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## Chemistry and Ecology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713455114>

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V. De Stefano<sup>a</sup>; A. M. di Trapani<sup>a</sup>; D. Macaluso<sup>a</sup>

<sup>a</sup> Dipartimento di Economia dei Sistemi Agro-Forestali (ESAF), Università degli Studi di Palermo, Palermo, Italy

**To cite this Article** De Stefano, V. , Trapani, A. M. di and Macaluso, D.(2006) 'Deep-sea shrimp fishery in Sicily: The economic performance of the shrimp trawling fleet in the ports of Mazara del Vallo, Sciacca, and Porto Empedocle', *Chemistry and Ecology*, 22: 4, S433 – S442

**To link to this Article: DOI:** 10.1080/02757540600571877

**URL:** <http://dx.doi.org/10.1080/02757540600571877>

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## **Deep-sea shrimp fishery in Sicily: The economic performance of the shrimp trawling fleet in the ports of Mazara del Vallo, Sciacca, and Porto Empedocle**

V. DE STEFANO\*, A. M. DI TRAPANI and D. MACALUSO

Dipartimento di Economia dei Sistemi Agro-Forestali (ESAF), Università degli Studi di Palermo,  
Viale delle Scienze 13, 90128 Palermo, Italy

*(Received 15 February 2005; in final form 30 November 2005)*

Shrimp fishing in Sicily is carried out by fishing companies using trawlers and multifunctional vessels equipped with trawling nets, in a complex and worrisome context, because of the decrease in catch over the last few years. After analysing the structural characteristics of Sicilian trawling, the study concentrates on the three most important shrimp fishing ports in Sicily: Mazara del Vallo, Sciacca, and Porto Empedocle. For each fleet, through a sample analysis, economic performance has been evaluated for the period from 2001 to 2003. Finally, a comparative analysis of the economic performance of the surveyed companies is carried out through a comparison of daily economic productivity indicators.

*Keywords:* Deep-sea shrimps; Fishing effort; Economic parameters

### **1. Introduction**

The technique of shrimp fishing using divergent trawl nets pulled by a single boat is practised all round the Sicilian coast, and this is one of the most widespread fishing activities, as it yields technical and economic results which are better on average than those of any other type of fishing, even though it involves higher levels of uncertainty [1].

The negative trend, in terms of number of fish caught over the last few years by Sicilian trawl fishing companies, highlights the need to adopt some corrective measures to make this sector both economically and ecologically sustainable [2].

In this context, the aims of the paper are to describe the characteristics of the Sicilian shrimp-catching trawling fleet, to analyse the economic performance of a representative sample of fishing enterprises and to produce a useful technical tool for policymakers.

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\*Corresponding author. Email: destefano@unipa.it

## 2. Materials and methods

This description of the characteristics of the Sicilian shrimp-catching trawling fleet is based on the processing of EU Fishing Fleet Register data (updated on 7 July 2004).

On the other hand, the economic performance analysis (referring to the 3 yr from 2001 to 2003), which is merely of exploratory nature, was made using a selected sample of representative fishing enterprises operating from the three main Sicilian ports for trawling fishing: Mazara del Vallo, Sciacca, and Porto Empedocle.

Research was carried out by filling in questionnaires, which had been compiled to give a picture of the economic activity in 2001–2003 and to identify the main characteristics of the vessels used (gross tonnage, engine power, equipment on board, fishing tools, etc.), of the crew and of the fishing activity itself. The data were collected with the help of people involved with fishing, such as employees in the harbour masters' fishing sector, the fishermen themselves, business advisors to fisheries, and managers in fishing cooperatives.

Overall, the survey covered 32 fishing companies: 15 from Mazara del Vallo, nine from Sciacca and eight from Porto Empedocle. The survey took into consideration only those companies that used shrimp trawl fishing all year round. The analysed income statement parameters were: the value of landings, various costs, depreciation costs, maintenance costs, crew share, value added, and net income.

The value of landings was calculated on the basis of the overall catch brought to shore and sold (at market prices) over the course of the 3 yr period.

Various costs included fuel costs, other variable costs linked to production (the purchase of nets, rigging, ropes and other accessories, expenses for board, telephones, TV, and various expenses for the ships' equipment), produce selling expenses (expenses for boxes, packing, ice, transportation vehicles, portorage, and commissions for wholesalers and/or auctioneers), and other costs linked to the vessel (expenses for accounting services, payroll bookkeeping, insurance for the boat, passive interests on current accounts and loans, trade union subscription, wharf services (water and electricity), management and warehouse costs, travel, current account operating costs, purchase and maintenance of company vehicles, road tax and insurance for company vehicles, stationary, RINA inspections, VHF controls, sanitary certifications, fire extinguishers, VAT number and other administrative charges, fishing licence renewal, harbour-office taxes, annual Chamber of Commerce membership costs, etc.).

The depreciation costs taken into account are those included in the companies' tax balance sheet, while maintenance costs refer to the costs incurred over the year for the maintenance and repair of the boat's components (hull, engine and equipment), expenses for ordinary maintenance, carpentry, haulage, painting, and repair of electrical systems, mechanical equipment (engines), hydraulic systems (pumps), navigation instruments, and freezers.

The crew share item includes the aggregate amount of salaries and of fiscal contributions and social security payments for the crew. The crew share is determined through a contractual relationship based on 'shares' that provides for the division of the equivalent value of the 'net catch' (that is, after deductions of the out-of-pocket expenses sustained by the ship owner such as expenses for fuel, ice, crates, repair and maintenance of nets and electronic equipment, etc.) into two parts, one assigned to the ship owner, and the other to the crew. As far as the port of Mazara del Vallo is concerned, all the fishing companies surveyed have an authorization for either coastal or Mediterranean fishing, and therefore the division of the turnover is based on what was provided by the share contract for these types of fishing. The crew of the motorized fishing vessels comprises the captain, the first and second engineer, the fishing chief, and a number of seamen varying in number from two to six. Among these, the share of the turnover is linked to the job title: the captain is entitled to 2 parts, the first engineer to 1.75 parts, the second

engineer to 1.25 parts, and each seaman to 1 part. In addition to these shares, it is necessary to take into account the tax contributions to be paid by the ship owner, who, in the end, will receive a share of about 40–42% of the net catch. The normal practice for Porto Empedocle is that 48% of the net turnover (after deduction of out-of-pocket expenses) is assigned to the crew for the payment of salaries and contributions, and 52% is assigned to the ship owner. The crew subdivide their share of turnover depending on the role of each component. Fishing companies in Sciacca carrying out trawl fishing divide net turnover (after deduction of the ship owners' expenses for crates, food and port services) assigning 36% to the crew if it consists of three members, or 40% if its members are four, which is the most common case. The crew subdivide their turnover share, depending on the role of individual crewmembers. The remainder is assigned to the ship owner, who pays for the remaining expenses and for the fiscal contributions and social security payments for all crewmembers.

In order to determine the crew share, the ship owner is always considered as a crewmember, and thus he receives his share not only as the ship owner but also as a member of the crew. However, this share is not included in the 'crew share' entry but contributes to net income. In Mazara del Vallo, where many fishing companies are partnership companies, each partner is counted as a crewmember.

Deducting various costs, depreciation, and maintenance costs from the value of landings, the true wealth produced by the fishing companies is obtained, i.e. gross value added (before deduction of taxes) or net company product.

In the economic balance sheet, net income is the indicator of the entrepreneur's reward (ship owner-fisherman) for providing all productive factors. In the present survey, net income, calculated inclusive of taxes, was obtained by subtracting various costs, depreciation costs, maintenance costs, and the crew share from value of landings—this represents the cost of directive work and the ship owner's on board work, as well as a reward for invested capital and entrepreneurial activity.

For each of these measures of financial surplus, we have calculated an average ( $x$ ) and assessed the extent of inter-vessel variation in terms of both standard deviation ( $S$ ) and variation coefficient ( $CV$ ).

### 3. Results and discussion

#### 3.1 Sicilian fleet

Sicily's productive structure is spread over about 1500 km of coast and over 10 different marine authorities (Augusta, Catania, Messina, Mazara del Vallo, Milazzo, Palermo, Porto Empedocle, Pozzallo, Siracusa, and Trapani). The various companies are registered in 47 different offices.

The most widespread type of fishing in Sicilian seas, except for Mazara del Vallo, Sciacca, and Porto Empedocle, is local coastal fishing, carried out by 3138 small boats whose overall length (OAL) is less than 18 m for a total of 15 922.6 tons of gross registered tonnage (GRT). The number of boats with fishing authorization for trawling (trawlers and multi-purpose vessels with trawling nets) with an OAL greater than 18 m is 422 for a total of 38 203 GRT (see table 1).

The classification of the Sicilian fleet possessing authorization for trawl fishing according to size classes (see table 2) highlights that a fifth of the vessels (20.1%) are of substantial size (larger than 100 GRT) and that, however, small boats (less than 10 GRT) are almost equally numerous (18.4%).

Table 1. Fishery fleet in Sicily by typology of vessel (2004).

Topology of vessel	No. vessels	GRT	kW
Vessels smaller than 18 m overall length	3138	15 922.6	134 813.3
Vessels over 18 m overall length without trawl fishing licence	135	7 805.7	44 269.2
Vessels over 18 m overall length with trawl fishing licence	422	38 203.0	135 845.9
Total	3695	61 931.3	314 928.4

Source: Our processing on the EU Fishing Fleet Register database.

Table 2. Fishery fleet in Sicily with trawl fishing licence by tonnage ranges (2004).

GRT ranges	No. vessels	%	Total GRT	%
Less than 10.0	130	18.4	1 132	2.7
From 10 to 49.9	342	48.4	10 413	24.5
From 50 to 100.0	92	13.0	6 276	14.7
Over 100.0	142	20.1	24 742	58.1
Total	706	100.0	42 565	100.0

Source: Our processing on the EU Fishing Fleet Register database.

The trawl fishing sector in Sicily, represented by 706 vessels (trawlers and multi-purpose vessels with trawling nets of any size) with an average size of 60.3 GRT and 242.6 kW (see table 3), is the most important sector, in productive terms, in Italy [3]. The marine authorities, in which most authorized trawl fishing vessels are registered, are Porto Empedocle and Mazara del Vallo (see figure 1).

The marine authorities of Porto Empedocle and Mazara del Vallo together comprise 56.8% of all vessels, 76.1% of the GRT, and 66.4% of the total kW of the entire authorized Sicilian trawling fleet. The marine authority of Porto Empedocle, comprising seven ports (Sciacca, Porto Empedocle, Licata, Gela, Lampedusa, Scoglitti, and Vittoria), is the most numerous: 248 trawlers (35.1% of the authorized Sicilian trawling fleet), of which 137 are over 18 m OAL. This also represents approximately one-fifth of the tonnage of the Sicilian trawling fleet. In the marine authority of Mazara del Vallo, comprising only one homonymous port, the largest overall tonnage and engine power are found. The following marine authorities follow in order of importance: Palermo (14% of vessels and 6.7% of GRT), Trapani (12.7% of vessels and 7.6% of GRT), and Siracusa (9.6% of vessels and 5.5% of GRT).

In general, Sicilian trawlers are characterized by a high degree of obsolescence: as a matter of fact, the average age of the fleet is about 29.6 yr (source: our processing on EU Fishing Fleet Register database), and this highlights the low level of capital replacement characterizing the sector.

The ports of Mazara del Vallo, Sciacca, and Porto Empedocle are the most important in Sicily due to the large number of fishing companies that carry out shrimp fishing. These are companies that work exclusively using trawl-fishing methods throughout the year in the Sicilian Channel (see tables 4–6).

### 3.2 Economic performance of selected fishing enterprises

The structural characteristics, activity, and number of seamen aboard the fishing vessels of the companies under investigation are summarized in table 7.

Table 3. Composition of the authorized trawling fleet by Sicilian marine authorities.

Marine authorities		Trawlers	Multipurpose vessels (also trawlers)	Total
Mazara del Vallo	Vessels	147	6	153
	GRT	23,528.0	796.3	24 324.3
	kW	70 186.7	2 312.7	72 499.3
Porto Empedocle	Vessels	232	16	248
	GRT	7 679.1	371.8	8 051.0
	kW	38 740.6	2 557.3	41 297.9
Pozzallo	Vessels	6	1	7
	GRT	119.1	9.1	128.2
	kW	909.8	85.0	994.8
Siracusa	Vessels	64	4	68
	GRT	2 189.8	156.7	2 346.4
	kW	13 944.3	884.4	14 828.7
Augusta	Vessels	4	–	4
	GRT	227.2	–	227.2
	kW	909.7	–	909.7
Catania	Vessels	19	9	28
	GRT	565.9	403.3	969.2
	kW	3 370.2	2 243.3	5 613.5
Messina	Vessels	4	–	4
	GRT	307.2	–	307.2
	kW	1 519.6	–	1 519.6
Milazzo	Vessels	3	2	5
	GRT	83.6	51.3	134.9
	kW	404.6	330.5	735.1
Palermo	Vessels	53	46	99
	GRT	1 920.7	938.0	2 858.7
	kW	10 153.7	6 594.9	16 748.6
Trapani	Vessels	71	19	90
	GRT	2 365.2	853.1	3 218.3
	kW	11 994.9	4 123.8	16 118.7
Sicily	Vessels	603	103	706
	GRT	38 985.7	3 579.6	42 565.3
	kW	152 134.2	19 131.8	171 266.0

Source: Our processing on the EU Fishing Fleet Register database.

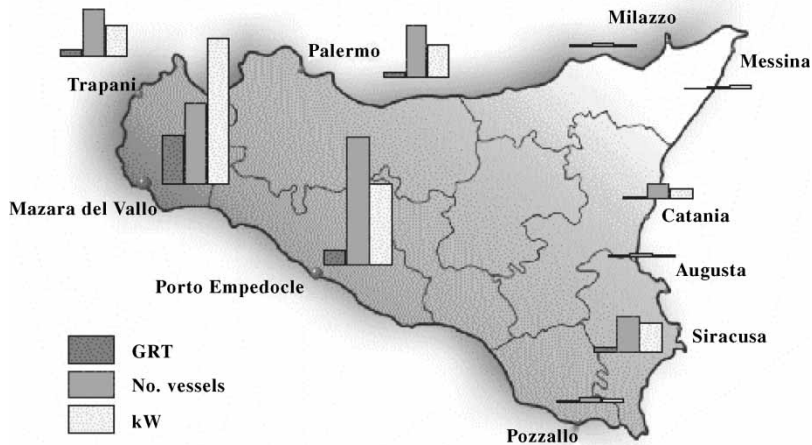


Figure 1. Division of the authorized trawling fleet into Sicilian marine authorities.

Table 4. Vessels of Mazara del Vallo divided by fishing gears (2004).

Type of gear	No. vessels	%	GRT ranges			
			0–9.9	10–50.9	51–99.9	>100
Gillnets	76	28.8	75	1	–	–
Gillnets, longlines	8	3.0	8	–	–	–
Towed lines, gillnets, longlines	1	0.4	1	–	–	–
Longlines	1	0.4	–	–	1	–
Bottom otter trawls	147	55.7	2	7	16	122
Bottom otter trawls, gillnets, longlines	1	0.4	–	1	–	–
Bottom otter trawls, longlines	4	1.5	–	–	1	3
Bottom otter trawls, purse seines, longlines	1	0.4	–	–	0	1
Purse seines	17	6.4	14	–	2	1
Purse seines, gillnets, longlines	3	1.1	3	–	–	–
Purse seines, longlines	2	0.8	–	–	2	–
Beach seines	3	1.1	3	–	–	–
Total	264	100.0	106	9	22	127

Source: Our processing on the EU Fishing Fleet Register database.

Table 5. Vessels of Sciacca divided by fishing gears (2004).

Type of gear	No. vessels	%	GRT ranges			
			0–9.9	10–50.9	51–99.9	>100
Gillnets	24	21.2	24	–	–	–
Bottom otter trawls	82	72.6	1	64	16	1
Bottom otter trawls, longlines	2	1.8	–	2	–	–
Bottom otter trawls, purse seines	1	0.9	–	–	1	–
Bottom otter trawls, purse seines, mid-water pair trawls	1	0.9	–	1	–	–
Purse seines	2	1.8	–	1	1	–
Purse seines, gillnets, longlines	1	0.9	1	–	–	–
Total	113	100.0	26	68	18	1

Source: Our processing on the EU Fishing Fleet Register database.

Table 6. Vessels of Porto Empedocle divided by fishing gears (2004).

Type of gear	No. vessels	%	GRT ranges			
			0–9.9	10–50.9	51–99.9	>100
Gillnets	29	23.6	29	–	–	–
Gillnets, gillnets drift, longlines	1	0.8	–	1	–	–
Gillnets, longlines	3	2.4	3	–	–	–
Towed lines, gillnets, longlines	2	1.6	2	–	–	–
Gillnets drift	2	1.6	1	1	–	–
Longlines, gillnets drift	1	0.8	1	–	–	–
Bottom otter trawls	65	52.8	9	47	9	–
Bottom otter trawls, gillnets, longlines	3	2.4	1	2	–	–
Bottom otter trawls, purse seines, gillnets	4	3.3	3	1	–	–
Purse seines	9	7.3	4	3	1	1
Purse seines, gillnets	1	0.8	–	–	–	1
Purse seines, gillnets, towed lines	2	1.6	2	–	–	–
Beach seines, bottom otter trawls, gillnets	1	0.8	1	–	–	–
Total	123	100.0	56	55	10	2

Source: Our processing on the EU Fishing Fleet Register database.

Table 7. Structural characteristics, activity, and number of seamen aboard the fishing vessels of the companies under investigation (2003).

	Mazara del Vallo			Sciacca			Porto Empedocle		
	$\bar{x}$	S	C.V. (%)	$\bar{x}$	S	C.V. (%)	$\bar{x}$	S	C.V. (%)
Tonnage (GRT)	127.3	37.1	29.1	35.6	6.2	17.4	45.6	17.5	38.4
Tonnage (GT)	135.0	30.2	22.4	46.2	7.0	15.1	56.9	24.3	42.7
Overall length (OAL)	29.1	2.5	8.5	19.4	1.4	7.3	21.1	3.5	16.4
Engine power (KW)	358.4	127.8	35.7	179.4	44.1	24.6	215.5	62.5	29.0
Age of hull	24.2	9.6	39.9	33.6	14.0	41.8	36.9	5.9	16.0
Fishing days	176.1	6.4	3.7	171.7	5.0	2.9	173.1	8.4	4.9
Units crew	7.5	0.8	11.1	3.7	0.5	13.6	3.8	0.5	12.3

The target species are deep-sea shrimps, such as the violet shrimp (*Aristeus antennatus*), the red shrimp (*Aristaeomorpha foliacea*), the pink or white shrimp (*Parapenaeus longirostris*), and shrimps of the *Plesionika* variety. However, the list of the species caught (especially those caught by coastal trawlers) is long: it includes red mullets, hakes, octopi, squid, groupers, red breams, white sea breams, sole, dogfish, and lobsters (see table 8).

The highest overall catch, but also the highest variability (CV) found for companies of Mazara del Vallo is due to the peculiarities of Mediterranean or deep-sea fishing: the big trawlers depart beyond 40 miles from the Sicilian coast towards Tunisia and Libya, carrying out fishing cycles of approximately 20 d and often facing adverse marine weather conditions. Fishing enterprises of Sciacca and Porto Empedocle, instead, carry out coastal fishing with smaller and often polyvalent vessels.

The comparison of the economic indicators of the enterprises in the three ports shows that the structural differences between Mazara del Vallo on the one hand and Sciacca and Porto Empedocle on the other hand are reflected by different economic performances: the enterprises of Mazara del Vallo, which use boats with the highest tonnage and power, show the highest values for all economic indicators (see tables 9–11).

The revenues are the result not only of the different amounts of catching, but also of the different distributive channels. In Mazara del Vallo, fishing catches exceed local demand, and all the fish caught by vessels specialized in deep-sea shrimp fishing are sold to wholesalers and taken to the major fish markets of the country. The catches of Sciacca and Porto Empedocle, on the other hand, are distributed in various ways: most of them are bought by wholesalers, while the rest are sold in regional fish markets or directly to retailers or consumers.

Table 8. Overall catch of the fishing companies under examination (2003).

	Total catch (Q.li)			Catch variation (%)		
	$\bar{x}$	S	C.V. (%)	2003/2002	2003/2001	
Mazara del Vallo	544.3	(100%)	333.5	61.3	-1.5	7.0
Sciacca	246.7	(100%)	15.2	6.2	19.6	-2.9
Porto Empedocle	198.5	(100%)	21.5	10.9	9.1	13.8
	of which shrimp (Q.li)			Catch variation (%)		
	$\bar{x}$	S	C.V. (%)	2003/2002	2003/2001	
Mazara del Vallo	239.7	(44%)	77.6	32.4	-4.0	-2.6
Sciacca	98.8	(40%)	16.7	16.9	23.4	-2.9
Porto Empedocle	66.3	(33%)	16.5	24.9	58.6	11.4



Table 9. Economic indicators of fishing companies under examination in Mazara del Vallo (in Euro 2003).

	$\bar{x}$	S	C.V. (%)	Variation (%)	
				2003/2002	2003/2001
Value of landings	353 463	97 743	27.7	10.4	12.5
Various costs	131 610	38 800	29.5	-1.8	-7.1
of which fuel	83 253	22 313	26.8	-4.7	-21.6
Depreciation costs	31 816	17 469	54.9	13.2	31.2
Maintenance costs	14 260	6 968	48.9	21.4	15.3
Crew share	115 595	35 777	31.0	16.8	22.6
Added value	175 777	49 006	27.9	20.2	29.3
Net income	60 182	20 357	33.8	27.5	44.6

Table 10. Economic indicators of fishing companies under examination in Sciacca (in Euro 2003).

	$\bar{x}$	S	C.V. (%)	Variation (%)	
				2003/2002	2003/2001
Value of landings	154 000	14 465	9.4	4.5	25.6
Various costs	42 933	5 306	12.4	3.6	17.2
of which fuel	33 433	4 197	12.6	-3.3	7.2
Depreciation costs	14 217	3 515	24.7	3.7	-0.2
Maintenance costs	4 282	496	11.6	12.5	15.6
Crew share	59 756	8 156	13.6	23.6	49.5
Added value	92 568	11 288	12.2	4.7	36.0
Net income	32 812	5 347	16.3	-18.0	16.7

As far as coastal fishing is concerned, comparing data for Sciacca with those for Porto Empedocle, it can be seen that, although the effort parameters are higher in Porto Empedocle, the average values of landings per boat are higher in Sciacca. This highlights the fact that, within the same fishing system, there are other factors influencing the companies' economic results beyond effort parameters. These include the fishing zones, the technical efficiency of the vessels, the ability of the captain and his crew, the number of seamen on board, the marketing methods, the current market prices of the produce, etc.

In Mazara del Vallo, the various costs entry is the most important cost entry, representing 37% of turnover, and is mainly determined by fuel costs, followed by the crew share entry, representing 33% of the value of landings. On the contrary, in Sciacca and Porto Empedocle the main cost item is the crew share entry, followed by the various costs entry.

Table 11. Economic indicators of fishing companies under examination in Porto Empedocle (in Euro 2003).

	$\bar{x}$	S	C.V. (%)	Variation (%)	
				2003/2002	2003/2001
Value of landings	138 100	18 071	13.1	5.6	14.1
Various costs	41 688	5 331	12.8	5.3	15.0
of which fuel	35 031	5 143	14.7	-0.9	11.2
Depreciation costs	9 200	1 248	13.6	12.4	11.3
Maintenance costs	5 281	927	17.6	-4.0	12.8
Crew share	46 278	6 368	13.8	5.8	13.7
Added value	81 931	12 123	14.8	5.8	14.0
Net income	35 653	5 786	16.2	5.8	14.4

Table 12. Indicators of daily economic productivity of fishing companies under examination (value in Euro).

		2001			2002			2003		
		$\bar{x}$	S	C.V. (%)	$\bar{x}$	S	C.V. (%)	$\bar{x}$	S	C.V. (%)
Value of landings (GRT*days)	Mazara del V.	15.4	6.5	42.4	15.7	7.3	46.4	16.9	7.4	43.6
	Sciacca	20.9	3.7	17.6	24.3	3.6	14.8	25.8	4.0	15.7
	Porto E.	18.8	9.2	51.3	19.1	10.0	52.4	20.7	11.3	54.4
Value added (GRT*days)	Mazara del V.	6.7	2.6	39.5	7.1	2.9	41.2	8.4	3.2	38.1
	Sciacca	11.6	2.2	19.0	14.6	2.2	15.1	15.4	2.3	15.1
	Porto E.	10.8	5.9	54.9	11.4	6.2	54.2	12.4	7.3	58.6
Net income (GRT*days)	Mazara del V.	2.1	0.9	44.9	2.3	1.0	41.1	2.8	1.1	39.8
	Sciacca	4.9	2.0	39.9	6.7	2.0	29.8	5.5	1.1	20.6
	Porto E.	4.7	2.6	56.3	4.9	2.6	52.6	5.4	3.3	60.3

The depreciation and maintenance costs in Mazara del Vallo are equal to 9% and 4% of the value of landings, respectively. In Porto Empedocle, the depreciation costs, equal to 7% of the value of landings, are much lower than those found in the samples of Sciacca (9% of the value of landings), which can be linked to the important modernization measures having involved the fleet in Sciacca; average costs for maintenance, on the other hand, are similar (4% of the value of landings).

Net income shows highest profitability for the enterprises of Mazara del Vallo, which however also show the highest variability coefficients.

The analysis of trends of economic productivity indicators (value of landings, value added and net income, relative to the number of fishing days and tonnage) carried out for the three samples of companies surveyed shows that the vessels from Sciacca, over the 3 yr period, have achieved the best economic results per unit of GRT compared with those of Porto Empedocle and Mazara del Vallo (see table 12).

#### 4. Conclusions

The catch of shrimp in Sicily is carried out by a large fleet authorized to trawl in coastal zones or in open sea (beyond 64 km from the Sicilian coast), mainly operating from the marine authorities of Porto Empedocle and Mazara del Vallo.

The vessels that carry out deep-sea shrimp fishing in open sea (in Mazara del Vallo) have capacity features such as tonnage, length, and engine power superior to those of coastal trawlers (in Sciacca and Porto Empedocle). Therefore, fishing enterprises in Mazara del Vallo have higher running costs, especially in terms of fuel, and higher levels of investment in equipment and maintenance, than coastal trawlers. Mediterranean or deep-sea fishing is, as a matter of fact, carried out using boats with over 100 GRT and with more sophisticated equipment, which requires special systems on land for maintenance and laying up. This type of fishing takes place all year round with fishing cycles lasting about 20 d and a crew made up of seamen ranging in number from seven to 11. Suitable navigation instruments (radar, GPS, blue box, VHF), shoal-location systems (echo-sounders), and complex equipment for catch preservation (refrigerators and freezing systems) and, in some cases, for initial processing of the catch are employed. The higher amount of capital invested is due to the characteristics of the fishing activity itself: fishing zones are far off the coast, the water is deep, and a high risk owing to adverse marine weather conditions is involved. The amount of capital invested per unit of tonnage is therefore higher than for a coastal trawler.

The micro-economic analysis of the surveyed companies highlights the good profitability of trawl fishing in all ports examined: the fleet of Mazara del Vallo is characterized by its entrepreneurial spirit, which allows ship owners to obtain high levels in value of landings, value added, and net income as return on their considerable investment; the companies operating from Porto Empedocle and Sciacca use significantly smaller vessels, and accordingly the values of the economic indicators are lower, but none the less they show high levels of economic productivity.

The results obtained are useful to allow the legislator to put into effect ecologically and economically sustainable development strategies.

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