (Figure 45) decreasing from the average value of 2.67 in the reference period to 2.14 in 2022 and remaining significantly above 1. The economic performance of this fleet segment can therefore be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: purse seiner 1218

In 2020, the purse seine segment between 12 and 18 metres in length consisted of 82 active vessels for a total turnover of about €7.8 million. In the reference period 2017–2019, on average the net profit stood at €3.5 million per year, equivalent to about €28 thousand per vessel. On average in the period 2017–2019, fishing days per vessel were 100, and reduced to 63 in 2020.

Table 23 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables and in Figure 46 the trends in net profit per vessel and the ratio between current revenue and break-even revenue (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the fuel price of ±20% compared to the estimated price for 2022.

Table 23 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Purse seiners 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	75,859	72,622	59,489
Fuel cost per vessel	15,551	17,772	30,904
Labour cost per employee	6,387	6,207	5,202
Net profit per vessel	27,526	25,547	17,739

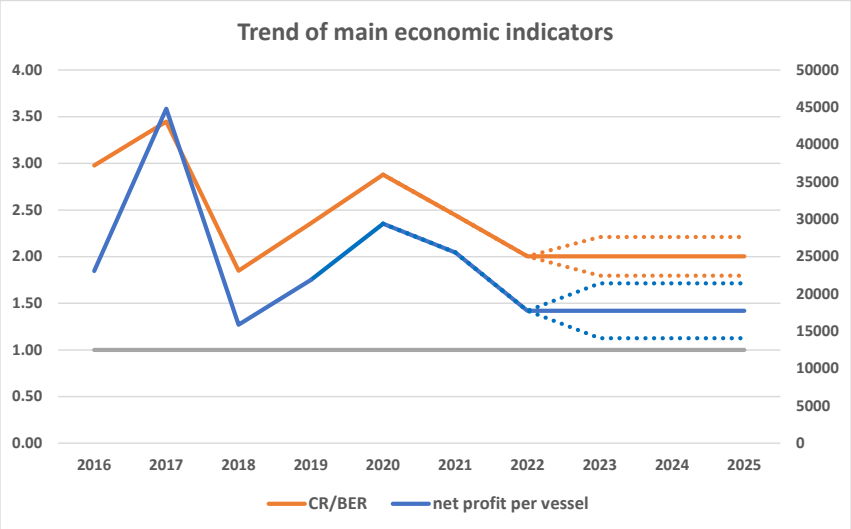


Figure 46 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Purse seiners 12–18m in length at national level (values in euros).

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic, shows an increase of 14% for 2021 and about 100% for 2022. Despite considerable increases in fuel costs, labour costs per employee are expected to contract by only 3% in 2021 and 19% in 2022. Value added per vessel and net profit per vessel are also expected to decrease compared to the base period by 4% and 7% respectively in 2021 and 22% and 36% respectively in 2022 (Table 23).

The net profit per vessel in 2021 onwards, although reduced compared to the base period 2017–2019, shows values in line with those of previous years (Figure 46). The increased number of fishing days, expected after the initial shock linked to the outbreak of the pandemic, have partially offset the increases in fuel cost. The CR/BER, follows the same trend of profits (Figure 46) decreasing from the average value of 2.55 in the base period to 2.00 in 2022, and remaining significantly above 1. The economic performance of this fleet segment can therefore be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: purse seiners 1824

In 2020, the purse seiner 18–24m segment consisted of 41 active vessels with a total turnover of approximately €6.7 million. In the reference period 2017–2019, the net profit stood at €3.1 million per year, on average, equivalent to about €53 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 103, which decreased to 76 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022. Table 24 shows the estimated values for the years 2021 and 2022 compared to the average values of the reference period (2017–2019) for the main economic variables and in Figure 47 the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the fuel price of ±20% compared to the estimated price for 2022.

Table 24 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Purse seiners 18–24m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	181,906	181,460	159,734
Fuel cost per vessel	27,616	29,401	51,127
Labour cost per employee	9,124	9,095	8,183
Net profit per vessel	53,020	53,458	40,454

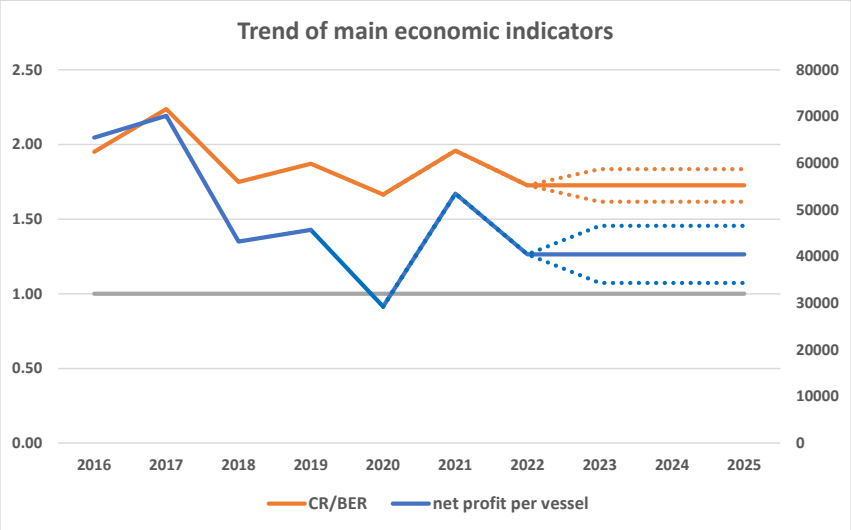


Figure 47 - Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Purse seiners 18–24m in length at the national level (values in euros).

The fuel cost per vessel, influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic, shows an increase of 6% for 2021 and 85% for 2022. Despite significant increases in fuel costs, labour costs per employee are expected to be almost unchanged in 2021 compared to the 2017–2019 average. In 2022, a reduction of 10% is expected. This is clearly linked to the lower incidence of fuel costs on revenues for vessels using less energy-intensive fishing techniques. Value added per vessel and net profit per vessel are also almost unchanged in 2021 compared to the base period; while in 2022 they show reductions of 12% and 24%, respectively (Table 24).

Net profit per vessel in 2021 and subsequent years, although reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 47). The greater number of fishing days, expected after the initial shock linked to the outbreak of the pandemic, seems more than a strategy to counterbalance the increases in the fuel cost. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 47), and, while decreasing from the average value of 1.95 in the base period to 1.73 in 2022, it still remains above 1. The economic performance of this fleet segment can therefore be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: purse seiner 2440

In 2020, the purse seiner segment between 24 and 40 metres in length consisted of 32 active vessels generating a total turnover of about €13.9 million. In the 2017–2019 reference period, net profit amounted to €3.8 million per year, on average, equivalent to about €105 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 115, decreasing to 85 in 2020.

Table 25 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 48 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR /BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) from 2023 in the fuel price compared to the estimated price for 2022.

Table 25 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Purse seiners 24–40m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	377,796	369,664	304,406
Fuel cost per vessel	72,042	88,309	153,567
Labour cost per employee	11,886	11,404	9,505
Net profit per vessel	105,616	103,286	63,312

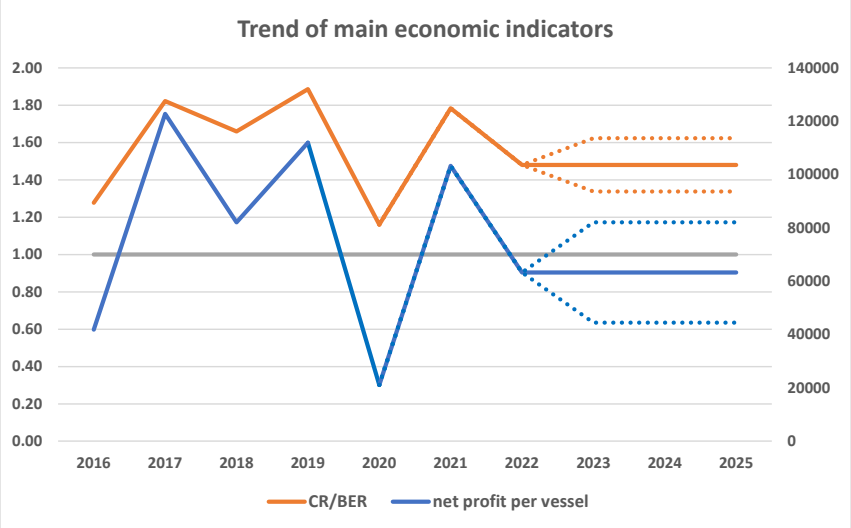


Figure 48 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Purse seiners 24–40m in length at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days, which are assumed to return to the average values before the outbreak of the pandemic—shows an increase of 23% for 2021 and 113% for 2022. Despite considerable increases in fuel costs, labour costs per employee are expected to decrease by only 4% in 2021 and 20% in 2022. Compared to the base period, value added per vessel and net profit per vessel are also expected to decline both by 2% in 2021 and by 19% and 40%, respectively, in 2022 (Table 25).

Net profit per vessel in 2021 onwards, although reduced compared to the base period 2017–

2019, shows higher values than in 2020 (Figure 48). The greater number of fishing days, expected after the initial shock linked to the outbreak of the pandemic, seems more than a strategy to counterbalance the increases in fuel cost. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 48), and, while decreasing from the average value of 1.79 in the base period to 1.48 in 2022, still remains above 1. The economic performance of this fleet segment can therefore be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: purse seiners 40XX

In 2020, the purse seiner segment of vessels longer than 40 metres consisted of 12 active vessels generating a total turnover of about €17.6 million. In the reference period 2017–2019, the net profit stood at €13 million per year, on average, equivalent to about €1.3 million per vessel. On average, in the period 2017–2019, the days of activity per vessel were 22, decreasing to 15 in 2020.

Table 26 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 49 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) from 2023 in the fuel price compared to the estimated price for 2022.

Table 26 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Purse seiners greater than 40m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	230,6248	2,176,100	2,113,338
Fuel cost per vessel	85,487	84,933	147,695
Labour cost per employee	46,752	45,590	44,318
Net profit per vessel	1,293,364	1,188,040	1,144,150

The fuel cost per vessel, influenced both by the increase in the diesel price of and by the expected change in the number of fishing days, shows values in line with the base period for 2021; while for 2022 an increase of more than 70% is expected. Despite these increases in fuel costs, labour costs per employee are expected to contract by only 2% in 2021 and 5% in 2022. Compared to the base period, limited reductions are also expected for value added per vessel and net profit per vessel: by 6% and 8%, respectively, in 2021, and by 8% and 12%, respectively, in 2022 (Table 26).

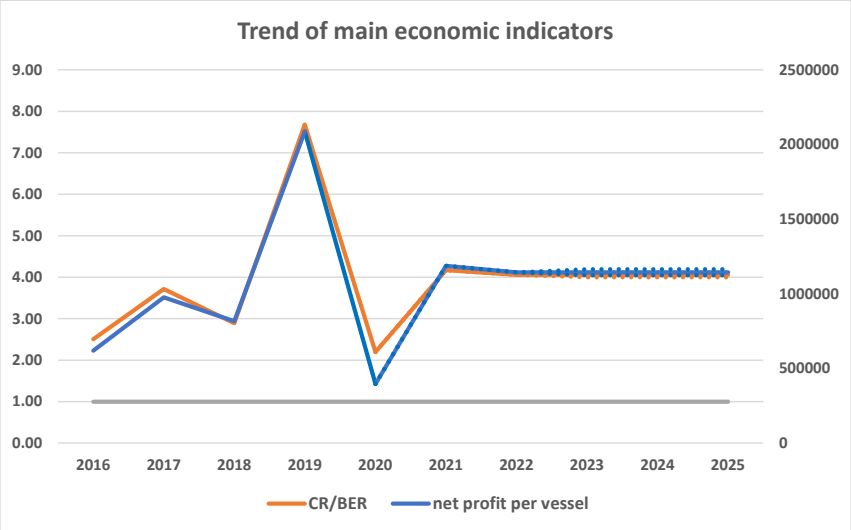


Figure 49 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Purse seiners greater than 40m in length at the national level (values in euros).

Net profit per vessel in 2021 and subsequent years, although slightly reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 49). The greater number of fishing days seems to be more than just offsetting the increases in fuel costs. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 49) and, while decreasing from the average value of 4.76 in the base period to 4.06 in 2022, remains significantly above 1. The economic performance of this fleet segment can certainly be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: beam trawlers 1218

In 2020, the beam segment of length between 12 and 18 metres were composed of 14 active vessels generating a total turnover of €1.6 million. In the reference period 2017–2019, net profit showed a decreasing trend going from about €300 thousand per year in 2017 and 2018 to a loss of about €37 thousand in 2019. On average, in the period 2017–2019, the days of activity per vessel were 101, rising to 114 in 2020. In the following years, fishing days by vessel are expected to decrease further as a result of the management measures placed to reduce fishing effort, particularly in the Adriatic. These effort limitations are expected to translate into an average figure for this fleet segment of 60 days of operation in 2021 and 58 days from 2022 onwards.

Table 27 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables. Figure 50 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming onwards a range of

variation (±20%) in the fuel price from 2023 compared to the estimated price for 2022.

Table 27 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Beam trawlers 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	73,992	28,907	7,378
Fuel cost per vessel	37,670	28,179	47,534
Labour cost per employee	13,064	5,822	2,997
Net profit per vessel	20,626	-5,073	-17,484

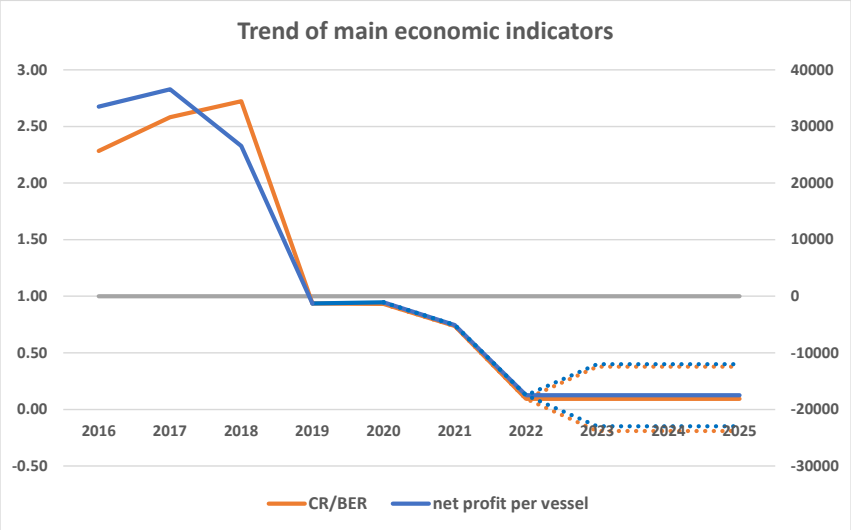


Figure 50 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Beam trawlers 12–18m in length at the national level (values in euros).

The fuel cost per vessel, positively influenced by the increase in the fuel price and negatively by the reduction in the number of fishing days as a result of management measures, shows a reduction of 25% for 2021 and an increase of 26% for 2022. In 2021, the model predicts that the reduction in fishing days will produce a reduction in fuel consumption resulting in a reduction in fuel costs per vessel. In 2022, the spike in diesel prices will result in very high fuel costs for the fleets.

Despite the reduction in fuel costs for 2021, the cost of labour per employee is still expected to decrease by more than 50%. This reduction is due to lower revenues resulting from the limitations on fishing days imposed at the management level. The decrease in labour costs per employee becomes even more significant from 2022, reaching almost 80% as a result of the increase in fuel costs. Compared to the reference period, value added per vessel follows a similar trend to that of labour costs per employee with expected reductions of 61% in 2021 and 90% in 2022. For the net profit (which compared to the added value also considers the

other costs), a negative value was already expected in 2021, and then it will worsen further in 2022 and result in a loss of about €17 thousand per vessel (Table 27).

Net profit per vessel shows significant reductions in both 2021 and 2022; reductions that are added to an already crisis situation with loss-making economic results since 2019 (Figure 50). The CR/BER, which measures the economic sustainability of fishing activity, also follows a trend similar to that of profits (Figure 50) with values below 1 already in 2019 and 2020, which worsen further in 2021 and 2022 reaching almost zero. The CR/BER therefore confirms the presence of a condition of unsustainability from an economic point of view with a serious risk of closure of the fishing activity.

Fleet segment: beam trawlers 1824

In 2020, the beam trawler segment with vessels between 18 and 24 metres were composed of 23 active vessels generating a total turnover of €4.6 million. In the reference period 2017–2019, net profit showed a fluctuating trend going from over €1 million in 2018 to a loss of over €800 thousand in 2019. On average, in the period 2017–2019, the days of activity per vessel were 147, down to 129 in 2020. In the following years, fishing days by vessel are expected to decrease further as a result of the management measures imposed to reduce fishing effort, particularly in the Adriatic. These effort limitations are expected to translate into an average figure for this fleet segment of 87 days of operation in 2021 and 84 days from 2022 onwards.

Table 28 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables. Figure 51 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) in the fuel price from 2023 compared to the estimated price for 2022.

Table 28 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Beam trawlers 18–24m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	142,962	52,105	-2,269
Fuel cost per vessel	102,634	71,575	120,738
Labour cost per employee	15,784	8,584	4,025
Net profit per vessel	8,558	-49,676	-83,930

The fuel cost per vessel—positively influenced by the increase in the fuel price and negatively by the reduction in the number of fishing days as a result of management measures—shows a reduction of 30% for 2021 and an increase of 18% for 2022. In 2021 the model predicts that the reduction in fishing days will produce a reduction in fuel consumption and fuel costs per vessel. On the contrary, further increases in the diesel price will result in higher fuel costs in 2022.

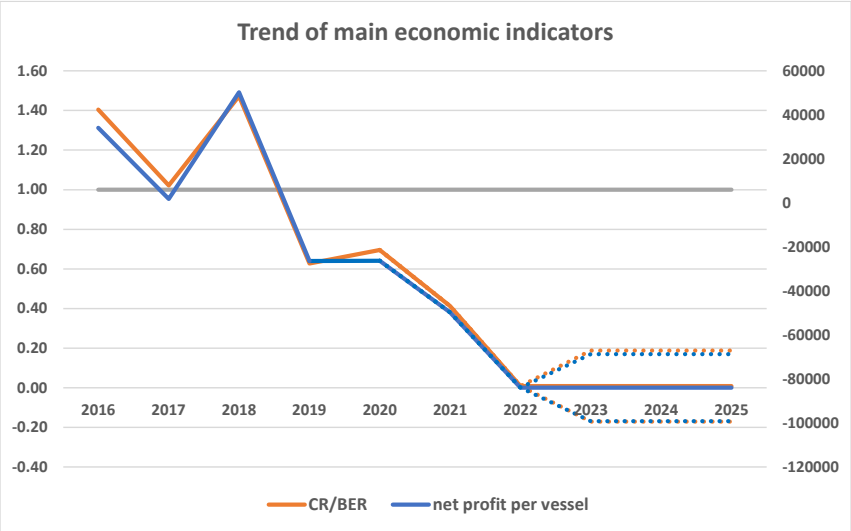


Figure 51 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Beam trawlers 18–24m in length at the national level (values in euros).

Despite the reduction in fuel costs for 2021, labour costs per employee are still expected to fall by 46%. This reduction is due to lower revenues resulting from the limitations on fishing days imposed at the management level. The decrease in labour costs per employee becomes even more significant from 2022 onwards, reaching 74% as a result of the increase in fuel costs. Compared to the basic period, value added per vessel follows a similar trend to that of labour costs per employee with more marked expected reductions. In particular, the model estimates a reduction of 64% in 2021 and more than 100% in 2022, i.e. the complete cancellation of added value. For net profit, which compared to value added also includes other costs, negative values are expected in both 2021 and 2022, when the theoretical loss would stand at €84 thousand per vessel (Table 28). Clearly, this would be an untenable situation which would lead to the interruption of fishing activity.

Net profit per vessel shows significant reductions in both 2021 and 2022; reductions that follow a negative trend that began already in 2019. The planned reductions would add to an already very critical situation with negative economic results (Figure 51). The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 51) with values below 1 already in 2019 and 2020, which worsen further in 2021 and 2022 reaching almost zero. The CR/BER therefore confirms the presence of a condition of unsustainability from an economic point of view with a serious risk of closure of the fishing activity.

Fleet segment: beam trawlers 2440

In 2020, the beam trawler segment with vessels between 24 and 40 metres in length were composed of 20 active vessels generating a total turnover of €8.5 million. In the 2017–2019

reference period, net profit showed a fluctuating trend, going from almost €700 thousand in 2017 to a loss of over €20 thousand in 2018. On average, in the period 2017–2019, the days of activity per vessel were 175, and decreased to 138 in 2020. In the following years, fishing days by vessel are expected to further decrease as a result of the management measures to reduce the effort that concern in particular the Adriatic. These effort limitations are expected to translate into an average figure for this fleet segment of 175 days of operation in 2021 and 171 days from 2022 onwards.

In the face of rising fuel prices and changes in fishing days, the forecast model estimated the likely impacts for 2021 and 2022. Table 29 shows the estimated values for these years compared to the average values of the base period (2017–2019) for the main economic variables. Figure 52 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) in the fuel price from 2023 compared to the estimated price for 2022.

Table 29 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Beam trawlers 24–40m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	247,974	234,845	98,306
Fuel cost per vessel	171,572	179,237	304,081
Labour cost per employee	24,063	24,532	13,369
Net profit per vessel	23,726	10,445	-67,579

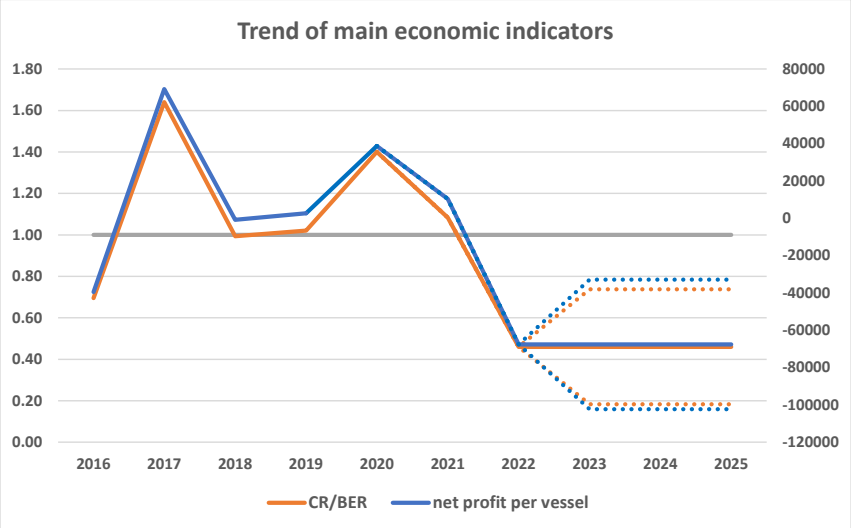


Figure 52 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Beam trawlers 24–40m in length at the national level (values in euros).

The fuel cost per vessel—positively influenced by the increase in the fuel price and negatively by the reduction in the number of fishing days as a result of management measures—shows an increase of 4% for 2021 and 77% for 2022. In the face of fuel cost increases, which negatively impact wages in a labour market dominated by the share contract, the cost of labour per employee is expected to be stable in 2021 and result in a sharp contraction (-44%) in 2022. Compared to the base period, value added per vessel is expected to fall slightly by around 5% in 2021 followed by a sharp decline of 60% in 2022. Net profit, which compared to value added also includes other costs, is expected to reduce by 56% in 2021, and then worsen further and record a loss in 2022 of over €67 thousand per vessel (Table 29). Clearly, this would be an unsustainable situation which would lead to the interruption of fishing activity or worse.

Net profit per vessel shows significant reductions in both 2021 and 2022; reductions that would add to an already difficult situation with negative or close to zero economic results (Figure 52). The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 52), with values below 1 already in 2016 and 2018. The further deterioration expected, particularly in 2022, would bring the indicator down to 0.46, a value below 1. The CR/BER therefore indicates that the fleet segment is proceeding towards a condition of economic unsustainability with a risk of closure of fishing activity.

Fleet segment: pelagic trawlers 1218

In 2020, the pelagic trawler segment of vessels between 12 and 18 metres in length were composed of 31 active vessels generating a total turnover of about €7.4 million. In the reference period 2017–2019, the net profit stood at €5 million per year on average, equivalent to about €140 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 136, decreasing to 123 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022. Table 30 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 53 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming from 2023 onwards a range of variation in the fuel price of ±20% compared to the estimated price for 2022.

Table 30 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Pelagic trawlers 12–18m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	296,883	317,305	273,669
Fuel cost per vessel	56,676	59,050	102,686
Labour cost per employee	30,455	32,894	29,089
Net profit per vessel	140,823	153,086	127,254

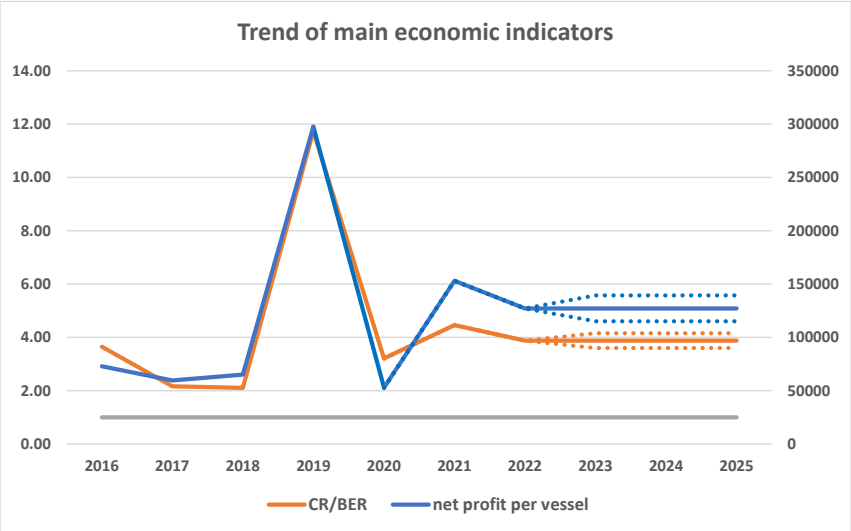


Figure 53 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Pelagic trawlers 12–18m in length at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days (which are assumed to return to the average values before the outbreak of the pandemic)—shows an increase of 4% for 2021 and 81% for 2022. Despite these increases in fuel costs, labour costs per employee are expected to increase by 8% in 2021. In 2022, a slight contraction of 4% is expected. Compared to the base period, value added per vessel and net profit per vessel are also expected to increase by 7% and 9% respectively in 2021; while reductions of 8% and 10% are expected in 2022 (Table 30) respectively.

Net profit per vessel in 2022 and subsequent years, although slightly reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 53). The greater number of fishing days is more than offsetting the increases in fuel costs. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 53). This indicator, while shrinking from the average value of 5.34 in the base period to 3.88 in 2022, remains significantly above 1. The economic performance of this fleet segment can certainly be considered sufficient to ensure the continuity of fishing activity.

Fleet segment pelagic trawlers 1824

In 2020, the pelagic trawler segment with vessels between 18 and 24 metres in length was composed of 22 active vessels generating a total turnover of about €6.6 million. In the reference period 2017–2019, the net profit stood at about €5 million per year on average, equivalent to about €104 thousand per vessel. On average, in the period 2017–2019, the days of activity per vessel were 153, decreasing to 142 in 2020.

In the face of the increase in the price of fuel, the forecast model has estimated the likely impacts for 2021 and 2022. Table 31 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 54 gives the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR /BER) from 2017 to 2020 and those expected from 2021 to 2025, assuming a range of variation (±20%) in the fuel price from 2023 compared to the estimated price for 2022.

Table 31 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Pelagic trawlers 18–24m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	295,754	279,740	209,211
Fuel cost per vessel	78,398	95,443	165,972
Labour cost per employee	25,076	23,925	18,864
Net profit per vessel	103,771	94,488	53,137

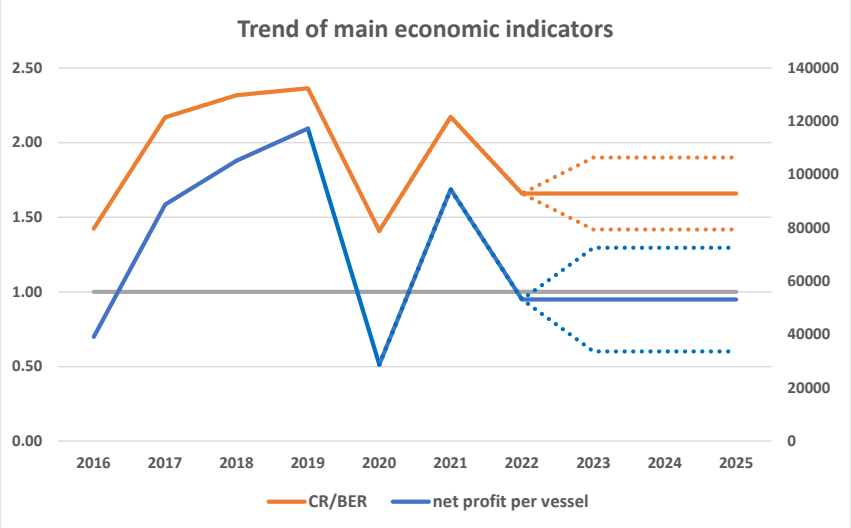


Figure 54 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Pelagic trawlers 18–24m in length at the national level (values in euros).

The fuel cost per vessel—influenced both by the increase in the diesel price and by the expected increase in the number of fishing days (which are assumed to return to the average values before the outbreak of the pandemic)—shows an increase of 22% for 2021 and 112% for 2022. Despite considerable increases in fuel costs, labour costs per employee are expected to contract by only 5% in 2021 and 25% in 2022. Compared to the base period, value added per vessel and net profit per vessel are also expected to decline by 5% and 9%, respectively, in 2021, and by 29% and 49%, respectively, in 2022 (Table 31).

The net profit per vessel in 2021 and subsequent years, although reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 54). The greater number of fishing days, expected after the initial shock linked to the outbreak of the pandemic, would seem more than to counterbalance the increases in the fuel cost. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 54) and, while decreasing from the average value of 2.28 in the base period to 1.66 in 2022, still remains above 1. The economic performance of this fleet segment can therefore be considered sufficient to ensure the continuity of fishing activity.

Fleet segment: pelagic trawlers 2440

In 2020, the pelagic trawler segment between 24 and 40 metres in length was composed of 37 active vessels generating a total turnover of about €13.6 million. In the reference period 2017–2019, the net profit stood at about €3.2 million per year on average, equivalent to about €86 thousand per vessel. On average, in the period 2017–2019, the days at sea per vessel were 144, decreasing to 124 in 2020.

In the face of fuel price increases, the forecast model has estimated the likely impacts for 2021 and 2022. Table 32 shows the estimated values for the years 2021 and 2022 compared to the average values of the base period (2017–2019) for the main economic variables. Figure 55 shows the trends in net profit per vessel and the ratio between current revenues and break-even revenues (CR/BER) from 2017 to 2020 as well as those expected from 2021 to 2025, assuming a range of variation (±20%) in the fuel price from 2023 compared to the estimated price for 2022.

Table 32 – Nowcast figures for 2021 and 2022 and average value 2017–2019 of the main economic indicators. Pelagic trawlers 24–40m in length (values in euros).

Variable	Average 2017–2019	2021	2022
Value added per vessel	288,597	248,595	134,336
Fuel cost per vessel	113,384	154,620	268,879
Labour cost per employee	18,443	16,357	10,120
Net profit per vessel	86,320	60,047	-10,569

The fuel cost per vessel—influenced both by the increase in the fuel price and by the expected increase in the number of fishing days (which were assumed to return to the average values before the outbreak of the pandemic)—shows an increase of 36% for 2021 and 137% for 2022. The considerable increases in fuel costs will undoubtedly have an impact on labour costs given the predominance of the share contract in the crew remuneration system. Considering the impact of fuel costs (as shown in the simulation model) on the calculation of wages, the cost of labour per employee is expected to contract by 11% in 2021 and 45% in 2022.

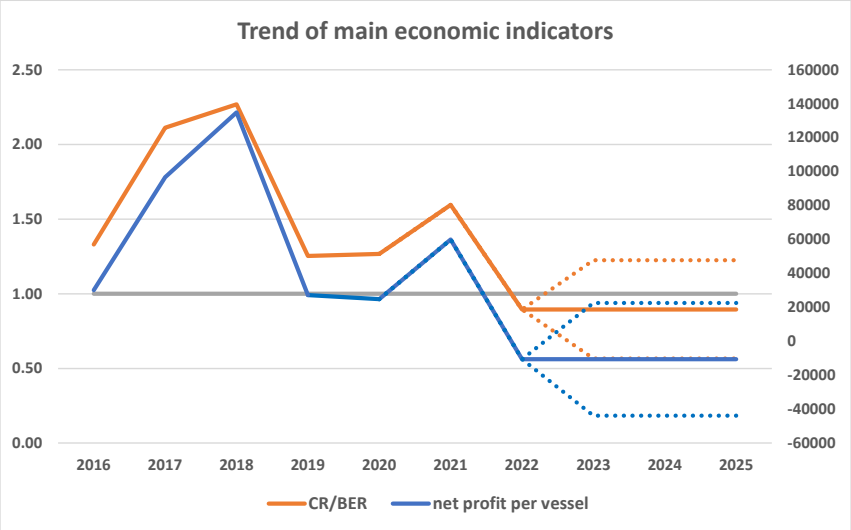


Figure 55 – Trends and forecast of the main economic indicators (±20% change in the fuel price from 2023). Pelagic trawlers 24–40m in length at the national level (values in euros).

Compared to the base period, value added per vessel is also expected to decrease by similar percentages: 14% in 2021 and 53% in 2022. The net profit per vessel, which compared to the added value also includes other costs, is expected to fall by 30% in 2021 and by more than 100% in 2022, resulting in a negative economic result (Table 32).

Net profit per vessel in 2021, although reduced compared to the base period 2017–2019, shows higher values than in 2020 (Figure 55). The greater number of fishing days, expected after the initial shock linked to the outbreak of the pandemic, would seem to have more than offset the increases in fuel costs in 2021. From 2022, however, the further increase in the fuel price will lead to a significant reduction in profits, which will become negative. The CR/BER, which measures the economic sustainability of fishing activity, also follows a similar trend to that of profits (Figure 55), with an increase in 2021 compared to 2020 and the subsequent contraction from 2022 onwards. If the CR/BER is even greater than 1 in 2021, then from 2022 it would fall to 0.90 thus highlighting economic unsustainability with a consequent risk of closure of fishing activity.

4. Ex-post evaluation of the impact on the seafood sector of the pandemic in the period 2020–2021

4.1 State aid

In 2020 and 2021, European and national institutions approved a number of financial measures to mitigate the impact of the COVID-19 pandemic on the fisheries sector, particularly through the provision of more flexible state aid rules. In light of the socio-economic impact caused by the COVID-19 emergency in all EU Member States, the European Commission has adopted the "Temporary framework for state aid measures to support the economy in the current COVID-19 emergency". In March 2020, the Commission, as part of the urgent relief measures in response to the pandemic, issued Reg. (EU). 2020/420, further supplemented by Regulations (EU) 2020/558 and 2020/560 which provided greater flexibility in the use of the Structural Funds, namely the European Maritime and Fisheries Fund (EMFF), to support economic activities. The covid temporary framework was amended on 3 April, 8 May, 29 June, 13 October in 2020, and on 28 January and 18 November in 2021.

The Italian measures mainly included compensation measures for the suspension of fishing activities following the health emergency, covering the period between 1 February and 31 December 2020, not subject to the funding limit applicable to other cases of temporary interruption and to vessels that had already reached the 6-month limit provided for in Article 33 of the EMFF Regulation.

Another measure concerned the amendment of Article 67 of the EMFF Regulation, in support of producer organisations (PO), for the temporary storage of fishery and aquaculture products intended for consumption: the ceiling for their production and marketing plans provided for in Article 66 were increased from 3% to 12% of the average annual value of production placed on the market. In addition, the simplification of the procedures for amendments to Member States' operational programmes has allowed for a rapid reallocation of available financial resources by Member States.

At the end of January 2022, the European Commission authorised the extension of the aid scheme until 30 June 2022 and the allocation of an additional €500 million for anti-crisis support to companies, also providing for the application of the new aid ceilings established in November 2022 with the sixth amendment of the temporary framework and implemented in Italy by the *Sostegni ter* Legislative Decree.

With regard to the form of the concessions, the aid scheme for companies active in the agricultural, forestry, fisheries, and aquaculture sectors (Ministerial Decree no. 57681 of 08/02/2022) provided for the granting of direct subsidies, repayable advances, tax incentives, reduction or cancellation of the payment of social security and welfare contributions, cancellation of debts to the Public Administration and other payment facilities for a total amount of aids (including all taxes and other charge) not exceeding €2,300,000.

The aid granted under the measure may be cumulated with aid under the *de minimis* regulations provided over three financial years, equal to €30 thousand for fisheries and aquaculture, but which must not exceed the new ceilings provided for by the Temporary

Framework, equal to €345 thousand for each company active in the fisheries and aquaculture sector. In addition, companies that have suffered a decrease in turnover of at least 30% compared to the same period of 2019 are granted aid to cover fixed costs not covered and actually incurred as well as aid for losses incurred between 1 March 2020 and 30 June 2022, excluding one-off losses.

4.2 Economic performance

The fishing sector was significantly affected especially in the first months of lockdown when, despite the fact that fishing activity was one of the essential economic activities and therefore not officially interrupted, the closure of Horeca services (Hotels, Restaurants, Catering) and many fish markets, the difficulties in adopting the health measures on board and, in general, the severe restrictions on movement initially led to a sharp reduction in demand for fresh fish products and the interruption or postponement of fishing activity. Overall, in 2020, a 24% overall reduction in sea days compared to 2019 was estimated, compared to a 6% contraction in the number of active vessels.

Between 2019 and 2020, the number of vessels engaged in large-scale fishing (LSF) decreased by 13%. In the same period, a 23% reduction in activity in terms of fishing days was reported. The fleet segments with the greatest reduction in the number of fishing days were those related to demersal trawling (DTS). A similar percentage reduction in days of activity was also recorded for small-scale coastal fishing (SSF) vessels operated by vessels of less than 12 metres in length that do not use towed gear, although the fleet remained stable over the 2 years considered.

Fishing effort plummeted in the first weeks of the lockdown. In the following months, fishermen adapted rapidly to changing market conditions, shortening the value chain through direct sales and e-commerce, changing target species, and turning more towards species destined for local markets or to those that could more easily be transformed and sold at a later time. Thanks to this adaptability, as well as to the measures put in place by the government, the dramatic initial impacts began to fade towards the summer of 2020 and, in many contexts, production returned to pre-crisis levels (FAO, 2020).

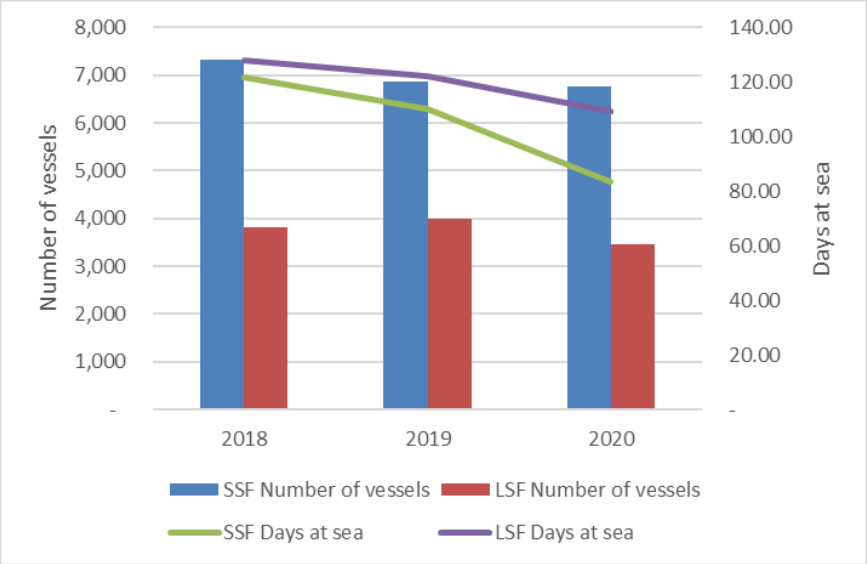


Figure 56 –Trend on the number of vessels and sea days of small-scale fishery (SSF) and large-scale fishery (LSF).

Looking at the trend of landings differentiated between small-scale coastal fishing (SSF) and large-scale fishing activities (LSF) it is possible to observe how the economic repercussions of the lockdown have variously affected the sector. Thus, if the total value of landings decreased from almost €900 million in 2019 to just over €650 million in 2020, equal to a volume of landings of 140 thousand tonnes, the reduction in production has mostly affected large-scale fishing (LSF), which has suffered a decrease of about a third compared to 2019 in landings, both in terms of value and quantities landed.

The trend in the value of landings between 2019 and 2020 of small-scale coastal fishing was stable, which instead decreased compared to 2018 by 12%. However, significant differences were highlighted between the geographical areas also for small-scale coastal fishing, with greater decreases in southern Sicily and smaller decreases in Adriatic Puglia (Sabatella et al., 2020). This disparity is linked to fishing effort; in fact, with the exception of the first 2 weeks of lockdown, fishing activities in some areas have returned to the average level of the period before COVID-19, while in others the stop has lasted longer. The different behaviours were largely determined by the different existing commercial structures and sales systems, with the fishing ports that rely on tourism being the most affected. Small-scale coastal fishing active in the Adriatic Sea in the weeks of closure suffered a 30% reduction in both landings and profits in the first weeks of lockdown, while small trawlers recorded an 85% decrease in landings and profits during the same period (Russo et al., 2021).

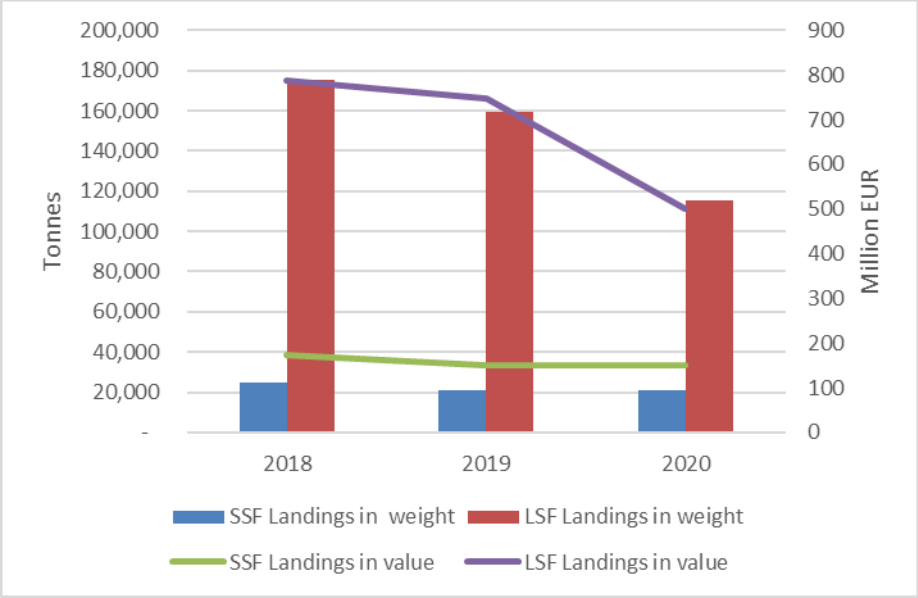


Figure 57 –Trends in landings in terms of value and landings of the small-scale fishery (SSF) and large-scale fishery (LSF)

Similar to the trend in sales revenues, the total value added produced in 2020 fell by 25%, from over €650 million in 2019 to €422 million in 2020. However, this result has to be referred exclusively to large-scale fisheries (LSF) whose added value has contracted by more than a third, going from about €450 million in 2019 to €303 million in 2020. In the same graph, it is interesting to observe the opposite trend of subsidies granted to shipowners including subsidies for the temporary cessation of fishing activities and compensation schemes to support fishing companies affected by the COVID-19 outbreak.

In 2020, 81% of these subsidies were allocated to larger vessels (LSF), reaching €18 million, compared to €4.3 million for small-scale coastal fishing vessels (SSF). As previously specified, these are one-off emergency aid measures, aimed at supporting economic activity for limited periods in which companies, alone, cannot sustain the surge in costs in the face of a sharp contraction in revenues (Doering et al. 2021).

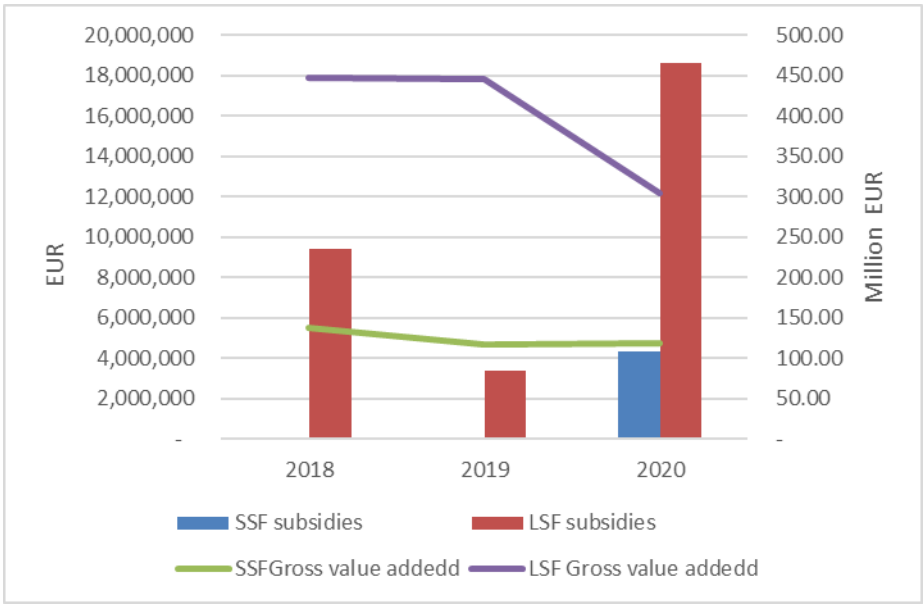


Figure 58 – Trend on subsidies and gross value added of small-scale fishery (SSF) and large scale fishery (LSF)

In 2020, the number of employees further declined, falling below the threshold of 10,000 person for small-scale coastal vessels and equal to 11,500 persons on large-scale vessels. The trend in decreased working hours is even stronger when considered for more than the 3 years covered in this report: reducing by a third for LSF and a half for SSF.

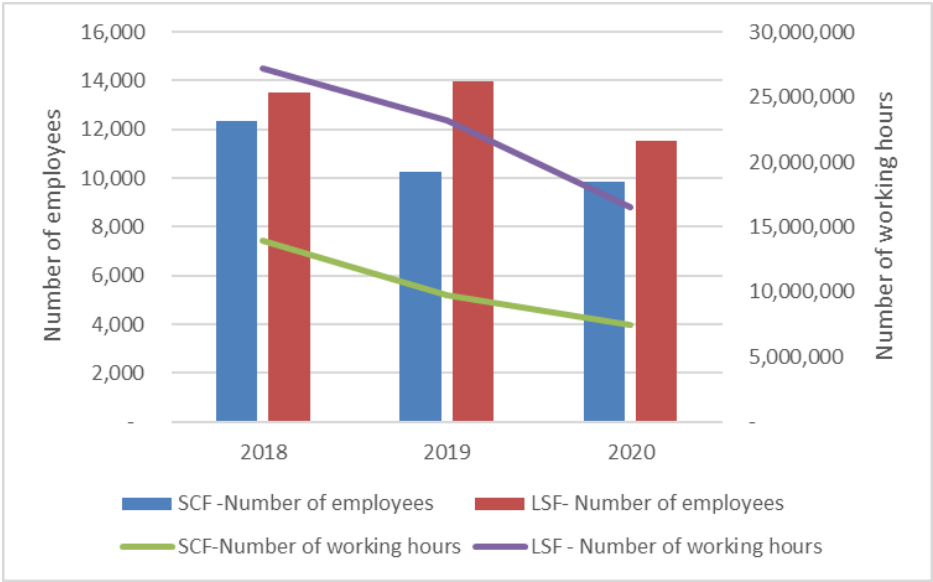


Figure 59 – Trends on number of employees and working hours in the small-scale fishery (SSF) and large-scale fishery (LSF)

The greater resilience of small-scale coastal fishing to the COVID-19 crisis is also reflected in the trend of average sales prices, which in 2020 recorded a slight increase compared to the previous 2 years. On the contrary, the first selling prices of LSF decreased by 8%, reaching €4.33/kg in 2020.

Small vessels were more likely to provide fresh produce of higher value, with shorter, more concentrated value chains based on direct selling. For example, FLAG (Fisheries Local Action Groups) have implemented some measures to support fishermen in diversifying their sales channels. These initiatives have allowed them to supply a fairly large number of consumers interested in home delivery and also to attract new customers who had never previously tried zero-kilometre food and home delivery. Some large-scale fleets have also been particularly affected by the decline in exports to some important markets, such as Spain and Germany, which were mostly closed especially in the first wave of COVID-19 in Europe (March–June) (FAO, 2020). Cold storage was commonly used to stabilise prices when import markets were closed or when demand was low, resulting in only modest decreases in first-sale prices compared to 2019 (STECF, 2021).

First-sale prices of some of the most important target species such as deepwater rose shrimp (DPS), clams (SVE), anchovies (ANE), and sardines/pilchards (PIL) showed a negative trend, while average prices of hake (HKE), Norway lobster (NEP), common sole (SOL), and common cuttlefish (CTC) remained rather stable compared to 2019, despite the sharp reduction in the quantities landed in 2020 (-50% in the case of hake). Blue and red shrimp (ARA) and Gian red shrimp (ARS) were the species with the highest prices (€29.26/kg and €21.07/kg, respectively), which increased by over 20% when compared to 2019.

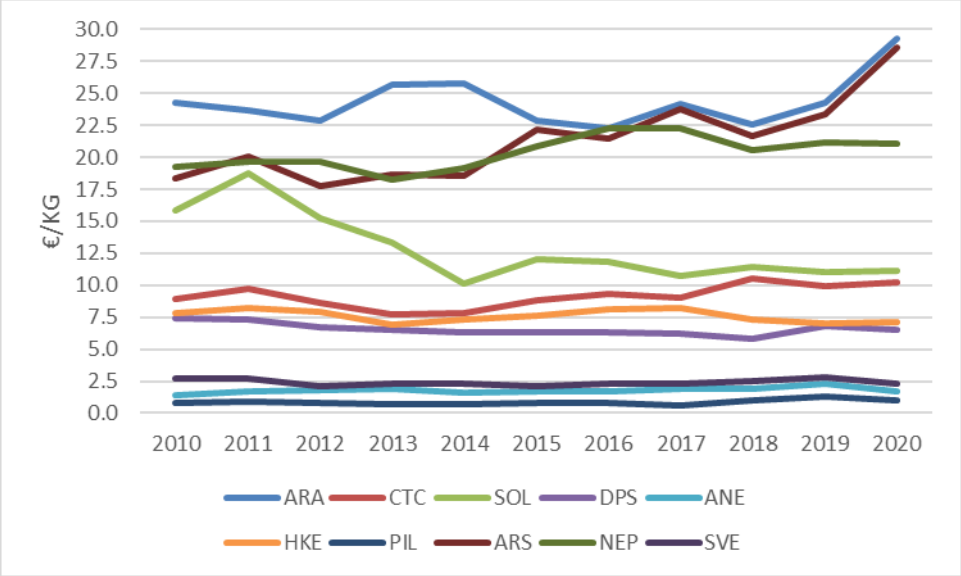


Figure 60 –Trends on average prices for the top species in landed weight and value

Source: STECF 22-06 – EU Fleet Economic and Transversal data

4.3 The impact of the economic downturn on the consumption of fish products

Although the fisheries sector has experienced a decline in catches, producer prices have remained at very low levels; rather than reflecting increases in operating costs, the latter remained stable or even fell, preventing fishing companies from introducing cost increases downstream of the supply chain. In addition, there was a low level of domestic demand due to the decline in household fish consumption in 2020.

Due to the contraction of domestic demand, in 2020 the deficit of the fish trade balance recorded a reduction (-13.1%), falling to €4,500 million. For the first time since 2011, imports decreased (-8.5% in volume and -11.7% in value). Distinguishing between fresh and processed products, the former recorded a decrease of 16% in 2020 and the latter recorded an increase of 4.6% compared to 2019 (BMTI, 2021). The increase was driven by the surge in sales of frozen products (+14.5%). Preserved fish (mainly canned tuna) recorded a + 4.2% increase in sales in 2020 compared to the previous year (ISMEA, 2021)

2020 was also a negative year for exports of fish products, which decreased by 2.3% in volume and 1.8% in value, thus falling to 124 thousand tonnes resulting in a total income of about €700 million. The decline in exports was influenced by the fall in both foreign demand and Italian fish production. However, in terms of volumes of value, a substantial long-term negative trend for fresh fish products and a strong upward trend in exports of processed products is highlighted (BMTI, 2021)

Table 33 – Main economic indicators of the fishing sector in 2019 and 2020.

	Volume		Value	
	Thousand tonnes		Million EUR	
	2019	2020	2019	2020
Domestic production (a)	180	136	896	651
Import (b)*	1049	960	5889	5200
Export (b)*	127	124	713	700
Trade balance	-922	-836	-5176	-4500
Household consumption	334	308	3.456	3.225

Source: a) FDI. b) BMTI, 2021

The unfavourable internal situation in Italy has also led to a general reduction in food consumption, which has also affected fish products. Indeed, in 2020, domestic consumption

of fish products fell by 6.7% compared to 2019, going from €3,456 million to €3,225 million.

In 2021, expenditure is estimated to grow by 15%, thanks to the over 40% increase in the sales prices of molluscs and crustaceans, thus confirming a positive trend started in previous years. Spending in the fish segment also recovered, after the slight decline in 2020, due in part to a lesser demand as well as reduced supply. During 2021, the easing of restrictions has therefore given new impetus to fish consumption and in particular to gourmet products, such as salmon and crustaceans (ISMEA, 2021).

Conclusion

The fuel cost and the cost of labour represent the most important items of expenditure for fishing companies; the variability of the price of fuel makes this cost item extremely unstable, positively or negatively affecting the profitability of fishing activities in the short and medium term.

Overall, the EU fleet became more fuel efficient from 2008 to 2020. The amount of fuel consumed per tonne landed has sharply decreased since 2014 (Stecf, 2022). At the European level, positive results induced by changes in fishing practices (speed limits or limited drag duration) in addition to technological improvements to vessel or fishing gear have been highlighted in several studies (Bastardie, 2013 and 2020). These changes have led to improvements in energy efficiency and consequent positive effects on profitability. However, this virtuous trend was not seen among the Italian fishing fleets. Instead, the data showed a worsening of the indicator relating to the fuel use intensity (FUI); in fact, daily fuel consumption has steadily increased since 2014 following the reduction in the unit fuel cost. In parallel, productivity has not increased and this has led the sector to become increasingly energy-intensive. Indeed, in recent years there has been a lack of investments aimed at reducing fuel consumption and, in general, few evidences of responsible behaviours among fishermen regarding fuel use.

Since fuel prices and labour costs represent the most significant cost items in the sectoral income statement and show large short-term variations, they are often perceived by fishermen, administrators, and researchers as being the most important factors driving the profitability of the fisheries sector. (Guillen, 2016). However, fishers are unable to pass the cost increases onto consumers by raising the fish price. In the years 2008 to 2020, fuel prices increased more than the first sale price; therefore, the greatest point of weakness for the sector can be identified in the scarce (or nil) capacity to intervene in the value chain.

The analysis of fuel consumption data has made it possible to identify the most economically efficient and environmentally sustainable production methods. The investigation was based on the calculation of two indicators: fuel use intensity (FUI) and fuel use efficiency (FUE). The most energy-intensive fleet segment was trawling with fuel consumption per tonne of landings proportionally increasing according to the size of the vessel. Purse seiners' and beam trawlers' fuel use per tonne landed is relatively low in contrast to their very low economic efficiency. The high levels of catches per day of fishing and the lower commercial value of landings explain these data. The analysis of the fuel use by the different types of fisheries also seems to indicate that while small vessels using passive gears (PG) consume less fuel in absolute terms, they are not necessarily more fuel efficient than larger vessels, particularly those targeting pelagic species. This element would seem somewhat counterintuitive, as small vessels fish closer to the coast using mainly passive gears. The reason may be that the CPUE is lower, meaning large vessels with pelagic trawls are capable of catching large numbers of fish with a relatively low fuel intake.

The data presented refer to average values for each fleet segment. However, it should be noted that each vessel behaves differently, despite operating with similar equipment (Sala, 2022).

Operating techniques and distances from fishing areas, as well as the size of the vessels and the characteristics of the hull and equipment, affect the amount of fuel consumed. Substantial differences in the intensity of fuel consumption also occur according to the target species. A recent study (Bastardie, 2022) has shown how the overall efficiency of fuel use reflects the situation of stocks. When the number of fish available for fishing is low due to overfishing, fishermen have to spend more effort and fuel to catch a certain amount of product. In the presence of stocks that are not overexploited, therefore, fuel consumption is reduced and company profits increase.

Estimates of the expected effects of the increases in the fuel price on the economic performance of the Italian fishing sector made it possible to quantify the economic losses deriving from the recent increases in the fuel cost; the evaluation of the economic and social impact of the increases in the fuel price was obtained by comparing the situation prior to such increases with that expected for subsequent years. The simulations were produced for each of the 21 segments into which the Italian fleet is divided and for which production, activity and socio-economic data are collected as part of the fisheries data collection programme in support of the Common Fisheries Policy of the European Union. Given the increase in the fuel price, the forecast model has estimated the expected impacts for 2021 and 2022. At the national level, the fuel cost per vessel for 2022 is expected to increase by 70% compared to the period 2017–2019, with an estimated one-third reduction in average wages, and an even more marked reduction of the net profit per vessel.

The CR/BER, which measures the economic sustainability of the fishing activity, is expected to decrease in the years of the simulation compared to the base period 2017–2019. In particular, the CR/BER should decrease from an average value of 1.76 in the base period to 1.52 in 2021 and to 0.52 from 2022 onwards. The expected CR/BER value in 2022 (less than 1) indicates that the average revenues will not be sufficient to cover costs, thus making fishing activity economically unsustainable. This condition, if continued over time, will inevitably lead to the cessation of the activity. The impact of expensive fuel on fishing activity will manifest itself in a diversified manner depending on the type of fishing practiced and the size of the vessel. The fishing techniques most affected by a more expensive fuel will be demersal trawling, beam trawling, and midwater pair trawling; while for dredgers, small-scale fisheries, and purse seiners, the deterioration in economic performance as a result of higher fuel costs should not compromise their economic sustainability, although decreased profits and reduced wages are expected.

These data therefore highlight an extremely difficult situation in the fishing sector. Despite the compensation measures envisaged by national and European administrations, in the medium term, if the fuel cost and other production factors continue to remain at high levels, it will be possible to hypothesise the exit from the sector of less efficient companies whose cost/income ratios are very high. Excessive indebtedness, which even before the energy crisis affected some segments of the fleet, will lead to changes in the ownership structure (currently predominantly family capital) in favour of third parties such as intermediaries and wholesalers. The increase in energy costs adds to the pandemic crisis that severely limited fishing activities in 2020, spreading its negative effects also into 2021. The closure of Ho.Re.Ca services (hotels, restaurants, catering) and many fish markets, the difficulties in adopting health measures onboard of fishing vessels and, in general, the strong restrictions

on travel initially led to a sharp reduction in the demand for products such as fresh fish and caused the interruption or postponement of fishing activity. Overall, a 24% reduction in fishing days was estimated in 2020compared to 2019, against a 6% decrease in the number of active vessels. Moreover, the total added value produced in 2020 fell by 25%—from over €650 million in 2019 to €422 million in 2020.

To cope with the earlier crisis induced by the pandemic coupled with the increase in the price of fuel in 2022, national and European fleets have been supported by a mix of financial aid measures. In particular, subsidies given to compensate for the increases in the fuel cost are aimed at supporting the sector during a transitory and short-term period to ensure the economic and social sustainability of the sector. However, medium and long-term interventions should be enacted to reduce the sector's dependence on fuel and, in general, to improve its efficiency. The data analysis made it possible to highlight how fuel consumption is extremely variable depending on the fishing techniques, the size of the vessel, and the state of the exploited stocks. In addition, it has been shown that individual fishers can improve fishing performance and be more efficient than other similar vessel, by adopting some virtuous behaviours (such as limiting the duration of tows, or other use of gear, or reducing speed while steaming to the fishing areas).

In addition to these individual changes, further measures to improve fuel efficiency (such as the development and implementation of more efficient innovative technologies that could affect the design of the vessel) should be considered by operators, including improvements to the propulsion system or replacement gear (particularly towed gear) to reduce their hydrodynamic drag on the seabed. Other solutions could, for example, be represented by the introduction of sensors that allow the acquisition in real time during fishing activities of data that measure fuel consumption during navigation and during the use of the fishing gear.

Reducing fuel use per unit of effort and improving fuel efficiency (ratio of litres of fuel consumed to quantities captured) not only leads to lower operating costs but could also accompany new directives on green transition to achieve the goal of reducing greenhouse gas (GHG) emissions by at least 55% compared to 1990 levels by 2030 (Regulation of the European Parliament and of the Council establishing the framework for achieving climate neutrality and amending Regulation [EU] 2018/1999 [European Climate Law]).

In this regard, and also on the basis of the "Stepping up Europe's 2030 climate ambition" document (COM (2020) 562 final), economic support measures could be envisaged to promote the use of renewable and low-carbon fuels produced in a sustainable way. Indeed, some recent studies (Bastardie, 2022, Stecf 2021) have investigated the idea of including gas emission indicators in current certification schemes such as the Marine Stewardship Council (MSC, www.msc.org), which sets standards for good fishing practices but does not currently consider the carbon footprint of a given product. The Italian Operational Programme for FEAMPA 2021–2027, as part of priority 1 (promoting sustainable fishing, the restoration and conservation of aquatic biological resources), provides for investments aimed at promoting climate neutrality with energy efficiency operations, such as replacement or modernisation of fishing vessel engines, thus encouraging the use of renewable energies.

These studies help to create a virtuous circle to promote less impactful and more efficient fishing practices that also meet the economic sustainability objectives defined in fisheries

policies. The journey now appears to have begun in the general context of reducing carbon emissions to achieve environmental objectives and by being compliant with the EU climate objectives plan (EC, 2020). European policies in the future will increasingly focus on "fuel-intensive" fleet segments.

In establishing fishing opportunities for different fleet segments, the EC could take into consideration criteria based on the fuel use intensity (FUI). Therefore, it is necessary to improve knowledge and obtain more detailed information by fishing technique, of fuel consumption, fishing areas, and target species. The resulting data collected can then be appropriately analysed to help identify the best available techniques (BAT, Bestardie 2022) required to guide fishing operators in improving their fuel use efficiencies.

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Annex I – Economic modelling to measure the impact of fuel price increase and fishing effort reductions on the fishing sector

To assess the economic and social impacts of the increased fuel prices as well as the management measures introduced in recent years to limit fishing effort (particularly for trawler fleets), the situation prior to these changes was compared with that expected for subsequent years. This analysis was conducted by developing a simulation model capable, (under certain assumptions) of predicting the probable trend over time of the main socio-economic variables of the sector as well as the related performance indicators.

The use of bio-economic modelling in the fisheries sector to simulate the potential impact of management measures from environmental, economic, and social points of view is now widespread. As part of the Common Fisheries Policy, the European Commission has long encouraged the development of studies and research on bio-economic models and the various European programmes that have followed over the years have funded numerous projects concerning bio-economic modelling. For example, the projects "Multi-Species Bio-economic Models" (FAIR CT95-0561) and "Bio-Economic Modelling of Mediterranean FISHeries (BEMMFISH)" (Q5RS-2001-01533) had as their main objective the production of bio-economic models suitable for analysing the management strategies of multi-species fisheries. Another research project funded by the European Commission was "EFIMAS – Operational Evaluation Tools for Fisheries Management Options", whose main objective was to develop an evaluation operating system that would allow trade-offs between different management objectives to be compared.

With regard to Mediterranean fisheries, the Italian model MOSES (Placenti et al., 1992) and the Spanish model MEFISTO (Lleonart et al., 1999) have long represented the main scientific tools for the simulation of the effects of management policies. Bio-economic modelling aimed at supporting management decisions has also been funded at national level in the research programmes of the Directorate General for Maritime Fisheries and Aquaculture of MIPAAF. In particular, the BIRDMOD model (Accadia and Spagnolo, 2006a) was developed specifically for Italian fisheries taking into account the local characteristics of the sector and the structure of biological and economic data available at the national level.

More recently, the development of a specific bio-economic model for Mediterranean fisheries that would allow to simulate the effects of a variety of management measures has been funded by DG MARE of the European Commission. The study, developed within the MAREA project (MARE/2009/05 – Lot 1), produced the bio-economic model BEMTOOL (Accadia et al., 2013).

A review of existing bio-economic models and their application in European waters can be found in Nielsen et al. (2018); while a more specific review for the Mediterranean is available in Lembo et al. (2012).

Mediterranean fisheries have specific characteristics, such as the heterogeneity of fishing activities, the variability in fishing strategies by the same vessel, the number of target species

and gear used, and the different level of aggregation of biological and economic data. These specificities have been addressed by some bio-economic models specially developed for Mediterranean fisheries, such as MEFISTO and BEMTOOL, or adapted to the Mediterranean fisheries, such as ISIS-Fish (Mahévas and Pelletier, 2004), DISPLACE (Bastardie et al., 2017), Fcube (Maravelias et al., 2011).

The models developed over the years for Mediterranean and more generally for European fisheries have been used on several occasions to produce short-term forecasts on the economic variables analysed by the Scientific, Technical and Economic Committee for Fisheries (STECF) for the production of the Annual Economic Report on the Fishing Fleet of the European Union (Annual Economic Report, AER).

The model used for this study is structured to consider the equations most widely used in modelling applied to Mediterranean fisheries. In particular, the model is the result of an adaptation of the latest methodology used by STECF for the forecasts contained in the AER (STECF, 2020); adaptation based on equations derived from the two main bio-economic models developed for Mediterranean fisheries, namely BEMTOOL and MEFISTO.

Among the main changes made to the STECF methodology, the following points are particularly relevant:

- Use of the average price of the landed for the calculation of revenues. In this case, an analysis possibility has been added to the model which, in this way, also allows a parametric analysis on the average price of the landed as well as a verification of how much this increase should increase to counterbalance the reduction in catches linked to the reduced fishing activity. This modification is derived from the aforementioned bio-economic models, BEMTOOL and MEFISTO.
- Use of the average price of fuel for the calculation of fuel costs. Also, in this case, a possibility of analysis has been added to the model which, so structured, allows a parametric analysis on the price of fuel and a verification of how much this should be reduced to counterbalance the reduction in catches linked to the reduced fishing activity. This modification is also derived from the aforementioned bio-economic models, BEMTOOL and MEFISTO.
- Use of the formula of the salary to the part for the calculation of labour costs. This change is closely linked to the characteristics of Mediterranean fisheries, which are only partially taken into account in the STECF forecasts. The use of this formula is present in almost all bio-economic models developed for Mediterranean fishing, including the aforementioned BEMTOOL and MEFISTO models.

The model, therefore, makes it possible to estimate the socio-economic variables and performance indicators for each year in the 2021–2025 simulation period for each fleet segment. These projections are based on input data organised by fleet segment and covering the last 13 years, i.e. from 2008 to 2020.

The variables used by the model (and for which the data organised in time series were collected) are mainly those that make up the income statement of the sector, as well as some structural variables such as the number of boats, fishing days, and employment.

With regard to the variables that make up the income statement of the sector, these can be

summarised, as in Table 34.

The first part, relating to revenues, consists both in the revenues generated by the sale of the landed product and in revenues produced through alternative uses of the boat, such as fishing tourism or support to aquaculture facilities. To the revenues deriving from production activities, any subsidies received from the owners of the boats are added to supplement the income or to cover losses deriving from management measures, such as biological withdrawal of activity.

The income described above is contrasted in the income statement with costs, divided into three macro-items: operating costs, labour costs, and capital costs. The former, which can be associated with the characteristic activity of the fishing company, see energy costs as the main component. These costs are essentially linked to fuel consumption, which generally accounts for more than half of the operating costs and about a fifth of the total costs of a trawling company.

Other operating costs are: (a) those incurred for the ordinary maintenance of the vessel, which is generally carried out every year during periods of layup (e.g. painting costs; repair of electrical, mechanical, and hydraulic systems; and repair of nets); (b) variable costs other than fuel consumption, such as costs for transporting the landed product and costs for storing it onboard (e.g. ice, crates, and packaging); and (c) fixed costs, i.e. costs independent of fishing activity, such as costs of securing the vessel, costs of keeping accounts, and costs of quay services.

The second macro-item of cost is represented by the cost of labour, comprising both the wages and salaries of the staff employed and actually remunerated, as well as the cost associated with the work of unpaid personnel. In Mediterranean fishing, the latter is generally due to the dual role of the owner of the boat who often (in small boats) turns out to be both the vessel's owner and operator. In these cases, where there is not necessarily a pay check, for statistical purposes, the compensation for the work done as embarked is deducted from the profit of the vessel and charged at the cost of labour. Labour costs in trawling are particularly significant and represent the second largest cost item after fuel.

The third and final macro-cost item consists of capital costs, i.e. the annual depreciation rate for the capital goods of the fishing activity and the opportunity cost of the capital invested in the activity. Depreciation represents the reduction in the value of fixed assets used within the production process during the reference period resulting from physical deterioration, normal obsolescence, or normal accidental damage. The opportunity cost of capital is the net return that a company forgoes when it chooses to use the funds in the fisheries sector rather than investing the money in a risk-free security (generally a government debt bond). This cost shall be calculated by applying the current interest rate of a risk-free investment net of the inflation rate to the value of the capital invested in the fisheries sector.

Table 34 – DCF profit and loss accounts for the catching sector.

Profit and loss accounts*	
A=A1+A2+A3	**Income**
A1	Value of landings
A2	Direct subsidies
A3	Other income
B=B1+B2+B3	**Costs**
B1=B1a+B1b+B1c+B1d	***Operating costs***
B1a	Energy costs
B1b	Repair and maintenance costs
B1c	Variable costs
B1d	Non-variable costs
B2=B2a+B2b	***Labour costs***
B2a	Wages and salaries of crew
B2b	Value of unpaid labour
B3=B3a+B3b	***Capital costs***
B3a	Annual depreciation
B3b	Opportunity cost of capital

**Income rights and rights costs are excluded as not being relevant in the analysis.*

To make the model more responsive to recent changes, it is also possible to include among the input data those from 2021 (if available) regarding the number of active vessels, total fishing days, catches, and revenues. In addition, the average price of fuel for the years 2021 and 2022 can be included in the model if already known or if it can be estimated with a good margin of reliability through alternative sources. For years when a reliable estimate of the fuel price fuel is not available, this is assumed to be constant and equal to the value of the last available year.

In particular, the increases in the price of fuel used for the simulations from 2021 onwards were based on the prices of diesel fuel for cars net of VAT and excise duties as recorded by the website https://dgsaie.mise.gov.it/open-data:

- 2021: 30% increase compared to 2020 recorded on an annual basis;
- 2022: 74% increase compared to 2021 recorded as an average for the period January–August;
- 2023–2025: value equal to that estimated for 2022 with a range of variation of ±20%.

To simulate possible changes in the fuel price, in addition to the cost of fuel, the model also requires data on fuel consumption (in litres).

To assess the economic and social impact of management measures to reduce fishing effort, the model requires as input the reductions expected in the average fishing days per boat for each year of the projections (2021–2025) compared to the average of the base period (2017–2019). Variations on fishing days, differentiated by fleet segment and defined on the basis of

the implementing regulations management measures, together with changes in the price of fuel, are the main drivers of the simulations produced by the model.

Each of the variables defined within the logical-conceptual scheme of the model is projected forward in time on the basis of a series of assumptions, which can be summarised as follows:

- The number of active boats is assumed to be constant and equal to the most recent value among those entered by the user (2020 data);
- Total catches, fuel consumption, and other variable costs are assumed in proportion to the fishing days;
- Maintenance costs, other fixed costs, depreciation, and opportunity costs are assumed in proportion to the number of vessels, as well as the number of employees and revenues from subsidies or from activities other than fishing;
- The cost of the work is estimated according to the share contract;
- The average price of the landed is assumed to be equal to the average value calculated over the basic period 2017–2019;
- The average price of fuel is estimated for the current (2022) and previous year (2021) by applying the changes detected by the Ministry of Economic Development (MISE) on the average monthly prices of car diesel net of VAT and excise duties at the last available value (year 2020); while for the following 3 years (2023–2025), the price of fuel is assumed constant and equal to the last estimated value (2022 data);
- The crew share for the calculation of labour costs is assumed constant and equal to the average value calculated over the basic period 2017–2019.

The assumptions of the model above can be described in mathematical terms as follows.

We indicate with *t* the year of projection and with *0* the base period, i.e. the average of the years 2017–2019. We also indicate with *N* the number of active vessels and with *gg* the average fishing days per boat, i.e. the main management variables in the fishing sector. The total fishing days exercised at time *t* by the analysed fleet segment will be given by the following equation:

$$GG_t = gg_t * N_t.$$

Since the number of active boats is assumed as a constant over time, $N_t = N_1$, where 1 indicates the last year of available data, the previous equation can also be written as:

$$GG_t = gg_t * N_1,$$

where the total fishing days depend solely on the management measures included in the model in terms of variations on the average fishing days per vessel.

In proportion to the total fishing days, the total catches, C, fuel consumption, Cons, and other variable costs, AV are then estimated:

$$C_t = C_0 \frac{GG_t}{GG_0},$$

$$Cons_t = Cons_0 \frac{GG_t}{GG_0},$$

$$AV_t = AV_0 \frac{GG_t}{GG_0}.$$

Once the total catches at time *t* have been calculated and considering the average price of the landed constant over time, $p_t = p_0$, the total revenues are estimated as a product of catches and price:

$$R_t = p_t C_t = p_0 C_t.$$

Similarly, the cost of *FC* fuel is estimated as a product between fuel consumption, *Cons*, and its average price, *pg*:

$$FC_t = pg_t Cons_t.$$

Proportionally to the number of vessels are instead estimated maintenance costs, *M*, other fixed costs, *AF*, depreciation, *Am*, opportunity cost, *CO*, the number of employees, *O*, and revenues not produced by fishing, *AR*:

$$M_t = M_0 \frac{N_t}{N_0},$$

$$AF_t = AF_0 \frac{N_t}{N_0},$$

$$Am_t = Am_0 \frac{N_t}{N_0},$$

$$CO_t = CO_0 \frac{N_t}{N_0},$$

$$O_t = O_0 \frac{N_t}{N_0},$$

$$AR_t = AR_0 \frac{N_t}{N_0}.$$

The cost of labour, *LC*, is therefore estimated according to the share contract, which is the prevailing remuneration system in the Italian fishing sector. Specifically, the model calculates the amount as the difference between revenues and the total of variable costs, understood as the sum of fuel cost and other variable costs. To the calculated amount is applied the crew share, *w*, the share of that amount used to remunerate the crew. In mathematical terms, labour costs can be represented as follows:

$$LC_t = w_t(R_t - FC_t - AV_t).$$

Based on the projections made on the variables that define the economic structure of fishing activity, the model estimates a series of profitability indicators and allows a series of parametric analyses to be carried out.

The main profitability indicators considered for this study are shown in Table 35 with an indication of the formula underlying their calculation, where the elements are reported directly from Table 34.

In particular, the net profit is given by the total of all revenues to which all costs are subtracted:

$$NP_t = (R_t + AR_t) - (FC_t + AV_t + LC_t + M_t + AF_t + Am_t + CO_t).$$

The net profit margin is instead a relative measure of net profit as it indicates the weight of net profit on total revenues:

$$NPM_t = \frac{NP_t}{(R_t + AR_t)}.$$

Finally, the ratio of current revenues (CR) to break-even revenues (BER) indicates the fishing company's ability to cover its costs. The BER is the level of revenue needed to cover fixed and variable costs. When revenues are lower than BER and therefore the CR/BER is less than one, the company is not able to cover its costs and is destined to exit the market if the losses continue. Conversely, when revenues are higher than BER and hence the CR/BER is greater than 1, fishing activity is economically viable. In mathematical terms, the CR/BER can be represented as follows:

$$\frac{CR_t}{BER_t} = \frac{(R_t + AR_t)}{1 - \frac{(LC_t + FC_t + AV_t + M_t)}{(R_t + AR_t)}}.$$

Table 35 – AER main profitability indicators for the catching sector

Main profitability indicators	
(A1+A3) – (B1+B2+B3)	*Net profit (NP)*
[(A1+A3) – (B1+B2+B3)]/(A1+A3)	*Net profit margin (NPM)*
(A1+A3)/[(B1d+B3)/(1 – (B2+B1a+B1b+B1c)/(A1+A3))]	*Current revenues on break-even revenue (CR/BER)*

Using the estimated values for the variables and indicators described above, the model produces a series of outputs, which can be summarised as follows:

- The percentage changes expected in 2021 and 2022 compared to the average for the period 2017–2019 for 4 socio-economic indicators: (1) the average cost of labour per employee, (2) the average revenues per vessel, (3) the average net profit per vessel; and 4) the net profit margin;
- The historical series of the CR/BER indicator from 2008 to 2020 with projections for the period 2021–2025 with bands of variability linked to the average price of the landed (±10% compared to the last available value);
- The historical series of the CR/BER indicator from 2008 to 2020 with projections for the period 2021–2025 with bands of variability linked to the average price of fuel (±20% compared to the last value estimated on real data);

- The parametric analysis on the CR/BER indicator for the years 2020, 2022, and 2023 as the average price of the landings changes;
- The parametric analysis on the CR/BER indicator for the years 2020, 2022, and 2023 as the average fuel price changes;
- The parametric analysis on the CR/BER indicator for the years 2020, 2022, and 2023 as the average fishing days per vessel change;
- The threshold values of the average landing price, the average fuel price, and the average fishing days per vessel resulting in a CR/BER of 1 and net profits of zero for each of the projected years.

Parametric analyses based on the average price of landings and fuel are particularly useful for assessing the impact of management measures in cases where these prices should vary as a result of factors exogenous to the fisheries sector. The parametric analysis based on the average fishing days per vessel has a different function, namely to estimate a limit to the reduction of the days of activity below which it is no longer economically sustainable to continue fishing.

In order to have more information on the limits that can determine the sustainability or otherwise of fishing activity from an economic point of view, the model also estimates threshold values both for landing and fuel prices and for average days of activity. These values, if exceeded downwards for the price of landings and for average fishing days or upwards for the price of fuel, result in a net loss for the company and an inability of revenues to cover fixed and variable costs, or a CR/BER value less than 1.

The threshold values for each of these three drivers are estimated assuming constancy in the value of the other two. In fact, as can be seen from the equations used for their estimation and reported below, the threshold value of each driver also depends on the values of the other two. In particular, the threshold value for the average price of the landing increases as the price of fuel increases and decreases as the average fishing days per vessel increase. Similarly, the threshold value for average fishing days also increases with the increase in the price of fuel and decreases as the average price of landings increases. These trends are clearly due to the fact that increases on average fishing days and in the price of landings act in the same direction, i.e. increasing profit, while increases in the fuel price fuel act in the opposite way and increase the costs. The fuel price threshold value increases both as the average landing price increases and as the average fishing days per vessel increase.

The following are the equations used to estimate threshold values.

Threshold value for the average price of the landing:

$$p_t = \frac{(pg_t Cons_0 + AV_0)}{C_0} + \frac{\frac{N_t}{N_0}(AR_0 - M_0 - AF_0 - Am_0 - CO_0)}{C_0 \frac{GG_t}{GG_0}(w_t - 1)}.$$

Threshold value for the average fuel price:

$$pg_t = \frac{(p_t C_0 - AV_0)}{Cons_0} - \frac{\frac{N_t}{N_0}(AR_0 - M_0 - AF_0 - Am_0 - CO_0)}{Cons_0 \frac{GG_t}{GG_0}(w_t - 1)}.$$

Threshold value for average fishing days per vessel:

$$gg_t = \frac{gg_0(AF_0 + Am_0 + CO_0 + M_0 - AR_0)}{(w_t - 1)(pg_t Cons_0 + AV_0 - p_t C_0)}.$$