“Piloting of eco-innovative fishery supply-chains to market added-value Adriatic fish products”

Priority Axis: Blue innovation

1.1 - Enhance the framework conditions for innovation in the relevant sectors of the blue economy within the cooperation area

D5.1.1: Supply chain report

WP5: Building up value chain and marketing of Adriatic eco-innovative fishery products / A5.1 Market opportunities for value chain enhancement

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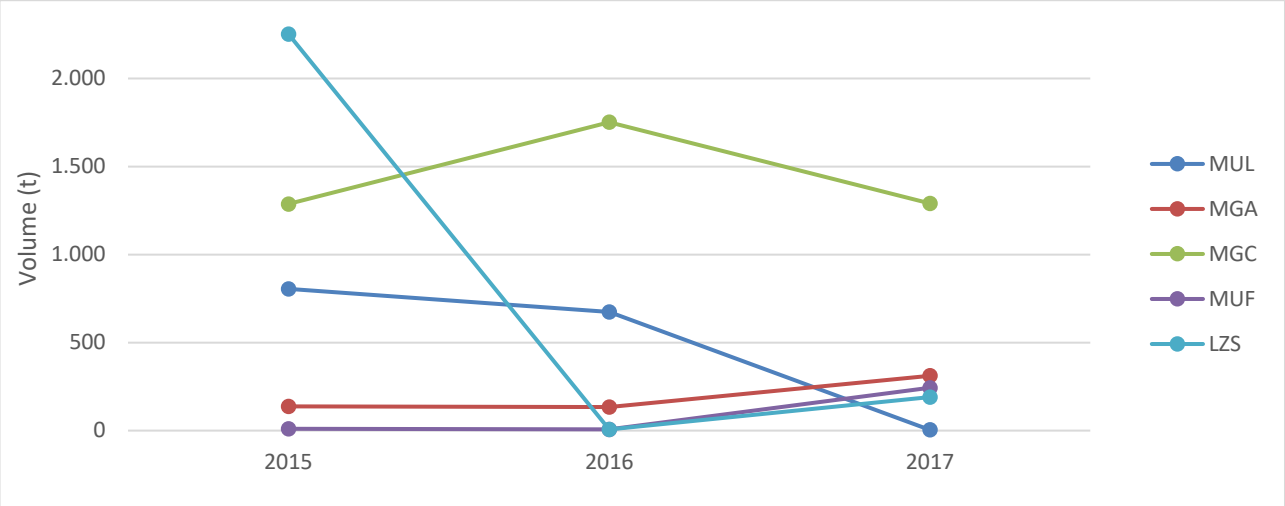
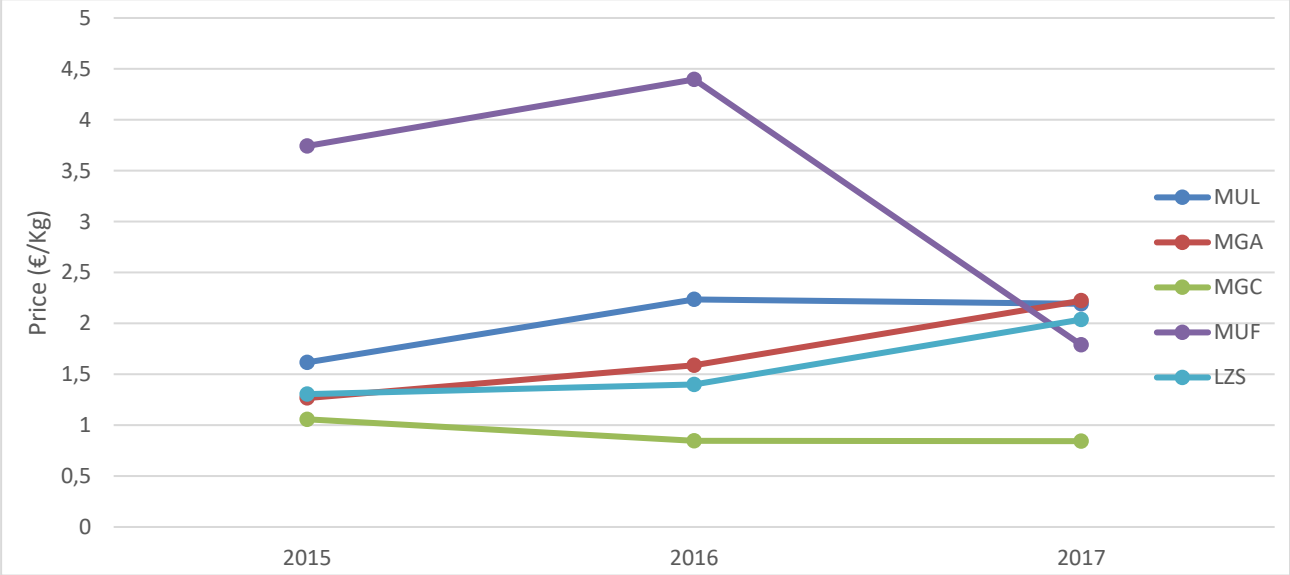




1. INTRODUCTION

This report addresses the current status of some of the main fish and seafood supply chains in Italy and Croatia. It intends to evaluate which species are produced and where, with which fishing gears, where they are traded and consumed. It also evaluates how the price change along the supply chain and how prices are integrated through the space and the supply chain. These two objectives have been realized recurring to official data from national statistics (Italy and Croatia) and from EU datasets (Eurostat, Eumofa). Finally, this report tries to integrate official data with information collected on the field, and it investigates more deeply a limited number of supply chains, recurring to interviews with key stakeholders that will permit to highlight specific structural characteristics of the production, trade and processing of selected species. In particular the relationships existing between different classes of actors along the supply chain will be investigated, as well as the processes that affect the formation of price and the opinion related to sustainability labels.

Since more official data are available for Italy compared with Croatia, more interviews have been conducted with Croatian stakeholders, in order to compensate the gap of information.

The report is structured as follow. The analysis of secondary data includes three chapters: Chapter 2 includes a structural analysis of Italian and Croatian supply chains; Chapter 3 includes a price analysis for Italy; Chapter 4 has a focus on Italian ex-vessel prices per gear and region. Chapter 5 presents the results of interviews with Italian stakeholders. Chapter 6 presents the results of interviews with Croatian stakeholders.

In the appendix, the procedure for the choice of the selected species is indicated.

2. ANALYSIS OF SECONDARY DATA: STRUCTURAL ANALYSIS OF SUPPLY CHAINS

2.1 INTRODUCTION AND METADATA

This analysis is based upon European sources from two different institutions. The first is Eumofa (European Market Observatory for Fisheries and Aquaculture Products) which presents three different data sets, depending on the requested period base: Weekly, Monthly and Yearly. Eumofa always receives the original data for all the single species recorded (basing on the FAO 3-alpha code) from National Authorities, Private information providers (such as Europanel and Euromonitor) and from EU institutional sources[1], and then aggregates them at main commercial species level. Moreover, Eumofa also grants a data harmonization (that helps in comparing different supply chain stages) and different kinds of data quality check.

The second source is EUROSTAT (the institutional statistical office of the European Union), on which data regarding the single species are recorded by FAO alpha code.

Six different items are analyzed in the report, each with its own source.

a) **Landings**. Landings datasets are chosen because they are more representative of the regional effective fishery production than the Catches ones. Both the available sources (Eurostat and Eumofa) are here used, analyzing measurement of Price, Volume and Value for Italy and Croatia. The Yearly Eumofa dataset presents data that are directly collected from European member states with a lag of 12-24 months. The Eurostat *Landings of fishery products - main data* (fish_ld_main) presents data from the 2000-2018 period.

[1] https://www.eumofa.eu/documents/20178/24415/Metadata+1+-+DATA+COLLECTION.pdf/ce349b1c-f73a-413a-b6f0-7dfee54fa042

b) **Import/Export.** Even for the I/E flows data from Eumofa and Eurostat are used, in both cases containing information for Italy and Croatia. The Eumofa Yearly database[2] for import/export derives from EUROSTAT – COMEXT and allows to analyze commercial flows dividing them by Intra/Extra UE and, moreover, for specific partner countries. Eurostat provides the *International trade in goods - detailed data (ext_go_detail)*[3]. This dataset admits looking at commercial flows by a very specific level: Combined Nomenclature (CN8). The CN8 is a goods classification tool that distinguishes transformed good in a very detailed way, giving products description, volume, value and price. Crossing the data from the Eurostat CN8 dataset and the Eumofa i/e dataset is observable which was the most exported (or imported) products between Italy, Croatia and the main export partners in a given year.

c) **Wholesale.** For the analysis of the intermediate distribution phases, data from the Eumofa Weekly dataset are used, originated for Italy by *Istituto di Servizi per il Mercato Agricolo Alimentare (ISMEA)*. That section does not have any information for Croatia. It distinguishes data between the primary market (usually situated in villages on the coast) and the secondary market (Milan and Rome). Price information for the last decade here is well-covered, quantity and value are less available.

d) **Processing.** Data regarding the transformation of raw material in final products are taken by the Eumofa Yearly dataset, which is took from the Eurostat PRODCOM dataset. PRODCOM contains a peculiar classification of manufactured goods and is compiled with data given by the National Statistical Institutes (NSIs). Data for Italy and Croatia are collected within the range 2005-2018. Unfortunately, on the Prodcom dataset only useful information about anchovies and sardines are recorded.

[2] https://www.eumofa.eu/en/ad-hoc-queries3
[3] *https://ec.europa.eu/eurostat/web/international-trade-in-goods/data/database*

e) **Consumption.** Eumofa provides two different datasets for consumption. The Weekly dataset contains information about supermarkets and other retail prices as well as information obtained from family panels. Eumofa does not report any indication about how they are combined. The Monthly dataset has Europanel as source and the household fresh products consumption as object. Europanel considered for Italy a sample made by 10.000 households chosen in a representative manner. There is a huge discrepancy between the two collected datasets, in particular for volumes (prices also differ but maintain the same length scale, they don't). In fact, weekly volume data result to be up to 4-5 times higher than monthly for all the considered species. For Italy there are only information covering 2009-2015 for Cuttlefish and 2009-2019 for Anchovy and Clam. No data for Croatia is available at all. The Monthly dataset's last loaded period is September 2019, so the information on 2019 must be considered partial.

f) **Supply Balance.** To create the supply-balance sheet the formula "Apparent Consumption (AC) = Production (Landings) + Import – Export" is used. Due to using two different sources, two distinct and sometimes different apparent consumption indices are obtained (where possible): one exclusively from Eumofa's data and one exclusively from Eurostat. As Eurostat only reports import/export data that refer to the net product weight, supply balance calculation can be more accurate harmonizing the net product weight (or the cn8 final product weight, that can be referred to a fresh, frozen or processed product) into live fish weight. This is possible multiplying the Comext Cn8 export or import data for the specific Conversion Factor (CF)[4] established by the European Commission, which yearly issues detailed rules for the implementation of Council Regulation (EC) No 1224/2009 to establish and enforce a Community control system. The result is the live fish weight supply balance for every considered and available species.

[4] A complete Conversion Factors list, used for the report, can be found at: https://www.eumofa.eu/documents/20178/24415/Metadata+2+-+DM+-+Annex+7+CF+per+CN8_%252707-%252714.pdf/7e98ac0c-a8cc-4223-9114-af64ab670532

Following data availability, the apparent consumption has been calculated for the years 2017-2018.

Data will be presented by selected species.

2.2 ANCHOVY

For analyzing the supply chain of anchovies, the European Anchovy (ANE) species is considered from Eurostat's database, where instead Eumofa considers the whole aggregate main commercial species of "Anchovy", but in this specific case volumes are almost the same. Thereby supposedly the European Anchovy is the most captured anchovy in Italy and Croatia, and the analysis can proceed like if they were the very same.

LANDINGS Ita/Cro

Anchovies are one of the most fished species between those considered.

There is a full data coincidence for Italy between Eumofa and Eurostat, giving an average yearly volume of 47.665t (for an average yearly value of 76,486 Million Euros) in the 2000-2017 period. This quantity has not been stable over time, it had a peak level in 2006, a minimum in 2013 and then the tendency has been a consolidation around 40.000t per year.

Croatian data cover a smaller timing but reveal a constant production slightly over 10.000t per year. Averagely speaking, Croatian anchovies are cheaper than Italians (0,91 €/Kg versus 1,62€/Kg) with a range that goes from 1,01€/Kg (2017) to 0,73 €/Kg (2014).

From a first analysis, volume and price result uncorrelated as price didn't react to the 2006 peak and continued its slow growing path.

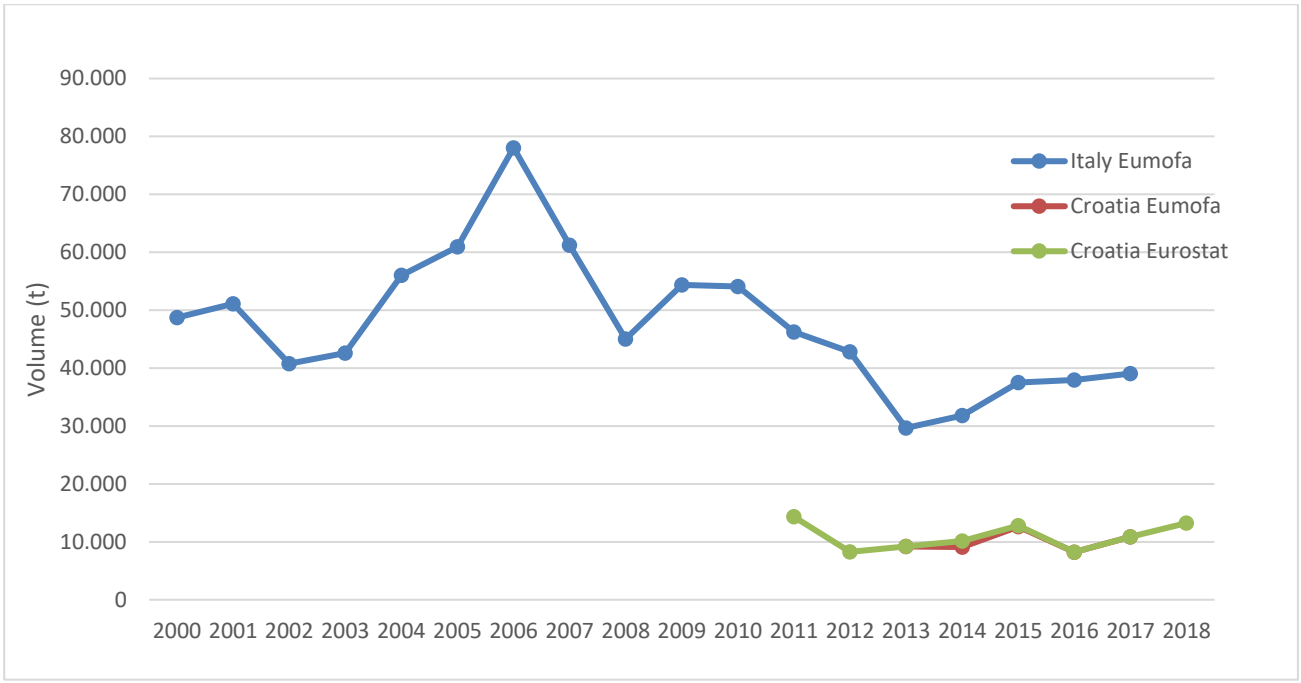


Figure 1: Landings volume (t) - Anchovy

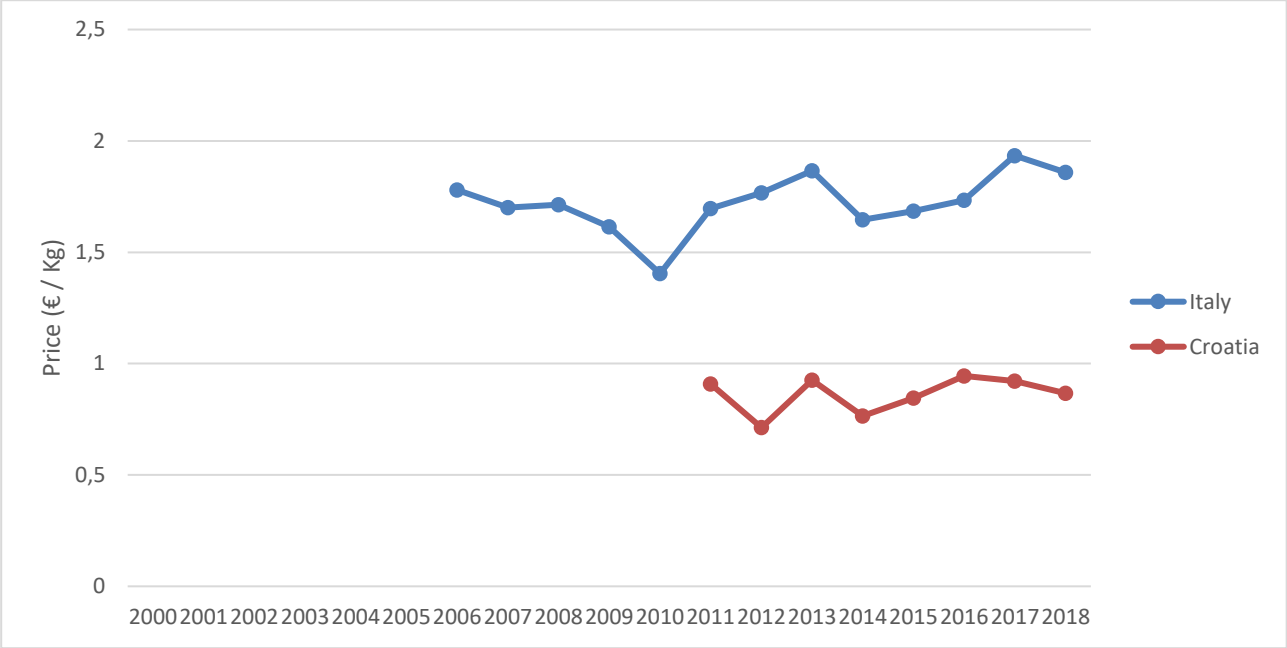


Figure 2: Landings Price - Eurostat - European Anchovy (ANE)

IMPORT/EXPORT Italy

The general export trend is descending, and this tendency is divisible into two different factors: if the Extra Eu export remains almost stable around 5.000t per year since the beginning of the century, the total export is mostly influenced by the Intra Eu trend, which is sinking from the 2006 peak (22.459t) to the actual 3.711t (2019).

In 2019 the total value of anchovy export amounted to 44 Million euros. The export price is constantly rising, from 2€/Kg in 2002 to actual 6€/Kg in 2019, without any particular shock or trend reversal and without any apparent link with the commercial flow volume.

The most important partner countries are Albany, Germany, Spain, USA and Tunisia. It's important to notice that Spain has had an undisputed primary role in the last 20 years (in particular its 2006 impressive peak leaded almost entirely the overall Italian export) as observable from the following graphs.

Analyzing the CN8 goods distinction stands out how in volume the most important exported anchovy product (in 2017-2018) has been the *Fresh or chilled Anchovy* (4.303t in average, equivalent to 11.45 Million euros), followed by *Prepared or preserved anchovies, whole or in pieces, excl. Minced* (2.512t) and *Anchovies salted or in brine only, excl. fillets* (1.936t). By value, the situation is different: the most important product is *Prepared or preserved anchovies, whole or in pieces, excl. Minced* (27,96 Million euros), chased by *Fresh or chilled Anchovy* (11,45 Million €).

Prepared or preserved anchovies (excl. whole or in pieces), Anchovies other than edible fish offal, dried, whether or not salted, but not smoked and *Anchovies excluding edible fish offal of subheadings frozen* are relegated to a minor commercial relevance.

During 2018, *Fresh anchovy (03024200)* has been the most exported form of anchovies from Italy to Spain (for an amount of 1.807.280€) and Germany (3.949.311€).

For Tunisia (1.273.867€) and Albania (3.908.308€) the most demanded product has been *Anchovies salted or in brine only excl. fillets (3056300). Prepared or preserved anchovies, whole or in pieces (excl. minced) (16041600)* resulted to be the most exported product to United States (3950994€) and Japan (3.367.754€), while it had relevant changes even with Albania (2.273.060€), Germany (1.726.399€) and Spain (293.352€).

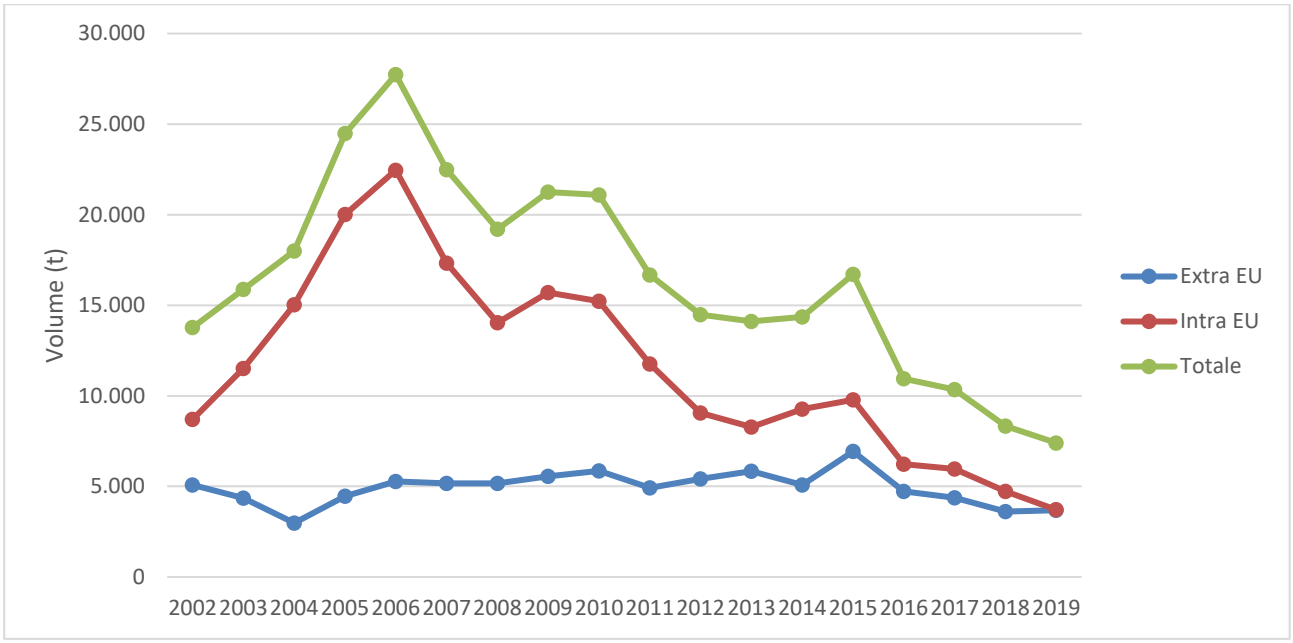


Figure 3: Volume Export Italy - Anchovy – Eumofa

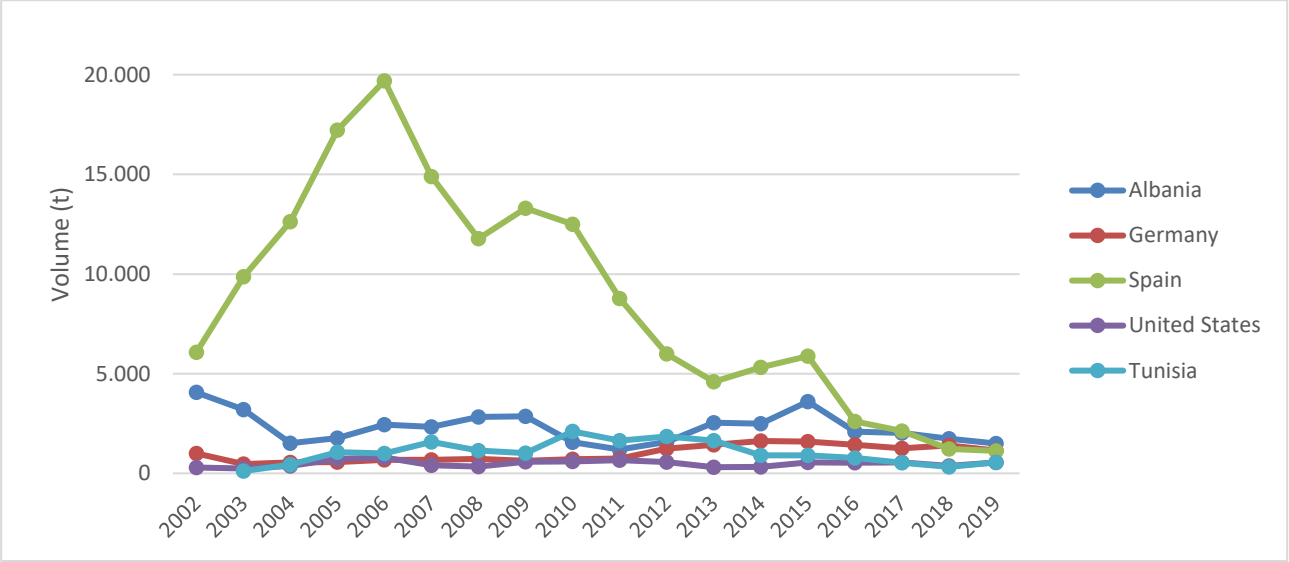


Figure 4: Major partners - Volume Export (t) - Anchovy - Eumofa

Two different phases are recognizable into the last 20 years of import: a first ascending phase (2000-2011) leaded by a strong Extra-Eu flow increase, and a second descending phase (2012-2019) where the extra-Eu fall is mitigated by an intra-Eu increase. A possible explanation is to be researched into import prices, as signaled by the graph. The price lines crossed in 2012, making intra-Eu import cheaper than extra-Eu and strengthening the trend. In the 2019 Italy imported 12.578t of Anchovies, for a total value of 78,36 Million euros at an average price of 6,23 €/Kg.

The most important partner countries, listed by a 5-years average volume, are Morocco, Spain, Albania, Croatia and Tunisia, but their order greatly depends on the considered year. Moreover, due to a huge price variability between countries (for example in 2019 anchovies from France costed 2,85€/Kg, whereas from Albania costed 8,75 €/Kg) compiling the list basing upon values instead of volume definitely changes the list order.

Some differences from exports are detectable analyzing the CN8 goods distinction. The same order here is valid both for value and volume. The most imported anchovy product (in 2017-2018) has been the *Prepared or preserved anchovies, whole or in pieces, excl. Minced* (7.499t and 60,7 Million euros), followed by *Anchovies salted or in brine only, excl. fillets (*3.658t, 16.5 Million euros), *Fresh or chilled Anchovy* (3.117t, 7.2 Million euros) and *Prepared or preserved anchovies excl. whole or in pieces* (587t, 4.6 Million euros). Import of other products are not relevant (<300k €).

In 2018, *Anchovies salted or in brine only excl. fillets (3056300)* were the most imported product from Morocco (21.419.781€) and Croatia (2.453.643€), but still relevant flows were those directed from Albania (4.386.176€) and Spain (4.600.151€). *Prepared or preserved anchovies, whole or in pieces (excl. minced) (16041600)* has been the most imported product from Albania (17.845.776€), Spain (5.143.209€), Tunisia (9.887.563€) and Peru.

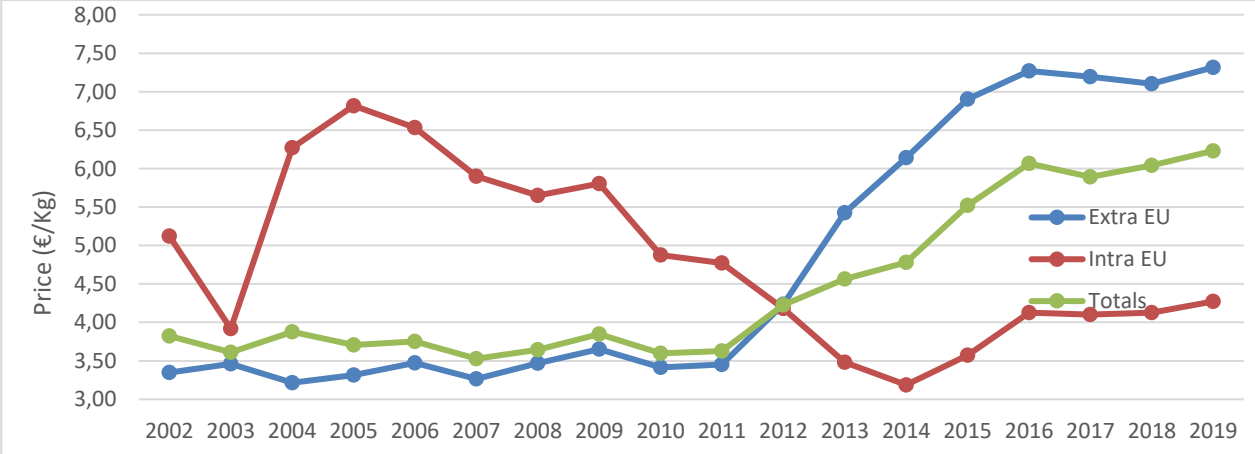


Figure 5: Price Italy (€/Kg) - Anchovy – Eumofa

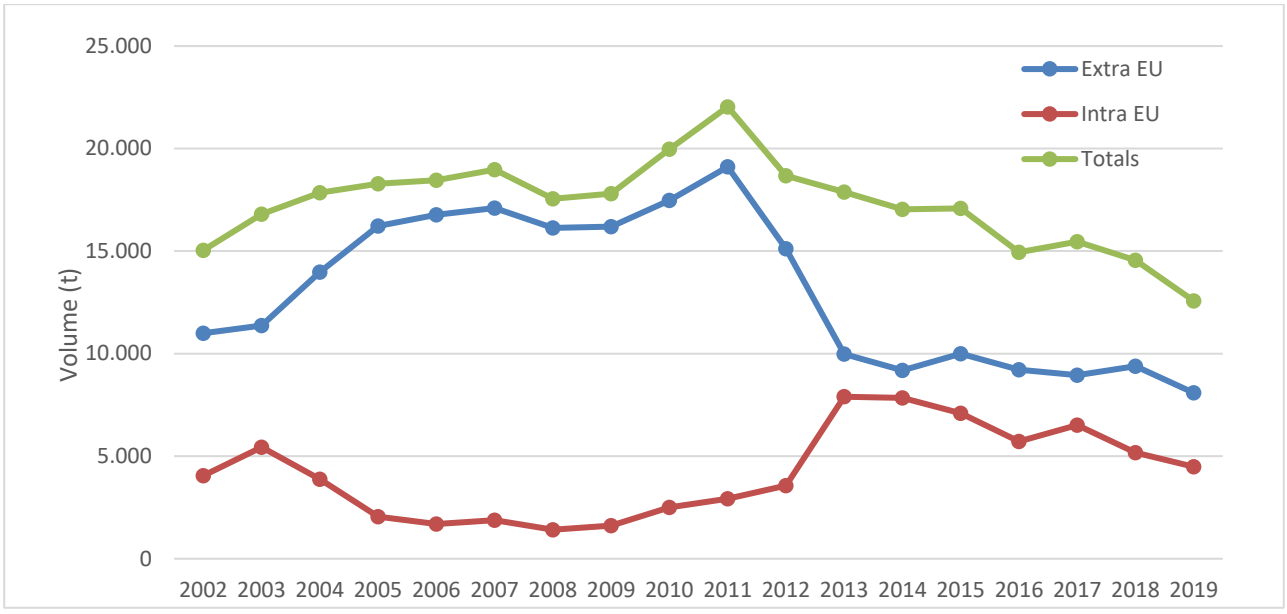


Figure 6: Volume Import Italy (t) - Anchovy - Eumofa

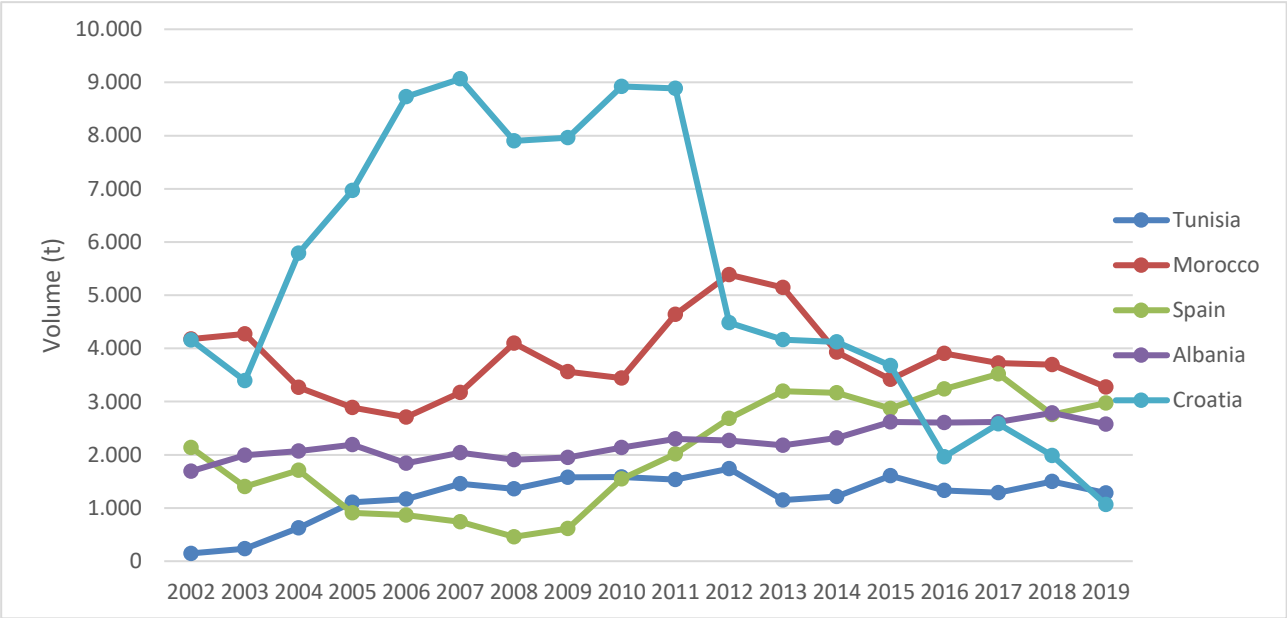


Figure 7: Five major partners - Volume Import (t) - Anchovy - Eumofa

IMPORT/EXPORT Croatia

Data for Croatian import/export only cover the 2013-2019 period.

For export, is noticeable a first phase of volume increase (2013-2015) and then a stabilization around 8.000t per year. Prices of export rose from 2,2€/Kg (2013), to the actual 2,50€/Kg passing through the 3€/Kg-maximum (2016). During 2019, Croatia exported 6.765t of anchovies for a total amount of 16,9 Million euros, with an average price of 2,5€/Kg.

The most important countries for Croatian anchovy export are Albania, Italy, Spain, Bulgaria and Greece.

Analyzing the CN8 goods distinction is observable how the most relevant product is *Anchovies salted or in brine only, excl. fillets (*3.820t, 12,3 Million euros), followed by *Fresh or chilled Anchovy* (2.344t, 3,72 Million euros), *Anchovies frozen (*1.369t, 1.95 Million euros) and *Prepared or preserved anchovies, whole or in pieces, excl. Minced* (532t and 2.6 Million euros).

During 2018, *Anchovies salted or in brine only excl. fillets (3056300)* has been the most traded product to Bosnia And Herzegovina (97.894€), Albania (8.078.917€), Spain (1.222.935€), Italy (3.541.046€).

Frozen anchovies (03035910) has been the most requested product from Bulgaria (413.196€) and Greece (277.409€).

Moreover, *Fresh anchovy (03024200)* has represented a relevant Croatian export to Albania (1.073.841€) and Italy (2.3867.431€) and 2.265.0.17€ worth of *Prepared or preserved anchovies (excl. whole or in pieces) (16042040)* were sent to Italy.

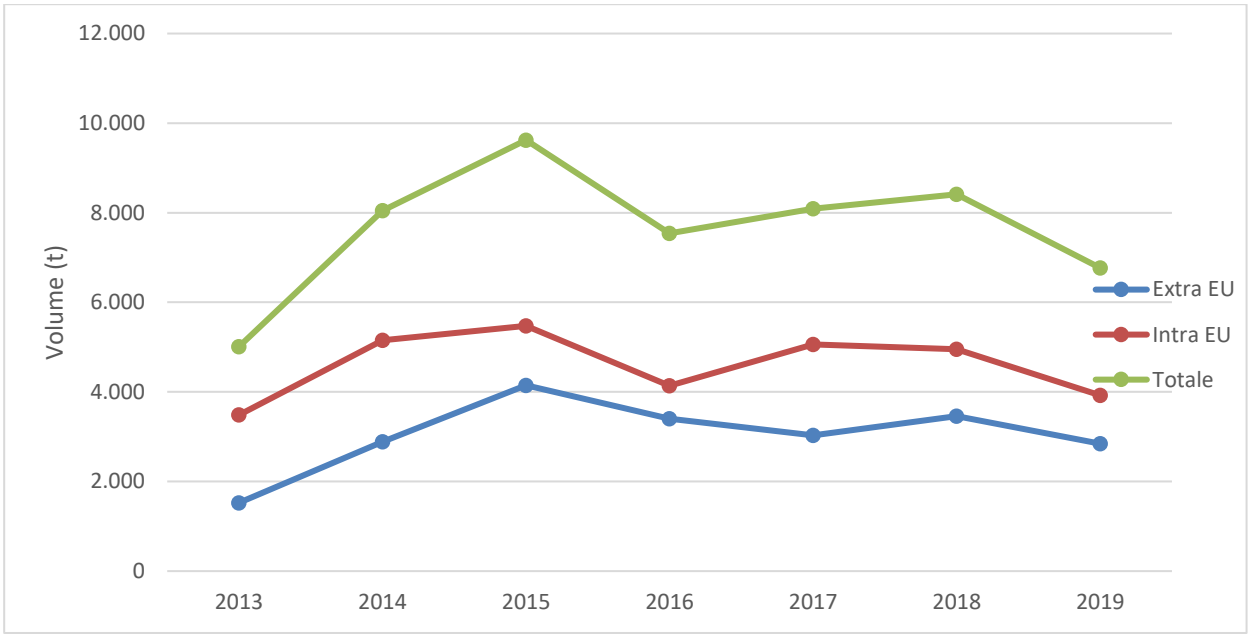


Figure 8: Volume Export Croatia - Anchovy - Eumofa

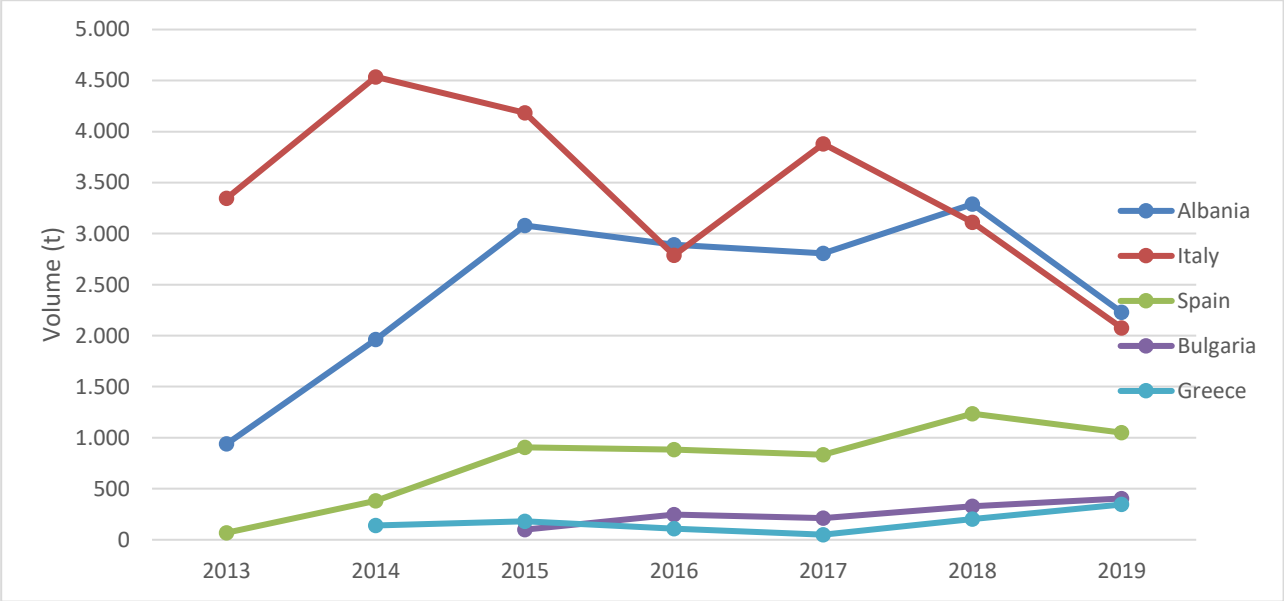


Figure 9: Five major partners Croatia - Export Volume (t) - Anchovy - Eumofa

During 2019, Croatia imported 274,8t of Anchovies, for a total value of 745.260€ (at an average price of 2,48€/Kg, where intra-EU anchovies were valued 2,38€/Kg and extra-EU 7,35€/Kg). The historical data show a continuous growth in the 2013-2017 lapse, with an apex at 1.588t, pushed at this level mainly by Spain and Italy, the two most relevant commercial partners (extra-Eu import has been nearly irrelevant in the last 7 years). Other relevant partners are Slovenia, Albania, Bosnia and Herzegovina, Czech Republic and Greece.

The most imported anchovy product (again, in 2017-2018 average) has been by far *Fresh or chilled Anchovy* (893t, 1,44 Million euros). Less important were *Prepared or preserved anchovies, whole or in pieces, excl. Minced* (33,8t and 0,39 Million euros), *Anchovies salted or in brine only excl. fillets* (38,4t, 0,18 Million euros) and *Anchovies frozen (135t,* 0,13 Million euros). Regarding

imports, *Fresh anchovy (03024200)* were the most important product from Spain (464.958€) and Italy (268.507€) and has been the only import from Slovenia (112.902€).

A relevant amount of *Prepared or preserved anchovies, whole or in pieces (excl. minced) (16041600)* has been imported from Bosnia and Herzegovina (72044€), Albania (69.531€) and Italy (159.064€).

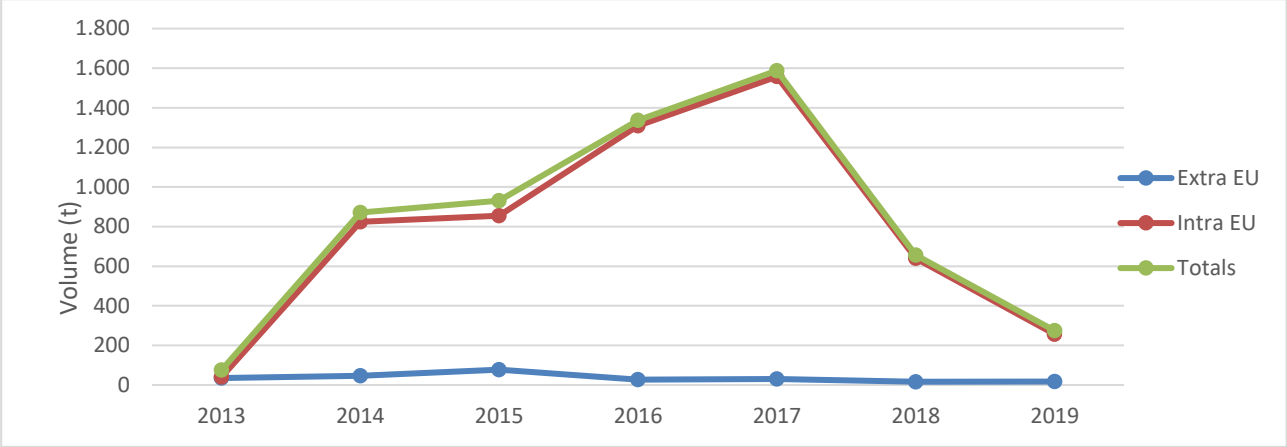


Figure 10: Volume Import Croatia (t) - Anchovy - Eumofa

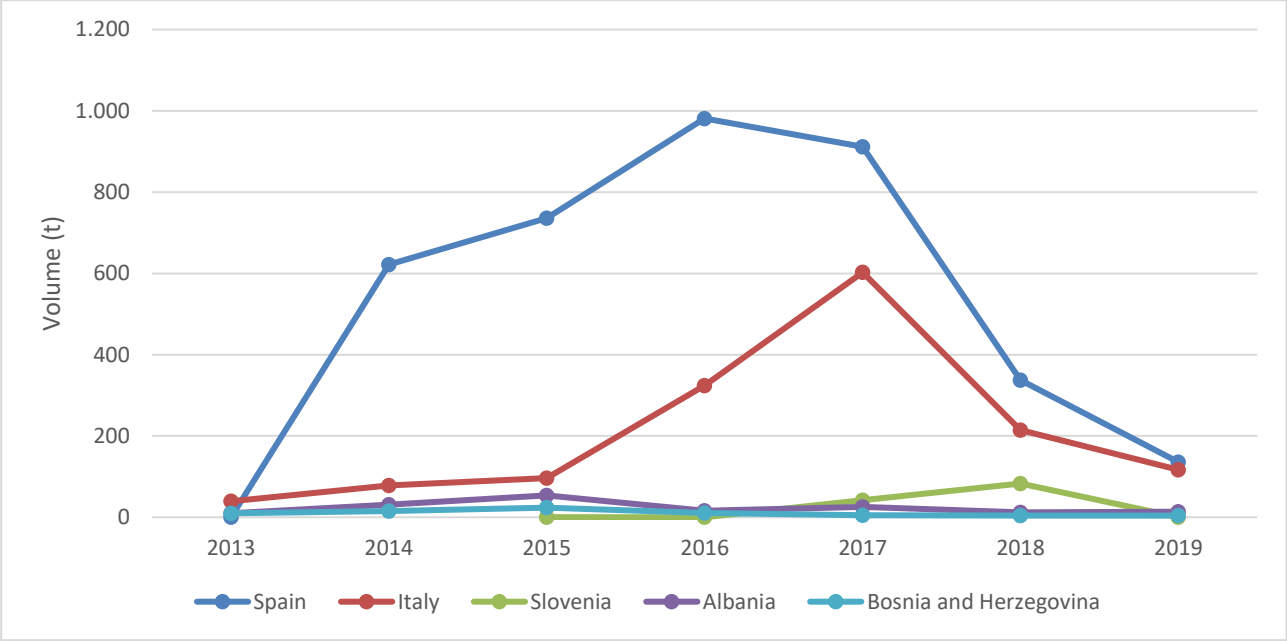


Figure 11:Five major partners Croatia - Import Volume (t) - Anchovy - Eumofa

WHOLESALE

Unfortunately no Croatian data are available for this item. For Italian anchovy there are some information, mostly about prices, both for the primary markets (Cesenatico, Molfetta, San Benedetto del Tronto) and secondary markets (Milano, Roma).

Between primary markets Cesenatico resulted to be the cheapest one, with an average price of 1,20€/Kg (2010-2017), a minimum price of 1,04€/Kg (2012) and a maximum price of 1,42€/Kg (2017). The most expensive was Molfetta (data available only for the period 2010-2013) that presented prices moving into the 1,64-2,76€/Kg range (2,04€/Kg in average). San Benedetto del

Tronto stays in the middle with an average price of 1,25€/Kg (minimum 1,07€/Kg during 2013, maximum 1,44€/Kg during 2017).

Secondary markets present prices way higher than the primary, for both we have data for the period 2010-2017. At Rome's market anchovies were sold within a price range of 3,94-4,94€/kg (on average 4,23€/Kg) while at Milano's they were sold within a range of 2,59-3,43 €/Kg. That makes Rome a way more expensive market than Milano for anchovies.

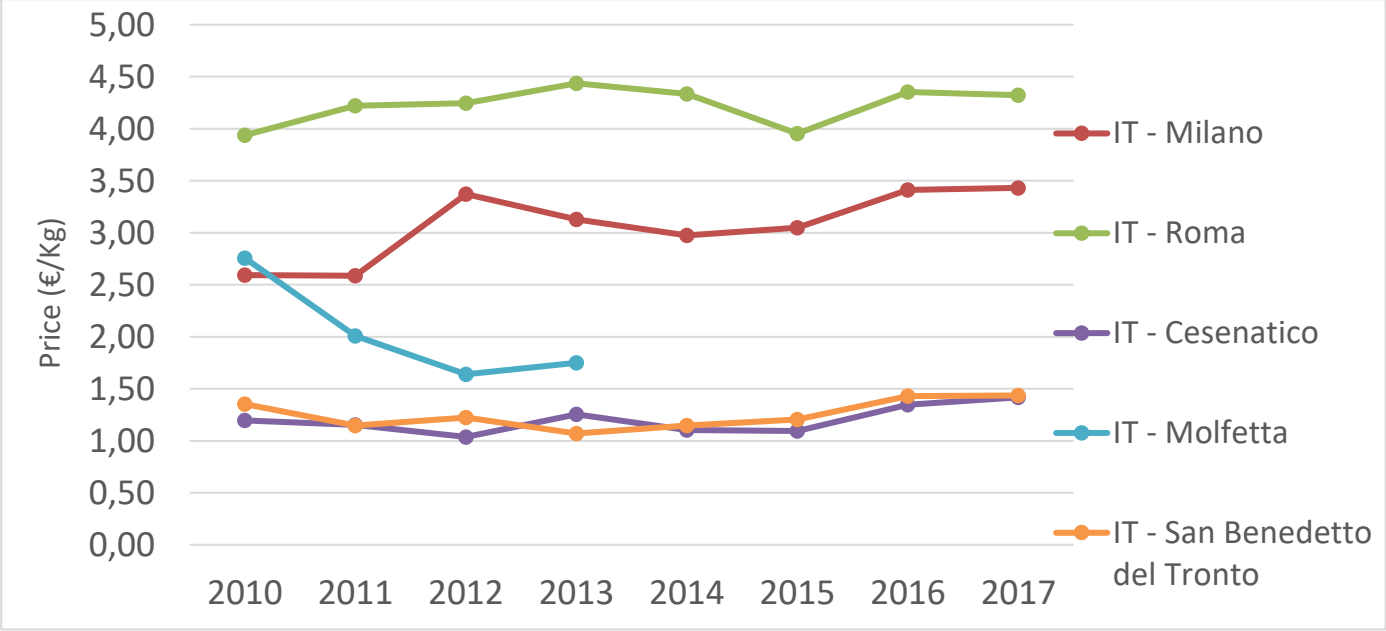


Figure 12: Primary and secondary wholesale markets prices – Anchovy - Eumofa

PROCESSING

The only anchovy-related voice inside the Prodcom dataset is *Prepared or preserved anchovies, whole or in pieces (excluding minced products and prepared meals and dishes),* which presents data from 2008 to 2018 for both Italy and Croatia.

Italian production of that processed product presents a descending trend that halved the volume between 2009 and 2015, before growing back in the following years and having a strong exploit in the 2018, with a transformed quantity of 16.557t. In the meantime, prices went up until the 2012 peak (from 8,43 to 12,37€/Kg) and then decreased back to 8,49€/Kg (2018).

In Croatia, this product is really inconstant: it has been irrelevant apart from particular years as during 2008 Croatia produced 2.195t, in 2014 700t and in 2015 329t. During 2019 Croatia only produced 12t. An interesting path is followed by price, which stayed under 4 €/Kg until 2014 and then suddenly moved over 14 €/kg for the following years.

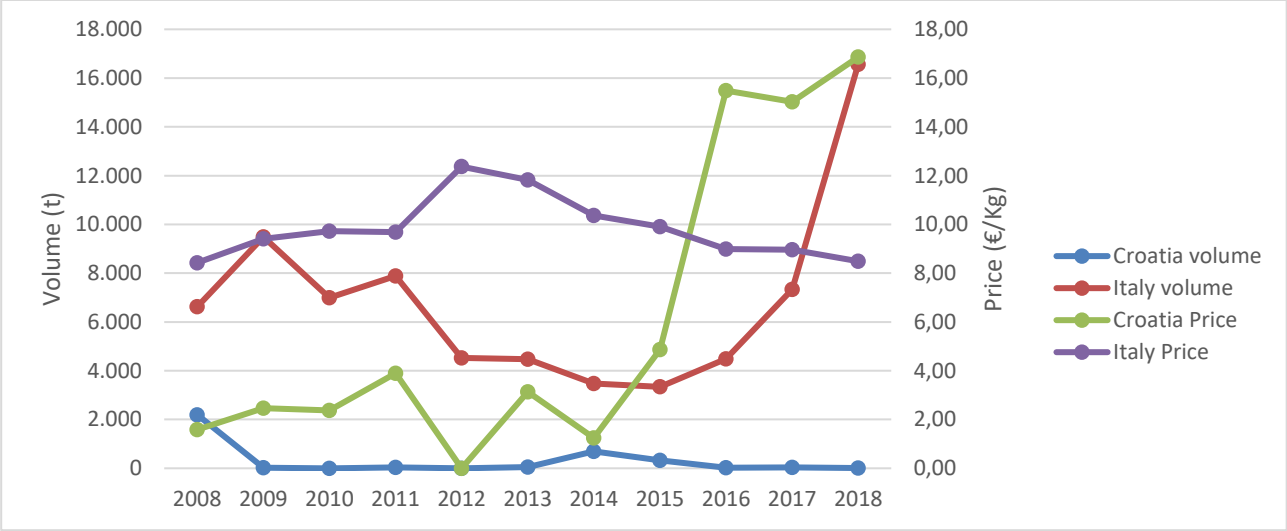


Figure 13: Prepared or preserved anchovies, whole or in pieces (excluding minced products and prepared meals and dishes) – Price and Volume

CONSUMPTION

From Eumofa's Weekly dataset information is available about Italian anchovy consumption, where the customer base is identified in both households and retail shops. During the last decade, on average, Italians consumed 87.225t of anchovies at a price of 5,79 €/Kg, for a total

amount of 493,3 Million euros. The consumption 10-years-trend is descending (2019 presented a volume of 59.861t) while prices are almost the same since 2009 (minimum 5,43€/Kg in 2009, maximum 6,34€/Kg in 2019).

From the Monthly dataset different information are derivable: basing on the household sample that Europanel consulted, considering the last decade Italians averagely consume 21.806t of Anchovy every year, at 5,68€/Kg. The last year with full information available, 2018, is the lowest data of the 2009-19 series by volume, and anchovy was priced 6,17€/Kg. Up to September, in 2019 the consumption has been of 14.965t and price 6,28€/Kg.

Even if with strongly different volumes, the graph extrapolated from Weekly gives back a shape similar to the Monthly one, but less sloping.

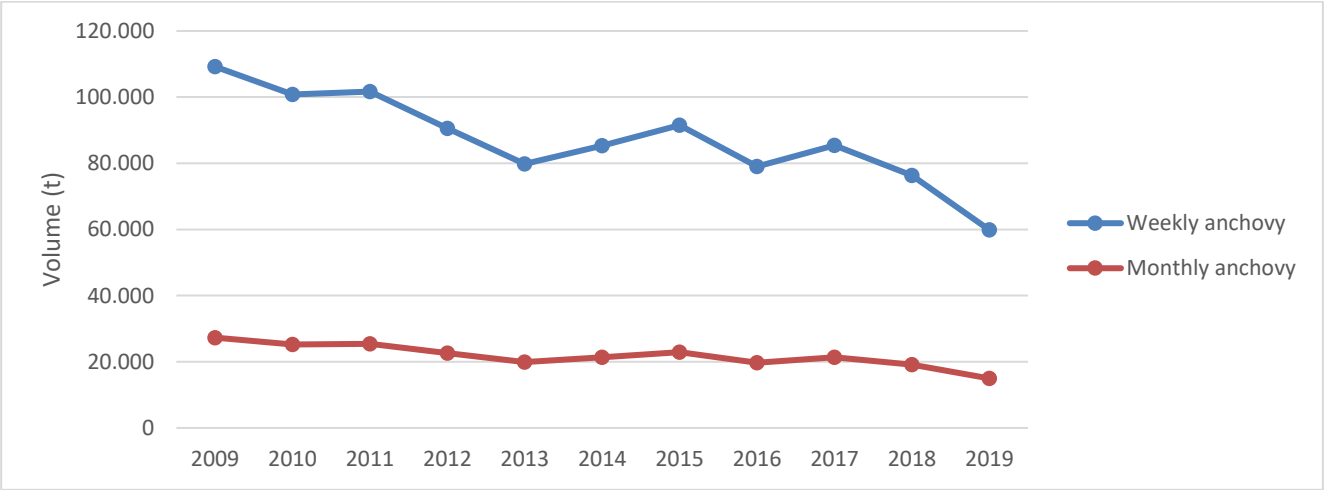


Figure 14: Weekly/Monthly Volume (t) - Anchovy

SUPPLY BALANCE

Combining the data previously presented in the report, an Apparent Consumption value for Italy and Croatia for the years 2017 and 2018 is calculable.

From Eumofa's datasets results that in 2017 Italy consumed 44.161,5t of anchovies, whereas Croatia consumed 4.380,80t. The same index isn't computable for the 2018 because there are not data about production (landings) neither for Italy nor Croatia.

From Eurostat are extractable information for both years: in 2017 Italy apparently consumed 49.203t of anchovies and Croatia consumed 2.630,2t. The following year Italy Consumed 48.741,9t and Croatia 3.574,6t.

If the consumption estimates made by Eumofa in weekly and monthly datasets are very different from each other, this result lays in the middle of this range.

Table 1: Supply balance computation - Anchovy

		Landings (t)	Import (t)	Export (t)	Apparent Consumption	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	39.039	15.466	10.343	44.161	0,7
	Cro 17	10.880	1.588	8.087	4.381	1,1
Eurostat	Ita 17	39.039	24.154	13.999	49.204	0,8
	Ita 18	36.330	23.794	11.382	48.742	0,8
	Cro 17	10.880	1.654	9.904	2.630	0,6
	Cro 18	13.251	697	10.373	3.575	0,9

The following chart allows to confront the available estimates for Italian and Croatian anchovy consumption. As immediately noticeable, they greatly differ from each other. Data for Apparent Consumption Eurostat lays in the middle of the two Eumofa consumption dataset (Monthly and Weekly).

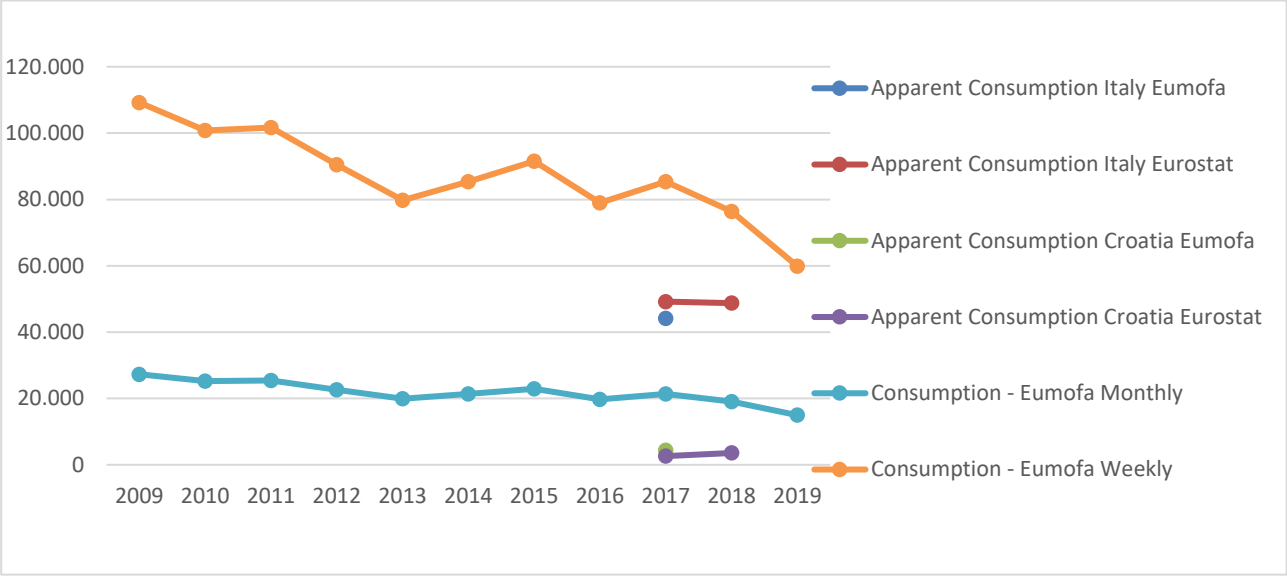


Figure 15: Anchovy Consumption and Apparent Consumption

2.3 CUTTLEFISH

With the aim of analyzing the supply chain of Cuttlefish, the focus is on the Common Cuttlefish (CTC) species, where instead Eumofa considers the whole aggregate main commercial species of "Cuttlefish", but even in this specific case volumes are almost the same. For Italy, between the Eumofa-Cuttlefish and Eurostat-Common Cuttlefish data, in the period 2015-2017, there is a coincidence of 96-98%, while for Croatia around 91-93%.

Thereby supposedly the Common Cuttlefish is the most captured Cuttlefish in Italy and Croatia and data can be confronted on similar bases.

LANDINGS Ita/Cro

For this species, Eurostat covers 2011-2018 for Croatia and only 2015-2018 for Italy. Eumofa instead covers the 2013-2017 period for Croatia and 2000-2017 for Italy.

On average, during those timings, Italy fished 7.531,27t of cuttlefish per year, at a price of 7,20€/Kg, according to Eumofa, and 6.183,4t, at a price of 9,47€/Kg, according to Eurostat.

Croatia fished 174t at 4.47€/Kg according to Eumofa and 145,48 t at 4.67€/Kg according to Eurostat.

The Cuttlefish landings data show for Italy a 3-phase pattern: during 2000-2004 the quantity stayed unstably around 6.000t per year, in the 2004-2010 the volume exploded to 14.000t before going back to 6.000t, where it stayed (with a small upward slope) until 2017, when data ends. That become clear on the following graph. During the whole considered period, price maintained a constant growth, that brought it from 4€/Kg (2000) to 9,12€/Kg (2017).

For Croatia, during 2011-2018, there was a growing tendency in the first part (2011-2014, with a 201.6t/year peak) and a descending one in the second (decreased to 91.5t/year in the 2018).

Recorded prices are always lower for Croatian Cuttlefish than for Italian, with differences contained into a 3-4.5€/Kg range.

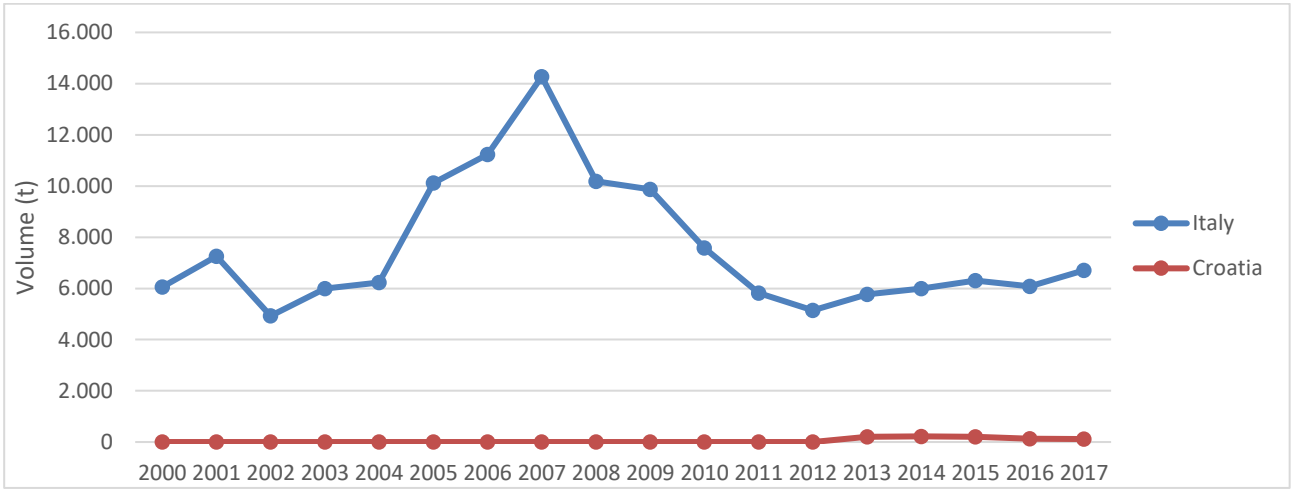


Figure 16: Landings Volume (t) - Eumofa - Cuttlefish

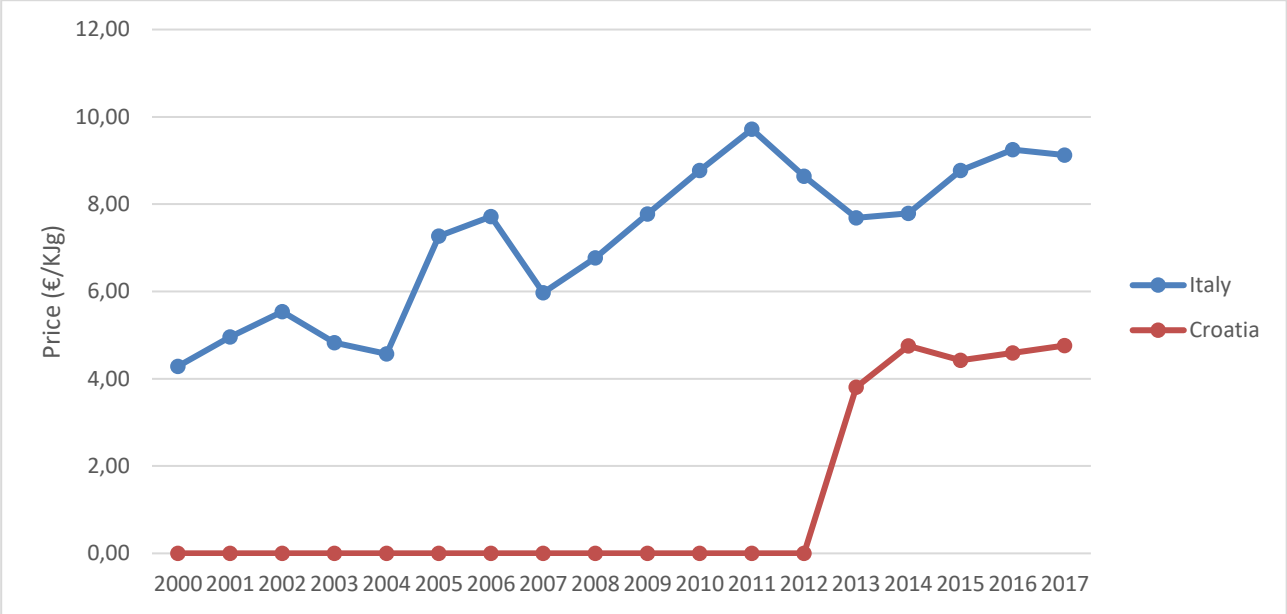


Figure 17: Landing Price - Eumofa - Cuttlefish

IMPORT/EXPORT Italy

Volume export for Italy shows an unstable pattern, generally descending but with some trend inversion. The main role has been covered by the intra-Eu exports, but on determined periods even extra-eu has been relevant, for example during 2009 when the importance of the export destinations has been inverted by the Swiss huge demand.

On average, during 2002-2019, Italy exported 1.217,6t at an average price of 4.8€/Kg, while during 2019 Italy only exported 519.9t at 7.69€/Kg, recording a very negative year (20-years low).

The price graph shows a positive pattern, more than doubling itself between 2003 (3,22€/Kg) and 2019. Extra-eu export prices grew just a bit slower than intra-European prices.

The most important commercial partners, ordered by 5-year volume average, are Spain (250,9 t.), Germany (177,9 t.), France (78.4 t.) Croatia (57.6 t.) and Ghana (which actually only presents a 43t. demand in the 2018). Between those, Spain historically covered the most important role, even if in the short past it stopped being more relevant than other countries. Speaking about prices, Germany presented the highest average price (10,32€/Kg), followed by Spain (7,31€/Kg) and France (7,29€/Kg), while the lowest price was recorded by Ghana (4,5€/Kg) and Greece (5,48€/Kg).

According to CN8 eurostat database, in 2017-2018 average, the most remunerative export product has been *Cuttlefish frozen, with or without shell (3.092.731€)*, followed by *Cuttlefish smoked, dried, salted or in brine, with or without shell (1.404.613€) and CuttleFish live, fresh or chilled, with or without shell* (1.353.361€). Ordering product per volume doesn't change their order.

Going more deeply into the export analysis it's discernible, having as a reference the 2018, that *Cuttlefish smoked, dried, salted or in brine, with or without shell* (3074920) has been the most requested cuttlefish product from Germany (64.5t, 751.690€) and Ghana (43t, 193.455€). *Cuttlefish frozen, with or without shell* (3074329), was the most exported to Spain (402.5t, 2.476.649€) and France (35.1t, 310.995€). Only Malta resulted being importing mainly *Cuttlefish live, fresh or chilled, with or without shell* (3074210) for an amount of 38.359€.

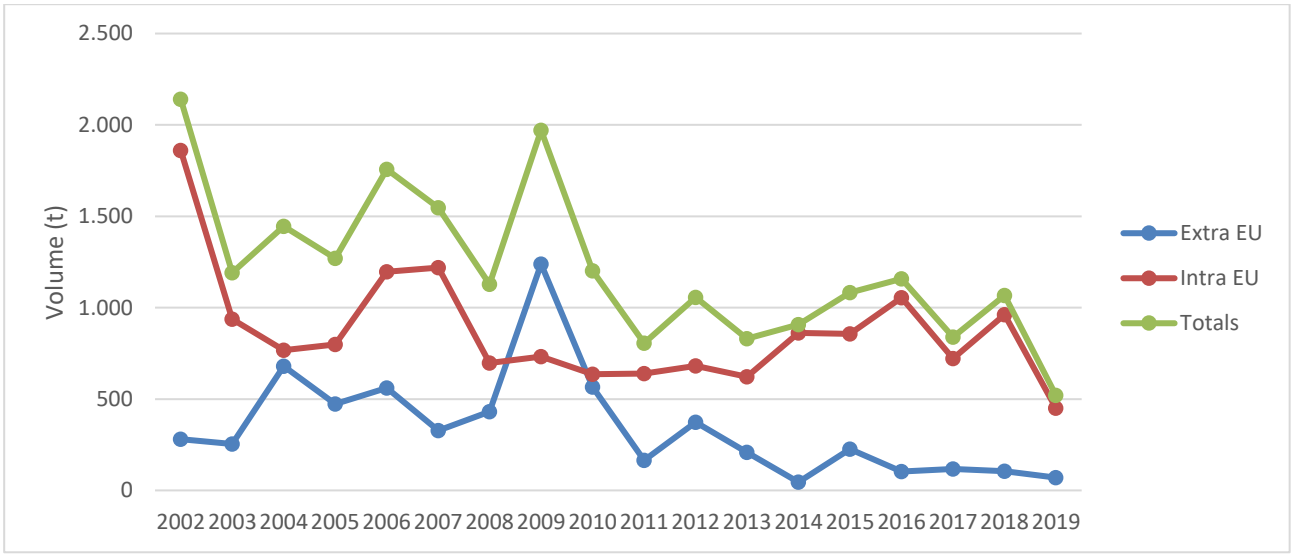


Figure 18: Volume Export Italy (t) - Cuttlefish - Eumofa

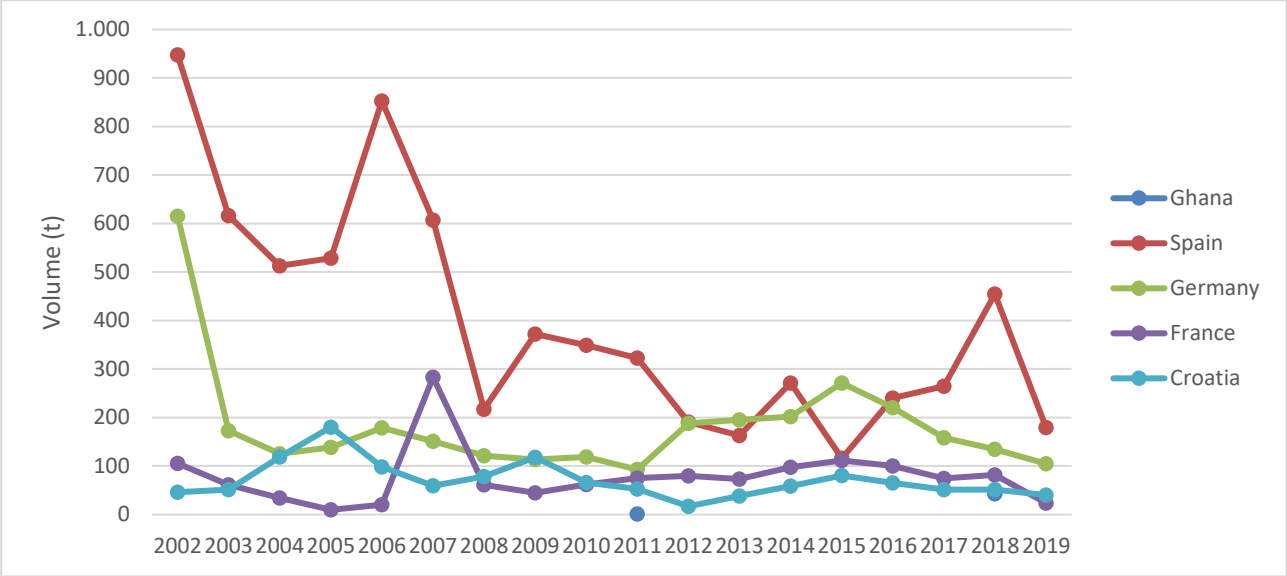


Figure 19: Five major partners- Volume Export (t) - Cuttlefish - Eumofa

Regarding Italian import flow, within the 2002-2019 period it maintained an average value of 29.264,5t, equivalent to 100.279.000€, with an average price of 3,79€/kg. In this case, since 2006, there isn't a real difference from intra and extra-eu imports, and the most important market varies from year to year. The general trend is a light descending slope that followed a fall that rapidly brought volumes down from 50.000t to 25.000t in 4 years (2005-2008).

During 2019, Italy imported 91,98 Million euros worth of Cuttlefish (17.253t) at 5,33€/Kg. The price curve presents an increasing tendency which started in 2004 (2,24€/Kg), reached its maximum in 2018 (6,23€/Kg) before having a setback in 2019.

The most relevant countries for imports, during the last 5 years, have been Tunisia, France, Morocco, Spain and Senegal. Their volume is almost similar up to now, but France used to play a bigger role until 2008.

Considering the 2017-2018 average, Italy mainly imported *Cuttlefish frozen, with or without shell* (77.131.684€), *Cuttlefish live, fresh or chilled, with or without shell* (27.561.280€) and *Cuttlefish smoked, dried, salted or in brine, with or without shell (8.092.008€).*

From those named countries, during 2018 the most requested product resulted to be the *Frozen cuttlefish* for Tunisia (20.839.617€), Morocco (15.918.844€), Spain (7.708.512€) and Senegal (18.489.707€) and *Cuttlefish live, fresh or chilled* only from France (11.896.569€).

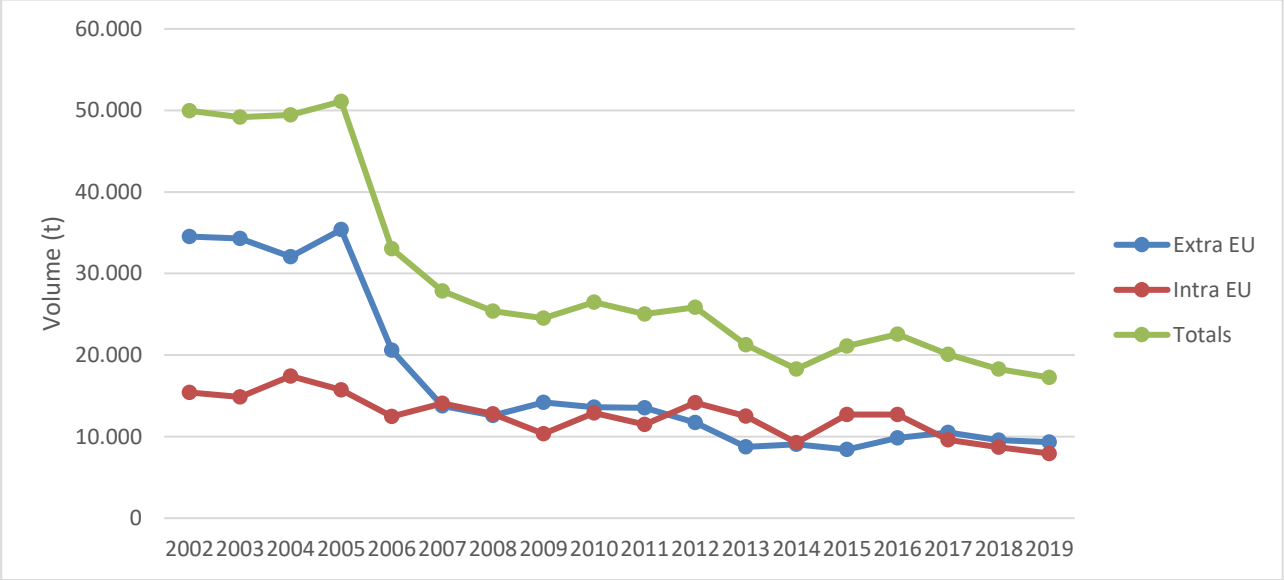


Figure 20: Volume Import Italy (t) - Cuttlefish - Eumofa

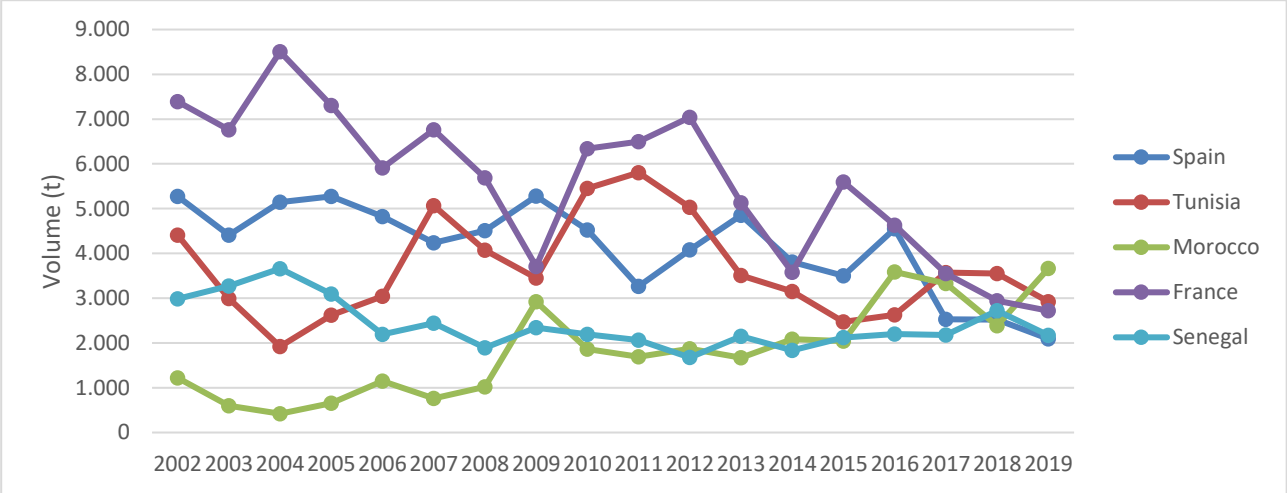


Figure 21: Five major partners - Volume Import (t) Italy - Cuttlefish- Eumofa

IMPORT/EXPORT Croatia

The Croatian cuttlefish export it's a sector almost completely dependent from intra-eu countries.

Eumofa's data show how since the 2014 peak (120t) the trend is linear and descending, reaching the 2019 minimum at 33,8t. In the same considered timing (2013-19) prices grew slightly from 4,62€/Kg (2013) to 6,15€/Kg (2019).

Considering the average value of the last 5 years, the most important partner for Croatian export are Italy (248.432€), Slovenia (84.036€), Serbia (13.240€), Montenegro (10.836€) and Netherlands (5.945€).

Between those it has been predominant the Italian role and secondary the Slovenian. There is also a relevant price difference within the same countries during different years (for example Netherland, where it costed 10,1€/Kg during 2018 and 4,56€/Kg during 2019) and between

different countries on the same year (for example during 2019 Netherland was 4,56€/Kg and Serbia was 8,18€/Kg).

Dividing the export for CN8 code, is observable that on 2017-18 average, Croatia mainly exported *Cuttlefish live, fresh or chilled, with or without shell* (3074210) (46,9t, equivalent to 277.262€), followed by *Cuttlefish frozen, with or without shell* (3074329) (7,3t, 49.142€) and *Cuttlefish smoked, dried, salted or in brine, with or without shell* (3074920) (1,2t, 9603€).

In the 5 considered partner countries, during 2018, *Cuttlefish live, fresh or chilled* was the predominant in Italy (30,2t, 180.810€), Netherland (0,5t, 5.054€) and Serbia (1,5t, 15.734€), *Cuttlefish frozen* was the most requested from Slovenia (8,4t, 53.362€) and *Montenegro* (0,8t, 4.724€).

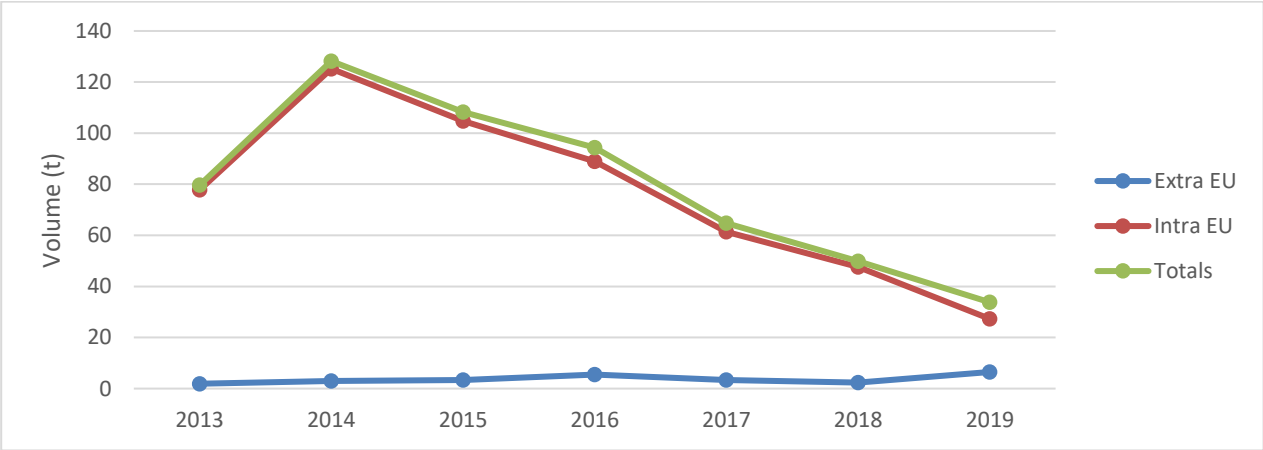


Figure 22: Volume Export Croatia (t) - Cuttlefish - Eumofa

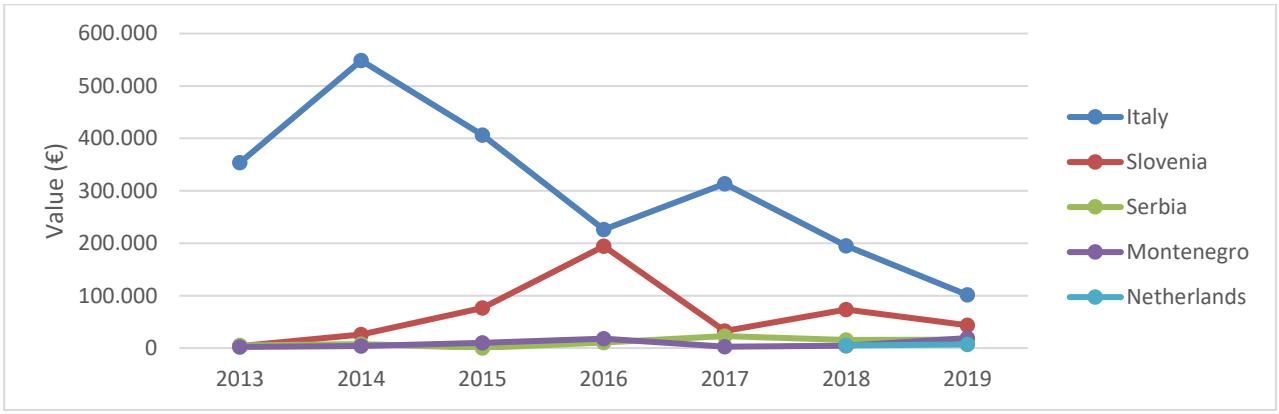


Figure 23: Five major partner - Value Export (€) Croatia - Cuttlefish - Eumofa

Speaking about Import, volumes and value are in a growing channel that brought volumes up from 135,4t/year (2013) to 459,6t in 2017, before resettling a little under 450t/year in 2018 and 2019. Prices followed a similar pattern, growing from 3,12€/Kg (2013) to their maximum at 5,82€/Kg (2018).

The totality of imports is made by intra-Eu flows, extra-Eu are basically zero or irrelevant apart from 2014 when they reached 61,7t.

The import major partners are different from the export markets: Croatia mainly import cuttlefish from Netherland, Italy, France, Portugal and Spain. Between those, Netherland is the most important since 2015, more than doubling the other countries volume.

Using the usual 5-years average, Netherland exported to Croatia cuttlefish for an amount of 859.532€/year, Italy for 373.154€, France for 228.286€, Portugal for 110.908€ and Spain for 192.106€.

Considering the Eurostat CN8, in 2017-2018 average, Croatia mainly imported *Cuttlefish frozen* (208,2t, 1,169,600€), followed by *Cuttlefish smoked, dried, salted or in brine* (130,2t, 713.955€) and *Cuttlefish fresh or chilled* (81,6t, 431.703€).

Moreover, *Cuttlefish frozen* was the most important cuttlefish import during 2018 in France (20,2t, 114.127€), Italy (30,8t, 201.713€), Portugal (12,8t, 102.206€) and Netherland (159t, 851.060€). From Spain, Croatia imported mainly *Cuttlefish smoked, dried, salted or in* brine, for a total amount of 18,9t and 100.873€.

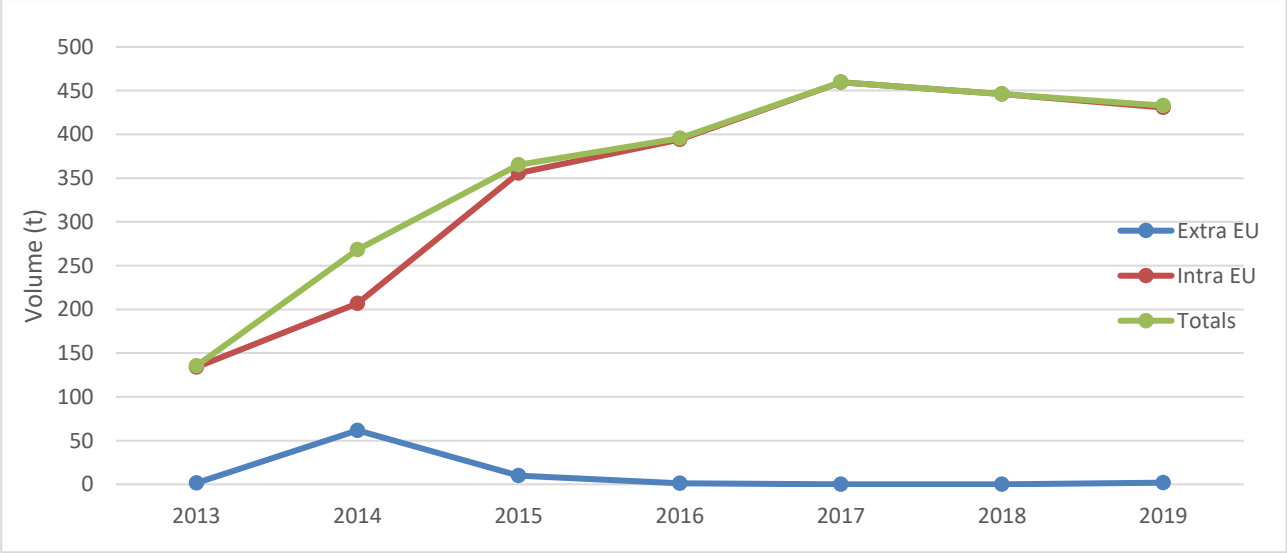


Figure 24: Volume Import Croatia (t) - Cuttlefish - Eumofa

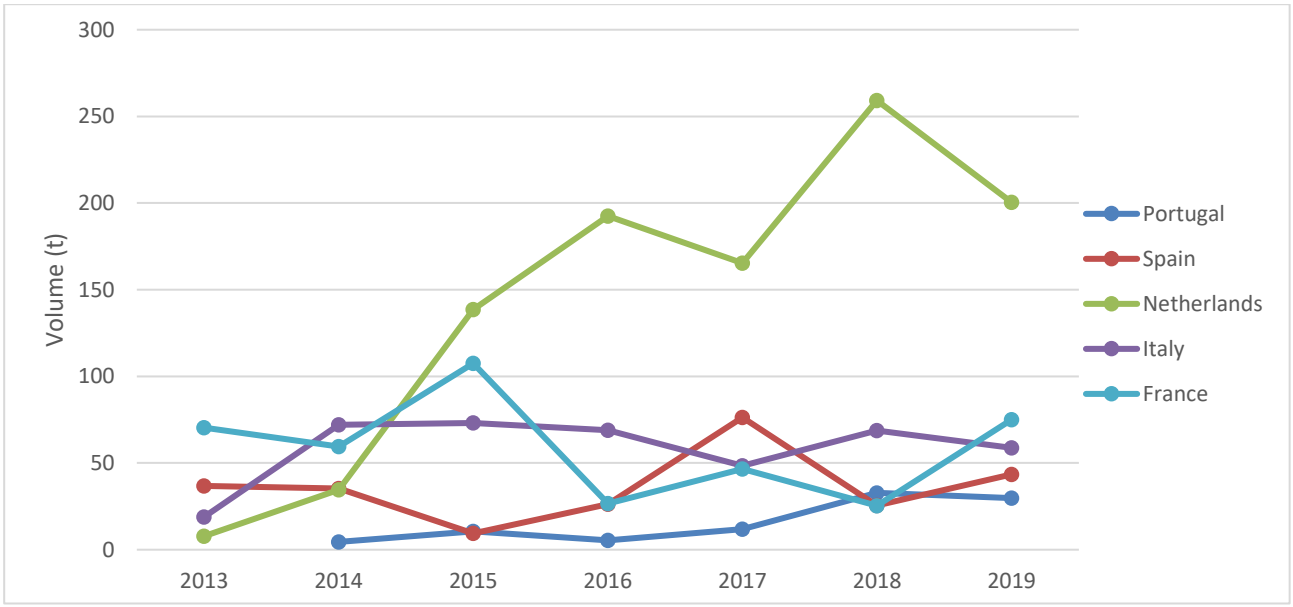


Figure 25: Five major partners - Volume Import (t) - Croatia- Cuttlefish - Eumofa

WHOLESALE

From the Eumofa weekly dataset prices fluctuations from Italian primary and secondary markets within the period 2010-2017 are trackable.

The primary markets (Ancona, Cesenatico, Livorno, Molfetta and San Benedetto del Tronto) are approximately divisible into three price range: the lowest one composed by Ancona e Cesenatico with an average price of 8,62€/Kg and 8,65€/Kg, the middle one by Molfetta and San Benedetto del Tronto (9,73€/Kg and 9,55€/Kg) and an upper one where stands Livorno (11,61€/Kg).

Speaking about secondary markets Roma resulted to be much more expensive than Milano. Rome presents an average price of 11,38€/Kg, with a maximum of 12,87€/Kg and a minimum of

9,94€/Kg. Milano has an average price of 7,92€/kg a lowest at 6,94€/Kg (2010) and a maximum of 10,19€/Kg (2017).

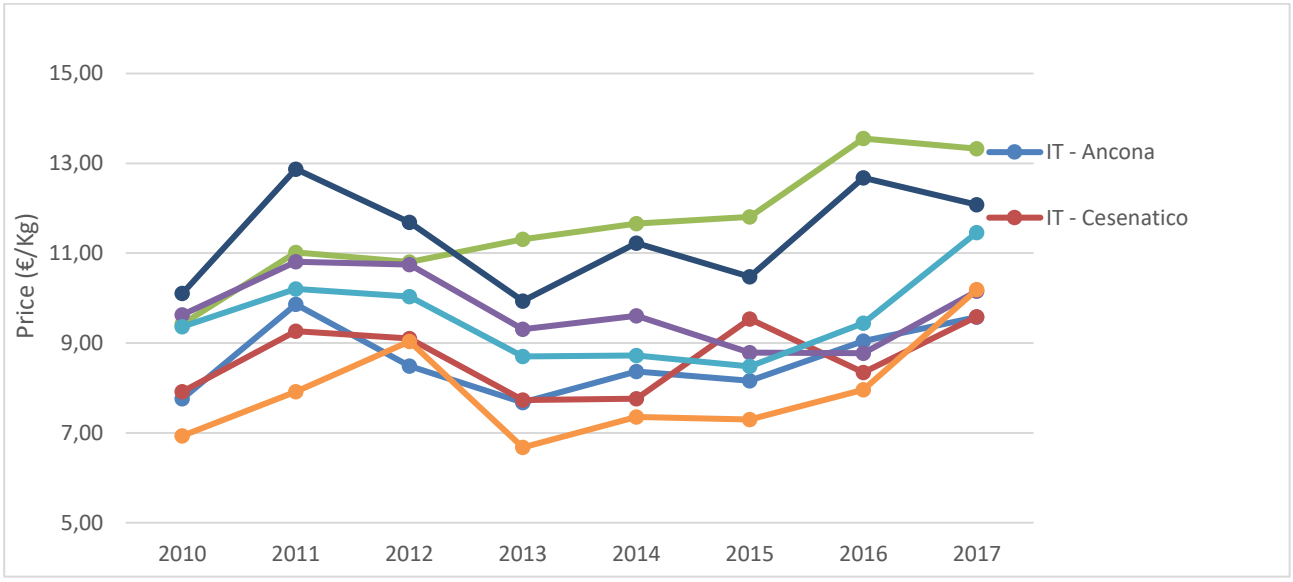


Figure 26: Primary and secondary wholesale markets price – Cuttlefish - Eumofa

CONSUMPTION

The eumofa weekly dataset only contains data for Italy, and only for 2009-2015. In this period, Italy mantained an average consumption (for households and retails) of 48.080t of Cuttlefish, equivalent to 461,77 Millions euro, considering an average price of 9,98€/kg. The graph shows a pattern almost stable around the average from 2009 to 2014, and a fall to 28,39t during 2015. For the whole considered period, price went slowly up from 9,46€/Kg (2009) to 10,87€/Kg (2015).

The Europanel's data collected from eumofa, which are strictly related to a sample of households, cover 2009-2015 as well. They show an average consumption of 12.020t per year, with a pattern similar to the weekly one. It stays almost stable during 2009-2014 and falls down nearly halving

during 2015 (7.099t). Prices stays in a channel that present a support level around 9,35-9,50€/Kg and a resistance at 10€/Kg.

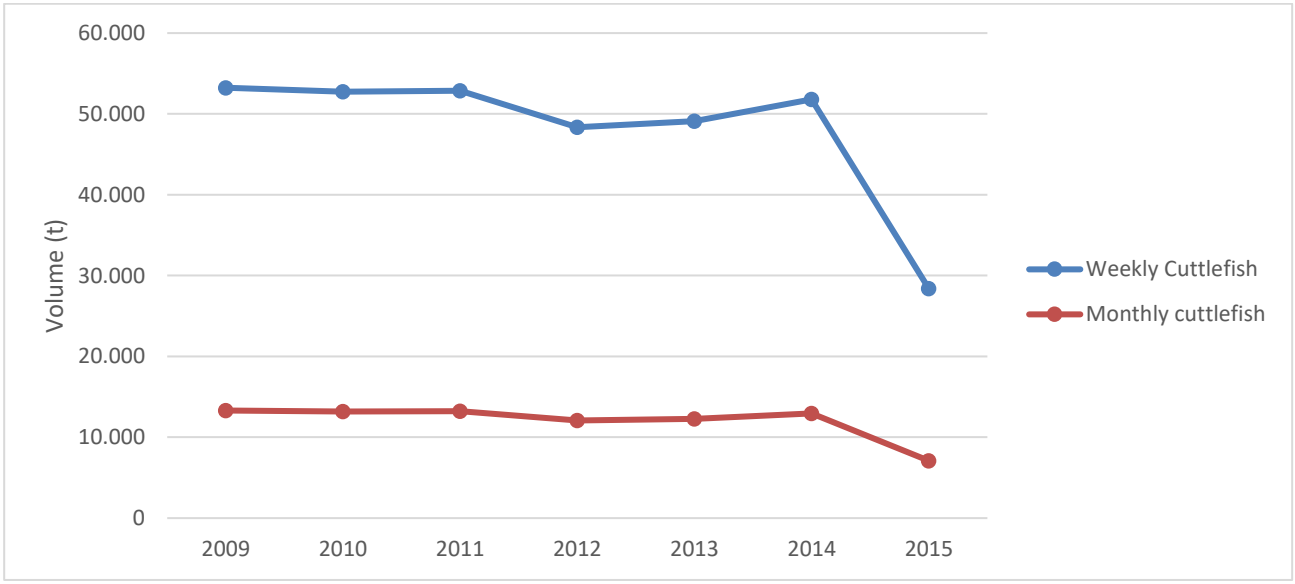


Figure 27: Weekly/Monthly Volume(t) - Cuttlefish

SUPPLY BALANCE

Combining the data already discussed, an Apparent Consumption value for Italy and Croatia for the years 2017 and 2018 is computable.

Elaborating Eumofa's dataset results that in 2017 Italy apparently consumed 25.972t of cuttlefish, whereas Croatia consumed 508,97t. The same index for the 2018 is not calculable because there aren't any data about production (landings) neither for Italy or Croatia.

From Eurostat the information is extrapolable for both years: in 2017 Italy apparently consumed 37.387t of cuttlefish and Croatia consumed 661,74t. The following year Italy Consumed 33.954,94t and Croatia 671,32t.

Table 2: Supply balance computation

		Landings (t)	Import (t)	Export (t)	Apparent Consumption	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	6.706	20.104	839	25.972	0,43
	Cro 17	114	460	64,8	509	0,12
Eurostat	Ita 17	6.604	31.903	1.120	37.387	0,62
	Ita 18	6.211	29.262	1.518	33.955	0,56
	Cro 17	106	660	104	662	0,16
	Cro 18	91,5	660	80,5	671	0,16

The following chart reports all the available estimates for Italian and Croatian cuttlefish consumption. As immediately noticeable, they greatly differ from each other.

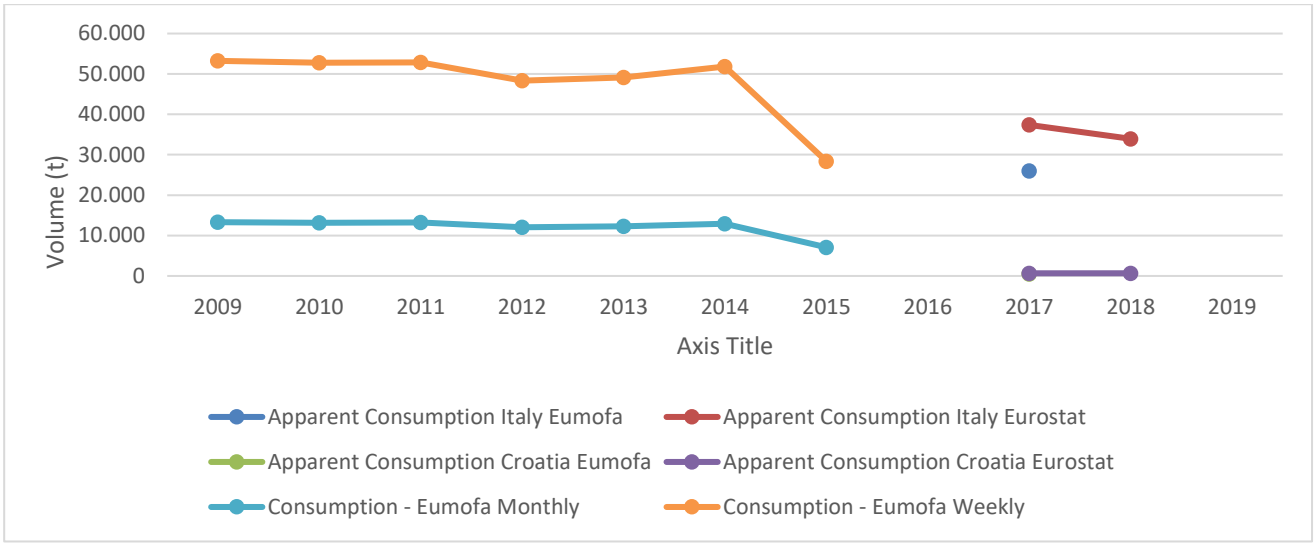


Figure 28: Cuttlefish Consumption and Apparent Consumption

2.4 DEEP WATER ROSE SHRIMP

Eurostat and Eumofa both consider separately the specific species of Deep-Water Rose Shrimp (DPS), making the two sources 100% comparable.

LANDINGS Ita/Cro

With regards to Deep Water Rose Shrimp, Eumofa and Eurostat present basically identical data, apart from the reported time frames. For Italy there is a 2005-2017 time series from Eumofa and 2006-2018 from Eurostat, for Croatia 2013-2017 from Eumofa and 2011-2018 from Eurostat.

The following graph represent the landing volume trends. Italy generally moves inside a channel between 8.000 and 10.000t. Croatia presents a noticeable and constant growth: since 2011 (when 151,22t were fished) it grew more than six times, arriving at 912,6t in the 2018.

During 2018 9.826,8t of Deep-Water Rose Shrimp were landed in Italy, at an average price of 5,8€/Kg. On the same year, in Croatia 912,6 t were landed at a very lower price (2,73€/Kg).

In the 2011-2018 window, the price gap between Italy and Croatia went up from -1,56€/Kg (2011) to -3,04€/Kg (2018), passing through the maximum value of -3,45€/Kg (2017).

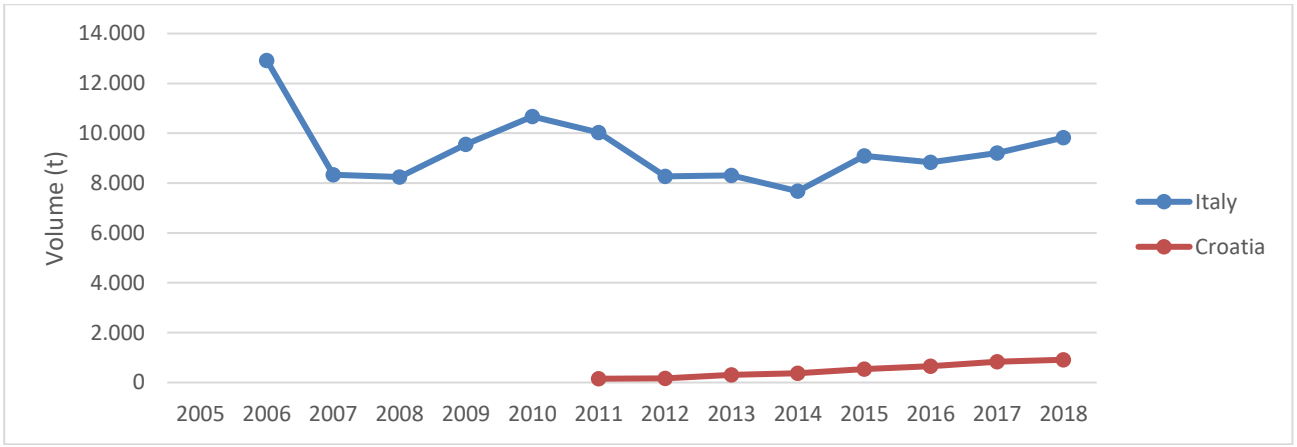


Figure 29: Landings Volume (t) - Eurostat – Deep Water Rose Shrimp (DPS)

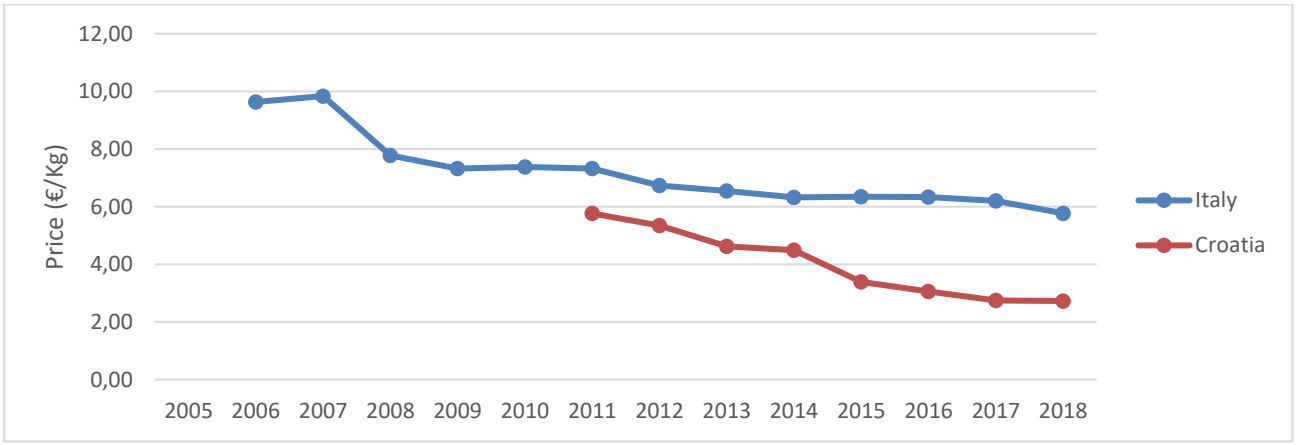


Figure 30: Price (€/Kg) - Eurostat – Deep Water Rose Shrimp (DPS)

IMPORT/EXPORT Italy

Basing on Eumofa's data, Italian export followed a negative pattern. In the 2002-2019 period, the close totality of export was made by Intra-Eu exchanges, and the average volume has been 1.148,1 t. The 2019 has been a very negative year, with only 326,5t exported, at an average price of 11,25€/Kg, for a total amount of 3,67 Million euros.

The most important partners on a 5-years average are Spain (3,5Million euros in 2019), Croatia (45.720€), Greece (57.360€), Albania (36.800€) and Belgium (no data on 2019, but 26.400€ in 2017-2018 average), but Spain is by far the most important among them even if its predominance is now slowing down.

The almost whole Italian export is composed by *Frozen deep water rose shrimps "Parapenaeus longirostris", even in shell, incl. shrimps in shell, cooked by steaming or by boiling in water (excl. smoked)* (03061791).

In fact, in the year 2018, Italy sent to Spain 8,61 Million euros worth of frozen D. W. Rose Shrimp (and at least 0,1 Million were sent to other countries), on that year the whole undefined export revenue was of 8,95 Million as reported from Eumofa. For the year 2017 this value is even closer, as presented 7.080.220€ of total earnings (and 7.080.190€ of frozen Deepwater rose shrimp earnings).

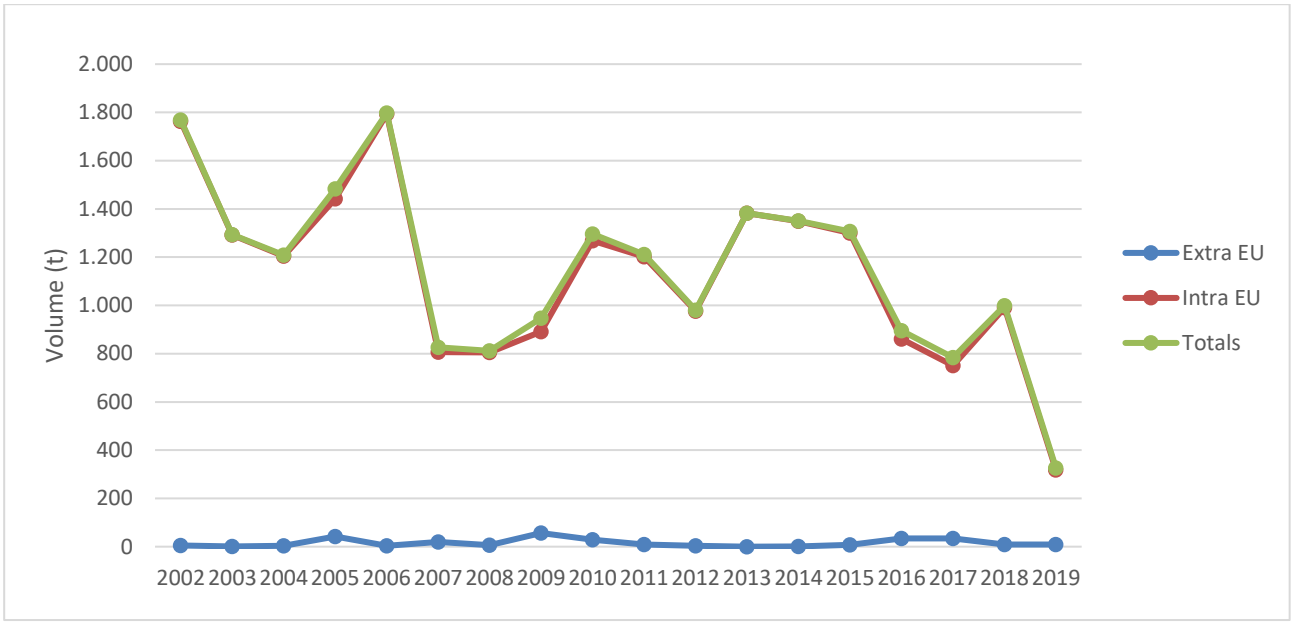


Figure 31: Volume Export Italy (t) - Deep Water Rose Shrimp - Eumofa

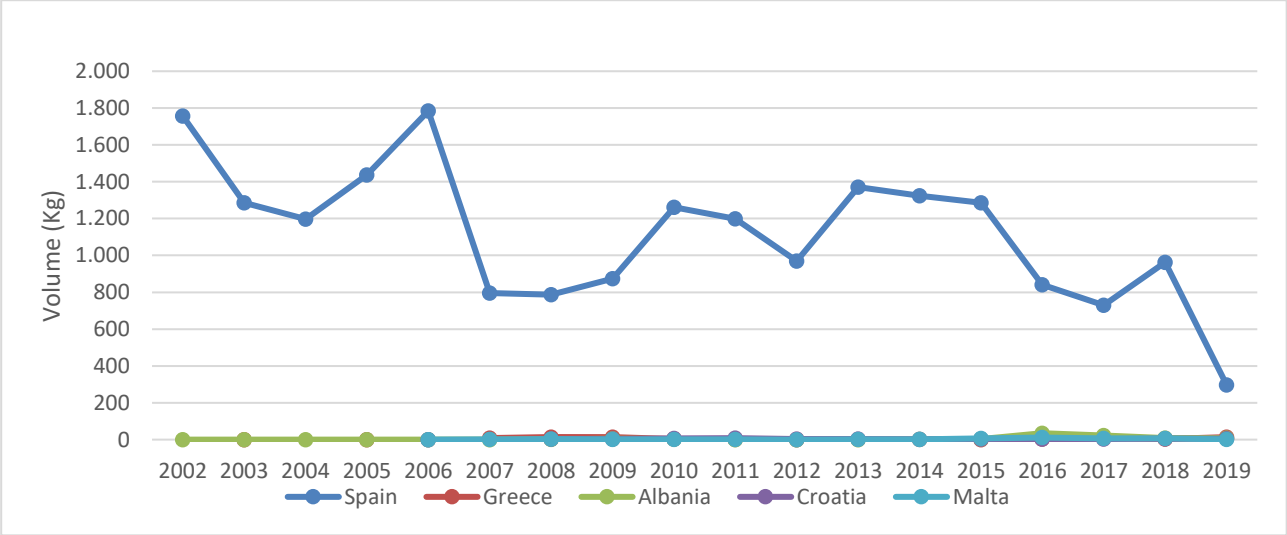


Figure 32: Five major partners - Volume Export - Italy - Deepwater rose shrimp - Eumofa

Speaking about import, Italy followed a confused pattern.
During 2002-2007 total import grew from 1.353,7t (2002) to 2.342,7t, mainly for the contribution of intra-eu partners (2007 was a year where Spain, UK, Denmark and Greece recorded a peak). In the 2008 the Volume felt down to 909,9t, reflecting the intra-eu crash (but even the extra-eu slower drop). From 2009 to 2019 it moved inside a 773,4t (2012)-1.176,5t (2017) channel, with a spike during 2018 (1.656,1t), and extra-eu import are re-gaining major importance confronting to intra-eu. In 2019 Italy imported 1.153,5t for a total amount of 7.200.570€ (which makes on average 6,24€/Kg).
Even price follows a fluctuating pattern, where the only movement linked to volume seems to be the inverted peak of 2007.

In a 5-year average the five most important partners resulted to be Tunisia (with 4,9 Million euros per year), Spain (1,47 Million €), Albania (0,74 Million €), Greece (0,4 Million €) and Portugal (0,2 Million €). Among them Tunisia maintained a primary role during the last 20 years, followed by Spain.

For the 2018 the combined import from the 5 major partners was 9,9 Million € (all made by frozen Deep-Water Rose Shrimp), where the total income has been 11 Million euros.

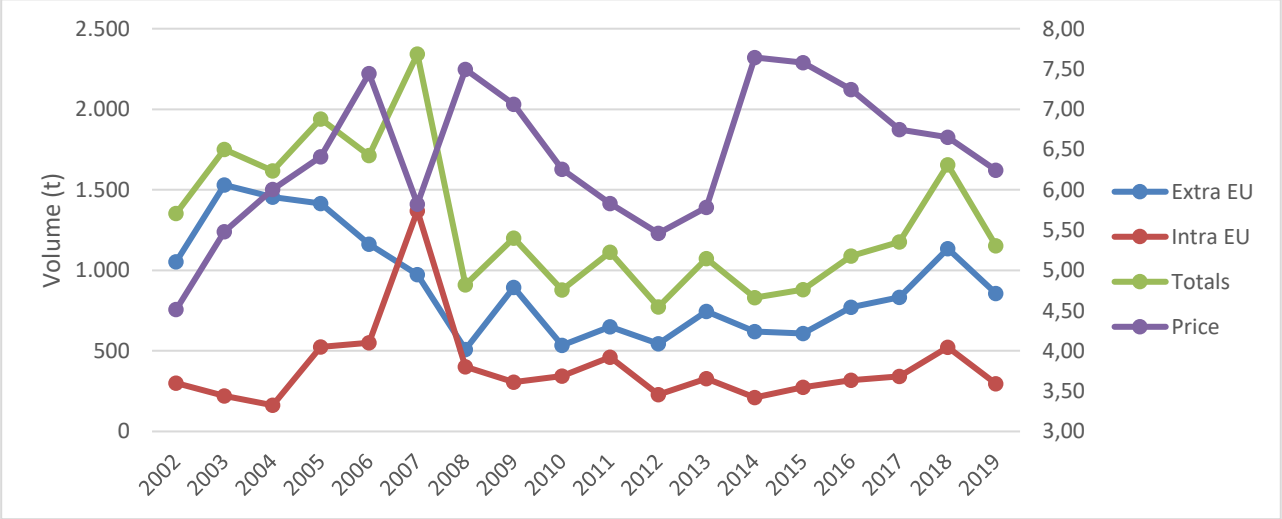


Figure 33: Volume Import Italy (t) - Deep Water Rose Shrimp - Eumofa

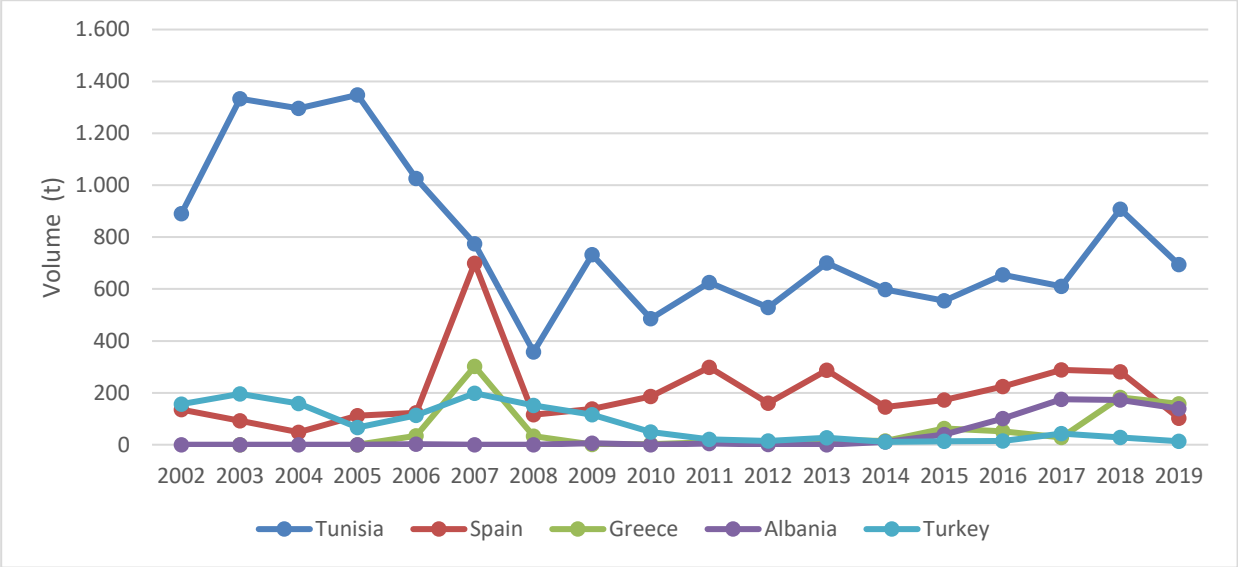


Figure 34: Five major partners - Import Volume Italy - Deep Water Rose Shrimp - Eumofa

IMPORT/EXPORT Croatia

Regarding Croatia, data are available from 2013 to 2019. In this time frame, it is possible to divide the trend into three different phases:

- the first, from 2013 to 2015, where volumes are very low and almost whole from extra-eu export.
- The second, from 2015 to 2017, where there's a vertical grow pushed by intra-eu export
- The last one, from 2017 to 2019 where extra-eu export falls and total export decrease (but more slowly)

During 2019 Croatia exported 28,6t of Deep-Water Rose Shrimp, at an average price of 5,4€/kg, for a total amount of 154.400€

In the available time frame, Albania, Italy, Slovenia, Spain and Montenegro have been the most important partners, but there are many differences regarding prices, as the by-value list and the by-volume list diverge for nations order.

Confronting the 2018-2019 average price, there are strong differences: if the average price to Albania is 2,9€/Kg and for Italy 5,94€/Kg, it cost over than 14€ for Slovenia and Spain to import 1Kg of Deep Water Rose Shrimp from Croatia.

Even here there is an almost complete coincidence between the total export value and the total export of frozen deep water rose shrimp (03061791).

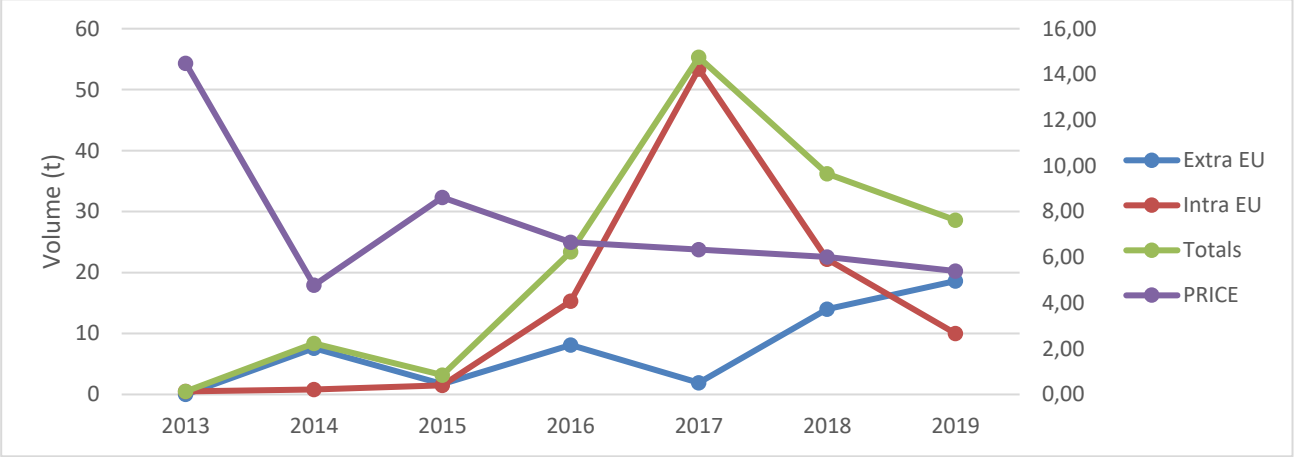


Figure 35: Volume Export Croatia (Kg) - Deep Water Rose Shrimp - Eumofa

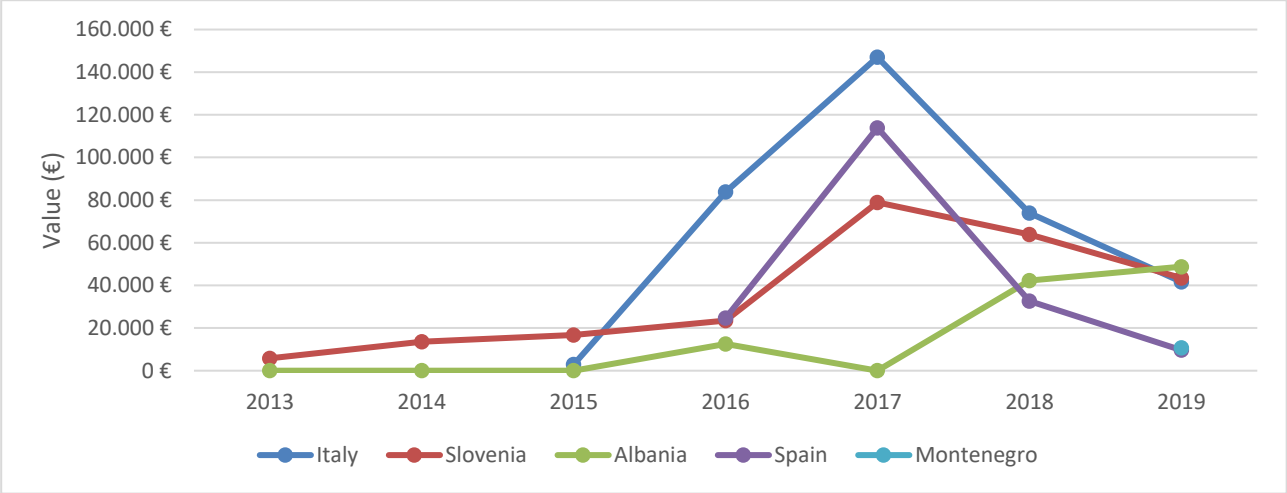


Figure 36: Five major partners - Export Value Croatia - Deep Water Rose Shrimp - Eumofa

Speaking about import, Croatia had a fluctuant pattern, following the extra-eu component trend as the intra-eu revealed to be more constant.
During 2019 Croatia imported 38,3t of Deep-Water Rose Shrimp, for a total amount of 227.110€ at 7,24€/Kg.
Italy has been the historical major partner, but during 2019 it has been overtaken by Albania. Minor partners are Portugal, Spain and Slovenia.

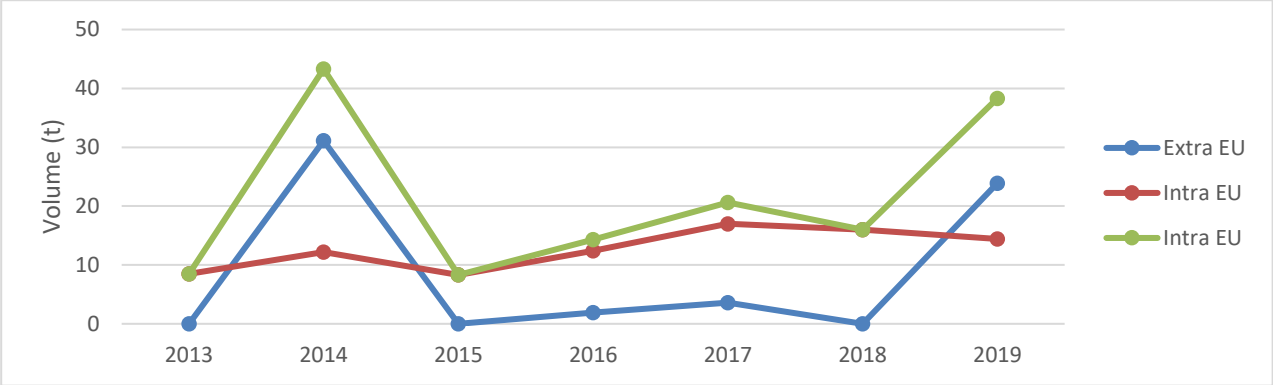


Figure 37: Volume Import Croatia (€) - Deep Water Rose Shrimp - Eumofa

WHOLESALE

Only data for two Italian primary markets are available: Molfetta and San Benedetto del Tronto. Molfetta proved to be the cheapest one, with a price gap that reached its maximum in 2012 (-4,36€/Kg) and its minimum in 2016 (-0,45€/Kg).

A noticeable movement is recorded in 2011-2012, where Molfetta's price was decreasing while San Benedetto's was increasing.

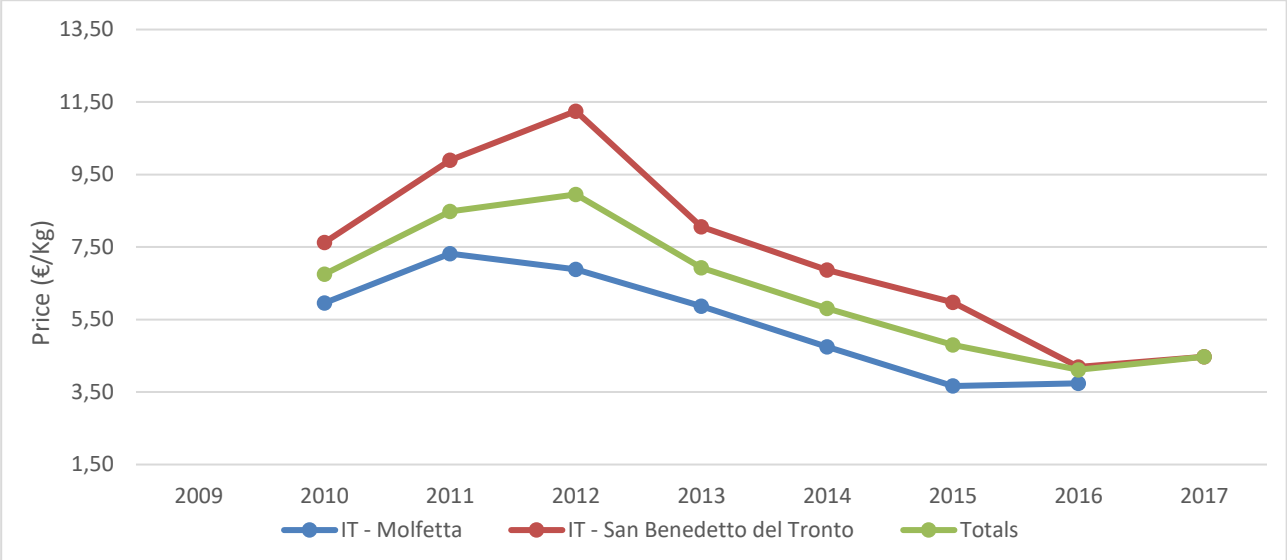


Figure 38: First market Price - Deepwater Rose Shrimp - Eumofa weekly

SUPPLY BALANCE

From Eumofa's datasets results that in 2017 Italy consumed 9.602,2t while Croatia 799,19t. Those results are really close to the ones deriving from Eurostat's data, where Italy apparently consumed 9.602,1t and Croatia 799,39t.

In 2018 calculations shows that Italy apparently consumed 10.511,1t while Croatia 892,5t (data from Eurostat).

Table 3: Supply balance calculation

	Landings (t)	Import (t)	Export (t)	Apparent Consumption (t)	Pro capita consumption (Kg/Person/year)

Eumofa	Ita 17	9.210	1.176	784	9.602	0,16
	Cro17	834	20,6	55	799	0,2
Eurostat	Ita 17	9.210	1177	785	9.602	0,16
	Ita 18	9.827	1686	1001	10.511	0,17
	Cro 17	834	20,8	55,3	799	0,2
	Cro 18	913	16,3	36,4	892	0,22

2.5 HORSE MACKEREL

For this species, Eumofa only consider the broader category of "Horse Mackerel, other". Confronting the volume data from Eurostat (that analyze the specific *Trachurus Mediterraneus* Horse Mackerel (HMM) species) and Eumofa it's calculable that HMM represented the 95-100% of the "Horse Mackerel, other" fished in the years 2016, 2017 and 2018. It's thereby possible to assume that he Horse Mackerel is by far the most fished species inside the "Horse Mackerel, other" group.

LANDINGS Ita/Cro

Eumofa presents a much wider time frame (2000-2017 for Italy, 2013-2017 for Croatia) than Eurostat (2015-2018 for Italy, 2018 for Croatia) related to landings. Assuming that at least in 2016-17-18 Eumofa's data are sufficiently representative of HMM, the following analysis is based on Eumofa's dataset.

Italian landings are separable into three parts: 2000-2004 when volume moved between 3.820t and 2.442t, 2005-2015 when, after a first boom (+2.524t in one year), volumes fell down until the 2015 minimum (721,8t) and at last, 2015-2017 showed a tiny try of recover.

Croatia only presents data for 2013-2017, on which volumes grew up to 987,96t, overtaking Italy.

The latest available data report how during 2018 Italy fished 803,1t of Horse Mackerel at an average price of 1,7€/Kg (data from Eurostat). Croatia instead during 2017 (there are no data for Croatia in 2018) fished 913,88t at an average price of 0,38€/Kg.

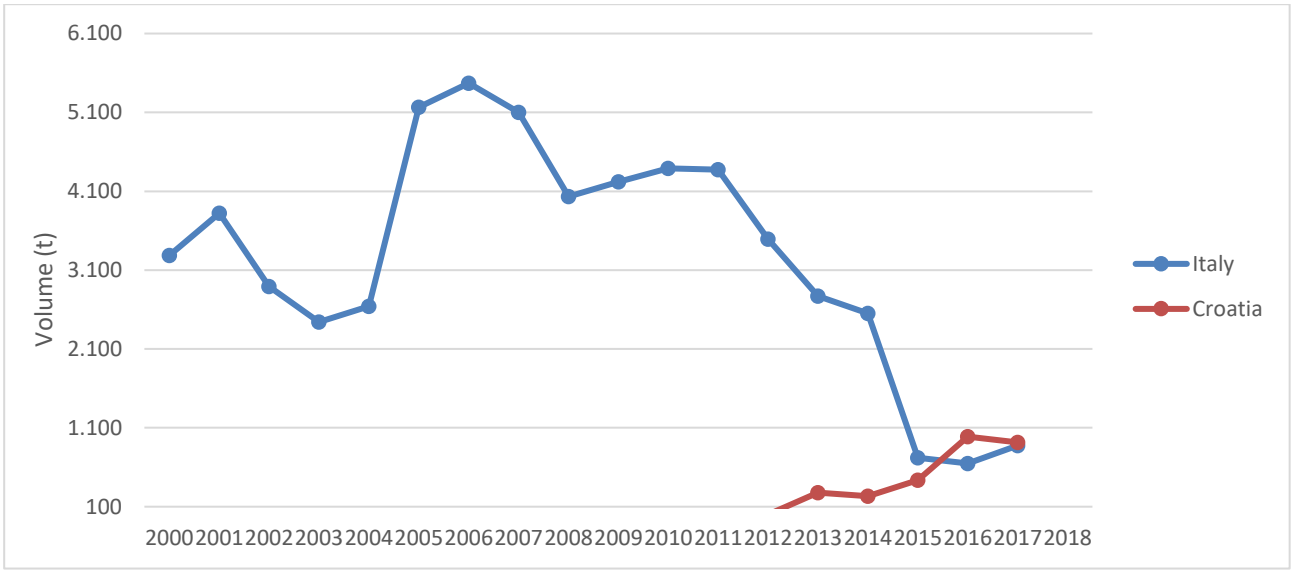


Figure 39: Landings Volume (t) - Eumofa - Horse Mackerel, others

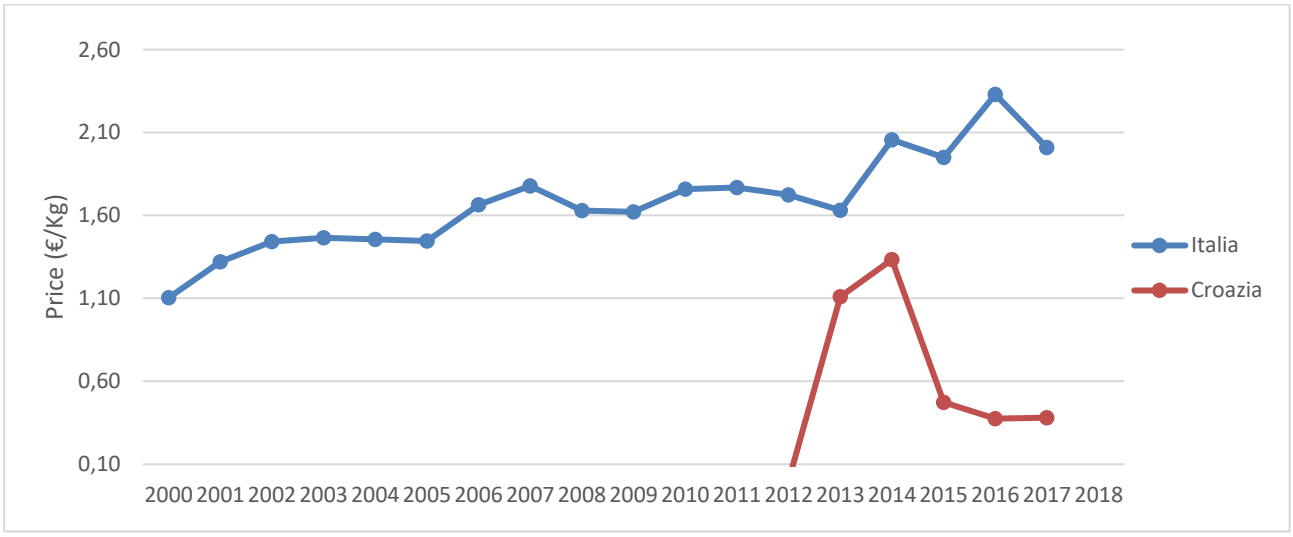


Figure 40: Landings Price (€/Kg) - Eumofa - Horse Mackerel, other

IMPORT/EXPORT Italy

Eumofa's data for Italian export show a cyclical pattern of expansion and contraction, almost entirely deriving from intra-eu commerce.

On the Chart are identifiable the two cycles, one covering 2004-2011 and the second 2011-2018.

During 2019 volumes increased at 220t (99,6t extra-eu and 120,4t intra-eu).

Considering a 5-years average (2015-2019), the most important partners have been Greece (421.368€/year), Malta (94.694€), Spain (68.962€), Albania (66.880€) and Croatia (23.436€).

Basing on the Eurostat's data, on 2017-2018 average Italy exported 74.880€ of *Fresh or chilled jack and horse mackerel (excl. Atlantic horse mackerel and Chilean jack mackerel) (3024590)* and 546.650€ of *Frozen jack and horse mackerel "(excl. Atlantic horse mackerel and Chilean jack mackerel) (3035590)*.

During 2018 (the last available year from Eurostat) Italy exported mainly *Fresh or chilled (3024590) products to Malta (52.652€), Spain (14.341€) and Croatia (35€). Frozen (3035590) was instead the most requested product from Greece (295.869€).*

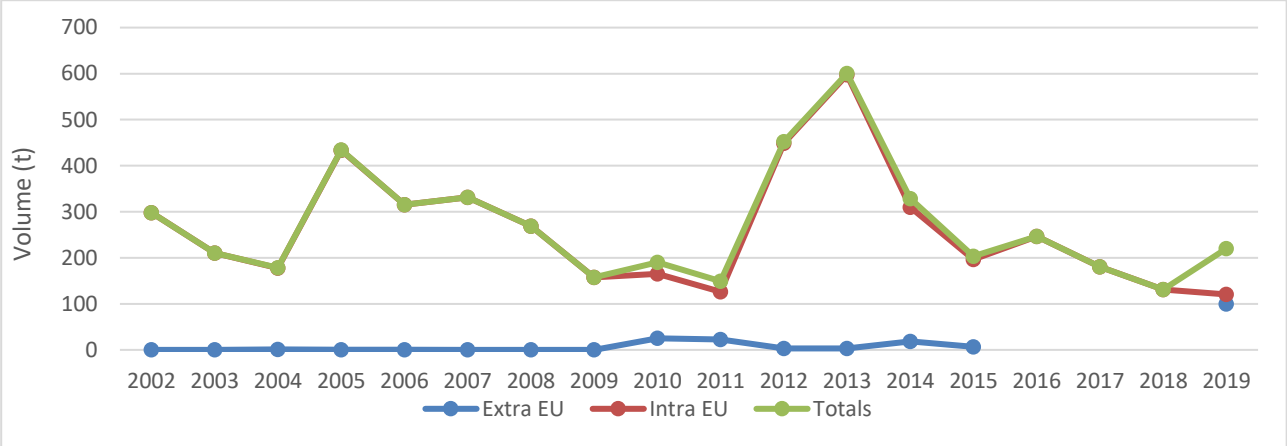


Figure 41: Volume Export Italy - Horse Mackerel, Others - Eumofa

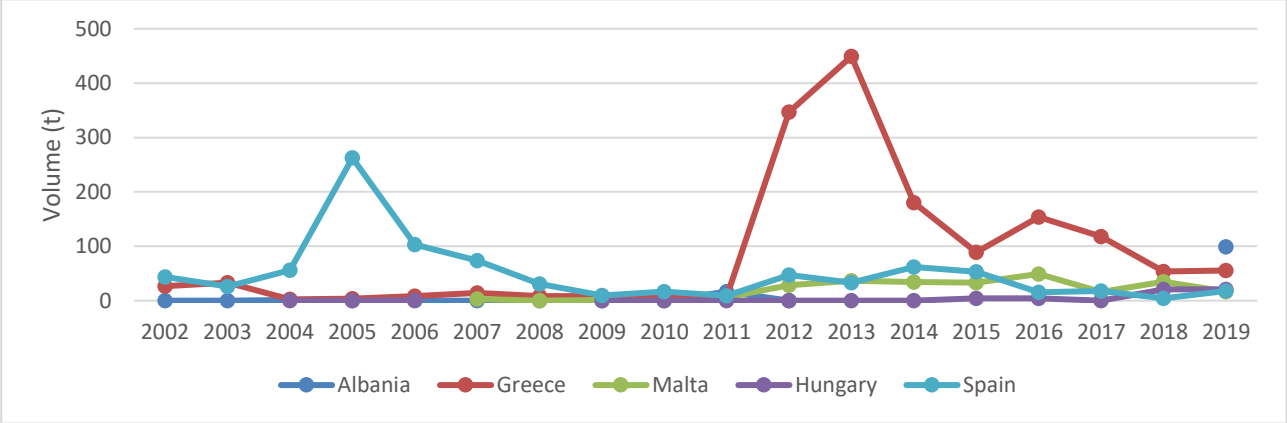


Figure 42: Five major partners by Export Volume - Italy - Horse Mackerell, Others - Eumofa

Speaking about import, basing on Eumofa's data is noticeable how since 2002 the volume increased more than 7 times, partially depending from intra-eu import increases, partially depending from extra-eu (during 2003-2009 mostly from extra-eu, 2010-2017 mostly from intra-eu). When the focus is moved on the total value of the flow, leaps out how the Horse Mackerel

import had a conspicuous jump during 2012, moving from 386.420€ to 2.241.800€ in just one year (and continuing the growth in the following).

During 2019, Italy imported 744,3t on Horse Mackerel, corresponding to 2,87 Million euros at an average price of 3,86€/Kg (differently divided between extra-eu, bought at 1€/Kg, and intra-eu bought at 5,79€/Kg).

On a 5-years average (2015-2019), the most important partners by value have been Spain (1,5 Million euros/year), Netherland (470.818€), France (336.212€), Malta (234.870€) and Greece (211.540€). The role of Spain has been the dominant from 2005 to 2017 for volumes, and from 2008 on by far for value.

Compiling the list by volume the order doesn't change, but Chile insert itself in the listing directly at the second place with a 178,4t/year average. That is explainable with the average price of import, which is the cheapest between those recorded by Eumofa (1€/Kg).

With the Cn8 analysis, is affirmable that on a 2017-2018 average, Italy predominantly imported *Fresh or chilled Horse Mackerel (03024590)* for an amount of 2,9 Million euros/year (equivalent to 476t at 6,08€/Kg). *Frozen Horse Mackerel* (03035590) has been marginal, with exchanges for 74.593€/year computable as 25,8t.

All the mentioned major partners country exported almost entirely Fresh or Chilled Horse Mackerel.

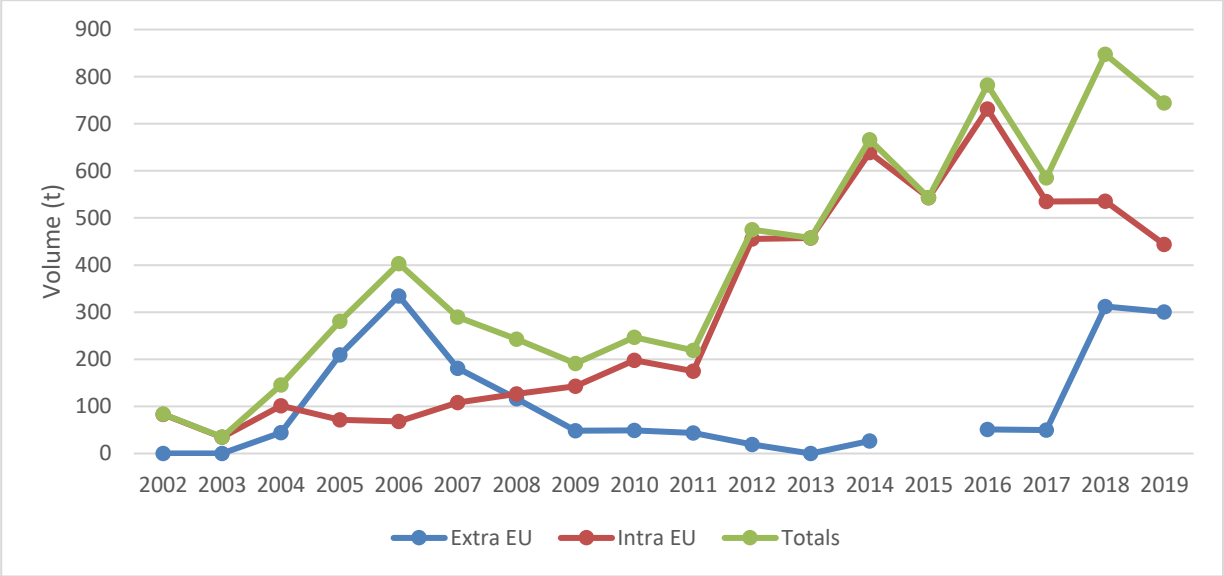


Figure 43: Volume Import Italy - Horse Mackerel, Others - Eumofa

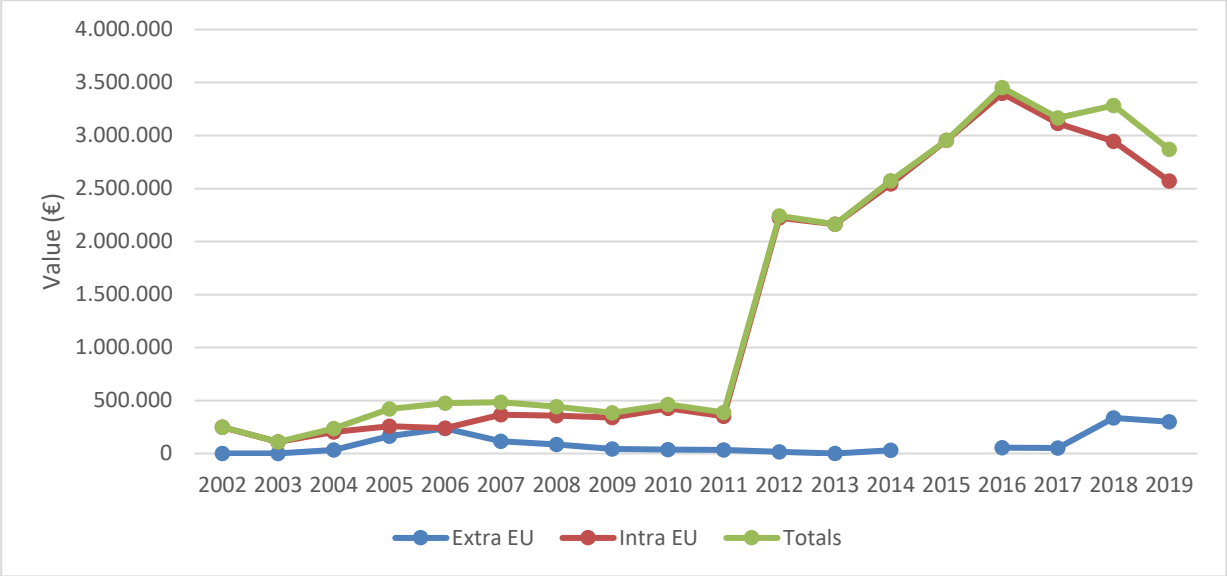


Figure 44: Value Import Italy - Horse Mackerel, Others - Eumofa

IMPORT/EXPORT Croatia

The Croatian export of Horse Mackerel is documented within the 2013-2019 time frame provided by Eumofa.

Starting from 2013, Croatia had a first peak (at 95,4t) before falling down to the 27t level, where it stabilized since 2017.

During 2019 Croatia exported 27,6t of Horse Mackerel, worth 22.460€ at 0,81€/Kg average price.

The most important partners in the last five years have been Italy (with an average value of 27.512€/year), Netherland (7353€) and Slovenia (4.822€). Between those, Italy is slowly losing its predominance.

Even if no data are available for other countries, from Eurostat results that Croatia mainly export *Frozen Horse Mackerel* to Netherland and Slovenia.

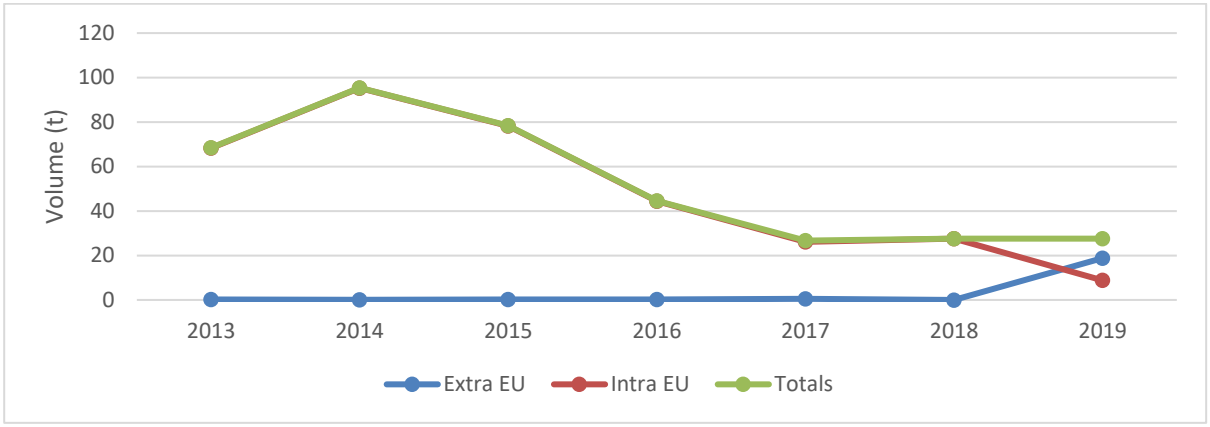


Figure 45: Volume Export Croatia - Horse Mackerel, Others - Eumofa

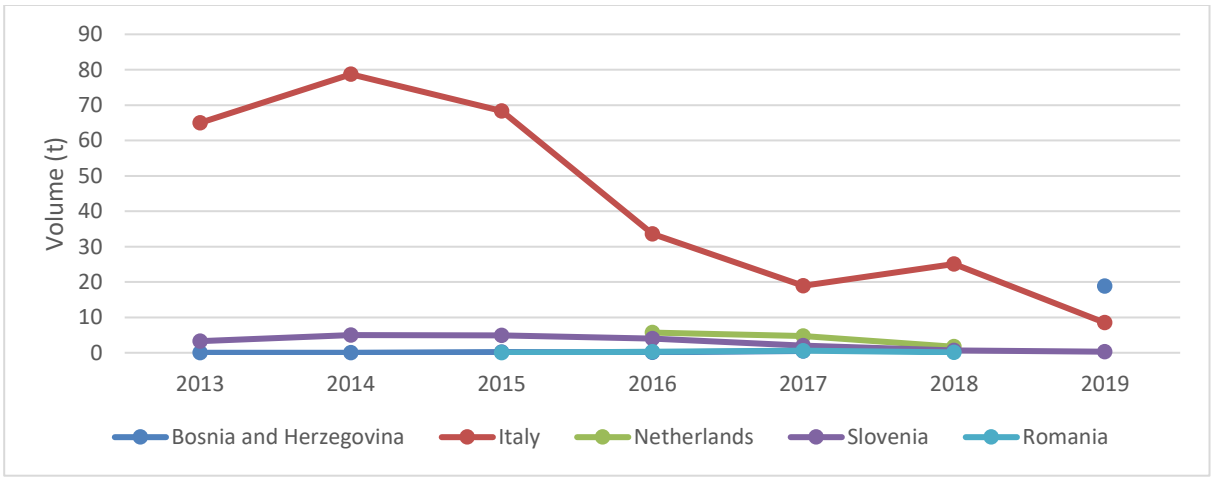


Figure 46: Five major partners - Croatia Export Volume - Horse Mackerel, Other - Eumofa

Croatian import shows a very uncommon scenario. Data from Eumofa are only available from 2014 to 2018. They show a dramatic fall that lead the production from 42,2t to 0,1t in only one year. Since there, the new high has been 1,9t during 2017. The cause of that has been the disappearing of the imports from Spain, which was the most important partner, followed by Italy and Netherlands

On 2018, Croatia imported 1,3t of Horse Mackerel at an average price of 3,55€/Kg, making the whole import flow worth 4.620€.

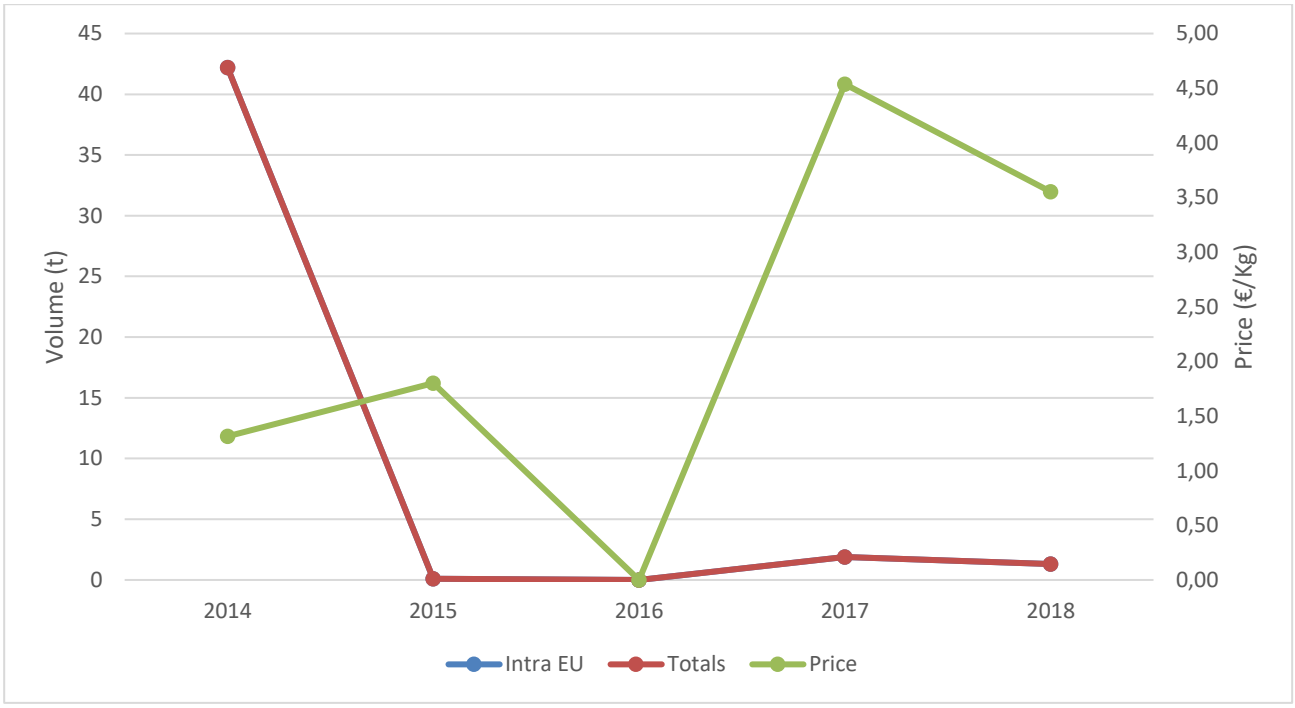


Figure 47:Volume Import and Prices - Croatia - Horse Mackerell, Others - Eumofa

SUPPLY BALANCE

With the already exposed data it's possible to calculate the supply balance for both Italy and Croatia for the years 2017 and 2018.

Starting with Eumofa's data, Italy apparently consumed 1.279t of "Mackerel, others" during 2017, while Croatia consumed 889t.

The lack of landing data from Eumofa for 2018 doesn't allow to compute the Apparent Consumption for that year.

Making the computation from Eurostat, it appears that Italy consumed 1.152t of Horse Mackerel during 2017 and 1.169t during 2018. From the same source is not possible to compute the Croatian data for 2017, while for 2018 it is negative (-26,69t).

Table 4: Supply balance calculation

		Landings (t)	Import (t)	Export (t)	Apparent Consumption	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	875	585	181	1.279	0,02
	Cro17	914	21	26,7	889	0,21
Eurostat	Ita 17	830	505	182	1.153	0,019
	Ita 18	803	498	132	1.169	0,019
	Cro 18	0,011	1,2	27,9	-26,69	-0,006

2.6 MULLET (MUGILIDAE)

With reference to *Mullet,* data are very difficult to be found.

As the aim of this section of the report is analyzing the supply chain of all the species belonging to the Mugilidae family, all the correlated 3-alpha codes reported by Eurostat have to be counted as one single object. In fact, following the FAO's taxonomic nomenclature, the MUL taxonomic code (16501XXXXX) stops to be descriptive at Family level (explaining Group and Order, but including every kind of genus and species inside the same family).

For Croatia no data are available regarding those other species, for Italy have to be considered *Leaping mullet - Liza saliens (LZS)*, *Golden grey mullet - Liza aurata (MGA)*, *Thinlip grey mullet - Liza ramada (MGC)*, *Thicklip grey mullet - Chelon labrosus (MLR) and Flathead grey mullet - Mugil cephalus (MUF*). All those species have a taxonomic code composed by the same radix of MUL (16501) and records into Eurostat's dataset for Italy.

Eumofa doesn't have any useful information at all, as it aggregates data for that species into the wider generical group of *Other marine fish*, making the two sources incomparable.

Eurostat does only report data regarding Landings. No considerations are thereby possible for the other items.

LANDINGS Ita/Cro

From Eurostat it's possible to find data about mugilidae on the 2006-2018 window for MUL and on the 2015-2018 for the others about Italy. Only MUL is available for Croatia (2011-2018).

In those timeframes, Italy had an average volume of 3.483t/year (worth 4,6 Million euros) while Croatia reported an average volume of 115,75t (267.000€).

On 2018, in Italy 32.668t of mugilidae landed, for a value of 5,1 Million euros. In the same time, Croatia fished 99,4t for a value of 183.264€.

The Italian volume had a huge peak on 2013 (5.304t), reached after four consecutive years of growth, and then settled around the 2.500t/year support.

The Croatian volume is generally stable since it has been recorded by Eurostat, with a peak on the first record (2011, 206,7t) and then stays over 85t/year with some cyclical movements.

Between the other mugilidae considered, the most important is the *Thinlip grey mullet (MGC)* which collected the 56-88% of the landing. 2017 has been the year of major relevance for MGC as 1.752t were fished, even more than MUL (1.277t).

It's noticeable that MGC is also by far the cheapest among all the recorded mugilidae, with an average price of 1,45€/Kg (while MUL in the same timeframe was 2,6€/Kg and MGA 2,8€/Kg).

It's feasible to confront the Mullet price in the two different markets, discovering that if from 2011 to 2014 it was more expensive in Croatia, from 2015 started to be the Italian, before going to an almost equal situation during 2018.

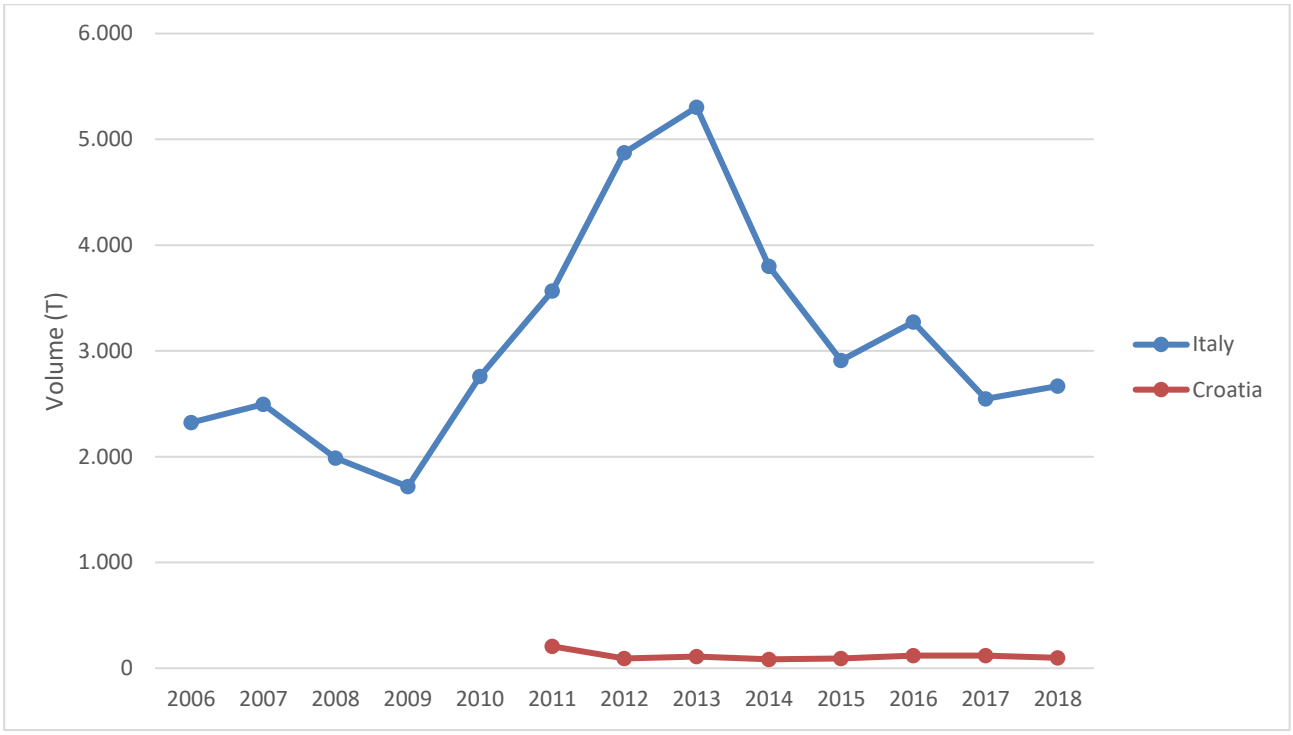


Figure 48: Landings Volume (t) - Eurostat - Mugilidae

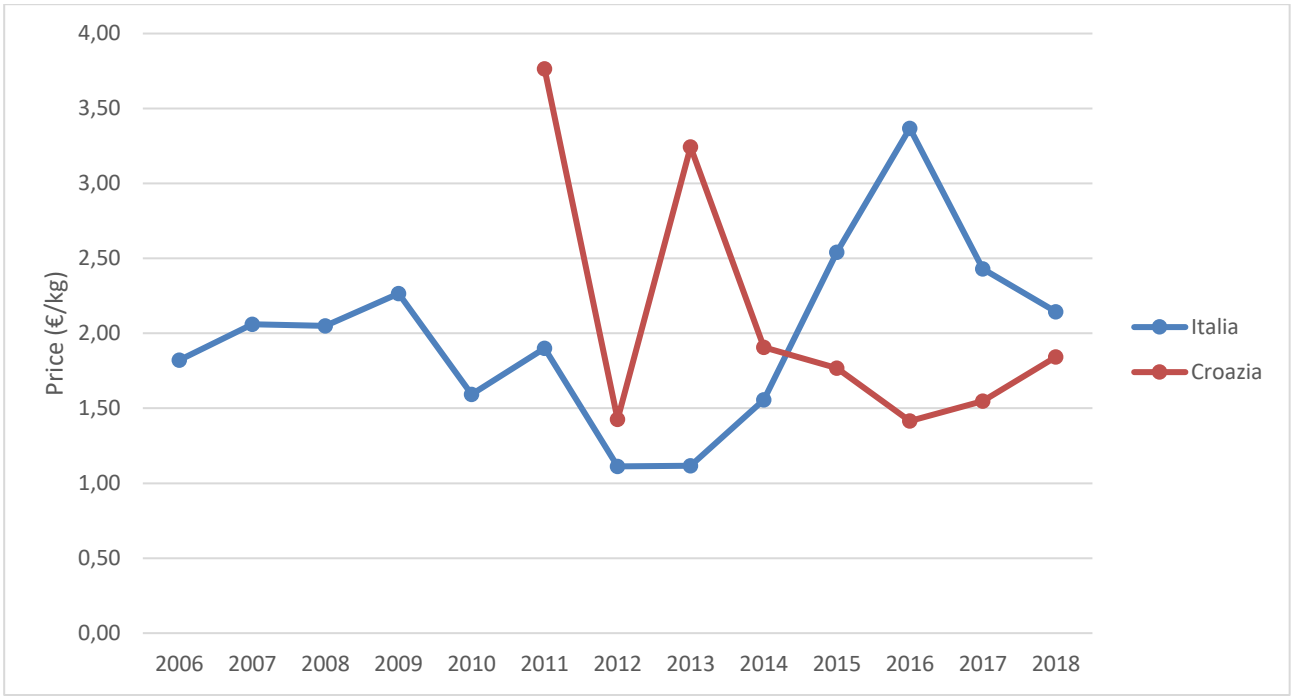


Figure 49: Landing Price - Eurostat - Mullet (MUL)

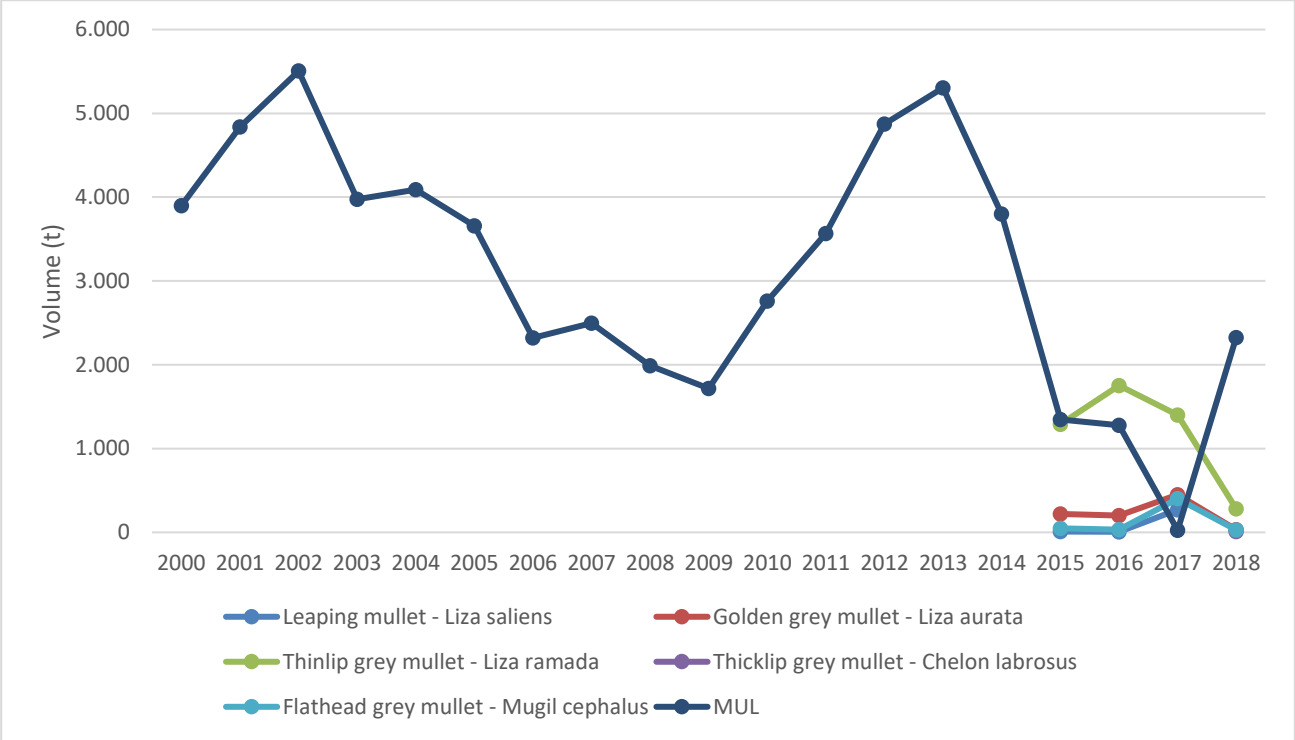


Figure 50: Other mugilidae volumes - Eurostat

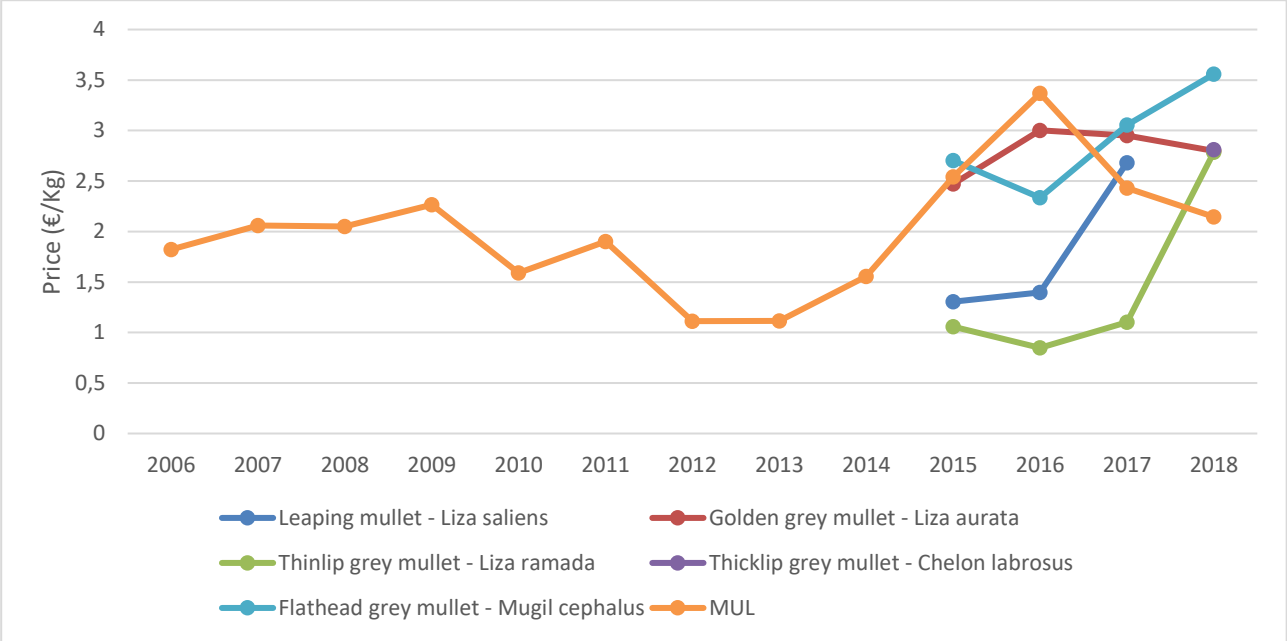


Figure 51: Other mugilidae prices – Eurostat

2.7 SARDINE

About Sardines, the object of this report is oriented to investigate the supply chain of the peculiar species of European Sardine (PIL).

Eumofa inserts PIL into the aggregate category of "Sardine". By comparing the volumes indicated by Eurostat, it's noticeable how European Sardine covered a percentage that goes from 93,5% to 100% of the total sardines, thereby the two datasets are compatible. The only incompatible data are the ones from Croatia 2014 and 2015, where the ratio landed PIL(Eurostat)/ landed Sardine (Eumofa) has a result bigger than 100%, but no information is available on the reason.

LANDINGS Ita/Cro

Sardines are one of the most fished and remunerative species between those considered.

Eurostat gives information about Italy for the period 2006-2018 and for Croatia for 2011-2018. Eumofa provides data about Italy with a 2000-2017 timeframe, about Croatia for 2013-2017.

Basing on the following graph, is assertable to say that the Italian trend is a slow but constant grow started in 2008, with slight yearly fluctuations. On average, from 2006 to 2018, Italy fished 20.068t (worth 16,5 Million euros) at 0,84€/Kg. During 2018, the last year with available data, on Italy landed 26.133t (25,4 Million euros at 0,97€/Kg).

Since when data are available, Croatia fished a way higher volume of Sardine than Italy, in fact averagely they fished 50.580t at 0,43€/Kg (for a total amount of 21,8 Million euros). During 2018 on Croatia landed 46,267t (19,5 Million euros, 0,42€/Kg), a value lightly under the average. The

chart shows a pyramidal movement, starting from 2012 (43.734t), having a peak on 2014 (60.974t) and then retracing back to the actual level.

In the whole considered timeframe, landing prices have been much lower for Croatia than for Italy, with a gap moving into the 0,16€/Kg (2011)-0,55€/Kg (2018).

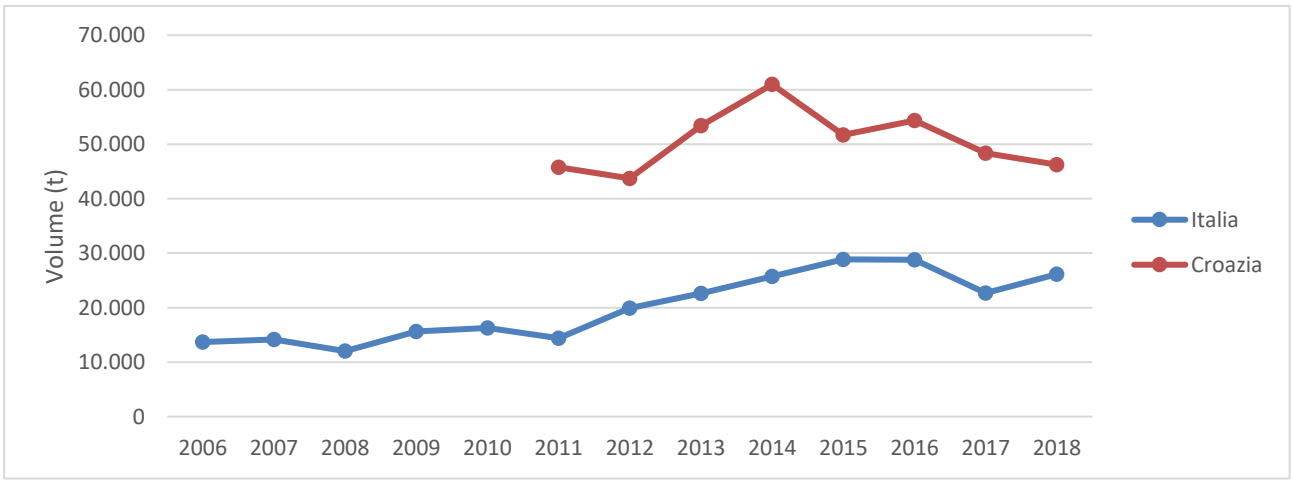


Figure 52: Landings Volume (t) - Eurostat - European Sardine (PIL)

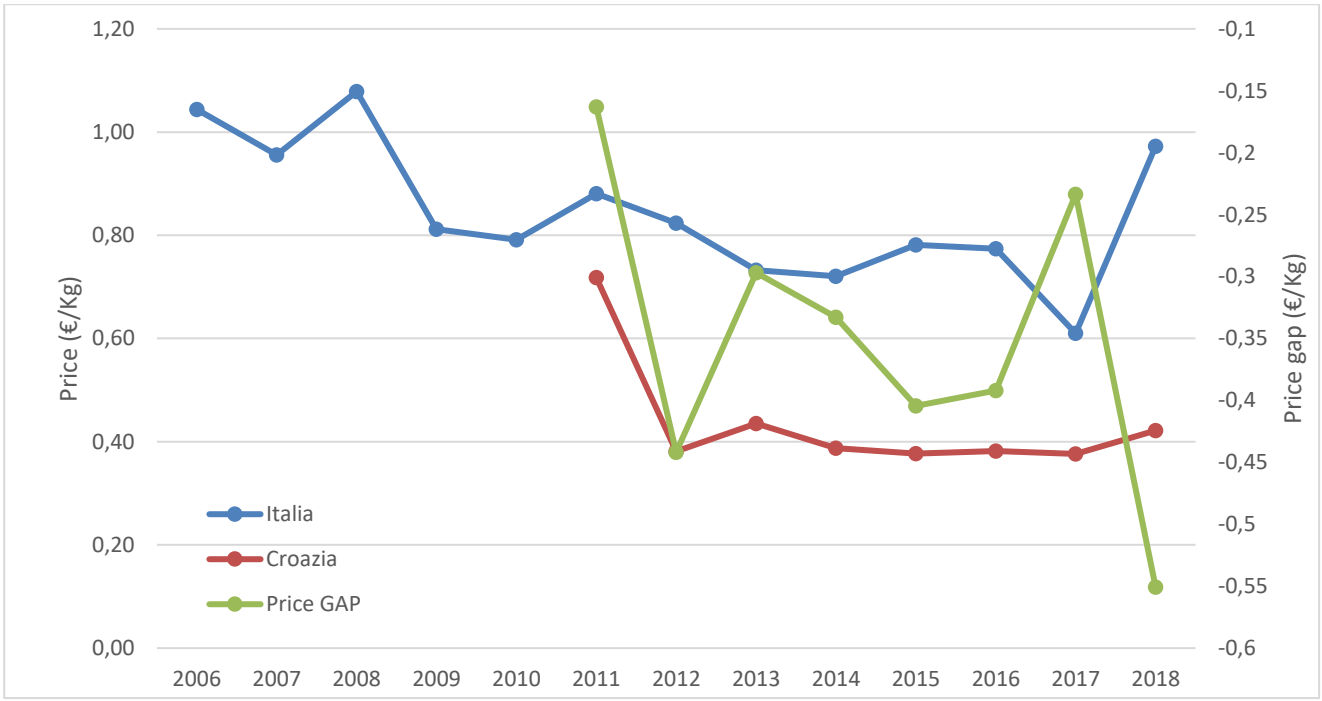


Figure 53: Landings Price (€/Kg) and Price Gap - Eurostat - European Sardine (PIL)

IMPORT/EXPORT Italy

The Italian export of sardines is almost entirely composed by intra-eu destinations. Averagely (in the 2002-2019 time window), Italy exported 13.149t of sardines (218t extra-eu, 12.931t intra-eu), worth 15,3 Million euros at 1,17€/Kg.

On 2019 11.453t were exported, a data which is slightly under the average, as is the price (-0,03€/Kg).

On the chart is identifiable a support line on the 12.000t level, broken only during 2004 (9.712t), 2005 (5.615t) and 2019.

With the Eurostat data it's possible to understand the sub-division of export product by Cn8, and their relative importance. With the usual 2017-2018 average, it's calculable that the most remunerative product has been *Fresh or chilled sardines "Sardina pilchardus" (3024310),* with a production of 9,3 Million euros/year (8.667t, 0,95€/Kg). The second most remunerative has been a processed product, *Sardines, prepared or preserved, whole or in pieces, in olive oil (excl. Minced sardines) (16041311) (2,3 Million euros, 279t at 4,53€/Kg)* followed by *Frozen sardines "Sardina pilchardus" (3035310)* (2,1 Million euros, 2.523t) and at last by *Sardines, prepared or preserved, whole or in pieces (excl. minced sardines and sardines in olive oil)* (16041319).

Listing the most important partners by 5-year average of volume exported, the first place is occupied by Spain (10.332t/year), followed by France (2.431t), Germany (307t), Netherland (162,7t) and Croatia (101,8t). Ordering the countries by value, the only relevant change is the 4th position of Austria, that even if presents low volume compensates with a very higher average price (9,49€/Kg) than other partners. Between those, Spain strongly maintains its preeminence.

Dividing the export for Cn8 predominance, Eurostat reports that Spain, France and Netherland mainly imported *Fresh or chilled sardines "Sardina pilchardus" (3024310).* Instead, Germany and Austria preferred *Sardines, prepared or preserved, whole or in pieces, in olive oil* and that may partially explain the difference of average export price between countries.

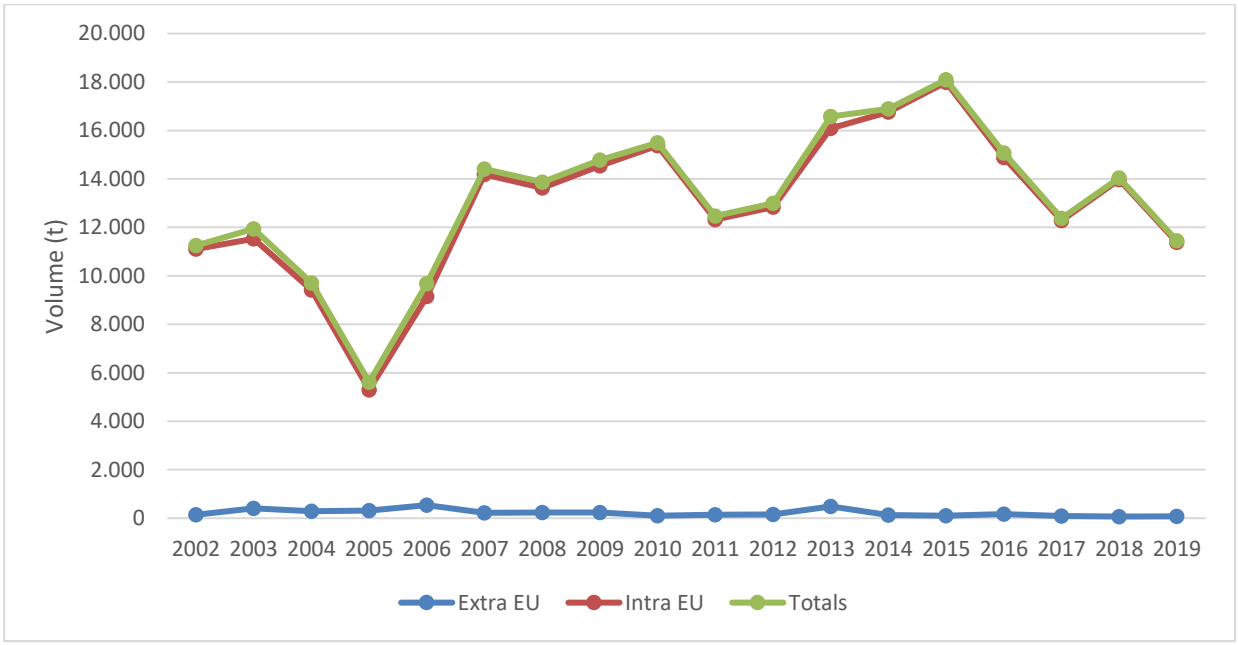


Figure 54: Export Volume Italy - Sardine – Eumofa

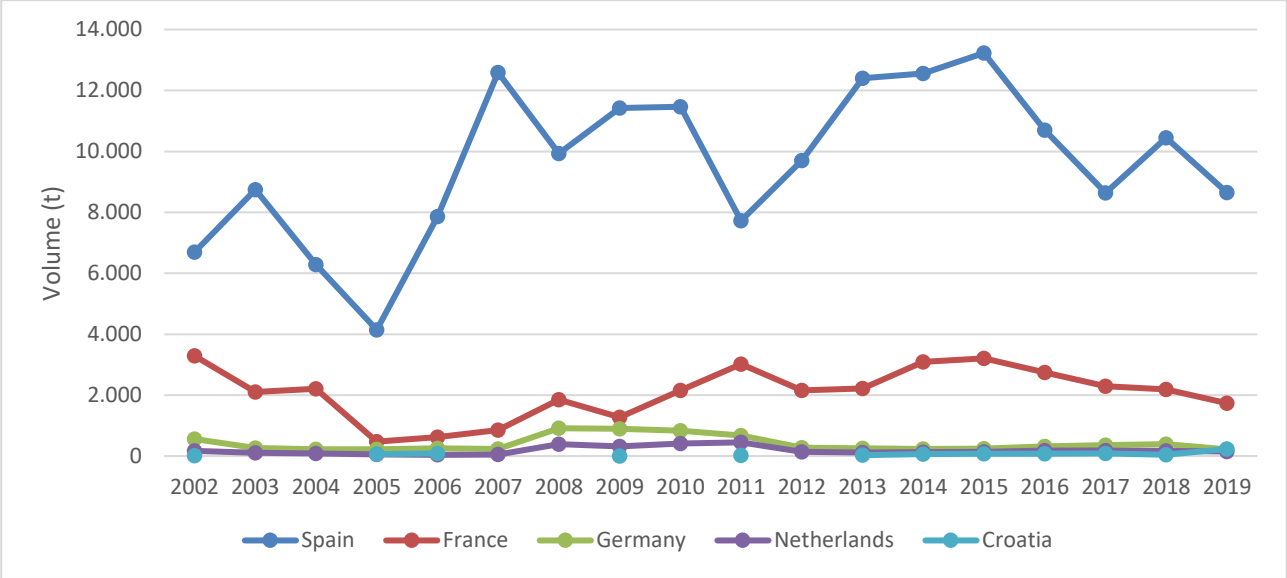


Figure 55: Five major export partners by export volume - Italy - Sardine - Eumofa

Regarding import the two components (intra and extra-eu) don't have a clear pattern, making the total volume oscillating year by year. The biggest import volume has been recorded on 2011, when 12.979t were imported (for a total value of 19 Million euros), and during 2019 it was 5.987t, the lowest volume since 2002.

Eurostat's dataset report how averagely (2017-2018) Italy mainly imported *Sardines, prepared or preserved, whole or in pieces, in olive oil* (2.099t, for a total value of 9,5 Million euros at 4,53€/kg). The second most requested product by Italy has been *Sardines, prepared or preserved, whole or in pieces (excl. minced sardines and sardines in olive oil)* (5,8 Million euros at 3,41€/Kg), only in

third place positioned *Fresh or chilled sardines* (3,5 million euros) and at last *Frozen sardines* (1,6 million euros).

The most relevant partner country is Croatia: by volume since 2007, by value since 2012. Other important partners are Morocco (1.573t imported during 2019), Spain (460t on 2019) and in a minor way Germany and Portugal.

Distinguishing the import from those nations by cn8 code, it's noticeable how *Sardines, prepared or preserved, whole or in pieces, in olive oil* is the most requested product from Spain (2 Million euros during 2018), Germany (1 Million euros) and Portugal (656.997€) while Italy mainly imported *Sardines, prepared or preserved, whole or in pieces (excl. minced sardines and sardines in olive oil)* from Morocco (for 3,5 Million euros) and *Fresh or chilled sardines* from Croatia for 2,7 Million euros.

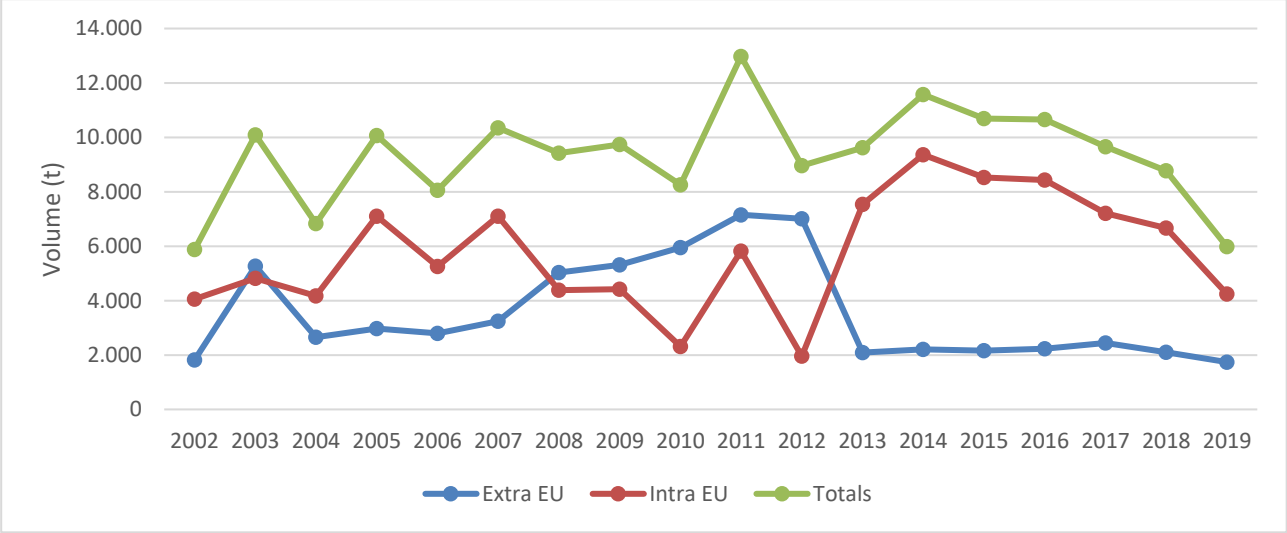


Figure 56: Import Volume Italy - Sardine - Eumofa

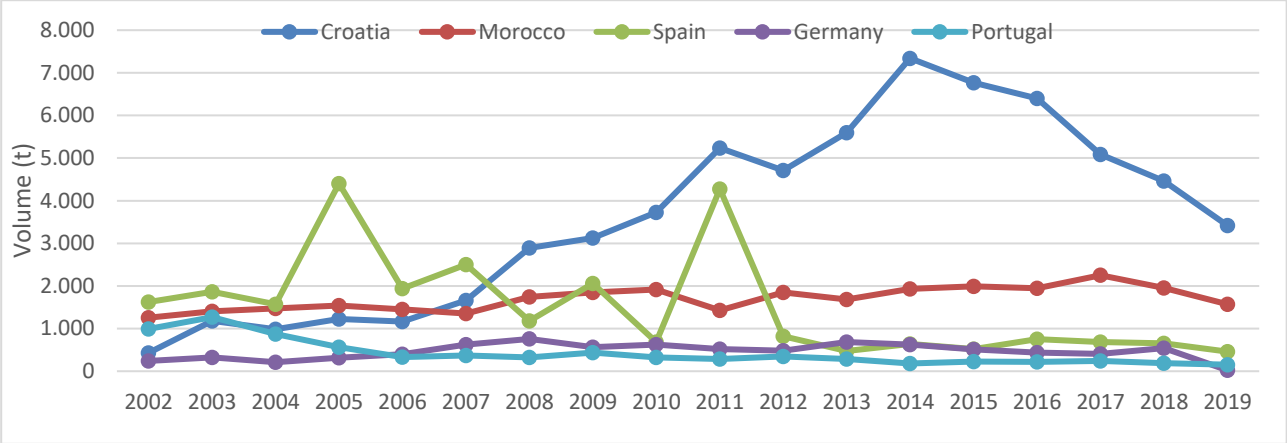


Figure 57:Five major partners by import volume - Italy - Sardine - Eumofa

IMPORT/EXPORT Croatia

If the extra-eu export from Croatia remained almost completely stable around 3.900-4.000t for year since 2014, the total volume shape depends from intra-eu flows and moves since 2014 into a channel delimited by 20.000 and 25.000t. Prices stays on the 1,5€/Kg line, with minor oscillations.

The average of the last seven years report that Croatia exports 20,647t of sardines at a price of 1,48€/Kg, resulting in a 30 Million euros/year revenue.

During 2019, Croatia exported 20,093t of sardines, for a total amount of 33,67 Million euros at 1,68€/Kg.

Ordering the commercial partners by volume, Spain results to be the most important country for Croatian export, with an average flow of 8.806t/year, equivalent to 10 million euros/year (on a 2015-2019 average). The second most relevant partner is Italy (6.393t, 4,9 Million €/year) and then Serbia (2.084t, 4,7 million euros), France (1.330t, 2Million euros/year) and Bosnia and Herzegovina (867t, 2,5 million euros).

Using the Eurostat Cn8 dataset it results that during 2017-2018, the most important sardine-related production by value for Croatian export is *Sardines, prepared or preserved, whole or in pieces (excl. minced sardines and sardines in olive oil)* (16041319) that has been exported for a total amount of 3.378t (worth 12,7 Million euros/year at 2,79€/Kg), followed by *Frozen Sardines (3035310*) (11,49 Million euros, 13.029t, 0,65€/Kg), *Sardines prepared or preserved in olive oil (16041311) (*4,7Million euros, 829t at 4,63€/Kg) and at last *Fresh Sardines (3024310) (*3,9 Million euros, 5.046t, 1,15 €/Kg).

Between the already mentioned partner countries, during 2018 Italy mainly imported *Fresh Sardines* (3,25 million euros), Spain mainly imported Frozen Sardines (7,86 million euros), France preferred *Sardines prepared or preserved in olive (*2,5 million euros), Serbia and Bosnia and Herzegovina instead mainly imported *oil Sardines, prepared or preserved (excl. minced sardines and sardines in olive oil*) (Bosnia for 2 million euros, Serbia for 3 million euros).

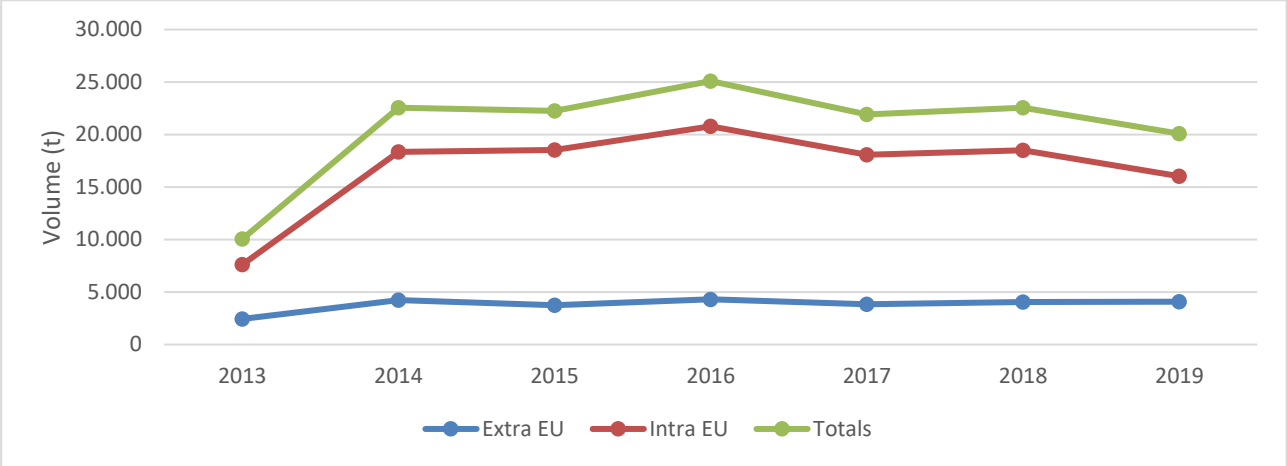


Figure 58: Volume Export Croatia - Sardine - Eumofa

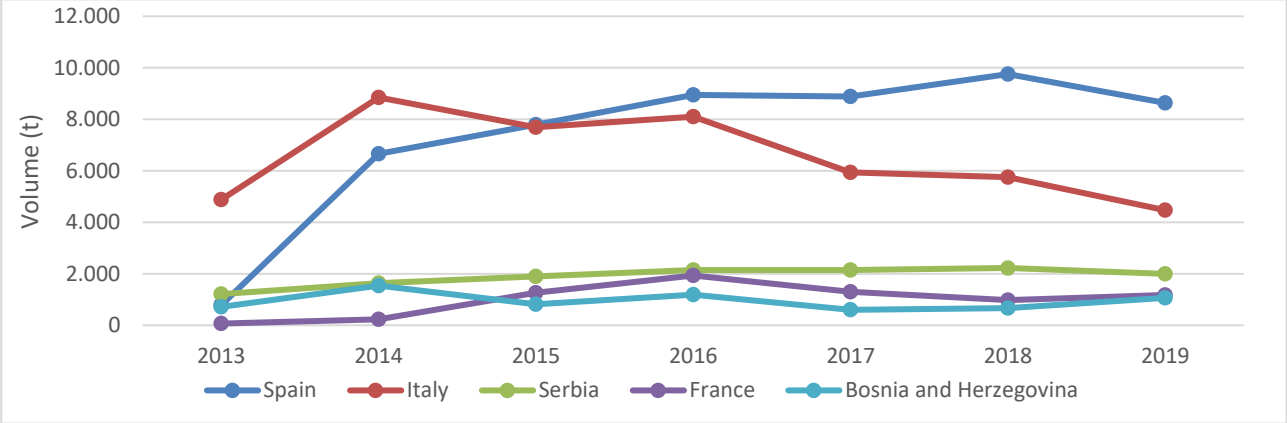


Figure 59: Five major partners by export volume - Croatia - Sardine - Eumofa

With reference to import, it's notable how the volume is almost 10X smaller than export, with an average (2015-2019) amount of 2.096t/year.

The volume pattern is depictable as a first growing phase (2013-2017), where it reached its peak at 3.472t during 2017, and a second descending and resettling phase. Remarkable is the behavior of extra-eu import, which was almost irrelevant until 2017 and then went up to the actual 1.604t, crossing the intra-eu line.

On 2019 Croatia imported 2.302t of sardines, at a price of 1€/Kg.

The relation with partner countries is often unstable, as many commercial flows only last few years or strongly vary their intensity. On a five-year average, the most important have been Netherland (1,16 million €), Morocco (809.000€), Italy (144.317€), Slovenia (113.825€) and France (99.650€). Between those Italy mainly exported *Fresh Sardines*, Netherland and Morocco preferred *Frozen Sardines*, and Slovenia *Sardines, prepared or preserved (excl. in olive oil).*

Considering the 2017-2018 average made on Eurostat's data, Croatia's most relevant import has been *Frozen Sardines* (1,6 Million €/year), followed by *Sardines, prepared or preserved (excl. in olive oil) (622.000€).* Other products collected 110.000€/year or less.

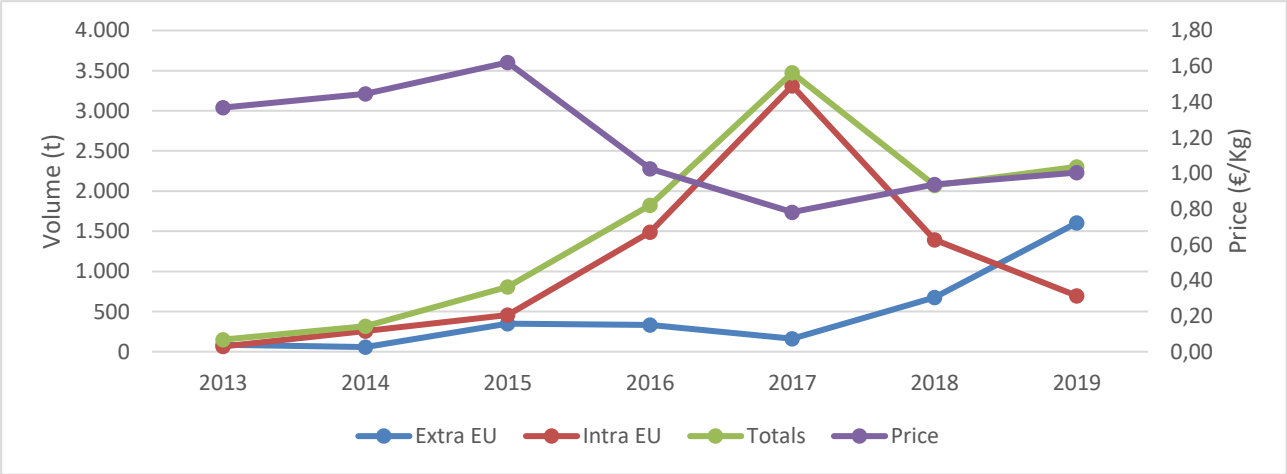


Figure 60: Import Volume and Price - Croatia - Sardine - Eumofa

WHOLESALE

The Eumofa weekly dataset contains information about prices on primary and secondary sardine markets in Italy.

Regarding primary markets, differences are not so clear and roles are not very defined. The available data shows that Ancona had an average price of 1€/Kg, Cesenatico of 1,05€/Kg, Molfetta's 0,87€/Kg and for San Benedetto del Tronto has been 1,17€/Kg.

Regarding volume, Eumofa only reports data for the 2016 and 2017, and averagely the most productive has been Molfetta (with 1,5t/year), then Ancona (0,9t) and San Benedetto del Tronto (0,35t). No volume information is reported for Cesenatico (which does even present a shorter timeframe for prices).

Talking about secondary markets Eumofa only report prices. It's affirmable, basing on this dataset, that Milano is more expensive than Roma (1,93€/Kg the first, 1,65€/Kg the second). The only years on which this relation was inverted was 2014 and 2015.

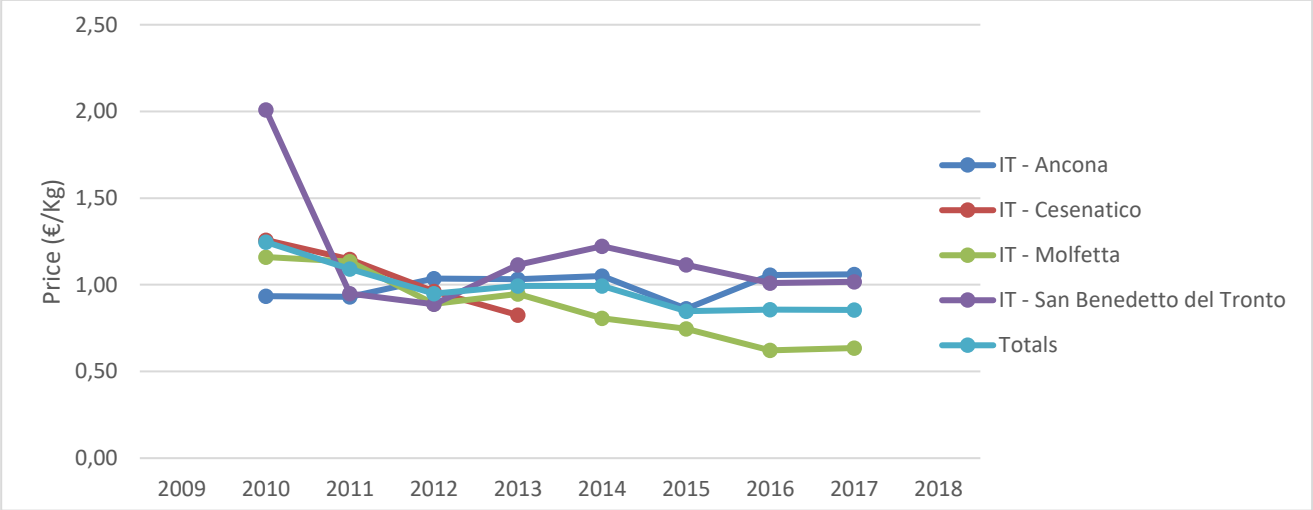


Figure 61: First market - Sardine Wholesale Price - Eumofa weekly

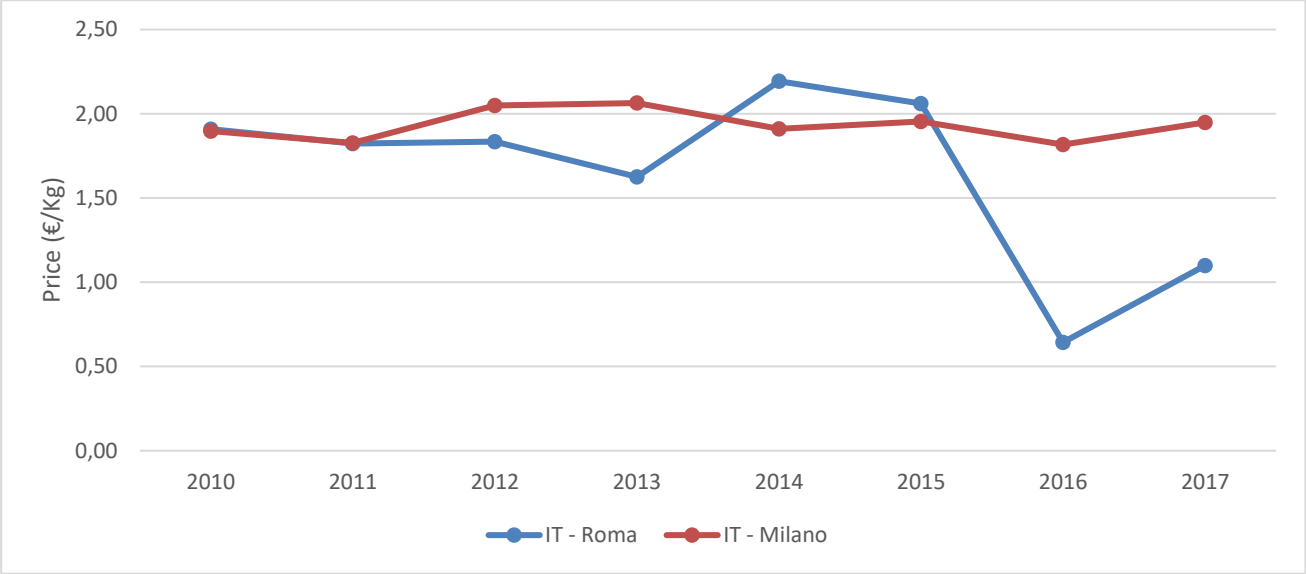


Figure 62: Secondary Market - European Pilchard Price - Eumofa weekly

PROCESSING

The only sardine-related voice inside the Prodcom dataset is *Prepared or preserved sardines, sardinella, brisling and sprats, whole or in pieces (excluding minced products and prepared meals and dishes)* which presents data from 2008 to 2018 for both Italy and Croatia.

Regarding Italy, the average production of this product has been 2.275t/year, for a value of 13,72 Million € at an average price of 6,03€/Kg. During 2018, the last available year, Italy produced 1.993t, sold at 7,05€/Kg for a total production amount of 14 million euros.

On its side, Croatia maintained an average production of 6.218t, corresponding to 17,2 Million €. During 2019 the production was of 5.174t, sold at an average price of 3,8€/kg for a total amount of 19,6 Million €.

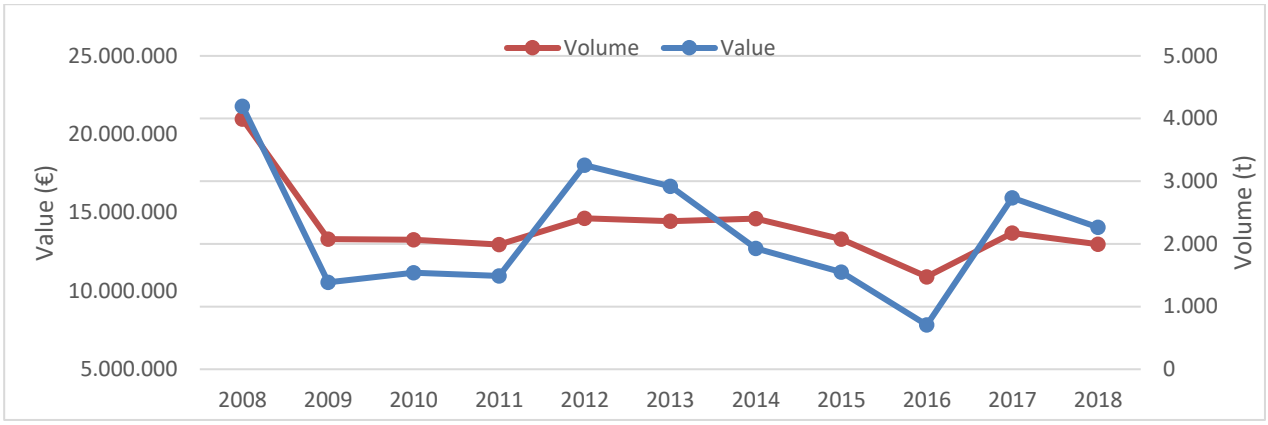


Figure 63: Prepared or preserved sardines, sardinella, brisling and sprats, whole or in pieces (excluding minced products and prepared meals and dishes) – Volume and Value - Italy

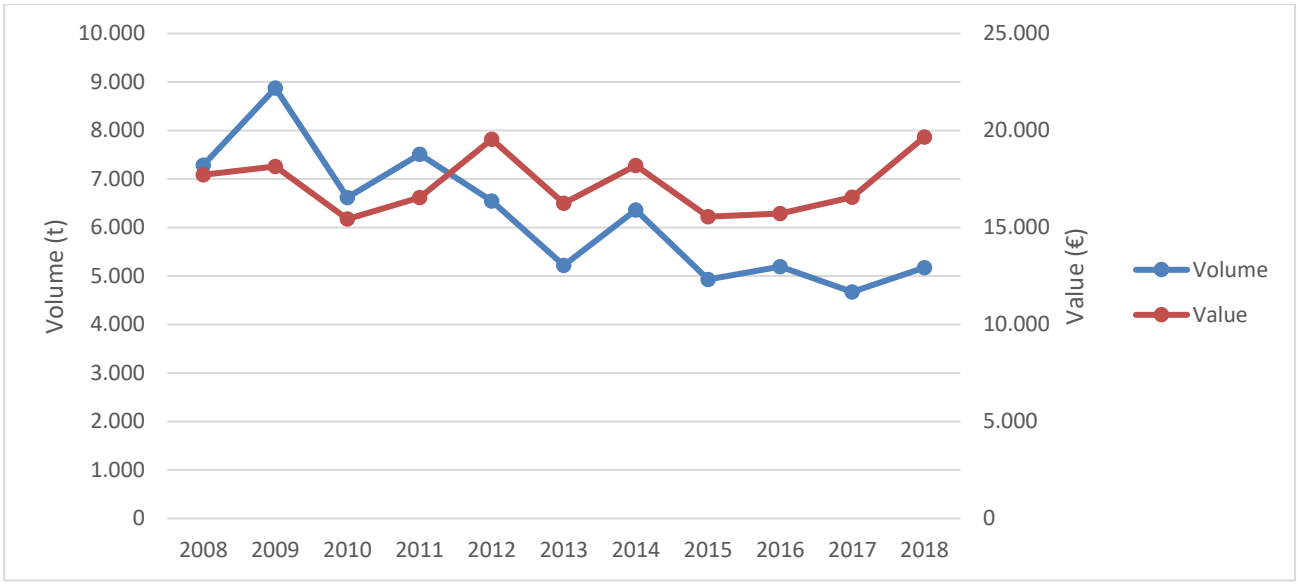


Figure 64: Prepared or preserved sardines, sardinella, brisling and sprats, whole or in pieces (excluding minced products and prepared meals and dishes) – Volume and Value – Croatia

SUPPLY BALANCE

Combining the data available from Eurostat and Eumofa, an Apparent Consumption value is computable for both Italy and Croatia for 2017 and 2018.

Eumofa only presents enough data to calculate the Apparent Consumption index for 2017. On that year, Italy consumed 21.572t while Croatia 30.007t. The index is not calculable for 2018 as landing data are missing.

Basing instead on Eurostat's database, Italy apparently consumed 24.452t in 2017 and 25.547t in 2018. From the same source Croatia consumed 20.088t in 2017 (much smaller than the data from Eumofa) and 13.943t in 2018.

Dividing the national consumption by population, it's noticeable how Croatian consumption of sardines is really much more consistent than the Italian.

Table 5: Supply balance computation

		Landings (t)	Import (t)	Export (t)	Apparent Consumption (t)	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	24.284	9.658	12.369	21.573	0,36
	Cro17	48.461	3.473	21.926	30.007	7,36
Eurostat	Ita 17	22.700	14.876	13.123	24.453	0,40
	Ita 18	26.133	13.531	14.117	25.547	0,42
	Cro 17	48.333	5.624	33.869	20.089	4,93
	Cro 18	46.267	3.439	35.763	13.943	3,42

2.8 BLUEFISH

The Bluefish (BLU) is one of the species considered with less data available. Due to Eumofa considering it inside the "Other marine fish" classification, it's only possible to make consideration on the Bluefish supply chain basing on Eurostat's data.

LANDINGS Ita/Cro

The first noticeable thing that emerge from the chart is that this species is basically not fished in Croatia, while Italian production has always stayed above the 100t/year.

During 2018 Italy fished 139,8t of Bluefish, an amount worth 858.777€ at 6,1€/Kg. Comparing those data with the ones from the previous years, 2018 resulted to be a slightly better year than the average (as it produced 17,1 more tons at -0,64€/kg).

In the same timeframe, Croatia fished 2,6t at 3,39€/Kg, a data in positive progression (0,3t in 2015, 0,74t in 2016, 2,26t in 2017.

Another consideration that is feasible to make basing on this chart is that Italian bluefish is way more expensive than Croatian (on 2015-2018 average, there is a difference of 3,05€/Kg).

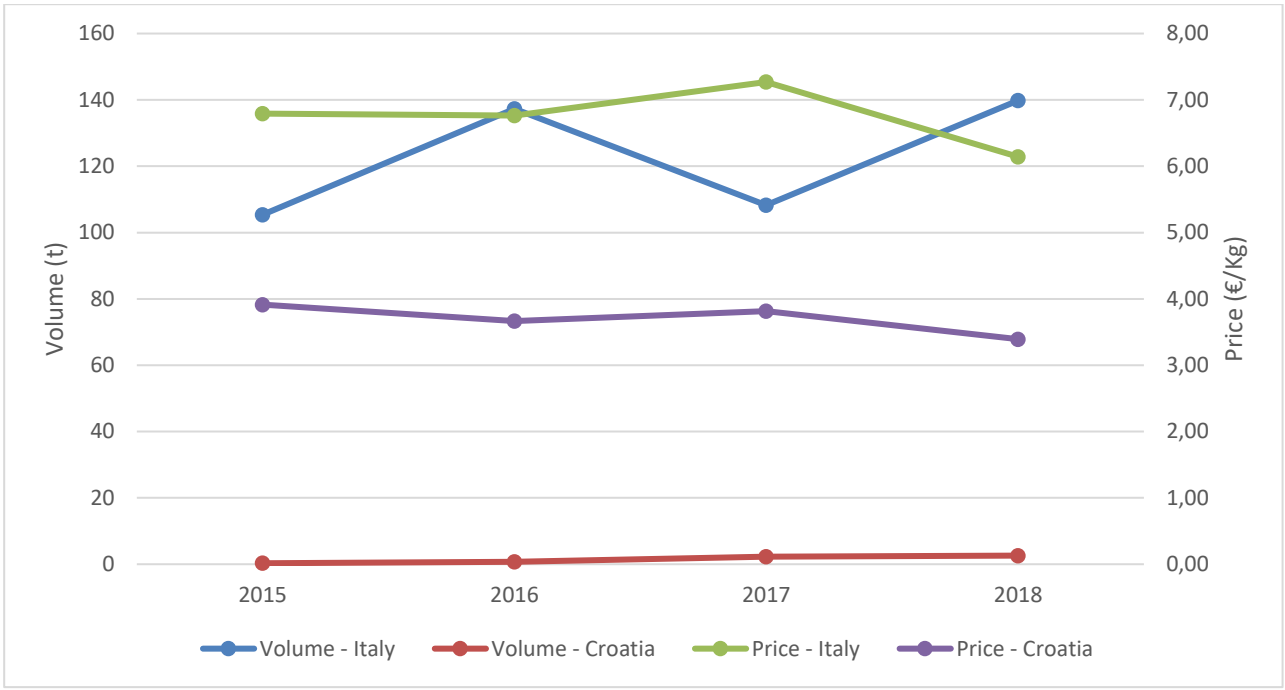


Figure 65: Volume and Price – Bluefish - Eurostat

2.9 MUSKY OCTOPUS

The Musky Octopus (EDT) is inserted by Eumofa into the wider group of “Octopus”. Confronting the specific data of Eurostat with those emerges that about 40% of “Octopus” fished were Musky Octopus.

LANDINGS Ita/Cro

About landings Eurostat does report a very short data timeframe: 2015-2017 for Italy and 2018 for Croatia. In this time, averagely Italy fished 2,790t of Musky Octopus (worth 15,3 Million € at 5,53€/Kg).
During 2018, on Italy landed 2.385t (12,8 Million € at 5,4€/Kg) while on Croatia only 35Kg. The Italian trend is not clearly defined.
Eumofa’s dataset evidences how the Italian Octopus landings have been following three phases: a first wave during 2000-2004, a second wave from 2004 to 2012 and then a stabilization. In this period the peak has been recorded during 2007, when 13.181t were fished. The price, even if oscillating, followed a clear upgoing trend, starting from less than 4€/Kg in 2000 and arriving to 7,27€/Kg in 2016. The entire octopus landing industry is worth 49,3 Million €/year in Italy, in an 18-years average.
In Croatia Octopus landings were not recorded by Eumofa until 2013, since then the volume grew for two years (arriving at its maximum of 975t on 2014) and then started to slowly descend. The 2013-2017 average is 2,56 Million €/year.

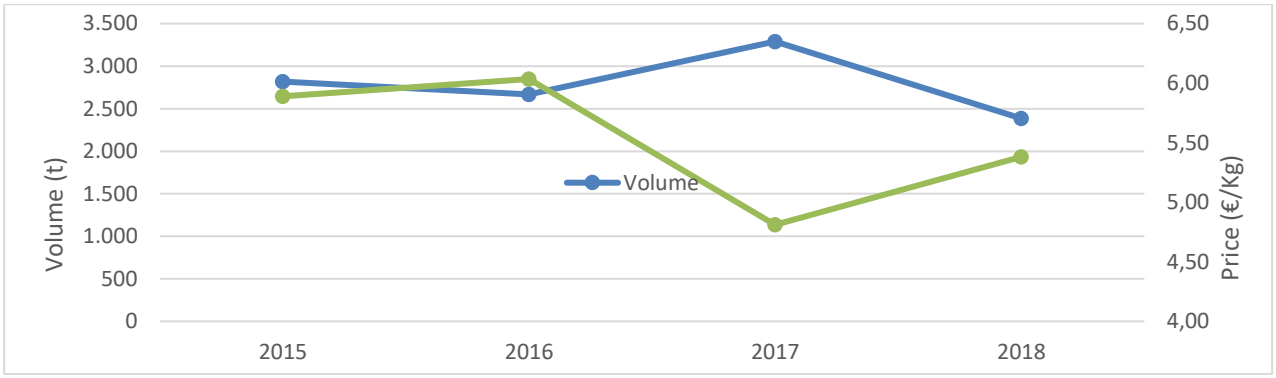


Figure 66: Landing Volume and Price - Italy - Eurostat - Musky Octopus (EDT)

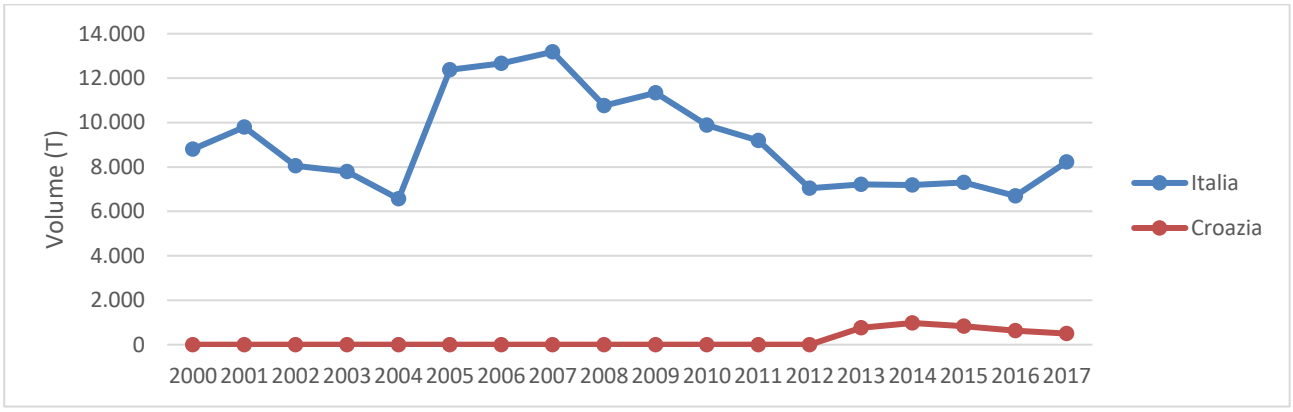


Figure 67: Landings Volume - Eumofa - Octopus

IMPORT/EXPORT Italy:

The only source reporting information on import/export is Eumofa, thereby the following analysis (for both Italy and Croatia) is based upon the generical "Octopus" class.

The volume chart shows an almost constant grow from 2003 to 2018 and a very steep dip during 2019, when Italy exported 2.548,9t of Octopus (for a total of 26 Million €, at 10,23€/Kg). Since 2003 the Intra-eu countries represent the most important market for Italian export, as extra-eu

only received a marginal interest. Moreover, the intra-eu market is the one who pushed the whole industry and shaped the "total" line, as extra-eu didn't pass the 500t/year resistance since 2002.

Considering the available data, the average year for Octopus export is characterized by a landing volume of 2.682t, exported at 7,08€/Kg for a total amount of 19,8 Million €.

The most important partner countries by value for Italy are Spain (on 2015-2019 average 6,5 Million €/year), France (5,2 Million €), Germany(6,6 Million €), Greece (4,5 Million €) and Malta (1,3 Million €).
Considering the 2002-2019 timeframe, as it is visible from the following chart, Spain and Greece have been the two most important between them.

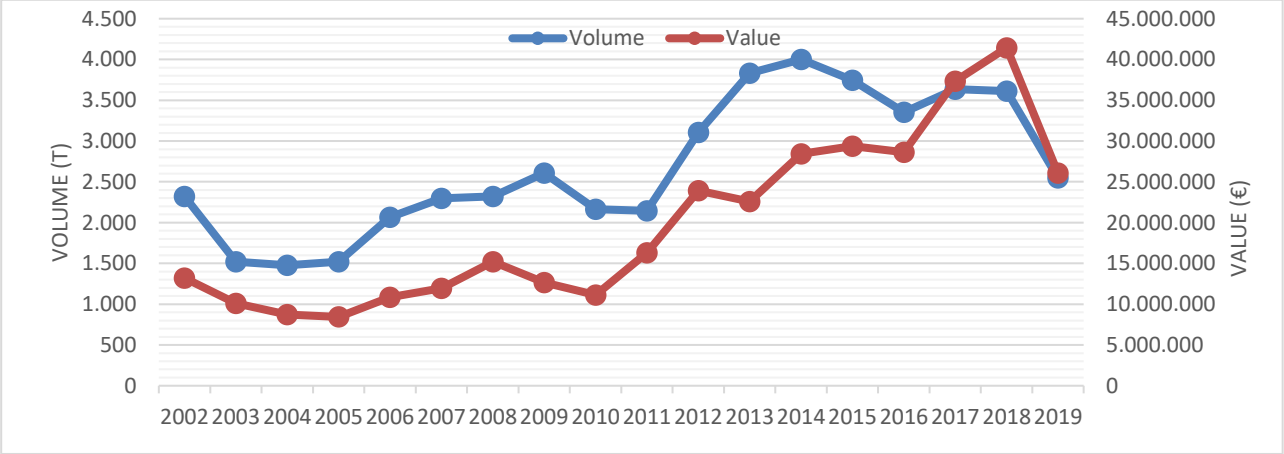


Figure 68: Italy export - Volume and Value - Octopus – Eumofa

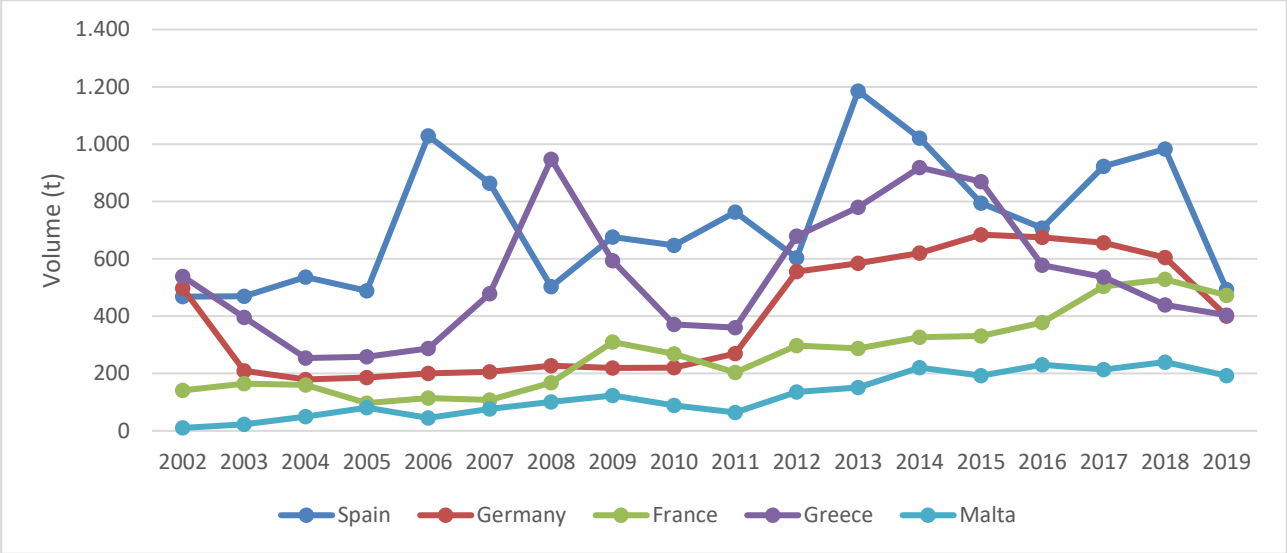


Figure 69: Five major partners - Export Volume Italy - Octopus - Eumofa

In the 2002-2019 timeframe, import moved inside the 46.000-60.000t channel, with a little drop on 2019 when Italy imported 44.786t at 7,01€/Kg (worth 314,1 Million €). By value, the trend is different as since 2013 Italy experienced a huge growth (from 182 Million € in 2013 to 432 Million € in 2018).

Differently than from export, for import the most important market is composed by extra-eu countries (extra-intra eu ratio remained roughly constant through the last eighteen years).

The most relevant partners by value have been Spain and Morocco (depending from year to year), followed by Senegal, Indonesia and Mexico (at approximately the same weight).

Making a 2015-2019 average results that Spain exported 93,3 Million €, Morocco 100,3 Million €, Senegal 25,2 Million €, Indonesia 26 Million € and Mexico 22,3 Million €.

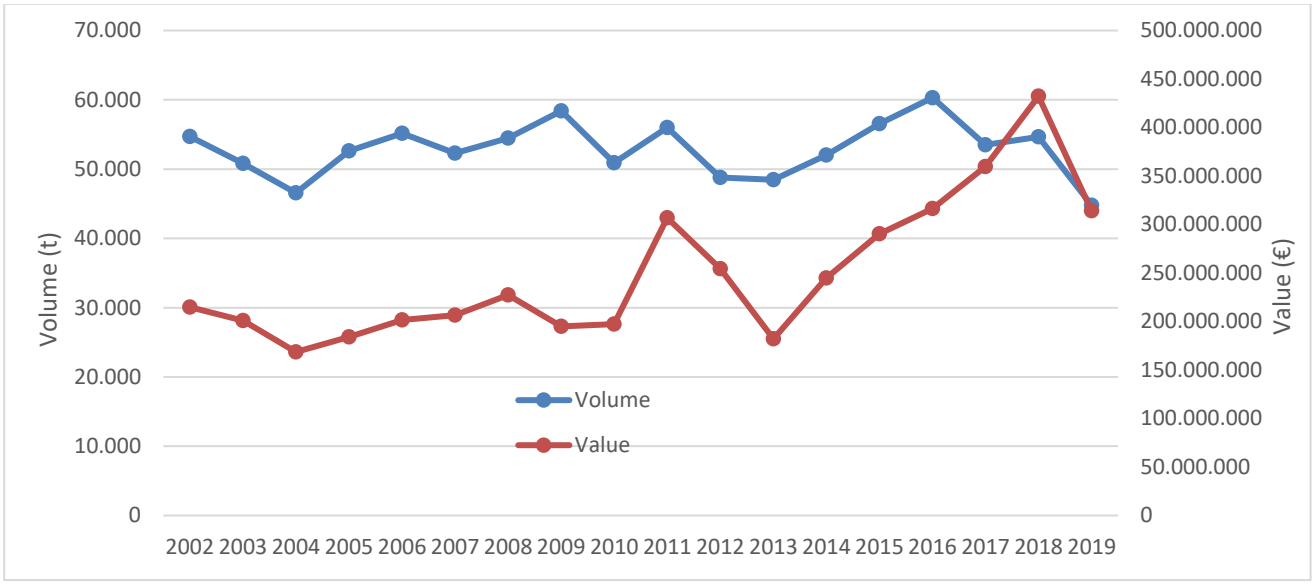


Figure 70: Italy Import - Volume and Value - Octopus - Eumofa

IMPORT/EXPORT Croatia

The Croatian export of Octopus is not as developed as the Italian. In fact, in 2019 Croatia only exported 65,8t (571.000€ at 8,68€/Kg) while on 7-years average the export was of 109,9t (611.000€ at 6,15€/Kg). The most important destination market is the intra-eu (extra-eu never arrived at 20t/year).

Between the major partners, the most important by value are Italy, Slovenia, Montenegro, Serbia and Austria. Until 2016 Italy was the most relevant, then diminished its importance at the point to be overtaken by Slovenia. Considering the 2015-2019 average, Croatia exported Octopus to

Slovenia for a total amount of 207.000€, to Italy for 220.000€, to Montenegro for 40.000€, to Serbia for 47.390€ and to Austria for 32.106€.

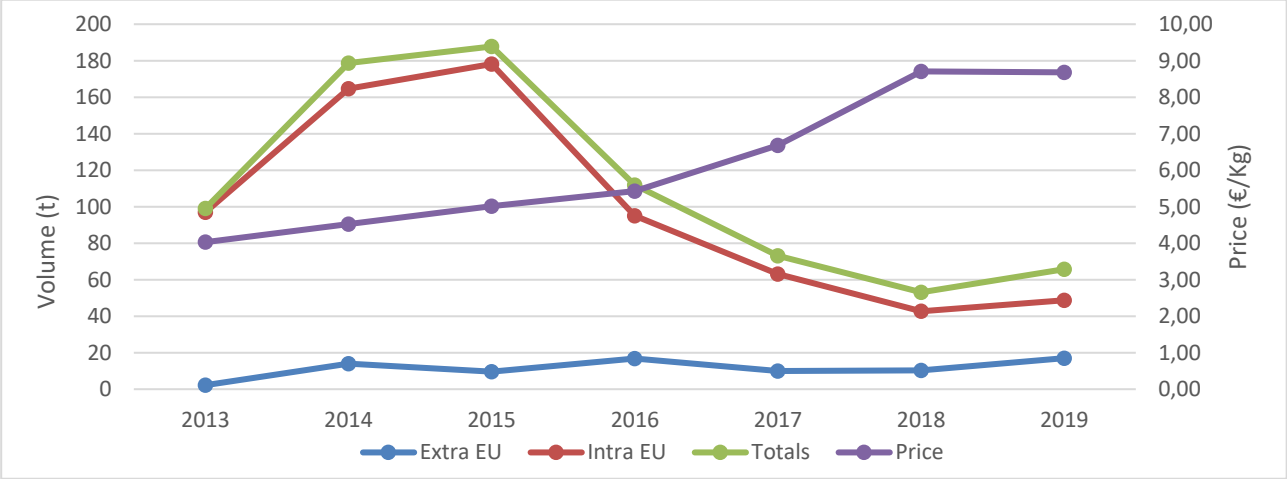


Figure 71: Croatia Export - Volume and Price - Croatia - Octopus - Eumofa

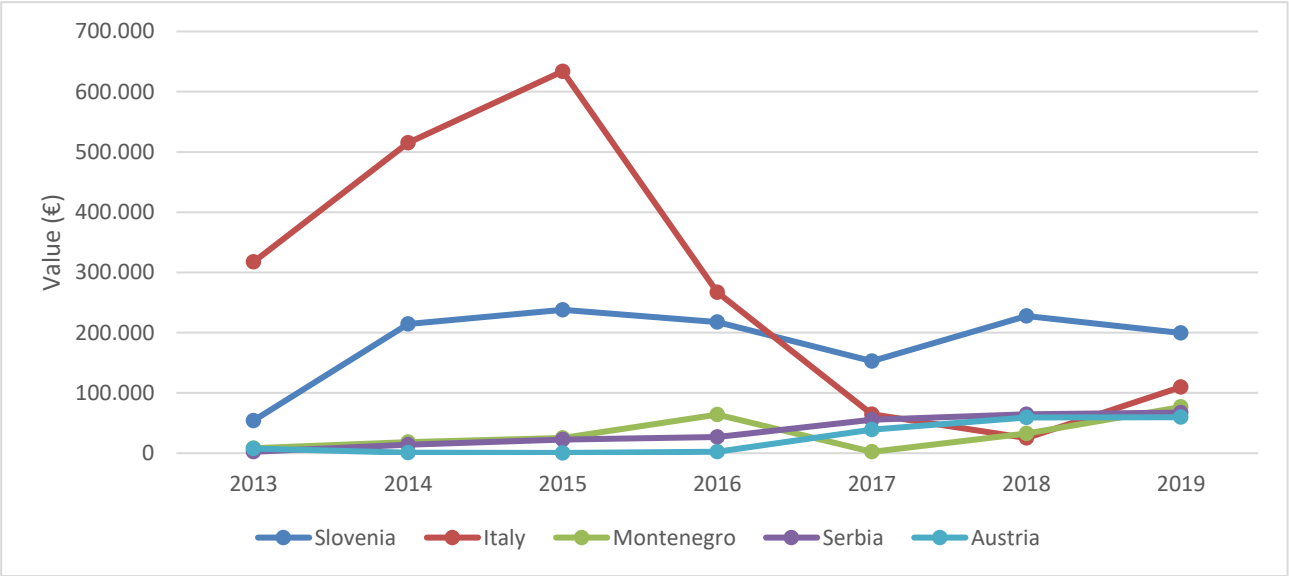


Figure 72: Five major partners by export Value - Croatia - Octopus - Eumofa

Regarding import, Croatia experienced a huge growth starting from 2015, mostly pushed by the intra-eu import increase.

On 2019 Croatia imported 513,2t of Octopus (worth 3,7 Million € at 7,24€/Kg), a value well beyond the average.

The most important partners are Spain and Slovenia (almost equal by volume level, different importance by value as Slovenian octopus is cheaper). Considering a 2015-2018 average, Spanish Octopus export to Croatia were about 1,4 Million €/year, Slovenian 848.000€, Italian 609.610€, Portuguese 286.500€ and Philippine 332.380€.

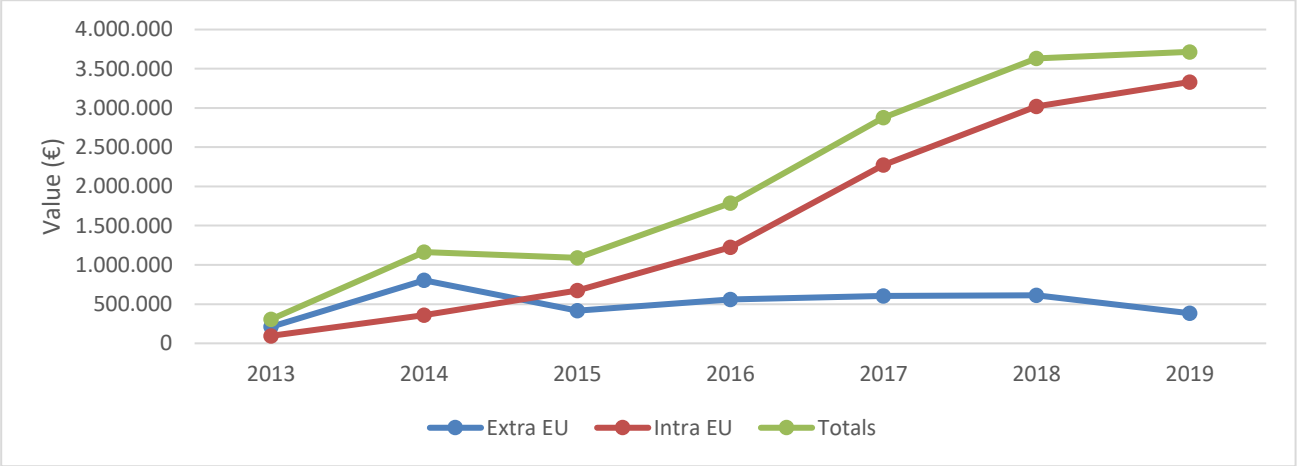


Figure 73: Import Value - Croatia - Octopus - Eumofa

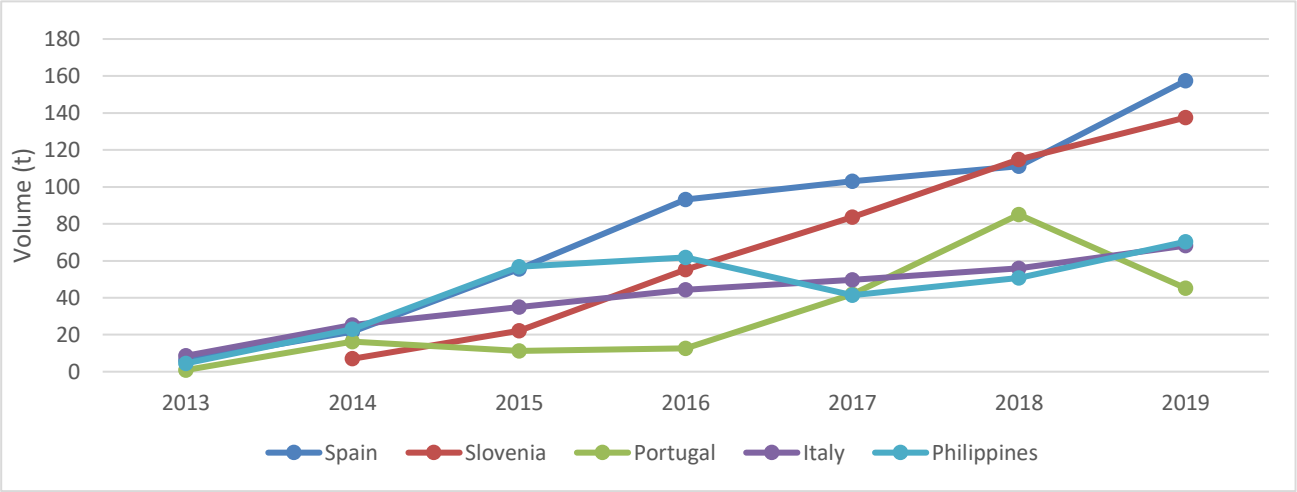


Figure 74: Five major partners by import Volume - Croatia - Octopus - Eumofa

2.10 QUEEN SCALLOP

The analysis of the Queen Scallop's supply chain can only be made upon Eumofa's data because Eurostat doesn't have specific information for the Queen Scallop (QSC), apart from those contained into the CN8 International trade in goods – detailed data upon import and export.

At the same time, Eumofa's data for QSC are inserted into the ample "Scallop" commercial species, composed by some scallop kinds specific from other global regions (as for example Peruvian scallop, New Zealand scallop, Patagonian scallop) and some other scallop species that live in the Mediterranean Sea (as the Great Mediterranean scallop), thereby the following elaborations should be accepted with reservation.

LANDINGS Ita/Cro

The Italian Scallop fishing volumes have been very variating (with a minimum of 76t in 2005 and a maximum at 436,4t in 2016) and there is not an identifiable clear trend. On average, considering all the 2005-2017 data, Italy fished 340,72t (corresponding to 1,78 Million € at 6,5€/Kg). During 2017, the last year with available data, the production has been below the average rate with only 140,2t (1,2 Million € at 6,04€/Kg), roughly one third of the previous year.

The Croatian scallop industry only has data starting from 2013. From then, Croatia averagely fished 130t/year of scallop (that correspond to 694.511€/year at 5,4€/kg) and had a peak during 2015 with 169,8t (896.734€).

Analyzing the Price gap chart, it's noticeable how until 2015 Croatian scallops were more expensive than Italian, but from 2016 on the situation switched.

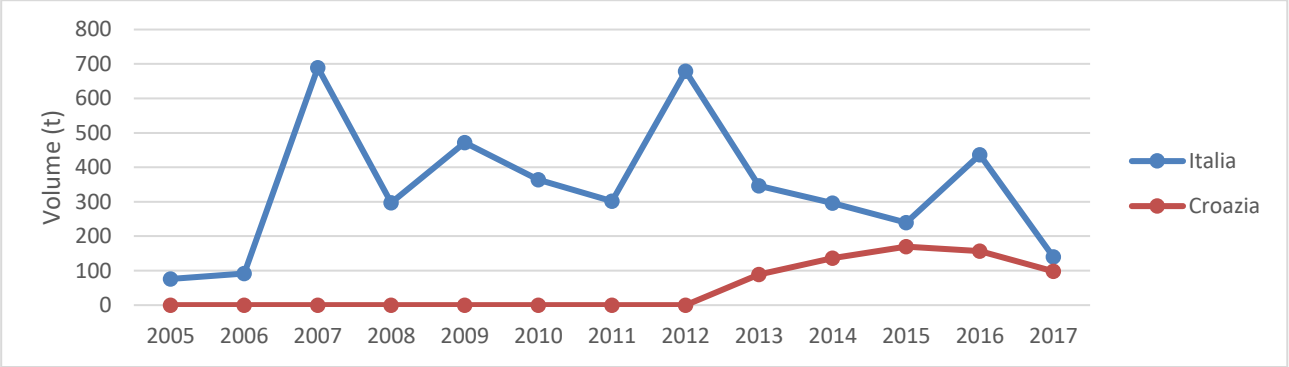


Figure 75: Landing Volume (t) - Eumofa - Scallop

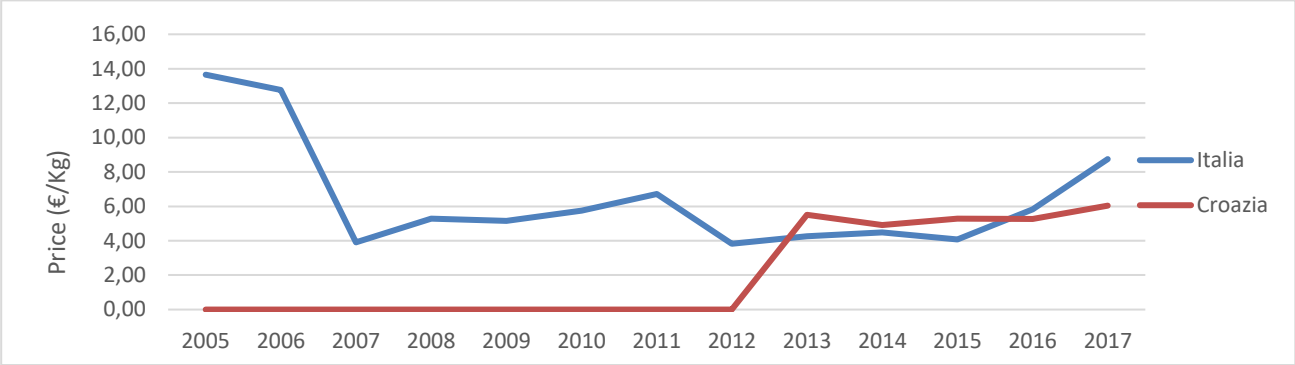


Figure 76: Landings Price - Eumofa - Scallop

IMPORT/EXPORT Italy

The Italian export of scallops has been, at least since 2002, almost completely destinated to Spain, at the point that the Spain/total landing ratio always maintained above 80-85%. Very low attention is given to extra-eu destinations.

The export chart defines an industry that had its peak in 2007 (5.776t, 15,9 Million €) after a growing phase that triplicated the volume, followed by a long-run decline.

The undisputed main commercial partner, as said, is Spain. Italy averagely (2002-2019) sent to Spain 2.473,5t of scallops, worth 6,78 Million €. Other relevant countries are France (with the same average 56,2t), Slovenia (62,25t), Austria (28,6t) and Malta (17,5t), but they are all lower by several size scales.

The most of those countries, apart for Malta and Austria, had as main import from Italy *Live, fresh or chilled scallops with or without shell (3072100).* In particular, during 2018 Spain imported 2,39 Million € (880,5t), Slovenia 204.689€ and France (242.715€).
Austria and Malta instead preferred *Scallops, smoked, dried, salted or in brine, even in shell (03072900)* and imported for 127.657€(Austria) and 35.227 (Malta).

Basing on Eurostat CN8 dataset, Italy during 2017-2018 on average exported 3,8 Million €/year of *Live, fresh or chilled scallops (1.128t),* 1,47 Million € of *Scallops, smoked, dried, salted or in brine, even in shell* (492,7t), 233.724€ of *Scallops frozen, even in shell* (30t) and 3.204€ of *Scallops, prepared or preserved (excl. smoked).*

Another consideration is to be made about prices, as they strongly diverge from each other. The average price of scallop sent to Spain in the last five years was in fact 2,47€/Kg, while the price to France 6,24€/Kg and Slovenian 10,54€/Kg.

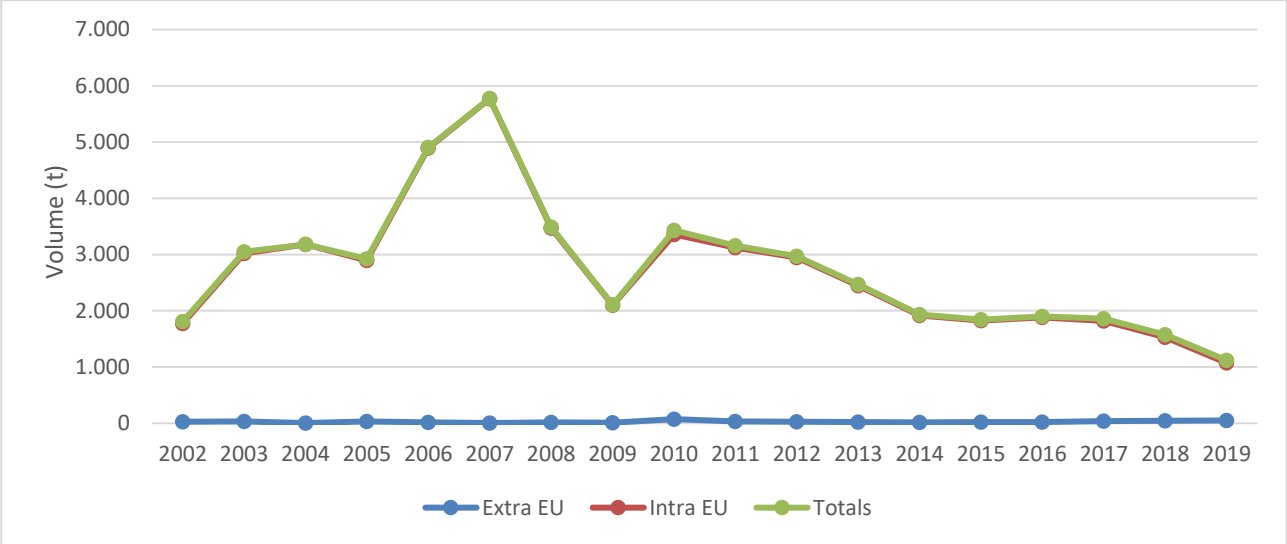


Figure 77: Export Volume Italy - Scallop - Eumofa

Regarding import the main target market is represented by intra-eu nations. During 2019 Italy imported 4.643t of scallops, worth 32,2 Million € at 6,94€/Kg, while the 5-years average was of 6.007t, worth 41,9 Million € at 7,33€/kg.

The most important destination market is by far the United Kingdom (and that will alterate the intra-extra eu distinction from 2020 on, due to Brexit) that sent to Italy 2.191,4t on its own. The second most important partner is France (1.253,6t in 2019) and then with a lower importance Spain (527,9t) Denmark (143,8t) and Netherland (155,8t).

Between those, Denmark mainly sent *Scallops, smoked, dried, salted or in brine, even in shell* to Italy (1.99 Million € during 2018), the others main export has been of *Live, fresh or chilled scallops (*United Kingdom 8,65 Million €, Netherland 974.272€, Spain 628.000€, France 5,45 Million €).

Generally speaking, Italian import is focused on *Live, fresh or chilled scallops* (on 2017-2018 average 18,7 Million €, 2.019t), *Scallops frozen, even in shell* (8,9 Million €) and *Scallops, smoked, dried, salted or in brine, even in shell (4,2* Million €*).*

Price didn't make any strong move from 2002 to 2016, apart from simple fluctuations, but during 2016-2018 it grew up to 9,27€/kg.

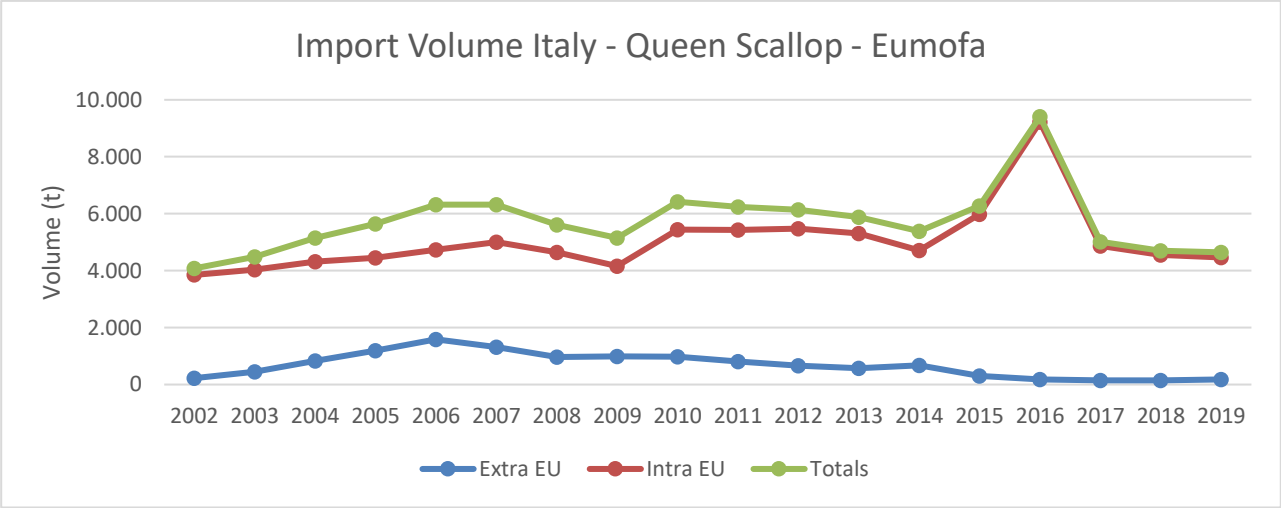


Figure 78: Import Volume Italy - Scallop - Eumofa

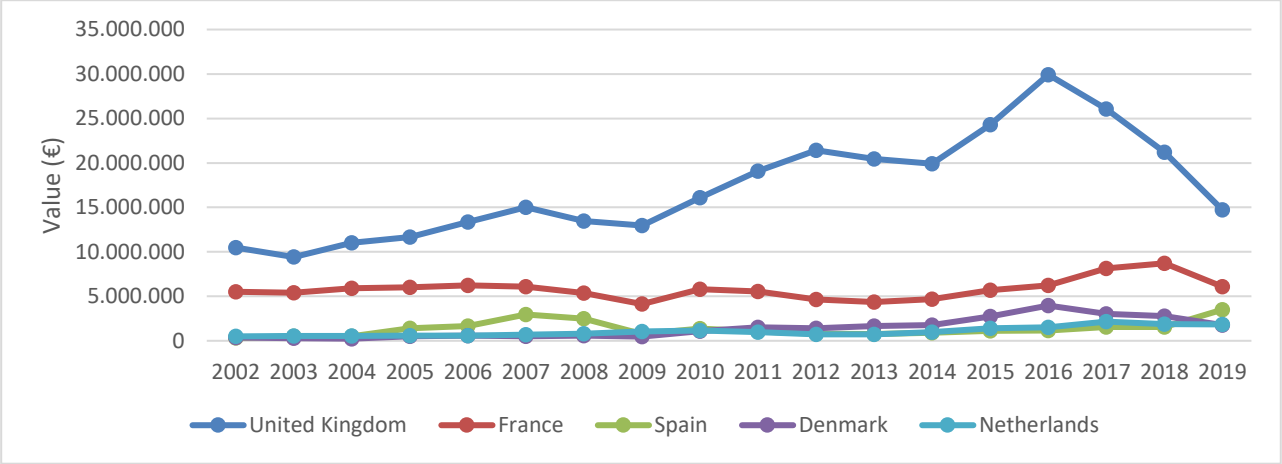


Figure 79: Five major partners by import Value - Italy - Scallop - Eumofa

IMPORT/EXPORT Croatia

Croatian export of scallops met two different phases: a first one where exports grew from 20t to the maximum of 168,1t/year (2013-2015) and a second one where the volume went back down to 47t (484.020€, 2019). The price followed a pattern inverse respect to the volume (when volume was going up, price went down and conversely).

Italy has always absorbed most of the Croatian export. During the 2015 peak, the 96,8% of the 168,1t exported were destined to Italy and in 2019 that percentage is still 72%. Other relevant partners are Slovenia (54.600€ exchanged during 2019), Serbia (24.860€) and Slovakia (22.610€).

The only relevant export product is *Live, fresh or chilled scallops*, that in average on 2017-2018 was about 734.922€. This is probably linked to the geographical proximity to Italy. The revenue of the second most important product, *Frozen scallop*, has just been of 5.956€/year.

Live, fresh or chilled scallops has been the most requested product from Italy, Slovenia and Serbia while Slovakia mainly asked for *Scallops frozen, even in shell.*

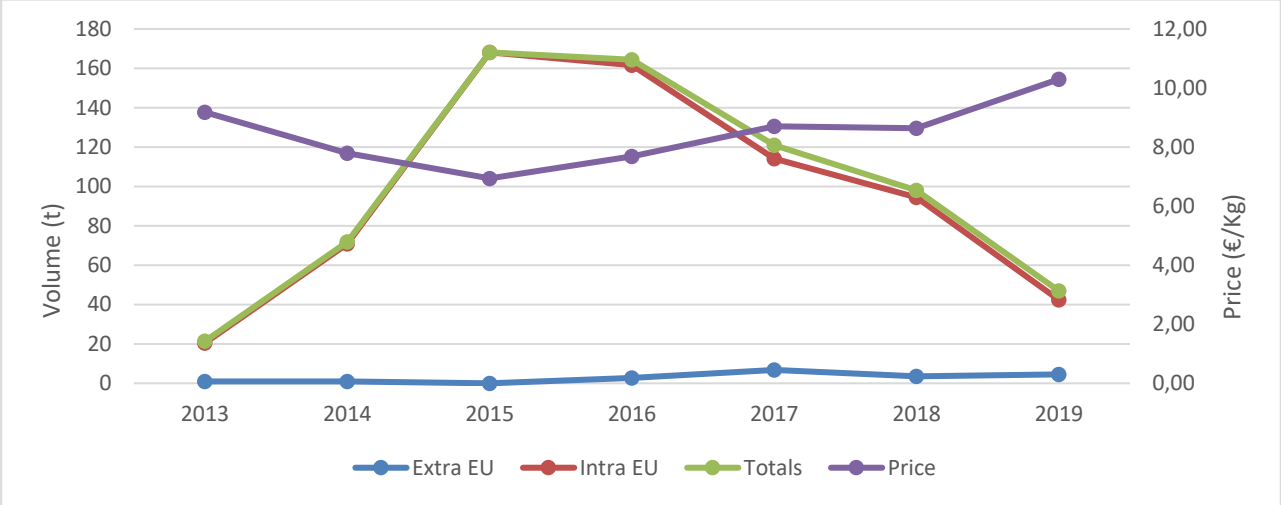


Figure 80: Export Volume and Price - Croatia - Scallop - Eumofa

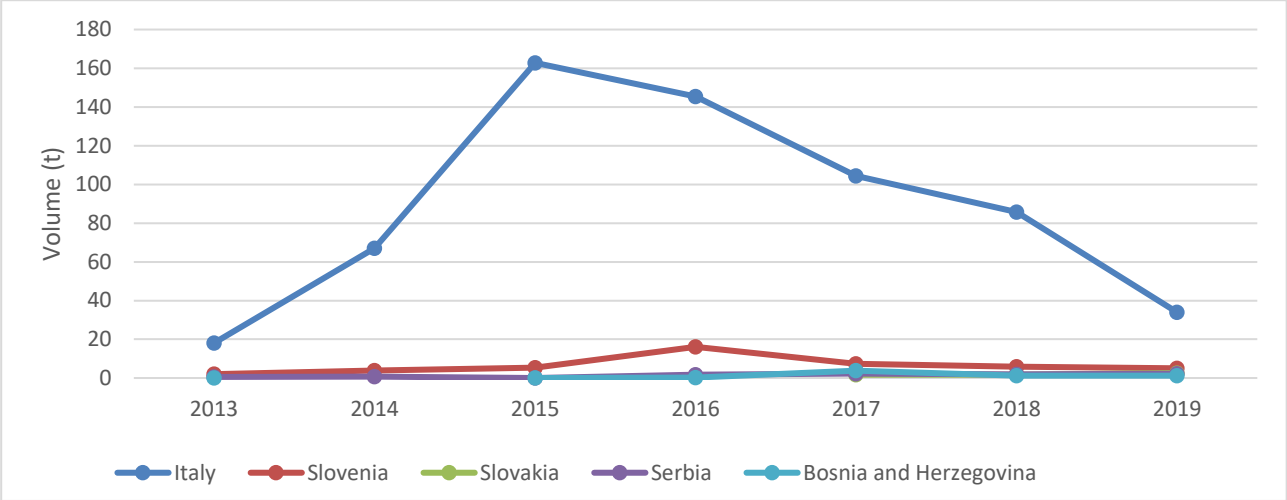


Figure 81: Five major partners by Export Volume - Croatia - Scallop - Eumofa

Speaking about import, Croatia only had commercial relations with intra-eu countries. Volume presents a noticeable growth, even if not constant, while price grew from 2013 to 2016 and then retraced from 2016-2019, without going out from the 100-120t/year channel.
During 2019 Croatia imported 151,7t of scallop, worth 1,1 Million € at 7,34€/Kg.

The most important partner country has always been Italy with an average of 358.002€/year (except during 2017 and 2018 when it was UK), followed by United Kingdom (221.451€), Spain (58.965€), Slovenia (51.356€) and Portugal (11.746€).
Between those, Italy and UK mainly sent Live*, fresh or chilled scallops* (in 2018 271.923€ Italy and 59.504 UK). Portugal mainly exported *Scallops, frozen, even in shell (*21.771€). From Spain and Slovenia instead, the preferred product has been *Scallops, smoked, dried, salted or in brine, even in shell* (28.152€ for Slovenia, 28.475 for Spain).

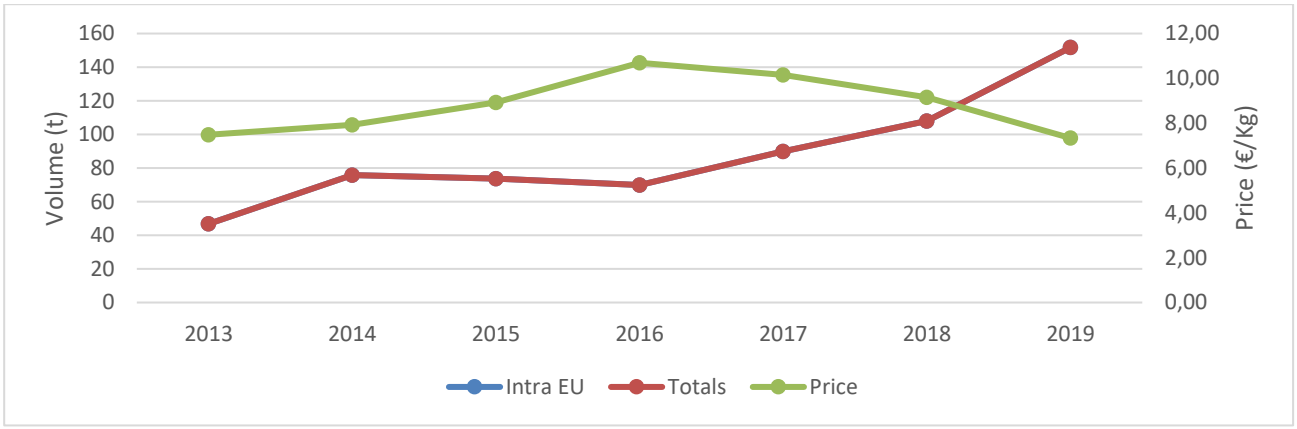


Figure 82: Import Volume and Price - Croatia - Scallop - Eumofa

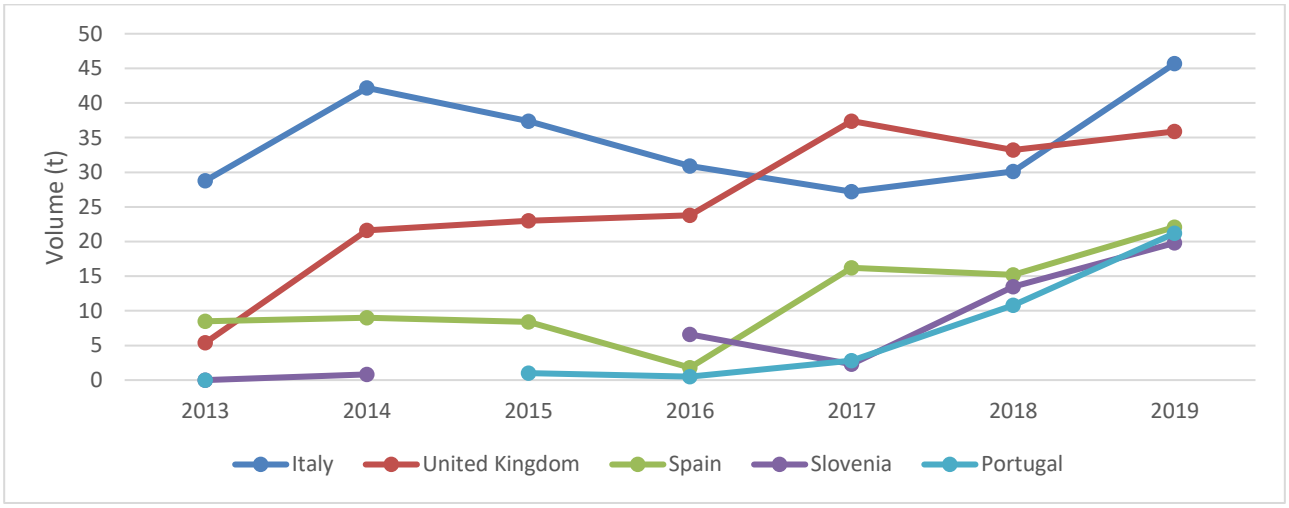


Figure 83: Five major partners by Import Volume - Croatia - Scallop - Eumofa

SUPPLY BALANCE

Combining the data from Eumofa already discussed, an Apparent Consumption value about Scallop for Italy and Croatia for the year 2017 is computable.

Elaborating Eumofa's dataset results that in 2017 Italy apparently consumed 3.291t of scallop, whereas Croatia only consumed 67,5t. The same index for the 2018 is not calculable.

Table 6: Supply balance computation

		Landings (t)	Import (t)	Export (t)	Apparent Consumption	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	140	5.011	1.860	3.291	0,055
	Cro 17	98	89,9	121	67	0,016

2.11 CLAM

Regarding Clam, the focus of this report is aimed at the *Chamelea Gallina* species (SVE) from the Veneridae family, but from Eumofa it's only possible to find data for the whole Clam main commercial species. Confronting the landing information from Eumofa and Eurostat, it appears that Italian clams fished between 2006-2017 were SVE in a percentage variating from 86% to 100%, while for Croatia that percentage is around 0,0% (apart from 2013 when it was 75%). Thereby the following analysis, when sourced by Eumofa, should be kept in consideration only when speaking about Italy, and for Croatia should only suggest a general clam tendency.

LANDINGS Ita/Cro

Eurostat covers a sufficient timeframe for Clam, 2006-2018 for Italy and 2011-2018 for Croatia.

In this period Italy averagely fished clams for a total value of 42,8 Million €, with volumes that after a peak in 2007 (28.802t, 54 Million €) slowly went down to the actual (2018) minimum of 11.808t. The price line follows the same pattern apart from 2018 when instead of a minimum there has been a little recover.

The Croatian production of clam, compared to the Italian, it's almost irrelevant as it has always been below 1t/year apart for an exploit during 2013 (299t).

Analyzing the price, it's noticeable how Croatian clams are always more expensive than Italian. The smallest gap in prices has been recorded in 2014 (when Italian clam costed 0,13€/Kg more than Croatian) and now sits on the historical maximum of +2,04€/Kg.

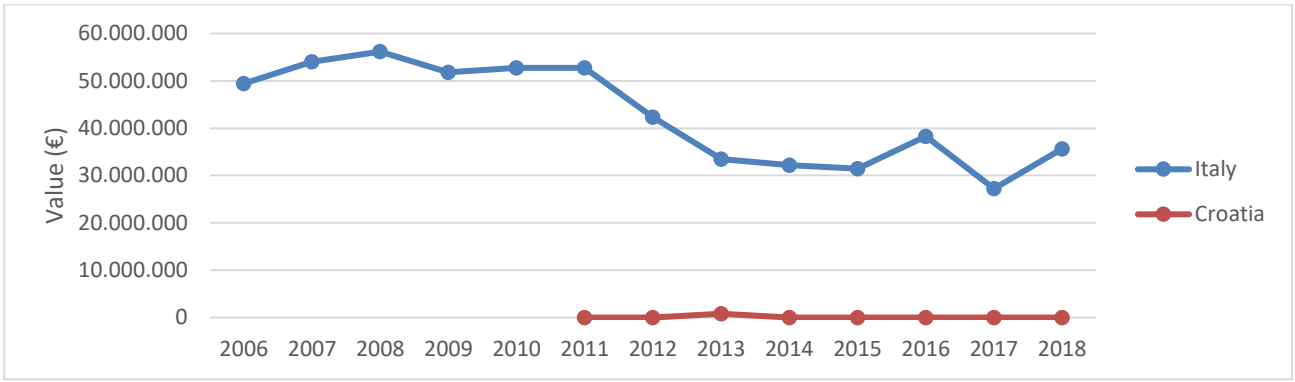


Figure 84: Landings Value (€) - Eurostat - Clam (SVE)

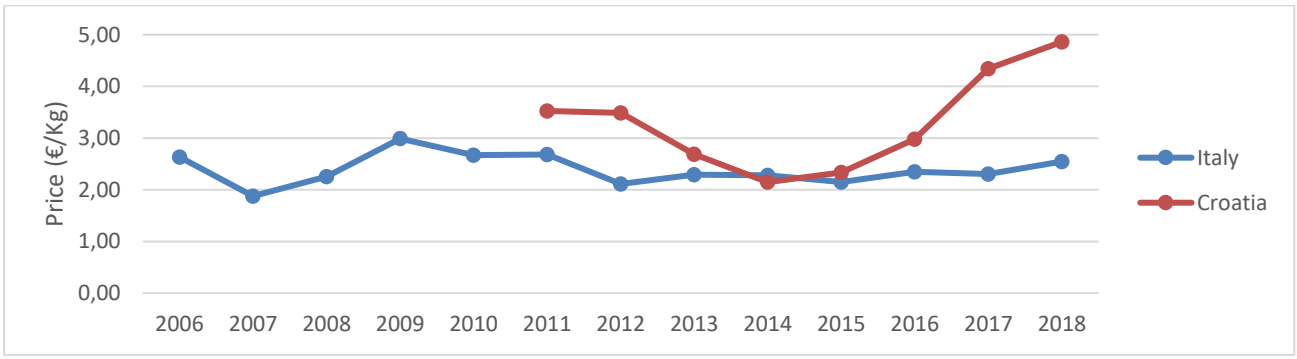


Figure 85: Landings Price - Eurostat – Clam (SVE)

IMPORT/EXPORT Italy

The whole Italian clam export industry is supported by Intra-eu flows, as extra-eu passed the 100t/year only from 2018.

The total export is splittable into two different phases: a first (2002-2011) when volume, even if growing, remained under 4.000t/year and a second phase where volume became bigger than 8.000t/year. The 2012 is the year where the big jump happened, as the export passed from 2.142t to 9.289t/year.

In this timeframe, price fluctuation didn't have a clear path, and continued to oscillate between 3 and 6€/kg.

The main partner has always been Spain (the total export chart shape completely depends from the Spanish export shape). With this country Italy traded 38,9 Million €/year on a 5-year average, for an average amount of 7.910t at 4,9€/Kg. Within the secondary partners, have to be named Germany (averagely 2,5 Million €/year), France (1,97 Million €), Malta (796.092€) and Austria (814.024€).

Analyzing the Eurostat's CN8 dataset, results that Italy (on 2017-2018 average) principally exports *Live, fresh or chilled, even in shell, clams, cockles and ark shells "families Arcidae, Arcticidae, Cardiidae, Donacidae, Hiatellidae, Mactridae, Mesodesmatidae, Myidae, Semelidae, Solecurtidae, Solenidae, Tridacnidae and Veneridae" (3077100)* for an amount of 50,9 Million €/year (9.471t, 5,38€/Kg). The second most important product, with 3,5 Million € (923t, 3,8€/Kg) is *Clams, cockles and arkshells, prepared or preserved (excl. smoked) (16055600).* Then *Striped venus or other "Veneridae", even in shell, frozen (3077210) 1,55* Million € *(192t, 2,77€/Kg)* and *Smoked, dried, salted or in brine, even in shell, clams, cockles and ark shells (3077900)* with 1,5 Million € (228t at 4,21€/Kg).

During 2019, between the above mentioned partner countries, *Live, fresh or chilled, even in shell, clams, cockles and ark shells (3077100)* has been the most imported clam product from Spain (44,6 Million €, 8.505t), Malta (634.786€, 61t) and Austria (865.925€, 80t). Germany mainly imported *Striped venus or other "Veneridae", even in shell, frozen (03077210) (125t, worth 1,4* Million €*)* and France mostly requested *Smoked, dried, salted or in brine, even in shell, clams, cockles and ark shells (03077900) (1,2* Million €*, 141t).*
Still relevant voice in the import clam product list are *3077100* for Germany (1,3 Million €) and *16055600 f*or Spain (1,8 Million €).

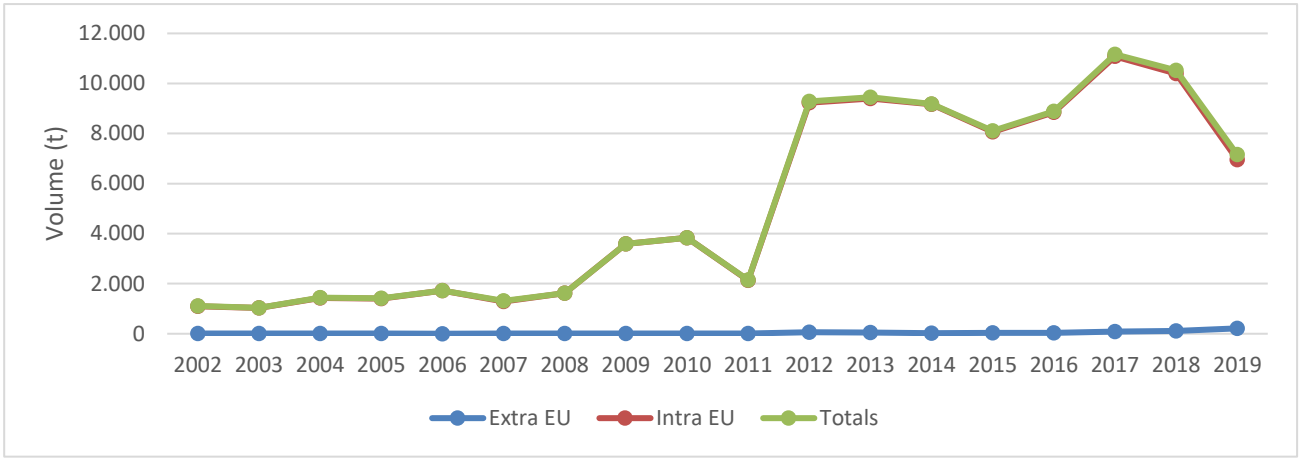


Figure 86: Export Volume Italy - Clam - Eumofa

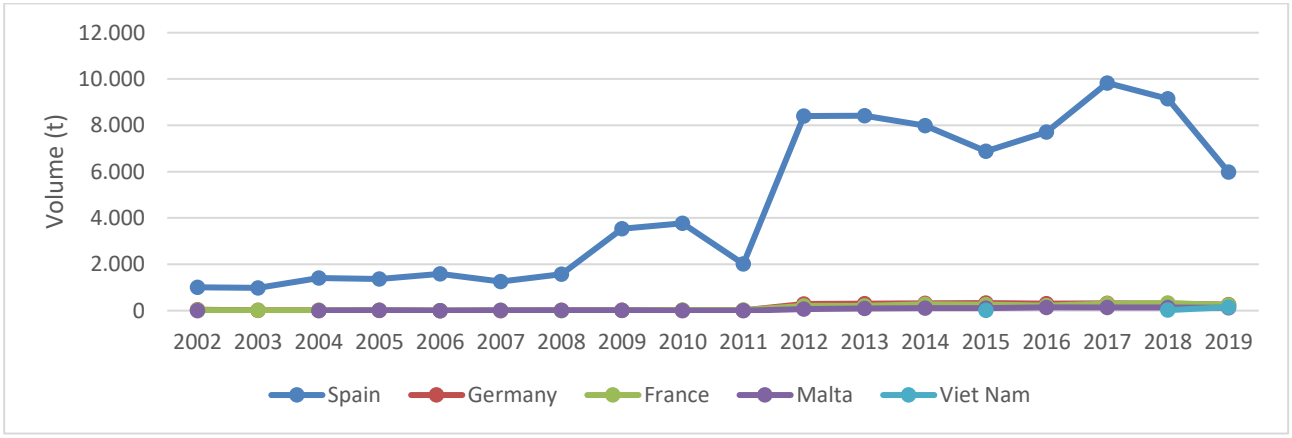


Figure 87: Five major partners by Export Volume - Italy - Clam - Eumofa

The Italian importation of clams has a significant increase from 2011 on, mostly moved from extra-eu flows. The general trend, after the peak of 15.783t in 2017 and the retracement during 2018, is still ascending in 2019 when 12.629t of clam have been imported in exchange for 32,1 Million € at 2,54€/Kg). The mentioned 2011 rapid increase must be attributed to the exceptional performance of Vietnam (which still is the most important partner) and partially Turkey.

In the 2015-2019 timeframe Eumofa records an average import of 12.000t, worth 32,3 Million €/year at 2,71€/Kg. Price chart is quietly horizontal, with a slight downward trend starting from 2009.

During 2019 Italy imported 6.467t of clam from Vietnam, worth 12,9 Million € at 1,99€/Kg. Other relevant partners are Thailand (3,1 Million €, 1.682t at 1,85€/kg), Turkey (5,43 Million €, 1.638t at 3,32€/Kg), Spain (3.97 Million €, 951,6t at 4,17€/Kg) and Netherlands (367,8t at 3,34€/Kg).

From the Eurostat CN8 dataset results that referring at the 2017-2018 average, Italian importation is mostly oriented to *Clams, cockles and arkshells, prepared or preserved (excl. smoked) (16055600),* as it costed 23,8 Million €/year (10.242t at 2,33€/Kg). The second import budget item for value is *Live, fresh or chilled, even in shell, clams, cockles and ark shells (3077100*), imported for 7,5 Million € (1.250t at 6€/Kg), followed by *Frozen, even in shell, clams, cockles and ark shells (03077290) (2,6* Million €*, 1.628t at 1,61€/Kg). Other products represent less than 1* Million *€/year each.*

Filtering by destination country, *Live, fresh or chilled, even in shell, clams, cockles and ark shells (3077100)* have been the most exported product from Spain (249t in 2019, worth 1,7 Million €) and Netherland (194t, 712.871€). Turkey (1.959t, 6,5 Million €), Thailand (1.969t, 3,3 Million €) and Vietnam (5.380t,11,1 Million €) primarily exported *Clams, cockles and arkshells, prepared or preserved excl. smoked (16055600).*

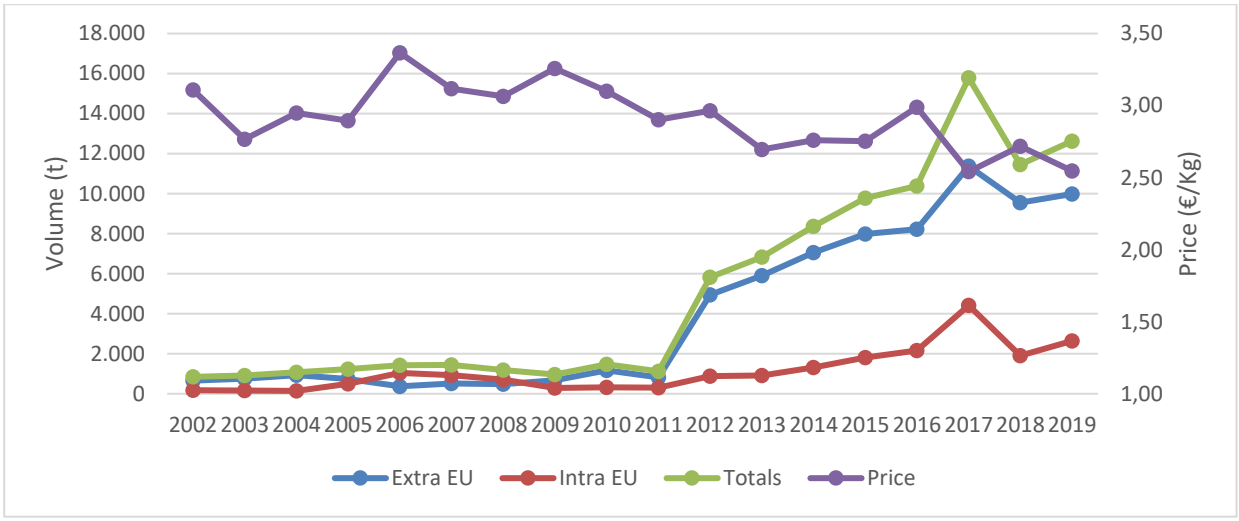


Figure 88: Italian import Volume and Price - Eumofa – Clam

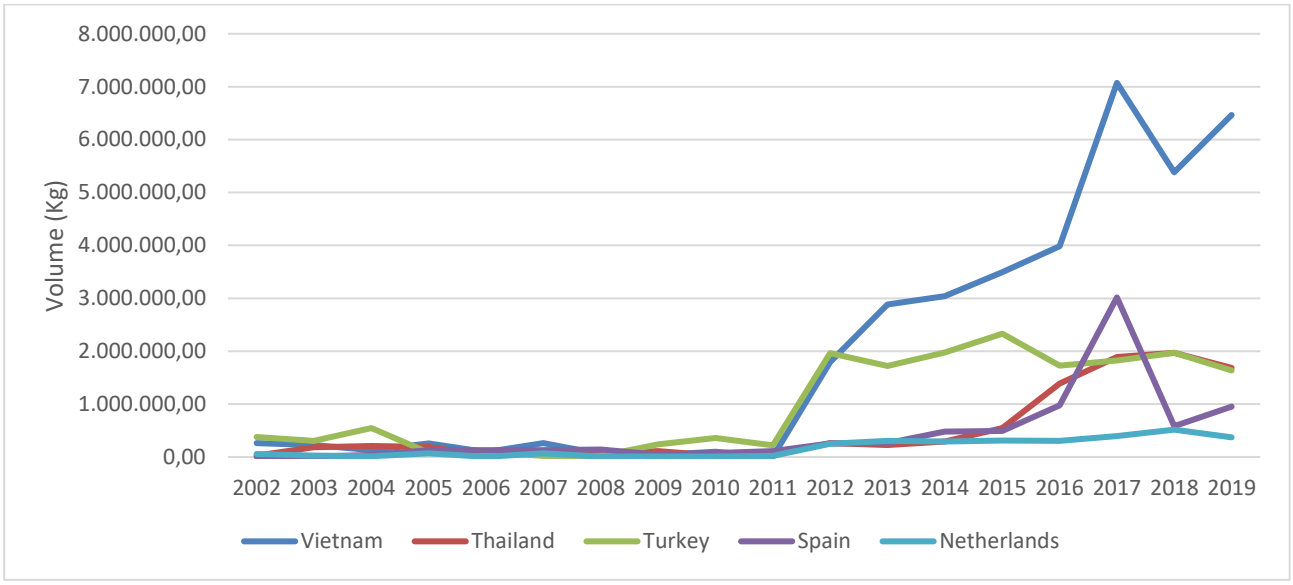


Figure 89: Five major partners by Import Volume Italy - Clam - Eumofa

IMPORT/EXPORT Croatia

The Croatian total exportation of clam, at least for the covered period 2013-2019, mostly depends from the Italian import, in fact the two charts shapes do overlap.

The general trend is divisible into two period, the first ascending (from 24.8t in 2013 to 70t in 2015) and the second descending. During 2019 Croatia exported 15,2t of clams, worth 142.700€ at 9,39€/Kg.

For the whole period price didn't went outside the 8-10€/Kg channel.

As overmentioned Italy absorbs the main part of Croatian export, in 2019 that consisted in 10,1t (95.470€ at 9,45€/kg). The other two countries where Croatia exported more than 10.000€ in 2019 have been Slovenia (23.510€, 2,1t) and Serbia (21.910€, 2,4t).

Analyzing the CN8 composition of export, it's noticeable how the only relevant product is *Live, fresh or chilled, even in shell, clams, cockles and ark shells (3077100)* which collected 246.292€ with the 2017-2018 average, corresponding to 29,3t at 6,93€/Kg. The other products' export didn't reach 5.000€ of value each.

In 2019, *17,4t of Live, fresh or chilled clams (3077100)* have been exported to Italy, for an amount of 148.688€. Slovenia imported 3,5t (35.855€) and Serbia 3,1t (29.343€).

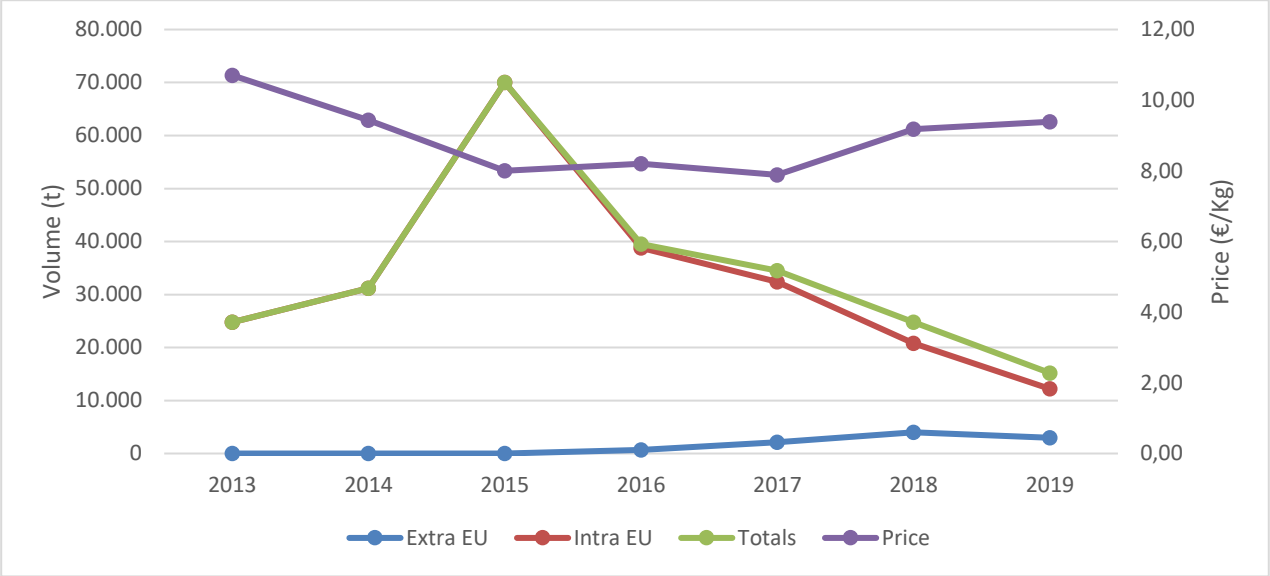


Figure 90: Export Volume and Price - Croatia - Clam – Eumofa

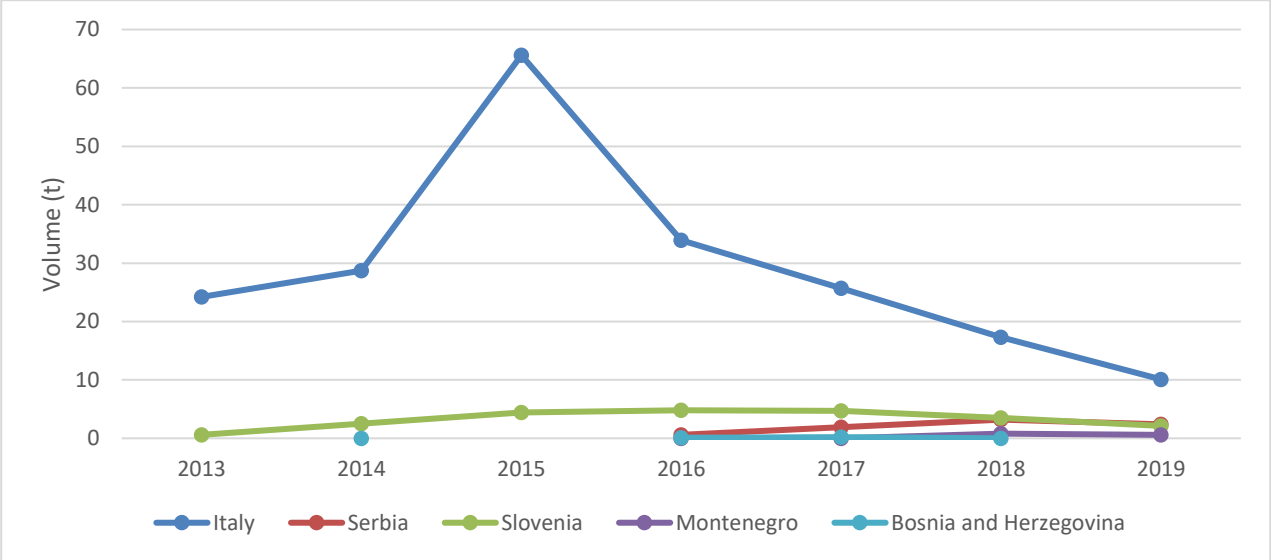


Figure 91: Five major partners by export Volume - Croatia - Clam - Eumofa

Speaking about import the trend is increasing, mostly composed by intra-eu f outside the European Union are recorded since 2013. Price is following the same direction but in a less energetic manner.

During 2019 Croatia imported 28,8t of clam, worth 143.460€ at 4,98€/Kg.

The most important partner is Italy (increasing its role from 2015), which during 2019 provided 12,2t (worth 100.800€ at 6,63€/kg). The other noteworthy countries are Portugal, who exported 8,7t (19.510€ at 2,24€/Kg), Spain (1,4t, 9.010€ at 6,44€/kg) and France (0,8t at 8,21€/kg).

Live, fresh or chilled, even in shell, clams, cockles and ark shells (3077100) is the product that has been imported for the great part (114.320€, 16,5t, 6,93€/Kg), followed by far from *Smoked, dried, salted or in brine, even in shell, clams, cockles and ark shells (3077900) that absorbed 10,2t*

(29.856€, 2,94€/Kg). Still mentionable is the *Frozen, even in shell, clams, cockles and ark shells (3077290) (10.560€, 4,3t, 2,46€/Kg).*

The most important clam product imported by Croatia in 2019 has been 03077100 for Italy (11,5t, 110.503€). For Spain was *03077290 with 1,8t (4.443€)* and for Portugal *03077900 (3,4t 10.280€).*

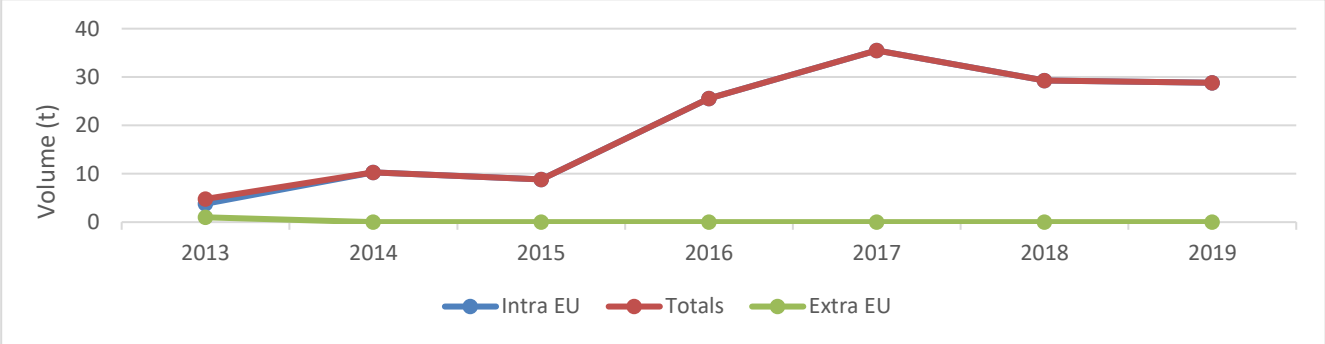


Figure 92: Import Volume Croatia - Clam - Eumofa

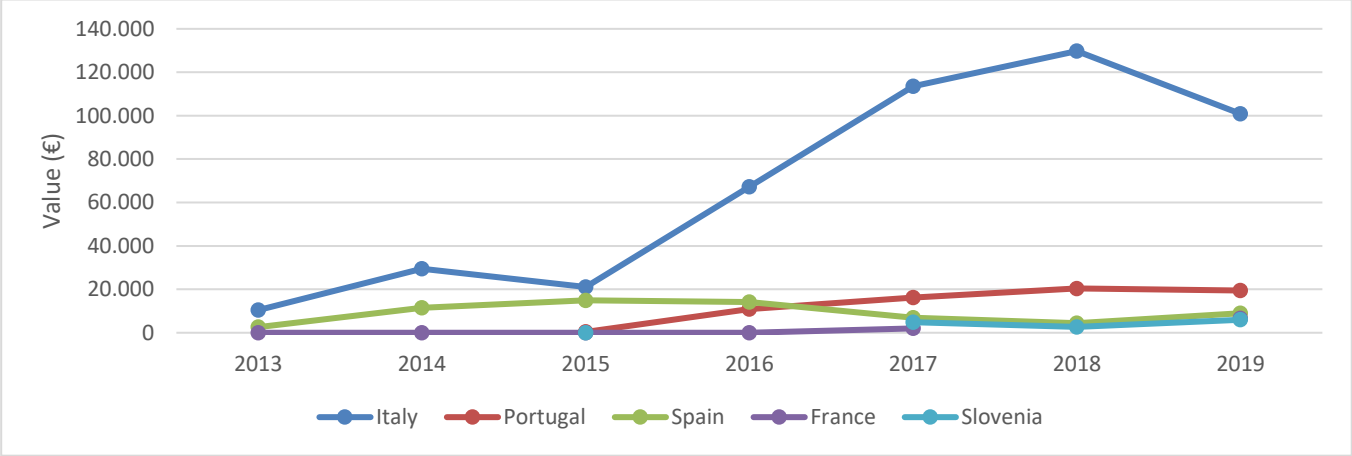


Figure 93: Five major partners by import Value - Croatia - Clam - Eumofa

WHOLESALE

The clam dataset for wholesale is less accurate then for Anchovy or other species. In fact, from the Eumofa's Weekly set no distinction between primary or secondary markets are possible, nor distinctions between the geographical location.

Data are available only for Italy and for the 2009-2019 window. In this period, averagely, Italian wholesale markets sold 55.890t of fresh clam (worth 497,8 Million € at 8,95€/Kg). The trend is descending since 2009 without any sign of recovery, while price is shyly increasing.

During 2019 Italian wholesale markets sold 39.254t, worth 354,6 Million € at 9,05€/Kg.

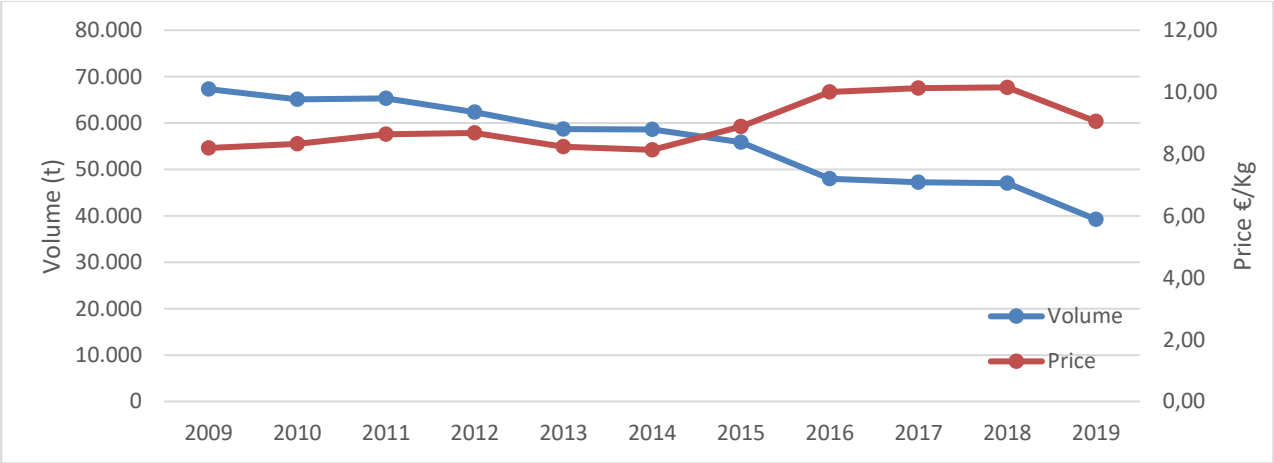


Figure 94: Clam Wholesale Volume and Price - Eumofa Weekly

CONSUMPTION

As for the other species, even for clam Eumofa's Weekly dataset refers to consumption keeping as customer base both households and retail shops.

During the available timeframe, Italy averagely consumed 55.890t of clam, for a total amount of 497,8 Million €/year at 9,31€/Kg. The data for 2019 report a consumption of 39.254t (354,7 Million € at 9,05€/Kg). The general trend is a slight decrease in value, with a stronger precipitation during 2019. Price moved in the opposite direction for the last ten years, but in 2019 recorded a strong decrease, too.

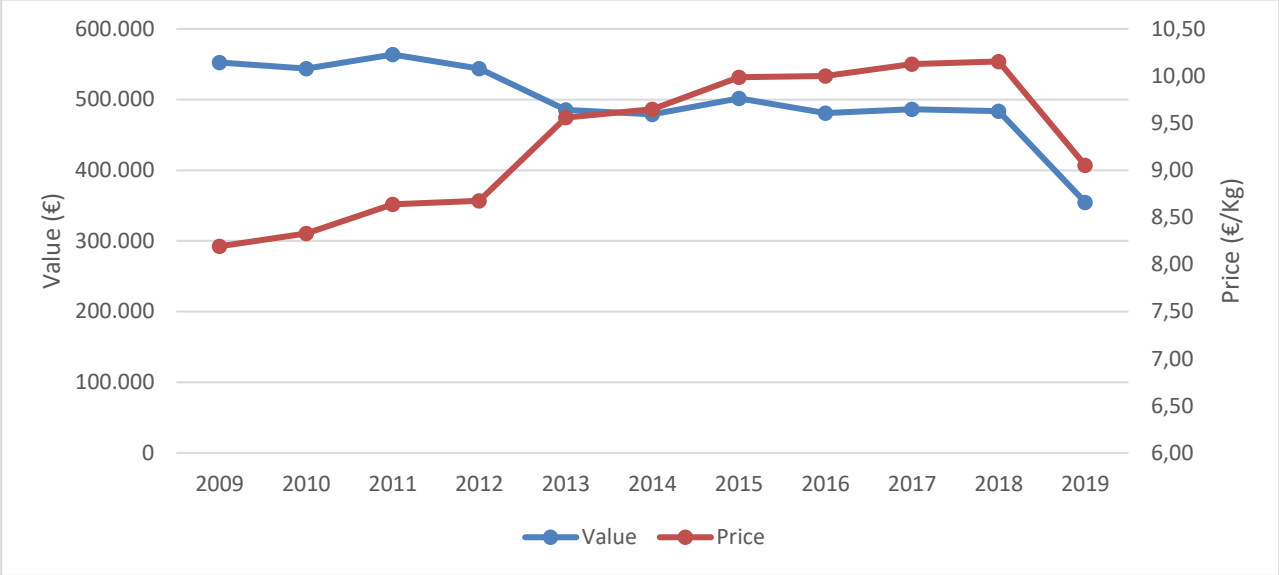


Figure 95: Clam Value and Price - Italian Consumption - Eumofa Weekly

The monthly dataset covers the same period, 2009-2019. Basing on the household sample consulted by Europanel, Eumofa elaborates that averagely Italians consumed 13.973t of clam every year, at a price of 9€/Kg. During 2019, up to September, the consumption was of 9.814t (9,04€/Kg), but the general ten years downward trend suggests that volume will stay under the average.

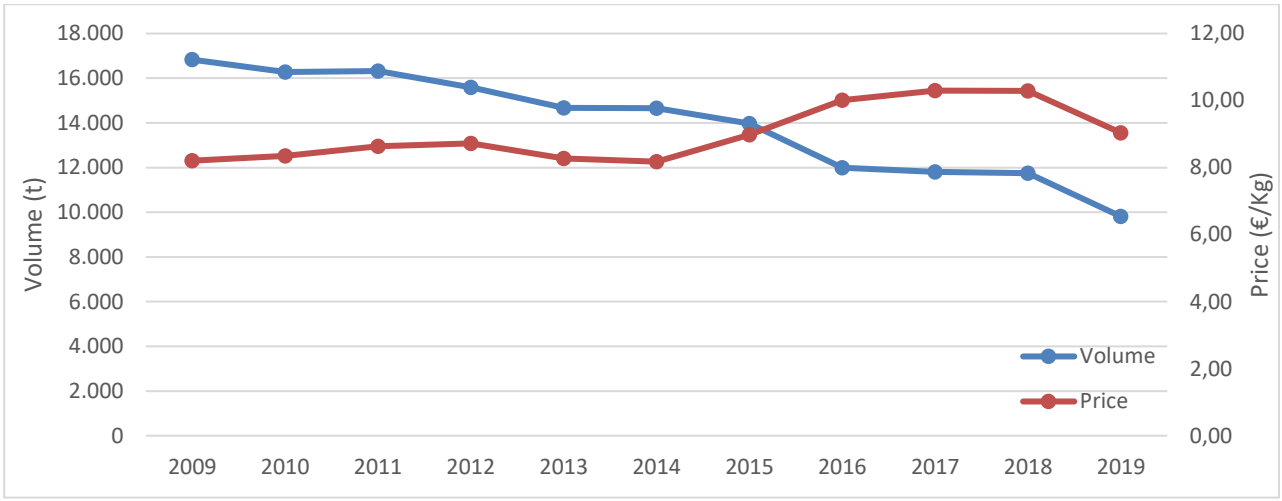


Figure 96: Clam Volume and Price - Italian Consumption - Eumofa Monthly

SUPPLY BALANCE.

Combining the data previously presented in the report, it's possible to compute an Apparent Consumption value for Italy and Croatia, both for 2017 and 2018.

From Eumofa's datasets results that in 2017 Italy consumed 18.301t of clam, whereas Croatia consumed 175,7t. The same index isn't computable for the 2018 because there are not data about production (landings) neither for Italy nor Croatia.

From Eurostat the index is determinable from both years: in 2017 Italy apparently consumed 32.136t of *Chamelea gallina* (SVE) and Croatia consumed 24,05t. The following year Italy consumed 19.969t and Croatia 22,7t.

Table 7: Supply balance computation

		Landings (t)	Import (t)	Export (t)	Apparent Consumption (t)	Pro capita consumption (Kg/Person/year)
Eumofa	Ita 17	13.682	15.783	11.164	18.302	0,3
	Cro17	175	35,5	34,5	176	0,04
Eurostat	Ita 17	11.808	33.024	12.697	32.136	0,5
	Ita 18	13.994	17.763	11.788	19.969	0,3
	Cro 17	0,07	59	35	24	0,0
	Cro 18	0,2	48,6	26	22,7	0,0

The following chart allows to confront the available estimates for Italian and Croatian clam consumption. As immediately noticeable, they greatly differ from each other.

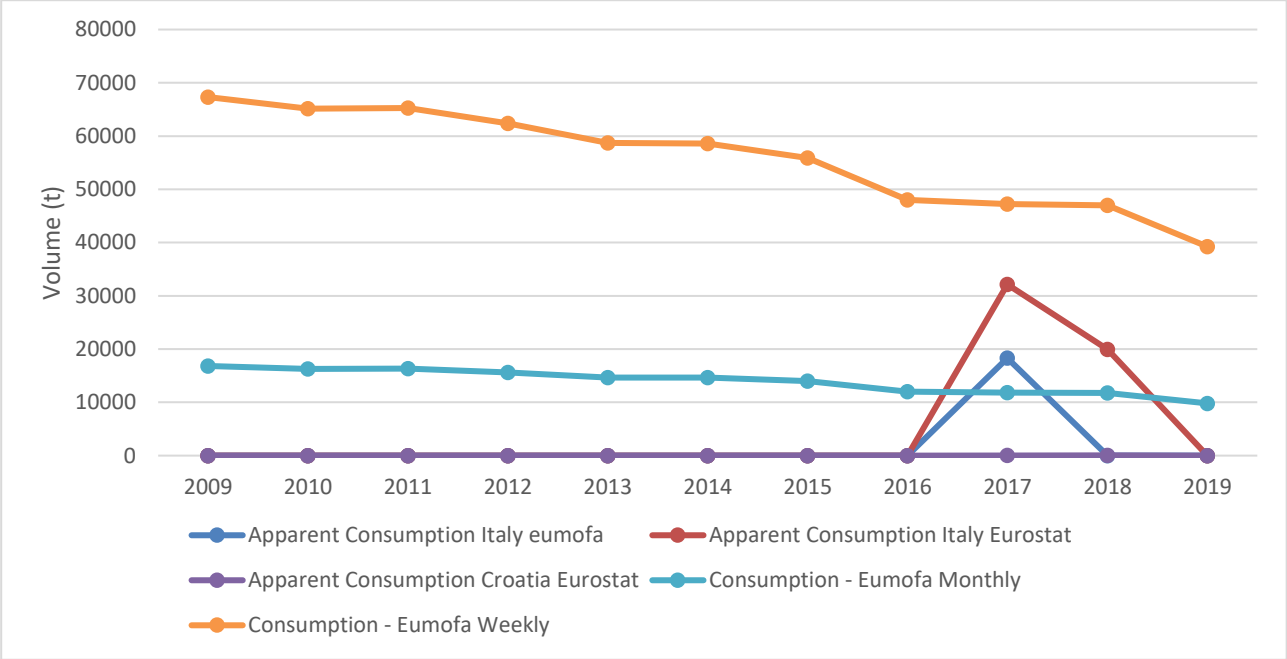


Figure 97: Consumption and Apparent Consumption - Clam

2.12 ENSIS MINOR

A supply chain analysis for Ensis minor is not possible due to the complete lack of information from Eumofa and Eurostat about this species.

2.13 MANTIS SHRIMP (MTS)

About Mantis Shrimp (MTS), whose scientific name is Squilla mantis, Eumofa reports landing information inside the main commercial species of Squillid, composed by MTS and SQY (scientific name Squillids nei.). Confronting those data with the ones provided by Eurostat for the specific MTS species, a complete adherence of volume appears, signaling that landings of squillidae (SQY) are almost not existent.

LANDINGS Ita/Cro

During the timeframe covered by Eurostat (2006-2018), the clear trend is a decrease of MTS landing in Italy. If the average data is 5.518t/year in fact, landings are constantly below that value since 2012, and in 2018 only 4.795t were fished, for a value of 33 Million € at 6,88€/Kg.
The price has never had any particular shock and moved within the 5,6-7€/Kg channel for the whole time.

Oppositely to Italy, Croatian landing of MTS are not as relevant as other species, but from 2013 the sector is increasing every year. In 2018 13,2t were fished (valued 21.931€), whereas the average is 7,13t.
The Croatian price is more much more competitive than Italian, as it's averagely valued 1,61€/Kg.

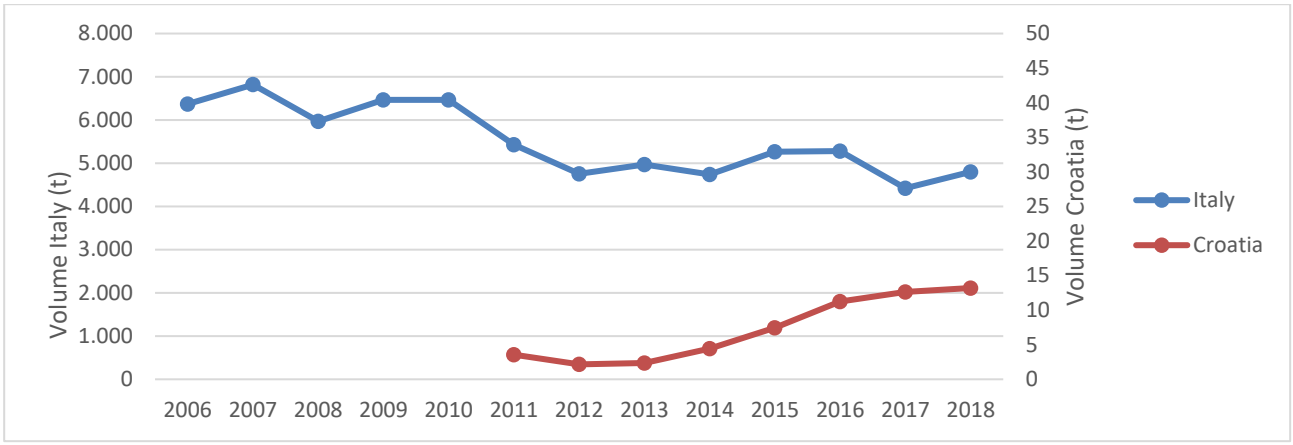


Figure 98: Landing Volume - Eurostat - Mantis Shrimp (MTS)

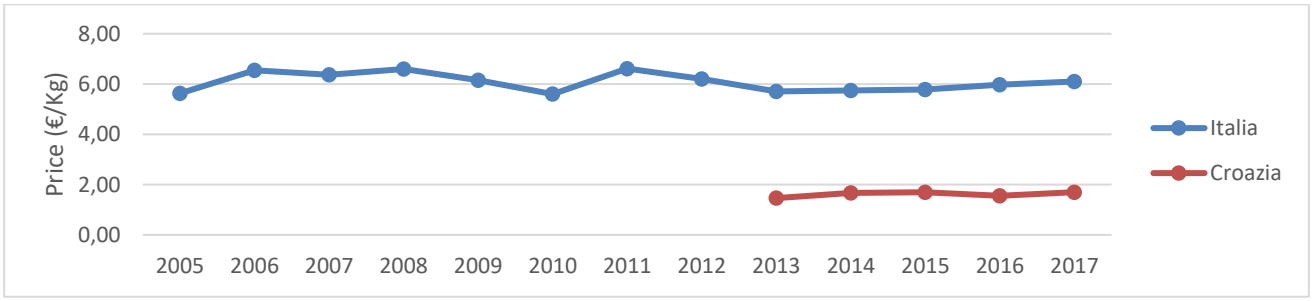


Figure 99: Landing Price (€/Kg) - Eumofa – Squillid

WHOLESALE

No Croatian data are available for this item. For Italian anchovy there are some information, mostly about prices, both for the primary markets (Cesenatico, Molfetta, San Benedetto del Tronto, Livorno, Ancona) and secondary markets (Milano, Roma).

Between primary markets Molfetta resulted averagely being the cheapest, with 3,98€/kg. A little more expensive are San Benedetto del Tronto (6,42€/Kg), Ancona (7,58€/Kg) and Livorno (8,12€/kg). Cesenatico is the most expensive as averagely Squilla Mantis costs 11,33€/Kg.

Volume data are available only for 2016 and 2017 (and not for Livorno at all) and evidence how by value Ancona and Cesenatico are very relevant (respectively 346.282€ and 425,912€ in 2017) while Molfetta (67.304€) and San Benedetto del Tronto (68.910€) collect less exchanges.

Secondary market's prices are not different from the ones from primary. Roma averagely presents 7,32€/Kg, but the general trend in the last years is slightly descending. Milano instead is reported with a price of 8,96€/Kg, but price is stuck at 9,50€/Kg since 2012.

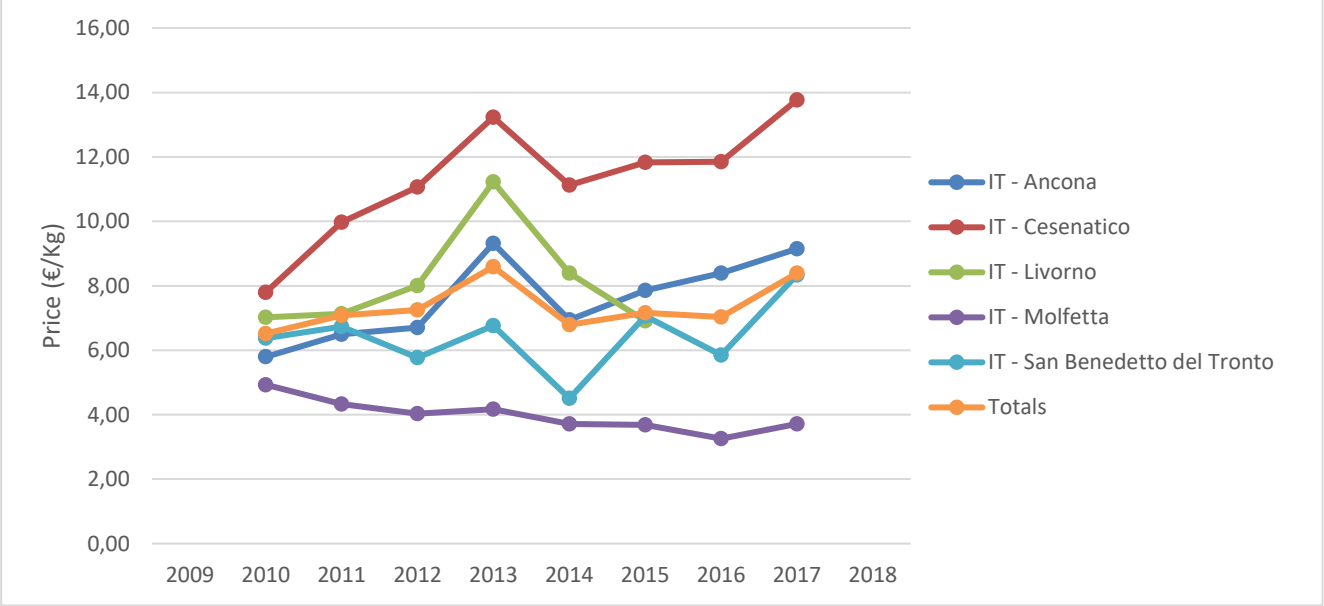


Figure 100: Spottail mantis squillid, Price at primary markets - Eumofa Weekly

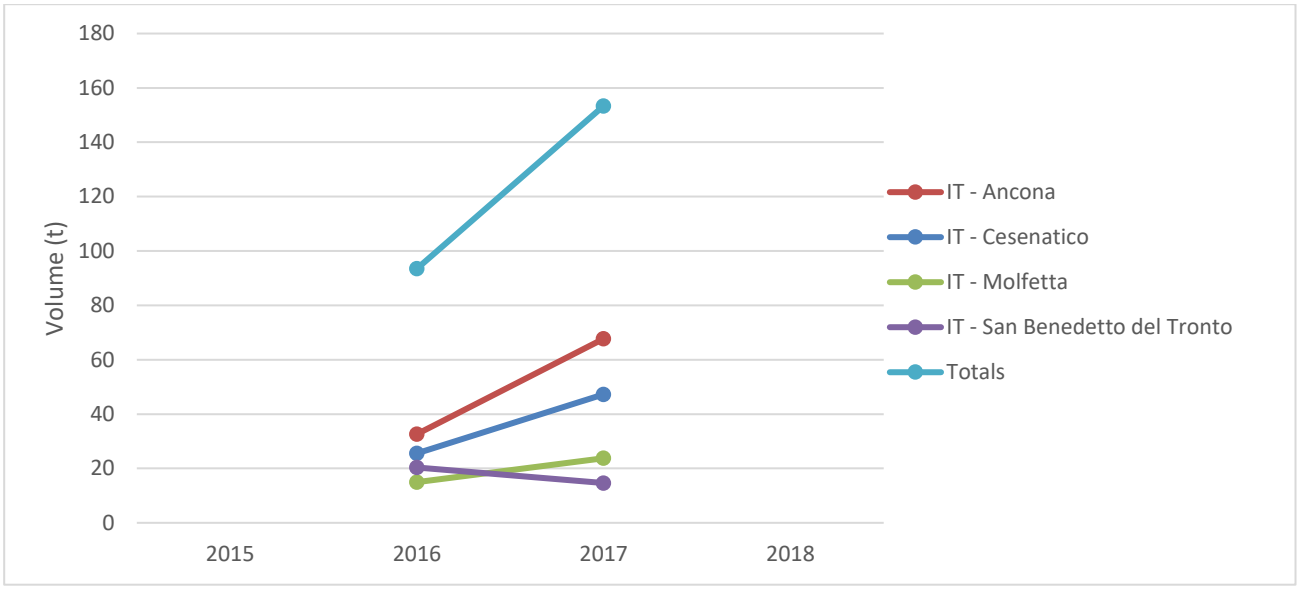


Figure 101: Spottail mantis squillid, Volume at primary markets - Eumofa weekly

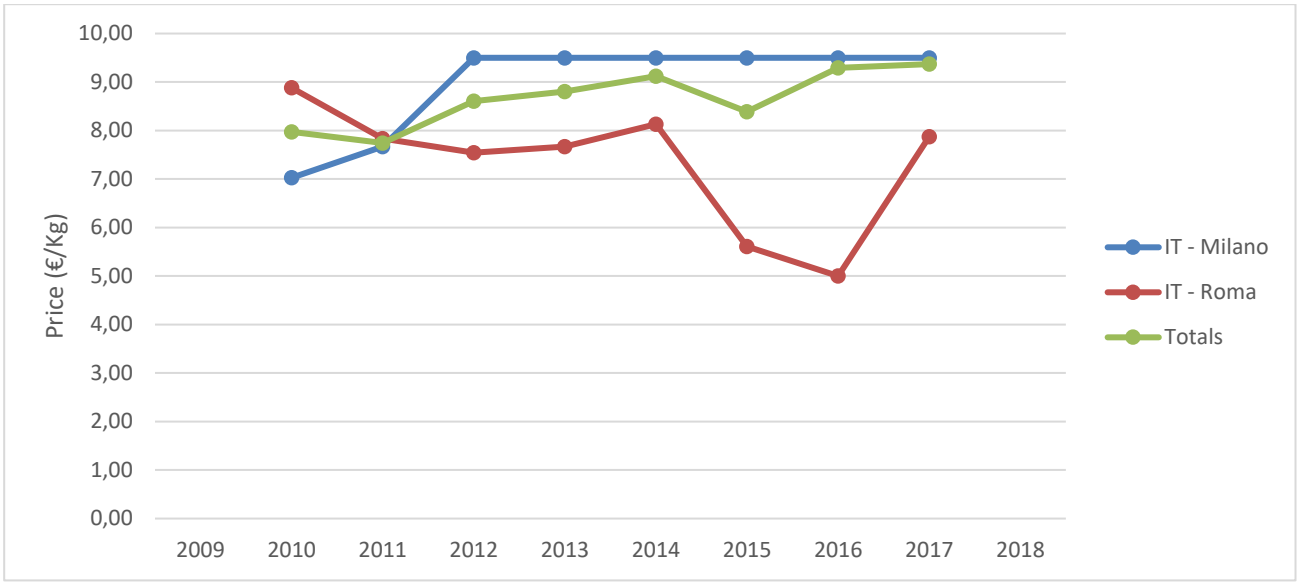


Figure 102: Spottail mantis squillid, Price at secondary markets - Eumofa weekly

3. ANALYSIS OF SECONDARY DATA: PRICE ANALYSIS

3.1 INTRODUCTION AND METADATA

This second part of the report is dedicated to exploring the price chain of the 12 selected species. Since the main source is the Eumofa Weekly set, the proxies for those species are the main commercial groups, as for the landing analysis, and no information are given for Croatia. The timeframe is 2009-2019, some periods are not covered.

Market integration will be analysed for First sale markets and Wholesale markets. Then, where possible, a price transmission analysis follows with reference at First sale, Wholesale and Consumption/Retail.

The correlation matrix is the medium to evaluate correlation between markets. This report considers as strongly correlated those markets who present a correlation index r≥0.8, as suggested by publications of the European Commission's Competition Policy Newsletter "*In general, it is hard to reconcile any correlation coefficient below 0.8 with the hypothesis that two geographic areas are in the same market*" [5].

[5] Daniel Donath, The use of pricing analysis for market definition purposes: the Arjowiggins/M-real Zanders Reflex and Arsenal/DSP mergers, Competition Policy Newsletter, Number 1-2009

3.2 ANCHOVY

First sale markets level

Regarding Anchovy Eumofa reports information for three different locations: Cesenatico (in the Emilia-Romagna region), Molfetta (Puglia) and San Benedetto del Tronto (Marche).

Correlation indexes between singles markets pairings are quite low: the highest is San Benedetto del Tronto-Molfetta with 0,302, others are not higher than 0,12.

Between those markets:

- Cesenatico is the market with the lowest average price in the available timeframe (1,19€/Kg). Despite that, it does present the highest minimum and maximum values (0,52€/Kg, 6€/Kg). The Standard Deviation is the lowest above all (0,59€/kg).
- San Benedetto del Tronto has an average price of 1,3€/Kg. The minimum value is the lowest between all (0,10€/Kg) and the maximum is 4,49€/Kg. San Benedetto has the highest Standard Deviation with 0,81€/kg
- Molfetta is averagely the most expensive market with 2,21€/kg. minimum and maximum values are 0,40€/Kg and 4€/Kg and the Standard deviation value is 0,79€/Kg.

Considering the first sale totals series, the average anchovy market presents a cost of 1,43€/Kg. It's noticeable that the maximum "total" value is 6€/Kg, recorded on 2017-week33. On that week Cesenatico was the only other market with available data, and it was on its maximum as well (6€/kg as well).

Table 8: First sale markets price stats

	Average	Standard Deviation	Min.	Max.
IT - Cesenatico	1,19	0,59	0,52	6,00
IT - Molfetta	2,21	0,79	0,40	4,00
IT - San Benedetto del Tronto	1,30	0,81	0,10	4,49
Totals	1,43	0,67	0,40	6,00

Table 9: First sale markets price correlation matrix

	IT - Cesenatico	IT - Molfetta	IT - San Benedetto del Tronto
IT - Cesenatico	1		
IT - Molfetta	0,12	1	
IT - San Benedetto del Tronto	0,11	0,30	1

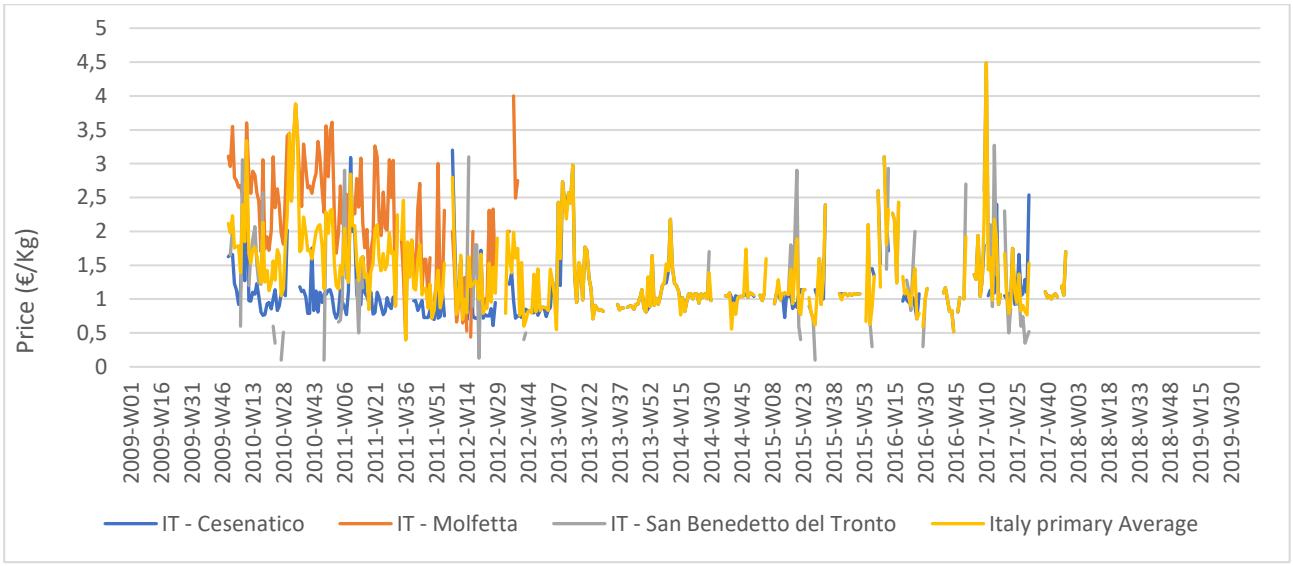


Figure 103: First sale markets price – Eumofa

Wholesale markets level

Roma and Milano are the two wholesale Anchovy markets listed on Eumofa Weekly. The Roma-Milano correlation index is quite low (0,37) signaling a possible weak positive correlation.

- Roma is more expensive on average (4,21€/kg), minimum (1,88€/Kg) and maximum (7,83€/Kg) price, but due to the higher standard deviation (1,14€/Kg Roma, 0,64€/kg Milano) on some specific periods may result cheaper than Milano.
- Milano has an average price on the reported period of 3,06€/Kg, which settle between the minimum of 1,65€/Kg and the maximum of 5,47€/Kg.

The wholesale totals series presents an average price of 3,65€/Kg.

Table 10: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	3,06	0,64	1,65	5,47
IT - Roma	4,21	1,14	1,88	7,83
Wholesale totals	3,65	0,80	1,65	6,90

Table 11: Wholesale markets price correlation matrix

	IT – Milano	IT - Roma
IT - Milano	1	
IT - Roma	0,367597	1

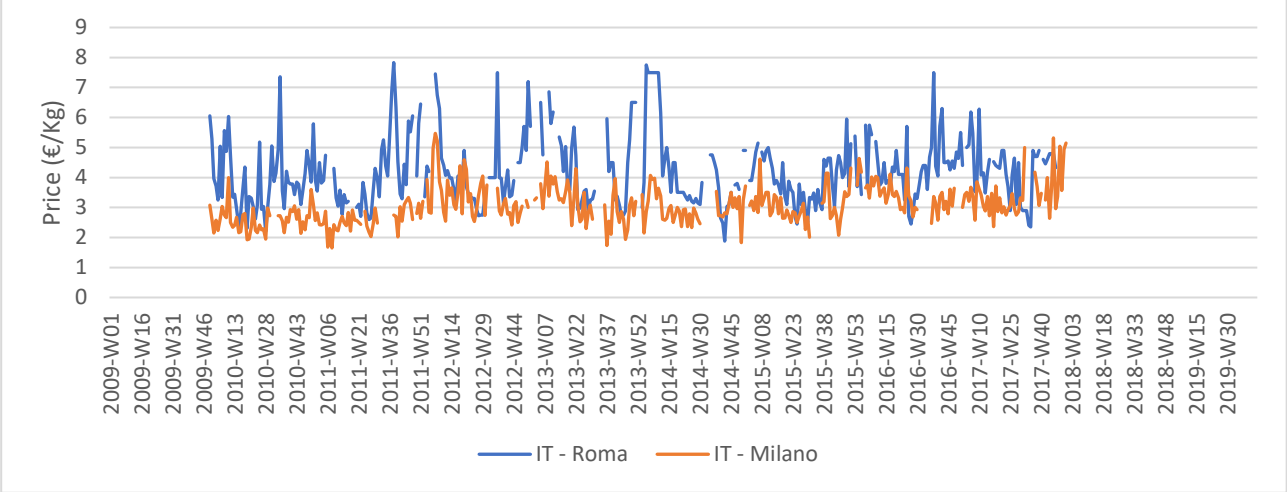


Figure 104: Wholesale markets price - Eumofa

Price transmission analysis

From a vertical price analysis of the Weekly dataset it's possible to compare the different phases of the distribution.

It has to be noticed that the standard deviation of Consumption/Retail is the lowest one, signaling greater price stability for consumers than for producers and wholesalers.
In the first step of the supply chain 2,22€/kg are added to the first sale price. The first sale price is just the 39% of the wholesale average price.

During the second step, from wholesalers to consumers/retailers, 2,11€/Kg are added. Wholesale average price explains the 63% of the retail/consumer price.

The correlation matrix for the three steps of the price chain does report low correlation indexes. The most correlated phase is Wholesale as presents r (Firstsale-Wholesale) =0,17 and r (Wholesale-consumption) =0,15. Anyway this value is not enough to suppose any kind correlation.

Table 12: First sale, wholesale and consumption/retail price stats

	Average	Standard deviation	Min	Max
Consumption/Retail	5,76	0,42	4,96	7,28
First sale average	1,43	0,67	0,40	6,00
Wholesale average	3,65	0,80	1,65	6,90

Table 13: First sale, wholesale and consumption/retail price correlation matrix

	Consumption/Retail	First sale average	Wholesale average
Consumption/Retai l	1		
First sale average	0,10	1	
Wholesale average	0,15	0,17	1

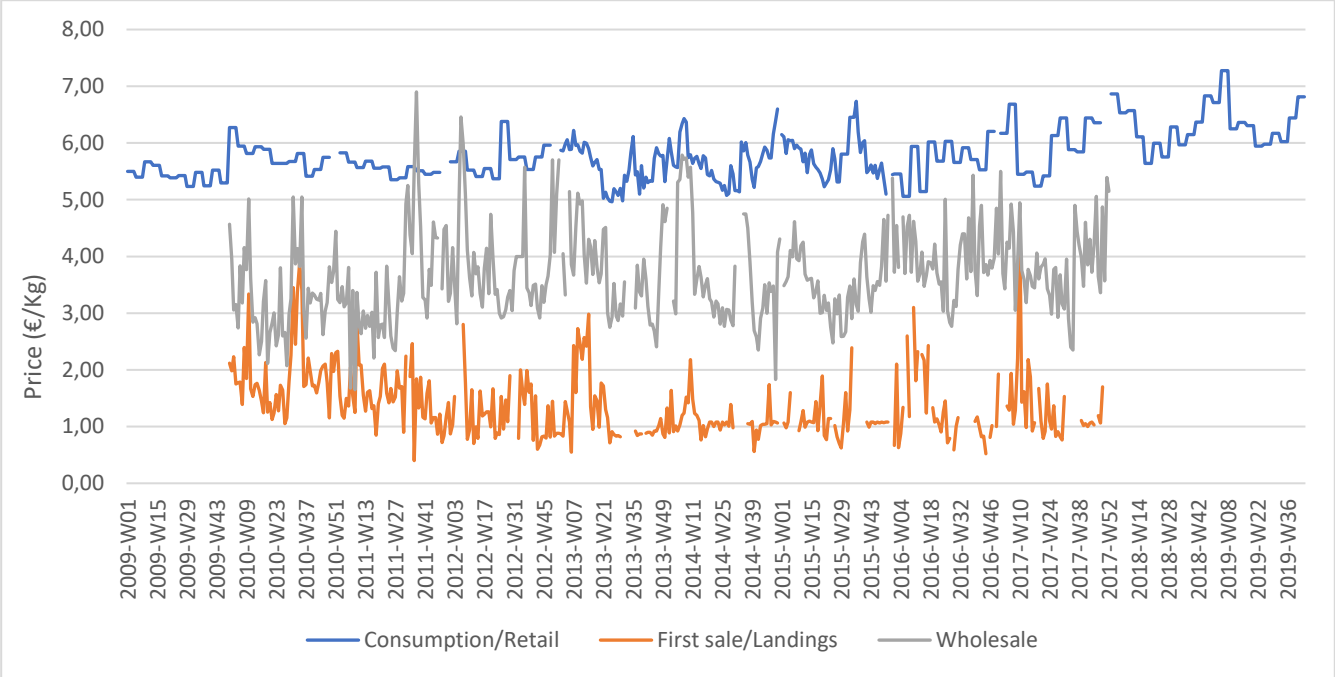


Figure 105: First sale, wholesale and consumption/retail average price - Eumofa

3.3 CUTTLEFISH

First sale markets level

For Cuttlefish five primary markets are available at Eumofa's Weekly dataset: Ancona, Cesenatico, Molfetta, San Benedetto del Tronto and Livorno. The last one is not going to be singularly analyzed in this report because Livorno is situated on the Thyrrhenian Sea, but the first sale total series does consider this harbor in its calculation.

Between those, Ancona-Cesenatico and Ancona-San Benedetto del Tronto resulted to be the markets pairings more correlated, with coefficients respectively of 0,67 and 0,65 (enough to both be considered moderately positively correlated). The correlation index for Cesenatico-San Benedetto del Tronto is 0,5 (weak positive correlation). Other pairings are ≤0,27.

Analyzing the single markets:

- Ancona is the one with the lowest average price (8,60€/Kg). The minimum price is 4,36€/Kg and the maximum (lowest between all cuttlefish first sales) is 14,63€/kg. The standard deviation is 1,93€/kg.
- At Cesenatico, the average price is 8,61€/Kg, minimum is 4,21€/kg and maximum 15,90€/kg. This market presents the highest standard deviation (2,17€/kg).
- Molfetta's market has the highest average price (9,71€/kg), but also the lowest minimum (3,66€/kg) and the highest maximum (19,62€/kg). Despite this variability, standard deviation is not different from others, with 1,89€/Kg.
- San Benedetto del Tronto's average price is 9,57€/Kg. Minimum (6,17€/kg), maximum (16,90€/kg) and standard price deviation (1,98€/Kg) don't signal anything particularly interesting.

It's important to note that the historical series for Cuttlefish's first sale and wholesale is not simply an arithmetic average between the mentioned markets, probably due to the presence of singularly unrecorded markets. That's the reason why the average value for this series is higher than single markets.

Table 14: First sale markets price stats

	Average	Standard Deviation	Min	Max
IT - Ancona	8,60	1,93	4,36	14,63
IT - Cesenatico	8,61	2,17	4,21	15,90
IT - Molfetta	9,71	1,89	3,66	19,62
IT - San Benedetto del Tronto	9,57	1,98	6,17	16,90
First sale total	9,70	1,82	5,00	17,59

Table 15: First sale markets price correlation matrix

	IT - Ancona	IT - Cesenatico	IT - Molfetta	IT - San Benedetto del Tronto
IT - Ancona	1			
IT - Cesenatico	0,674882	1		
IT - Molfetta	0,185299	0,271956	1	

IT - San Benedetto del Tronto

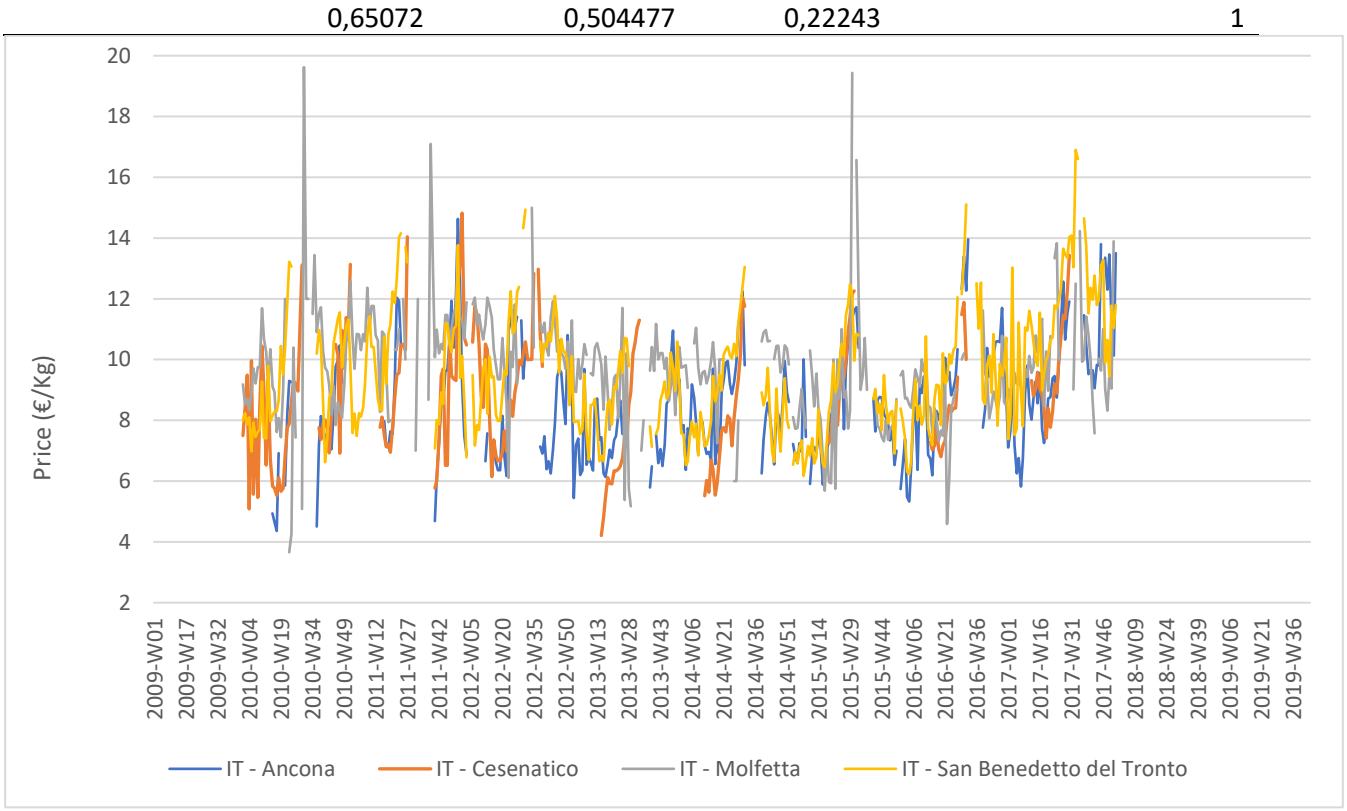


Figure 106: First sale markets price - Eumofa

Wholesale markets level

At wholesale level, Milano and Roma are very weakly positively correlated, with an r index of 0,37.

- Milano is generally the cheapest wholesale market. It presents the lowest average (7,92€/kg), minimum (3,5€/Kg) and maximum (13,25€/Kg) price, but its standard deviation is higher (1,81€/kg) than Rome.
- Rome's average price is 9,66€/Kg, minimum 6€/Kg and maximum 16€/kg. Standard deviation is 1,61€/Kg.

Table 16: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	7,92	1,81	3,50	13,25
IT - Roma	9,66	1,61	6,00	16,00
Wholesale totals	9,09	1,54	6,10	14,50

Table 17: Wholesale markets price correlation Matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	0,371616	1

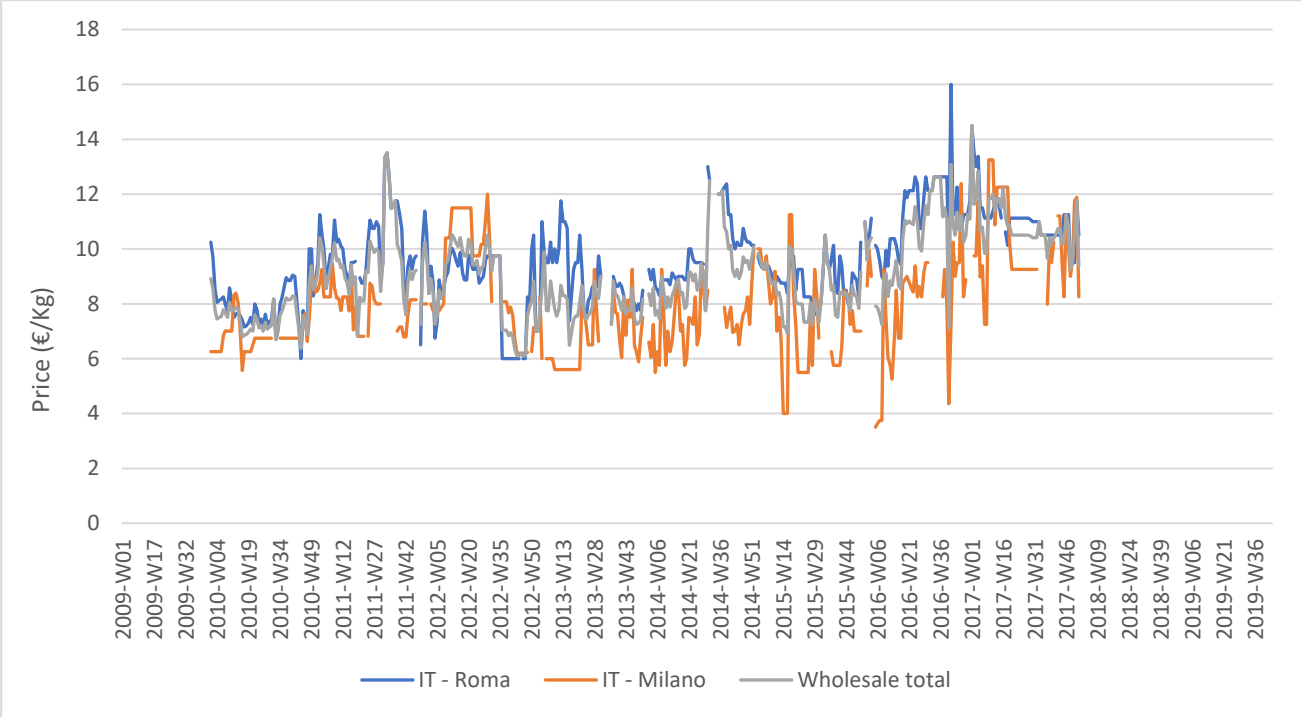


Figure 107: Wholesale markets price - Eumofa

Price transmission analysis

The vertical analysis shows that the cuttlefish supply chain has a peculiar behavior: first sale total average price is higher than wholesale's price.

From wholesale to consumption/retail, price only grows of 0,95€/Kg. Wholesale price does explain the 90% of the consumption price.

The correlation matrix returns a very slight positive relation between first sale and wholesale (r= 0,4). Other indexes are low (0,1 and -0,1).

Table 18: First sale, wholesale and consumption/retail price stats

	Average	Standard deviation	Min	Max
Consumption/Retail	10,04	0,66	8,46	13,49
First sale average	9,70	1,82	5,00	17,59
Wholesale average	9,09	1,54	6,10	14,50

Table 19: First sale, wholesale and consumption/retail correlation matrix

	Consumption/retail	First sale totals	Wholesale totals
Consumption/retail	1		
First sale totals	-0,11	1	
Wholesale totals	0,10	0,40	1

3.4 DEEP WATER ROSE SHRIMP

For Deep Water Rose Shrimp, Eumofa's Weekly only reports information regarding first sale markets. No further investigations are thereby possible for the price chain.

First sale markets level

The markets with data at disposal are Molfetta and San Benedetto del Tronto.

- Molfetta is the cheapest between those, with an average price of 5,72€/Kg. The minimum price (2,45 €/Kg) is a bit higher than San Benedetto's while the maximum price (10,71 €/Kg) is nearly half of the San Benedetto's. Standard deviation is 1,92 €/Kg.
- San Benedetto del Tronto has an average price of 7,25€/Kg and a standard deviation of 3,37€/Kg. Minimum and maximum price are very far from each other, as minimum is 1,98€/kg and maximum 19,22€/kg.

The correlation matrix for Molfetta and San Benedetto del Tronto returns an r index of 0,48, enough to suppose a slight positive correlation.

Table 20: First sale markets price stats

	Average	Standard Deviation	Min	Max
IT - Molfetta	5,72	1,92	2,45	10,71
IT - San Benedetto del Tronto	7,25	3,37	1,98	19,22
Totals	6,55	2,45	1,98	14,90

Table 21: First sale markets price correlation matrix

	IT - Molfetta	IT - San Benedetto del Tronto
IT - Molfetta	1	
IT - San Benedetto del Tronto	0,48	1

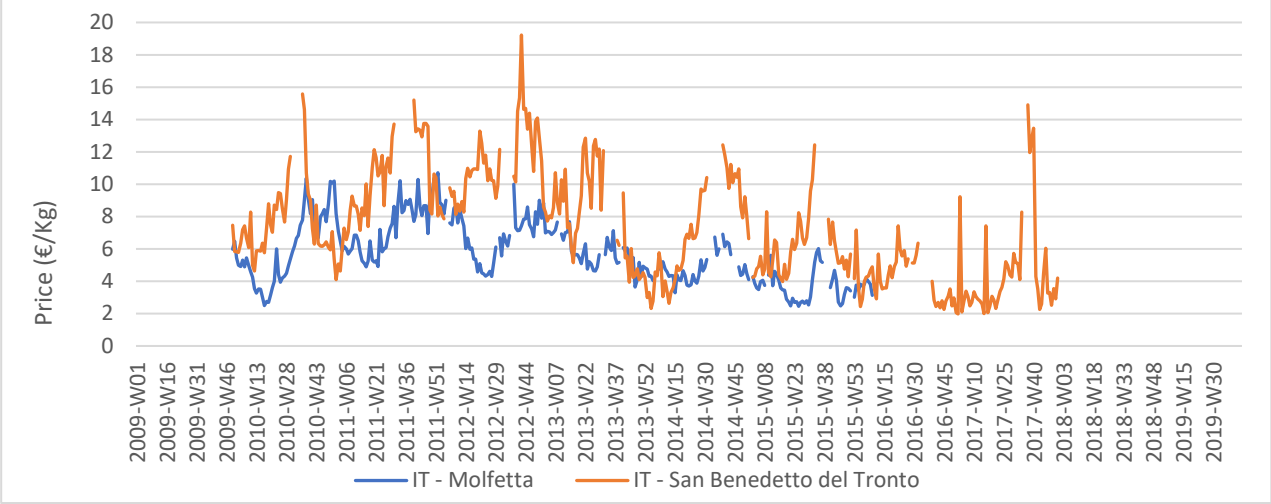


Figure 108: First sale markets price - Eumofa

3.5 SARDINE

First sale markets level

Eumofa reports four different first sale markets of anchovies.

- It's assertable that the cheapest market is Molfetta. In fact, it presents the lowest average value (0,88€/Kg), the lowest standard deviation (0,41€/Kg). Moreover minimum (0,12€/kg) and maximum (3€/Kg) values are the seconds lowest between all.
- Ancona is another cheap market, with an average price of 0,99€/Kg, a minimum of 0,30€/Kg and a maximum of 4€/Kg. the standard deviation is 0,5€/kg.
- Cesenatico moves between 0,4€/Kg and 2,93€/Kg with as average value 1,15€/Kg and standard deviation 0,53€/Kg.
- San Benedetto del Tronto is the most unstable market. It presents a standard deviation of 1,1€/Kg, a minimum price of 0,5€/Kg and a maximum price of 5,86€/Kg. Averagely is the most expensive (1,24€/Kg).

The correlation matrix doesn't return any strong correlation. The highest r-value is 0,35 between Cesenatico and Molfetta. San Benedetto del Tronto-Molfetta follows with r=0,31, others are below 0,28.

Table 22: First sale markets price stats

	Average	Standard Deviation	Min	Max
IT - Ancona	0,99	0,50	0,30	4,00
IT - Cesenatico	1,15	0,53	0,40	2,93
IT - Molfetta	0,88	0,41	0,12	3,00
IT - San Benedetto del Tronto	1,24	1,11	0,05	5,86

Totals	1,02	0,45	0,14	3,00

Table 23: First sale markets price correlation matrix

	IT - Ancona	IT - Cesenatico	IT - Molfetta	IT - San Benedetto del Tronto
IT - Ancona	1			
IT - Cesenatico	0,28	1		
IT - Molfetta	-0,00	0,35	1	
IT - San Benedetto del Tronto	0,04	0,23	0,31	1

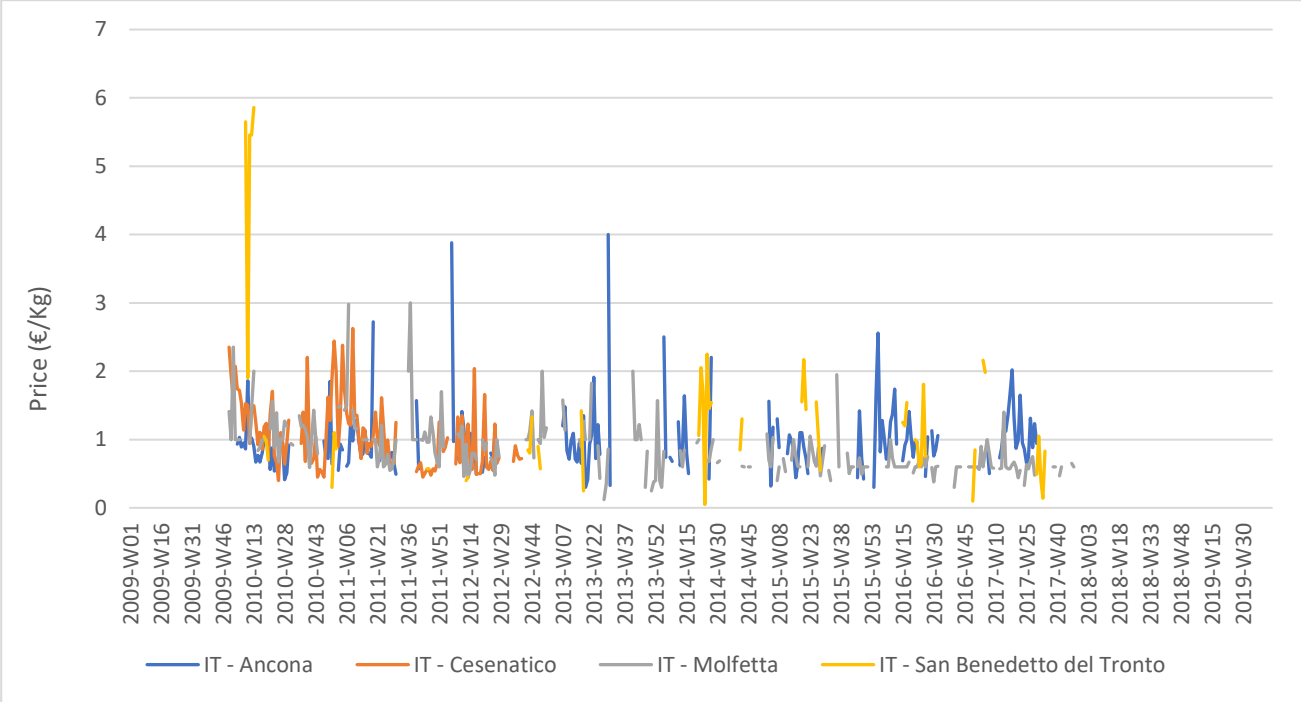


Figure 109: First sale markets price - Eumofa

Wholesale markets level

At wholesale level is not possible to clearly define a cheaper market.

- Milano has an average price of 1,93€/kg but its standard deviation is far lower, defining a more stable market than Roma. Minimum (1,29€/Kg) and maximum (4,65€/Kg) prices are the highest.
- Roma's average price is 1,79€/Kg, minimum is 0,6€/Kg and maximum is 4,5€/Kg. Its standard deviation is 0,64€/Kg.

Averagely at wholesale markets sardines cost 1,88€/kg, with a standard deviation of 0,43€/kg.

Milano and Roma have a very low correlation index (0,11), so no considerations are possible for this sector.

Table 24: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	1,93	0,38	1,29	4,65
IT - Roma	1,79	0,64	0,60	4,50
Totals	1,88	0,43	1,03	4,65

Table 25: Wholesale markets price correlation matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	0,11	1

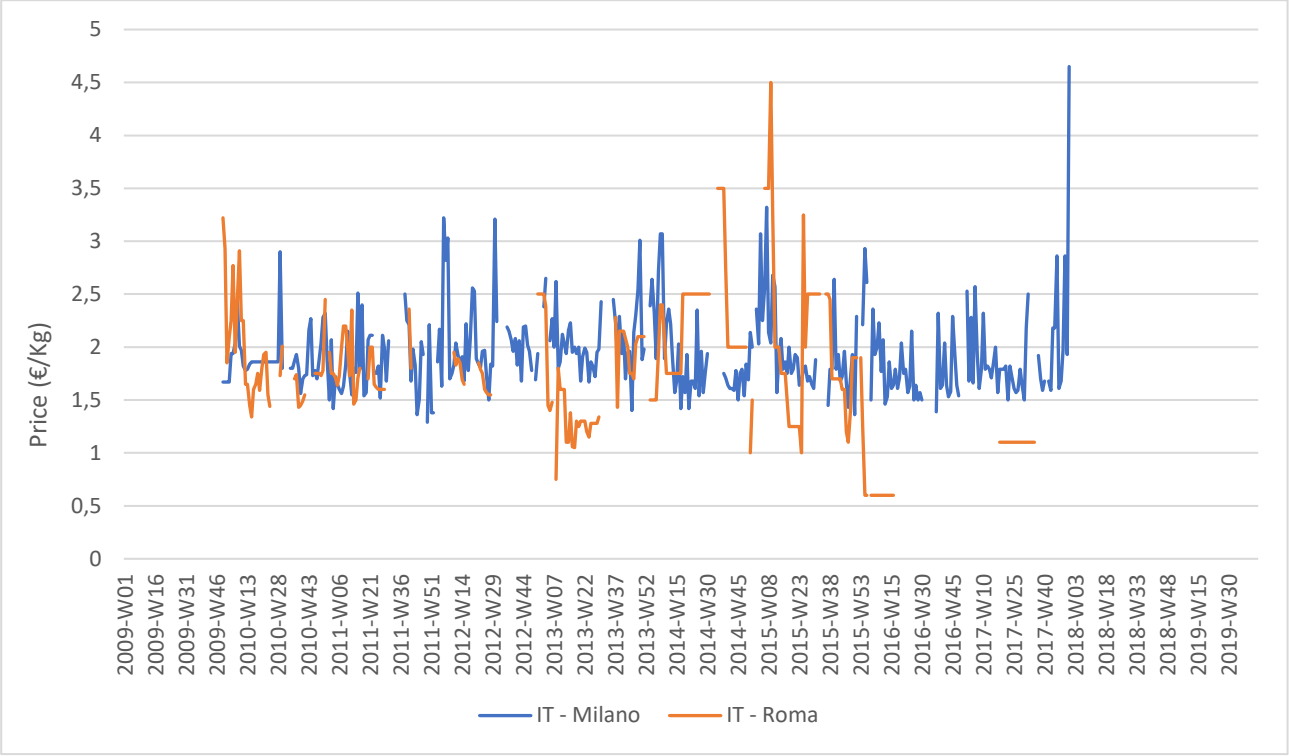


Figure 110: Wholesale markets price - Eumofa

Price transmission analysis

Unfortunately, no Consumption/retail data are available for Sardine on Eumofa's Weekly, thereby the price transmission analysis is focused on first sale – wholesale.

Those two series have an almost identical standard deviation (0,45 €/Kg on first sale, 0,43 €/Kg for wholesale). Passing from the first to the second step of the chain 0,86€/Kg are added. First sale market price averagely represents the 54% of the wholesale price.

The correlation index between the two averages is very low, as r=0,11.

Table 26: First sale and wholesale markets price stats

	Average	Standard Deviation	Min	Max
First sale markets Totals	1,02	0,45	0,14	3,00
Wholesale markets Totals	1,88	0,43	1,03	4,65

Table 27: First sale and wholesale price correlation matrix

	First sale markets Totals	Wholesale markets Totals
First sale markets Totals	1	
Wholesale markets Totals	0,11	1

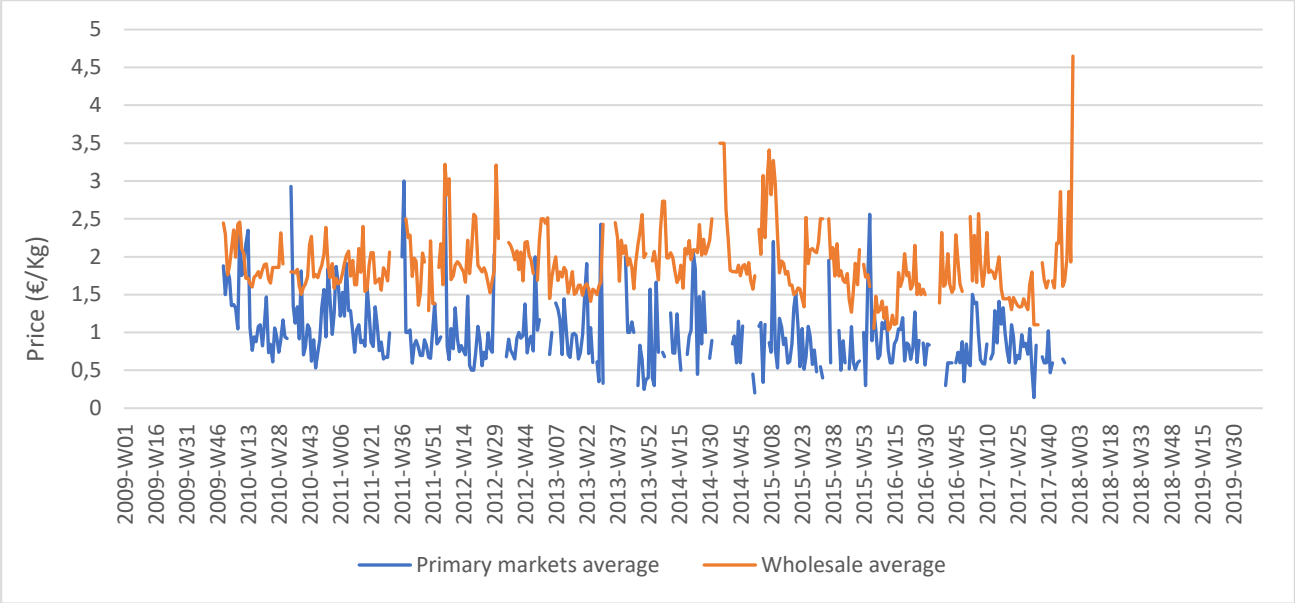


Figure 111: First sale and wholesale price - Eumofa

3.6 MUSKY OCTOPUS

As already mentioned, Eumofa aggregates Musky octopus into the more inclusive main commercial species of Octopus, so this paragraph will refer to its dataset.

First sale markets level

At first sale stage four markets list Octopus. Livorno has not been included as it is situated on the Thyrrhenian Sea. The totals average series includes this location.

- Molfetta is generally the cheapest first sale market. It presents the lowest values of average price (5,18€/kg), minimum (1,64€/Kg) and maximum (9,21€/Kg). Contrarily to this trend, standard deviation for this series is lightly higher than other markets, as it is 1,57€/Kg.
- Ancona has an average price of 6,57€/kg. This series moves between 4,34€/Kg and 11,35€/Kg. Its standard deviation is 1,24€/kg.
- San Benedetto del Tronto's average price is 6,5€/Kg. The minimum is 3,58€/Kg and the maximum 14,47€/Kg.

The most noticeable correlation that emerges from the correlation matrix is the one between Ancona and San Benedetto del Tronto, with an r index of 0,66. The other r-values are far below and not relevant.

Table 28: First sale markets price stats

	Average	Standard Deviation	Min	Max
IT - Ancona	6,57	1,24	4,34	11,35
IT - Molfetta	5,18	1,57	1,64	9,21
IT - San Benedetto del Tronto	6,50	1,47	3,58	14,47

Totals	6,10	1,13	3,69	11,68

Table 29: First sale markets price correlation matrix

	IT - Ancona	IT - Molfetta	IT - San Benedetto del Tronto
IT - Ancona	1		
IT - Molfetta	0,34	1	
IT - San Benedetto del Tronto	0,66	0,31	1

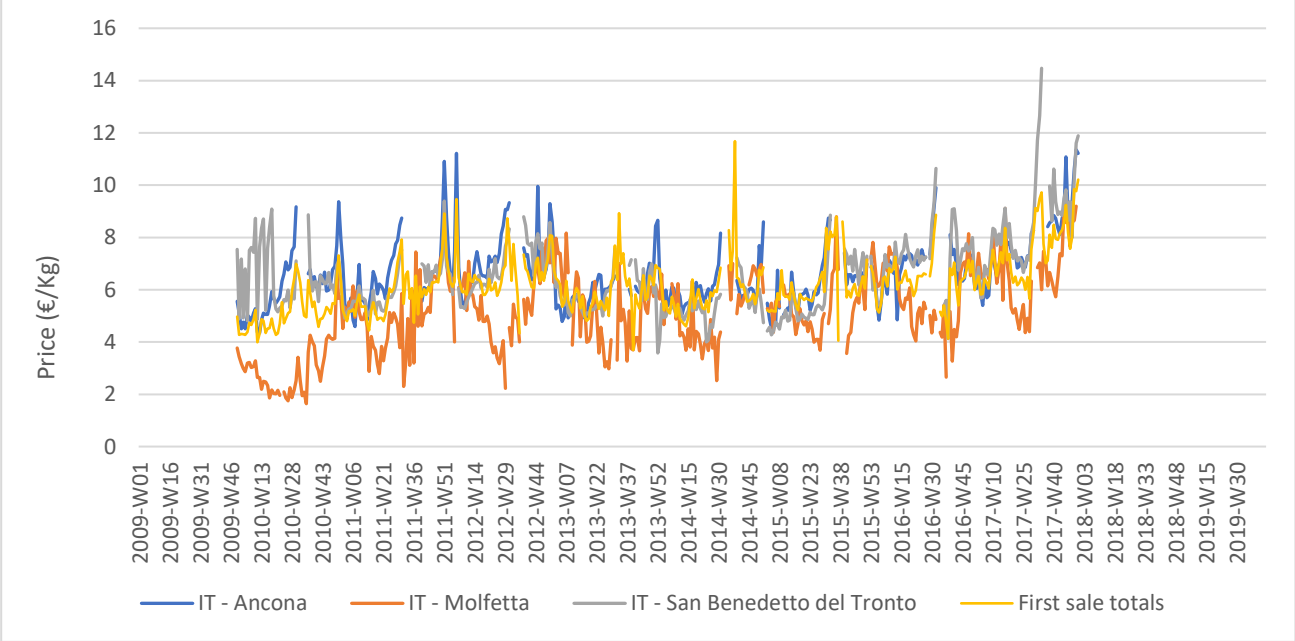


Figure 112: First markets price

Wholesale markets level

Between Roma and Milano there isn't a real price dominance. As clearly emerges from the graph, from period to period one is cheaper than the other.

- Milano's average price is 8,72€/kg. Minimum is 5,65€/kg and maximum is 12,59€/kg. Its standard deviation is 1,61€/kg.
- Roma's price presents a higher variability, as its standard deviation is 2,17€/Kg. The average price (8,75€/Kg) differs from Milano's for only 0,03€/Kg. The series moves between 5,21€/kg and 17,75€/Kg.

Between the two markets elapses a negative low correlation index (r= -0,23).

Table 30: Wholesale markets price stats

	Total	Standard Deviation	Min	Max
IT - Milano	8,72	1,61	5,65	12,59
IT - Roma	8,75	2,17	4,1	17,75
Totals	8,73	1,52	5,21	17,75

Table 31: Wholesale markets price correlation matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	-0,23	1

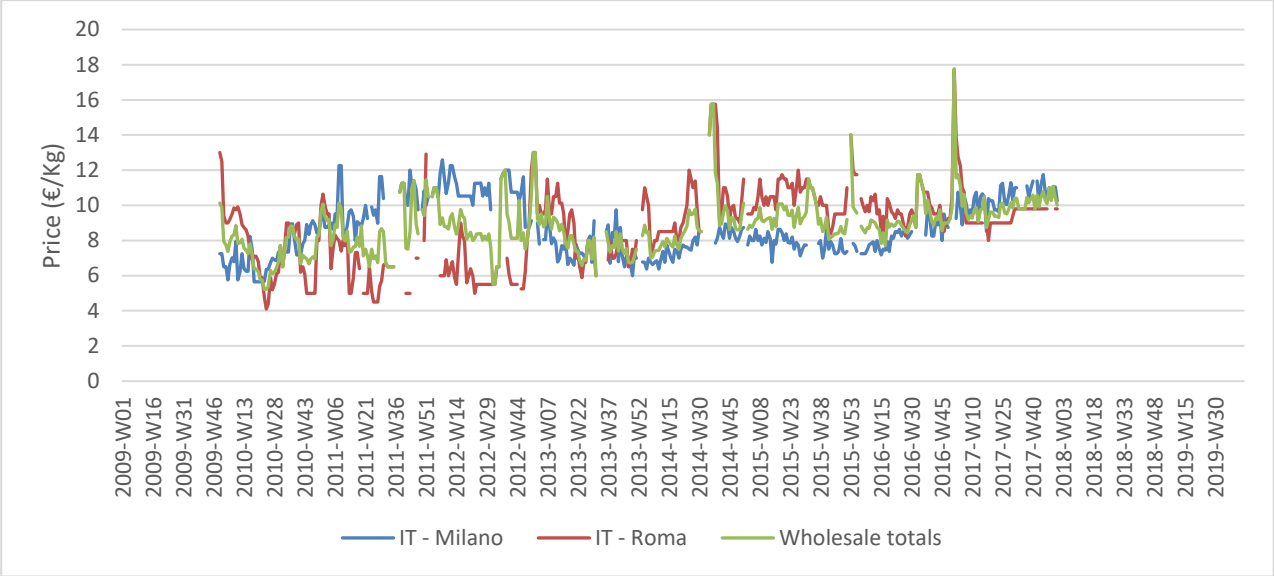


Figure 113: Wholesale markets price - Eumofa

Price transmission analysis

Analyzing the three steps of the price chain, for octopus the most stable market appears to be First sale, with a standard deviation of 1,13€/Kg.

Between first sale and wholesale 2,63€/Kg are added to the price. First sale price represents therefore the 70% of the second stage's price.

From wholesale to consumption/retail price increases of 5,45€/Kg.

The only light r-value is the one related to the first sale/wholesale (r=0,41). Others are not relevant as they settle below 0,25.

Table 32: First sale, Wholesale and Consumption/Retail markets stats

	Average	Standard Deviation	Min	Max
Consumption/Retail	11,55	1,51	8,86	16,36
First sale Totals	6,10	1,13	3,69	11,68
Wholesale totals	8,73	1,53	5,21	17,75

Table 33: First sale, Wholesale and Consumption/Retail correlation matrix

	Consumption/Retail	First sale totals	Wholesale totals
Consumption/Retail	1		
First sale totals	0,17	1	
Wholesale totals	0,25	0,41	1

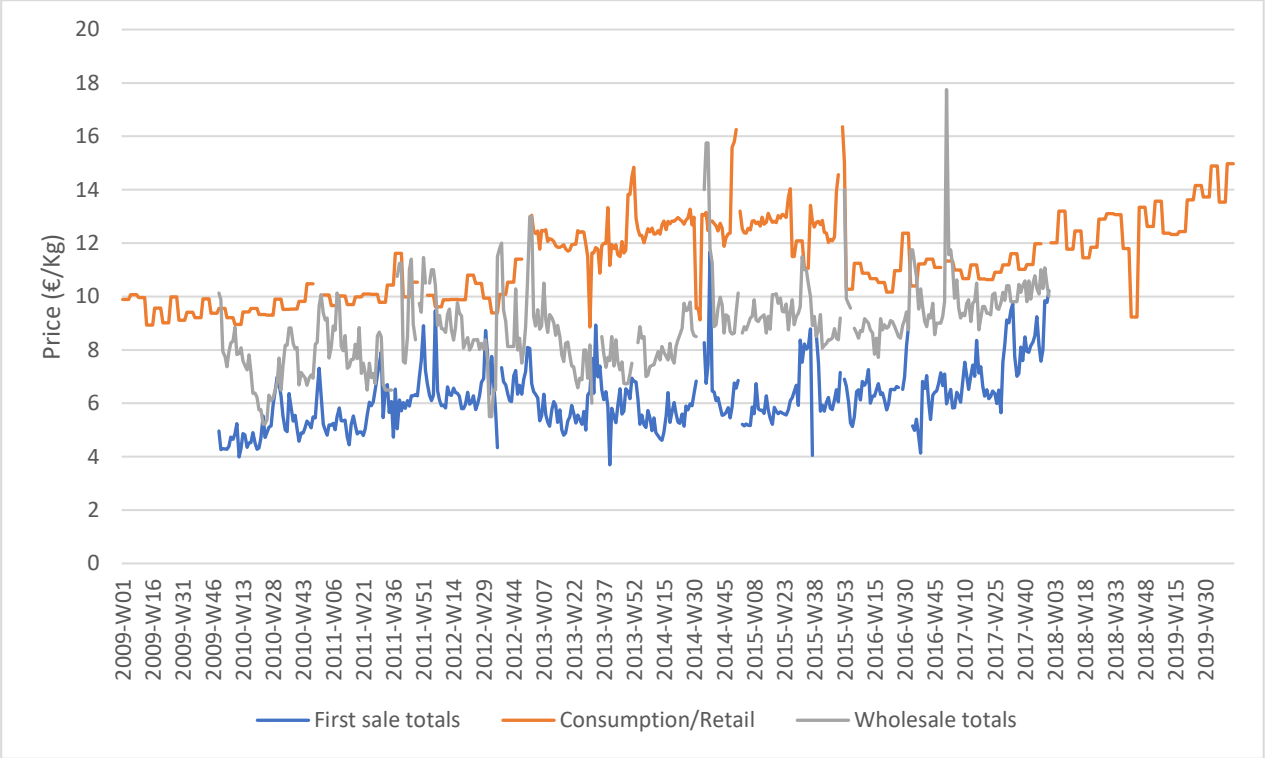


Figure 114: First sale, wholesale and consumption/retail price - Eumofa

3.7 QUEEN SCALLOP

As already mentioned, Eumofa inserted Queen scallop into the main commercial species of Scallops. The only supply chain stage recorded is the wholesale. Following results thereby are to be considered referred to the whole scallop fishing industry.

Wholesale markets level

Both the wholesale markets look quietly "artificial" due to their behaviors:

- Milano's price is stuck at 9,68€/kg since 2010-week 29. The first data (2010-week 1 to 2010-week 28) instead are all at 12,13€/Kg. Average price is 9,87€/Kg and standard deviation 0,66€/kg. Maximum and minimum prices are the only two recorded values.
- Roma has an average price of 11,83€/Kg. It has to be noticed that price almost always move of multiple of 0,25 or units. The standard deviation is 1,54€/kg, minimum price is 7€/Kg and maximum is 15,5€/kg.

The total series report a standard deviation of 7,25€/Kg and an average value of 10,56€/Kg. This series moves between 8,78€/Kg and 13,5€/Kg.

Even the correlation matrix looks particular if confronted to other species: Milano and Roma result slightly negative correlated with r= -0,45.

Table 34: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	9,87	0,66	9,68	12,13
IT - Roma	11,83	1,54	7,00	15,50
Totals	10,56	0,76	8,78	13,50

Table 35: Wholesale markets price correlation matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	-0,45	1

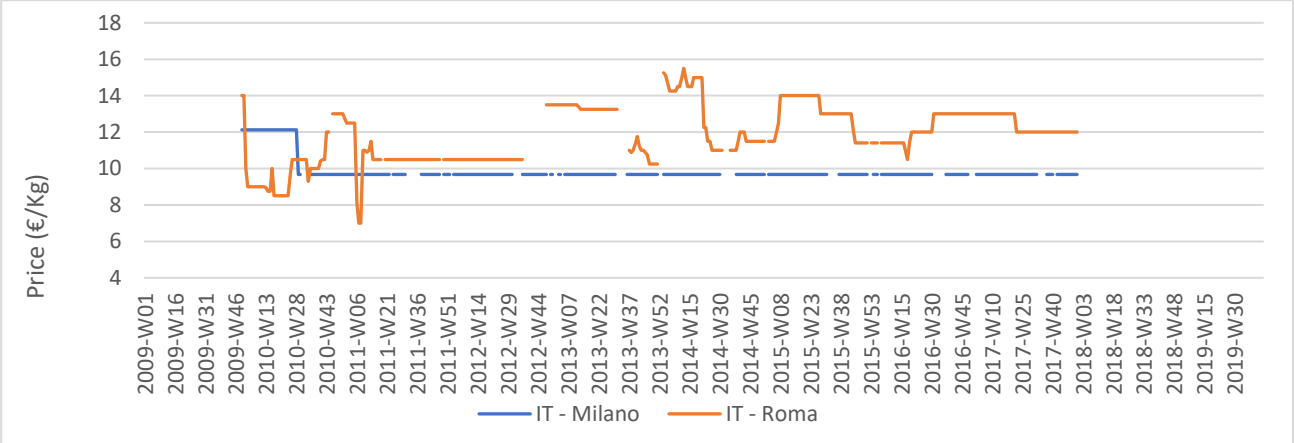


Figure 115: Wholesale markets price - Eumofa

3.8 CLAM

Regarding Clam the Weekly dataset reports data for Wholesale and Consumption/Retail.

Wholesale markets level

- The first thing to notice about Roma is that covers a much smaller timeframe as its data stop at the end of 2013. Averagely its price is lower (6,09€/kg) than Milano, as the standard deviation (1,01 €/kg). The series has a minimum at 4,65€/kg and a maximum at 8,17€/Kg.
- Milano's data is more complete. The average price is 6,75€/Kg, the minimum 4,22€/Kg and the maximum 11,25€/Kg. Its standard deviation is 1,44€/kg.

The correlation matrix shows a positive correlation between Milano and Roma as r=0,67.

Table 36: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	6,75	1,44	4,22	11,25
IT - Roma	6,09	1,01	4,65	8,17
Totals	6,53	1,43	4,65	11,25

Table 37: Wholesale markets price correlation matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	0,67	1

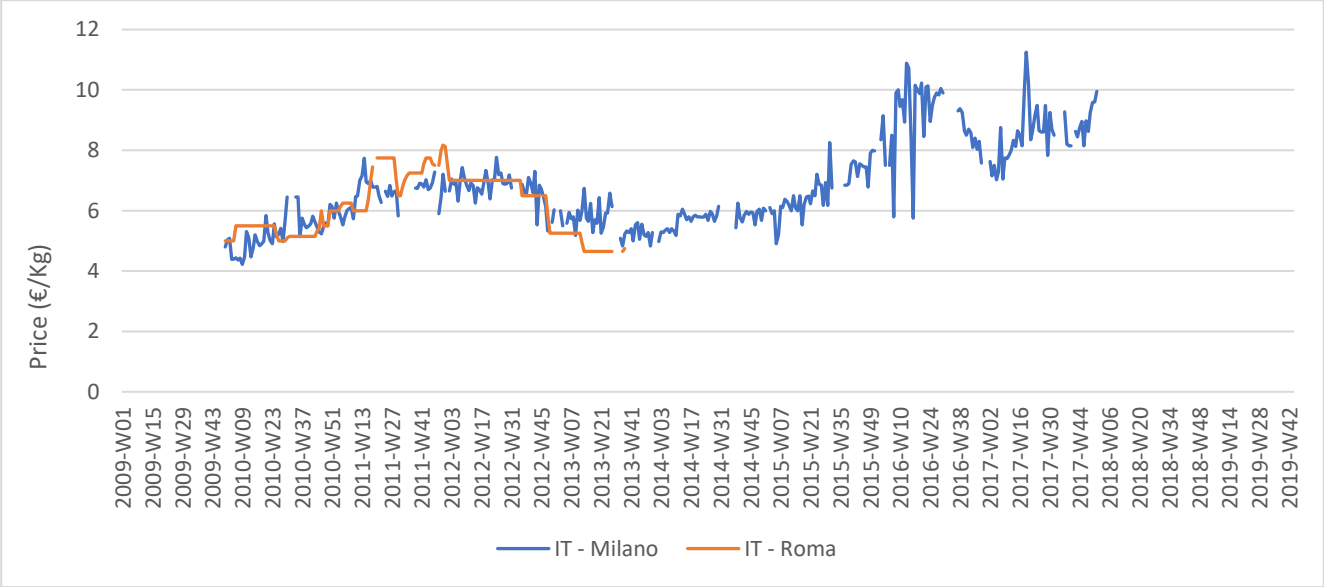


Figure 116: Wholesale markets price - Eumofa

Price transmission analysis

Looking at the graph is perceptible how since 2013 wholesale price is moving closer to retail/consumption.

Averagely, from wholesale to consumption/retail the price grows of 2,87€/Kg. The wholesale price averagely explains the 69% of the consumption price.

Even in that case, as easily expected, consumption price has a lower standard deviation than wholesale markets, signaling a stronger price stability.

The two stages are related with an r-index of 0,35.

Table 38: Wholesale and Consumption/retail stats

	Average	Standard Deviation	Min	Max
Consumption/Retail	**9,40**	1,00	7,37	13,29
Wholesale Totals	**6,53**	1,43	4,65	11,25

Table 39: Wholesale and consumption/retail price matrix correlation

	Consumption	Wholesale average
Consumption	1	
Wholesale average	0,35	1

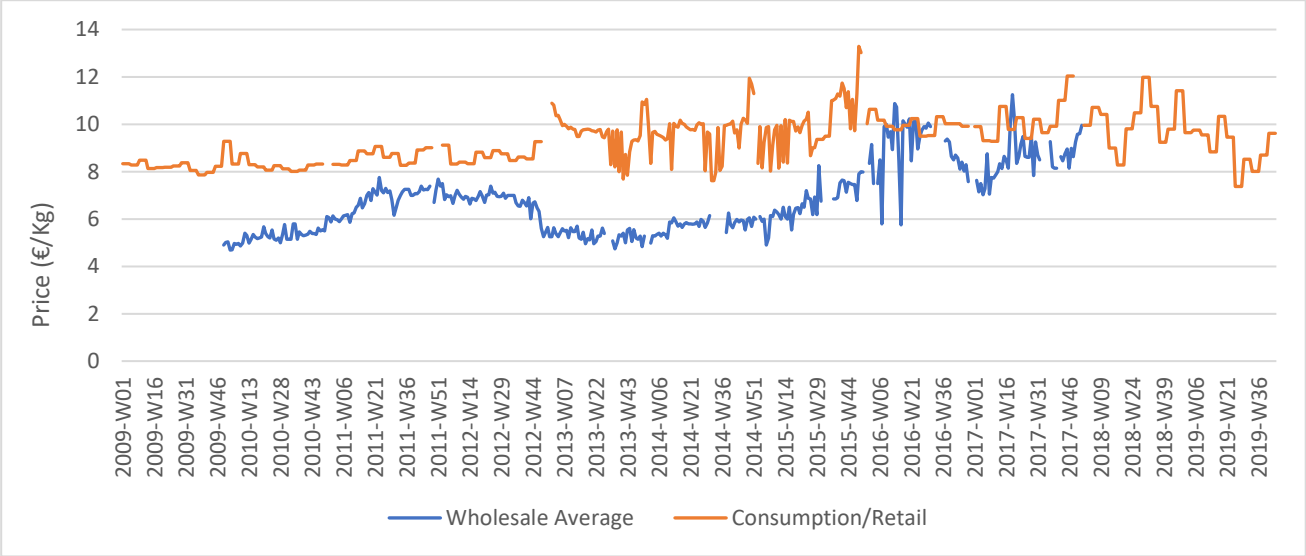


Figure 117: Wholesale and consumption/retail price - Eumofa

3.9 MANTIS SHRIMP

Eumofa inserted mantis Shrimp into the main commercial species of Squillid. Following results are thereby valid for the whole squillid category.

First sale markets level

At first sale stage, squillid price greatly changes from location and location.

- Molfetta is considerable the cheapest. Its average price is the lowest (3,98€/Kg), as it is the standard deviation (1,78€/Kg). Minimum and maximum prices are 1,29€/Kg and 20€/Kg.
- At San Benedetto del Tronto squillid is averagely listed at 6,45€/kg. Its price moves between 0,31€/kg and 17,32€/Kg with a standard deviation of 3,84€/Kg.
- Ancona has an average price of 7,57€/kg. The standard deviation is in line with the others (4,14€/Kg), the minimum price is 1,2€/Kg and the maximum is 17,68€/Kg.
- Cesenatico is the most expensive markets as all the indicators reports the highest value among all the first sale markets. Average price is 10,84€/Kg, the standard deviation is 4,46€/Kg and minimum/maximum prices are 1,47€/Kg and 27€/Kg.

The correlation matrix for squillid returns a first sale stage more correlated than other species.

In particolar, the pairing San Benedetto del Tronto/Ancona has a strong positive r-index of 0,80. Then in descending order: Cesenatico/Ancona (r= 0,75), San Benedetto del Tronto/Molfetta (R= 0,7), San Benedetto del Tronto/Cesenatico (0,65) and Molfetta (r=0,6).

Table 40: First sale markets price stats

	Average	Standard Deviation	Min	Max

IT - Ancona	7,57	4,14	1,20	17,68
IT - Cesenatico	10,84	4,46	1,47	27,00
IT - Molfetta	3,98	1,78	1,29	20,00
IT - San Benedetto del Tronto	6,45	3,84	0,31	17,32
Totals	7,30	2,87	1,85	14,66

Table 41: First sale markets price correlation matrix

	IT - Ancona	**IT - Cesenatico**	**IT - Molfetta**	**IT - San Benedetto del Tronto**
IT - Ancona	1			
IT - Cesenatico	0,75	1		
IT - Molfetta	0,60	0,35	1	
IT - San Benedetto del Tronto	0,80	0,65	0,70	1

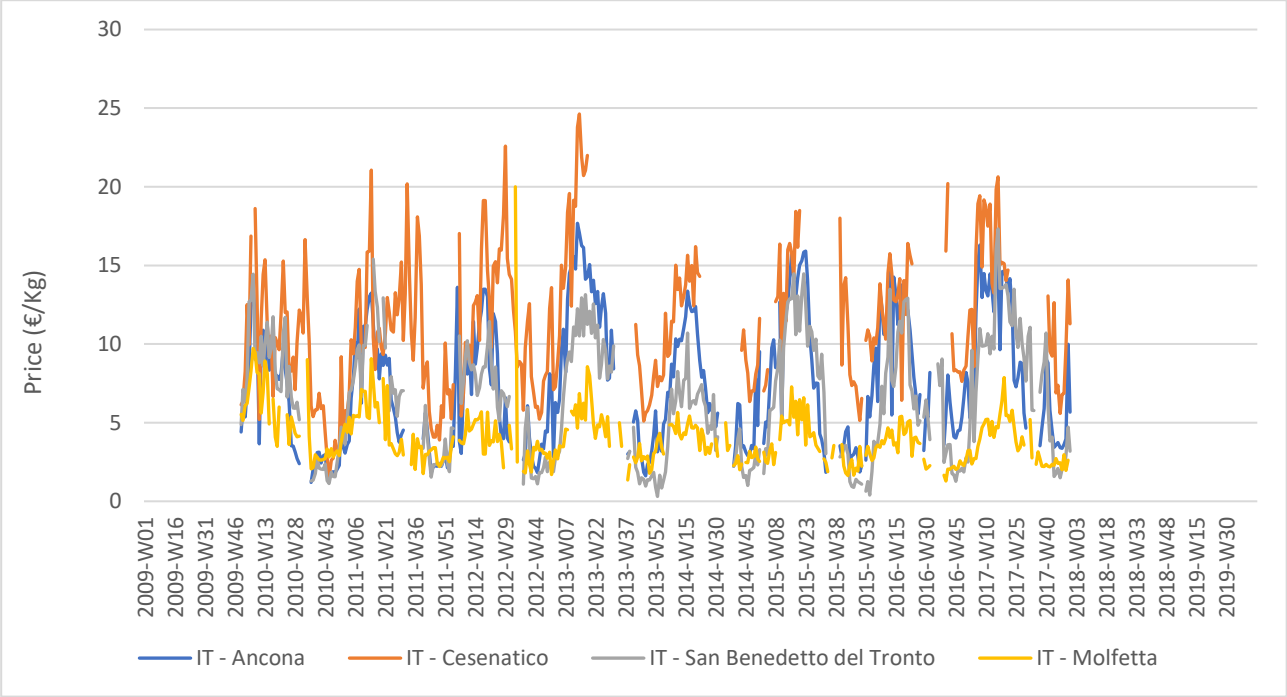


Figure 118: First sale markets price - Eumofa

Wholesale markets level

At wholesale level no noticeable correlation is present, but the negative sign of r (-0,20) should be further analyzed.

- Milano has an average price of 8,94€/Kg. Price is not moving since late 2011, the minimum price is 4,88€/Kg and the maximum is 10,50€/Kg. Its standard deviation is 1,26€/Kg.
- Roma's price has a higher variability (standard deviation=2,70€/Kg), but its average (7,82€/Kg) is lower than Milano's. Minimum price is 3,25€/kg while maximum 21,5€/Kg.

Table 42: Wholesale markets price stats

	Average	Standard Deviation	Min	Max
IT - Milano	8,94	1,26	4,88	10,50
IT - Roma	7,82	2,70	3,25	21,50
Totals	8,55	1,32	4,88	15,50

Table 43: Wholesale markets price correlation matrix

	IT - Milano	IT - Roma
IT - Milano	1	
IT - Roma	-0,20	1

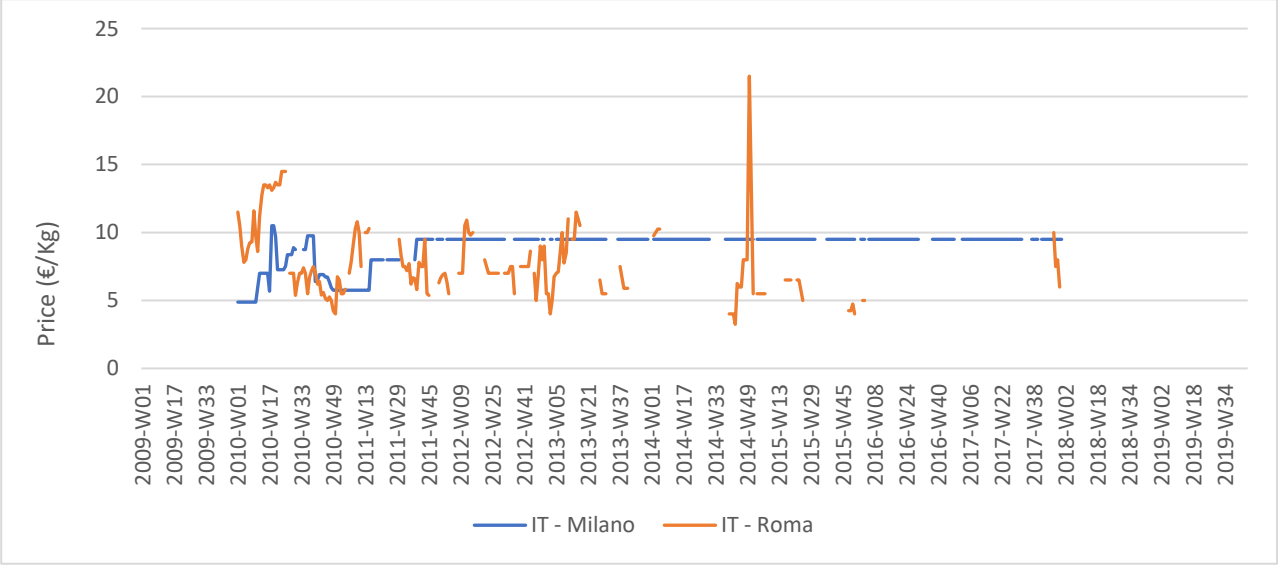


Figure 119: Wholesale markets price - Eumofa

Price transmission analysis

Between first sale totals and wholesale totals the price increase of 1,25€/Kg. The price at the first stage explains the 85% of the wholesale price. The two datasets present a low, not significant, r-value (0,23).

Table 44: First sale and wholesale correlation matrix

	First sale	Wholesale
First sale	1	
Wholesale	0,23	1

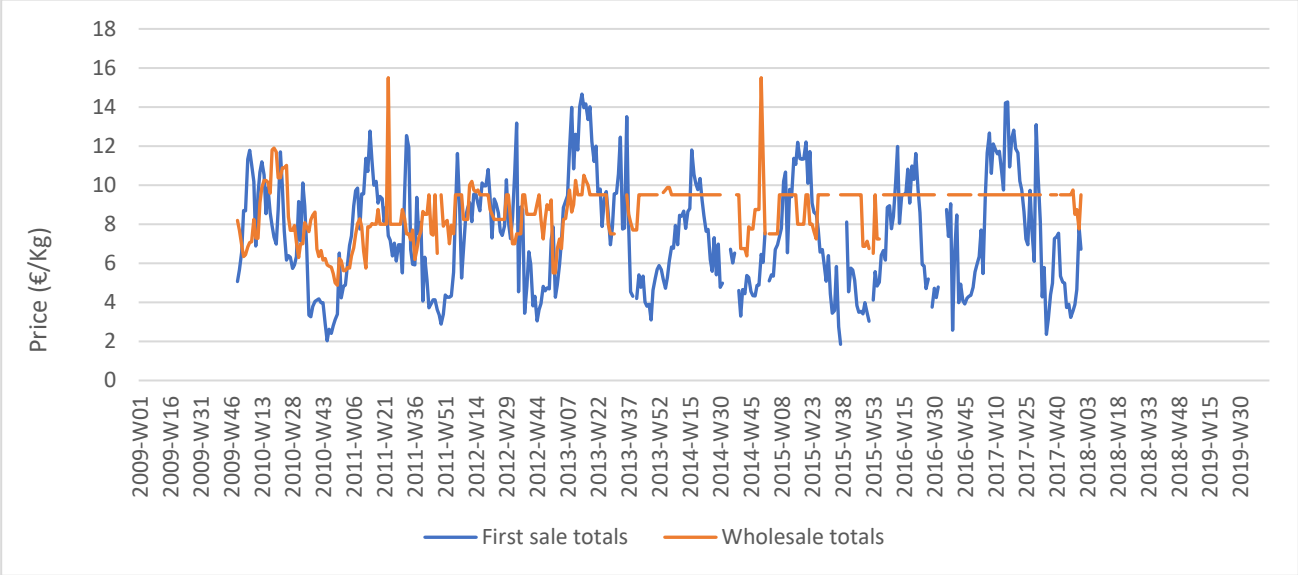


Figure 120: First sale and wholesale price - Eumofa

3.10 INTER-SPECIES MARKET PRICE ANALYSIS

In this final part of the chapter, first sale and wholesale markets are singularly analyzed to find correlation between different species' prices.

Ancona

Considering the first sale market of Ancona, Squillid resulted negatively correlated with all the other species (even if with a very low r-index). The only moderately correlated pairing is octopus/cuttlefish (r= 0,61).

At Ancona, the product with the highest variability is Squillid (standard deviation= 4,14€/Kg), followed by Cuttlefish (1,93 €/kg), Octopus (1,24€/Kg) and Sardine (0,5€/Kg).

Table 45: Prices correlation matrix

	Cuttlefish	Octopus	Sardine	Squillid
Cuttlefish	1			
Octopus	0,61	1		
Sardine	0,06	0,13	1	
Squillid	-0,21	-0,27	-0,02	1

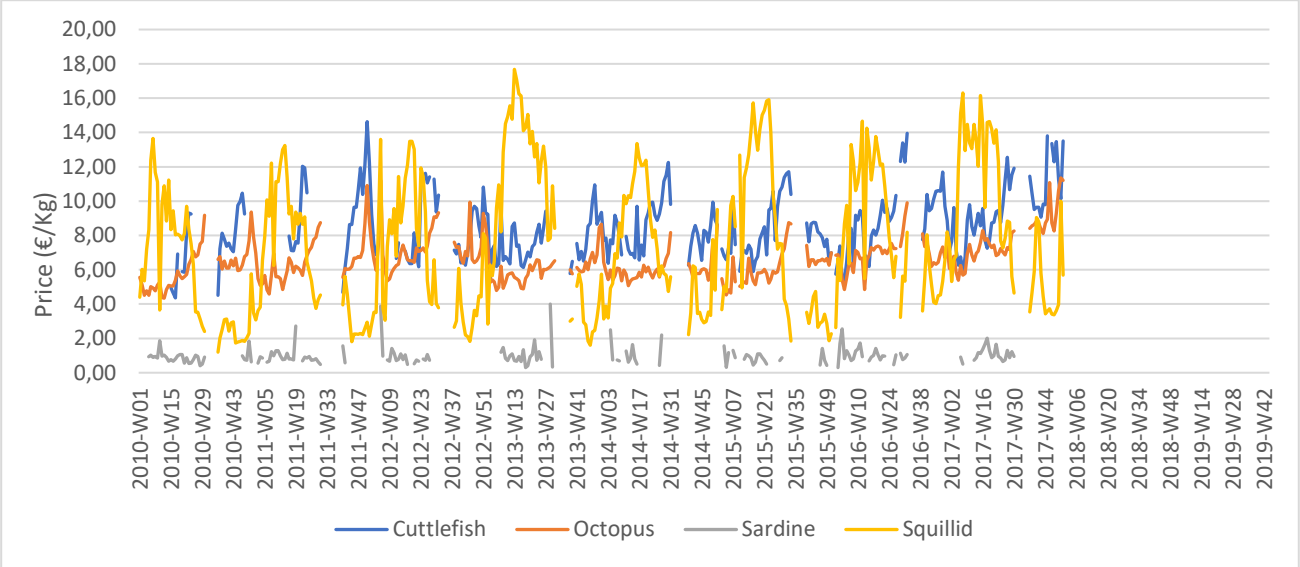


Figure 121: First market prices – Ancona

Cesenatico

The products sold at Cesenatico's result not correlated, as the highest correlation index is for sardine/anchovy with r=0,38.

The most variable price is squillid's, with standard deviation of 4,46€/Kg. Then Cuttlefish 2,17€/Kg, Anchovy 0,59€/Kg, Sardine 0,53€/kg.

Table 46: Prices correlation matrix

	Anchovy	Cuttlefish	Sardine	Squillid
Anchovy	1			

Cuttlefish	0,09	1		
Sardine	0,38	0,06	1	
Squillid	0,19	-0,23	0,06	1

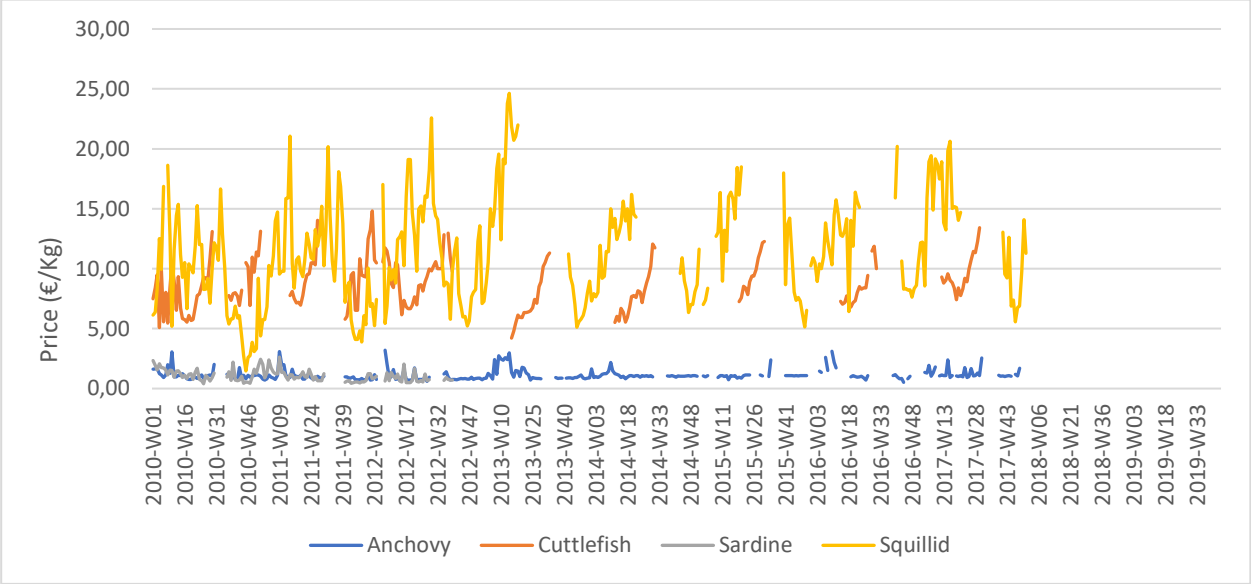


Figure 122: First market prices – Cesenatico

Molfetta

The correlation matrix for Molfetta doesn't returns any r-value greater than 0,39. In absolute value the highest are Deep wate rose shrimp/Cuttlefish (r= 0,39) and Octopus/Anchovy (r= -0,34). Others are not relevant.

At Molfetta, three species have the most stable pattern among first sale markets, as squillid's standard deviation is 1,78€/kg, Deep Water Rose Shrimp presents the minimum variability at

1,91€/kg (the only other market where it's listed is San Benedetto Del Tronto) and Sardine's standard deviation is 0,41€/Kg.
Other values are generally low, as Anchovy's is 0,79€/Kg, Cuttlefish 1,89€/Kg and Octopus 1,57€/Kg.

Table 47: Prices correlation matrix

	Anchovy	Cuttlefish	Octopus	Sardine	Shrimp, deep-water rose	Squillid
Anchovy	1					
Cuttlefish	-0,06	1				
Octopus	-0,34	0,15	1			
Sardine	0,16	0,11	-0,08	1		
Shrimp, deep-water rose	-0,06	0,39	0,25	0,28	1	
Squillid	0,15	0,03	-0,32	0,21	-0,16	1

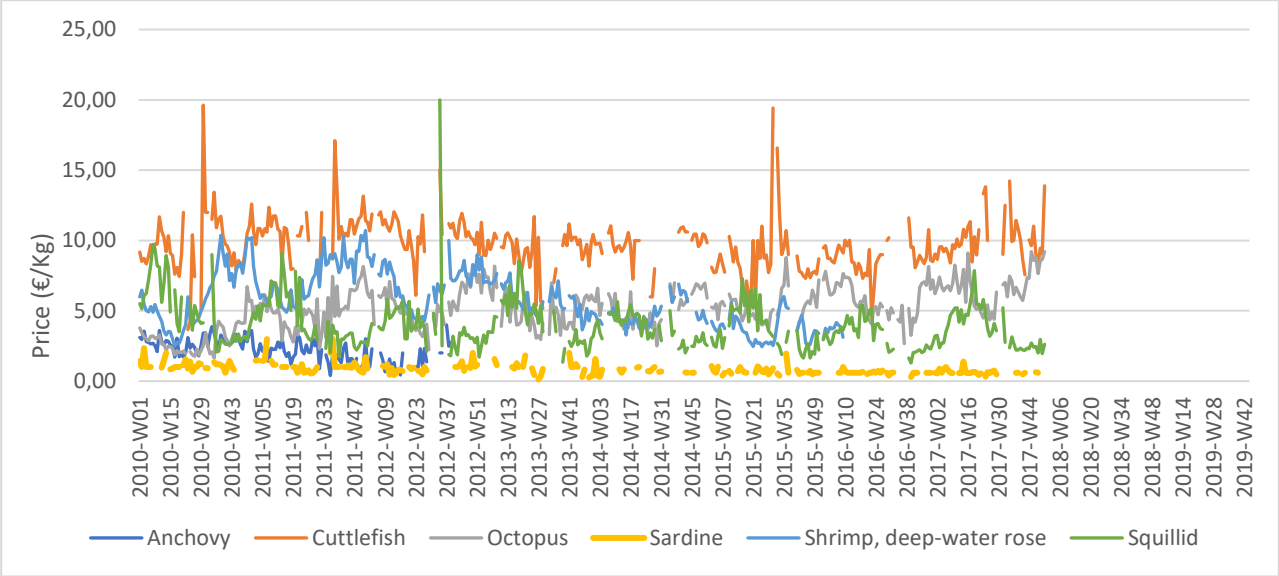


Figure 123: First market prices – Molfetta

San Benedetto del Tronto

The highest r-value for San Benedetto del Tronto is Octopus/Cuttlefish with an r-index of 0,49. The second higher is Sardine/Anchovy (0,39).

At San Benedetto, ordered by standard deviation, the first species listed is Squillid (st. deviation= 3,84€/Kg), followed by Deep Water Rose Shrimp 3,37€/Kg, Cuttlefish (1,98€/Kg) Octopus (1,47€/Kg), Sardine (1,1€/Kg) and Anchovy (0,81€/Kg).

Table 48: Prices correlation matrix

	Anchovy	Cuttlefish	Octopus	Sardine	Shrimp, deep-water rose	Squillid

Anchovy	1					
Cuttlefish	-0,20	1				
Octopus	0,20	0,49	1			
Sardine	0,39	-0,26	-0,05	1		
Shrimp, deep-water rose	-0,22	0,24	-0,03	-0,11	1	
Squillid	0,15	0,05	-0,10	0,25	-0,07	1

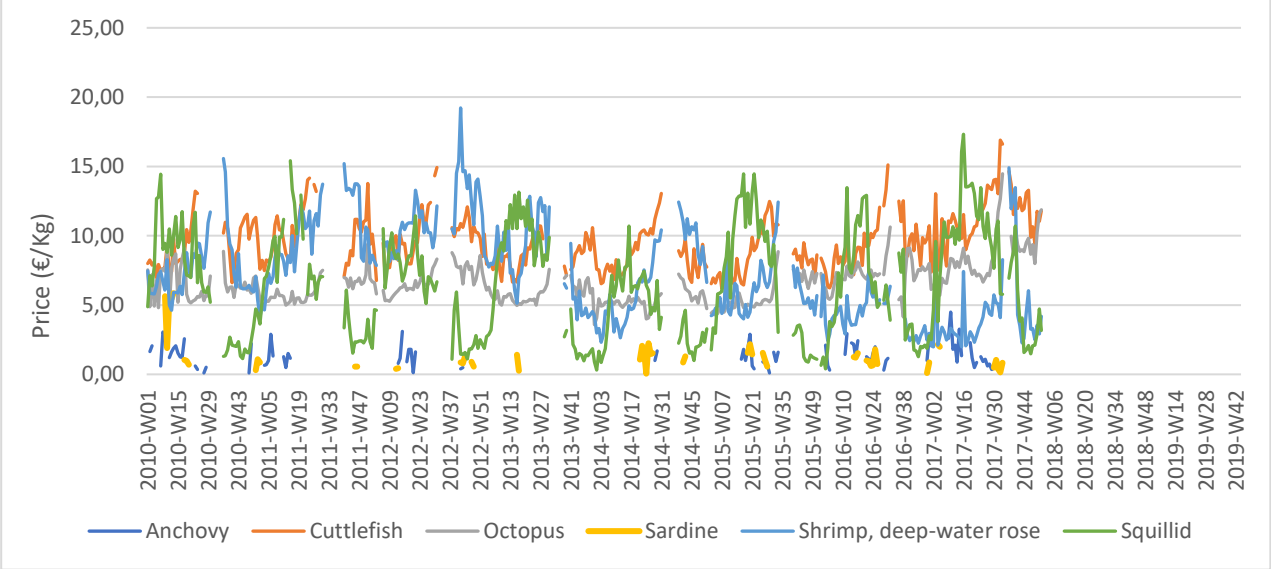


Figure 124: First market prices – San Benedetto del Tronto

Milano

Milano doesn't present any strong correlation between product prices. The highest value is Octopus/Cuttlefish (r= 0,52) and Squillid/Scallop (r= -0,52).

Analysing standard deviation of wholesale markets, Milano presents the lowest values for Anchovy (0,64€/kg), Octopus (1,60€/Kg), Sardine (0,38€/Kg), Scallop (0,66€/kg) and Squillid (1,26€/Kg). Prices of Clam and Cuttlefish are more unstable here than at Roma (clam standard deviation = 1,44€/Kg, cuttlefish st. deviation= 1,81€/Kg)

Table 49: Prices correlation matrix

	Anchovy	Clam	Cuttlefish	Octopus	Sardine	Scallop	Squillid
Anchovy	1						
Clam	0,33	1					
Cuttlefish	0,18	0,38	1				
Octopus	0,19	0,40	0,52	1			
Sardine	0,38	-0,08	0,01	0,04	1		
Scallop	-0,26	-0,37	-0,19	-0,4	-0,05	1	
Squillid	0,33	0,35	0,11	0,15	0,07	-0,52	1

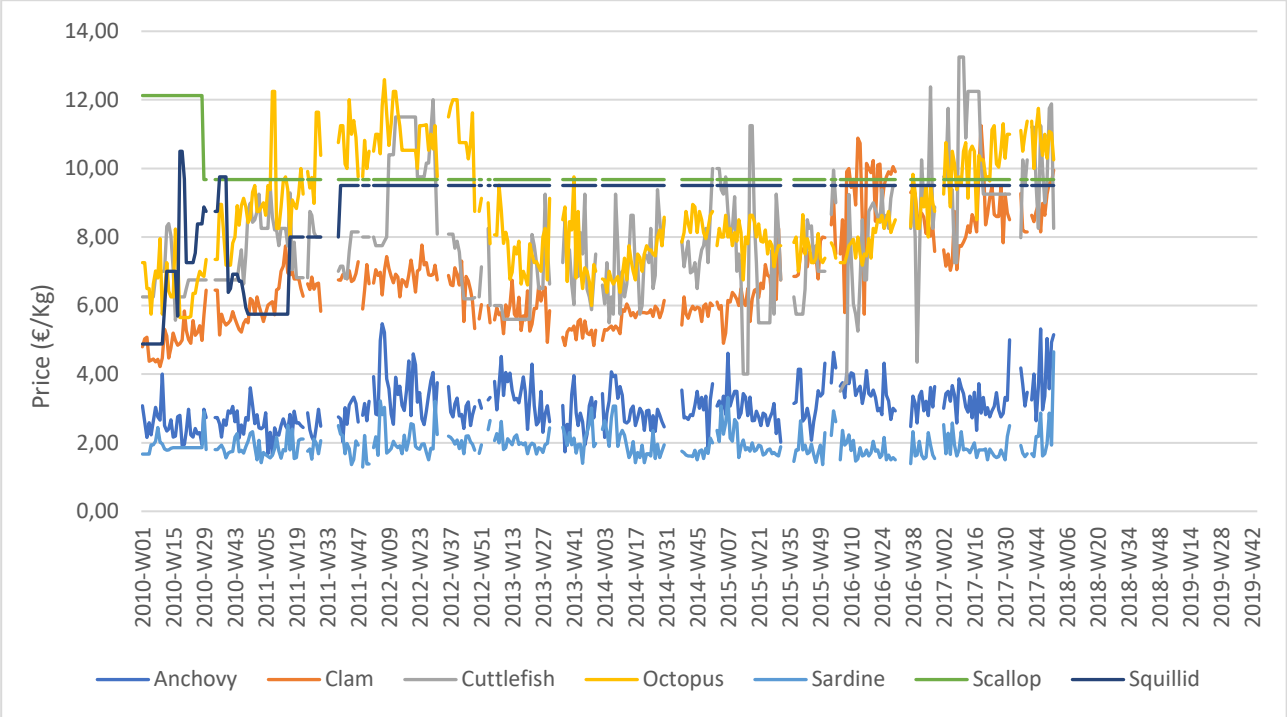


Figure 125: Wholesale market prices - Milano

Roma

Roma's market has a correlation matrix with lower value than Milano. The highest is Octopus/Clam (r= -0,44). Prices are generally more unstable than Milano: Squillid has a standard deviation of 2,7€/Kg, Octopus' is 2,17€/Kg, Cuttlefish's 1,61€/Kg, Scallop's 1,54€/kg, Anchovy's 1,14€/Kg. Clam's standard deviation is 1,01€/Kg and Sardine's (0,64€/Kg).

Table 50: Prices correlation matrix

	Anchovy	Clam	Cuttlefish	Octopus	Sardine	Scallop	Squillid
Anchovy	1						
Clam	0,02	1					
Cuttlefish	0,14	0,28	1				
Octopus	0,19	-0,44	0,42	1			
Sardine	0,10	0,16	-0,06	0,24	1		
Scallop	0,17	-0,37	0,17	0,40	0,01	1	
Squillid	-0,06	-0,15	-0,14	-0,15	-0,10	-0,30	1

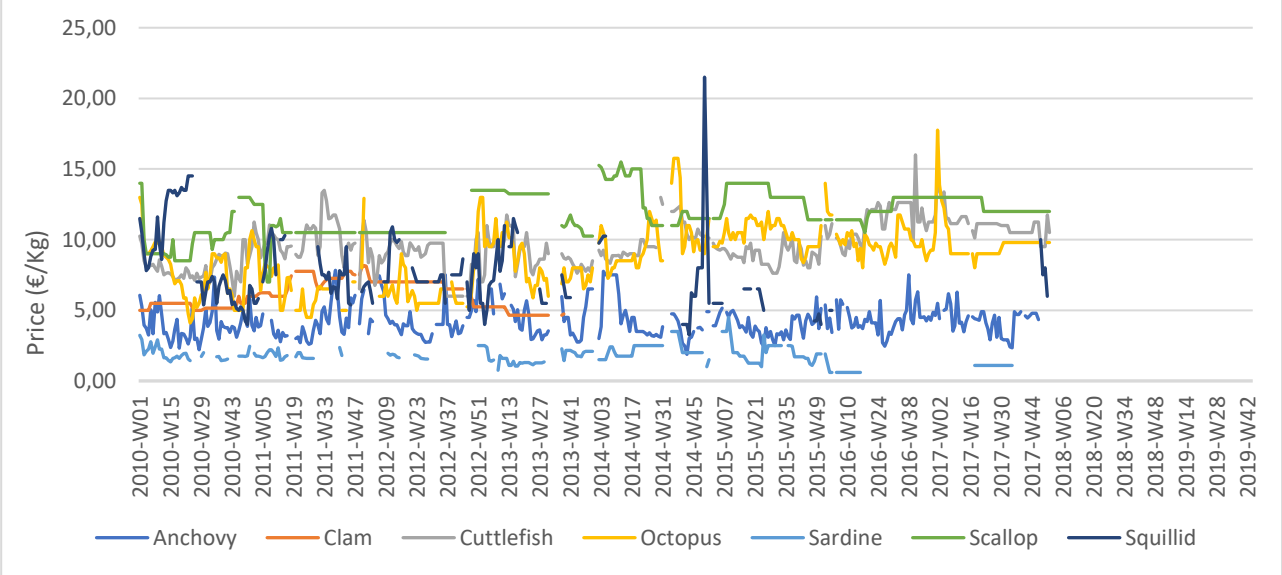


Figure 126: Wholesale market prices – Roma

4. FOCUS ON ITALIAN PRICES PER GEAR AND REGION

4.1 INTRODUCTION AND METADATA

A deeper analysis can be conducted using a database that consents to separately study price and volume behaviours of different fishing techniques.

This is the case of the Italian database collected for the *Programma Nazionale Raccolta Dati Alieutic*i (PNRDA) (Reg. CE n. 199/08).

From the original landings database all the regions not bordering the Adriatic Sea have been filtered. Data shows prices and volumes of Friuli Venezia Giulia, Veneto, Emilia-Romagna, Marche, Molise, Abruzzo, Puglia Nord (Ionian side excluded) for the period 2015-2017.

Data are collected for those fishing techniques:

- *DTS* = Demersal trawl and demersal seiner
- *DRB = Dredges*
- *PGP* >12 lft = Polyvalent passive gears
- *PGP* <12 = Polyvalent passive gears
- *PS = Purse Seiner*
- *TM = Pelagic trawl*
- *HOK = Gears using hooks*
- *TBB = Beam trawl*

Starting from raw data, totals of technique and region are computed summing all the dataset entry. Similarly, average prices (regional sum of all the methods and single method sum of the regions) shown in the following tables have been manually obtained through weighted average.

The “Mullets” sub-chapter treats all the different species belonging to the *mullet nei* family as a single entity (through manual sums and weighted price calculation). Data from those species have been aggregated: MUL, MGA, MGC, MUF, LZS. Other species were in the ro dataset but didn’t present any value.

No data are reported inside the database on Queen Scallop (QSC).

4.2 ANCHOVY

By regional point of view

Considering all the fishing techniques, between 2015 and 2017, particularly significant movements in volume have been made by Puglia Nord (upward) and Emilia-Romagna (downward). During 2017 Puglia Nord became the major region for anchovy fishing (with 7.315t), overtooking Veneto's 7.193t.

It has to be noticed that the two regions where price is averagely higher (F.Venezia Giulia and Molise) are those which present volume practically nil.

Table 51: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	3.644	4.172	3.507	0,99	1,73	1,65
∑ E.Romagna	4.700	2.858	1.408	0,86	1,39	1,66
∑ F.V.Giulia	266	250	150	3,08	3,98	2,75
∑ Marche	4.498	5.107	4.409	0,98	1,56	1,36
∑ Molise	9,8	1,4		3,23	2,68	
∑ Puglia Nord	5.688	5.586	7.316	1,43	1,24	1,64
∑ Veneto	8.093	7.754	7.193	2,13	1,41	2,28

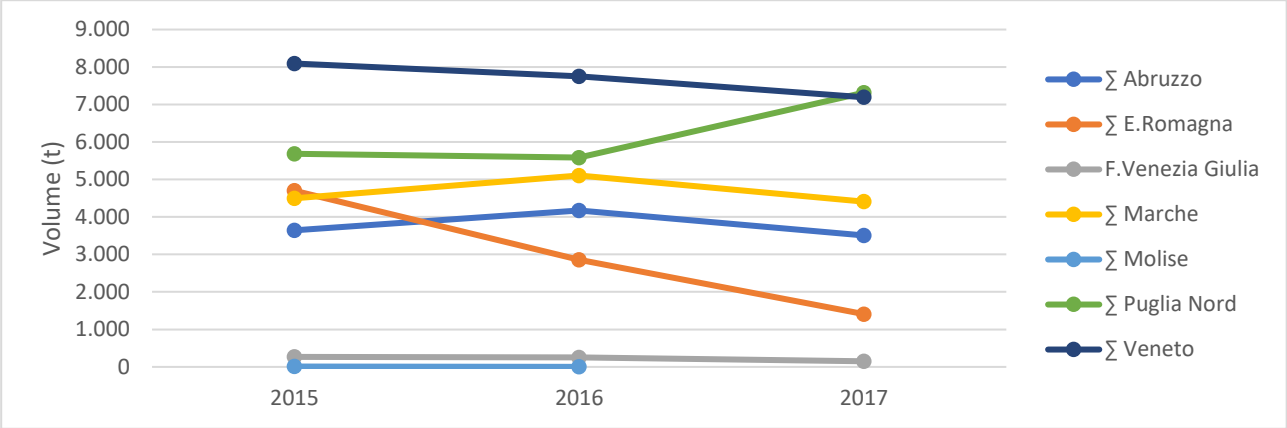


Figure 127: Anchovy Volume by region

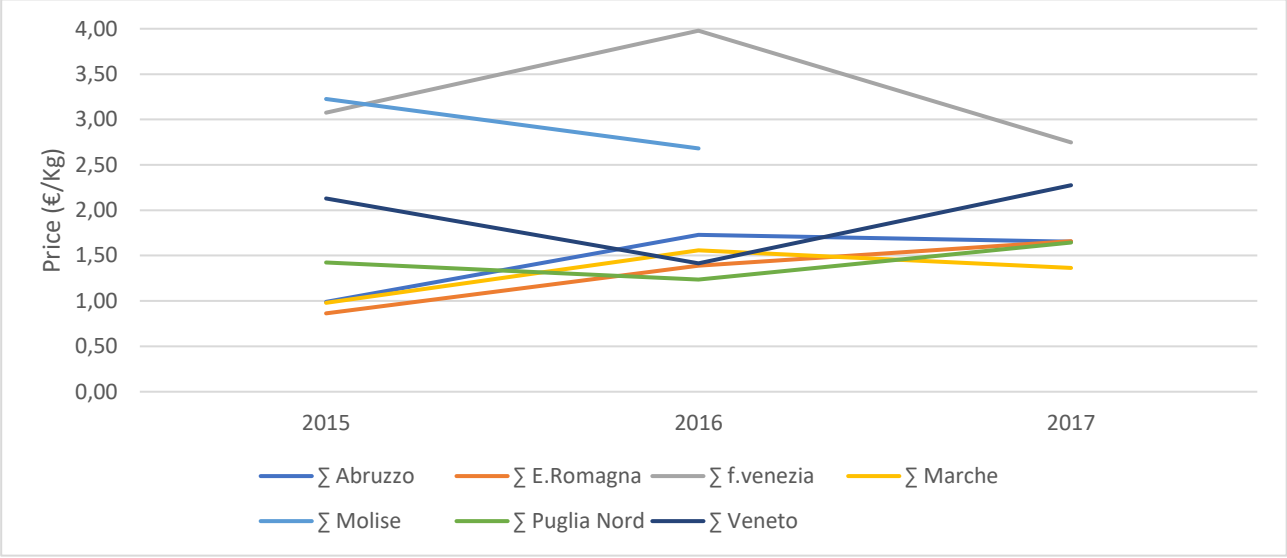


Figure 128: Anchovy average price by region

The following tables shows volumes and prices of different fishing techniques within a single region.

- In Abruzzo PNRDA keeps track of DTS and PS fishing techniques. PS is by far the most relevant by volume, and it's more expensive than DTS.

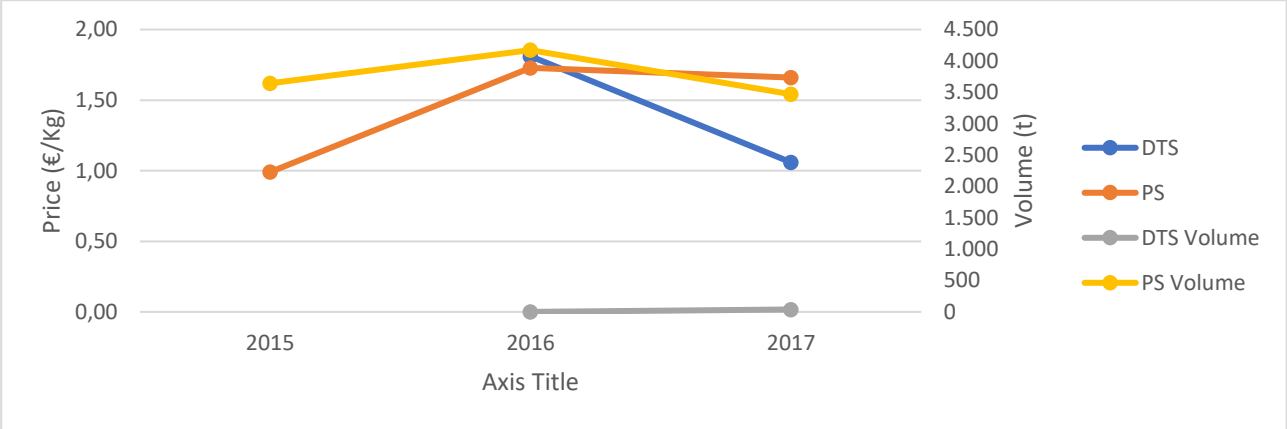


Figure 129: Price and Volume by techniques - Abruzzo - PNRDA

- In Emilia-Romagna the only relevant technique is TM, as others volume are almost zero. From 2015 to 2017 fishing by TM were dramatically reduced, passing from 4.696t to 1.408t. In the meantime, its price (starting from 0,86€/Kg) moved to 1,36€/Kg and back again to 0,87€/Kg.

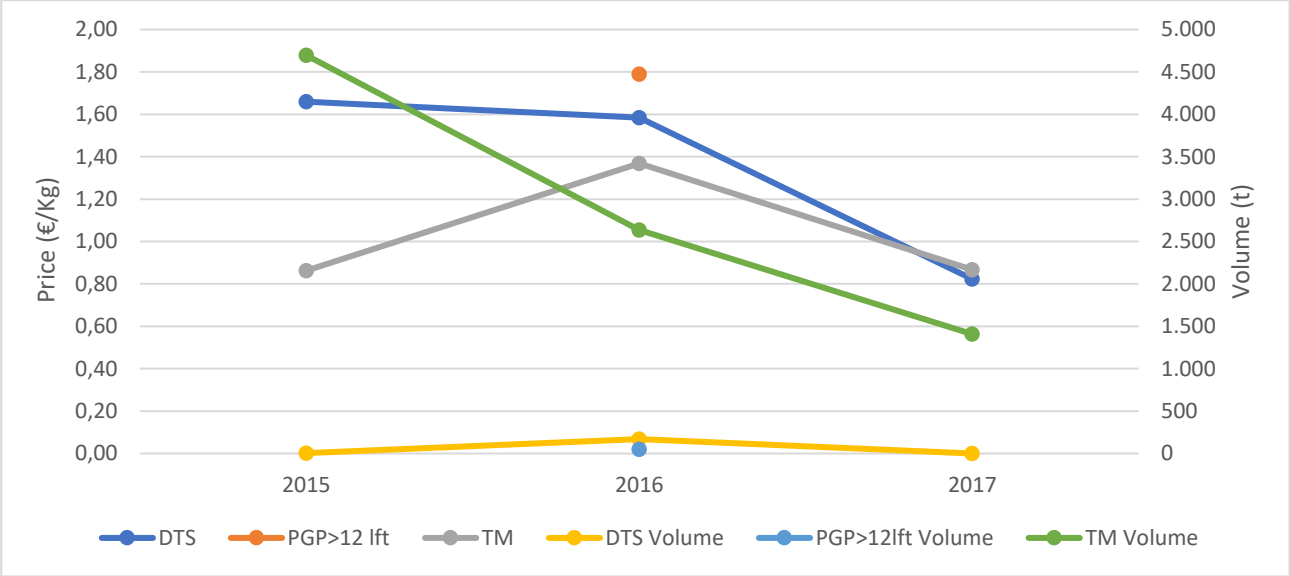


Figure 130: Price and Volume by techniques - Emilia-Romagna - PNRDA

- In Friuli Venezia Giulia fishing by TM and DTS is of almost marginal interest. Volume fished by PS follows a descendant pattern, it started from 255,6t in 2015 to 147,8t in 2017. Ps' price firstly increased (3,12€/Kg to 4,01€/Kg) and then decreased to 2,74€/Kg in 2017. Anchovy fished with TM and DTS methods instead presented an increasing price.

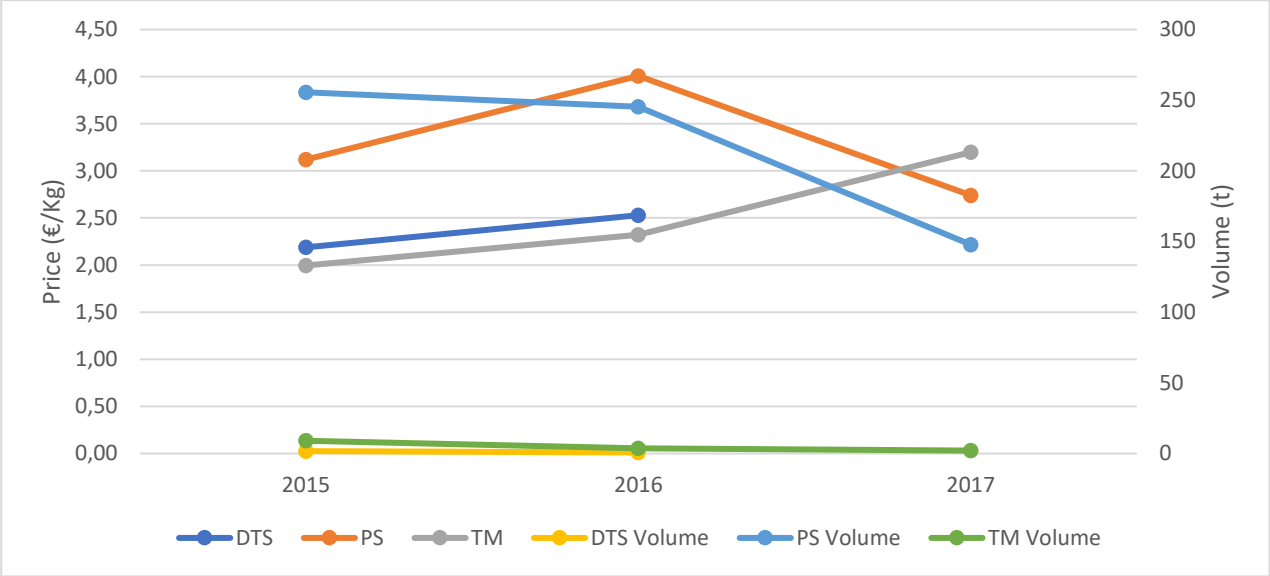


Figure 131: Price and Volume by techniques - Friuli Venezia Giulia – PNRDA

- In the Marche region the only relevant fishing technique is TM. Its price strongly increased from 0,97€/Kg (2015) to 1,56€/Kg (2016), before settling on 1,36€/Kg. Its volume in 2017 is almost at the same level of 2015.

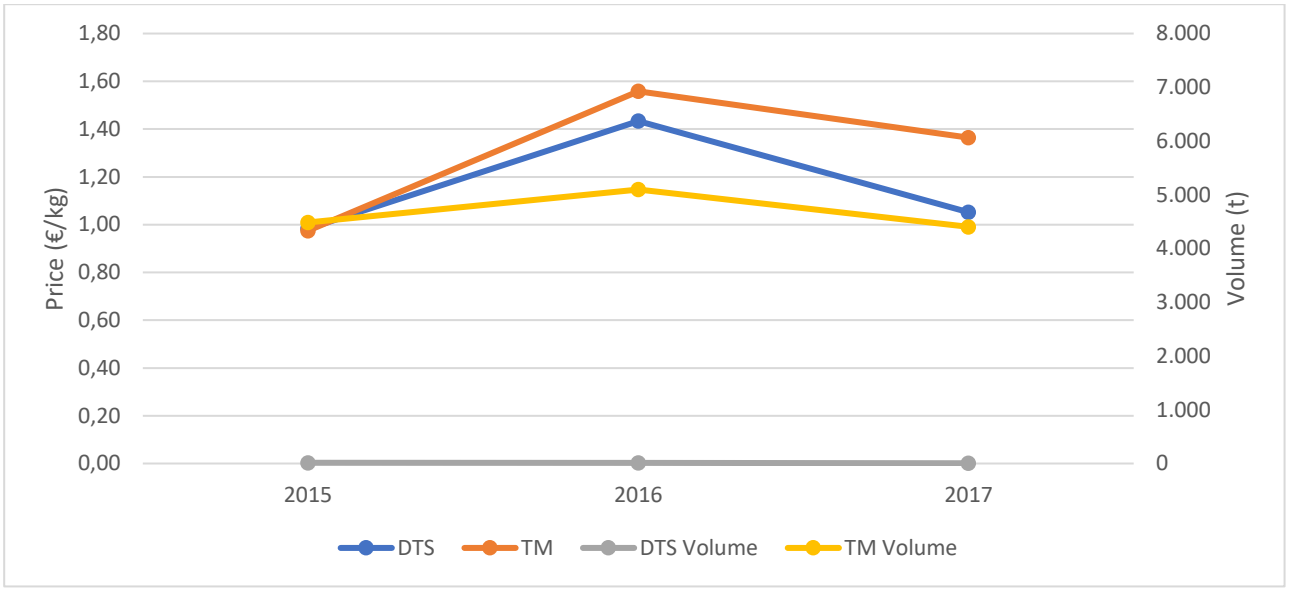


Figure 132: Price and Volume by techniques - Marche – PNRDA

- PNRDA only reports data from DTS fishing for Molise. Between 2015 and 2016 volume experienced a 7x reduction, along with a price reduction.

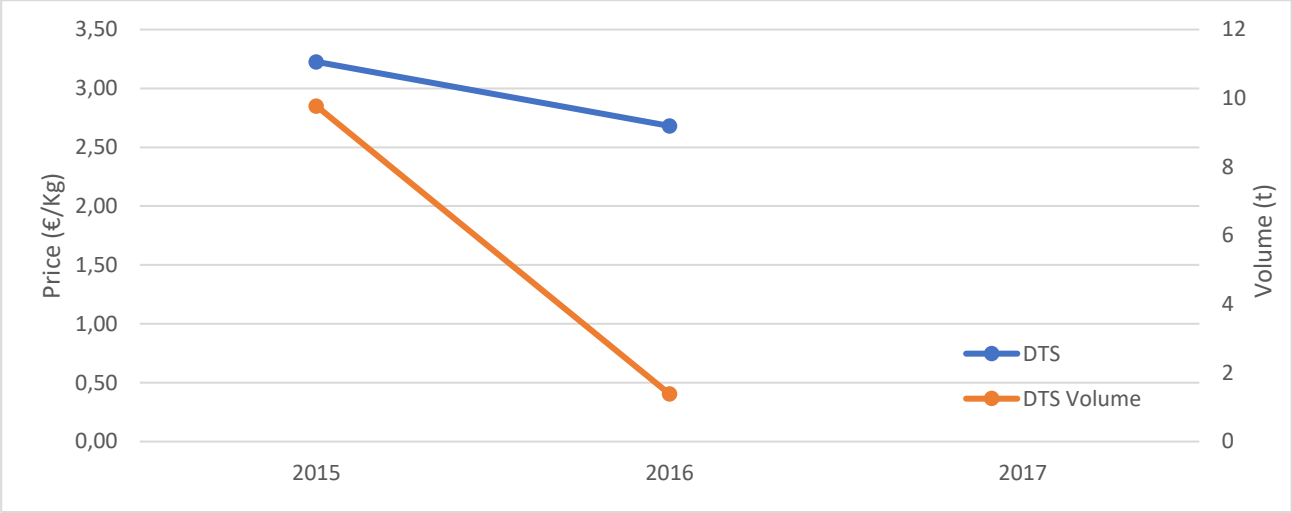


Figure 133: Price and Volume by techniques - Molise - PNRDA

- In the North side of Puglia (the one which overlooks the Adriatic Sea), the most relevant fishing technique is TM. TM's volume stayed almost stable around 4,1-4,3t/year, with a slight drop in 2016 at 3,7t. Its price strongly increased from 2016 to 2017.
  The second most important technique by volume is PS which is constantly increasing its share, from 1.312t in 2015 to 2.994 in 2017. Its price remained almost stable.
  DTS doesn't present a sufficient volume to be considered relevant.

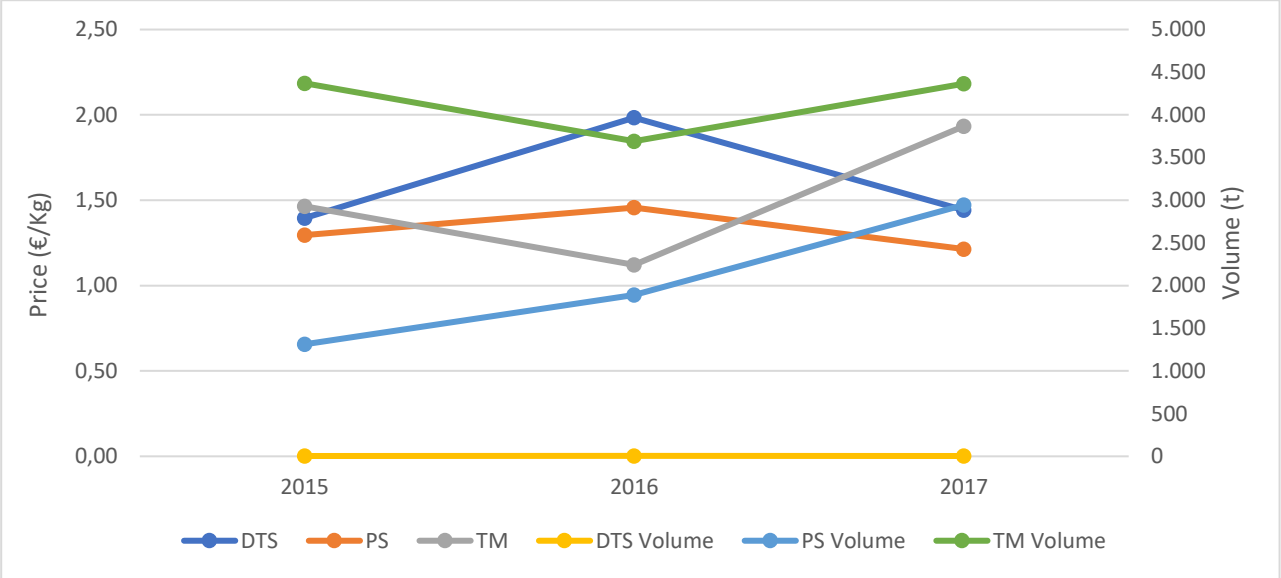


Figure 134: Price and Volume by techniques - North Puglia – PNRDA

- In Veneto the only method with relevant volumes is TM, which follows a very slight descendant pattern, but stays over the 7.000t support.

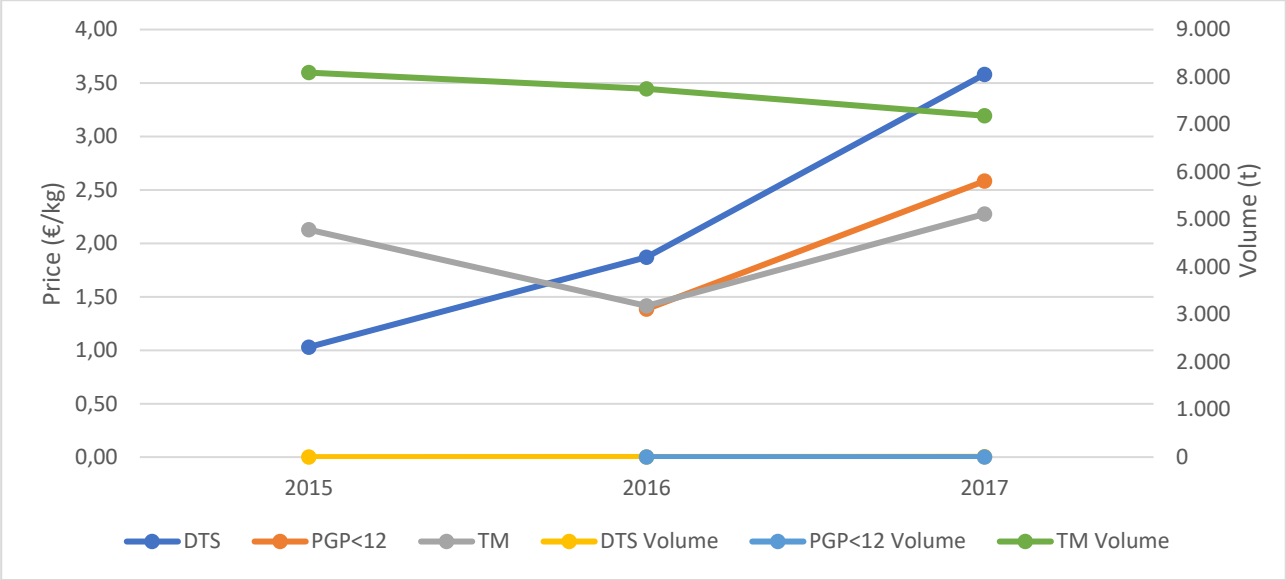


Figure 135: Price and Volume by techniques - Veneto - PNRDA

By fishing techniques point of view

From the dataset it's assertable the most important techniques by volume are TM (72% of total shares in 2017) and PS (27% in 2017). Their patterns are opposite, even if both in slight manner PS volume is increasing while TM's is decreasing.

Price of anchovies fished with PS method started in 2015 at 1,17€/Kg, then moved to 1,74€/Kg and back to 1,48€/Kg. TM presented a sensible increase in 2017, hitting 1,84€/Kg.

Table 52: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DTS	34,1	188,6	54,6	1,82	1,60	1,42

∑ PGP<12		0,23	0,091		1,39	2,58
∑ PGP>12 lft		50,1			1,79	
∑ PS	5.212	6.306	6.561	1,17	1,74	1,48
∑ TM	21.654	19.183	17.367	1,48	1,39	1,84

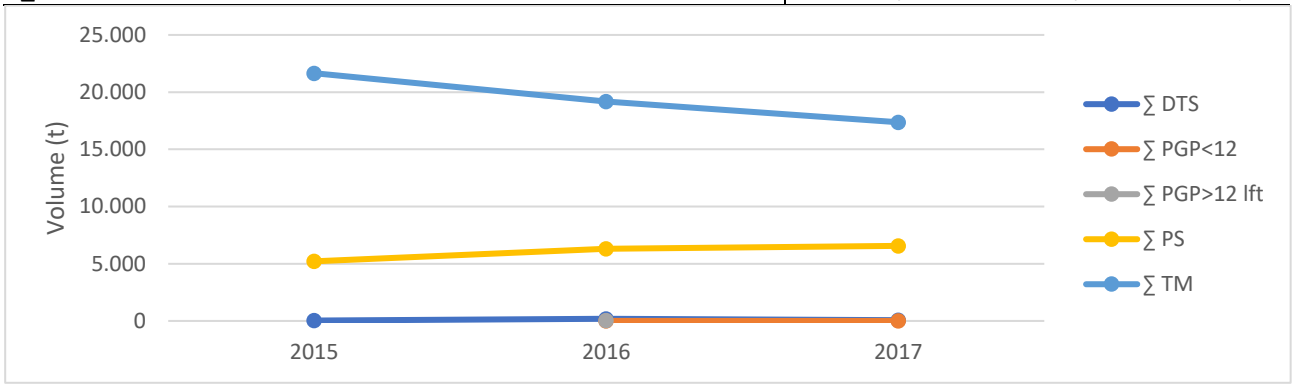


Figure 136: Anchovy Volume by technique - PNRDA

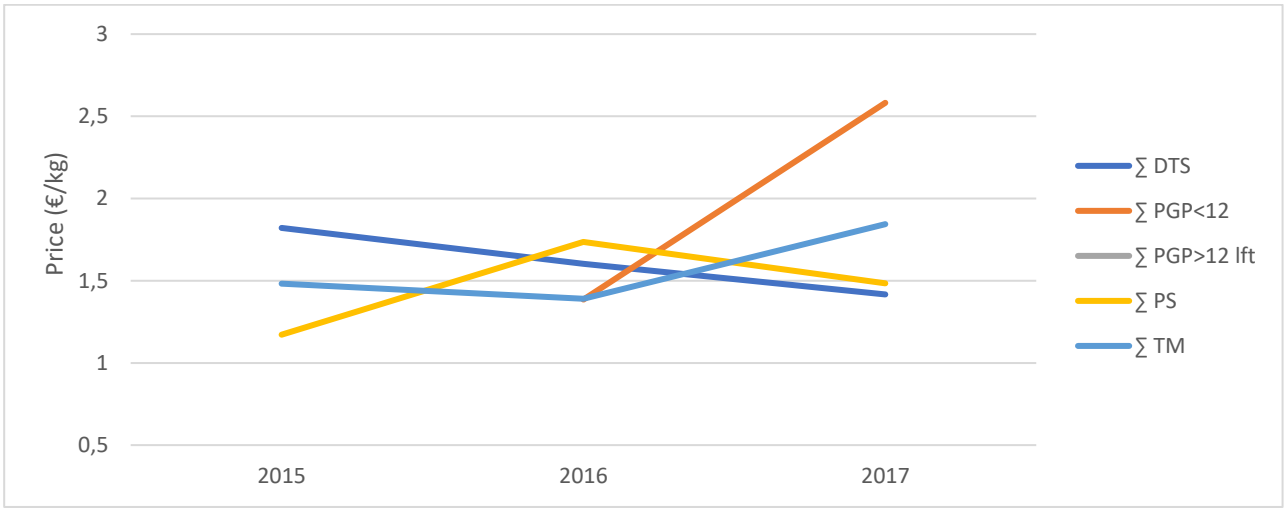


Figure 137: Anchovy average price by technique - PNRDA

- Looking at the regional distribution of price and volume by fishing technique, the general trend of prices is a slight increase in 2016 and a slight decrease in 2017. Veneto is strongly countertrend as its price almost duplicated from 2016 (1,87€/Kg) to 2017 (3,58€/Kg). Considering volumes, Emilia-Romagna acts as a real outlier as it increased its production by more than 40 times in 2016 (from 4t to 170t) before sinking to 0,4t in 2017. Abruzzo during 2017 has been the most DTS productive region with 38,5t.

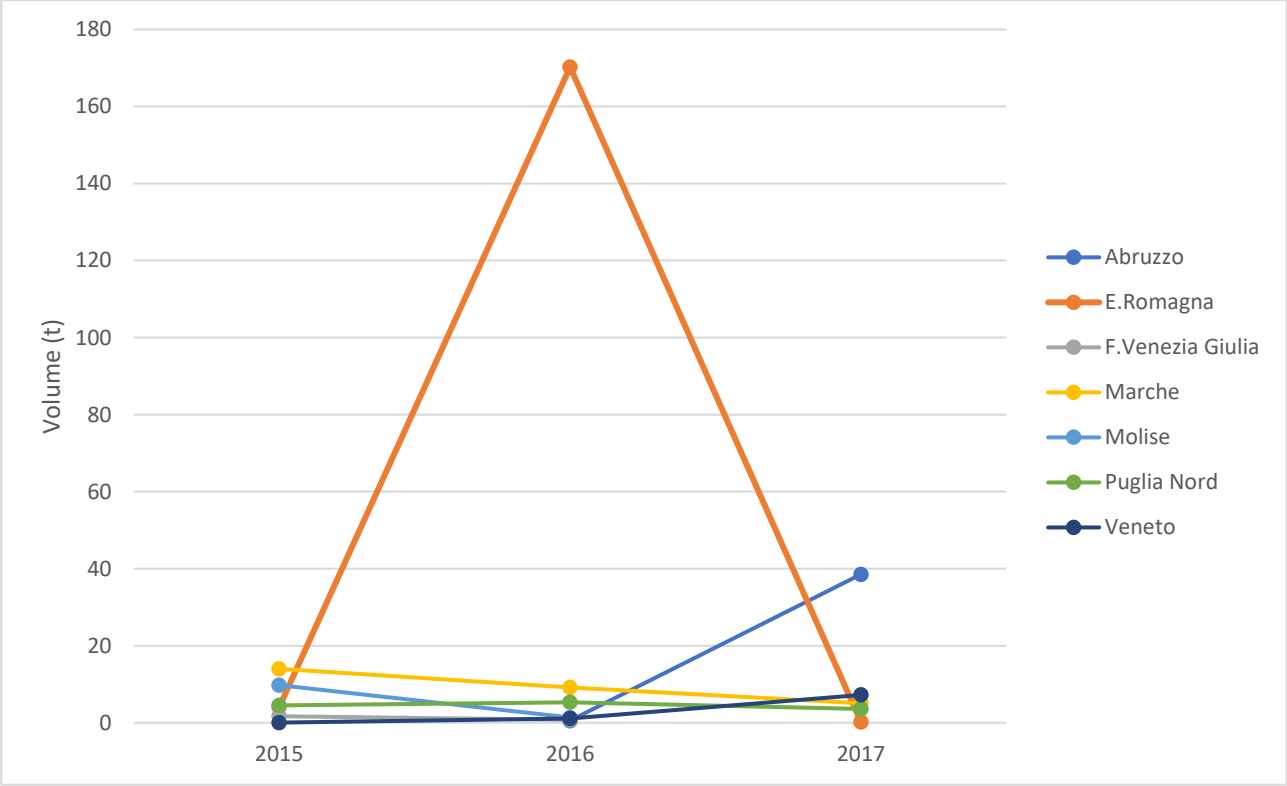


Figure 138: Volume by region - DTS

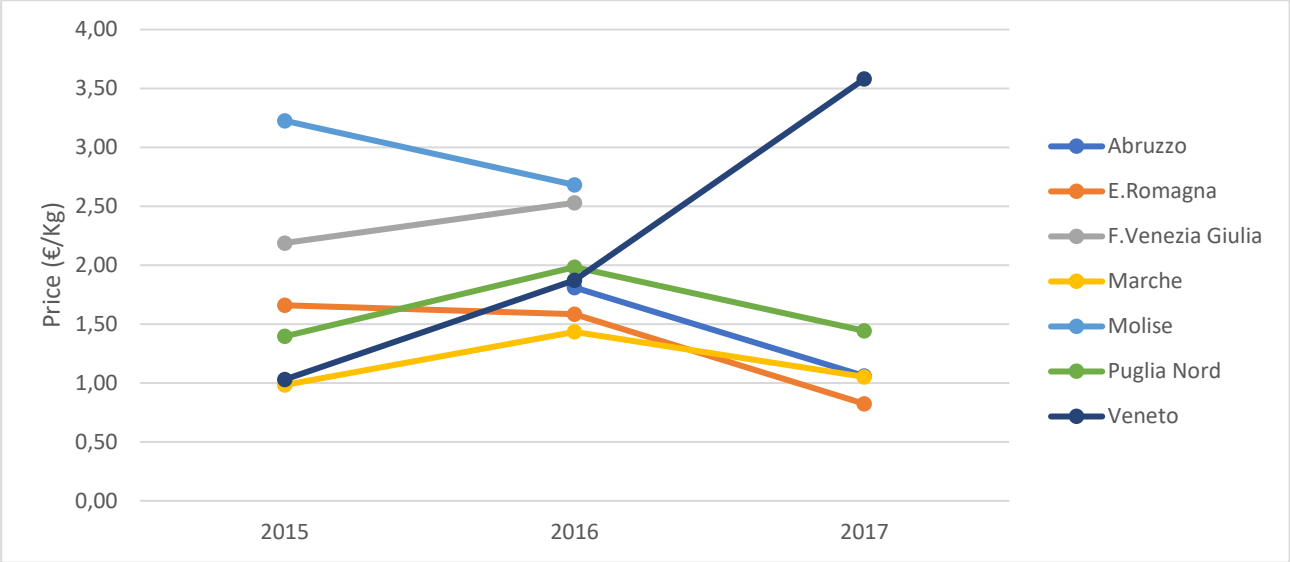


Figure 139: Price by region - DTS

- The most important by fishing region for PS from 2015 to 2016 has been Abruzzo, followed by Puglia North (in strong progression). Abruzzo became more expensive than Puglia North in 2016 and increased its price gap in 2017.
  Friuli Venezia Giulia presents a very low volume and volatile prices.

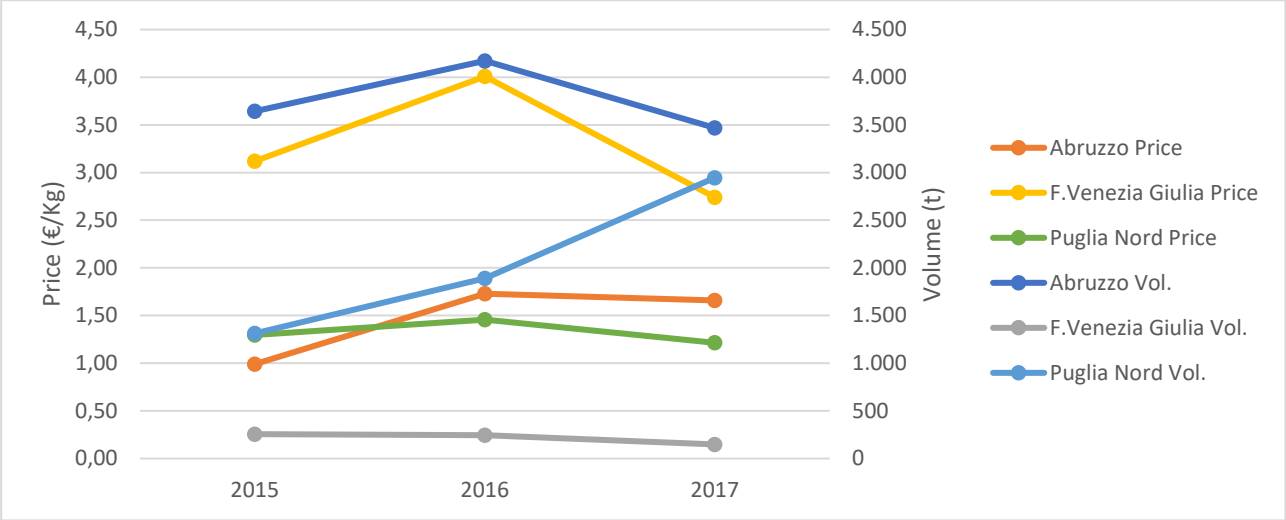


Figure 140: Price and Volume by region - PS

- In the whole considered period, Veneto resulted being the region with the most anchovy fishing by TM. During 2017 in Veneto 7.186t were fished this way. Puglia North and Marche scored almost equally in 2017, but Marche comes from a more aggressive 2016. Emilia-Romagna presents a clear descendant path, starting from 4.966t in 2015 and arriving at 1.408t in 2017.

  During 2017 (not considering Friuli Venezia Giulia due to the very low volume) Veneto has been the most expensive region with an average price of 2,27€/Kg, followed by Puglia North (1,93€/kg), Marche (1,36€/Kg) and Emilia-Romagna (0,86€/Kg).

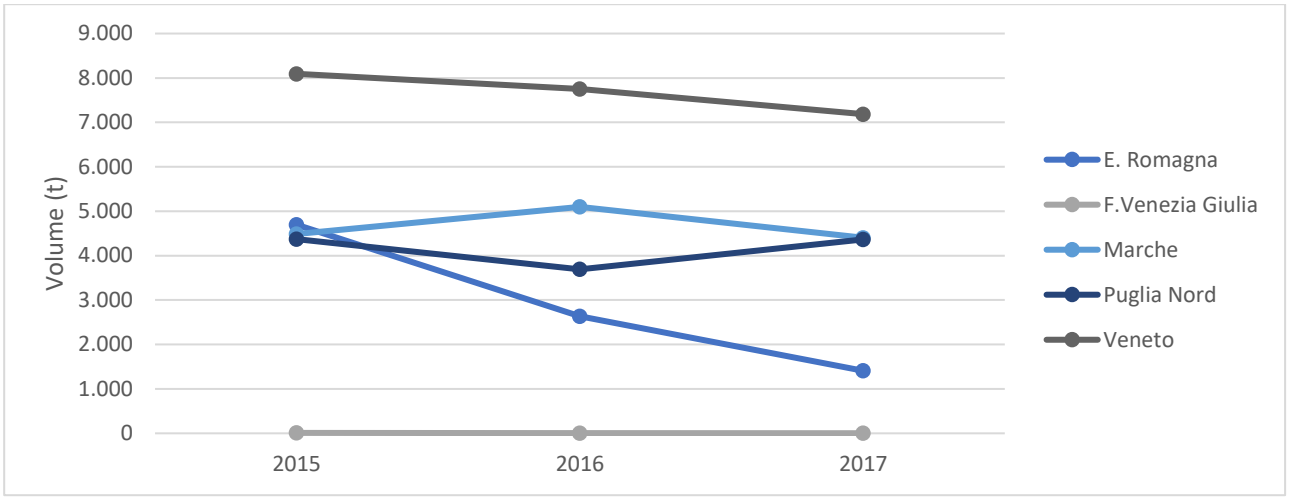


Figure 141: Volume by region - TM

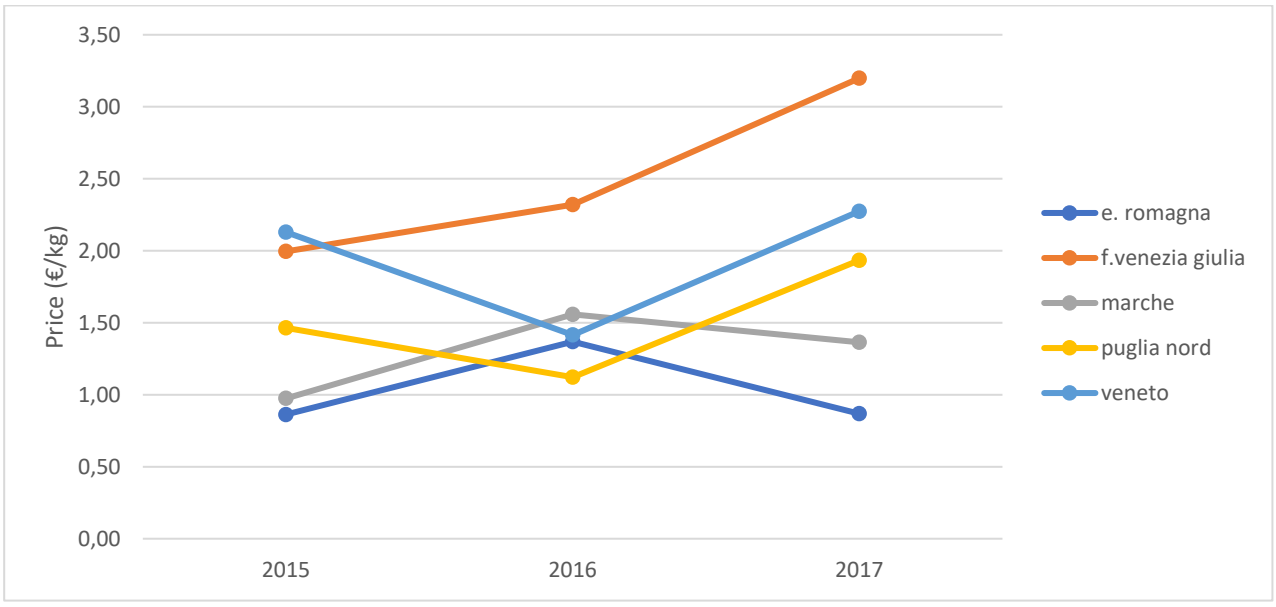


Figure 142: Price by region – TM

- PGP>12 lft is the least detailed method inside the PNRDA dataset. Only data recorded are for Emilia Romagna on 2016, when 50,1t were fished at 1,79€/Kg.

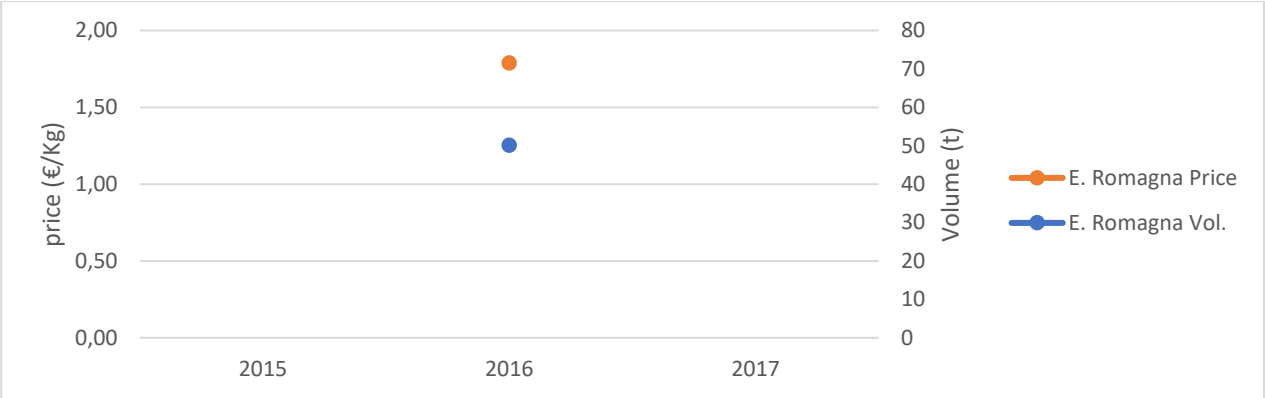


Figure 143: Price and Volume by region - PGP>12 lft

- PGP<12lft is only recorded in Veneto for 2016 and 2017. Volume decreased from 0,23t to 0,09t while price went up from 1,39€/Kg to 2,58€/Kg.

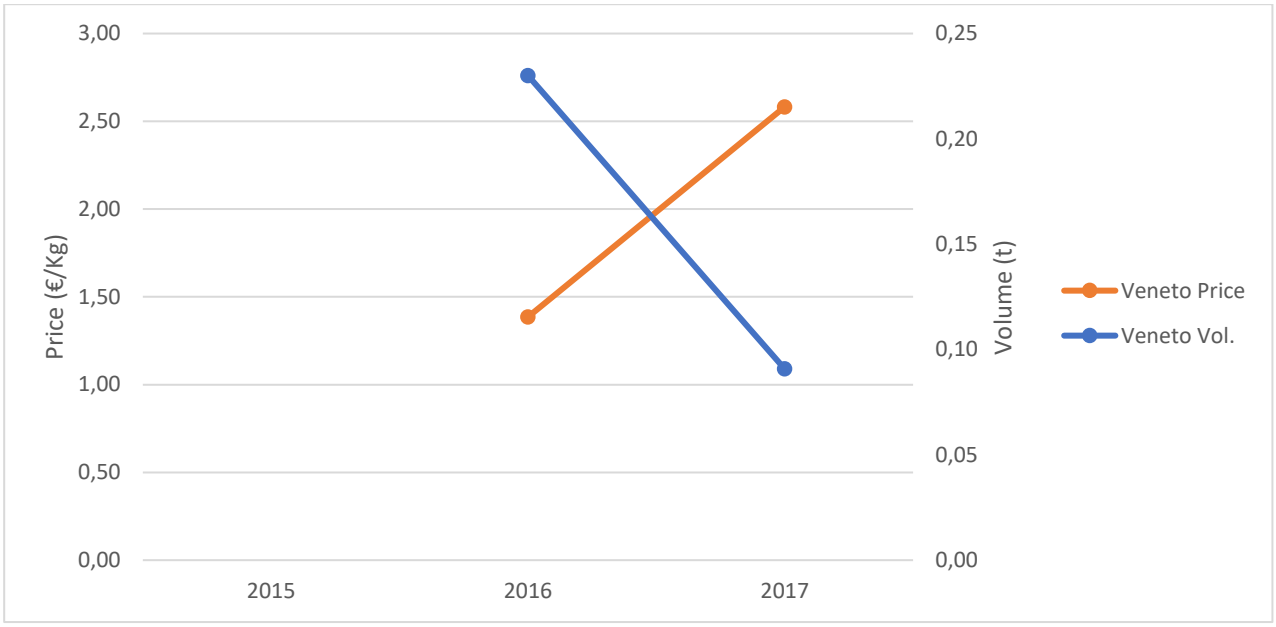


Figure 144: Price and Volume by region - PGP<12

4.3 COMMON CUTTLEFISH

By regional point of view

Cuttlefish is fished in all the considered regions. The most productive are Veneto and Puglia Nord which both produced over 1.000t during 2017.

Veneto is experiencing a slow decline in volume (and a slow increase in price) from 1.658t (2015, at 6,62€/Kg) to 1.237t (2017, at 7,78€/Kg), which makes of it the second cuttlefish fishing area in Adriatic Italy during 2017.

Northern Puglia made the biggest increase during 2016-2017, passing in only one year from 970t to 1.618t.

Marche is the third region for cuttlefish importance, with a descendant volume trend, followed by Emilia-Romagna, Friuli Venezia Giulia, Molise and Abruzzo.

Speaking about price, 2017 presented a significative convergence on values around 9,82-10,15€/Kg, with four regions within this small range (Veneto and Northern Puglia excluded, both cheaper). The most sensible price movement has been the one from Northern Puglia, which decreased from 9,86€/Kg to 6,82€/Kg.

Table 53: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	109	97	55	9,96	10,96	11,40
∑ E.Romagna	342	336	324	8,36	9,11	9,82
∑ F.V.Giulia	330	285	221	6,79	7,79	10,15
∑ Marche	744	675	533	7,76	8,51	10,01
∑ Molise	110	110	82	8,37	7,96	9,93

∑ Puglia Nord	879	970	1.618	10,39	9,86	6,82
∑ Veneto	1.658	1.473	1.237	6,62	7,37	7,78

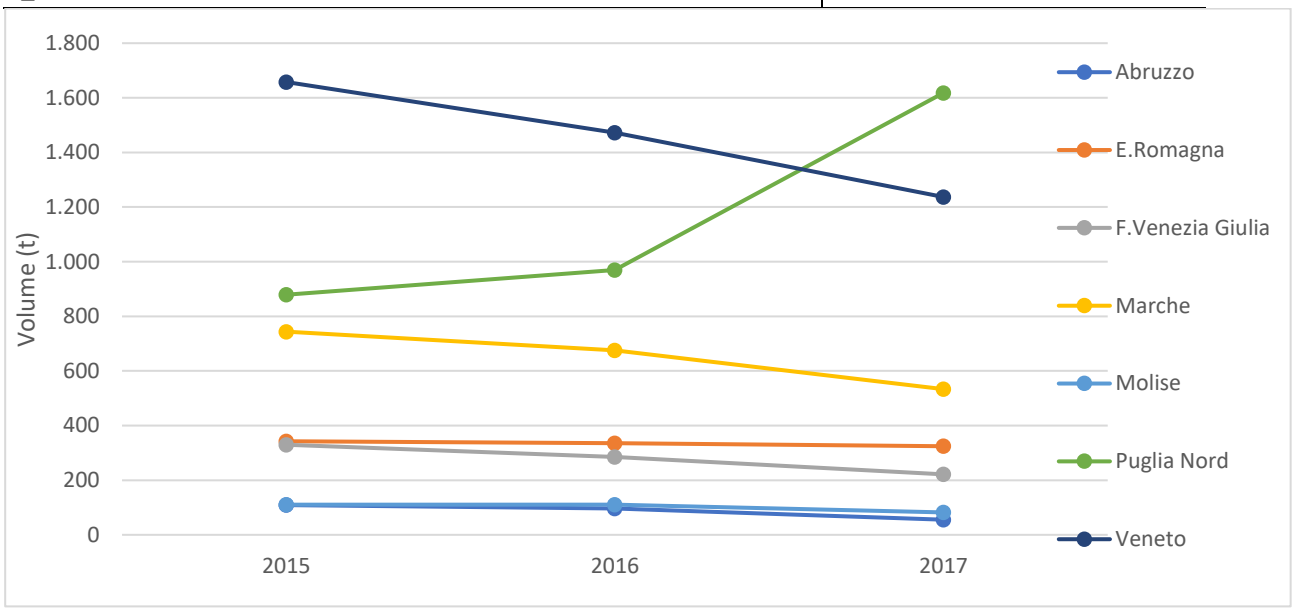


Figure 145: Cuttlefish Volume by region

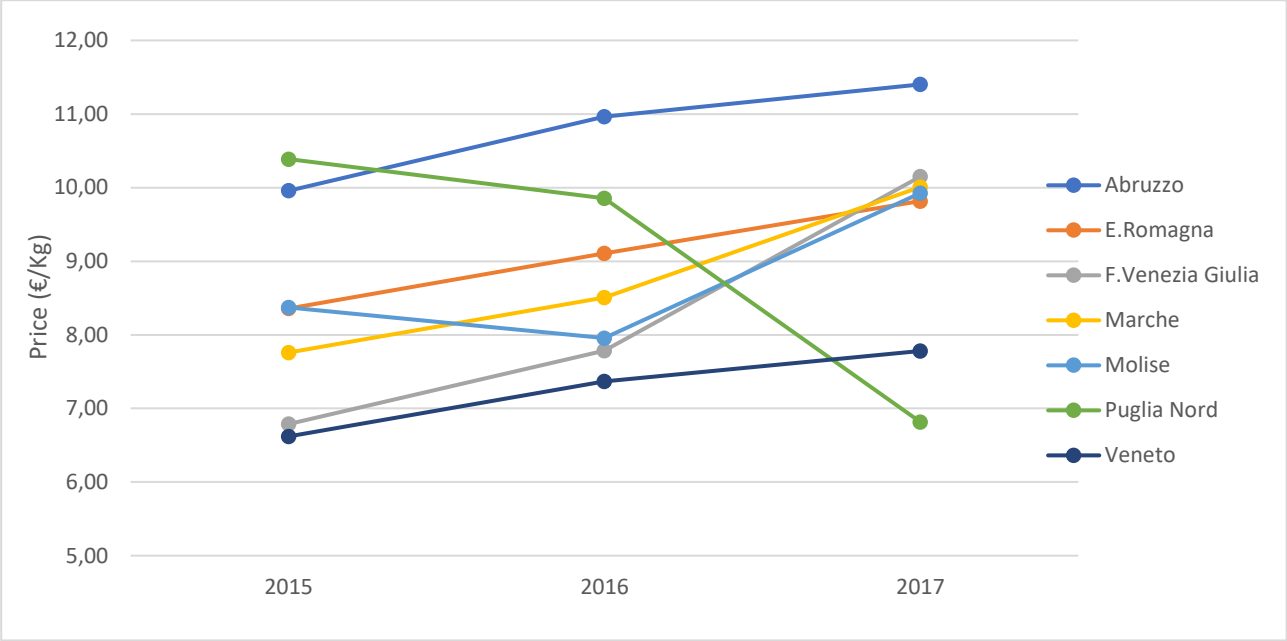


Figure 146: Cuttlefish average Price by region

- Abruzzo halved its production between 2015 and 2017. Until 2016 DTS was the only relevant fishing method, as it occupied the 88% of total volume. Its fall in 2017 explains the regional reduction.
  Price of cuttlefish fished by PGP<12 became cheaper than DTS in 2016, at the same time as a small increase in PGP<12 activity.

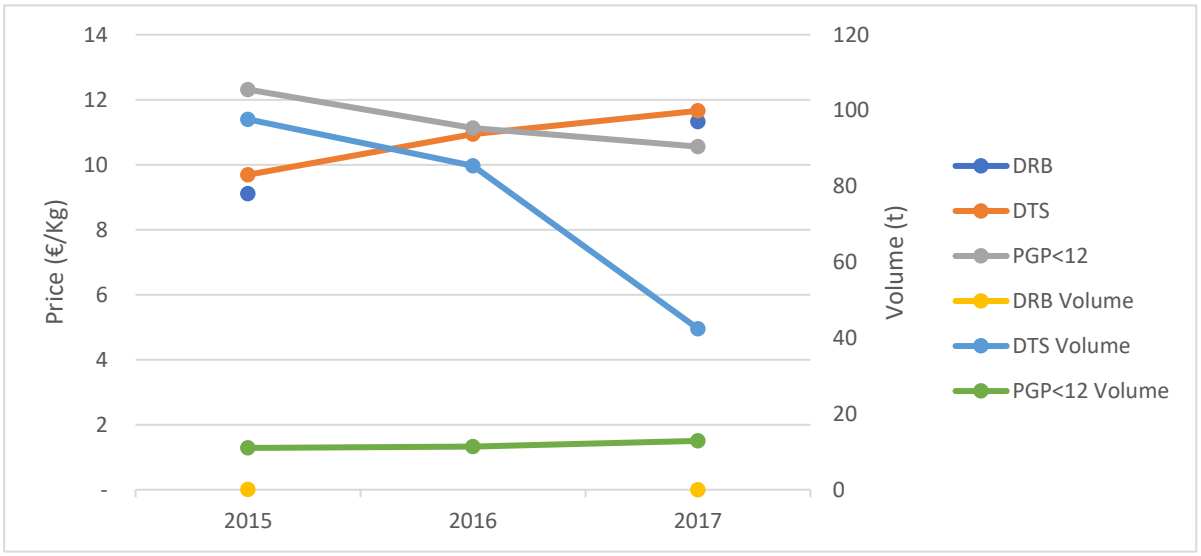


Figure 147: Price and Volume by techniques - Abruzzo – PNRDA

- Emilia-Romagna had a quite stable volume level in the past years, losing 20t from 2015 to 2017. The most important fishing technique is PGP<12 (slightly growing), followed by DTS (slightly downward) and TBB.
  For the first two prices followed a growing path, converging around 10€/Kg in 2017, while TBB maintained itself cheaper, closing 2017 with on average 8,66€/kg.

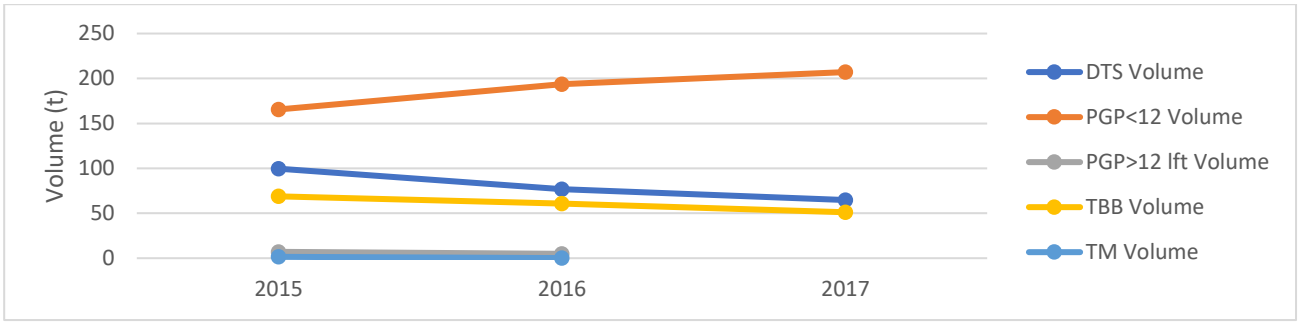


Figure 148: Volume by techniques - Emilia-Romagna – PNRDA

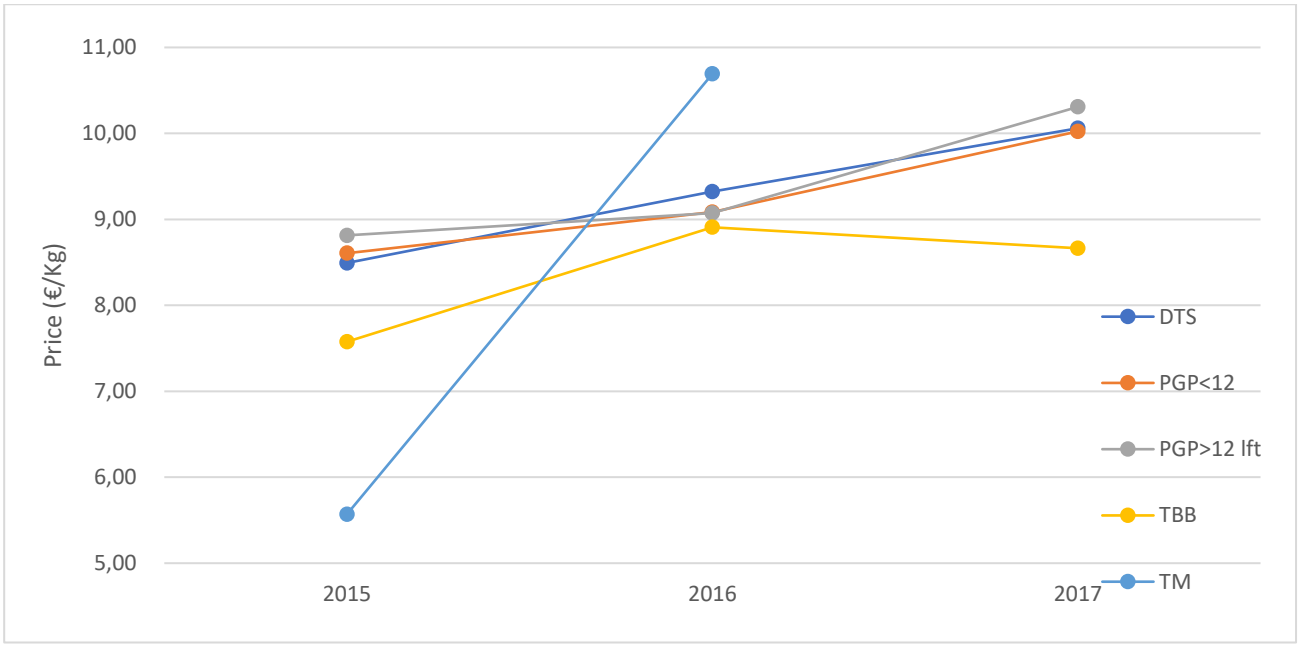


Figure 149: Price by techniques - Emilia-Romagna – PNRDA

- Friuli Venezia Giulia had a sensible decrease in volume during 2015-2017. Its primary technique is PGP<12, followed by DTS (in strong reduction), TBB and (only for 2015-2016) TM.
  The most noticeable and relevant price movement is PGP<12 passing from 7,63€/kg to 10,69€/kg in 2017. In the same year the other prices tended to converge around 8-8,5€/Kg.

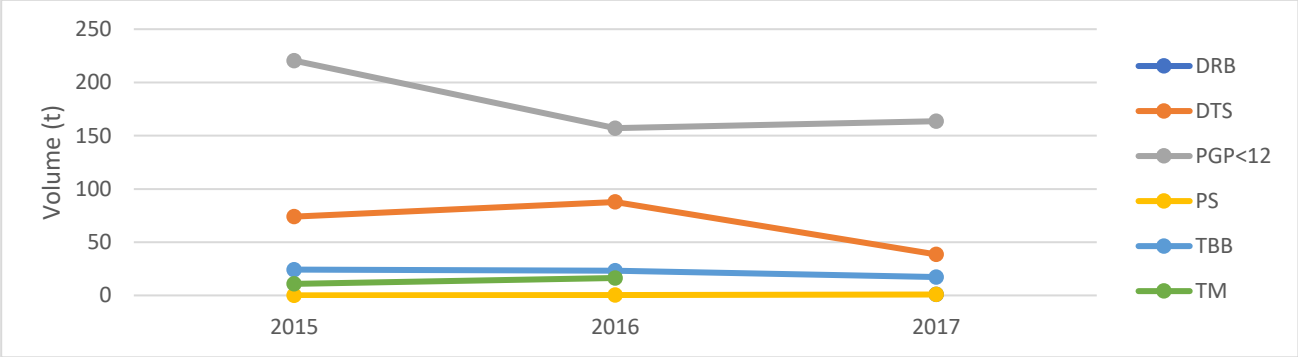


Figure 150: Volume by technique - Friuli Venezia Giulia - PNRDA

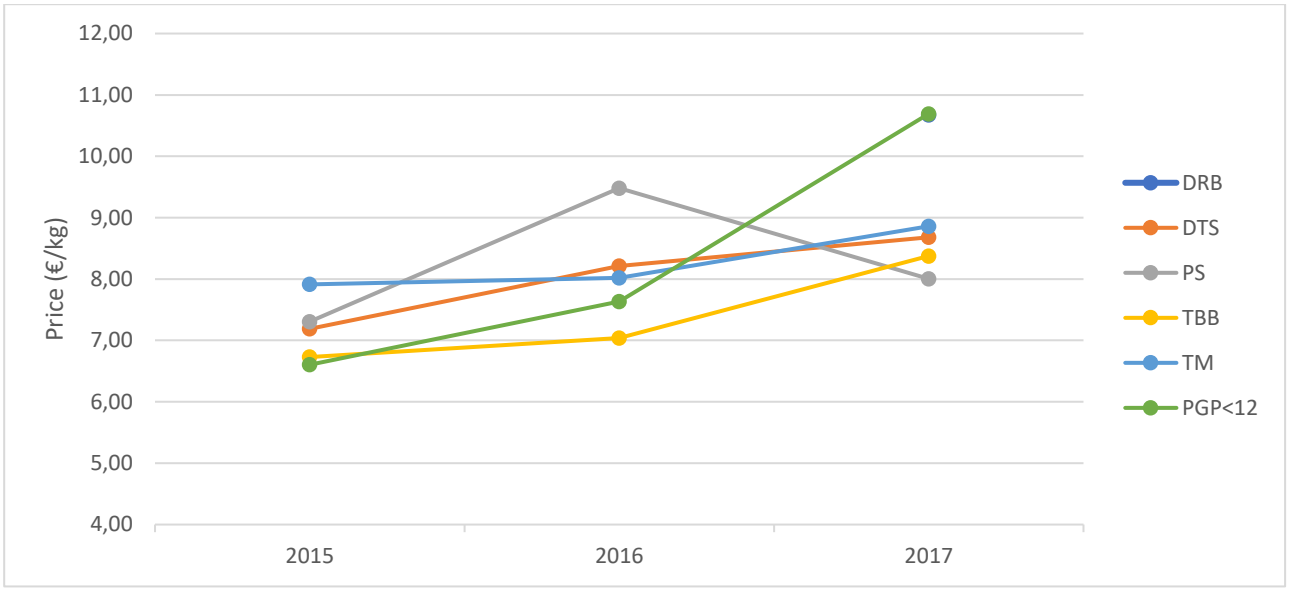


Figure 151: Price by techniques - Friuli Venezia Giulia – PNRDA

- The most important fishing techniques for Marche are PGP<12 and DTS, both in significant volume downturn and price increase.
  On 2017 DTS was the method with the highest price (10,90€/Kg), while PGP<12 was at 9,58€/Kg.
  TBB is less relevant in volumes, but maintained a solid 29,5t/year minimum. Its price went up from 6,72€/kg (2015) to 9,67€/Kg (2017).

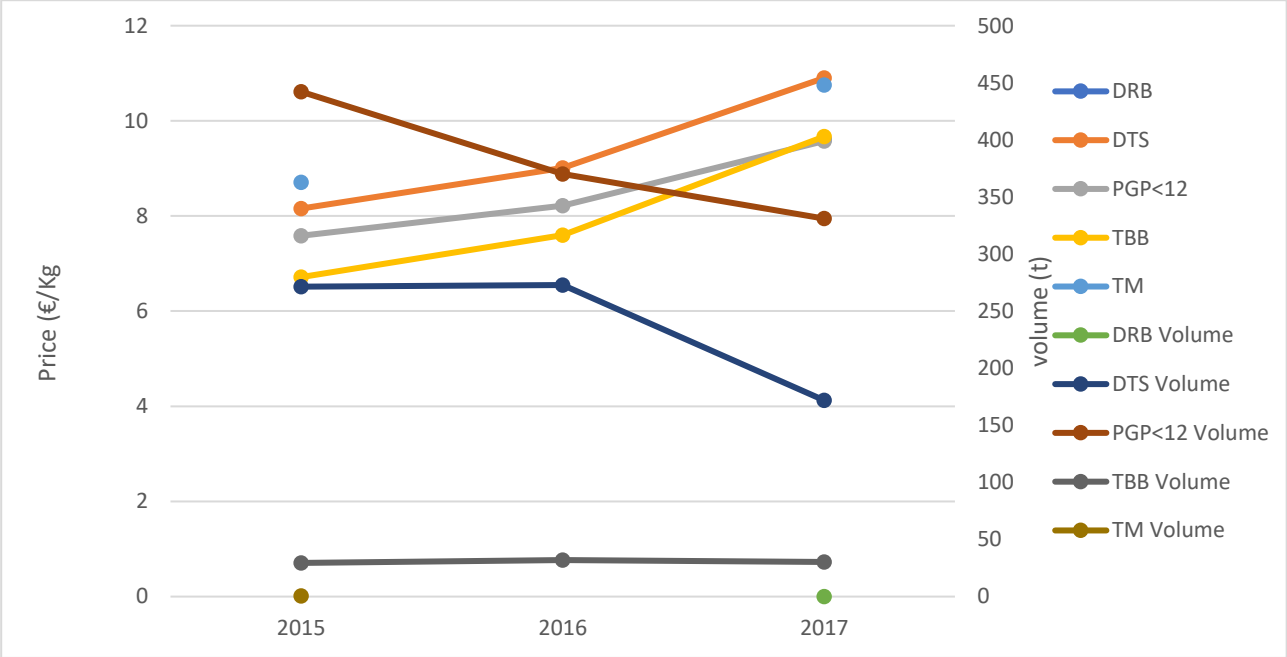


Figure 152: Price and Volume by techniques - Marche – PNRDA

- For Molise, data shows that price for the only two practiced techniques moved in the same direction, while oppositely DTS Volume crashed in 2017 (-43,5t) and PGP<12 grew 15,5t.

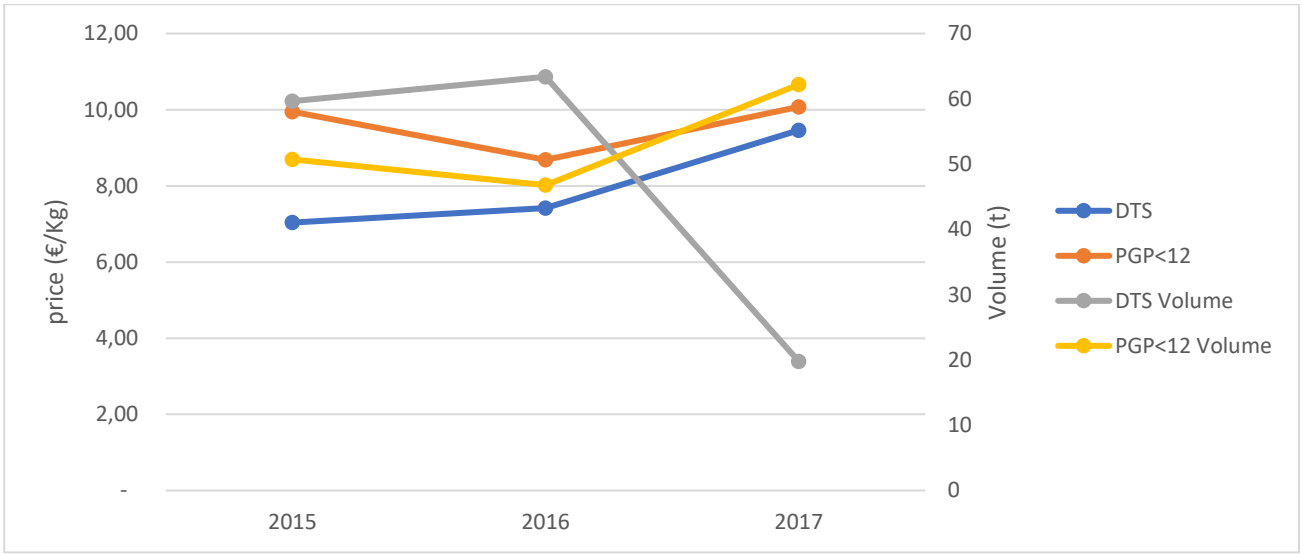


Figure 153: Price and Volume by techniques - Molise – PNRDA

- Adriatic Puglia represent a particular case among the considered regions: it's the only one that in those three years not only didn't lose volume, but strongly increased. Part of this is explainable with the impressive performance of DTS Volume, that passed from 510t in 2016 to 1.225t in 2017. Contemporary to this, DTS's price decreased from 10,54€/Kg (2016) to 5,84€/kg (2017).
  Until 2016 PGP<12 relevance was close to DTS, but in the following year it lost 168t.

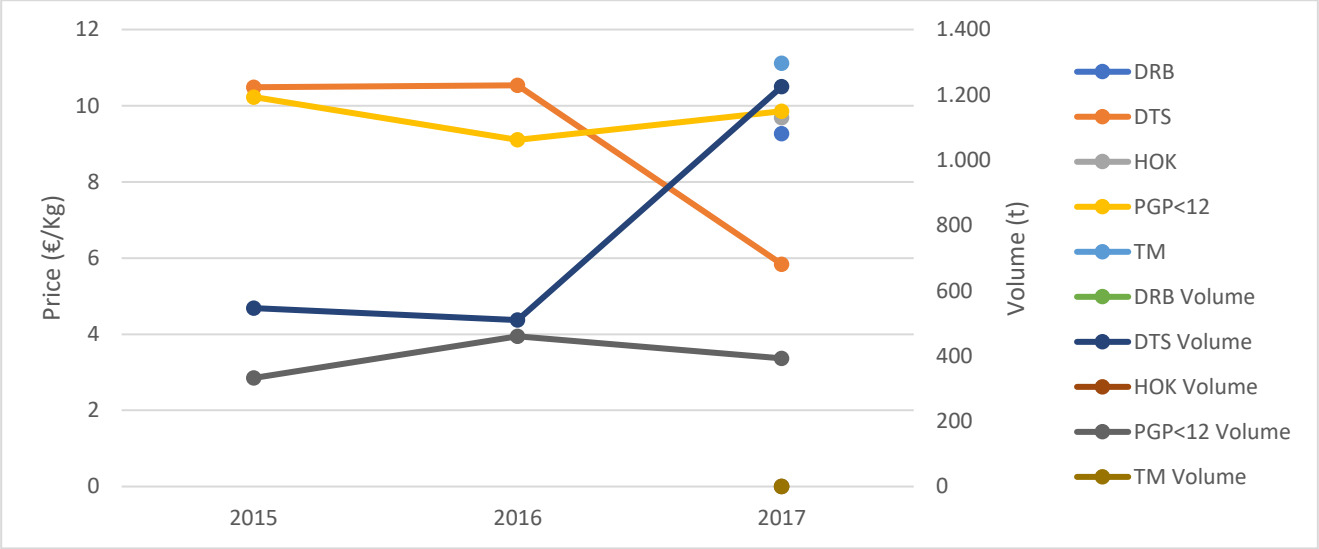


Figure 154: Price and Volume by techniques - Puglia Nord – PNRDA

- In Veneto DTS, TBB and PGP<12 are the used fishing techniques, all of them decreased their volume, the first in a more accentuated manner.
  In 2017 between those PGP<12 has been the most expensive (9,33€/kg), then DTS (7,76€/Kg) and TBB (6,57€/kg).

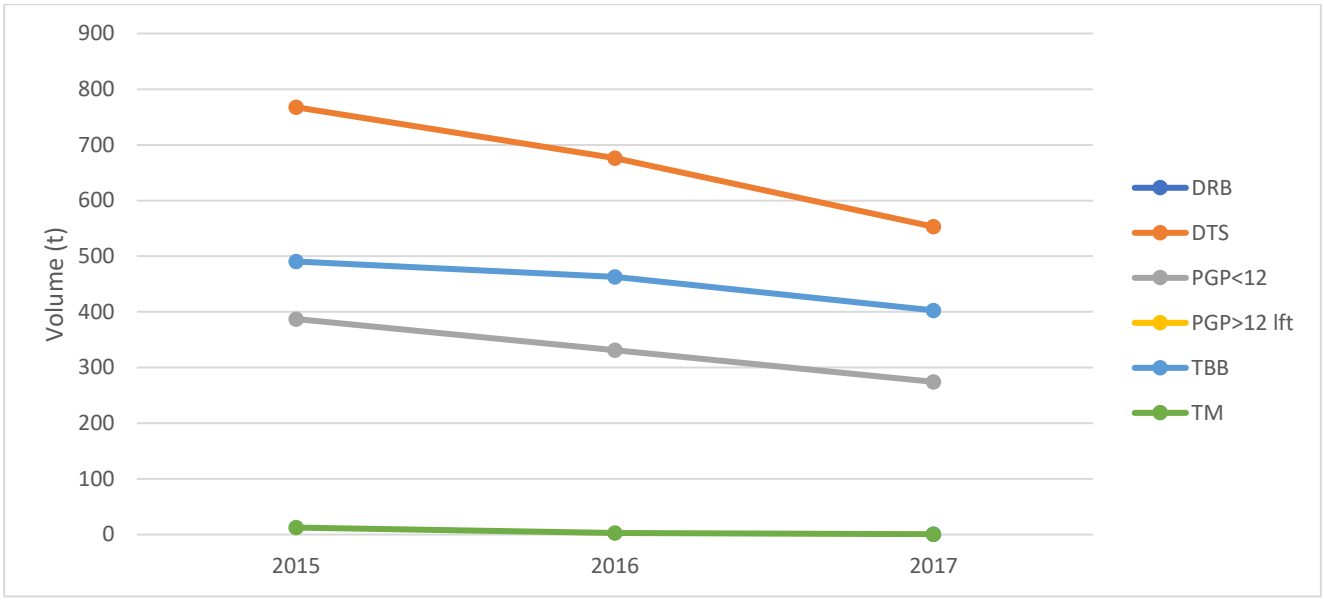


Figure 155: Volume by techniques - Veneto - PNRDA

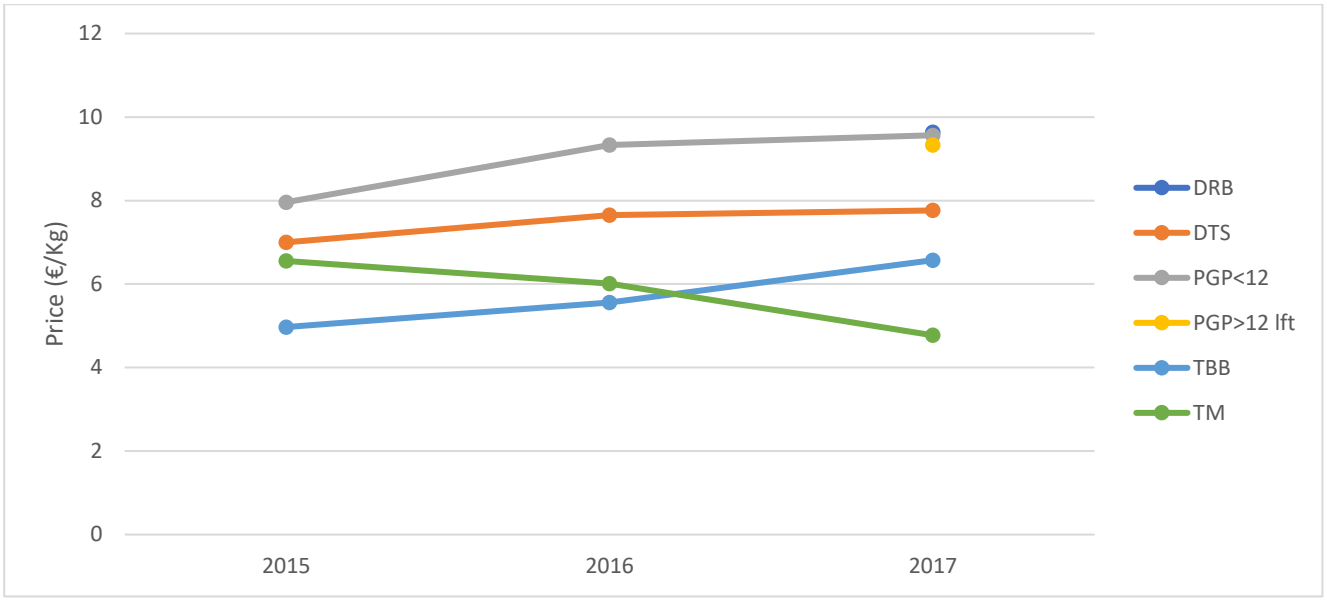


Figure 156: Price by techniques - Veneto - PNRDA

By fishing techniques point of view

The division of the total fished volume by technique didn't present any change in the three considered years. Their share remained almost stable.

The most (52,6% in 2017) has been fished by DTS, with a small increase, then 36% by PGP<12. Less relevant is the 11,2% by TBB and the contribute of TM, PS and PGP>12 lft.

Analysing the price movements, 2016 has been a year of general increase. During 2017, among relevant techniques for volume, DTS strongly cut its price, while PGP<12 increased of more than 10%.

Amid secondaries, TBB, DRB and PGP>12 lft increased their cost, while PS, DTS and TM's has been cut.

Table 54: Average Price and total Volume fished by technique, including all regions – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DRB	0,09	0	1,3	9,11		10,39
∑ DTS	1.917	1.772	2.115	8,38	8,94	7,08
∑ PGP<12	1.609	1.570	1.444	7,80	8,79	9,87
∑ PGP>12 lft	7	4,8	7,5	8,81	9,07	9,52
∑ PS	0,09	0,4	0,87	7,31	9,48	8,00
∑ TBB	613	578	450	5,42	6,08	7,03
∑ TM	26	19	0,73	7,13	7,73	5,87

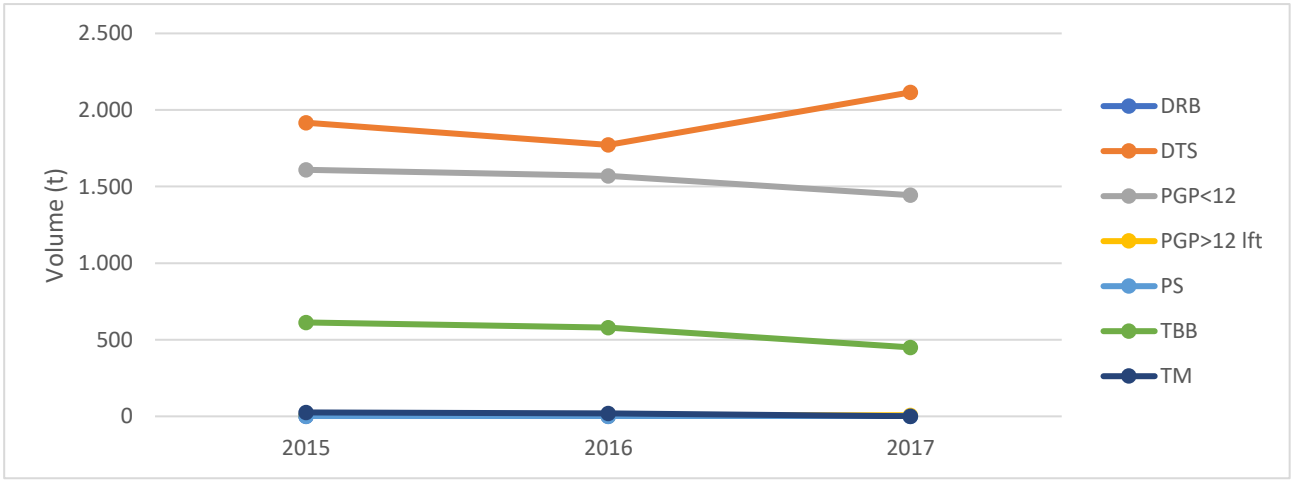


Figure 157: Cuttlefish Volume by technique - PNRDA

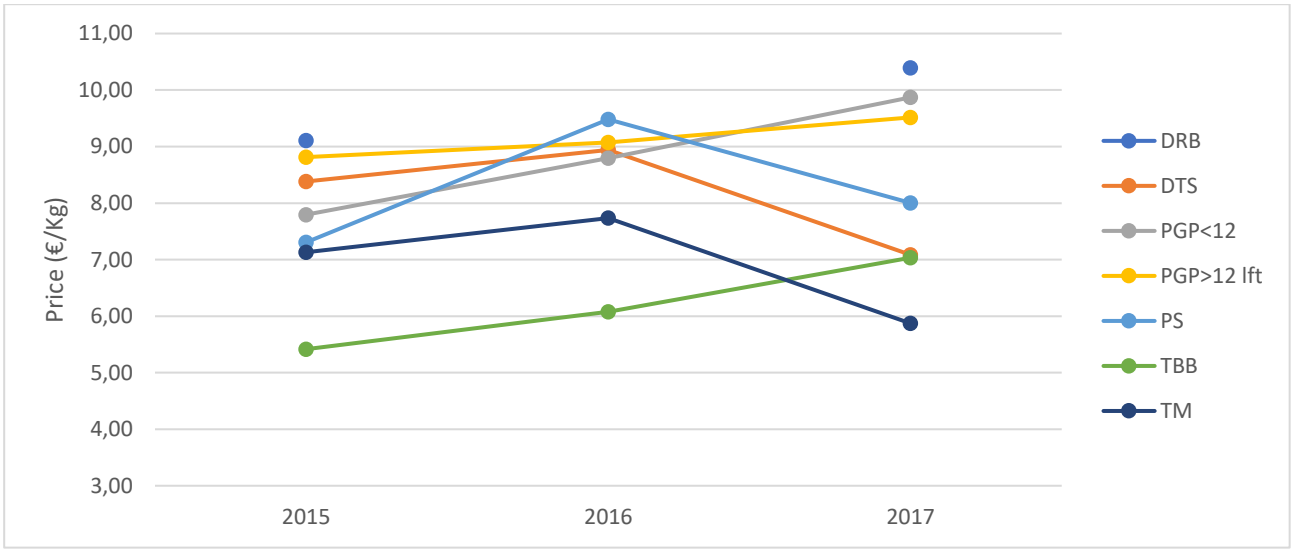


Figure 158: Cuttlefish average Price by technique - PNRDA

- DRB is not well documented as other fishing techniques. Data are discontinuous and drive the low importance of this method. The highest value is Friuli Venezia Giulia in 2017 who collected 1t at 10,67€/kg.

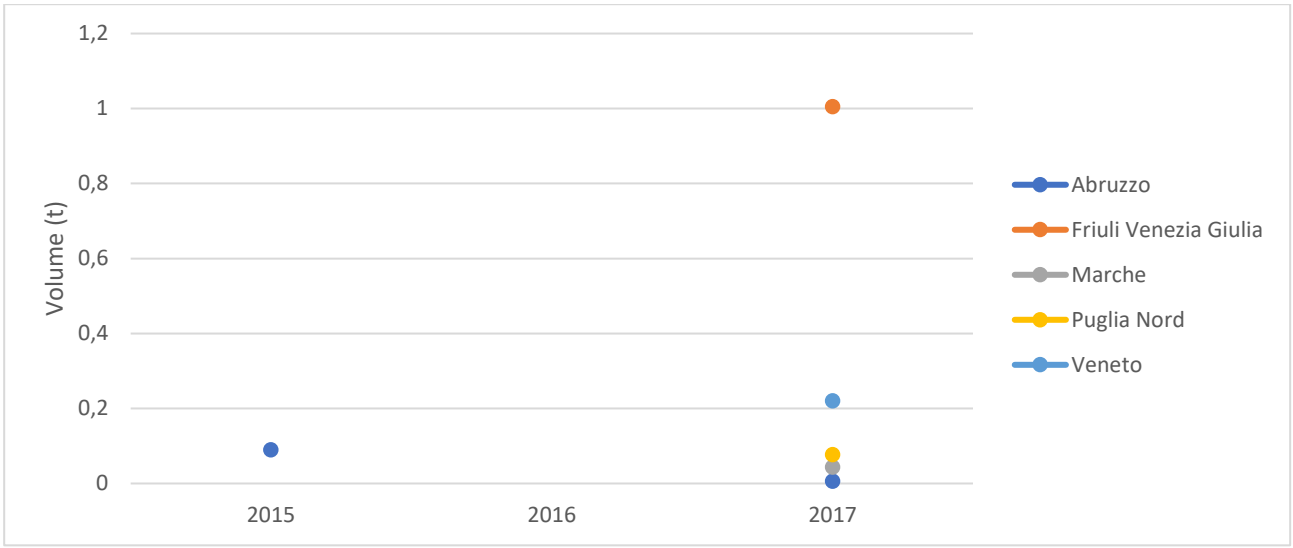


Figure 159: Volume by region - DRB - PNRDA

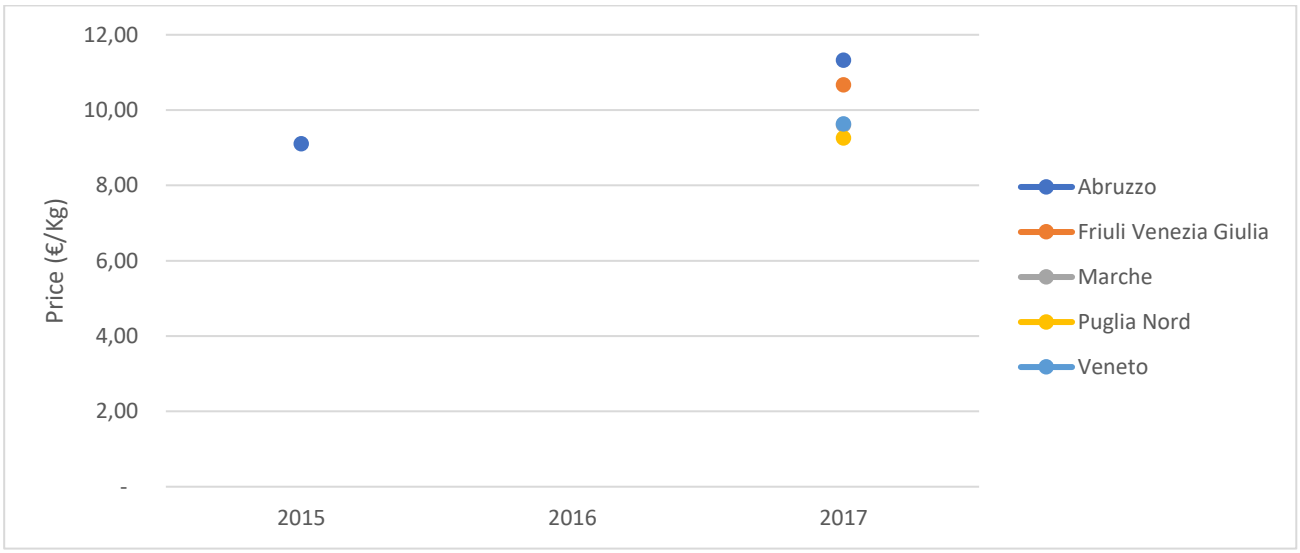


Figure 160: Price by region - DRB – PNRDA

- DTS is the most important fishing technique in the considered years.
  As already seen, the most relevant region in 2017 has been Puglia Nord. Veneto lost its dominance and continues its slow descendant trend, followed by Marche. Among other regions Emilia-Romagna provided in 2017 provided 64,7t.

  All the regions followed a price growing path, apart from Puglia Nord which in 2017 became the cheapest region, followed by Veneto at 7,76€/kg.

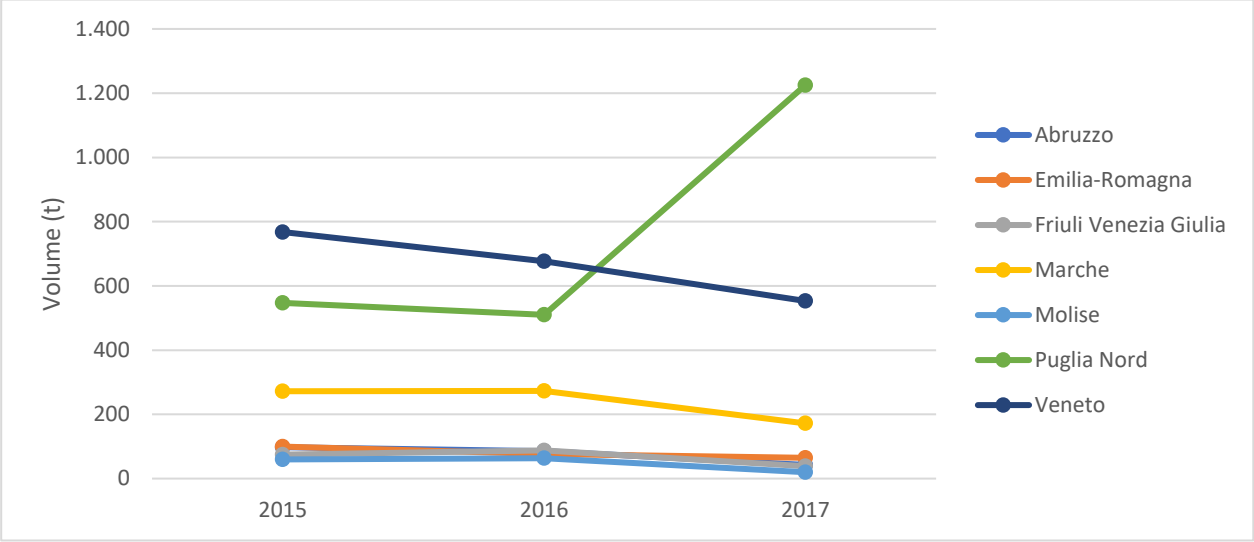


Figure 161: Volume by region – DTS - PNRDA

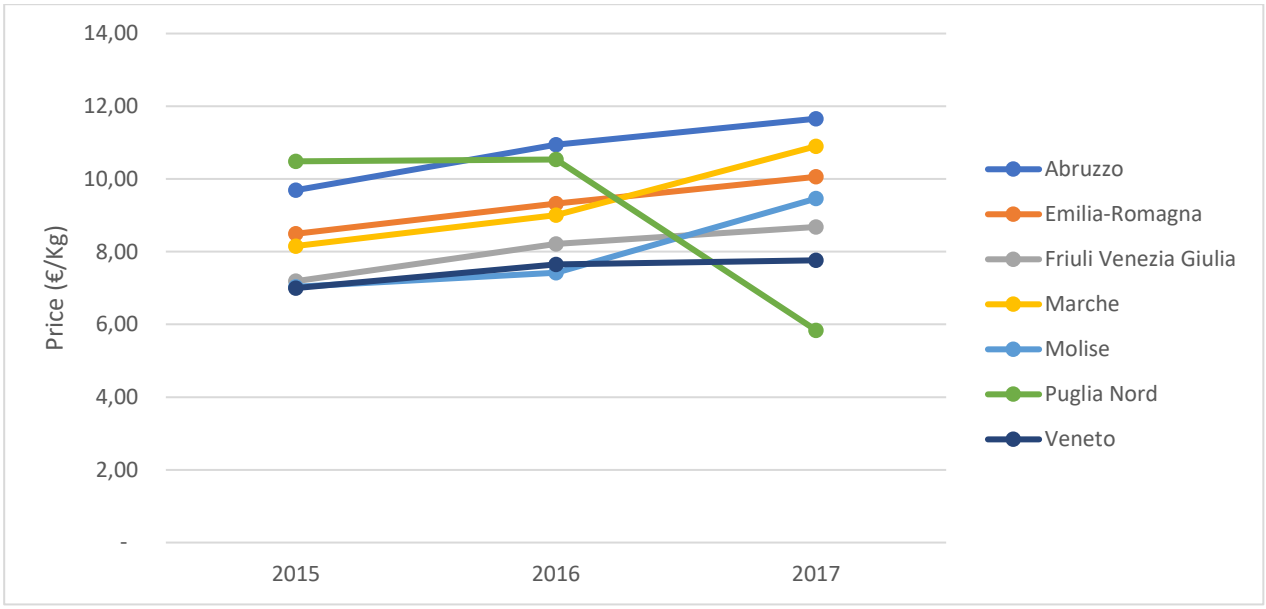


Figure 162: Price by region - DTS – PNRDA

- PGP<12 is the second fishing technique by volume relevance in Adriatic Italy.
  The highest volume in one of the considered years are the 460t fished in 2016 by Puglia Nord (about which no data are available for 2017). On 2016 the second most important region has been Marche (which, too, doesn't present data for 2017).
  Veneto is in a decreasing trend, that brought from 387t in 2015 to 274t in 2017.
  After those three, in volume order are to be mentioned Emilia-Romagna, Friuli Venezia Giulia, Molise and Abruzzo.
  Price chart shows a price convergence ongoing. Starting from a fragmented situation, on 2017 all the prices were compressed into a range of only 1,13€/kg.

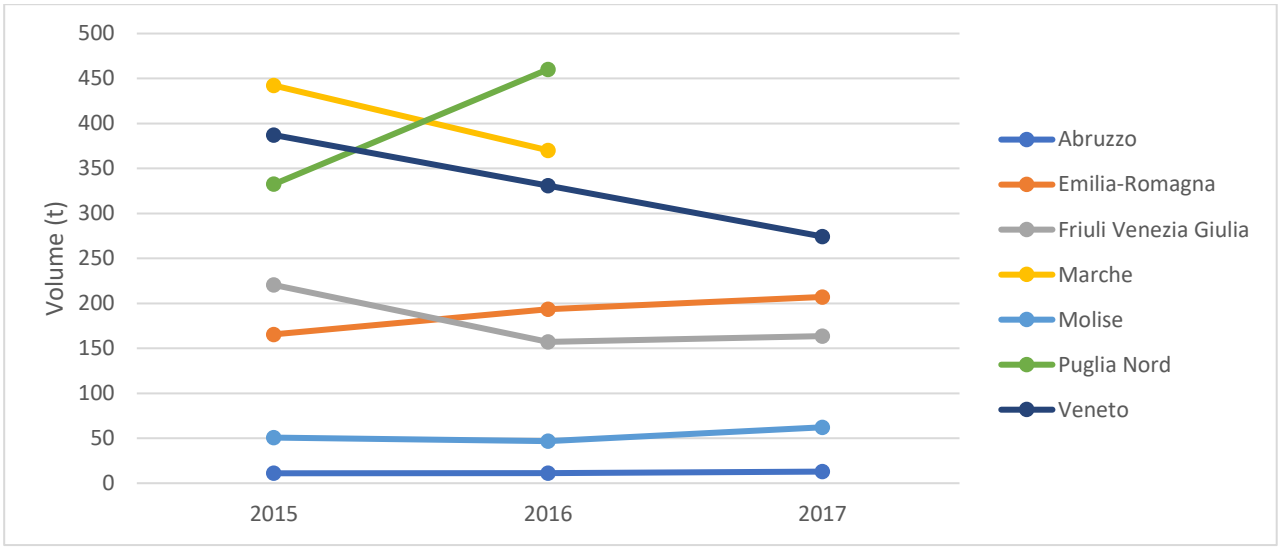


Figure 163: Volume by region - PGP<12 - PNRDA

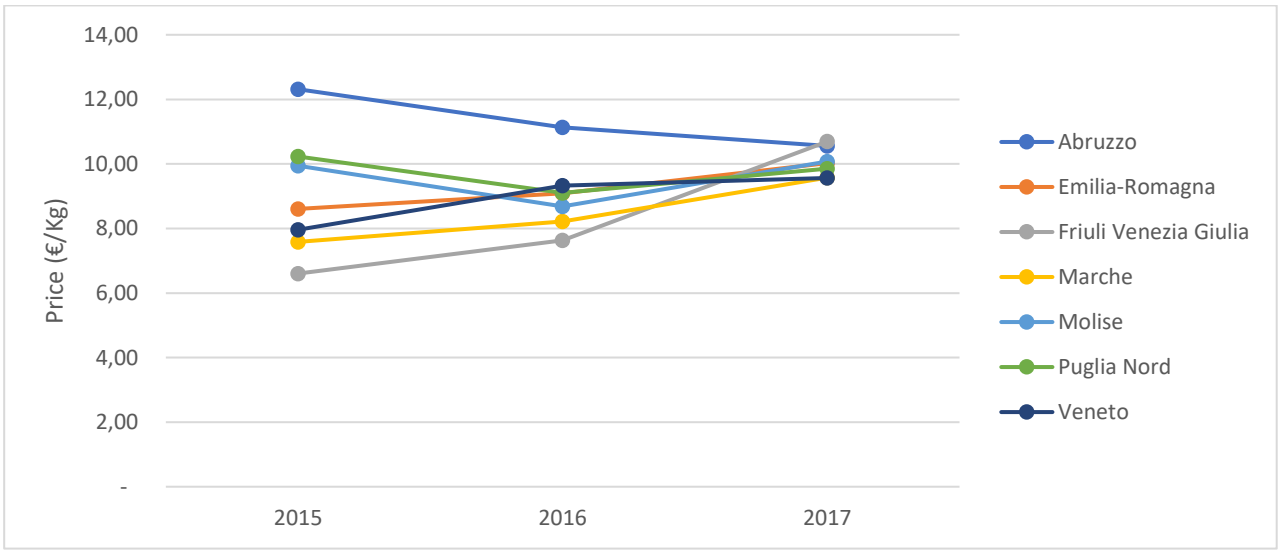


Figure 164: Price by region - PGP<12 – PNRDA

- Fishing on PGP>12 lft is practiced only in Emilia-Romagna and Veneto.
  Data from Veneto are reported only for 2017, showing a production of 6,1t at 9,33€/Kg. Emilia-Romagna is following a heavy decreasing path (1,4t fished in 2017), while its price is mirrorly increasing (far more expensive than Veneto).

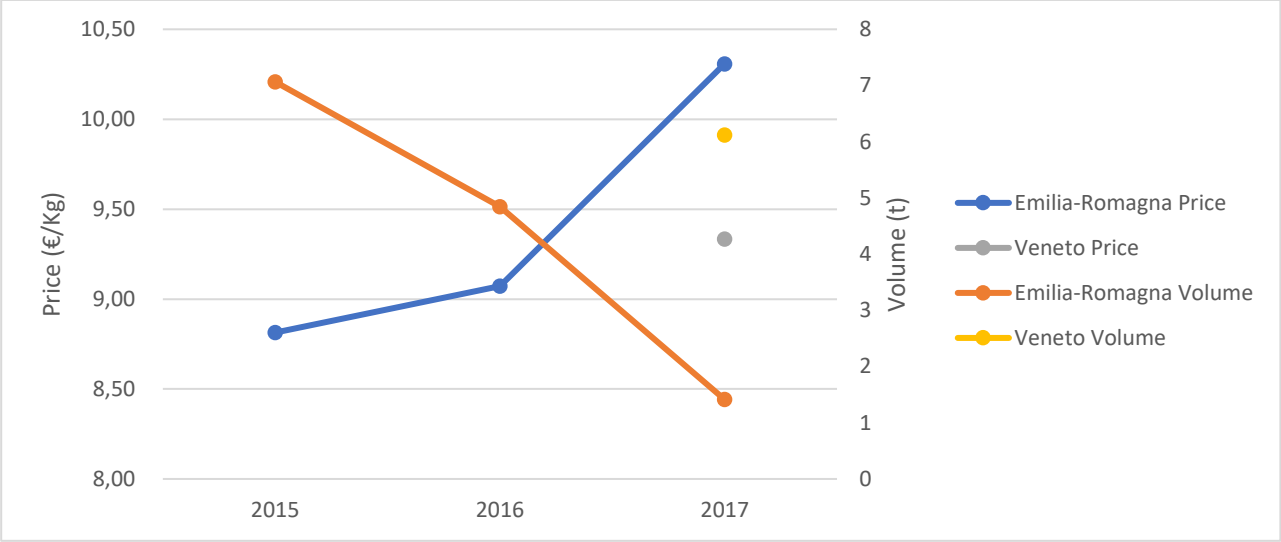


Figure 165: Volume and Price - PGP>12 lft – PNRDA

- Only Friuli Venezia Giulia has a cuttlefish fishing industry by PS. Its volume started in 2015 with only 89 Kg (at 7,31€/Kg) and sharply moved to 0,87t in 2017 (at 8,01€/Kg).

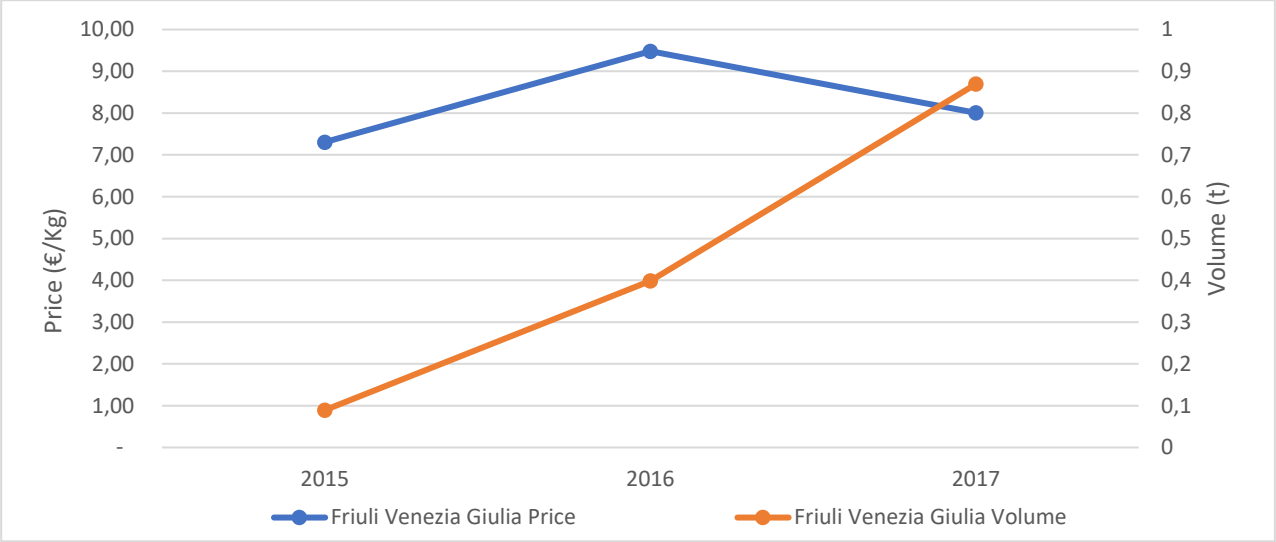


Figure 166: Volume and Price by region - PS - PNRDA

- By order of importance, TBB is the third method. Veneto is the region where it's more strongly practiced, even if in slow decrease. On 2017 Veneto produced 402,7t of cuttlefish, followed far below by Emilia-Romagna (51,1t), Marche (30,3t) and Friuli Venezia Giulia (17t).
  Speaking about price, on 2017 Marche made an upward movement that defined itself as the most expensive region with 9,67€/kg, chased by Emilia-Romagna at 8,66€/Kg, Friuli Venezia Giulia 8,38€/kg and Veneto 6,57€/kg.

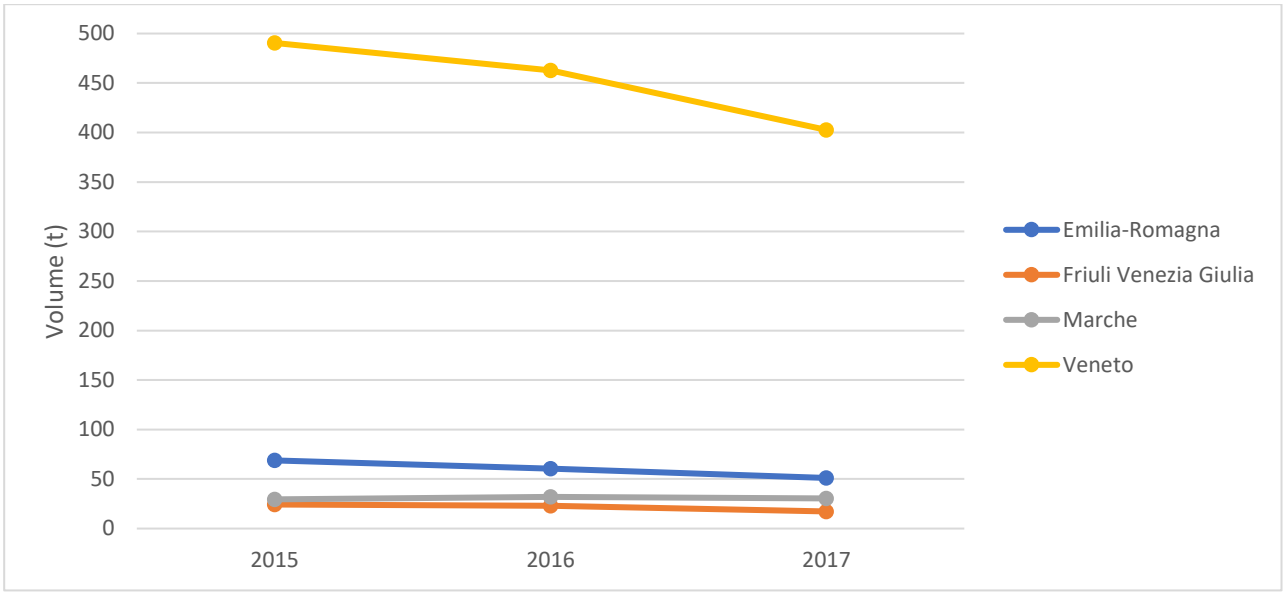


Figure 167: Volume by region – TBB – PNRDA

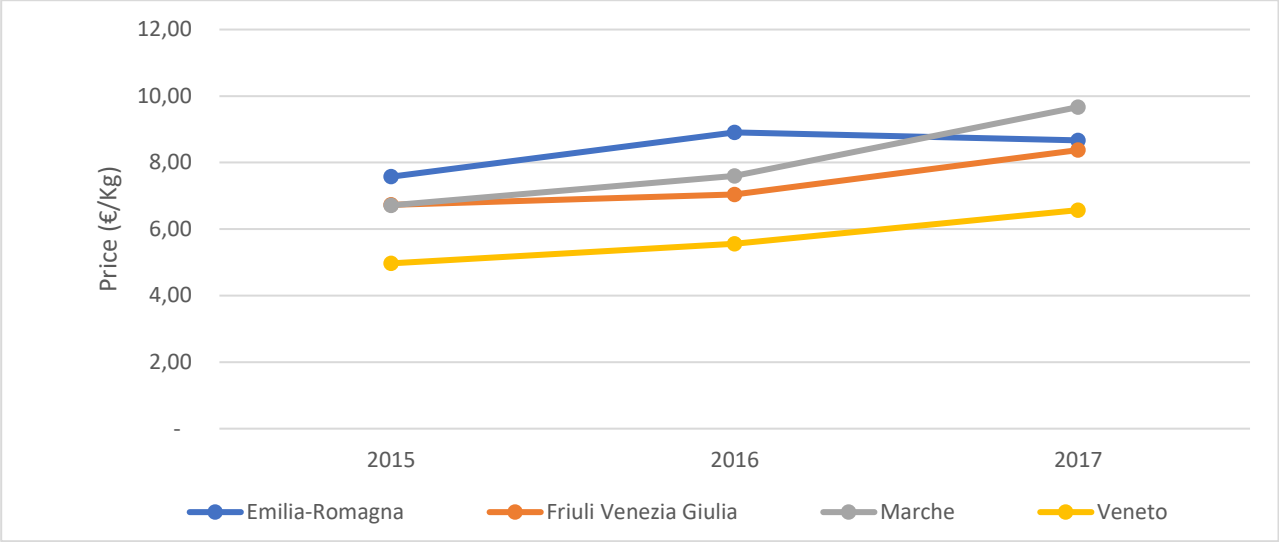


Figure 168: Price by region - TBB – PNRDA

- Fishing by TM presented a strong stop in 2017. Friuli Venezia Giulia practically wiped out its production, passing from 16,3t in 2016 to 55kg in 2017. Even Veneto attested itself at 580Kg on 2017, after having fished more than 12t in 2015.
  Those crashes are not accompanied by relevant or explaining moves in price.

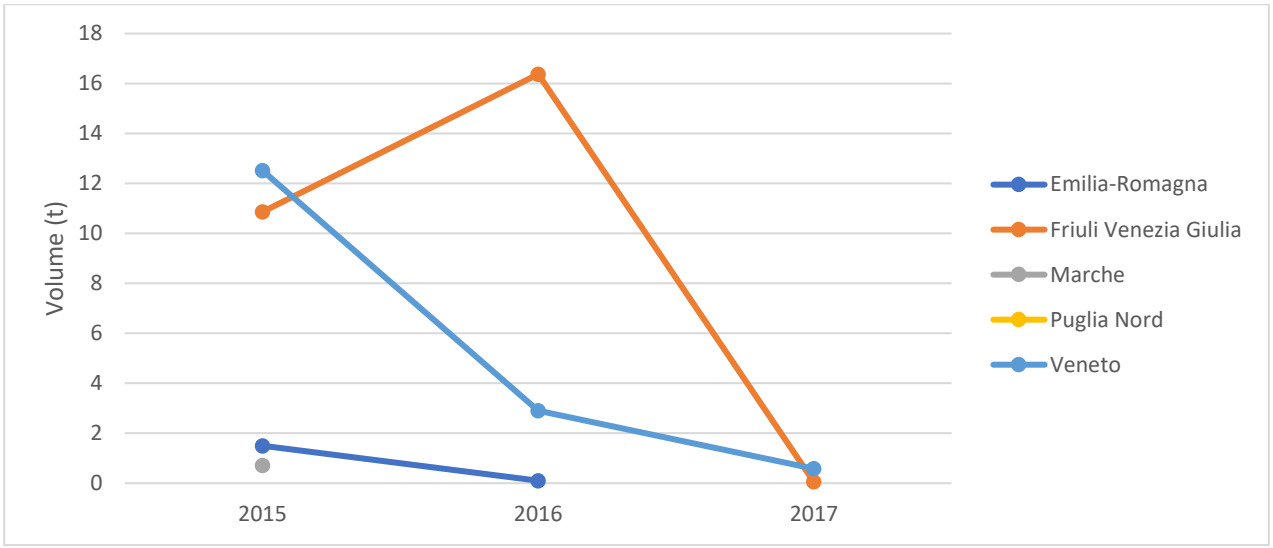


Figure 169: Volume by region – TM - PNRDA

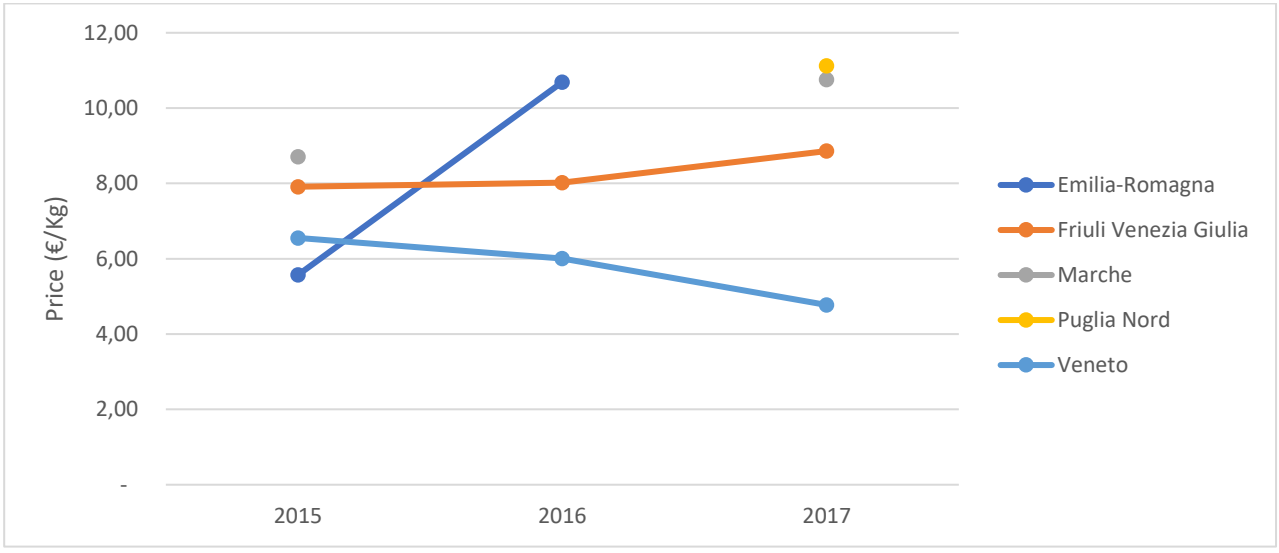


Figure 170: Price by region - TM - PNRDA

4.4 DEEP WATER ROSE SHRIMP

By regional point of view

The Adriatic fishing of Deep-Water Rose Shrimp is dominated by Puglia Nord, which produced in 2017 1.109t, far above the 229t of Abruzzo (the second most productive region), the 169t of Molise and the 123t of Marche.

About prices, Marche and Emilia-Romagna are following a growing trend, which led Molise to be the most expensive region with an average price of 7,46€/kg in 2017. Other regions are constant or decreasing: during 2017 Marche was at 6,24€/Kg, Puglia 4,99€/Kg and Abruzzo 4,64€/Kg.

Table 55: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	148	215	229	5,75	4,90	4,64
∑ E.Romagna		0,016	0,78		3,93	6,09
∑ F.V.Giulia						
∑ Marche	130	113	123	6,84	6,34	6,24
∑ Molise		143	169		4,84	7,46
∑ Puglia Nord		996	1.109	5,48	4,60	4,99
∑ Veneto	0,2			10,59		

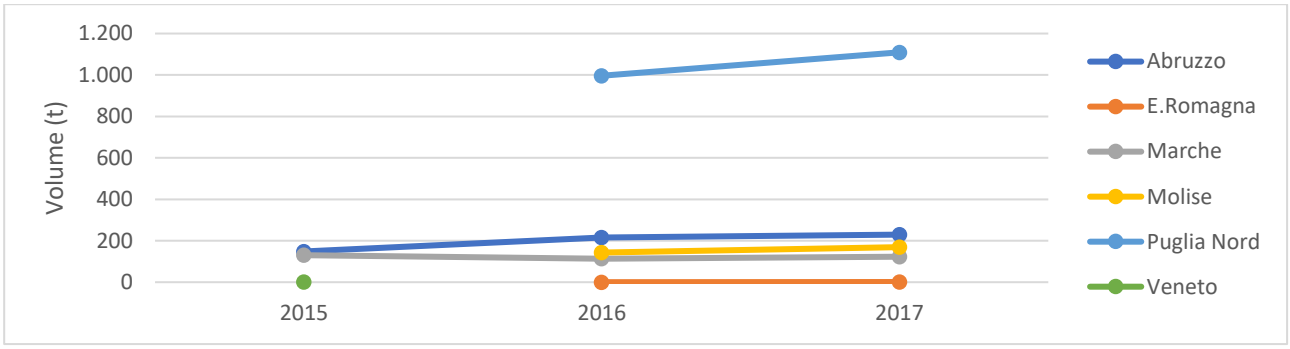


Figure 171: Deep Water Rose Shrimp Volume by region - PNRDA

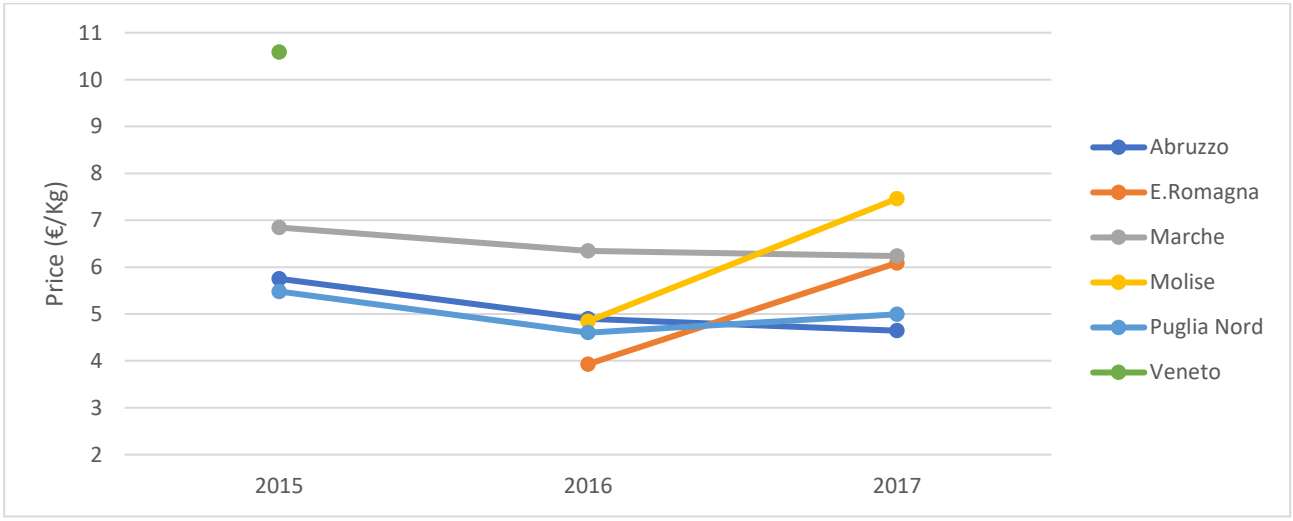


Figure 172: Deep Water Rose Shrimp Price by region - PNRDA

- In Abruzzo only two methods are applied: DRB (which only has data for 2017 at very low level) and DTS, which is increasing its volume (148t in 2015 and 229t in 2017).
  Price by DTS fishing followed a descending trend, closing 2017 with an average of 4,64€/kg. DRB price on 2017 was lower, at 3,59€/Kg.

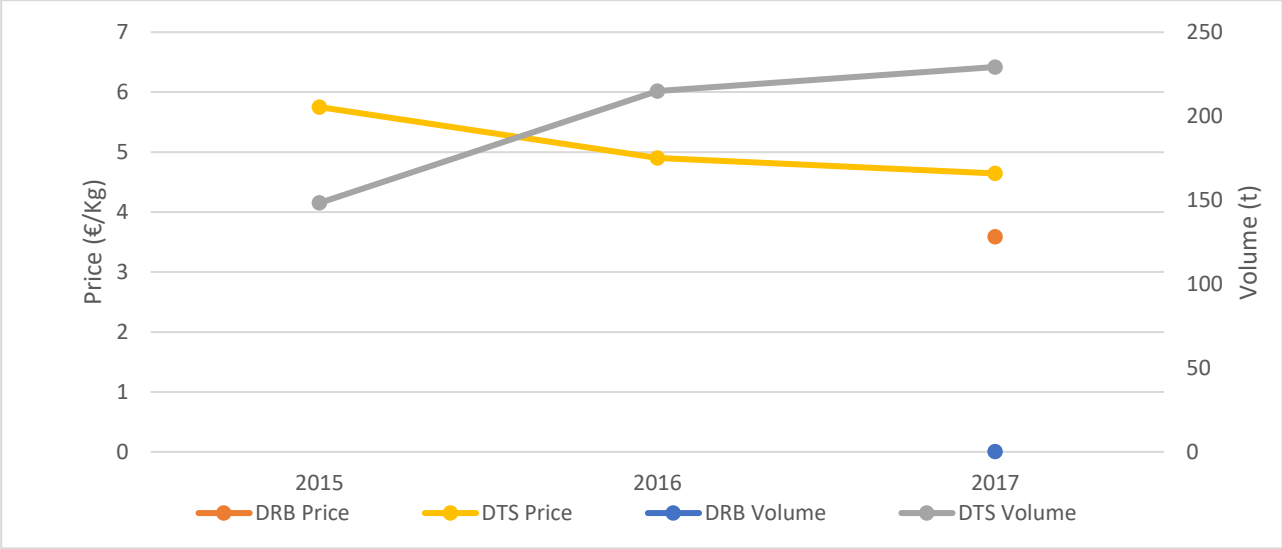


Figure 173: Price and Volume by techniques - Abruzzo – PNRDA

- Emilia-Romagna is reported to have only been fishing Deep Water Rose Shrimp by DTS. If in 2016 its volume was close to nil (16Kg), on 2017 it reached 0,78t (at 6,09€/Kg).

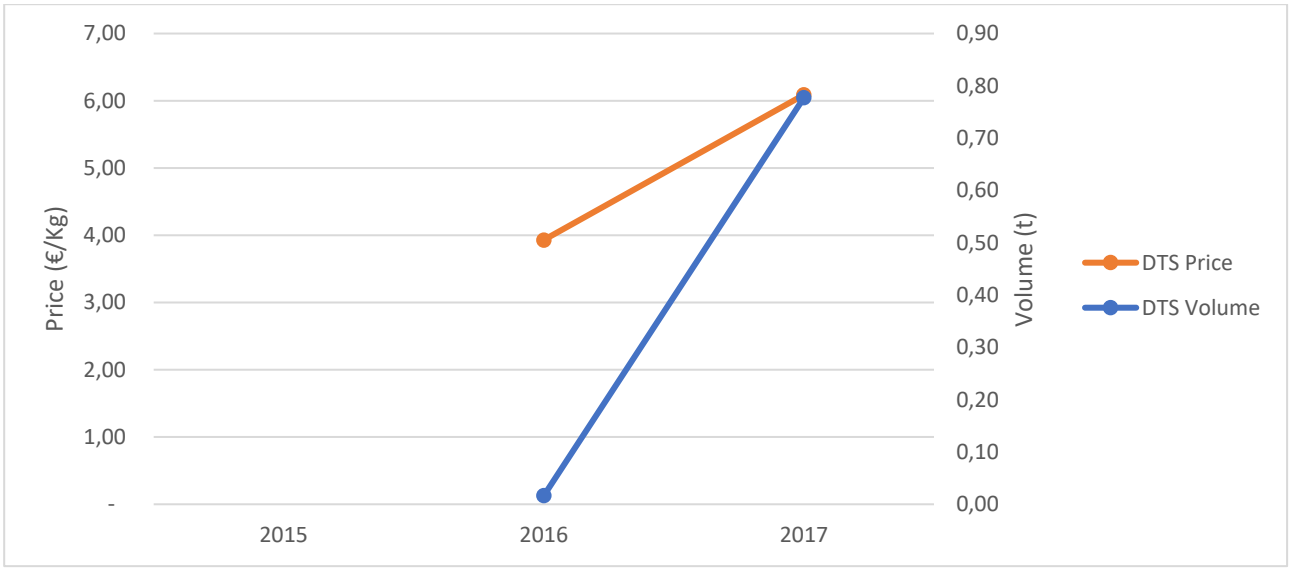


Figure 174: Price and Volume by techniques - Emilia-Romagna - PNRDA

- The only relevant fishing technique in Marche is DTS, which closed 2017 with 122t. Its price is in a slight decrease, but maintained itself over 6,25€/Kg. Other techniques didn't present enough volume to make considerations upon their price.

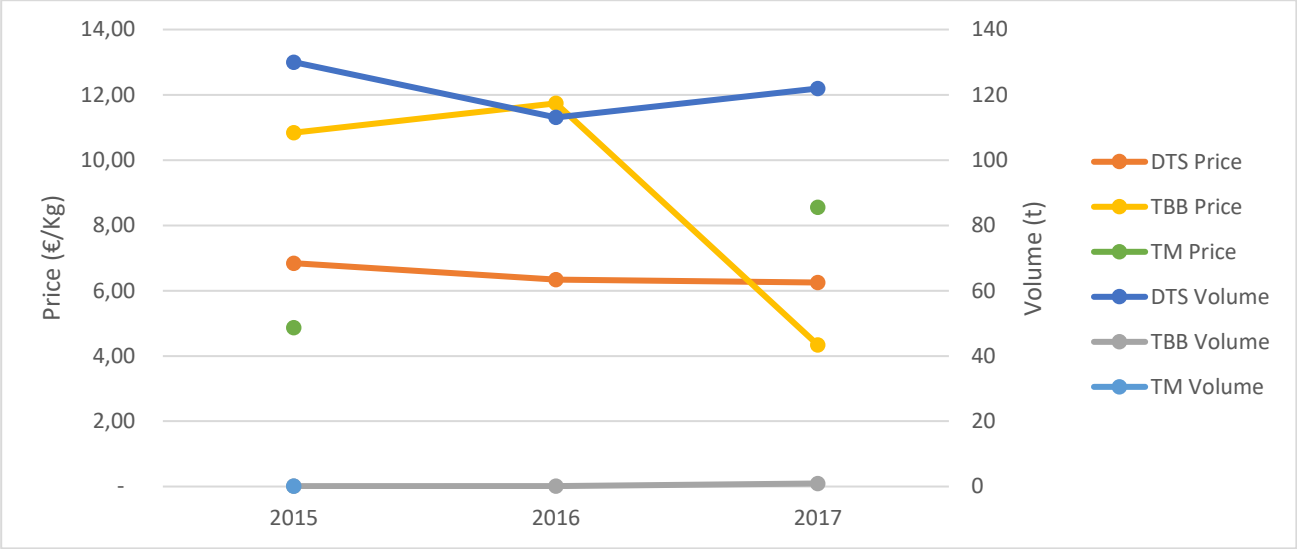


Figure 175: Price and Volume by techniques - Marche - PNRDA

- In Molise DPS is fished by DTS. In 2016-2017 there have been an increase in this activity, with volume rising from 143t to 169t. Price followed the same direction, rising from 4,84€/Kg to 7,46€/Kg.

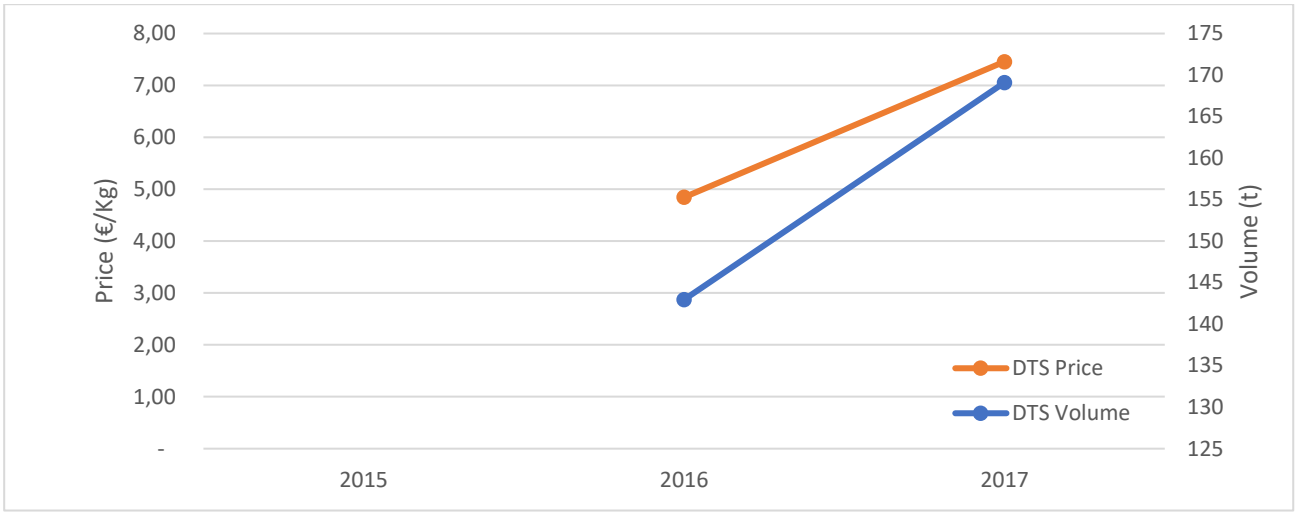


Figure 176: Price and Volume by techniques - Molise - PNRDA

- The whole Northern Puglia DPS industry relies on DTS fishing.
  Its volume knew a rapid development in the three considered years, passing from 651t to 1.101t. Its price had a first descendant move (from 5,48€/Kg to 4,60€/Kg and then a small recover to 4,97€/Kg).

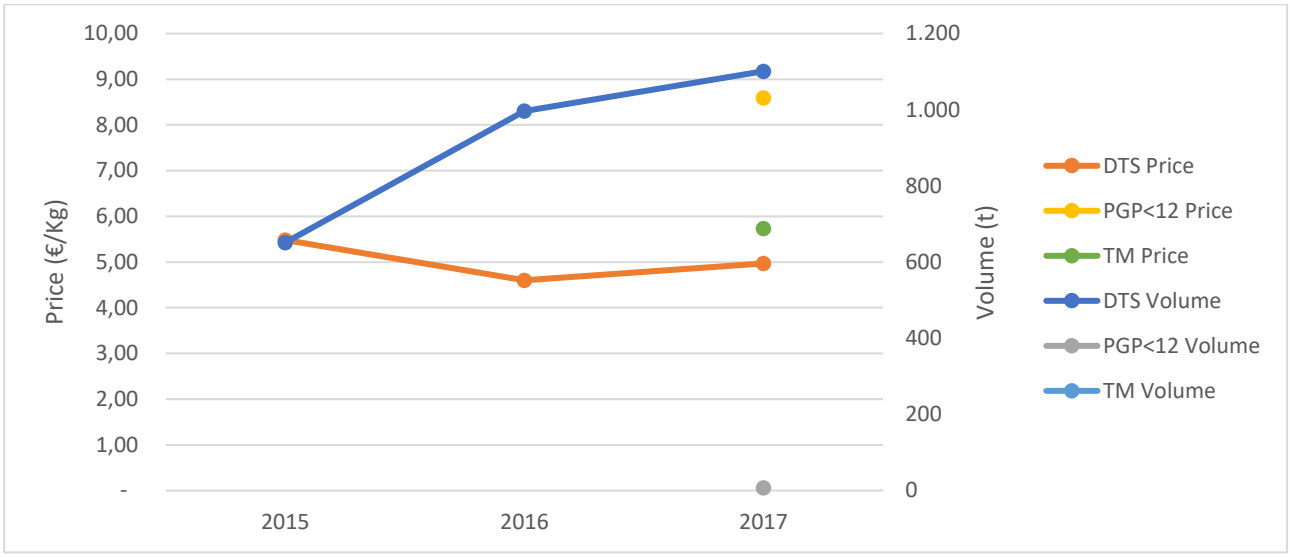


Figure 177: Price and Volume by techniques - Puglia Nord - PNRDA

- Data for Veneto only reports DTS on 2015. On that year 221Kg were fished and sold at 10,59€/Kg.

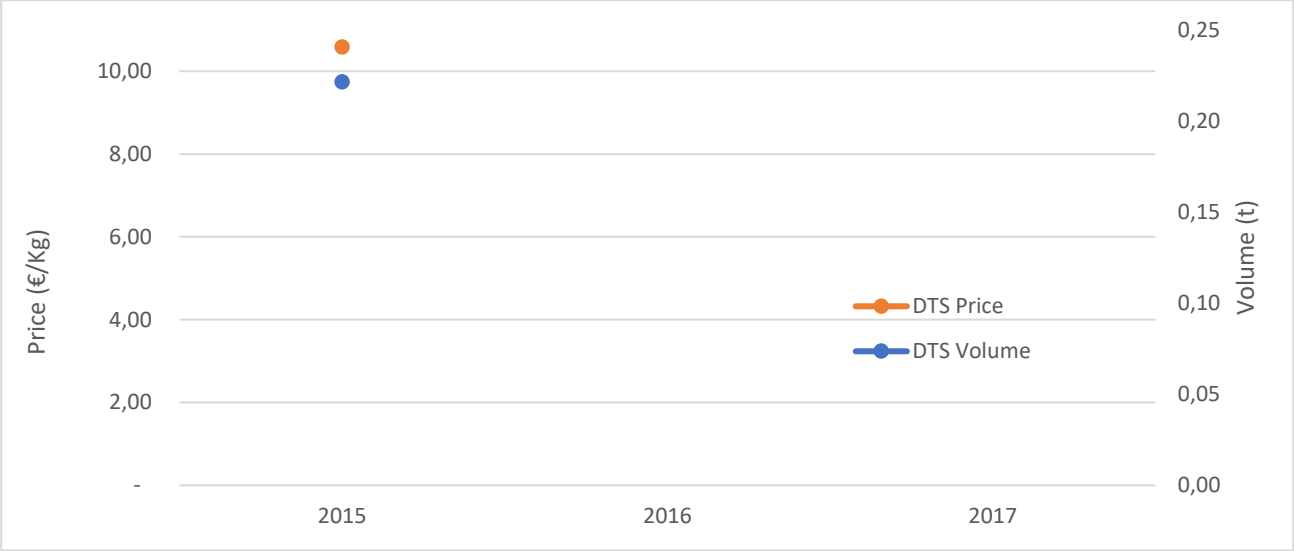


Figure 178: Price and Volume by techniques - Veneto - PNRDA

By fishing techniques point of view

Speaking about fishing techniques, DTS has been the most important with growing predominance and volume. If on 2015 80% of DPS were fished this way, in 2017 this share increased to 99,4%. Its price remained quite stable, moving between 4,8€/Kg and 5,71€/Kg.

Table 56: Average Price and total Volume fished by technique, including all regions – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DRB			0,2			3,59
∑ DTS	930	1.467	1.622	5,71	4,80	5,28

∑ PGP<12			6,8			8,59
∑ PGP>12 lft						
∑ PS						
∑ TBB	125	0,16	0,9	10,84	11,74	4,34
∑ TM	102		1,6	4,87		5,81

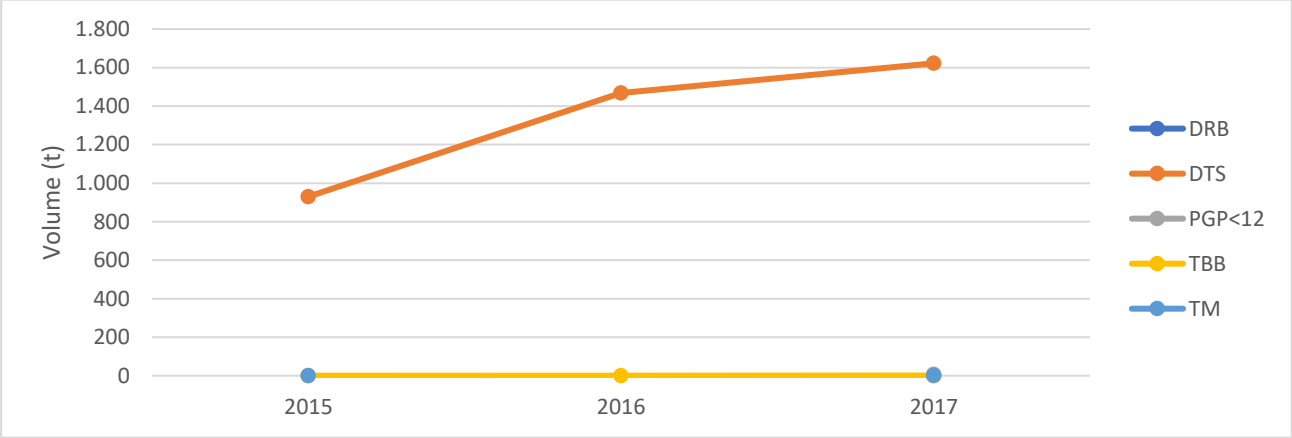


Figure 179: Deep Water Rose Shrimp Volume by technique

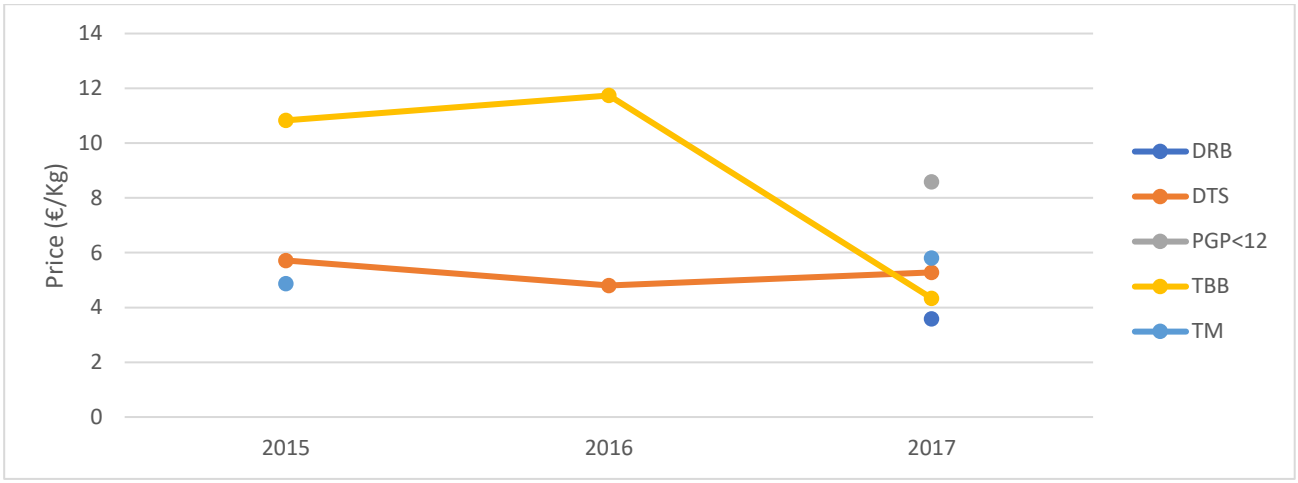


Figure 180: Deep Water Rose Shrimp Price by technique

- DRB has been the least productive technique. On 2017 0,2t were fished and sold at 3,59€/Kg.

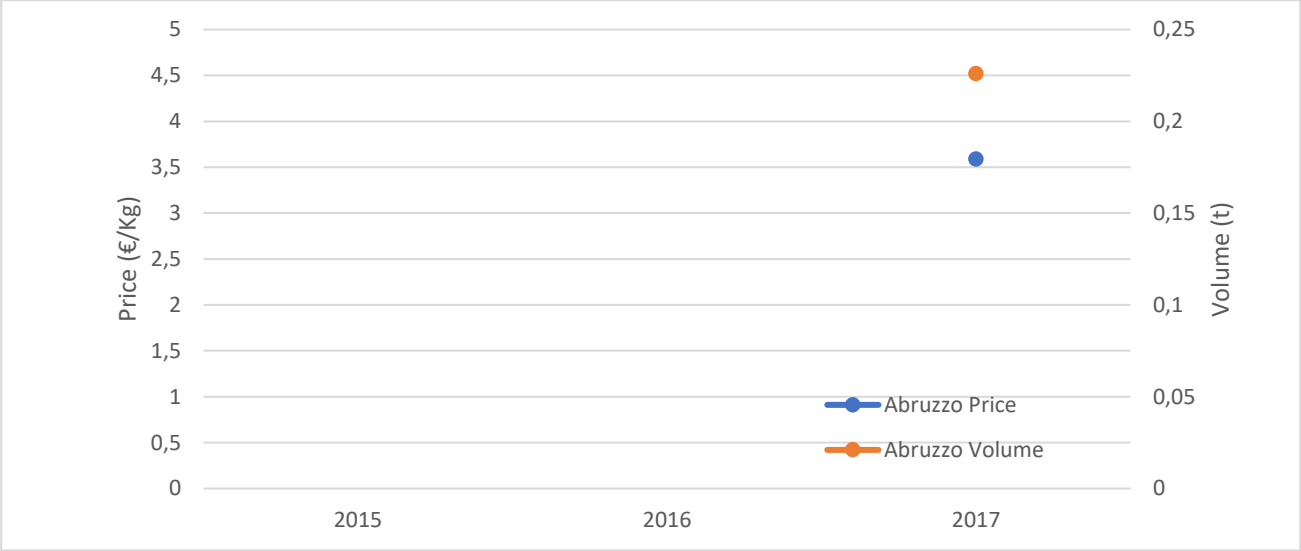


Figure 181: Volume and Price by region - DRB – PNRDA

- Production by DTS has been strongly pushed by Puglia Nord performance. If 651t were fished there during 2015, this value increased to 1.101t in 2017. Less important, but still relevant, is the contribution of Abruzzo (229t in 2017), Molise (169t) and Marche (121,9t). During 2017, on descending price order, Molise was at 7,46€/Kg, Marche 6,25€/Kg, Emilia-Romagna 6,09€/Kg, Puglia Nord 4,97€/Kg and Abruzzo 4,97€/kg.

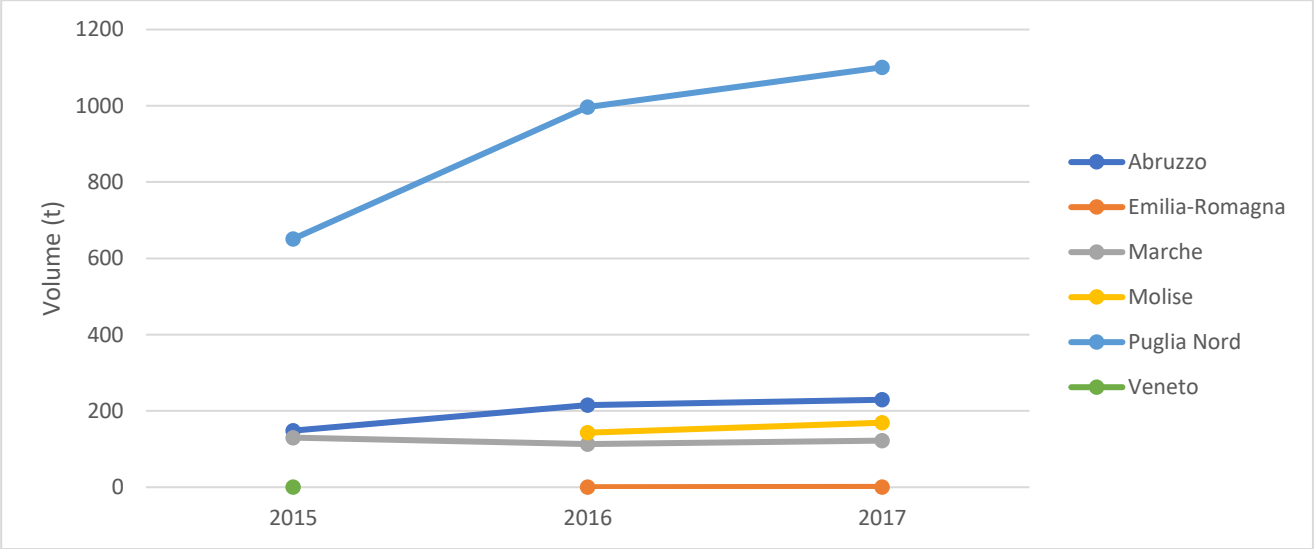


Figure 182: Volume by region - DTS - PNRDA

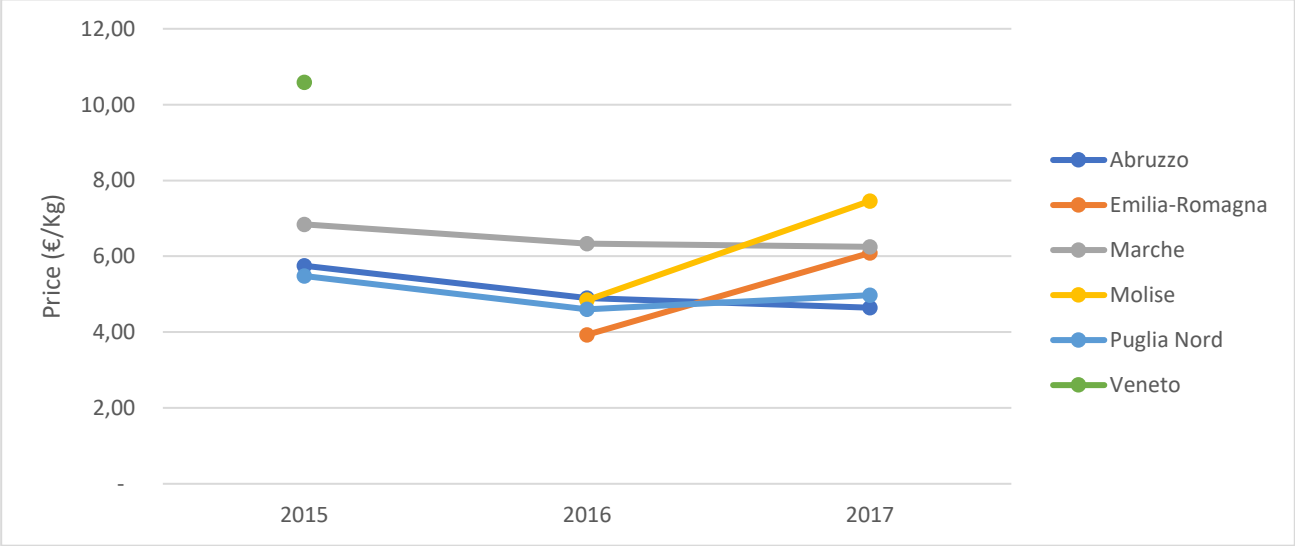


Table 57: Price by region - DTS - PNRDA

- Information for PGP<12 is only reported for Puglia Nord on 2017. On that year 6,8t were fished this way, and price averagely was 8,59€/kg.

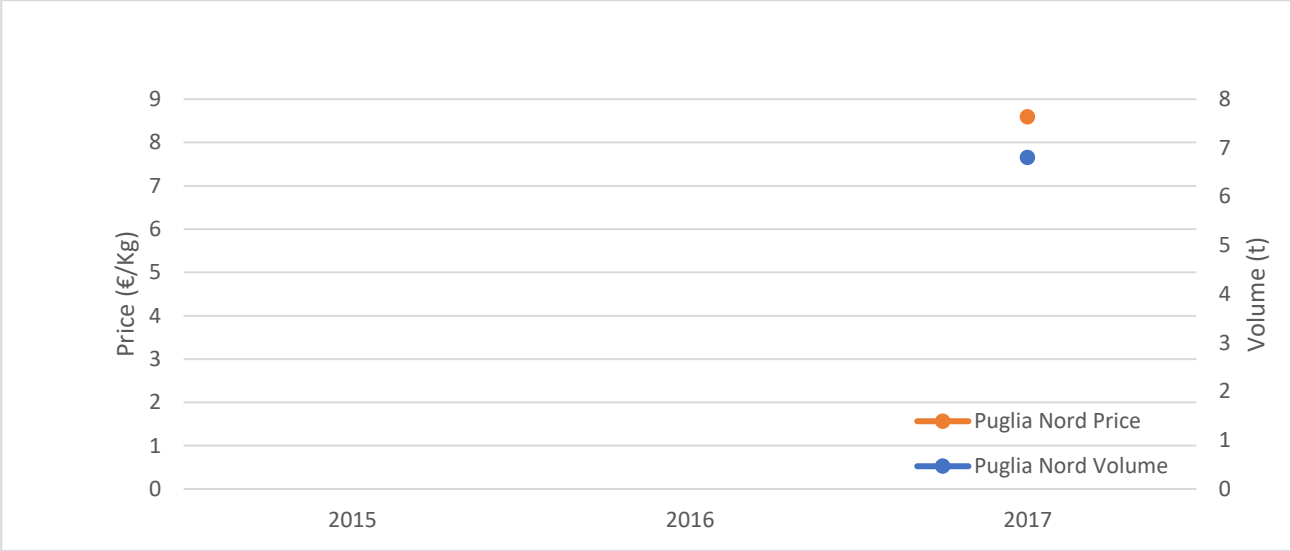


Figure 183: Volume and Price by region - PGP<12 – PNRDA

- Fishing by TBB is a technique only reported for Marche. Its volume is not solid in confronts with other methods, but 2017 has been a year of strong development, with landings increasing from 164Kg to 0,93t. At the same time, price drop from 11,74€/Kg to 4,34€/Kg.

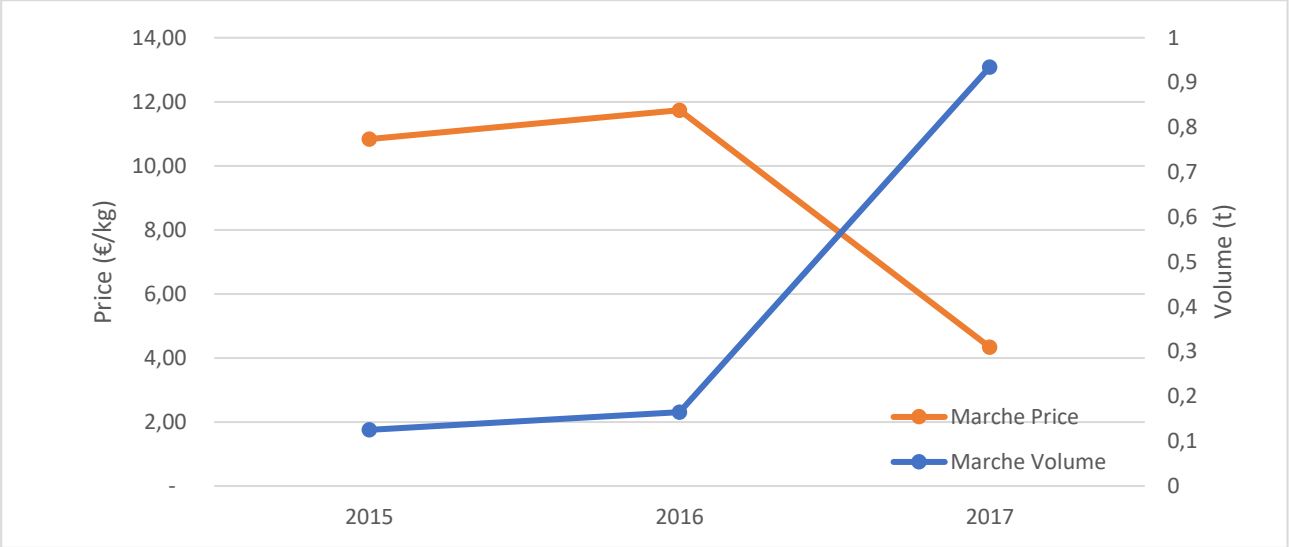


Figure 184: Volume and Price by region - TBB – PNRDA

- TM has been reported in Marche and Puglia Nord.
  Marche presents a descendant trend, with volumes below 0,1t. Puglia Nord is only reported on 2017, when produced 1,5t at 5,73€/Kg.

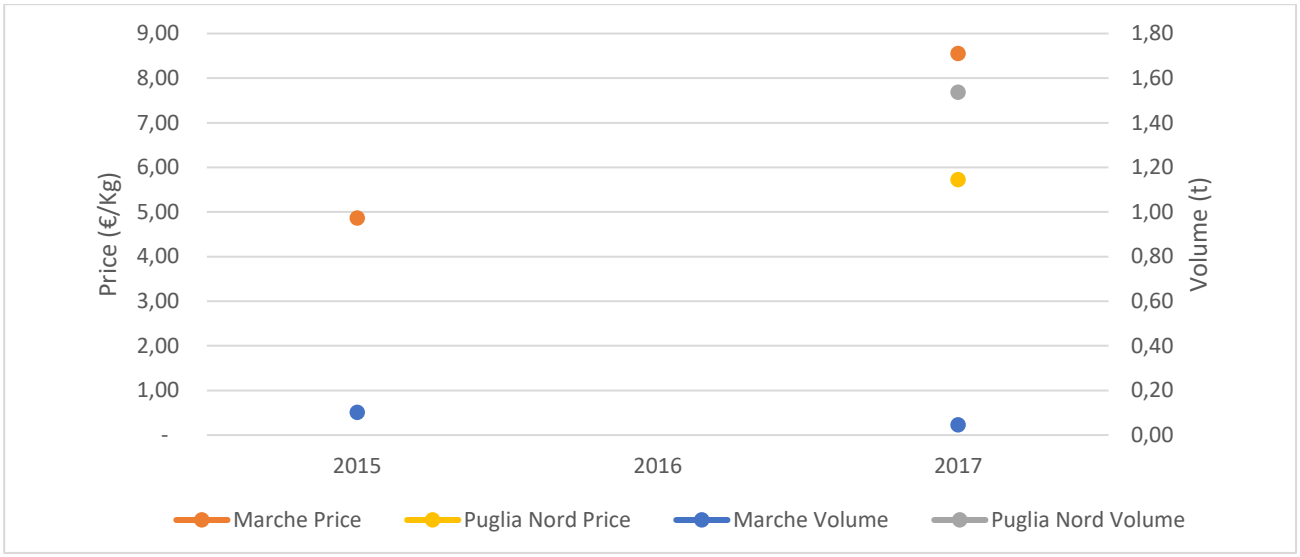


Figure 185: Volume and Price by region - TM – PNRDA

4.5 HORSE MACKEREL

By regional point of view:

Horse Mackerel resulted to be a species mostly fished in Puglia Nord. During 2017 it collected the 247,6t (90% of all HMM landings) jumping from the 123t of 2016.
The second player on 2017 has been Veneto with 12,5t, followed by Abruzzo (6,8t).

Price in Puglia Nord has been the cheapest in both 2015 and 2017 (0,82€/Kg and 0,54€/Kg), in 2016 had an upturn at 1,41€/Kg.
Veneto is following a descending trend, 1,19€/Kg in 2017, 1,42€/Kg in 2016, 1,67€/Kg in 2015.
Abruzzo's price has a great variability: in 2015 it costed 0,90€/Kg, in 2016 2,49€/Kg and in 2017 retraced to 1,16€/Kg.

Table 58: Average Price and total Volume fished by region, including all techniques - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	11,1	6,2	6,8	0,90	2,49	1,18
∑ E.Romagna	4,2	2,12	3,33	2,11	3,02	2,57
∑ F.V.Giulia	1,46	1,06	1,15	1,12	1,90	1,64
∑ Marche	16,3	9,2	2,62	2,56	2,27	2,07
∑ Molise	0,06	0,77	1,17	1,04	1,54	2,66
∑ Puglia Nord	160,8	123,3	247,7	0,82	1,51	0,54
∑ Veneto	10,1	8,9	12,5	1,67	1,42	1,19

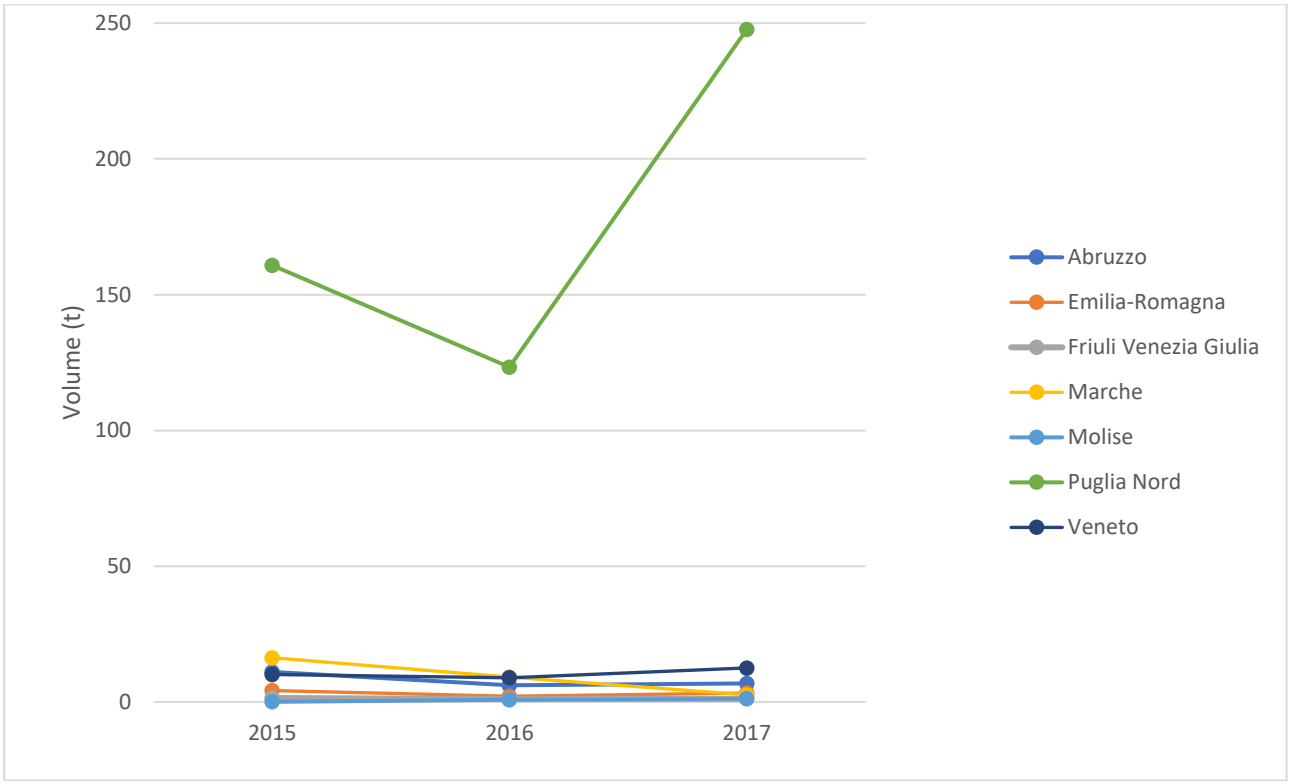


Figure 186: Horse Mackerel Volume by region

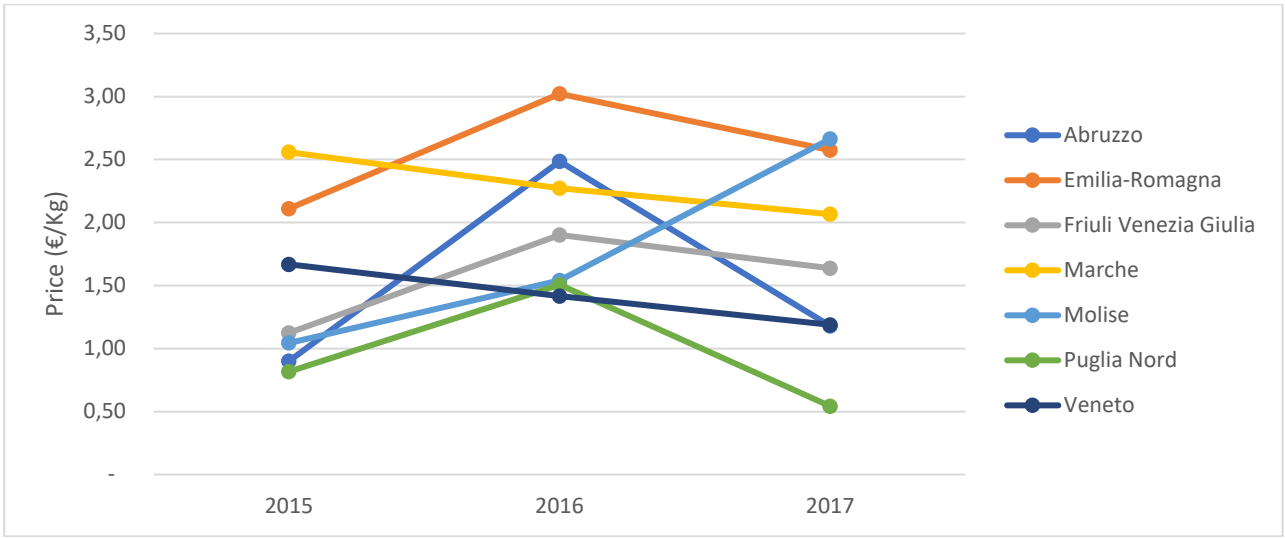


Figure 187: Horse Mackerel average Price by region

- In Abruzzo only DTS is relevant. On 2015 11t were collected with this method, 6,16t on 2016 and 6,4t on 2017. Commercially less relevant, 0,4t were fished by DRB and 39Kg by PS.
  On 2017 DTS has been the cheapest technique costing 1,16€/Kg, way less than the 2,49€/Kg of 2016.

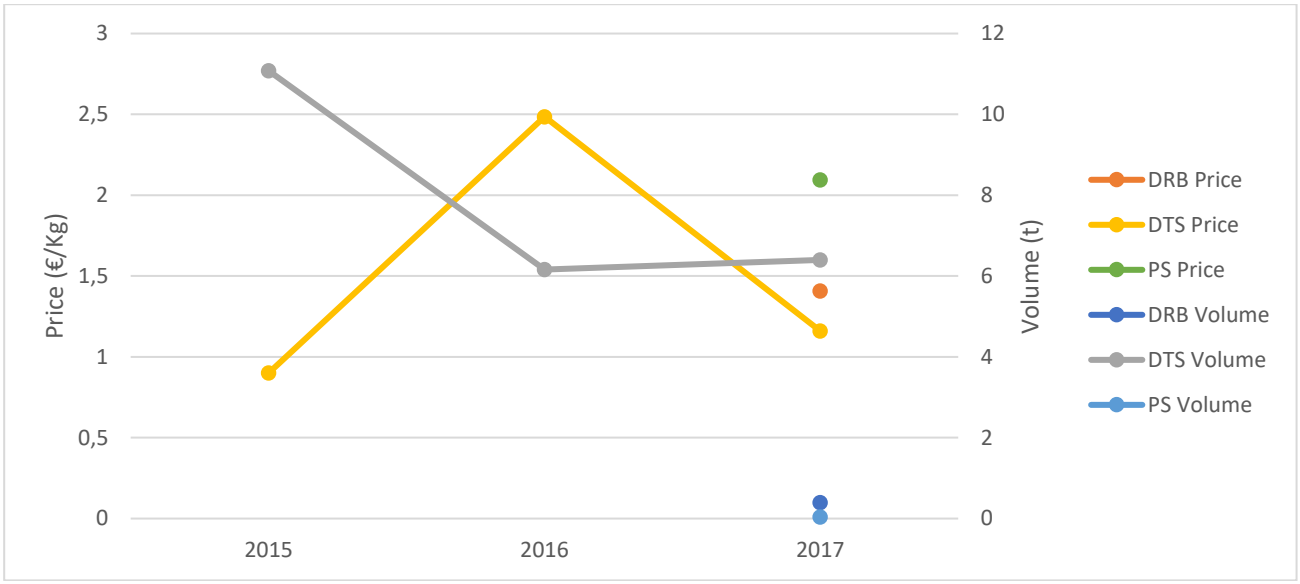


Figure 188: Price and Volume by techniques - Abruzzo - PNRDA

- In Emilia-Romagna DTS is increasing its dominance, growing up to 2,9t in 2017 (were 2,3t in 2015 and 1,8 in 2016). On 2017 only 0,35t by PGP<12 and 84Kg of TM were reported. Price of DTS fishing had a step up on 2016, passing from 1,66€/Kg to 3,06€/Kg. In the following year slightly decreased, attesting to 2,66€/Kg on average.

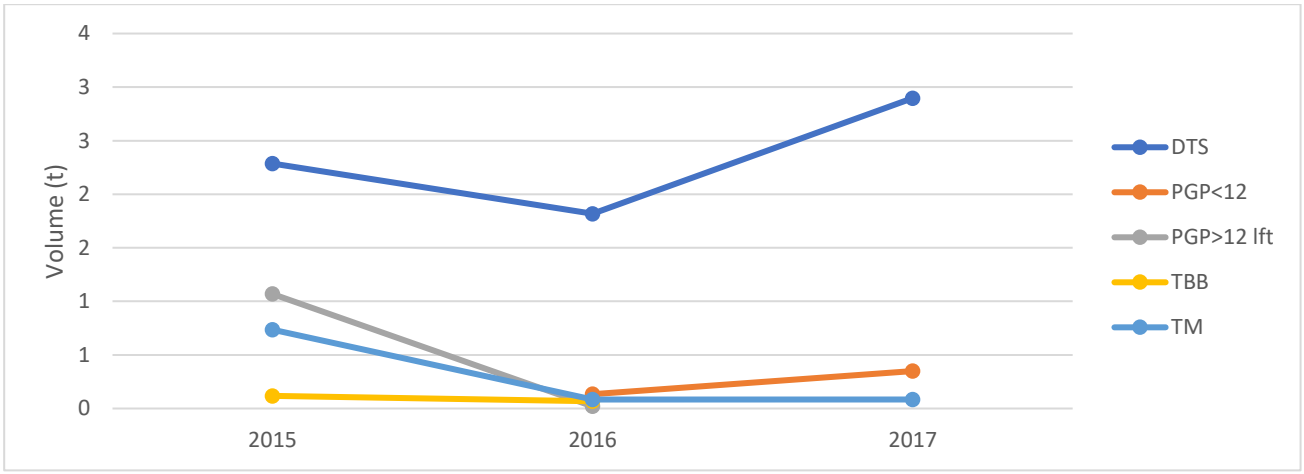


Figure 189: Volume by technique - Emilia-Romagna - PNRDA

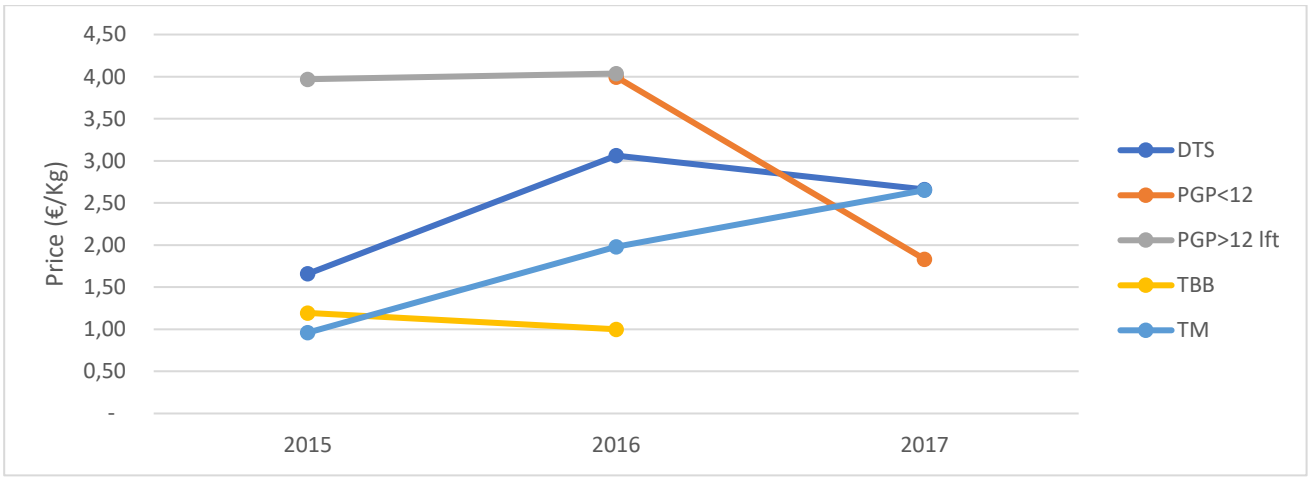


Figure 190: Price by technique - Emilia-Romagna - PNRDA

- Friuli Venezia Giulia's production is obtained by DTS as TM progressively diminished (152Kg on 2015, 16Kg on 2017).

DTS's maximum was on 2015 at 1,3t (at 1,10€/Kg), then on 2016 0,95t (1,94€/Kg) and on 2017 1,1t (1,63€/Kg).

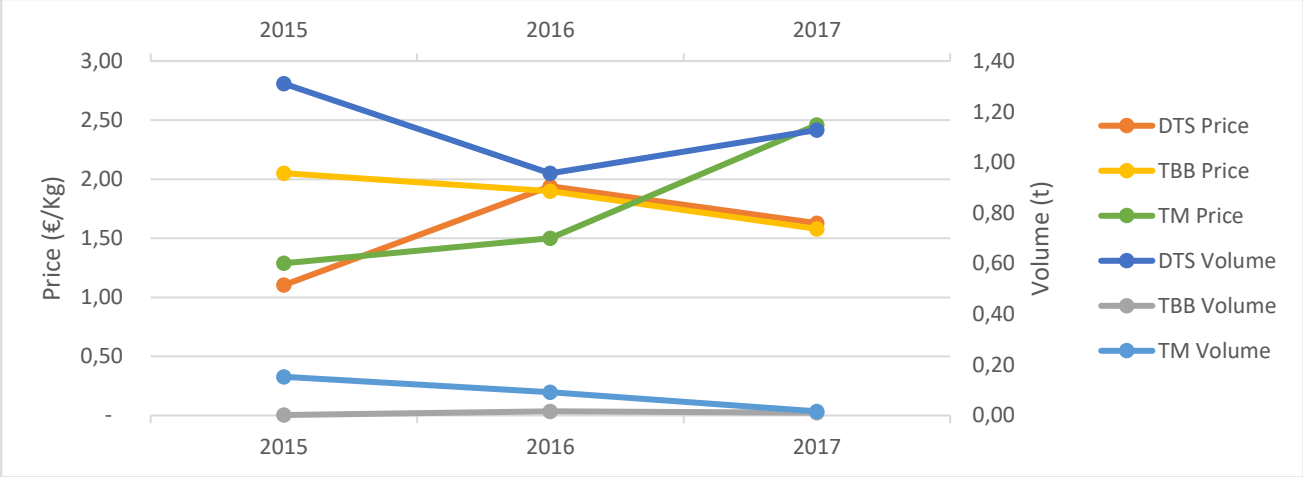


Figure 191: Price and Volume by techniques - Friuli Venezia Giulia - PNRDA

- All the volumes had a reduction from 2015 to 2017. By DTS 8t have been fished in 2015, 5,8t in 2016 and 2,3 in 2017. PGP<12 passed from the 7t of 2015 to 2,5t in 2016.

  DTS's price went slightly up from 1,73€/Kg on 2015 to 2,01€/kg in 2017. Price by PGP<12 is available only for 2015 (3,78€/Kg) and 2016 (3,87€/Kg). TM's price is in solid growth, from 1,14€/Kg in 2015 to 2,53€/Kg in 2017.

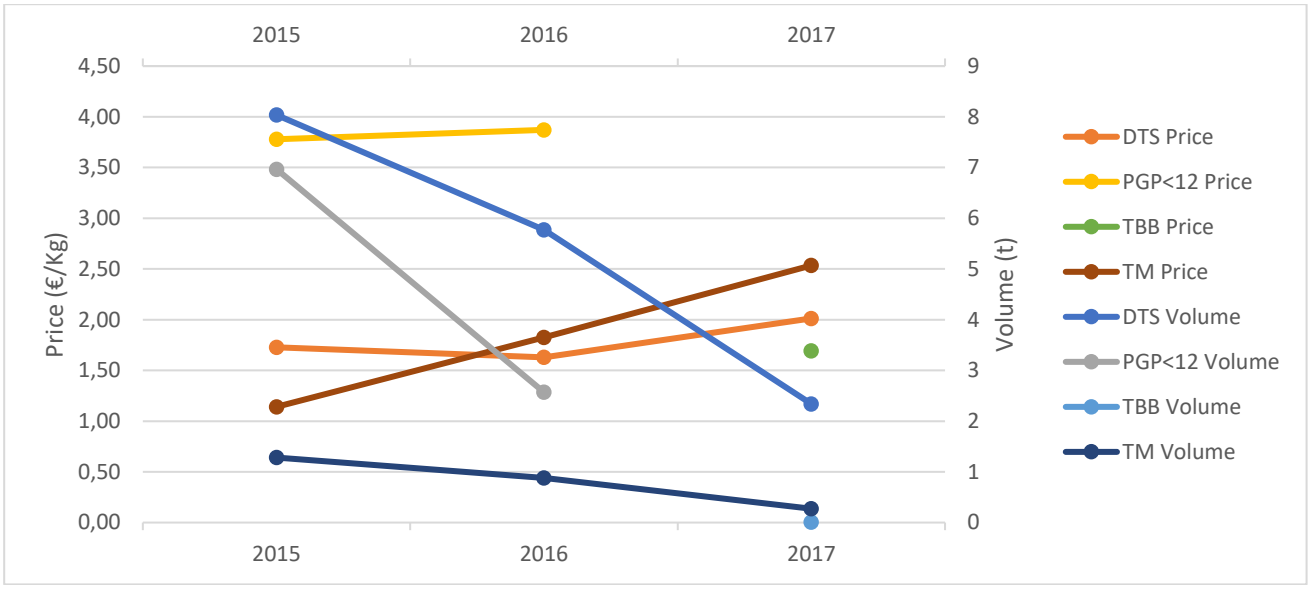


Figure 192: Price and Volume by techniques - Marche – PNRDA

- In Molise only DTS fishing is reported. Its volume growth from 56Kg in 2015 to 1,2t in 2017.
  Price also is increasing, passing in two years from 1,04€/Kg to 2,66€/Kg.

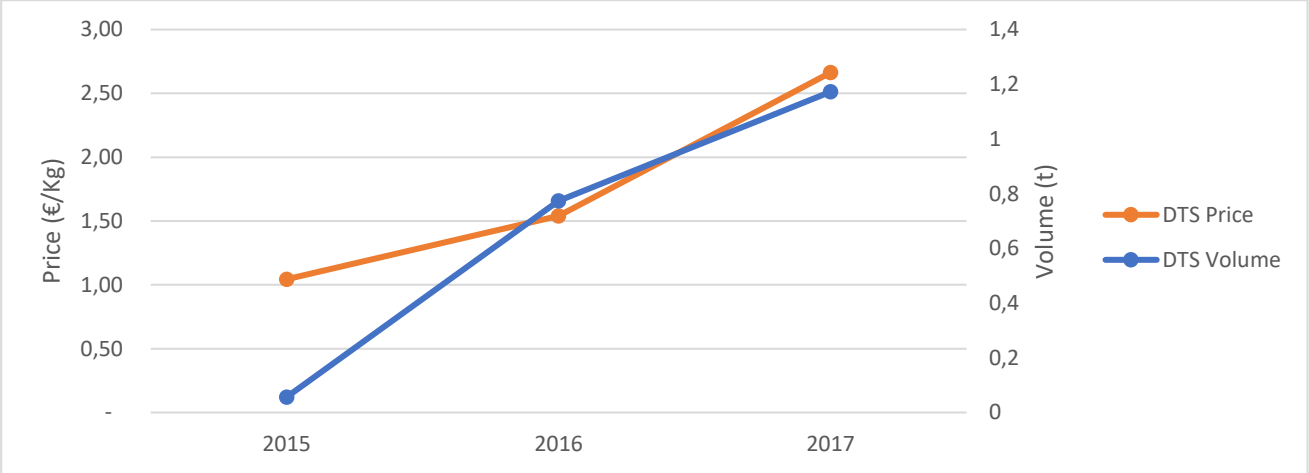


Figure 193: Price and Volume by techniques - Molise - PNRDA

- The most important fishing method in Puglia Nord is DTS.
  Starting with 156,9t in 2015, DTS volume had a minimum on 2016 (116t) and then a maximum at 221,5t.
  TM had low volumes on 2015 and 2016, and then went up to 25,7t on 2017.

  Prices of TM and DTS started in 2015 from an almost equal position (0,80€/Kg and 0,76€/Kg), then moved both up to 2,90€/Kg (TM) and 1,41€/Kg (DTS) in 2016 and both moved down to 0,69€/Kg (TM) and 0,53€/Kg (DTS).

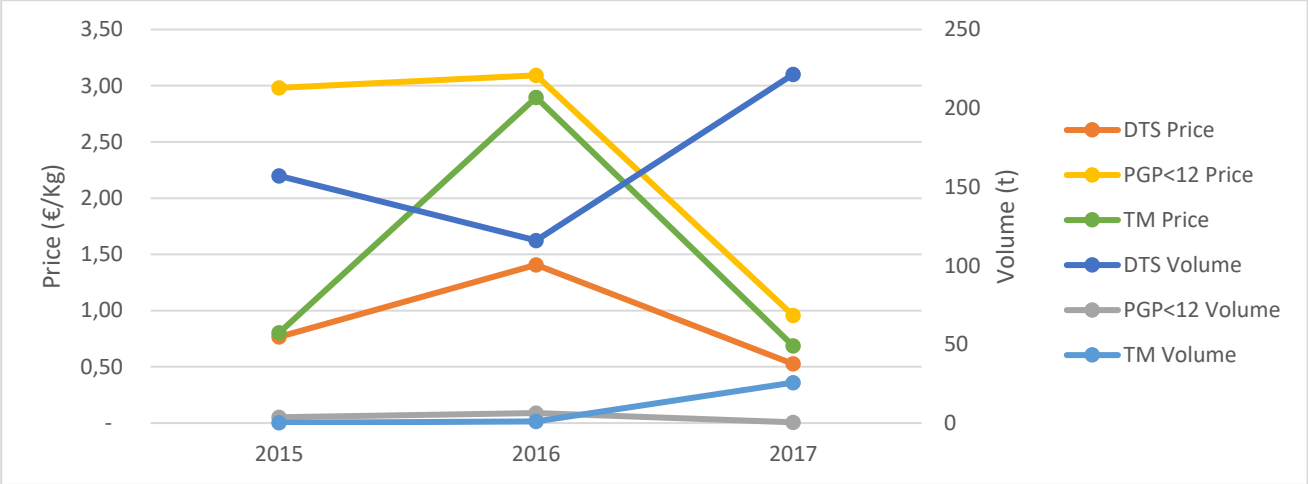


Figure 194: Price and Volume by techniques - Puglia Nord - PNRDA

- Fishing by TM in Veneto had been the most productive method in 2015 (7,8t) and 2016 (5t), then in 2017 moved to the second position at 3,8t.
  DTS started from 2,3t in 2015, then in 2016 3,8t and in 2017 had a strong increase to 8,3t.

  DTS and TM had similar prices on 2015 (1,64€/Kg and 1,68€/Kg) and 2017 (1,21€/Kg and 1,15€/Kg), while in 2016 they greatly diverged (1,96€/Kg TM, 0,71€/Kg DTS).

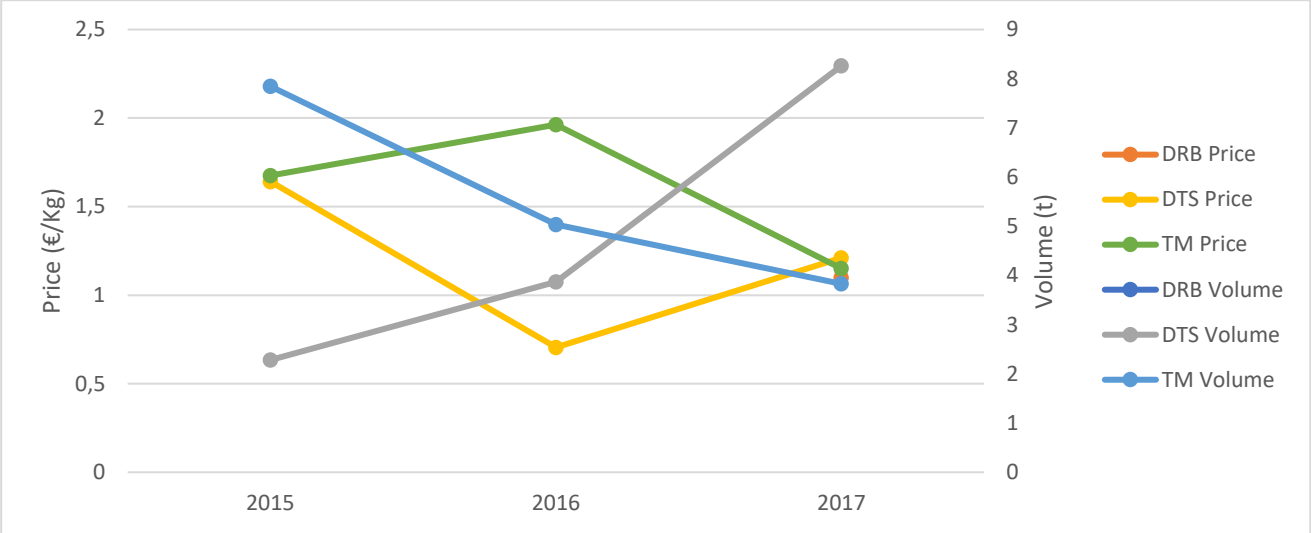


Figure 195: Price and Volume by techniques - Veneto - PNRDA

By fishing techniques point of view

The most productive fishing technique is by far DTS (88% on 2017, 89% on 2016). Its volume had a reduction on 2016, passing from 181,9t to 135,3t, and then moved up to 243,7t on 2017.

Also TM has some relevance as it collected 29,9t on 2017, developing the production of the past years (10t in 2015 and 7,1t in 2016).

DTS had the lowest price (except TBB in 2016, but with only 80Kg fished), as it costed 0,62€/Kg on 2017. TM reduced its gap on 2017 but remained higher at 0,77€/Kg (after an expensive 2016 at 2,07€/Kg).

In general, all prices went down during 2017, only TBB moved in the opposite direction.

Table 59: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DRB			0,85			1,24
∑ DTS	181,9	135,3	243,7	0,84	1,47	0,62
∑ PGP<12	10,66	9,06	0,81	3,50	3,33	1,33
∑ PGP>12 lft	1,07	0,02		3,97	4,04	
∑ PS			0,04			2,10
∑ TBB	0,12	0,08	0,02	1,21	1,18	1,62
∑ TM	10,19	7,1	29,9	1,54	2,07	0,77

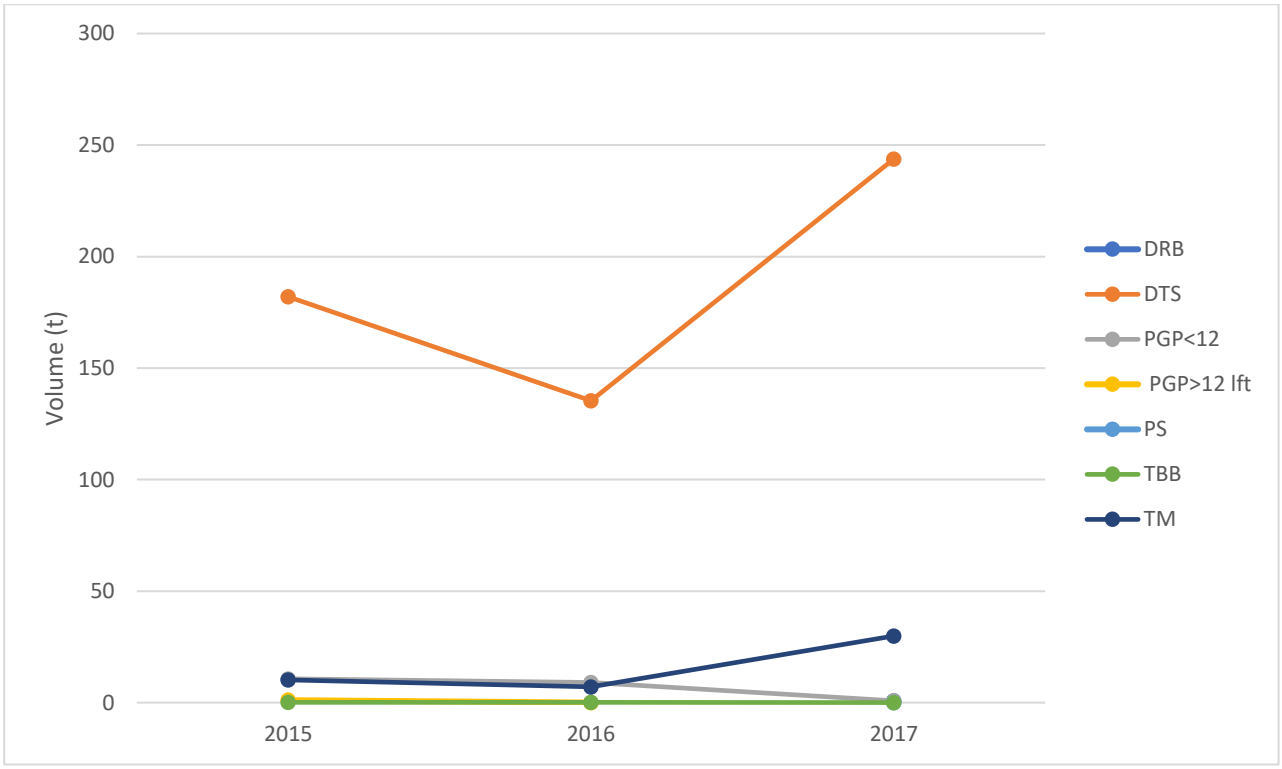


Figure 196: Horse Mackerel Volume by technique

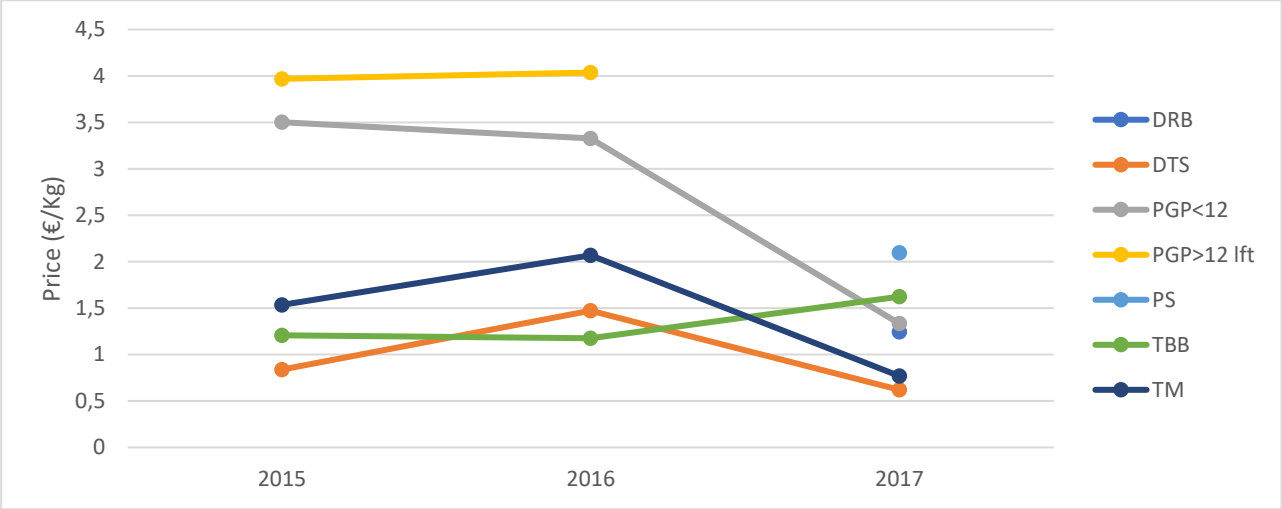


Figure 197: Horse Mackerel Price by technique

- Data for DRB are available only for 2017. On that year in Veneto 0,45t were fished and sold at 1,10€/Kg, while in Abruzzo 0,4t at 1,41€/Kg.

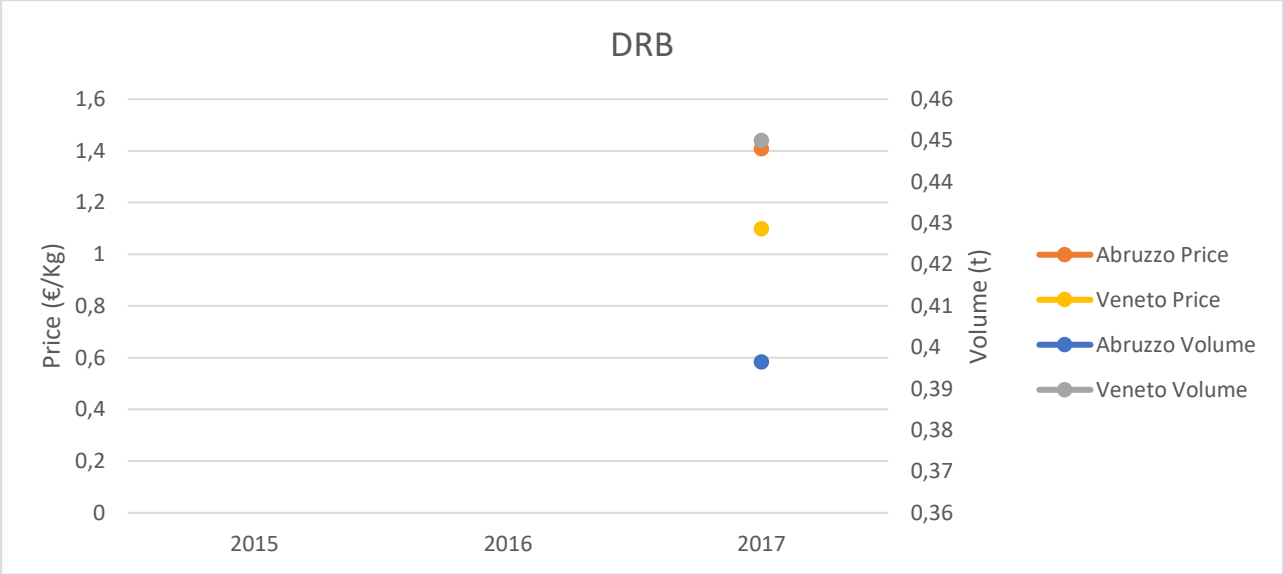


Figure 198: Price and Volume by region - DRB – PNRDA

- DTS is the most relevant fishing technique for HMM, and the region where it's most adopted is Puglia Nord. There, after a decreasing 2016 (from 156,9t to 116t), volume went up to 221,5t in 2017.
  Among other regions, during 2017, 8,26t were fished in Veneto and 2,9t in Emilia-Romagna.

  On 2017, as from historical trend, Emilia-Romagna is the most expensive region with Deep Water Rose Shrimp quoted averagely 2,66€/Kg. Follow Veneto 1,21€/Kg (on 2017) and Puglia Nord 0,53€/Kg.

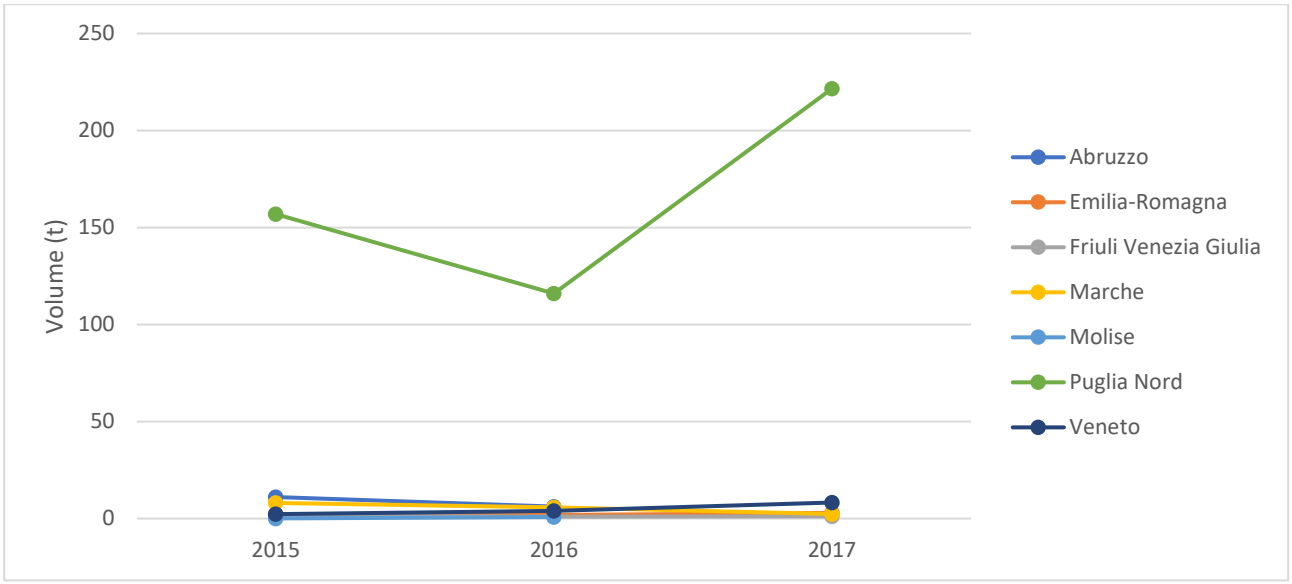


Figure 199: Volume by region - DTS - PNRDA

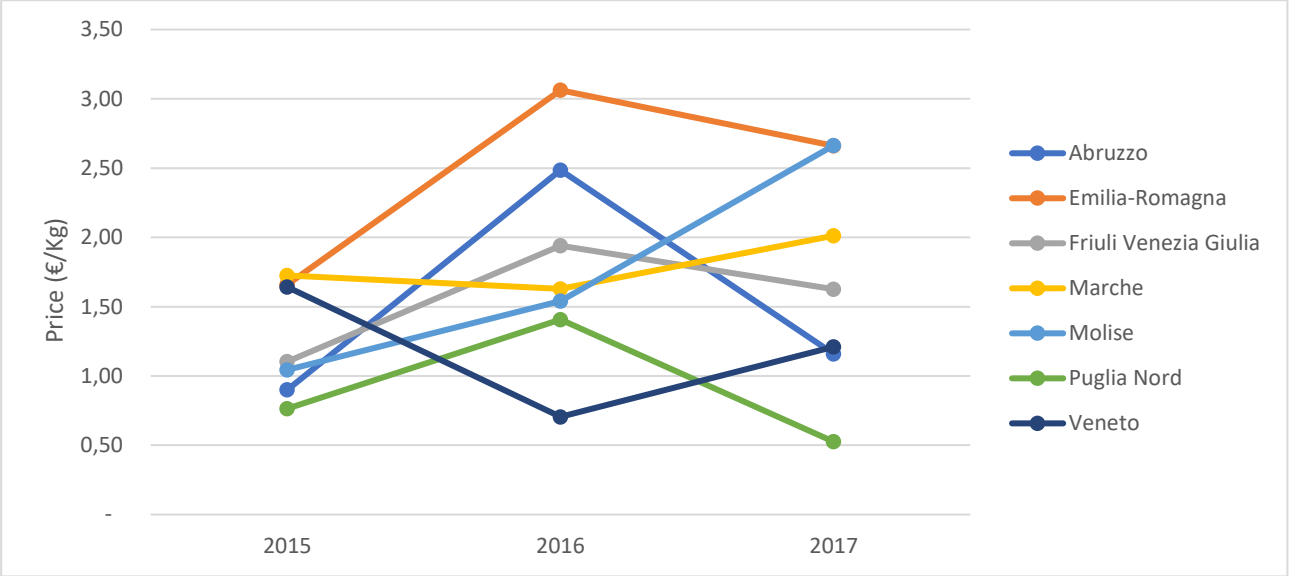


Figure 200: Price by region - DTS – PNRDA

- Marche have a decreasing volume with the PGP<12 method. On 2015 6,9t where fished, 2,6t on 2016.
  Puglia Nord started from 3,7t on 2015 and had a peak at 6,3t before retracing to 0,46t in 2017.
  Prices of all three regions are characterized by a slight increase in the first year and a solid drop on 2017.

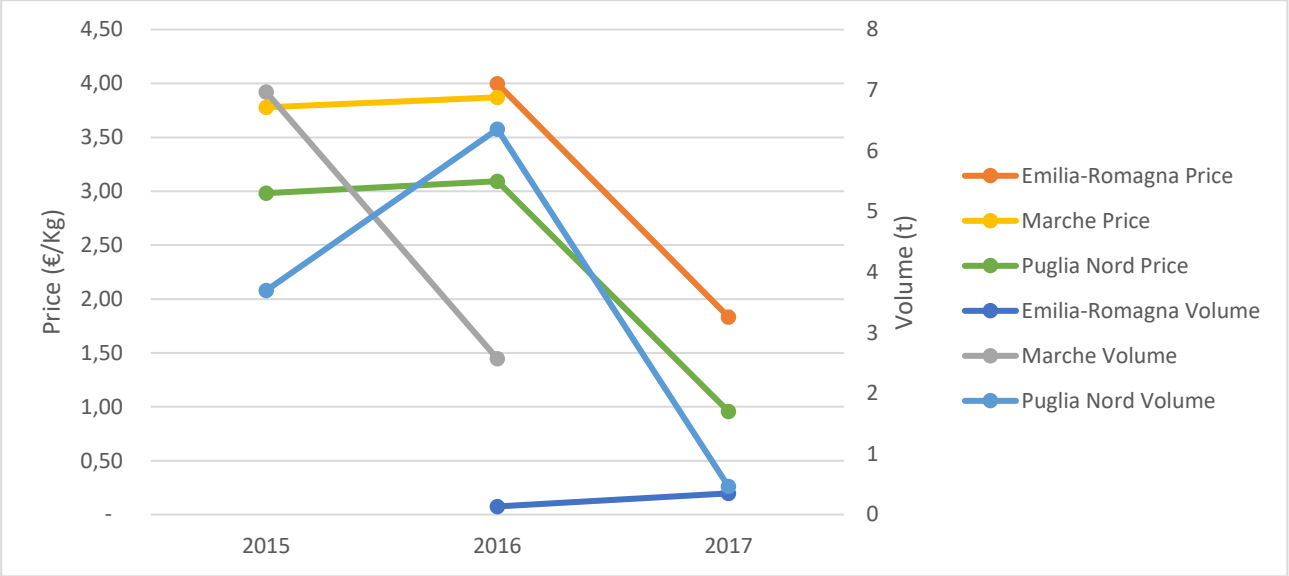


Figure 201: Price and Volume by region - PGP<12 – PNRDA

- PGP>12 lft is reported only for Emilia-Romagna. On 2015 1t has been produced here, only 20Kg in 2016. Meanwhile its price rose from 3,97€/Kg to 4,04€/Kg.

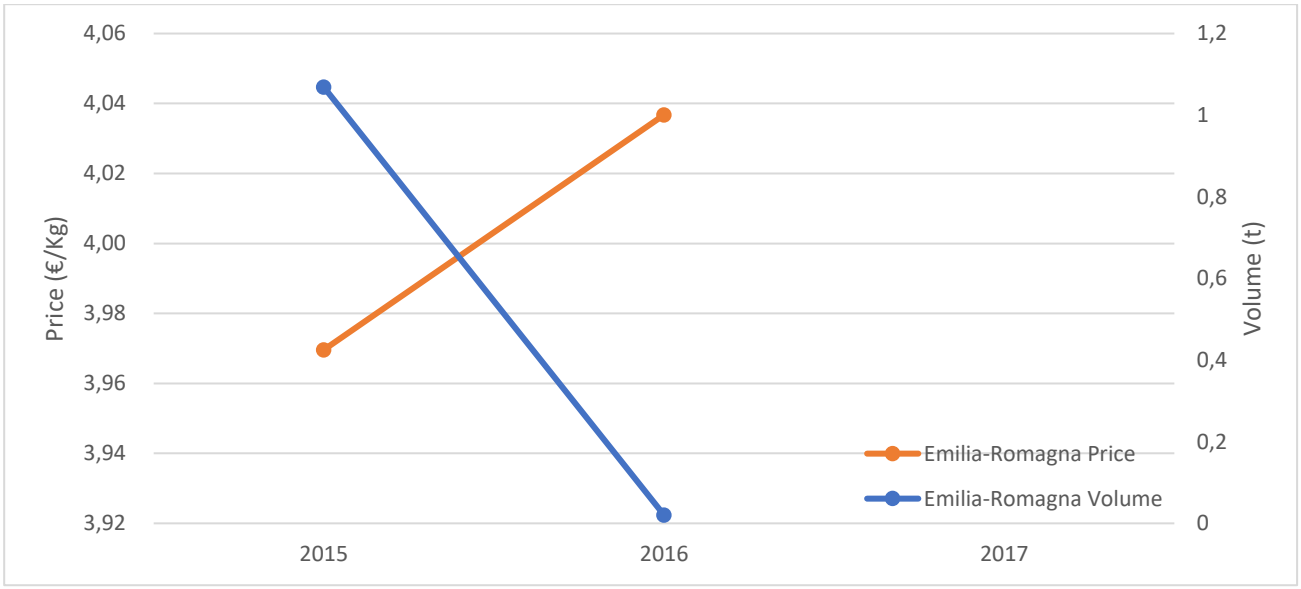


Figure 202: Price and Volume by region - PGP>12 lft - PNRDA

- Abruzzo is the only region with data for PS fishing. Its relevance is nil. On 2017 39Kg have been fished and sold at 2,10€/Kg.

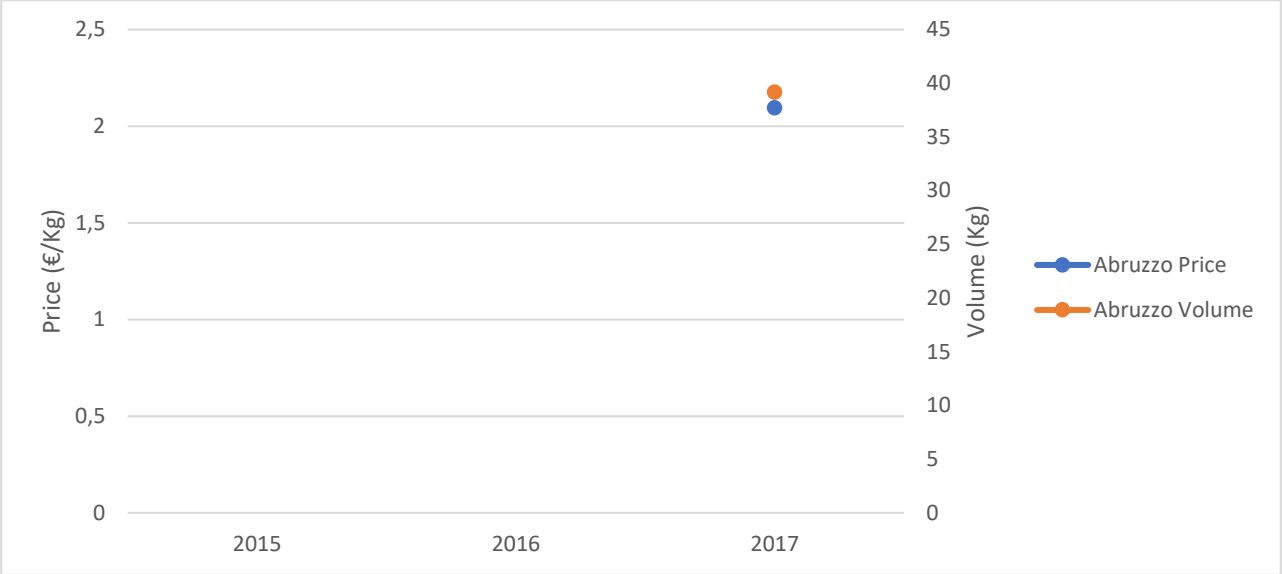


Figure 203: Price and Volume by region - PS – PNRDA

- TBB is a marginal fishing technique for HMM. Emilia-Romagna reported landings for 118Kg in the 2015 and 67Kg for 2016. Friuli Venezia Giulia has lower volumes (highest is 16Kg on 2016).
  Price in Emilia-Romagna decreased from 1,19€/Kg to 1€/Kg.

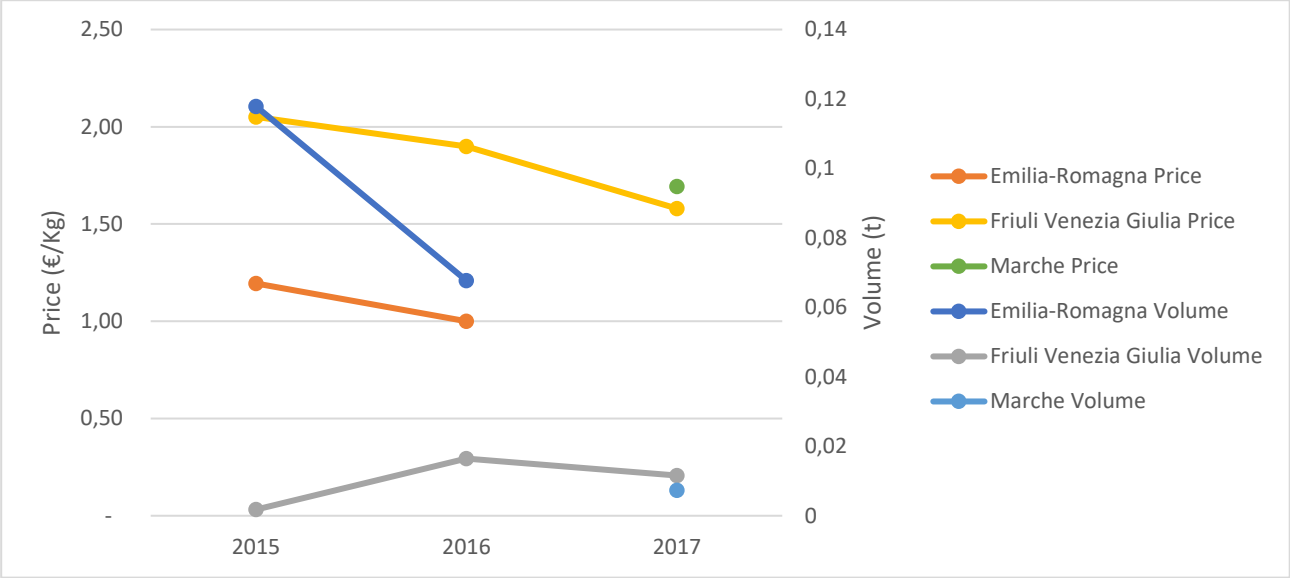


Figure 204: Price and Volume by region - TBB - PNRDA

- TM has been the second most important fishing method in 2017. Its increase is explainable by the performance of Puglia Nord, that passed from 0,98t in 2016 to 25,7 in 2017. Veneto was the most important player in 2015 and 2016 (with 7,8t and 5t), then in 2017 moved to 3,8t.

  Price in Puglia Nord had a relevant jump in 2016, passing from 0,8€/Kg to 2,9€/Kg. During 2017 moved back to 0,69€/Kg.
  Veneto closed 2017 at 1,15€/Kg averagely.

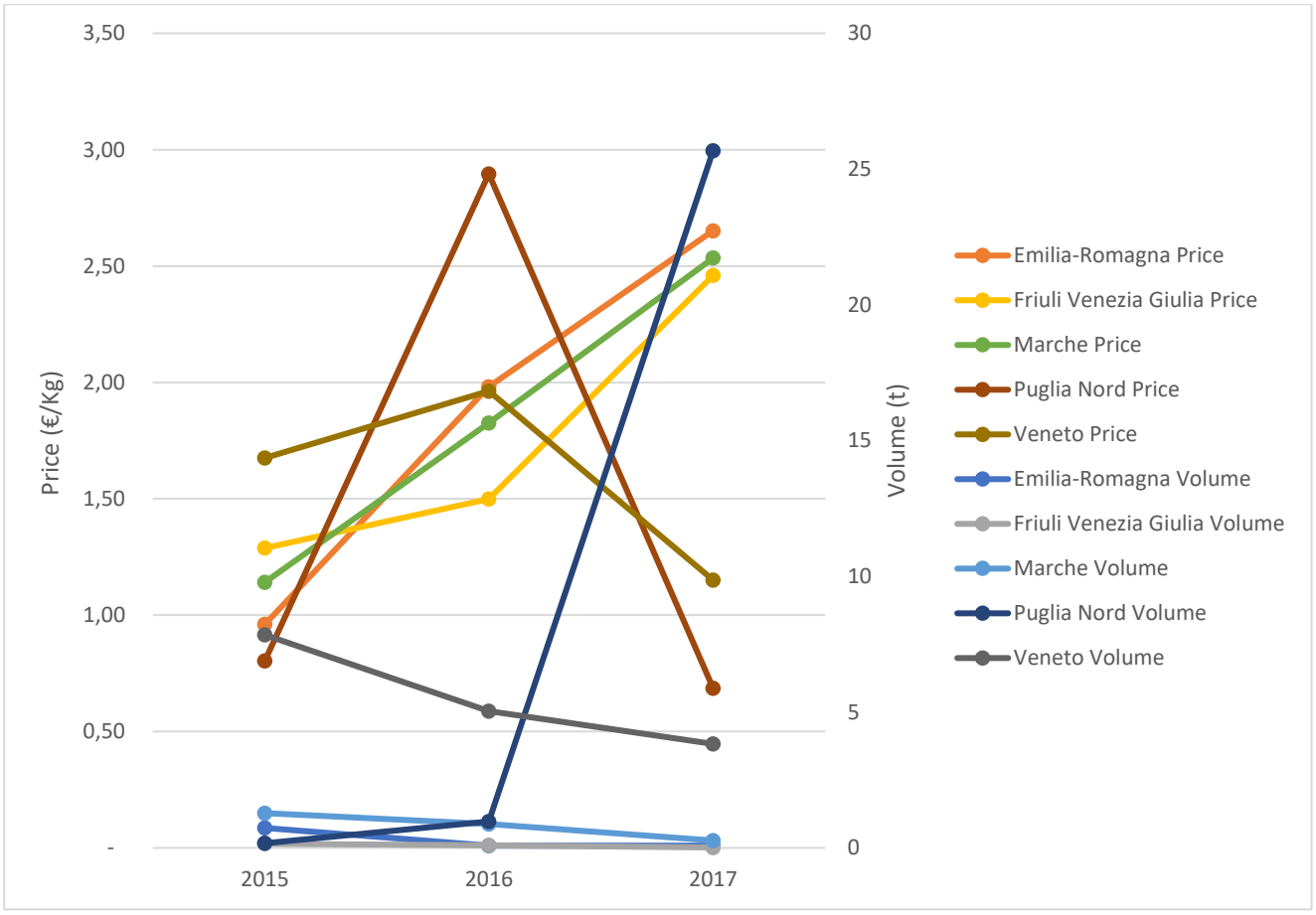


Figure 205: Price and Volume by region - TM - PNRDA

4.6 MULLET

As reported into the chapter introduction, all the species belonging to the Mugilidae family are in this paragraph considered as Mullets. Between those, only five presents volume landing data for Italy and those species are: MUL (Mugilidae, mullets nei), MGA (Liza Aurata, Golden Grey Mullet), MGC (Liza Ramada, Thinlip Grey Mullet), LZS (Liza Saliens, Leaping Mullet) and MUF (Mugil Cephalus, Flathead Grey Mullet). Summing up the different fishing methods and the different regions admits to section off mugilidae total landing volume by species on Adriatic Coast.

The chart signals a changing species relevance between the considered years. On 2015, Liza Saliens (LZS) has been the most fished mullet species, with 2.253t. During 2016 and 2017 its volume sank to 6,7t and 189,6t.

MGC (Liza Ramada) has a peak on 2016, when 1.751t has been captured with an increase of +464t from the previous year. Even during 2017 MGC has been the most important species, with 1.289,8t.

MUL's (mullets nei) landings have a strengthening negative trend. If 805t were fished in 2015, in 2016 were 673,5t and only 3,9t in 2017.

MGA and MUF follow a similar pattern (still with MGA reporting way higher volumes), almost stable between 2015 and 2016 and a sensible grow in 2017.

Speaking about prices, with a simple look at the weighted average, three different behaviours are identifiable:

- MUF has been the most expensive species during 2015 and 2016 (more than two times MUL) at 3,74€/kg and 4,39€/Kg. On 2017 the price strongly moved down to 1,79€/Kg.
- Price of MUL, MGA and LZS lay in the middle, with a slight increasing trend (especially MGA and LZS.
- MGC has stably been the cheapest species, costing 1,06€/Kg in 2015, 0,84€/Kg in 2016 and 0,84€/Kg in 2017.

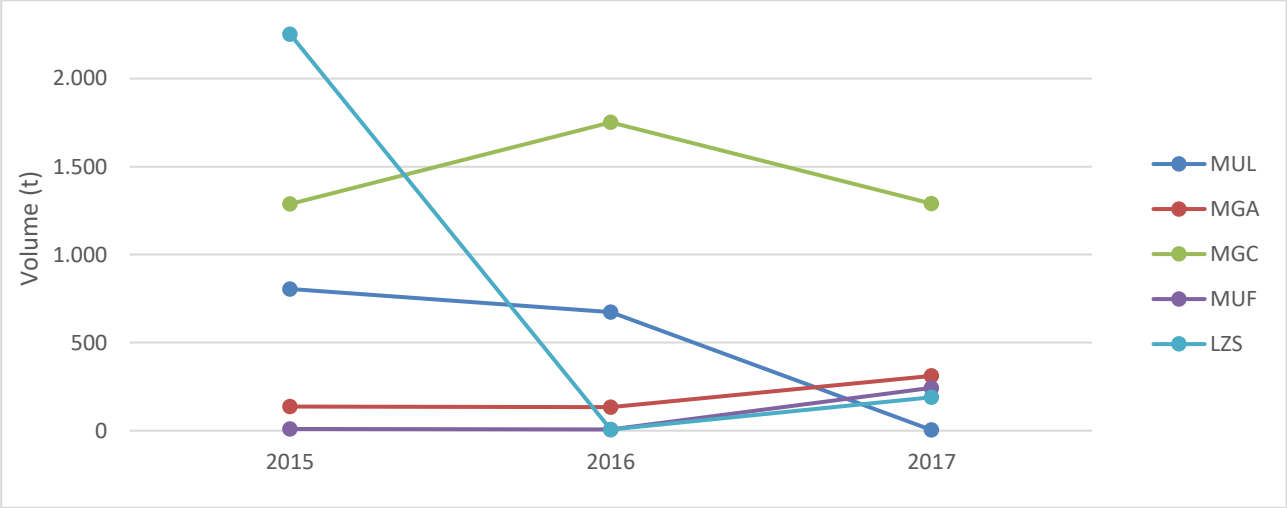


Figure 206: Mullets species volume

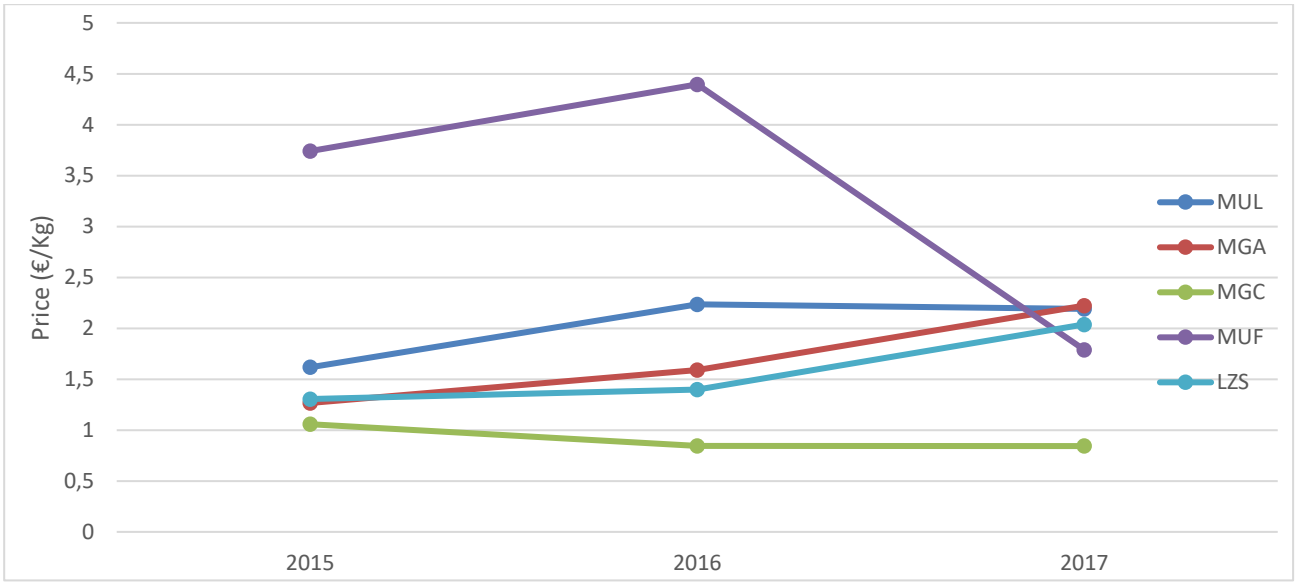


Figure 207: Mullets species weighted average price

By regional point of view

Emilia-Romagna played the major role in mullets fishing, granting 1.236t in 2015 and 1.609t in 2016 (Mullets maximum) before adjusting to 897t. Veneto has a positive trend, passing from the 498t of 2015 to 594t in 2017, through the 594t of 2016.

Marche increased their effort in 2017, passing from the previous 104t to 484t. Friuli Venezia Giulia closed 2017 with 134t fished, below both the volume of 2015 (180t) and 2016 (213t). Puglia Nord, Abruzzo and Molise lay below, under the 83t line.

By prices, the most productive region, Emilia-Romagna, has also been the cheapest, with 0,96€/Kg in 2015 and 0,88€/Kg in 2016 and 2017. Marche had a price drop in 2017, passing to 1€/Kg from the previous 2,58€/Kg. Veneto follows a negative trend that led it from 1,82€/Kg of 2015 to 1,16€/Kg of 2017.

In the upper part of the chart, during 2017, Puglia Nord had an average price of 1,83€/Kg, Friuli Venezia Giulia of 2,58€/Kg (positive almost linear trend) and Abruzzo of 2,24€/Kg.

Table 60: Average Price and total Volume fished by region, including all techniques - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	24,54	13,38	63,3	1,57	2,99	2,24
∑ E.Romagna	1.236	1.609	897	0,96	0,88	0,88
∑ F.V.Giulia	180	213	134	1,59	2,23	2,58
∑ Marche	237	104	484	1,17	2,58	1,00
∑ Molise	2,53	3,11	3,4	0,98	3,20	2,69
∑ Puglia Nord	72,8	35,6	82,9	2,76	3,12	1,83
∑ Veneto	498	594	594	1,82	1,56	1,16

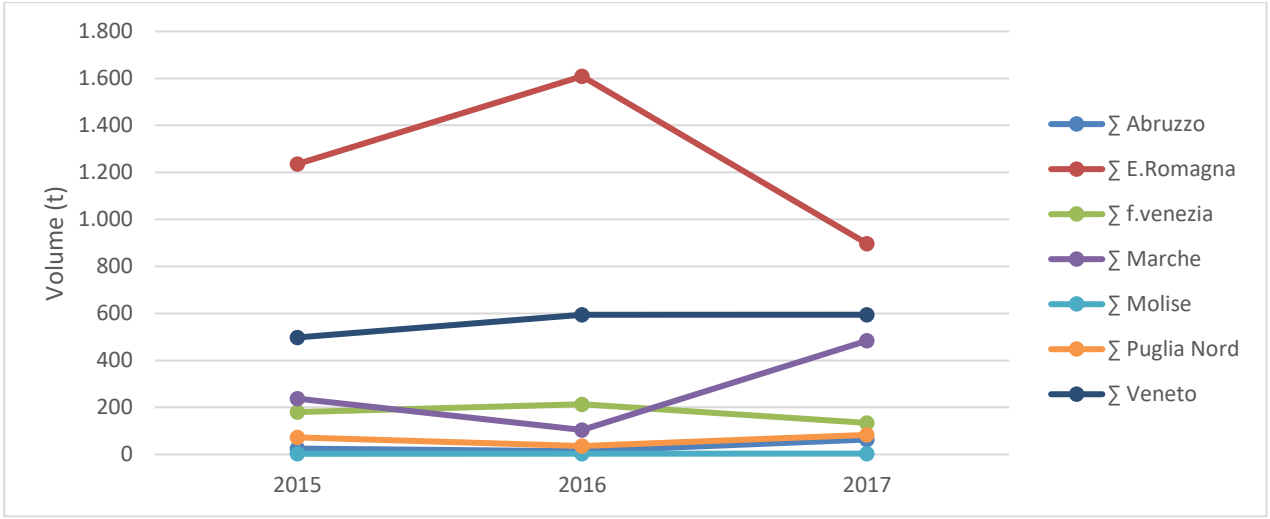


Figure 208: Mullets volume by region

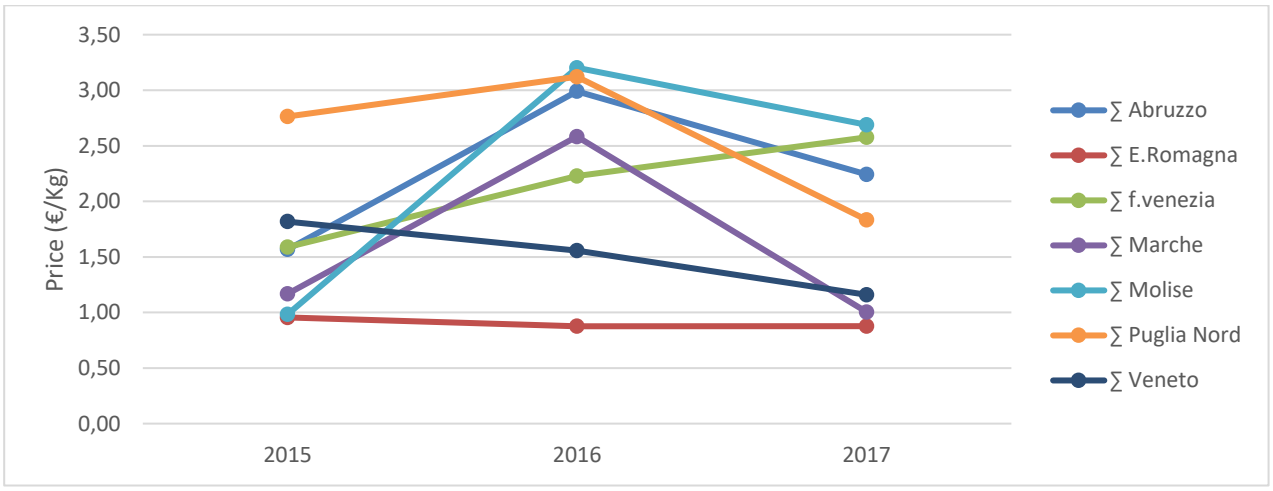


Figure 209: Mullets average Price by region

- Abruzzo reportedly used three different fishing technique in the 2015-2017 timeframe. DRB has been the least productive method as it only granted 15Kg in 2015 (worth 0,68€/Kg).

  PGP<12 started in 2015 with low volume (4,5t), then rapidly developed to 10,2t in 2016 and 61,6t in 2017. Price is decreasing, from the 4,24€/kg in 2015 to 2,23€/kg in 2017.

  DTS follow a negative trend as is 2015 granted 20t and only 1,6t in 2017. Its price, oppositely, hardly grew from 0,97€/kg in 2015 to 2,70€/Kg in 2017.

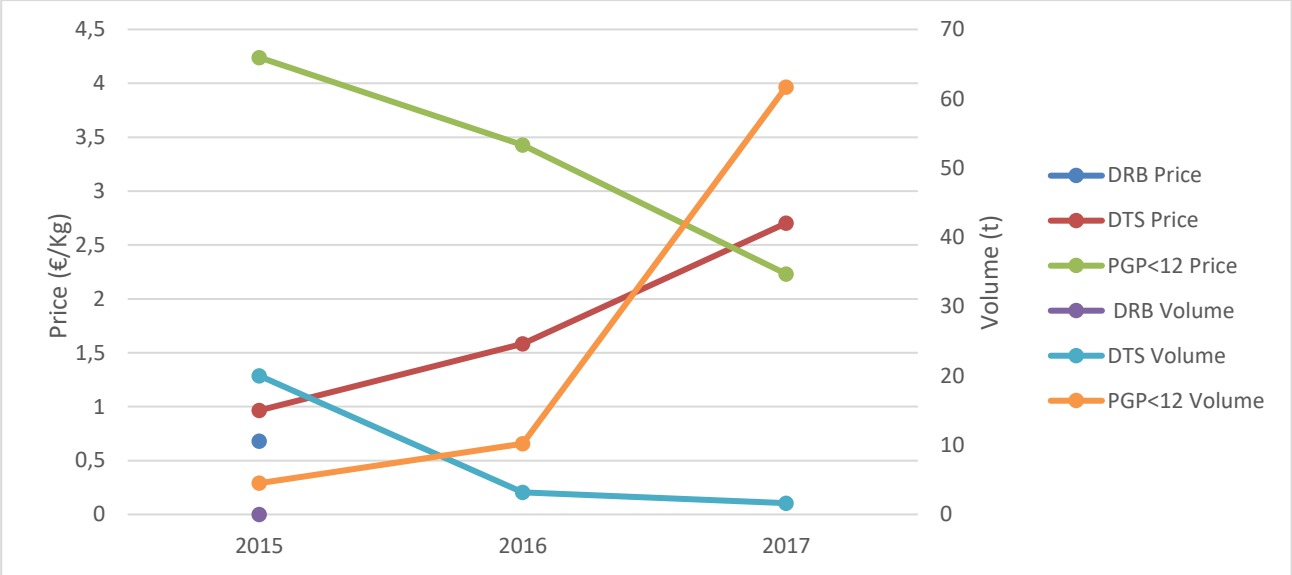


Figure 210: Price and Volume by technique - Abruzzo – PNRDA

- Emilia-Romagna's large Mullets production is mainly based upon TM fishing. This technique granted 1.061t in 2015, 1.189t in 2016 and 724t in 2017. In that timeframe Tm granted even the cheapest Mullets, averagely costing 0,77€/Kg in 2015, 0,66€/Kg in 2016 and 0,76€/kg in 2017.

  Follow by volume relevance PGP<12 (164t in 2015, 145t in 2017, on clear negative price trend ended at 1,89€/Kg in 2017) and DTS (153t in 2016, 24t at 0,82€/Kg in 2017).

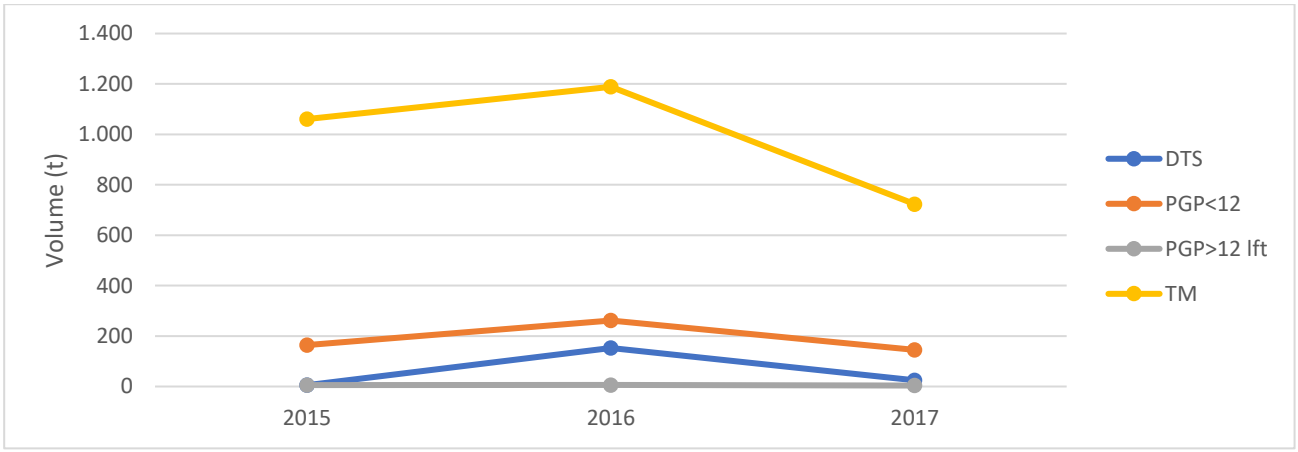


Figure 211: Volume by technique – Emilia-Romagna - PNRDA

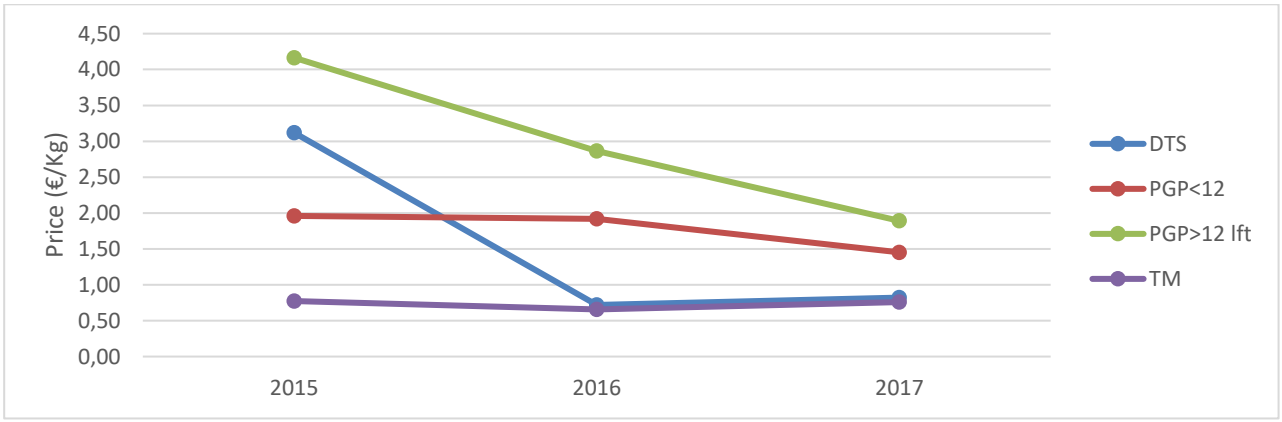


Figure 212: Price by technique – Emilia-Romagna – PNRDA

- Mullets fishing in Friuli Venezia Giulia is implemented by DTS, PGP<12 and PS.
  DTS has been the most productive during 2015 (90,7t) and 2016 (122t), but in 2017 decreased to 42t (less than PGP<12 and PS). Its price followed a positive trend, from 0,78€/Kg in 2015 to 2,24€/Kg in 2017.

  PGP<12 has been recorded producing 72,6t in 2015, having a slight increase in 2016 hitting 77t and then retracing to 52,7t. Price followed the same geometrical pattern (2,5€/Kg in 2015, 2,95€/kg in 2016 and 2,42€/Kg in 2017).

  Mullets fished by PS were less than 15,7t in 2015 and 2016, but had an increase on 2017 hitting 42t. Price has been in the highest positions for the whole considered time, linearly growing from 2,50€/Kg in 2015 to 3,08€/Kg in 2017.

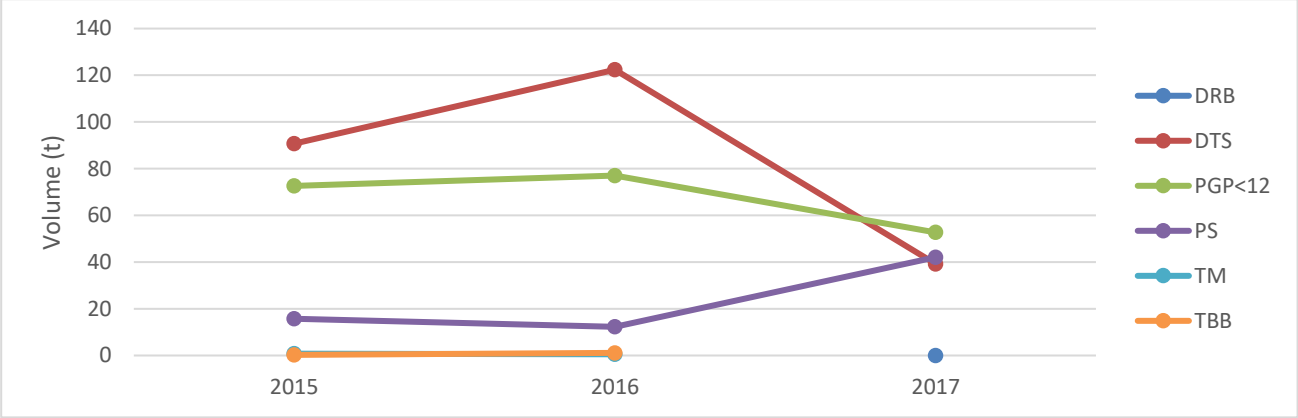


Figure 213: Volume by technique – Friuli Venezia Giulia – PNRDA

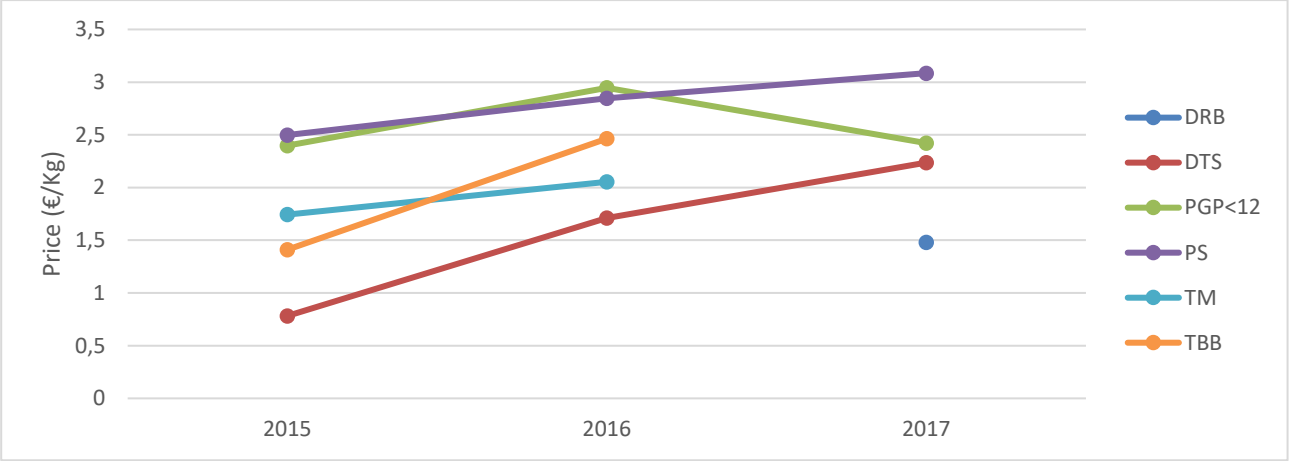


Figure 214: Price by technique – Friuli Venezia Giulia – PNRDA

- Marche's apport is determined by the PGP<12 fishing technique. On 2015 and 2016 it produced 82,9t and 101,9t, but in 2017 volume rose to 482t. Its price moved in the opposite way, dropping in 2017 from 2,59€/Kg to 1€/Kg.
  TM is only reported for 2015, when procured 153t at 0,54€/Kg.

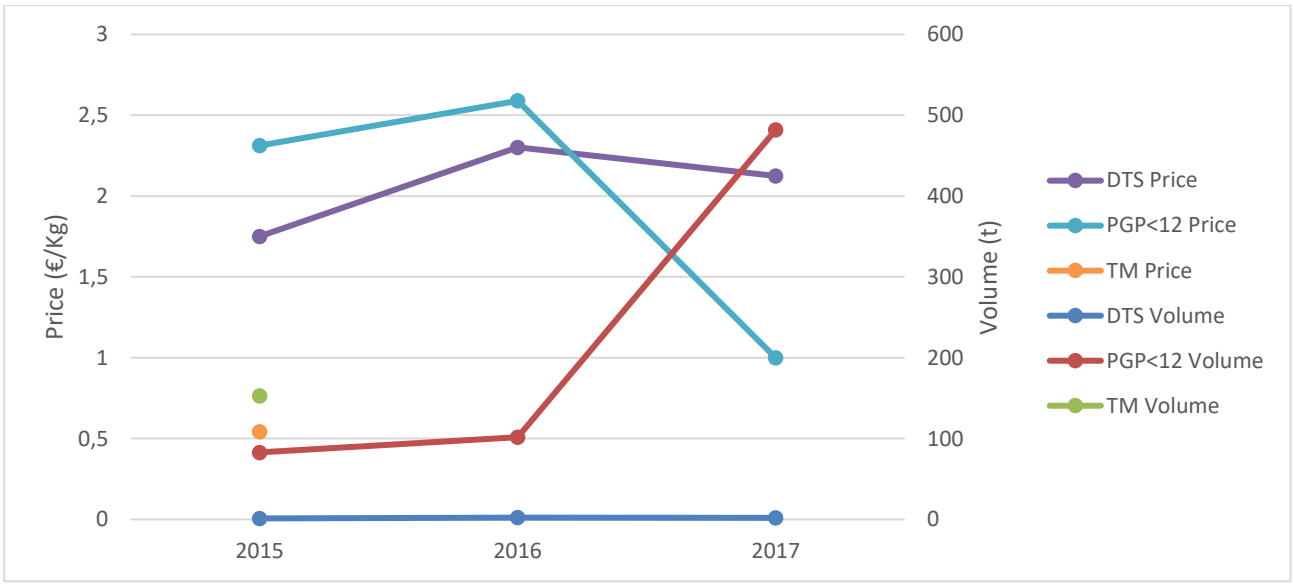


Figure 215: Price and Volume by technique - Marche – PNRDA

- Molise's contribution in Mullets is quite low. Roles between PGP<12 and DTS switched in 2016, when PGP<12 increased from 0,1t to 2,4t and DTS decreased to 0,7t from 2,4t.
  Price of Mullets fished by PGP<12 followed a positive trend, moving from 1,03€/Kg in 2016 to 2,66€/kg in 2017.
  DTS had a price noticeable peak on 2016, when averagely costed 6,12€/Kg. During 2017 it declined to 2,76€/Kg.

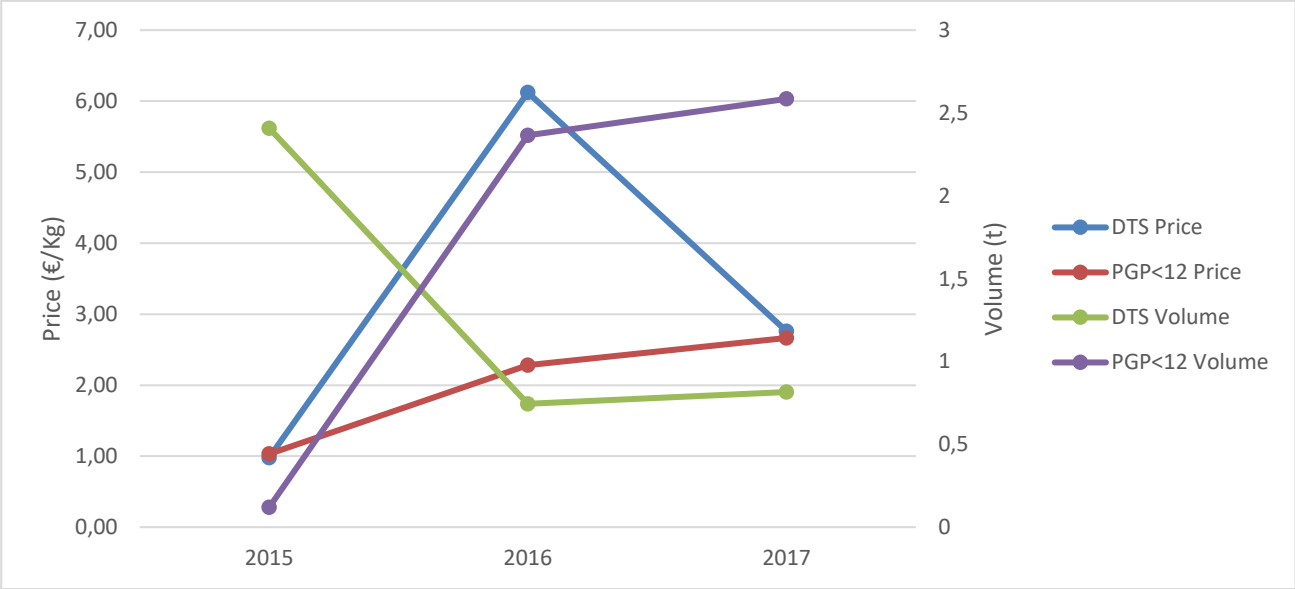


Figure 216: Price and Volume by techniques - Molise – PNRDA

- Price by DTS in Puglia Nord followed a negative trend, from the 43,5t in 2015 to the 12,6t of 2017. Its price moved only about 0,01€/Kg during 2016 (3,32€/kg and 3,33€/Kg), before decreasing to 1,58€/Kg in 2017.
  Fishing by PGP<12 presented the most noticeable movement. It passed from 5,8t in 2016 to 69,8t in 2017. Contemporary, price decreased from 2,43€/kg to 1,87€/Kg.

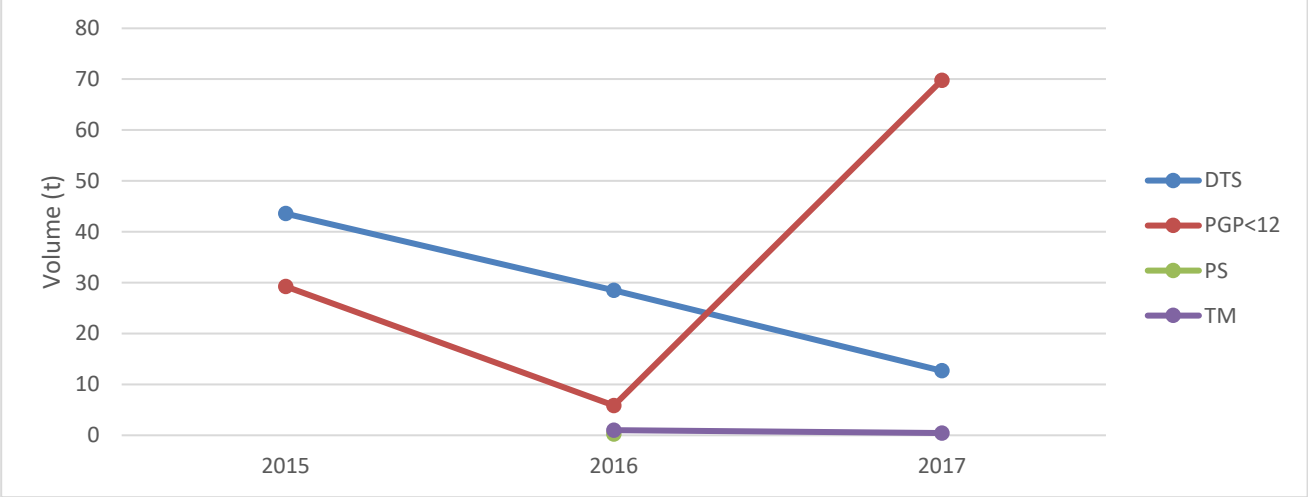


Figure 217: Volume by techniques – Puglia Nord – PNRDA

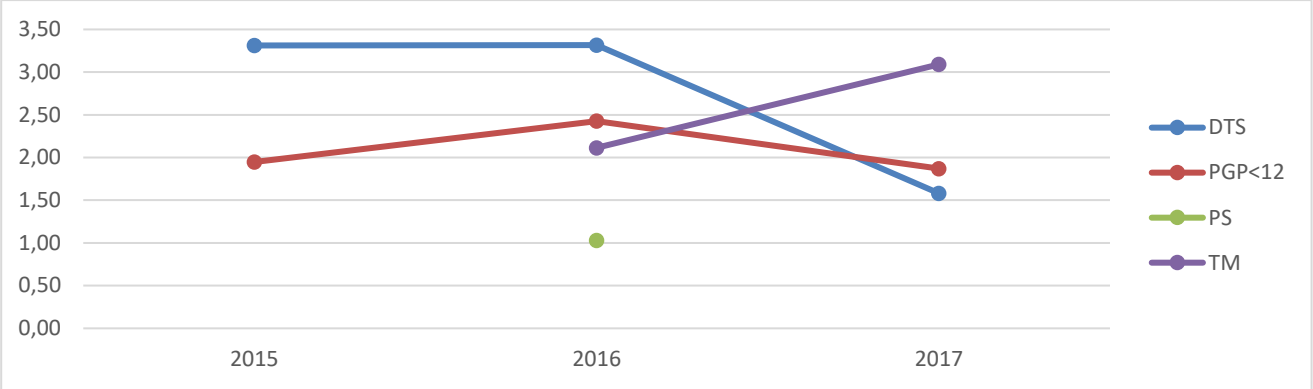


Figure 218: Price by technique – Puglia Nord – PNRDA

- Veneto has been the second most productive region for Mullets on Adriatic Sea on 2015-2017.
  Particularly effective resulted PGP<12 (467t in 2015, 491t in 2016 and 342t in 2017. On positive progression is TM, that starting from 9,7t in 2015 got to produce 181t in 2017. Also, DTS made positive progresses, passing from 20,8 t in 2015 to 63,2t in 2017.

  Concerning prices, PGP<12 diminished from the 1,81€/Kg of 2015 to 0,97€/Kg in 2017. TM's price fell in 2016, passing from 2,43€/Kg to 0,89€/Kg, in the following year it adjusted to 0,97€/Kg.

  DTS' grew from 1,72€/Kg in 2015 to 2,15€/Kg in 2017.

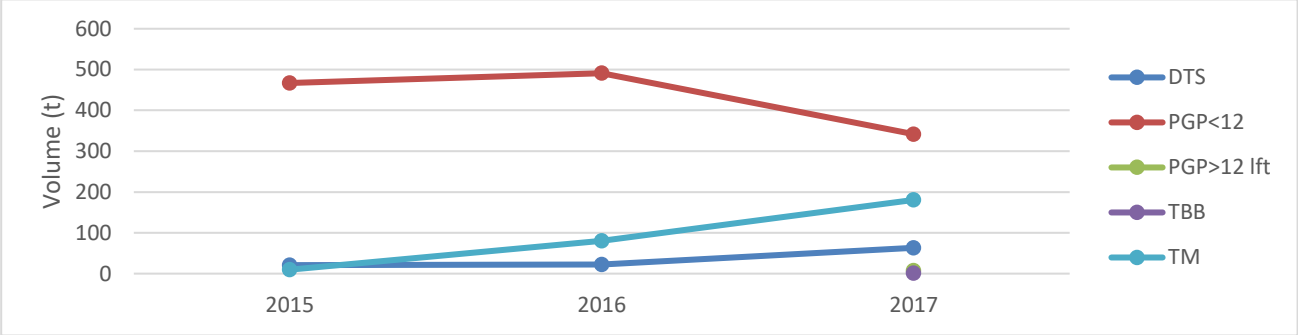


Figure 219: Volume by technique - Veneto – PNRDA

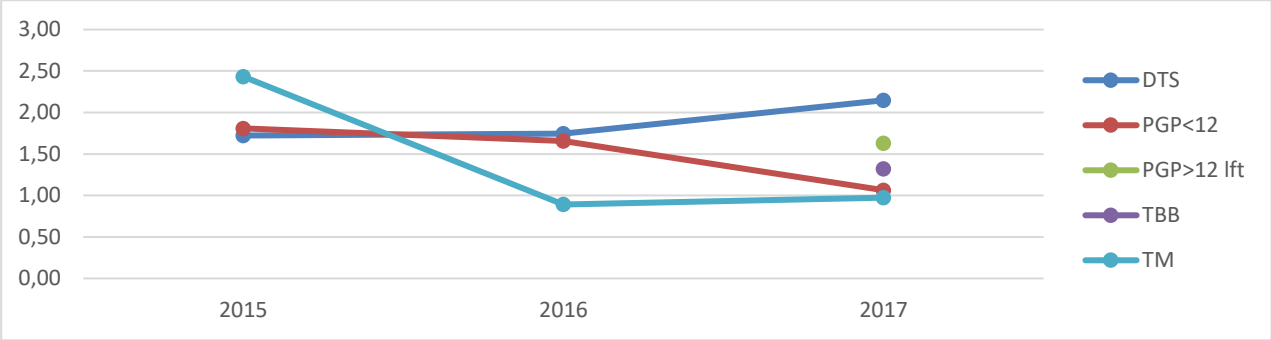


Figure 220: Price by technique - Veneto – PNRDA

By fishing techniques point of view

Mullets fishing is characterized by the strong presence of both PGP<12 and TM. PGP<12 is on increasing volume trend: from the 821t of 2015 grew up to the 1.156t of 2017.

TM had a first year of slight increase in 2016 (from 1.225t to 1.271t) and then decreased to 905t in 2017.

Among others, have to be mentioned DTS (144t in 2017, 332t on 2016's peak) and PS (that collected 42t in 2017, increasing the 12,5t of 2016 and the 15,74t of 2015).

Regarding prices, TM has been the cheapest for the whole period (0,76€/Kg in 2015, 0,67€/kg in 2016 and 0,80€/Kg in 2917). PGP<12 has a descending trend, starting from 1,96€/kg in 2015 to 1,26€/Kg in 2017). PS's price grew in the three years from 2,50€/kg to 3,08€/kg, becoming the most expensive method in 2017. Price by DTS decreased in 2016 from 1,58€/kg to 1,41€/kg, but in 2017 rose to 1,91€/Kg.

Table 61: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)	Price (€/Kg)

	2015	2016	2017	2015	2016	2017
∑ DRB	0,01	0	0,004	0,68		1,48
∑ DTS	184	332	144	1,58	1,41	1,91
∑ PGP<12	821	950	1.156	1,96	1,96	1,26
∑ PGP>12 lft	5,2	6,16	11,1	4,16	2,86	1,72
∑ PS	15,74	12,52	42	2,50	2,81	3,08
∑ TBB	0,26	1,12	1,49	1,41	2,46	1,32
∑ TM	1.225	1.271	905	0,76	0,67	0,80

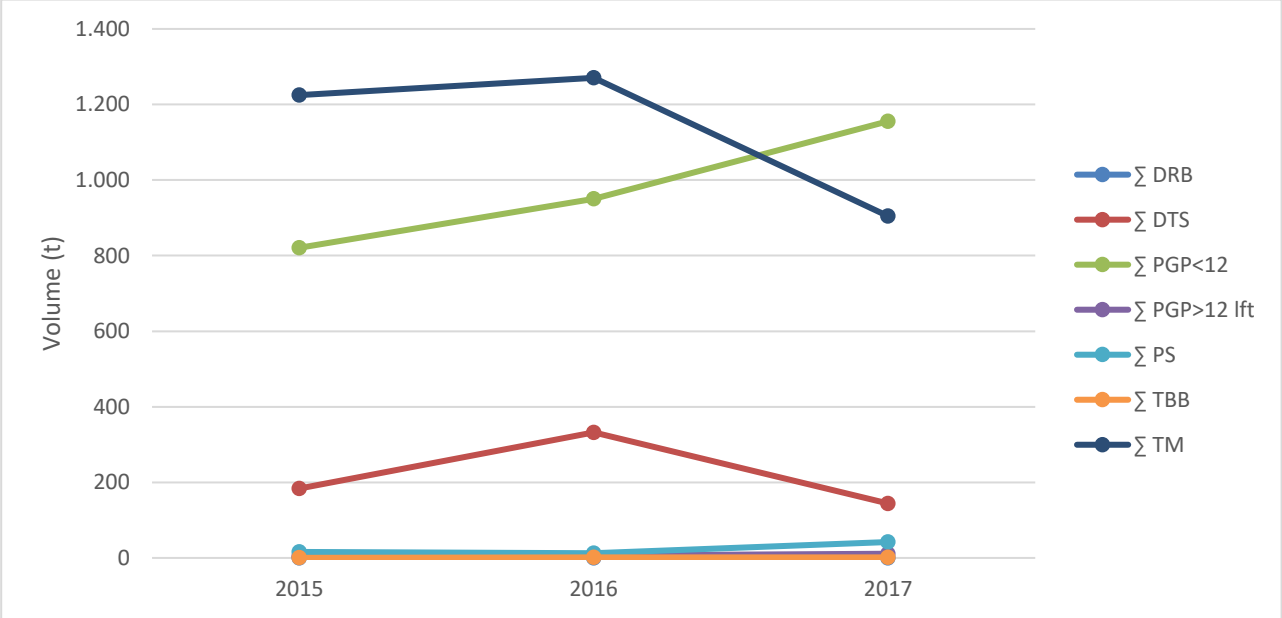


Figure 221: Mullets Volume by technique

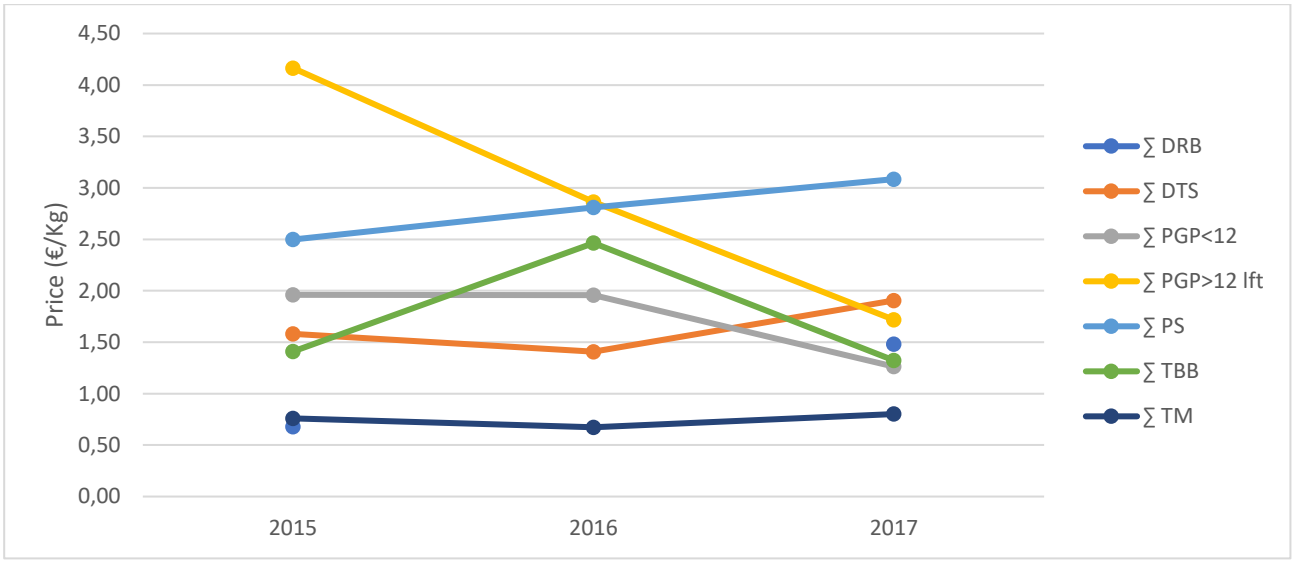


Figure 222: Mullets average price by technique

- DRB is a low effective fishing method for Mullets. It provided 15Kg in Abruzzo in 2015 (worth 0,68€/Kg) and 4Kg in Friuli Venezia Giulia in 2017 (at 1,48€/kg).

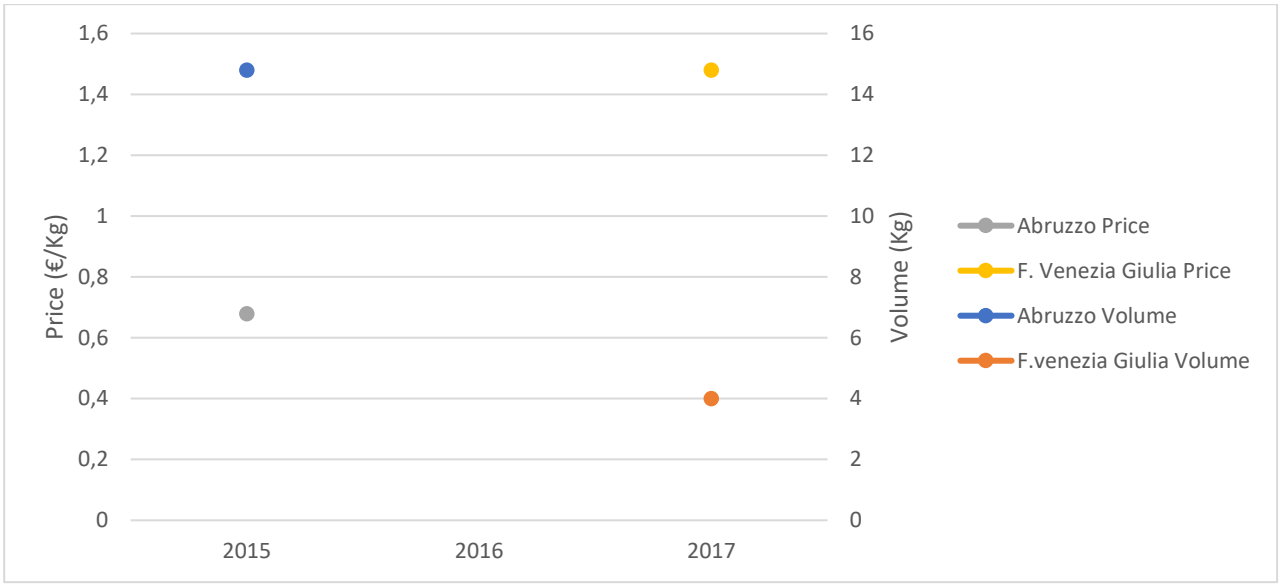


Figure 223: Price and Volume by region - DRB

- The production of Emilia-Romagna and Friuli Venezia Giulia has been quite discontinuous. Emilia-Romagna during 2016 had a peak of 152,6t in 2016, starting from 5,1t in 2015. In the following year volume went down to 24,5t. Its price in 2016 dropped to 0,72€/Kg from 3,12€/Kg, before settling to 0,82€/Kg.

  Friuli Venezia Giulia also had a peak in 2016 at 122t, and in the 2017 decreased to 39,2t. Price followed a positive trend, moving from 0,78€/Kg in 2015 to 2,24€/Kg in 2017.

  Puglia Nord is decreasing its contribution with DTS. Landed volume was 43,5t in 2015 and 12,7t in 2017. Price moved along with volume, with a noticeable reduction in 2017 (from 3,32€/Kg to 1,58€/Kg.
  Veneto is on positive trend. Its progression has been wider in 2017, reaching 63t (+40,6t on the previous year). Price slightly increased in the considered period from 1,72€/kg to 2,15€/kg.

  Last relevant region, on 2015 Abruzzo fished 20t of Mullets, a volume that decreased to 3,1t in 2016 and 1,6t in 2017. Price in Abruzzo presented a positive trend, growing from 0,96€/kg in 2015 to 2,70€/Kg in 2017.

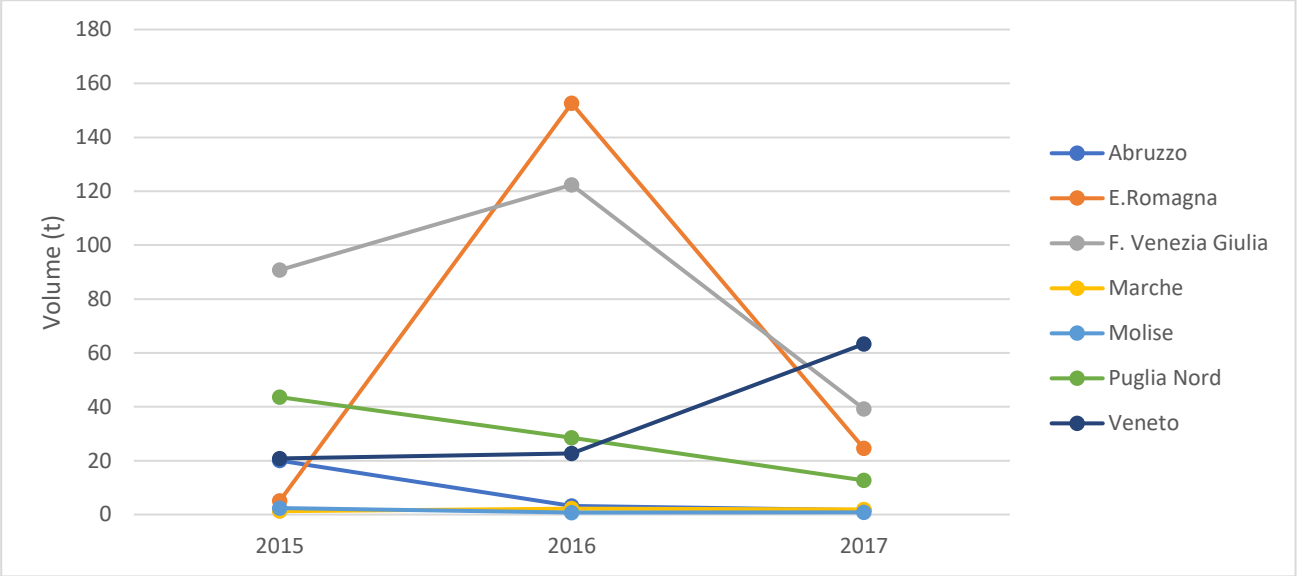


Figure 224: Volume by region - DTS

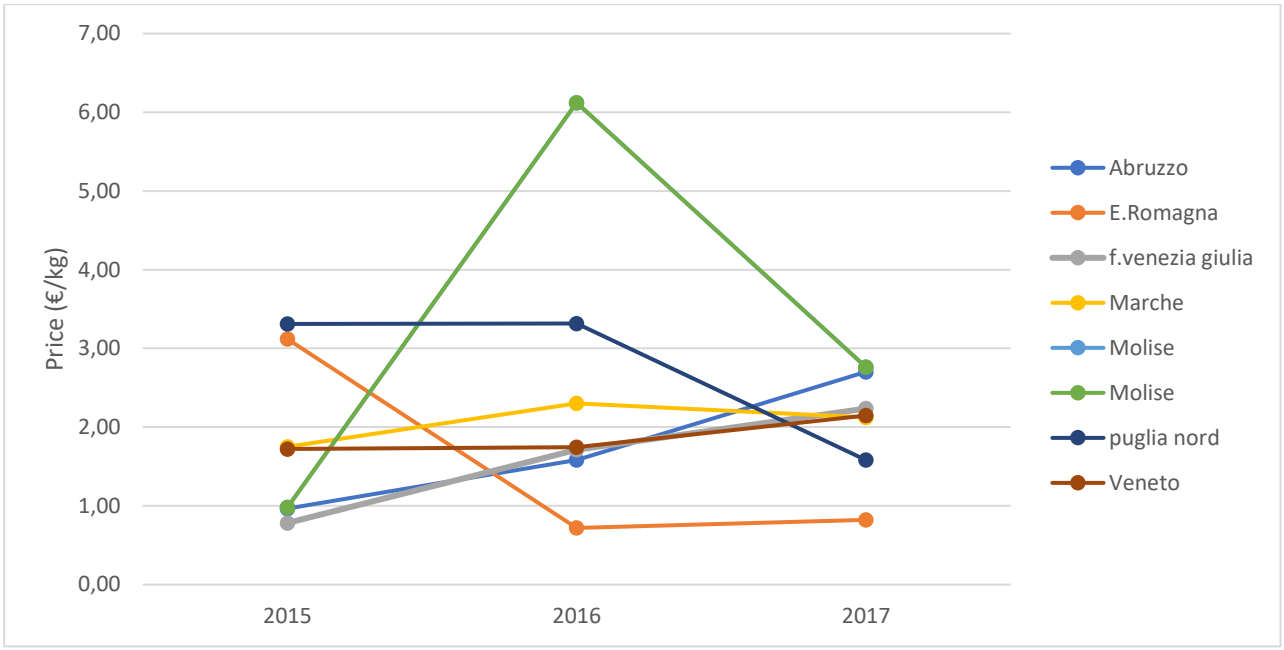


Figure 225: Price by region - DTS

- PGP<12 became the most relevant fishing technique in 2017. In that year Marche advanced from 101,9t to 482t while Veneto decreased from 491t to 342t.
  Emilia-Romagna leads the other regions, with 164t in 2015,261,6t in 2016 and 145t in 2017. Follow Friuli Venezia Giulia (72,6t in 2015, 77t in 2016 and 52,7t in 2017), Puglia Nord (29,3t, 5,8t, 69,8t) and Abruzzo (grown from 4,5t in 2015 to 61,6t in 2017).

  Veneto's price stayed in the lower part of the chart for the three years. On 2015 Mullets was quoted 1,81€/Kg, 1,66€/Kg on 2016 and 1,06€/Kg in 2017.
  Price in Marche strongly decreased during 2017, passing from 2,59€/Kg to 1€/Kg.

Emilia-Romagna followed a descending trend as costed 1,96€/Kg in 2015 and 1,45€/Kg in 2017),

Friuli Venezia Giulia, Puglia Nord and Abruzzo have been more expensive.

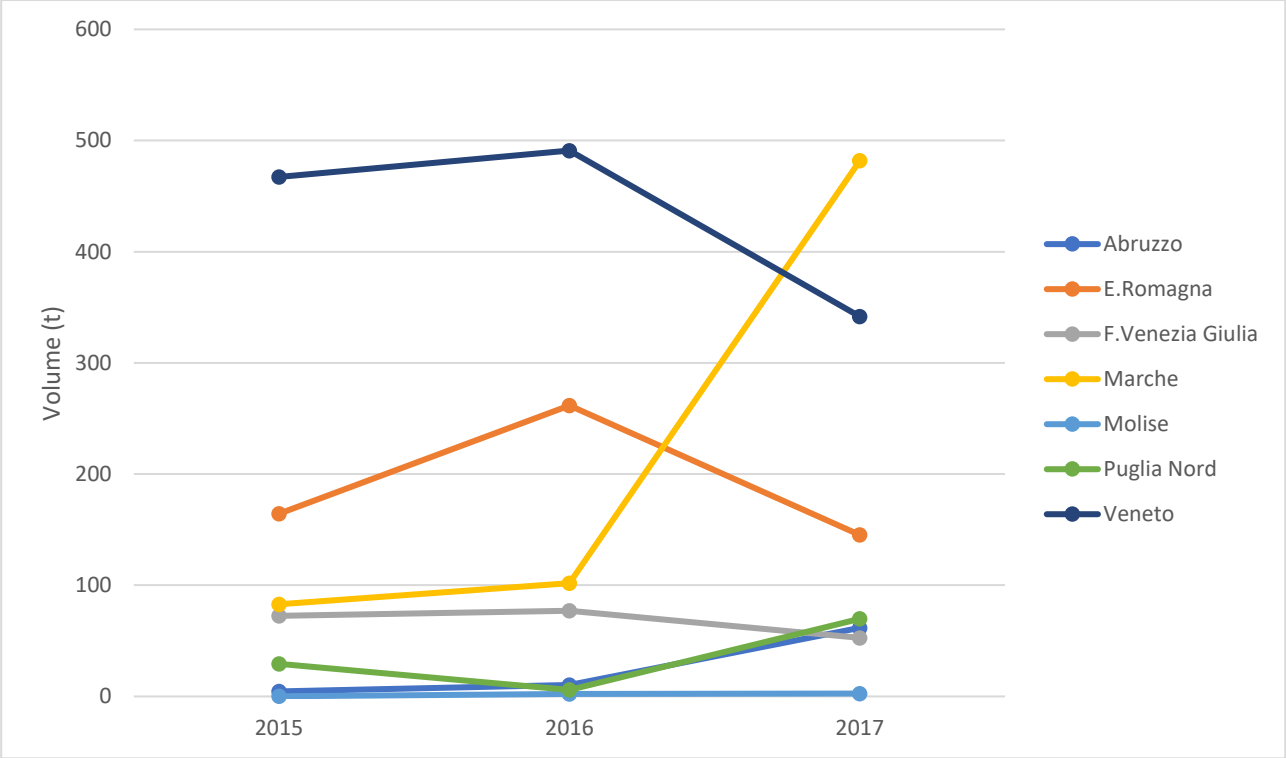


Figure 226: Volume by region - PGP<12

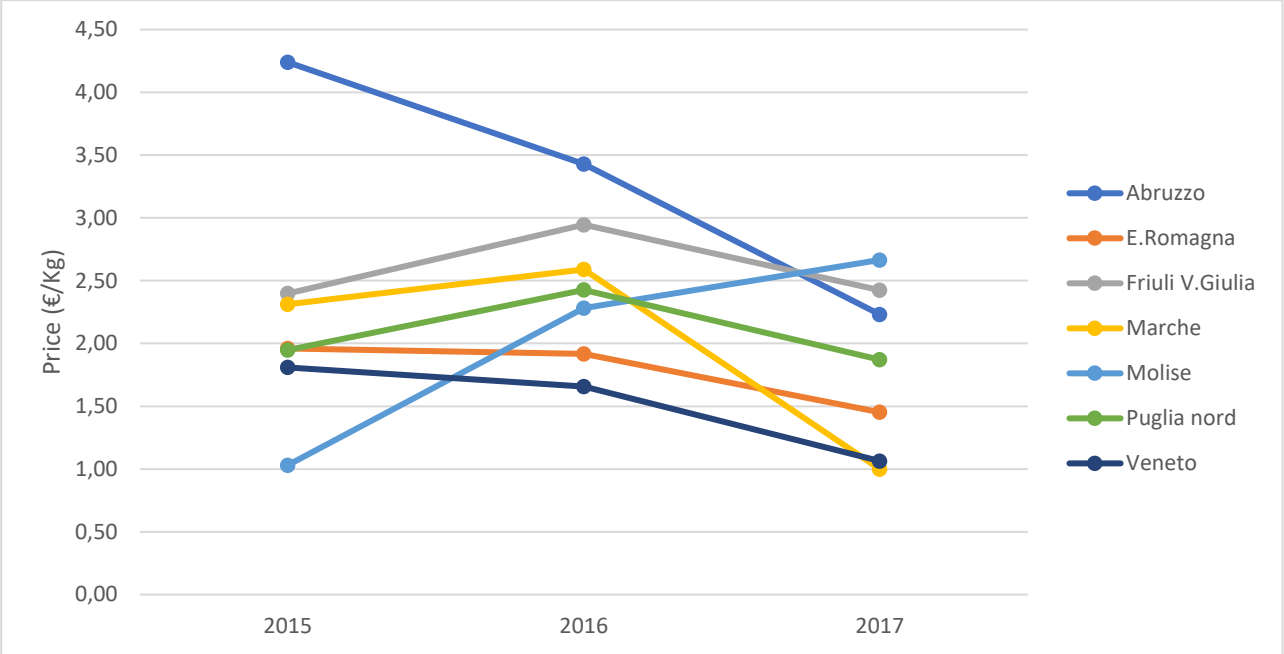


Figure 227: Price by region - PGP<12

- PGP>12 lft is a fishing method of secondary relevance. Emilia-Romagna fished 5,2t in 2015, 6,1t in 2016 and 3,7t in 2017. Its price followed a negative trend, costing 4,16€/Kg during 2015, 2,86€/Kg in 2016 and 1,89€/Kg in 2017.
  Veneto produced 7,3t during 2017, worth averagely 1,63€/Kg.

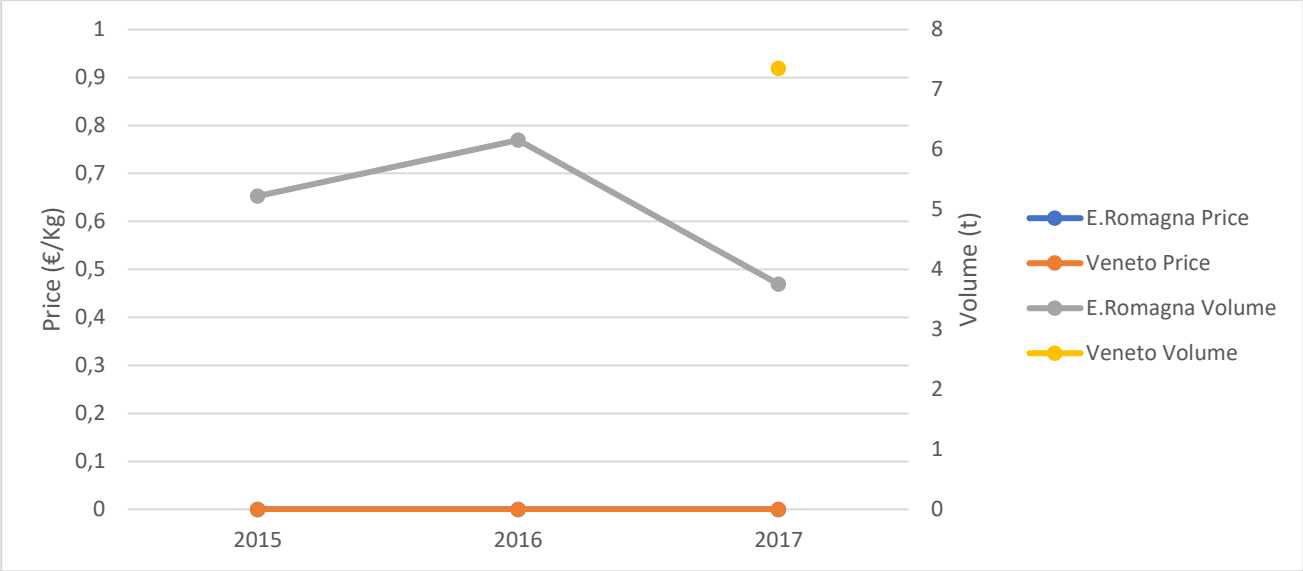


Figure 228: Price and Volume by region - PGP>12 lft

- Friuli Venezia Giulia is the most important region by PS fishing. 15,7t were produced in 2015, 12,3t in 2016 and 42t in 2017. Price followed a positive trend: from 2,50€/Kg in 2015 moved to 3,08€/Kg.
  During 2017, Puglia Nord produced 0,2t of Mullets worth 1,03€/Kg.

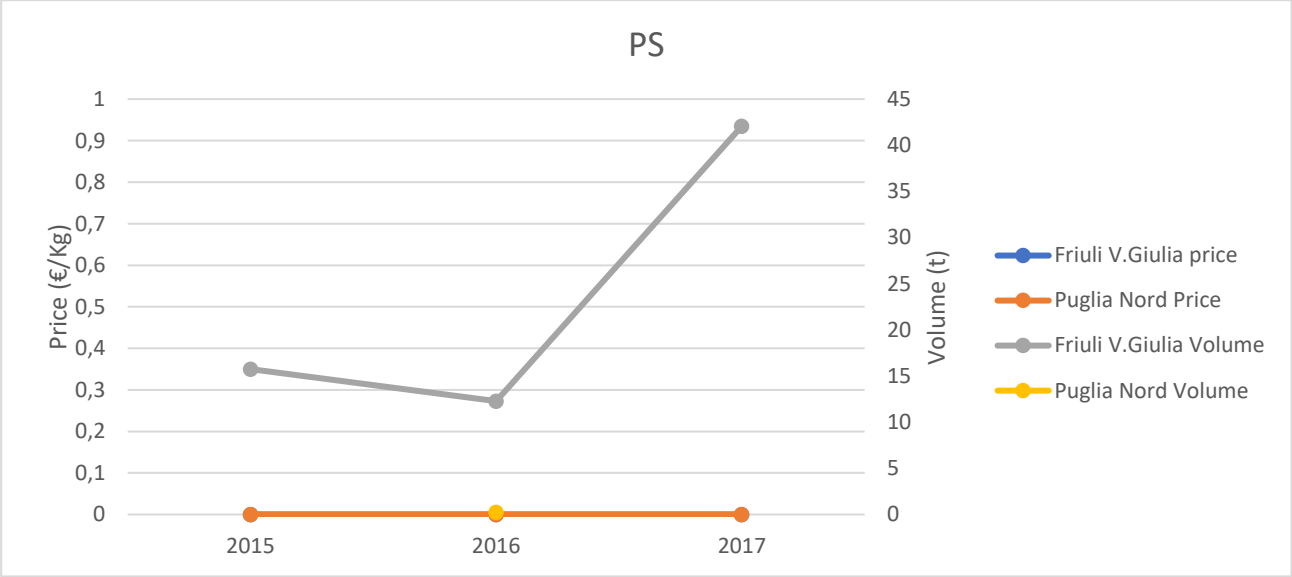


Figure 229: Price and Volume by region - PS

- TBB has been reported for Friuli Venezia Giulia only for 2015 (0,26t) and 2016 (1,1t). Price moved accordingly, 1,41€/Kg in 2015 and 2,46€/Kg in 2016.
  Veneto during 2017 produced 1,5t at 1,32€/Kg.

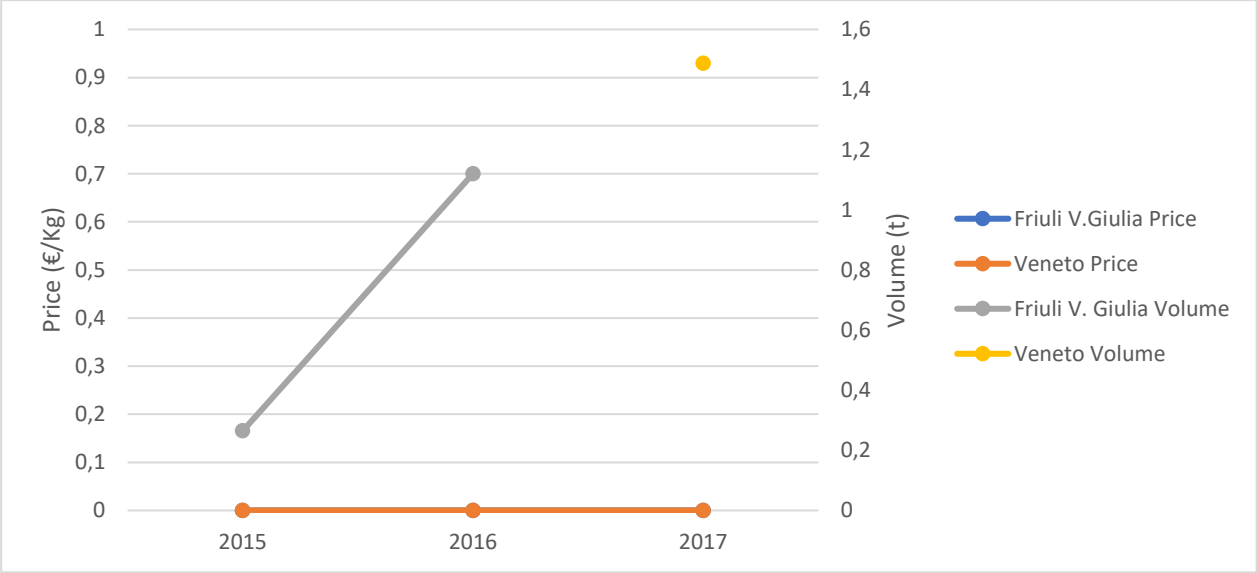


Figure 230: Price and Volume by region - TBB

- The most important region for TM fishing is Emilia-Romagna, that produced 1.061t in 2015, 1.189t in 2016 and 723t in 2017. Its price (apart from Marche) has been the cheapest, reporting 0,77€/Kg in 2015, 0,66€/Kg in 2016 and 0,76€/Kg in 2017.
  Veneto progressively increased its production, passing from 9,7t during 2015 to 180t in 2017. Price decreased during 2016 from 2,43€/kg to 0,89€/Kg, and in the following year stabilized to 0,97€/Kg.
  Marche are only reported for 2015, when produced 153t at 0,54€/Kg.

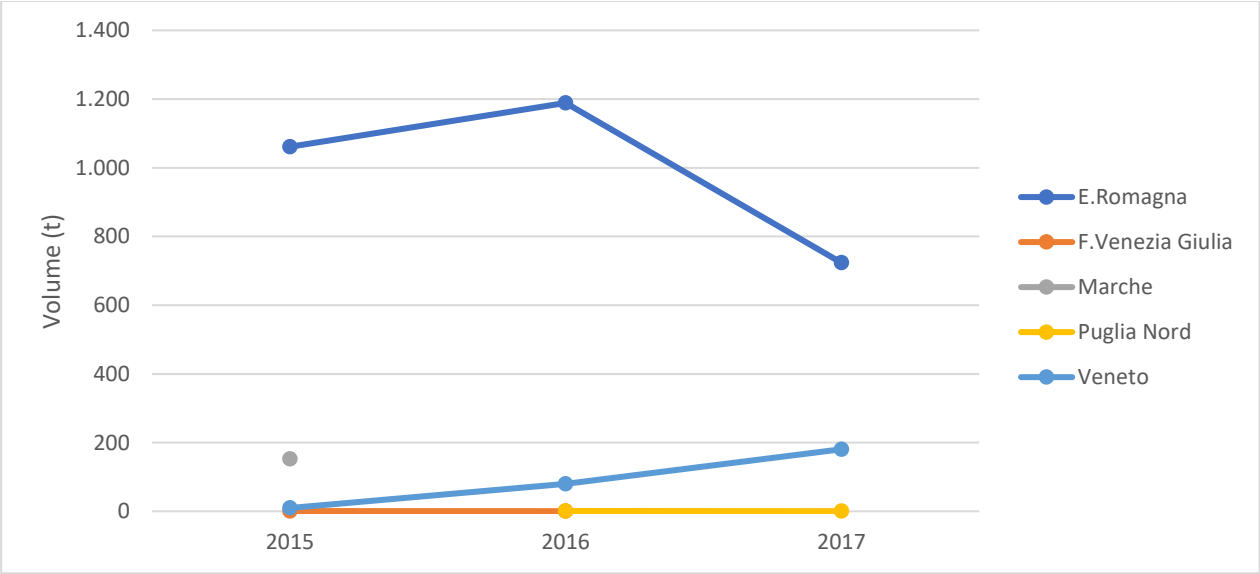


Figure 231: Volume by region - TM

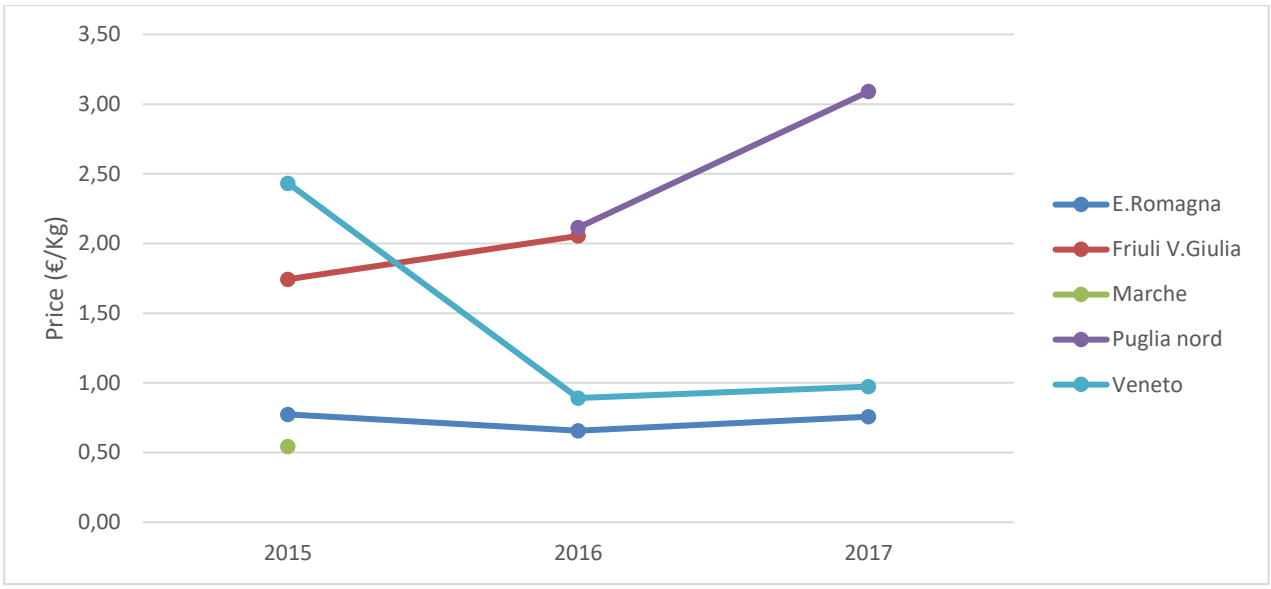


Figure 232: Price by region – TM

4.7 SARDINE

By regional point of view

Sardine is a relevant fishing sector in Adriatic Italy.

From 2015 to 1017 Veneto has been the most contributing region, but during 2017 lost part of the total share, reducing its production to 8.820t (-2.314t from the previous year's peak). Emilia-Romagna is stable over 6.000t/year, gaining more gap on the third region (which on 2017 became Puglia Nord with 2.082t).

Marche are in a clear descending trend, that started on 2015 with 4.813t and on 2017 led to 1.385t.

Friuli Venezia Giulia, Abruzzo and Molise are secondary producers: Friuli Venezia Giulia stands in a quite stable trend around 400t/year, Abruzzo halved its production (557t in 2015, 288 in 2017), and Molise only fished 60 Kg on the only recorded year.

Speaking about prices, they went averagely down during 2017.

Friuli Venezia Giulia is the most expensive region. Its peak (1,66€/Kg in 2016) is more than the double of the highest value from another region (0,8€/Kg, Veneto, 2015), but on 2017 its price decreased to values closer to the average.

Veneto's price is following a linear descendant line, (from 0,8€/Kg to 0,42€/Kg), as well as Puglia Nord (from 0,6€/Kg to 0,39€/Kg). Emilia-Romagna's pattern in more stable, and on 2017 sardine averagely costed 0,57€/Kg).

Table 62: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	557,5	489,6	288,4	0,54	0,68	0,51
∑ E.Romagna	6.156,9	7.069,7	6.822,1	0,64	0,58	0,57
∑ F.V.Giulia	374,1	449,6	397,8	1,36	1,66	0,94
∑ Marche	4.813,1	3178,5	1.384,9	0,51	0,51	0,57
∑ Molise			0,06			0,73
∑ Puglia Nord	2.627	2.235,8	2.082,7	0,60	0,57	0,39
∑ Veneto	10.730,4	11.134,3	8.820,9	0,80	0,66	0,42

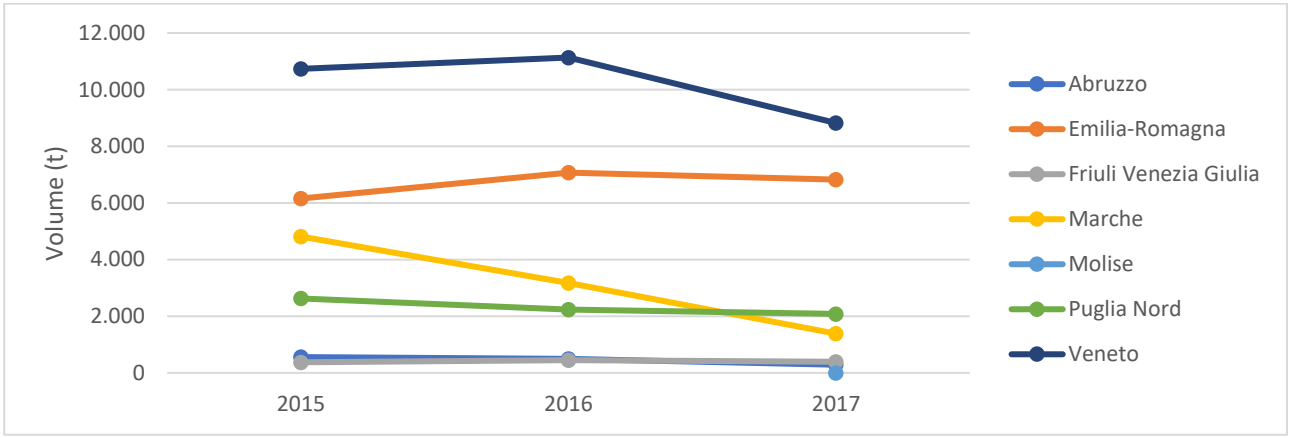


Figure 233: Sardine Volume by region - PNRDA

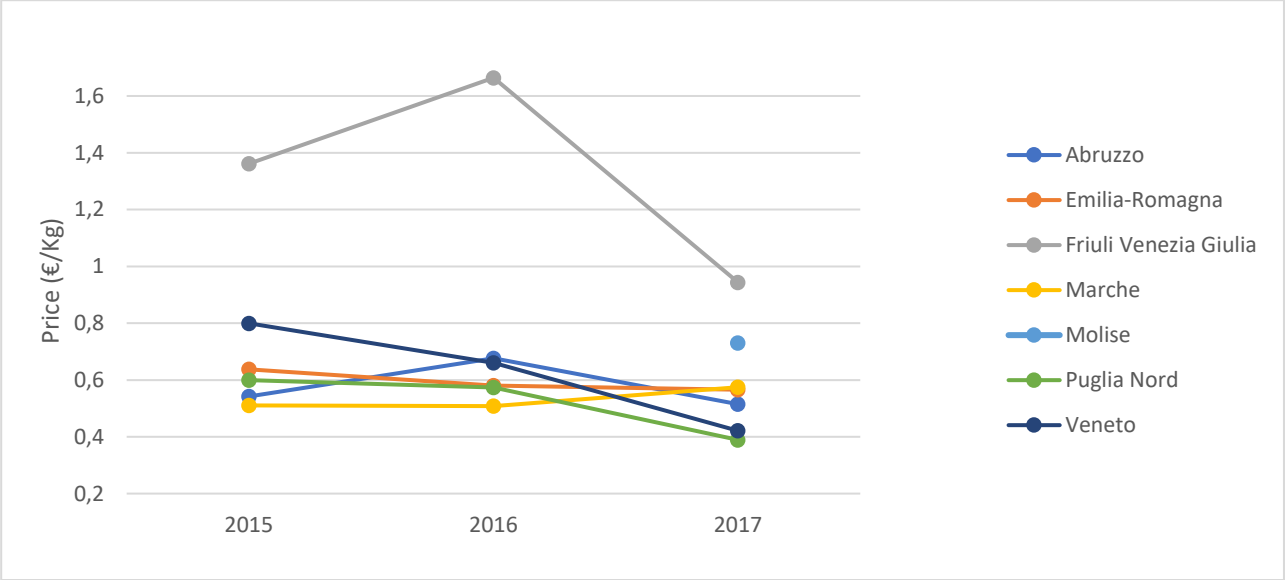


Figure 234: Sardine average Price by region – PNRDA

- Abruzzo is the fourth region for sardine fishing of the considered coast.
  PS is the relevant technique, as TM is not reported. Fishing by this method is in a strongly descendant trend. On 2015 557t were fished, while on 2017 287t. its price followed a first moment of increase (from 0,54€/Kg to 0,68€/Kg) and then moved down to 0,52€/Kg.

  DTS reached 1,4t on 2017, a particular year due to the price fall (from 1,03€/Kg in 2016 to 0,42€/kg in 2017).

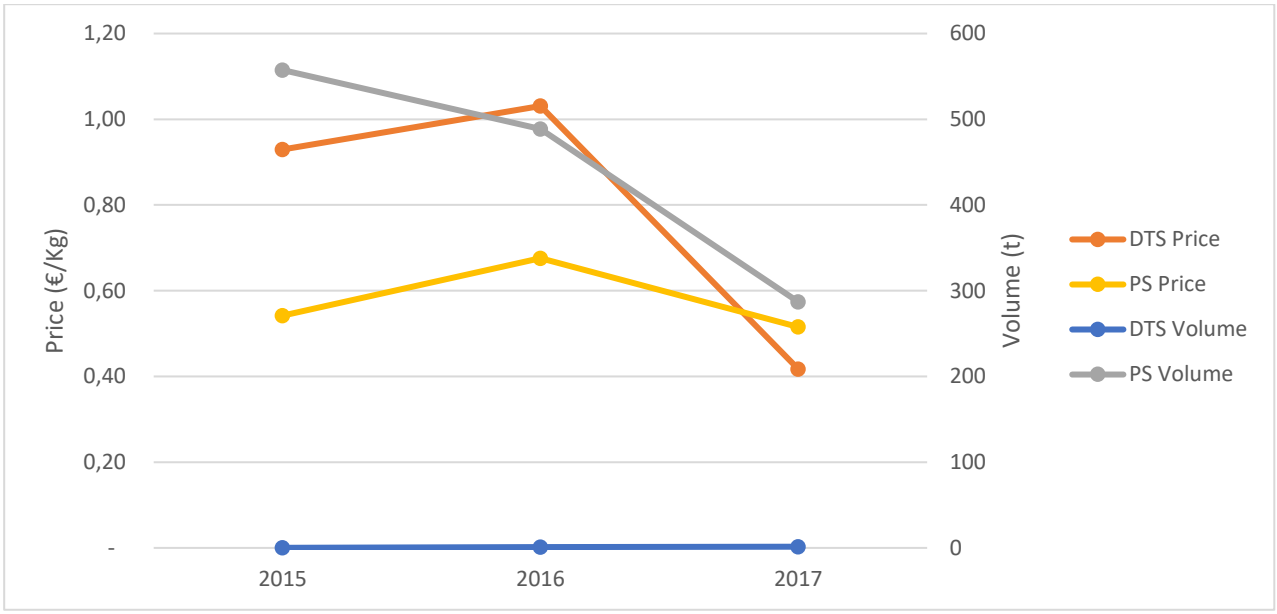


Figure 235: Price and Volume by techniques - Abruzzo – PNRDA

- Emilia-Romagna's landings are almost entirely composed by TM fishing. Starting from 6.154t during 2015, 6.977t followed on 2016 and 6.786t on 2017. The second alternative (DTS) is stuck at a maximum volume of 89t (2016), that happed on a year of substantial price inflexion (0,6€/Kg).
  TM's price stays quite stable, with a slight slope tendency (from 0,64€/kg in 2015 to 0,56€/Kg in 2017).

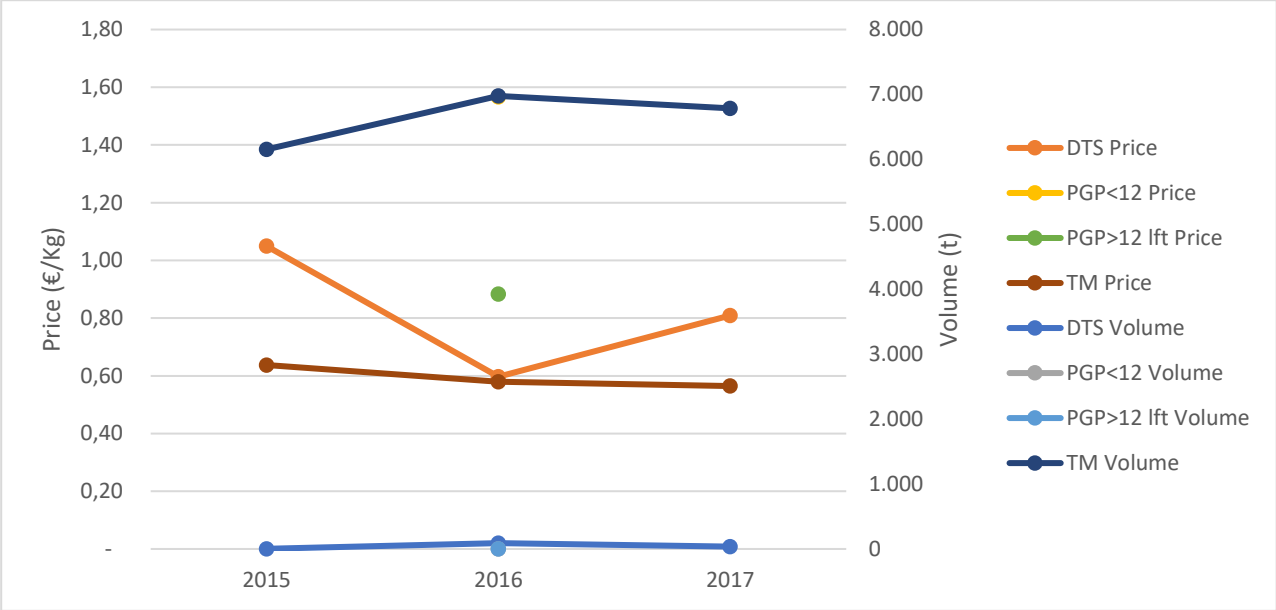


Figure 236: Price and Volume by techniques - Emilia-Romagna - PNRDA

- About Friuli Venezia Giulia the most relevant adopted technique is PS, which granted 293t in 2015, 406t in 2016 and 361,7t in 2017. The second most competitive method is TM, even if decreasing its production. 2017 has been the worst year with 33,5t.
  All prices decreased in this triennium, converging on 2017 in a very tiny range 0,88-0,95€/kg after a 2016 more variable (0,91€/Kg TM, 1,74€/Kg PS).

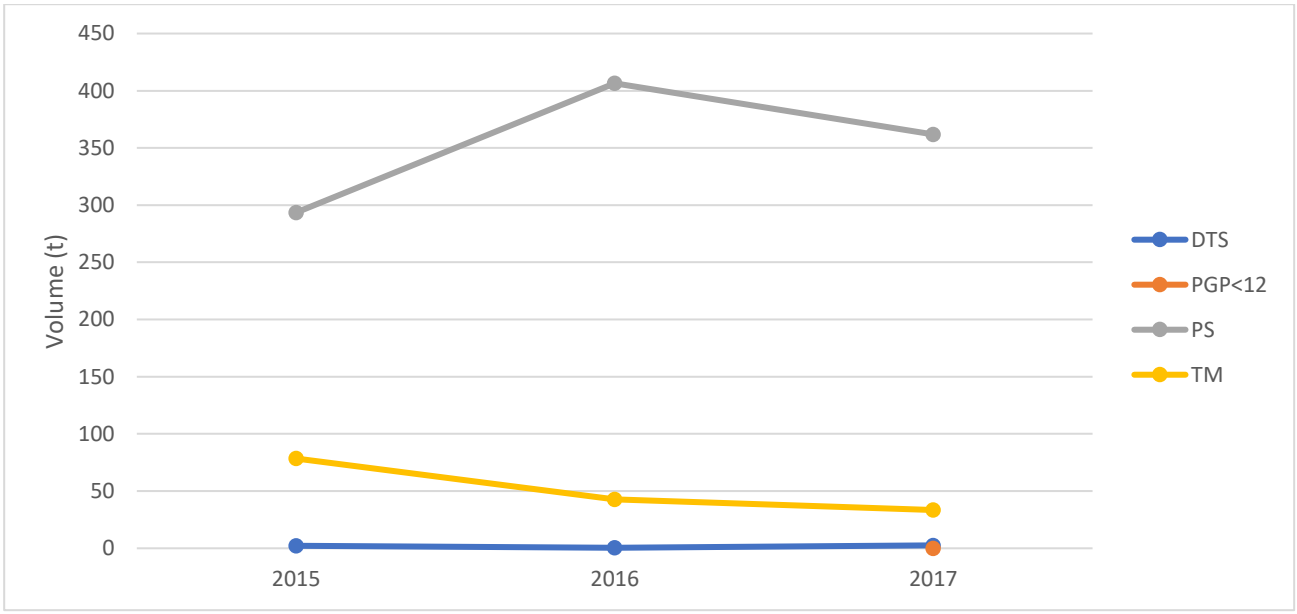


Figure 237: Volume by techniques – Friuli Venezia Giulia – PNRDA

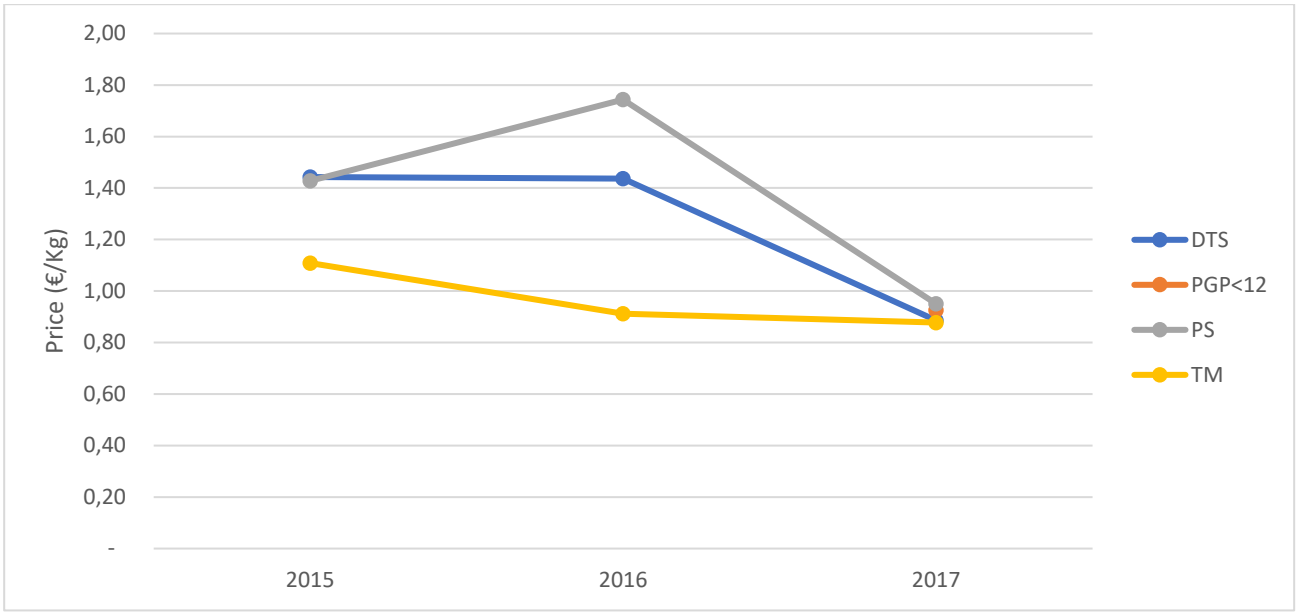


Figure 238: Price by techniques – Friuli Venezia Giulia – PNRDA

- Marche are mostly interested in TM fishing, but its volume is on serious drop. 4.810t were fished in 2015, only 1.380 in 2017.
  Price is having a small increase, closing 2017 with an average of 0,57€/kg.

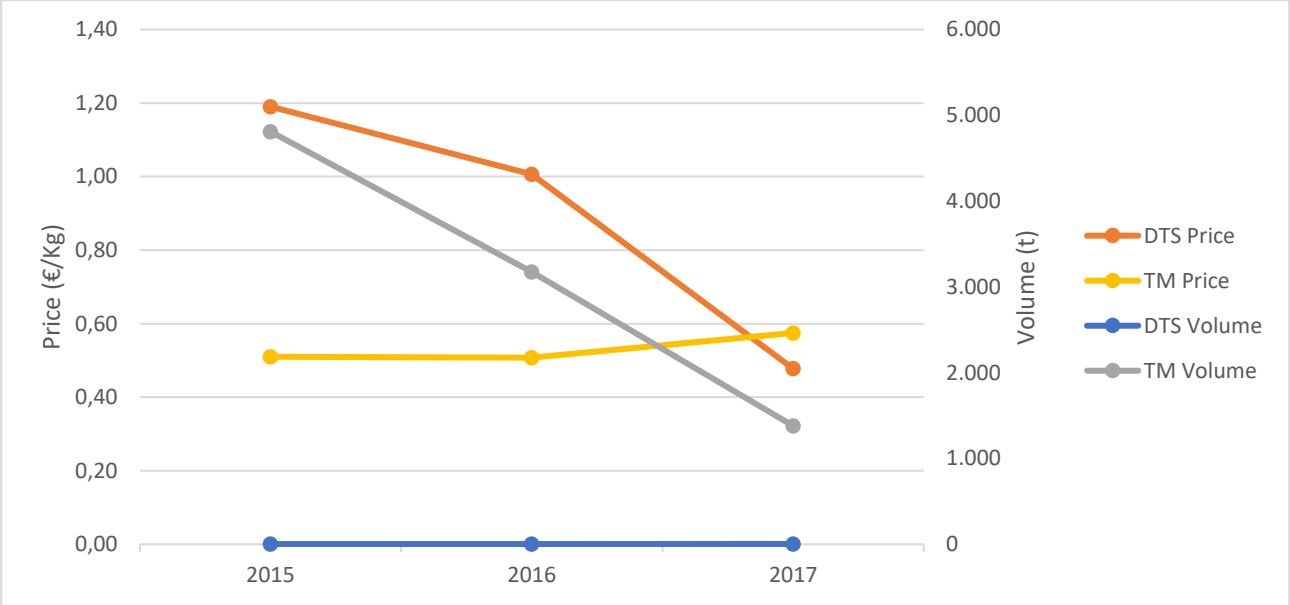


Figure 239: Price and Volume by techniques - Marche – PNRDA

- Data for Molise are almost non-existent. The only reported sardine fishing is in 2017 (60Kg, 0,73€/Kg).

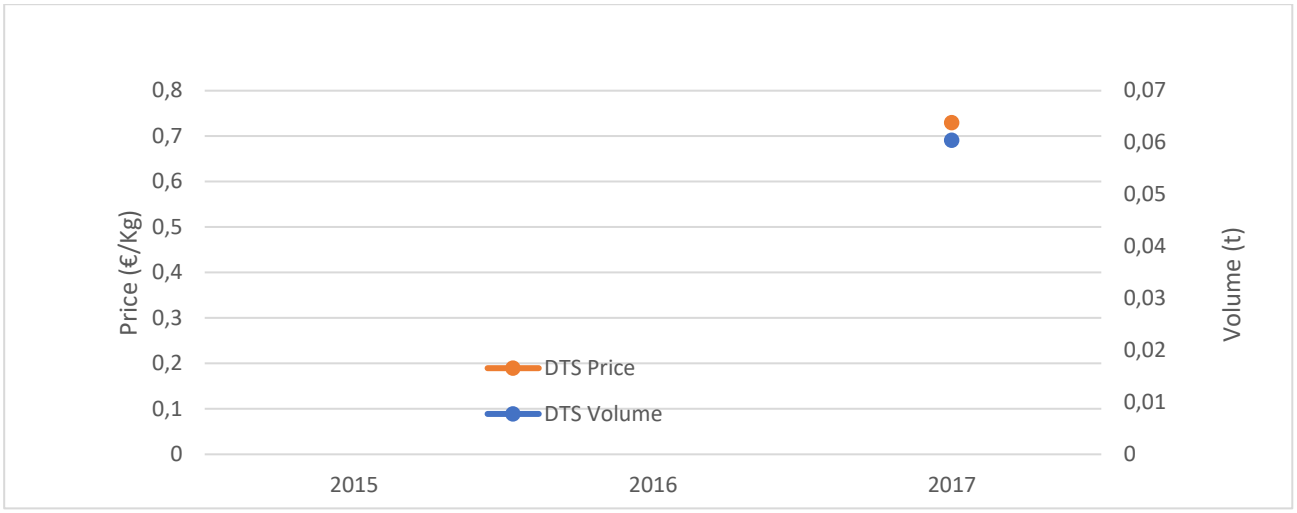


Figure 240: Price and Volume by techniques - Molise – PNRDA

- Since 2017 PS became the most important fishing method in Puglia Nord with 1.127t, following two very lower years (164t and 136t). TM followed a decreasing trend starting on 2015 at 2.462t and arriving at 2017 with 948t.
  Part of the PS fishing increase is due to the price reduction (lowest of all the others, at 0,31€/Kg).

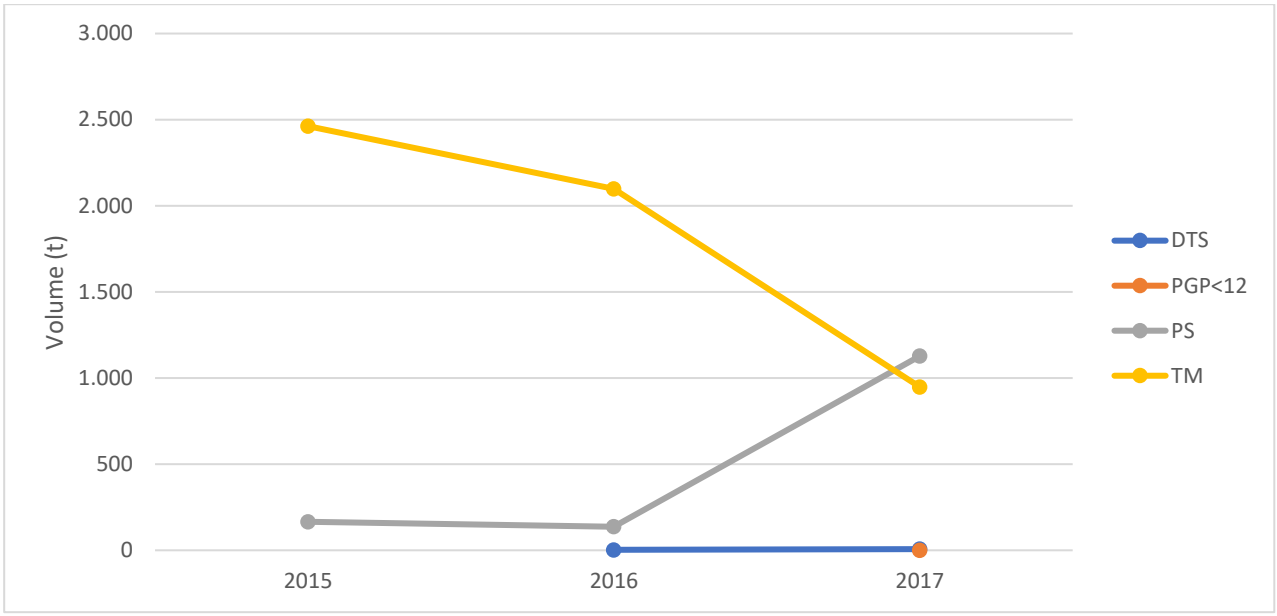


Figure 241: Volume by techniques – Puglia Nord - PNRDA

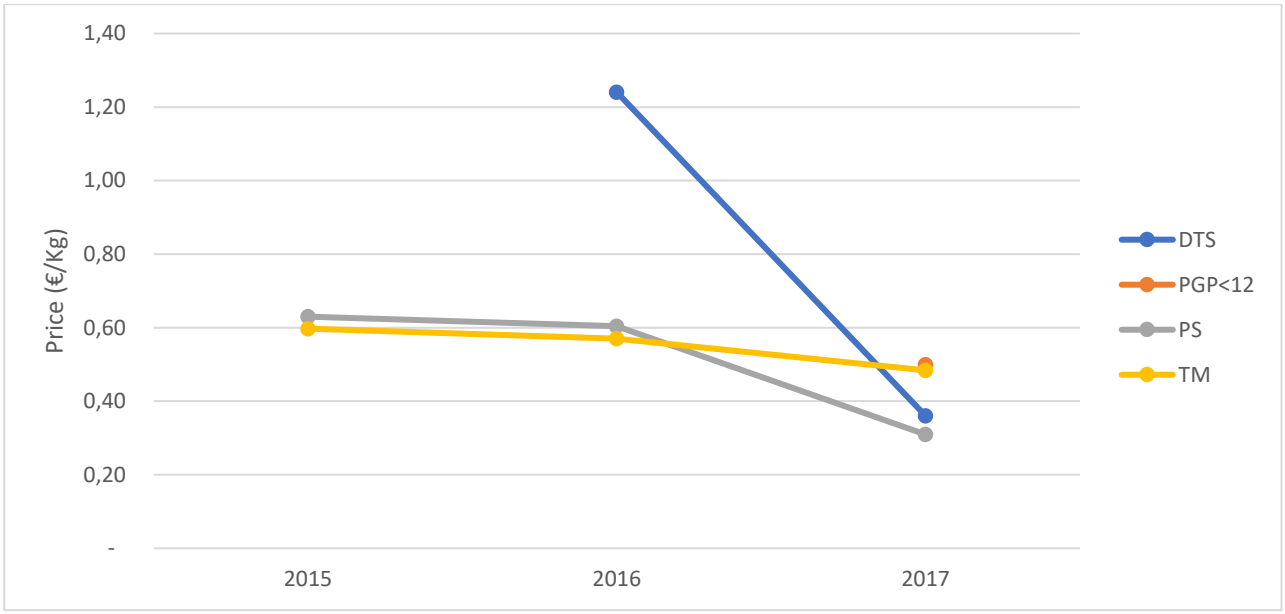


Figure 242: Price by techniques – Puglia Nord – PNRDA

- Veneto has been the most relevant region for sardine in the reported timeline. Its most productive fishing technique is TM, that provided 8.778t in 2017. Its price halved from 0,80€/Kg (2015) to 0,42€/Kg (2017).
  Of secondary importance is DTS (42t on 2017), the price of which is higher than TM's (especially on 2016's peak).

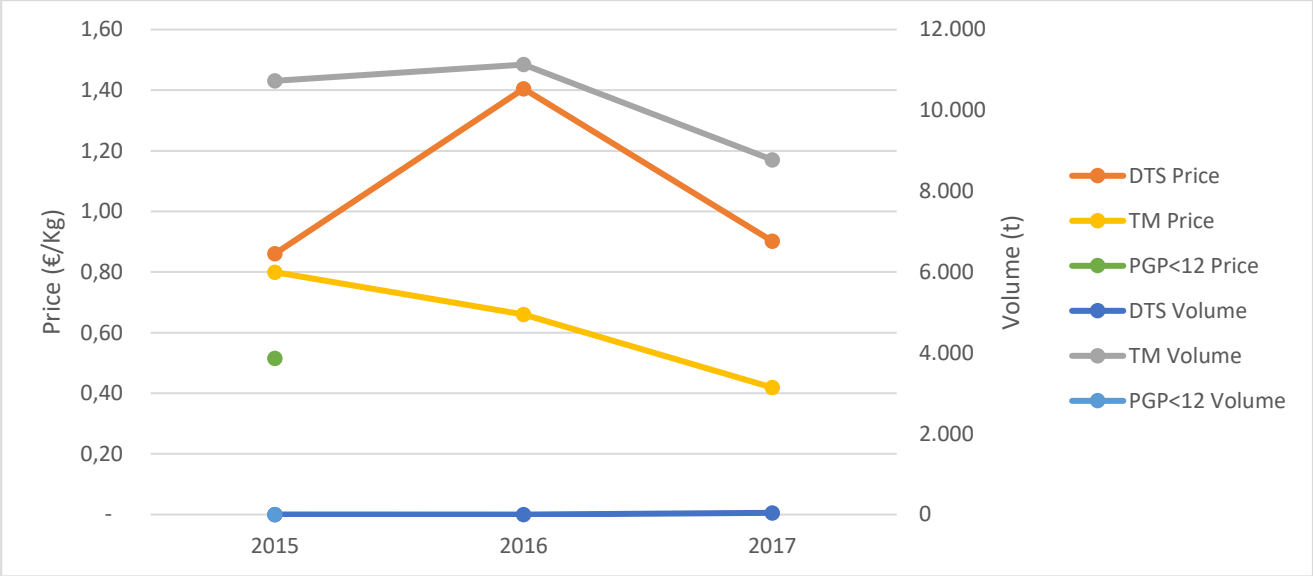


Figure 243: Price and Volume by techniques - Veneto - PNRDA

By fishing techniques point of view

Analysing the sector by fishing techniques, the most relevant results to be TM, and secondarily PS.

Fishing by TM represented the 90,5% of total landings on 2017, with a volume of 17.927. On 2016 and 2015 both volumes and dominance were higher. PS had a significant growth in 2017 (1.776t, +745t on the previous year).

TM granted the lowest prices on the considered years, and on progressive decrease. During 2017 averagely sardines fished by TM costed 0,49€/Kg, while by PS 0,47€/Kg. On 2016 PS was more expensive, as it costed 1,09€/Kg.

Table 63: Average Price and total Volume fished by technique, including all regions – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DTS	8,8	98	93,4	1,16	0,65	0,80
∑ PGP<12	0,13	0,15	0,14	0,52	1,57	0,68
∑ PGP>12 lft		2,4			0,88	
∑ PS	1.015,6	1.031,8	1.776,2	0,81	1,09	0,47
∑ TM	24.234,6	23.427,9	17.927	0,68	0,61	0,49

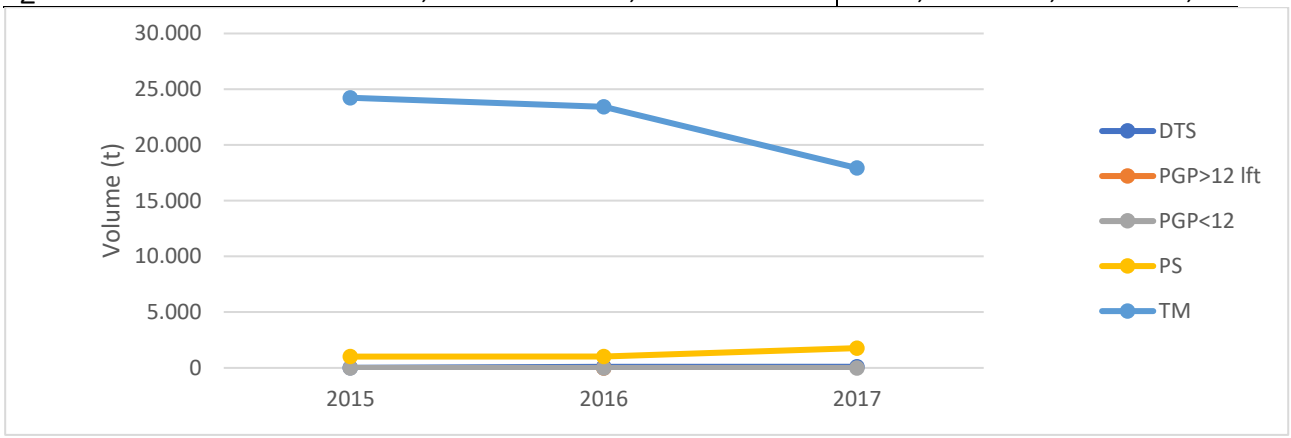


Figure 244: Sardine Volume by technique - PNRDA

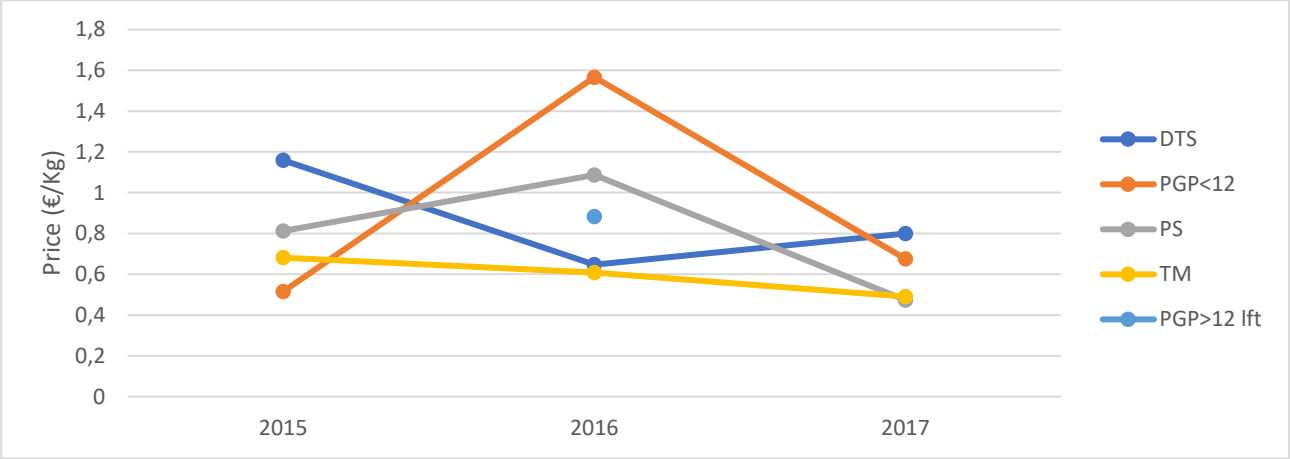


Figure 245: Sardine Price by technique – PNRDA

- DTS fishing chart is characterised by Emilia-Romagna in 2016-2017 (89t and 36t) and by Veneto during 2017 (42,4t). Then, in decreasing order, Puglia Nord (6,7t in 2017), Marche (4,1t), Friuli Venezia Giulia (2,5t), Abruzzo (1,3t) and Molise (60 Kg).
  Veneto's price had an increase during 2016, passing from 0,86€/Kg to 1,40€/Kg, and on 2017 retraced to 0,90€/Kg. Specularly Emilia-Romagna had a minimum on 2016 at 0,60€/Kg.

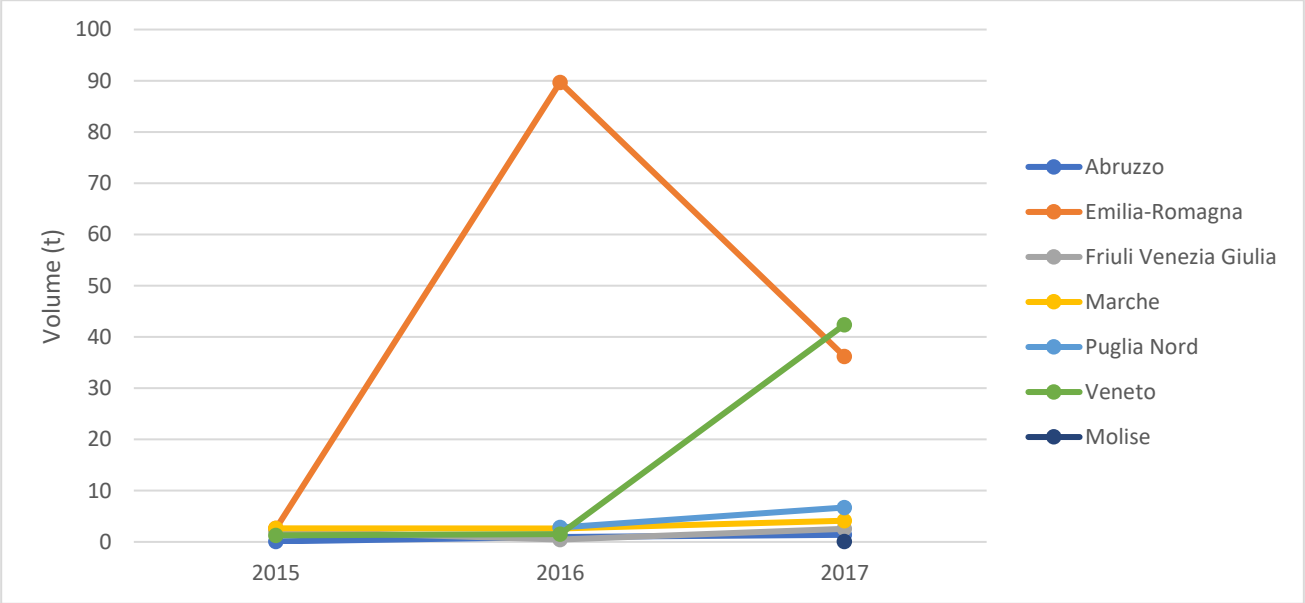


Figure 246: Volume by region - DTS

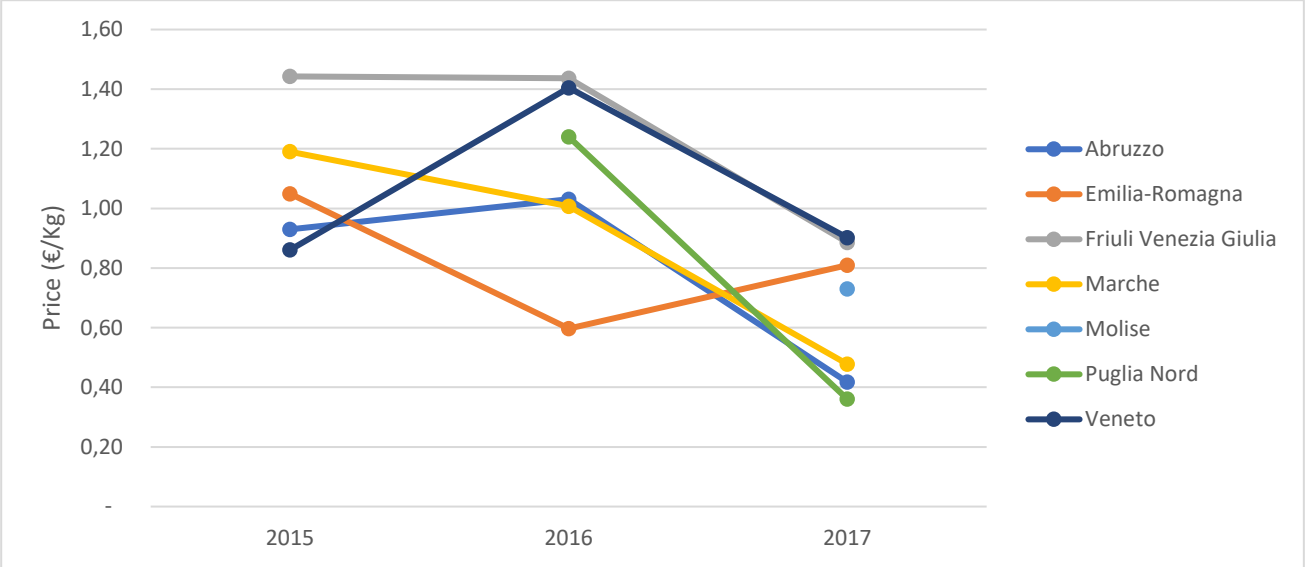


Figure 247: Price by region - DTS

- Data for PGP<12 is discontinuous and rarefied.
  The highest reported volume is Emilia-Romagna in 2016 (146Kg at 1,57€/Kg), followed by Veneto in 2015 (130Kg at 0,52€/Kg) and Puglia Nord in 2017 (85Kg at 0,50€/Kg).

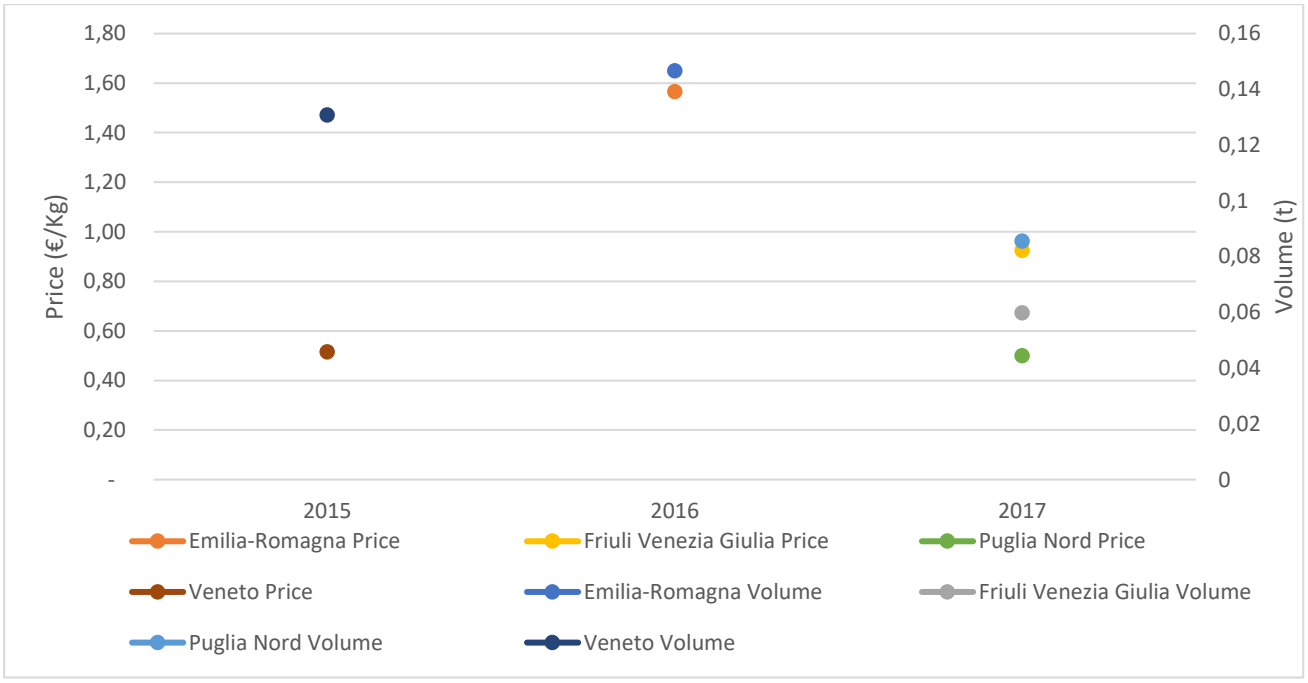


Figure 248: Price and Volume by region - PGP<12

- PGP>12 lft is one of the least used or reported fishing techniques. In Emilia-Romagna on 2016 2,45t were fished and sold at 0,88€/Kg. No data are present for other regions.

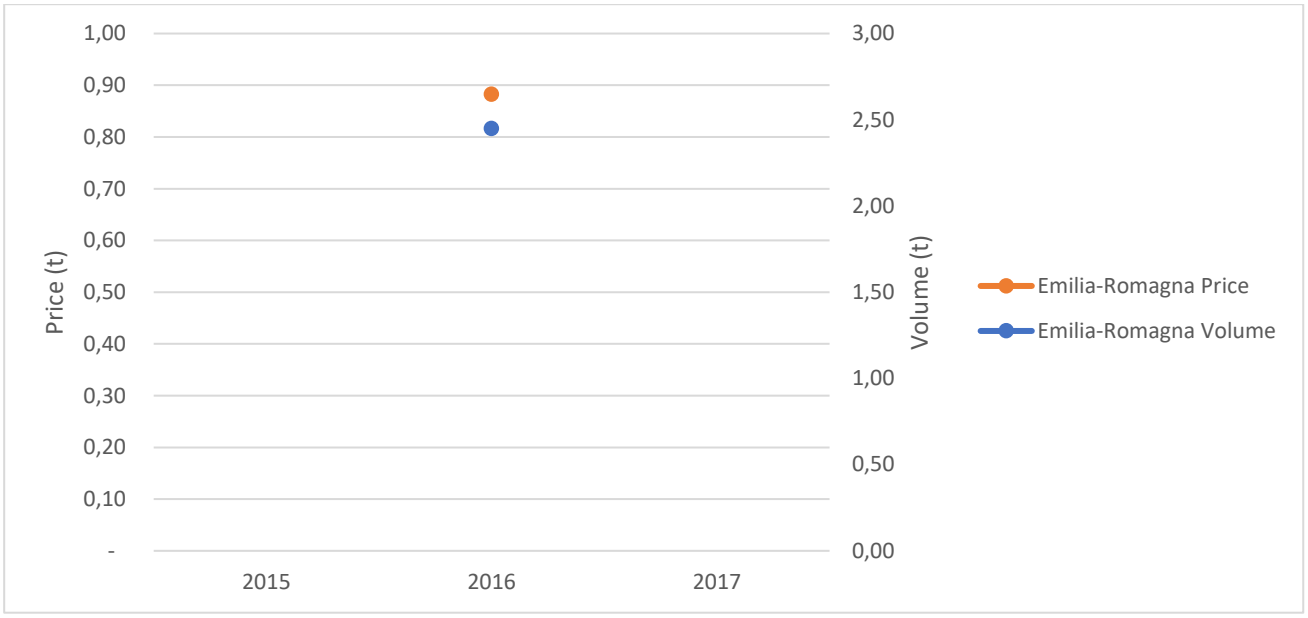


Figure 249: Price and Volume by region - PGP>12 lft

- PS is the second most important method for sardine fishing. All regions are in diminution or stagnation of volumes (on the 2015-2017 run) but Puglia Nord, that on 2017 passed from 136t to 1.127t (price on 2017 had a reduction to 0,31€/Kg from 0,60€/Kg).

  Abruzzo is following a decreasing tendency that led to 287t in 2017, passed by Friuli Venezia Giulia (361,7t). In all the three years Friuli Venezia Giulia presented the highest price, followed (in 2016 and 2017) by Abruzzo.

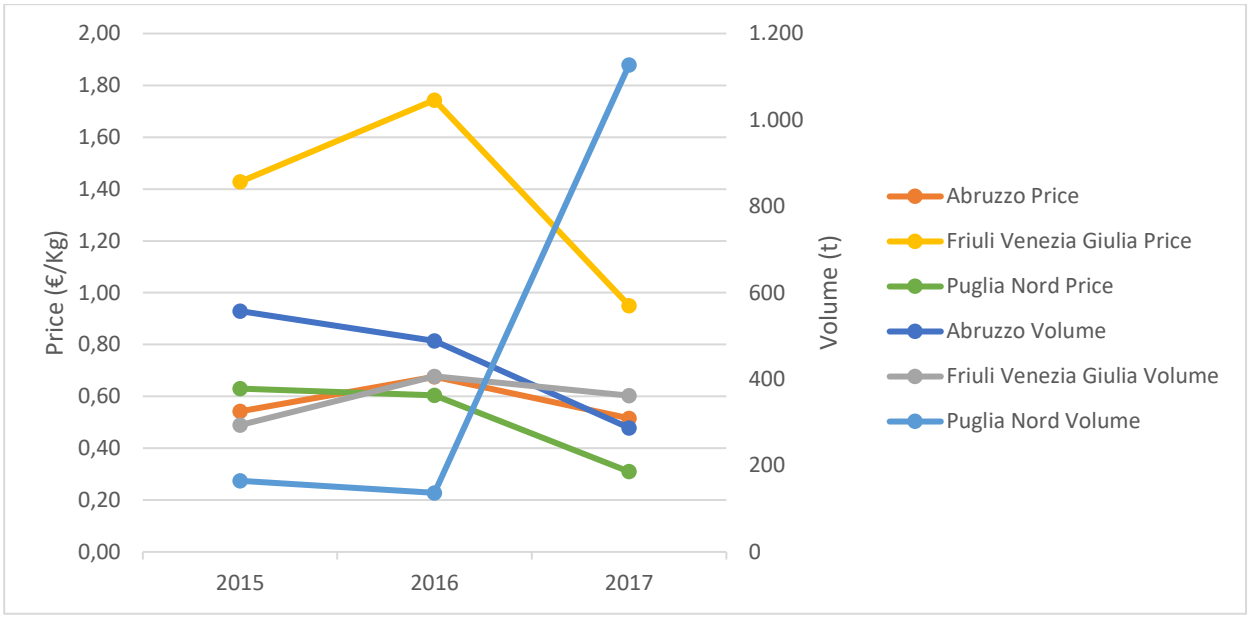


Figure 250: Price and Volume by region - PS

- TM is the most productive fishing techniques for this species.
  Veneto, even if in light inflexion, is the first supplier with 8.778t in 2017 (2016 was the maximum with 11.132t). Follows Emilia- Romagna (6.785t in 2017, stable trend), Marche (1.380t in 2017, strongly descending trend) and Puglia Nord (948t in 2017). Friuli Venezia Giulia only fished 33,5t.

  Speaking about prices: probably because of the low volume, Friuli Venezia Giulia is the region were sardines are more expensive.
  On 2017 then at Marche was worth 0,57€/Kg, Emilia-Romagna 0,56€/Kg, Puglia Nord 0,48€/Kg and Veneto (in strong decrease) 0,42€/Kg.

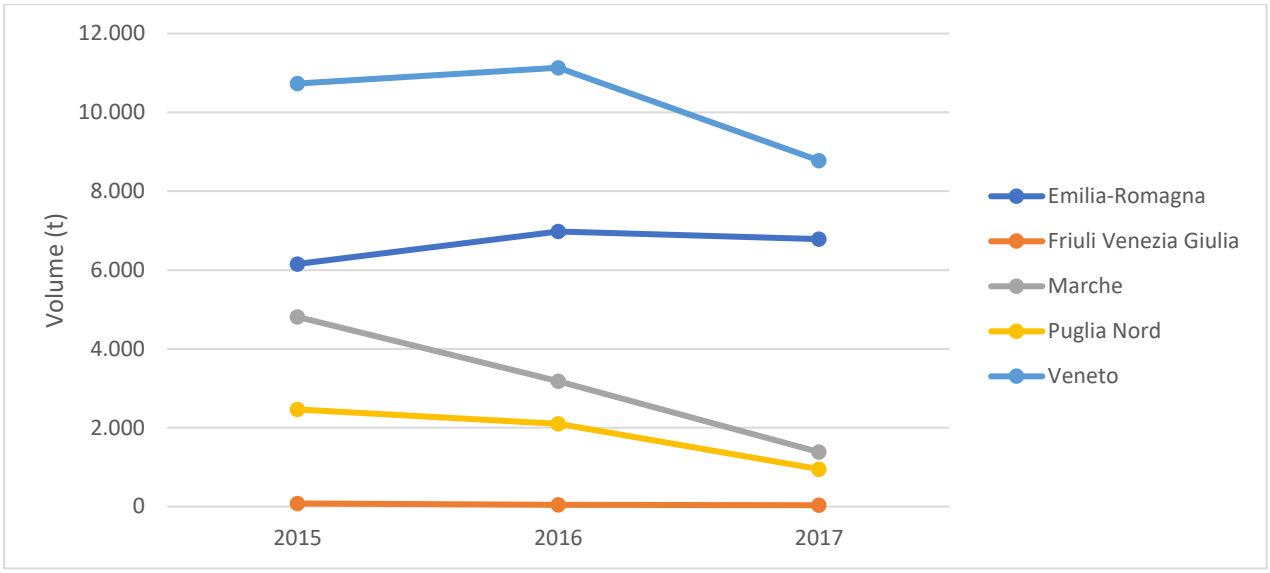


Figure 251: Volume by region - TM

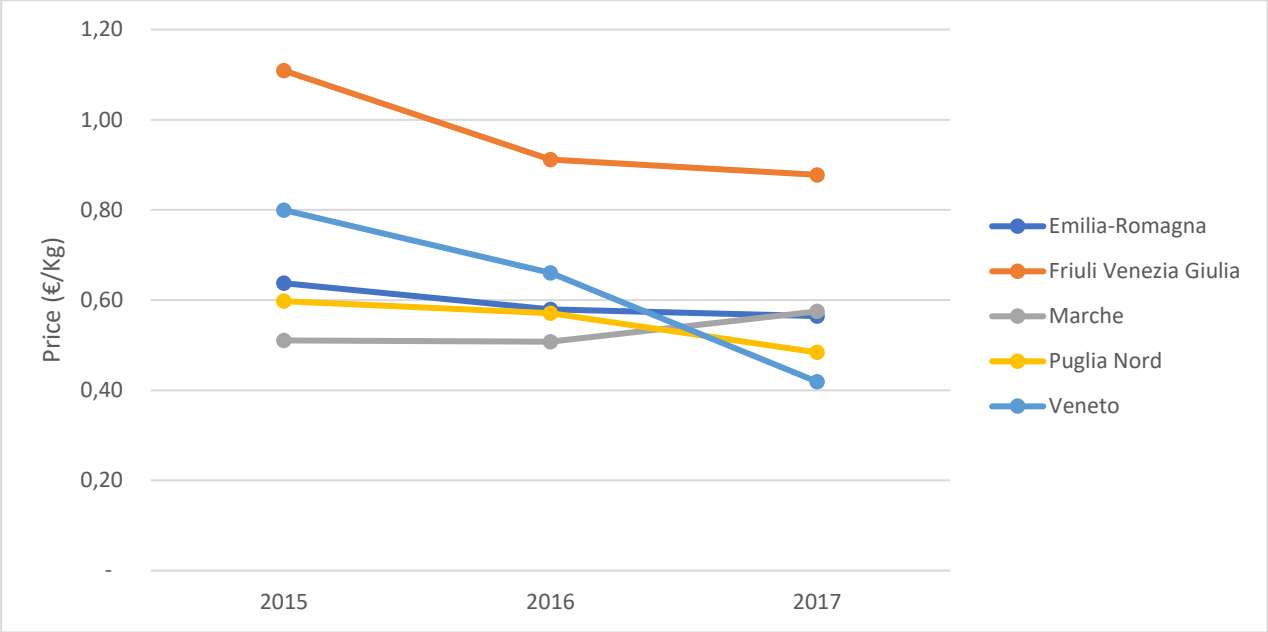


Figure 252: Price by region - TM

4.8 BLUEFISH

By regional point of view

Bluefish fishing does not have volumes comparable to other species.

The most important region is Puglia Nord. Only region in upward trend, it produced 0,18t in 2015, 48t in 2016 and 53,7t in 2017.

Emilia-Romagna is decreasing its role. It produced 23t during 2015 and 8t in 2017. Marche went from 10t (2015) to 4,5t (2017), Friuli Venezia Giulia from 16t (2015) to 3t (2017).

Molise and Abruzzo's contribution with this species are almost zero.

In the three considered years, Marche have been the most expensive region (8,79€/Kg in 2017, maximum 9,88€/Kg in the previous year) followed by Friuli Venezia Giulia (7,36€/Kg in 2017).

Puglia Nord increased its price during 2017 (6,83€/Kg, +1.75€/Kg on the previous year).

In Emilia-Romagna Romagna landed bluefish costed 4,40€/Kg in 2015, 5,46€/Kg in 2016 and 5,95€/Kg in 2017.

Table 64: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	0,29	0,23		1,11	4,82	
∑ E.Romagna	23,23	21,29	8,04	4,40	5,46	5,95
∑ F.V.Giulia	16,18	12,8	3	5,88	7,09	7,36
∑ Marche	10,15	6,43	4,52	6,69	9,88	8,79
∑ Molise			0,04			5,94
∑ Puglia Nord	0,18	48	53,7	5,15	5,08	6,83
∑ Veneto	5,43	2,65	3,03	5,35	5,15	5,57

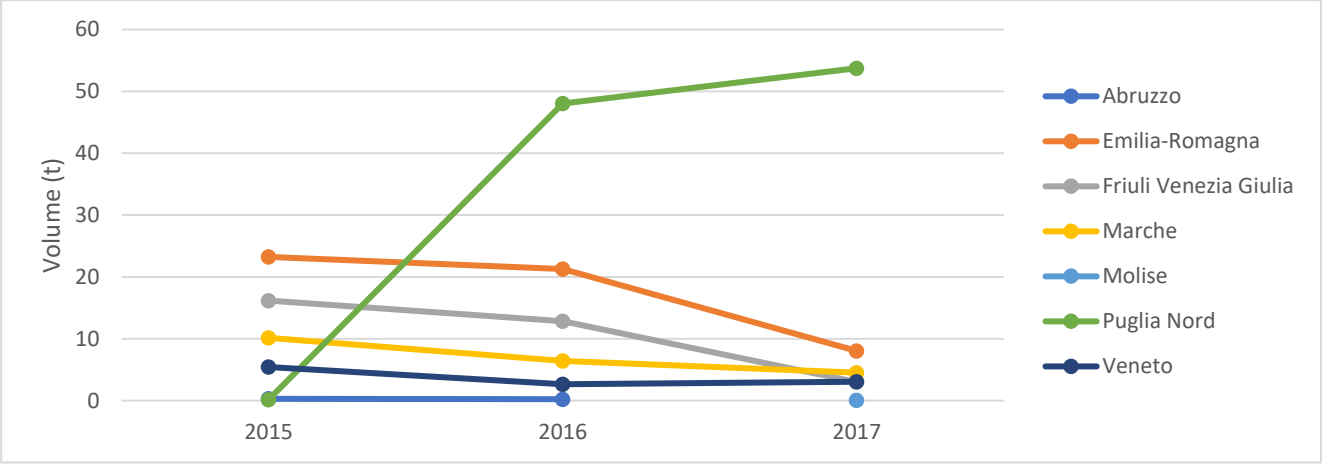


Figure 253: Bluefish Volume by region

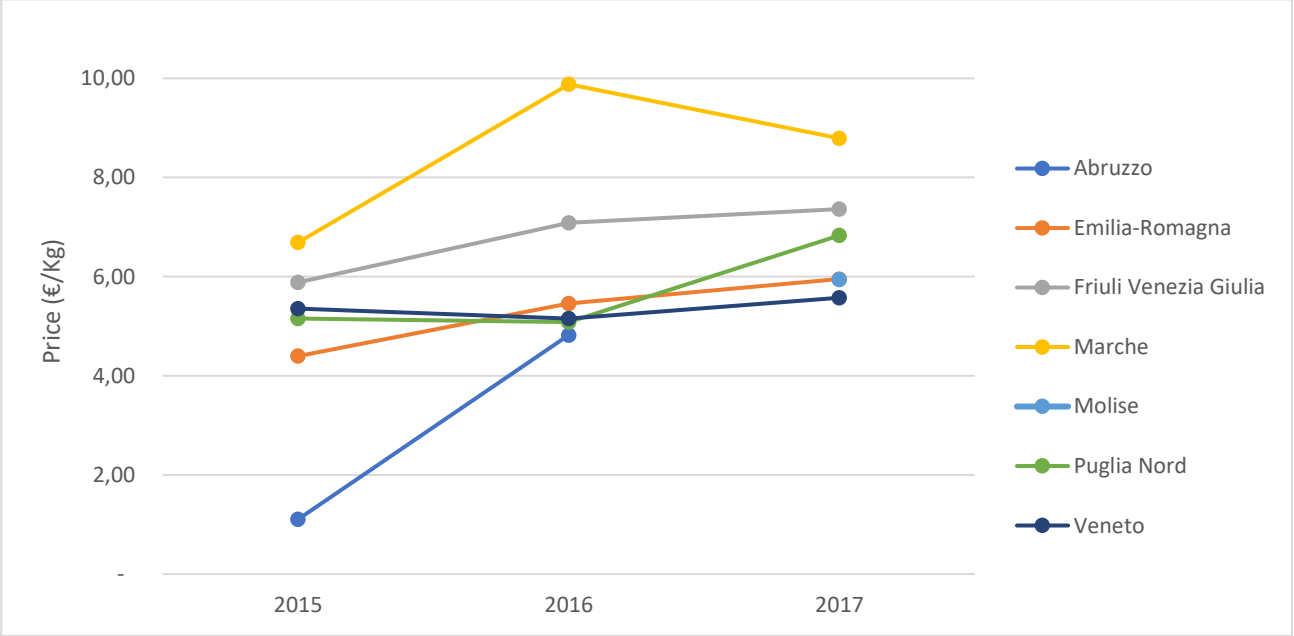


Figure 254: Bluefish average Price by region

Data in Abruzzo is discontinuous. Fishing by DTS provided 0,3t on 2015 and 0,2 on 2015, costing 1,11€/Kg on the first year and 4,42€/Kg on the second.

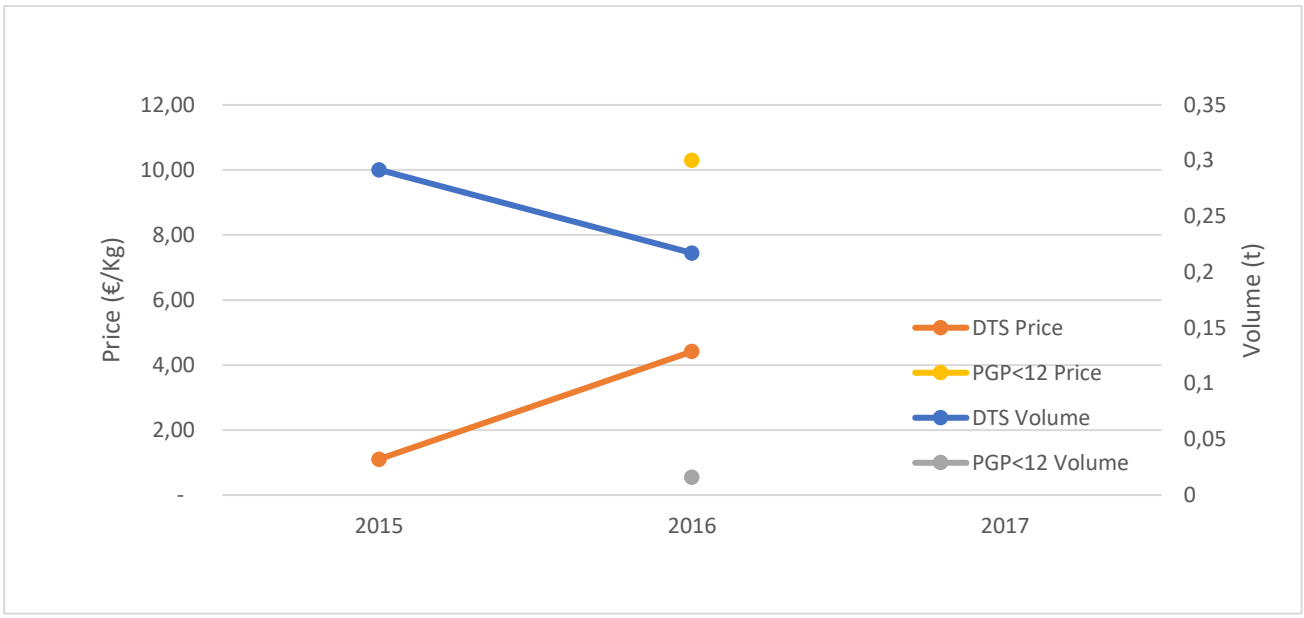


Figure 255: Price and Volume by techniques - Abruzzo – PNRDA

- PGP<12 has been the most productive technique on 2017 with 5,6t (DTS follows with 2,17t, both increasing production on 2016 and decreasing on 2017).
  TM is reported only for 2015 (10,7t) and 2016 (4,9t).
  PGP>12 lft on the considered years has been the method with the highest price and the lowest production.
  PGP<12's price started from 5,62€/Kg on 2015, went to 7,10€/Kg on 2016 and then decreased to 5,86€/Kg.

Oppositely, DTS's price decreased from 3,80€/Kg to 3,29€/Kg on 2016 and then grew to 6,11€/Kg on 2017.

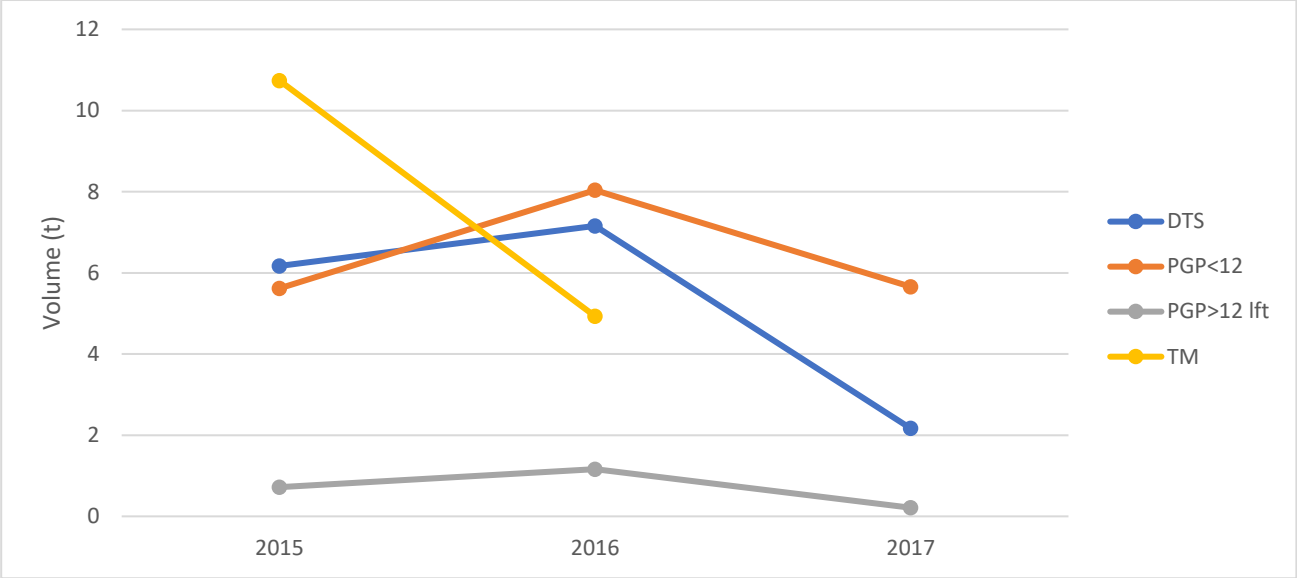


Figure 256: Volume by techniques – Emilia-Romagna – PNRDA

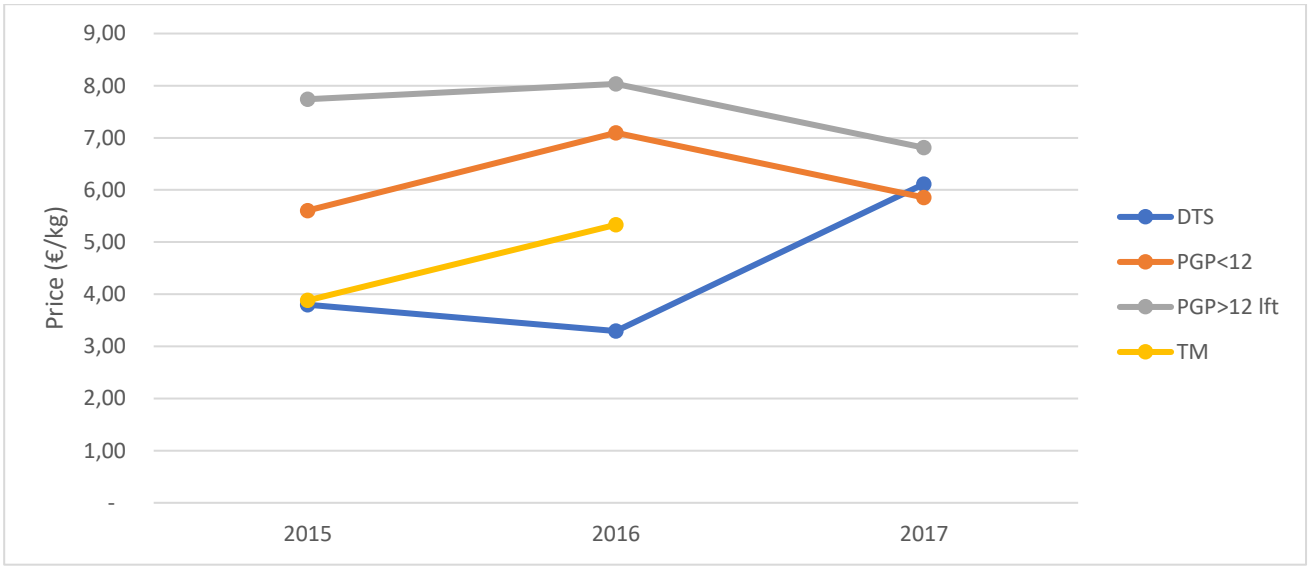


Figure 257: Price by techniques – Emilia-Romagna – PNRDA

Relevant techniques for Friuli Venezia Giulia are PGP<12 and PS.

On 2015 PS produced 3,7t and PGP<12 7,9t, on 2016 PS 6,3t and PGP<124,7t. During 2017 production went down for both: PGP<12 produced 1,5t and PS 0,64t.

Price by PS is on a straight up warding trend, starting from 5,36€/Kg in 2015 and arriving to 7,66€/Kg.
PGP<12's price went up from 6,21€/Kg to 7,66€/Kg during 2016, on 2017 7,86€/Kg.

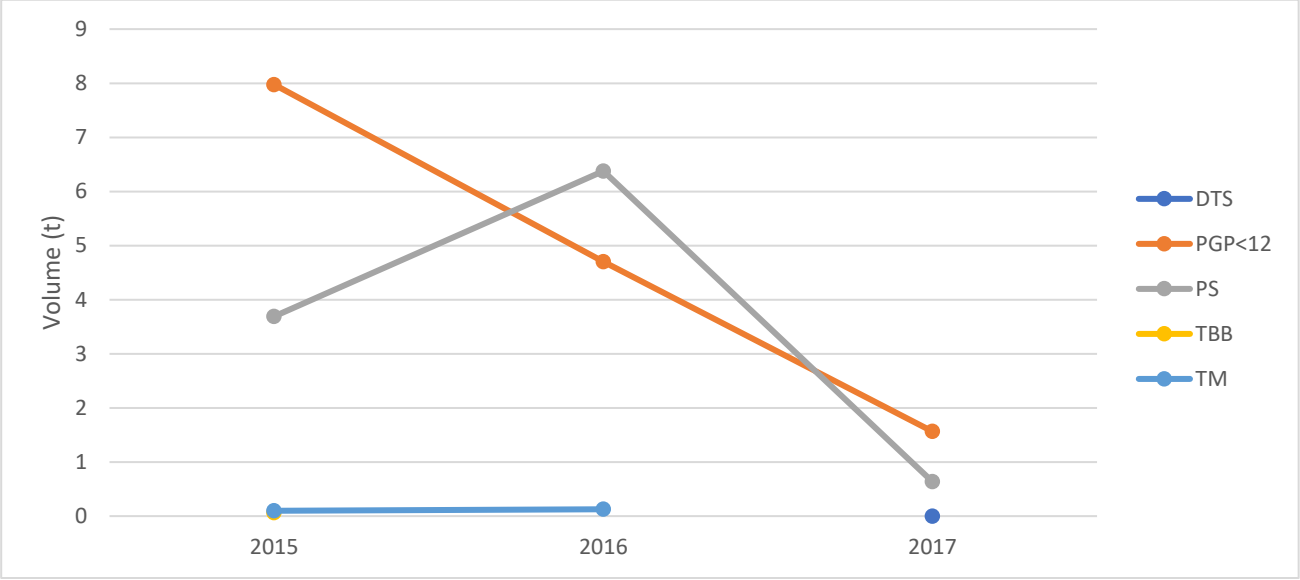


Figure 258: Volume by techniques - Friuli Venezia Giulia - PNRDA

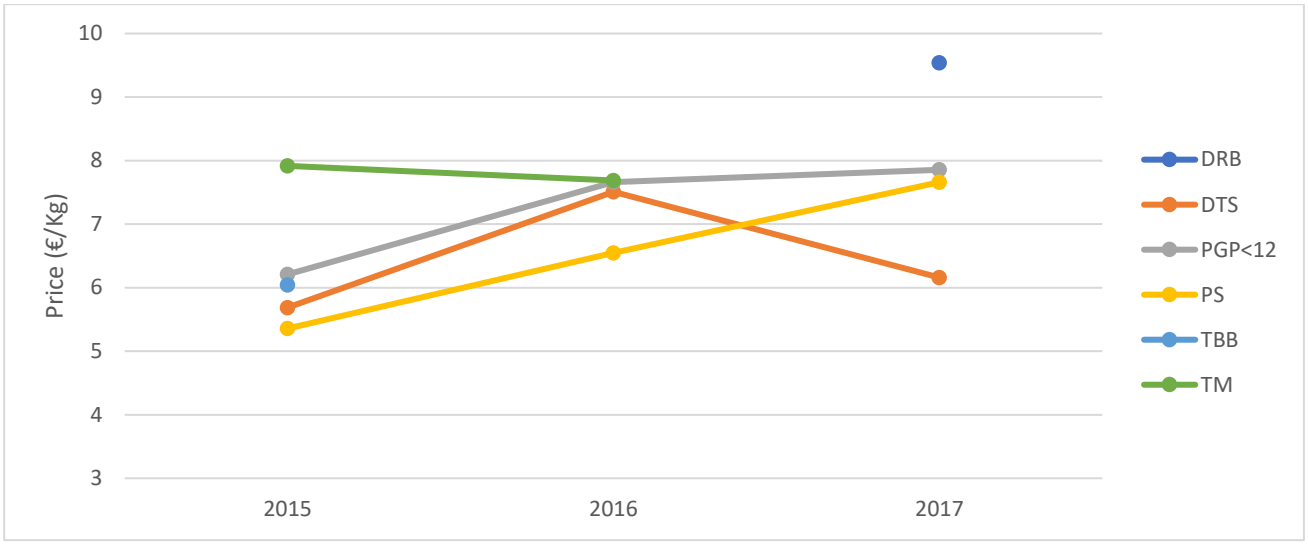


Figure 259: Price by techniques - Friuli Venezia Giulia - PNRDA

- Bluefish fishing is decreasing its importance in Marche.
  PGP<12 is the most important method, on 2015 it granted 9,1t, 5,8 on 2016 and 3,4t on 2017. It is also the most expensive method, with price at 6,95€/Kg in 2015 and 9,21€/Kg in 2017.
  Far below, DTS granted volumes between 0,5t and 1t. On 2015 costed 4,31€/Kg and on 2017 7,43€/Kg.

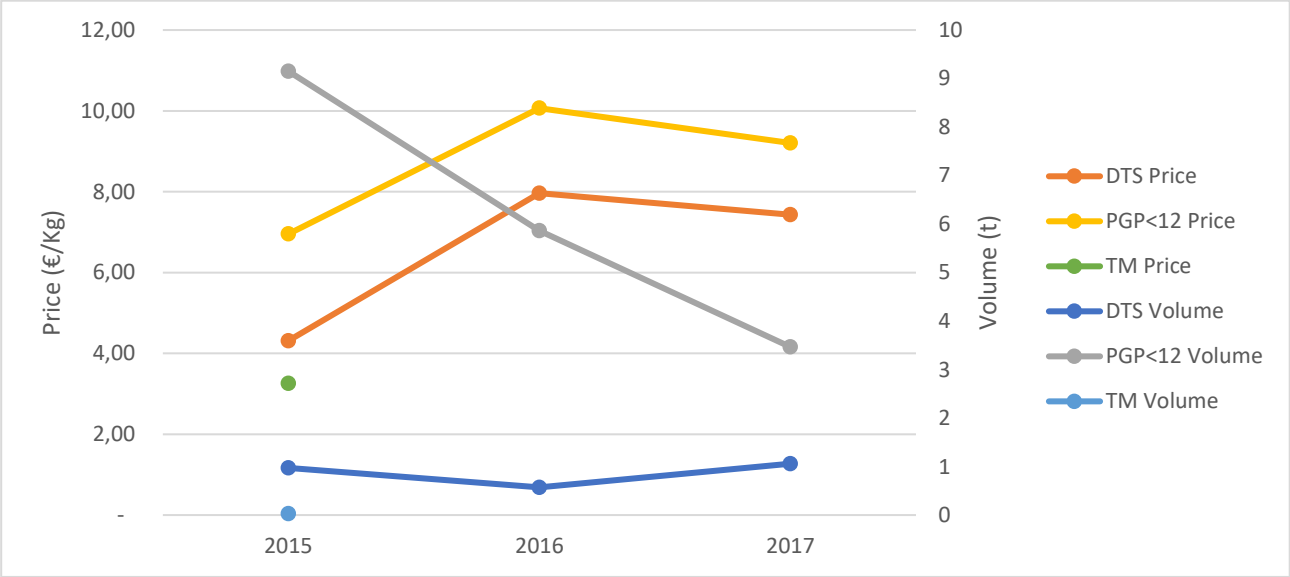


Figure 260: Price and Volume by techniques - Marche – PNRDA

- In Molise Only DTS is reported, and only for 2017. On that year Molise produced 42Kg, sold at 5,94€/Kg.

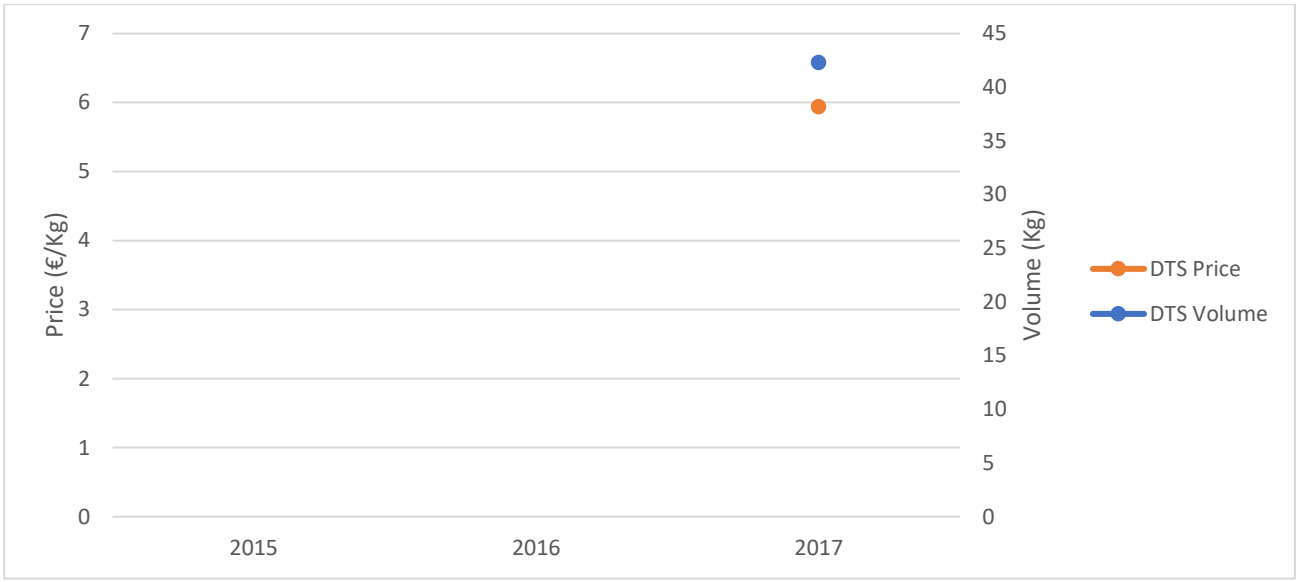


Figure 261: Price and Volume by techniques - Molise - PNRDA

- Puglia Nord is characterized by PGP<12 fishing, which collected 47t on 2016 and 49,6t. Its price is the highest, at 5,15€/Kg and 7,10€/Kg.
  Well below, even if in progression, 4t has been fished by DTS at 3,57€/Kg. On 2015 DTS's price was at his maximum, at 5,15€/Kg.

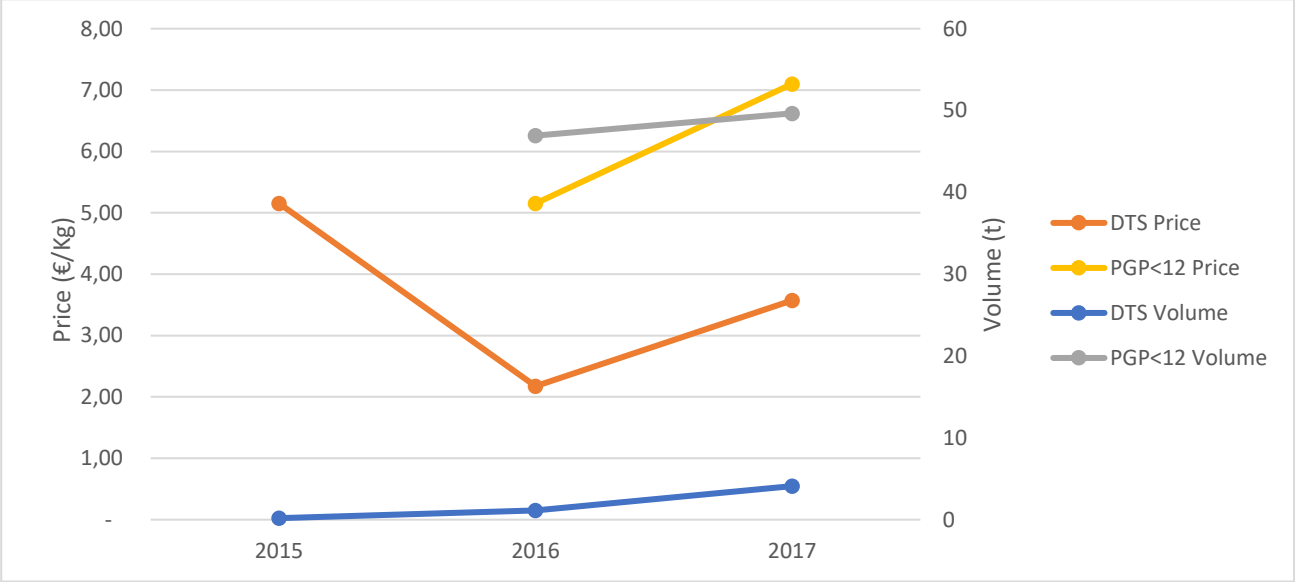


Figure 262: Price and Volume by techniques – Puglia Nord – PNRDA

- DTS and PGP<12 are the most relevant techniques in Veneto.
  DTS started with 120Kg on 2015 and then has been progressively more adopted, coming to produce 1t on 2016 and 1,7t on 2017. Its price drop from 6,11€/Kg to 1,89€/Kg on 2016, and in the following year recovered to 4,64€/Kg.
  PGP<12 had a huge drop on 2016, passing from 5,3t to 1,3t. Its price has been the highest during 2017 with 6,85€/kg.

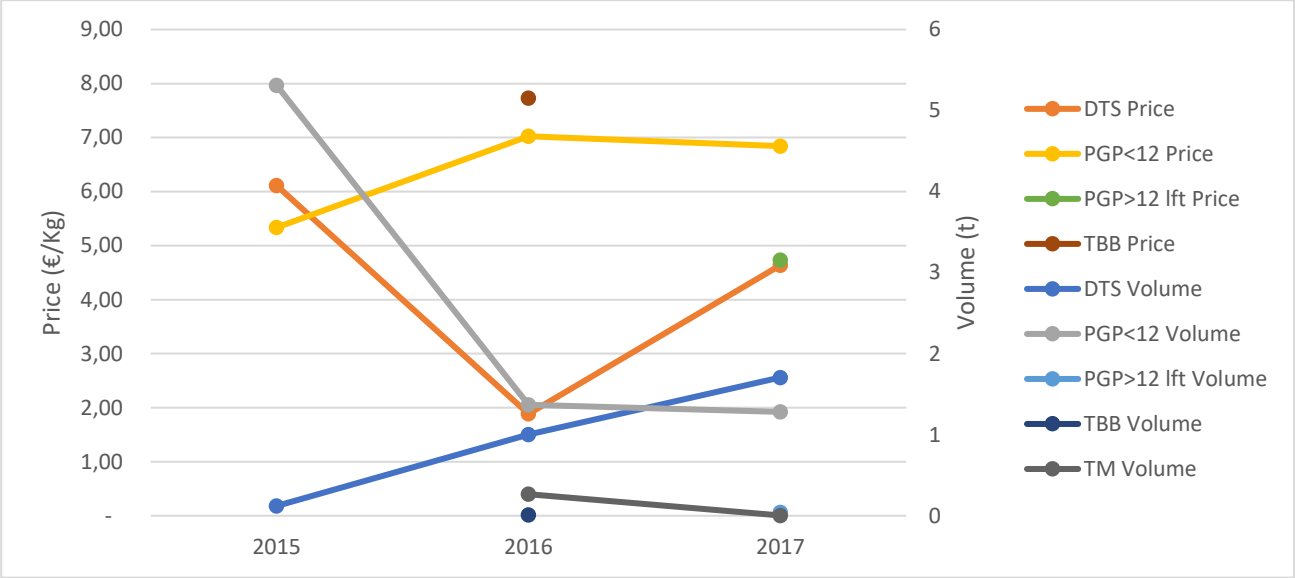


Figure 263: Price and Volume by techniques – Veneto - PNRDA

By fishing techniques point of view

PGP<12 is the most used fishing technique for Bluefish, with an 85% dominance in 2017. 28t were fished with this technique in 2015, 66,9t in 2016 and 61,6t in 2017.

DTS is the second most relevant, but its trend is decreasing. During 2015 were fished 12t, 11,69t in 2016 and 9,87t in 2017.

All the other techniques almost didn't make any landing on 2017, as PS produced 0,64t (from 6,4t of the previous year) and PGP>12 lft 0,26t.

During 2015 Tm has been the cheapest technique at 3,92€/Kg (in the following years, with higher prices, it got lower volumes). Price of PGP<12 had a slight increase in 2017, reaching 7,12€/Kg (+1,09€/Kg on 2016).

Bluefish fished by DTS costed 4,49€/Kg in 2015. During 2016 and 2017 it has been the cheapest at 3,90€/Kg and 4,95€/Kg.

Table 65: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DRB			0,001			9,54
∑ DTS	12,08	11,69	9,87	4,50	3,90	4,95
∑ PGP<12	28,05	66,9	61,6	6,17	6,03	7,12
∑ PGP>12 lft	0,71	1,16	0,26	7,74	8,03	6,46
∑ PS	3,69	6,38	0,64	5,36	6,55	7,66
∑ TBB	0,06	0,01		6,04	7,73	
∑ TM	10,86	5,32	0,004	3,92	5,51	6,16

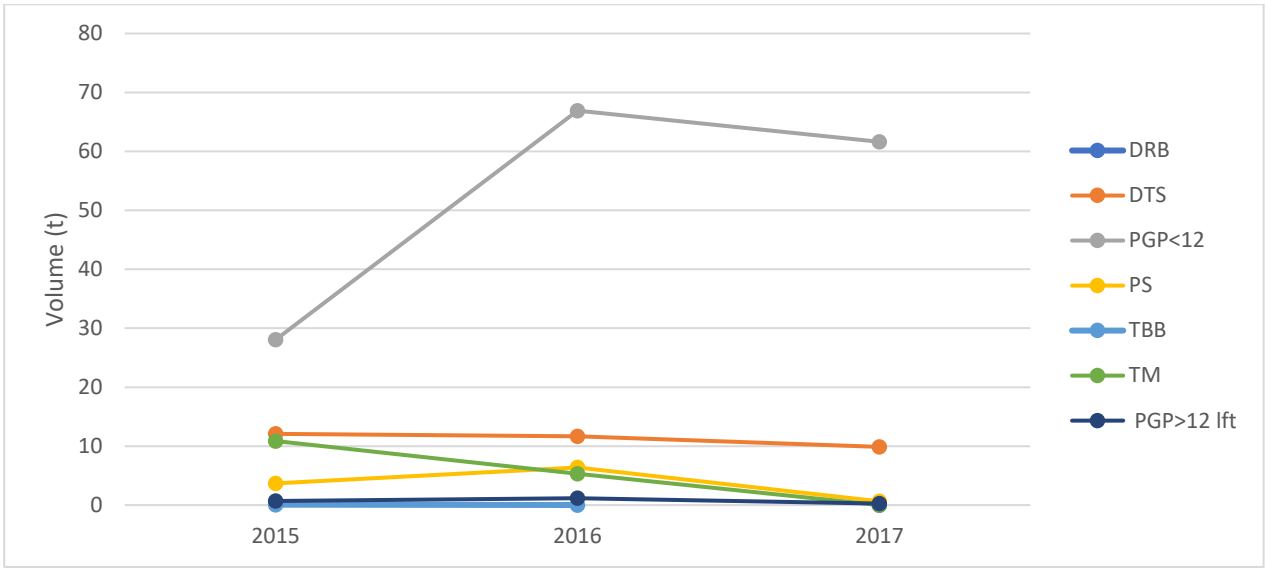


Figure 264: Bluefish Volume by region

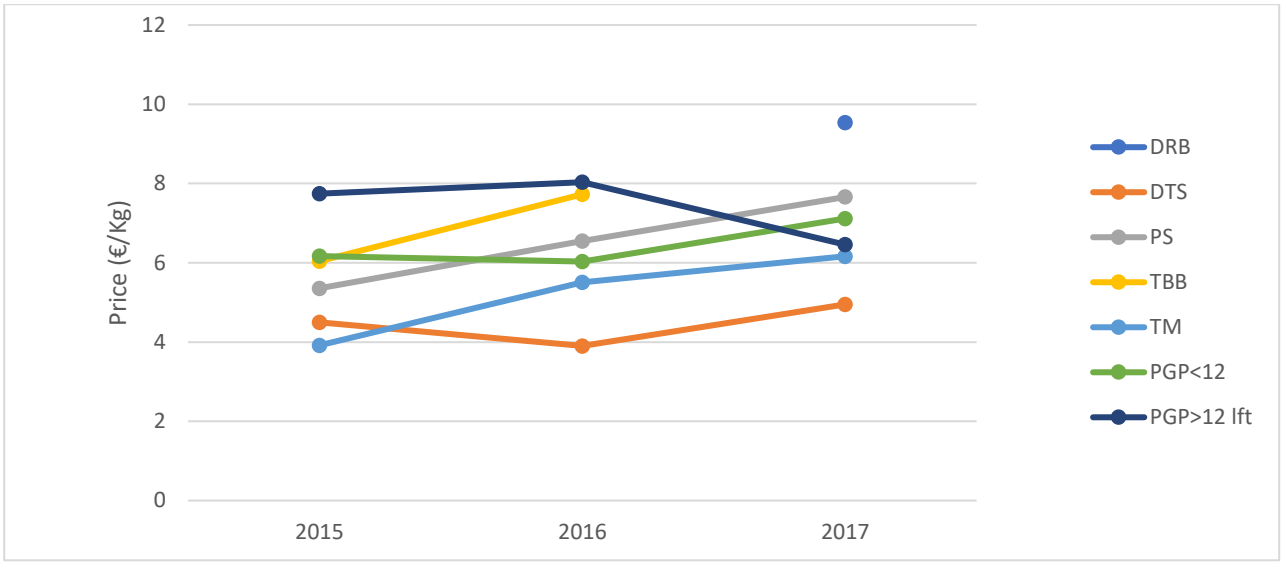


Figure 265: Bluefish average Price by technique

- DRB's use is basically nil. Friuli Venezia Giulia fished 1,7Kg at 9,54€/kg on 2017.

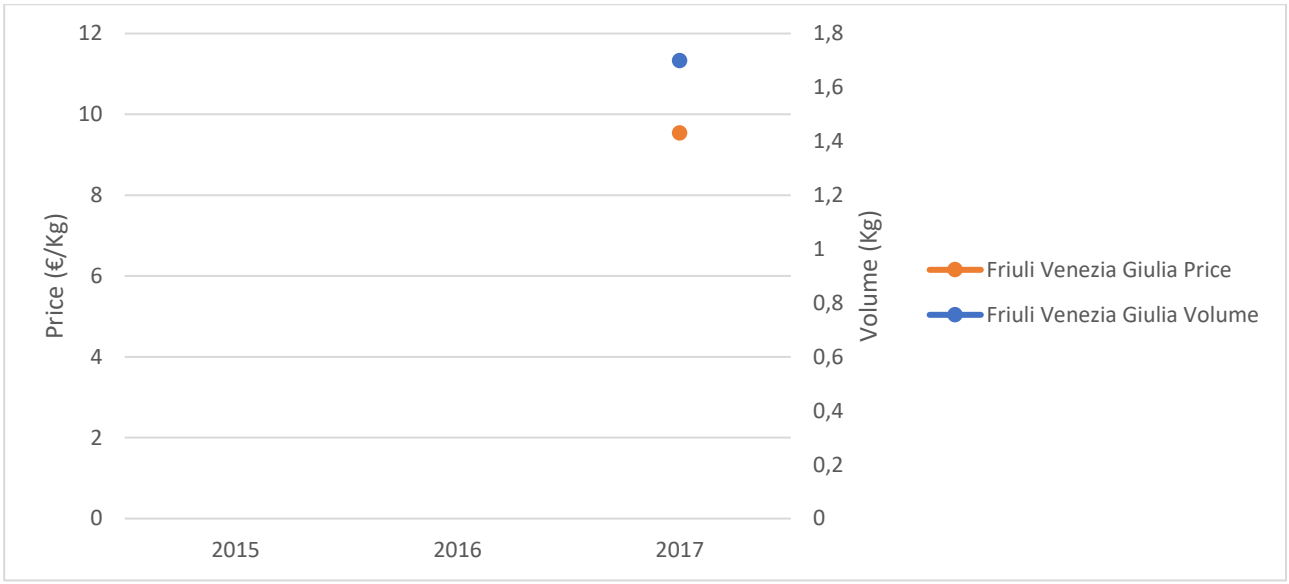


Figure 266: Price and Volume by region – DRB

- DTS was characterised by a great role of Emilia Romagna (6t in 2015, 7,1t in 2016) then decreased to 2,1t. Puglia Nord is strongly developing this sector: from 182 Kg in 2015 to 4,1t in 2017.
  Friuli Venezia Giulia is decreasing its effort, passing from 4,3t in 2015 to 1t in 2017.
  On 2017 Friuli Venezia Giulia's and Emilia-Romagna's price went very close (6,16€/Kg and 6,11€/Kg), Puglia Nord maintained cheaper prices, averagely 3,57€/Kg.

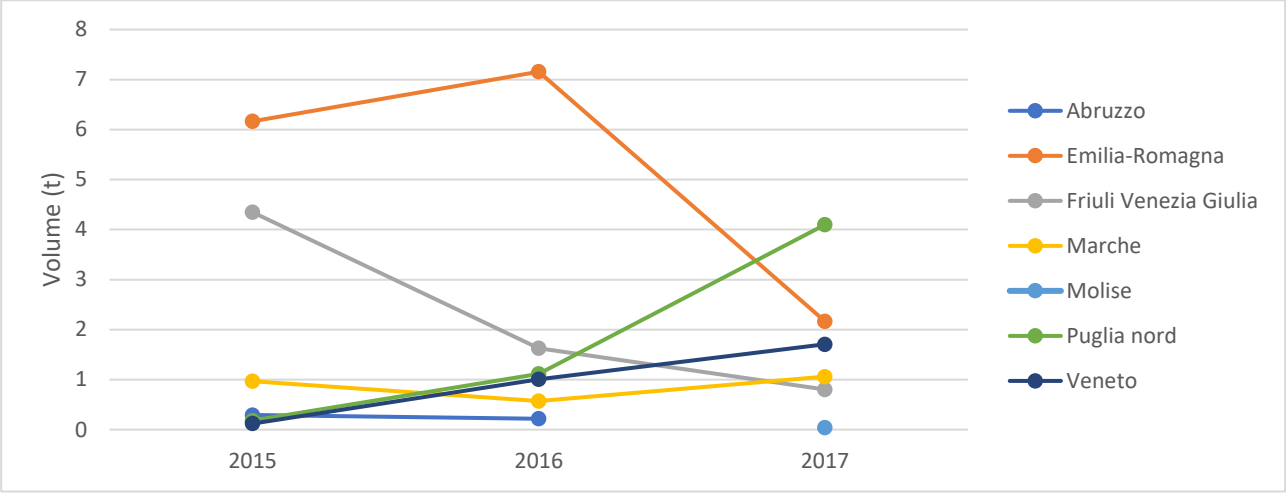


Figure 267: Volume by region - DTS

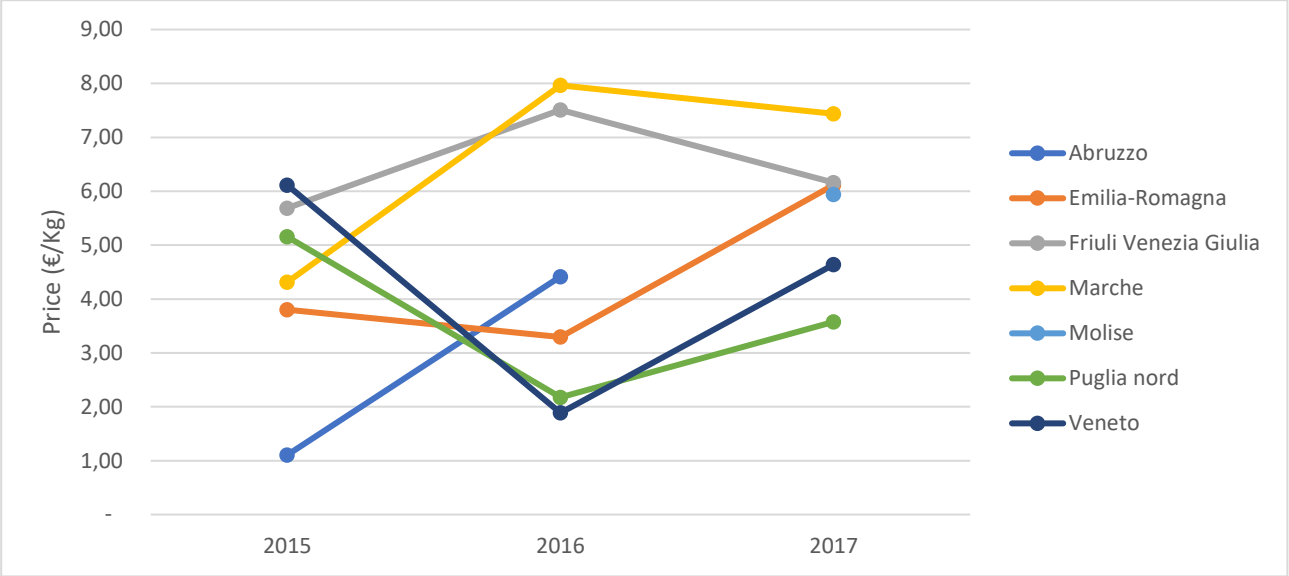


Figure 268: Price by region – DTS

- As already told PGP<12 is reported to be the most productive fishing technique for Bluefish.
  Puglia Nord has reported data only for 2016 (46,9t) and 2017 (49,6t). In 2017 secondary contributions are from Emilia-Romagna (5,6t), Marche (3,4t) Veneto (1,3t) and Friuli (1,5t).

  About prices, Marche has been the more expensive (10,07€/Kg peak in 2016, 9,21€/Kg in 2017), followed by Friuli Venezia Giulia (on a 6,21€/Kg, 7,66€/Kg 7,86€/Kg progression). On 2017, Veneto's Bluefish costed 6,85€/Kg and Emilia-Romagna's 5,86€/Kg.

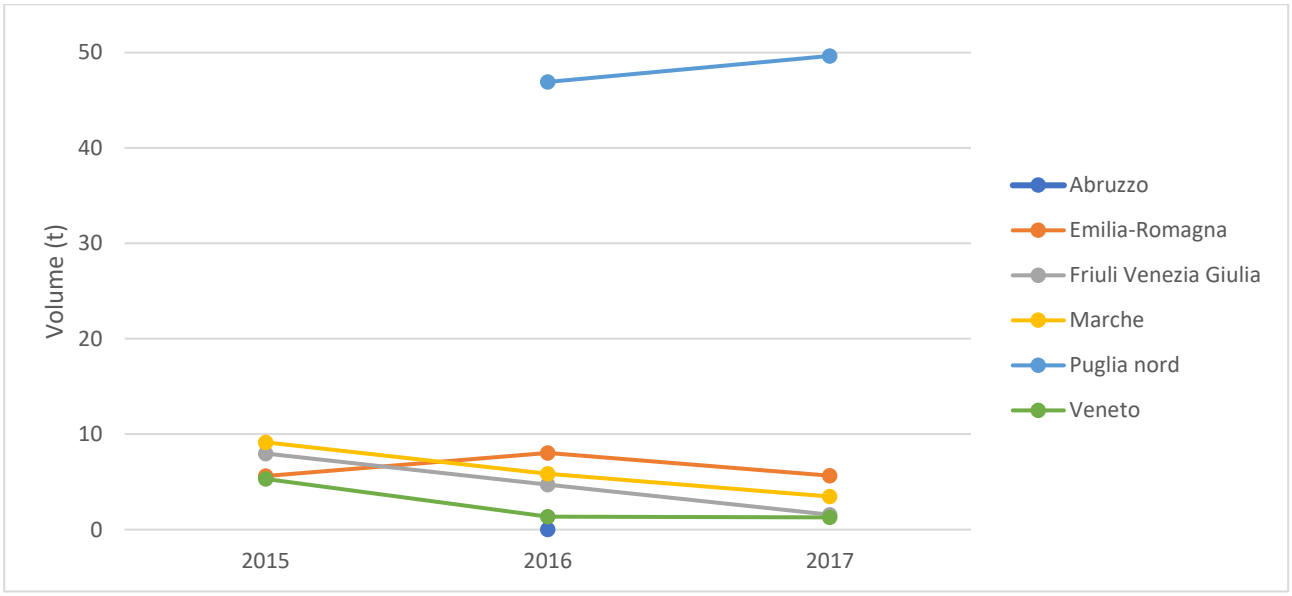


Figure 269: Volume by region - PGP<12

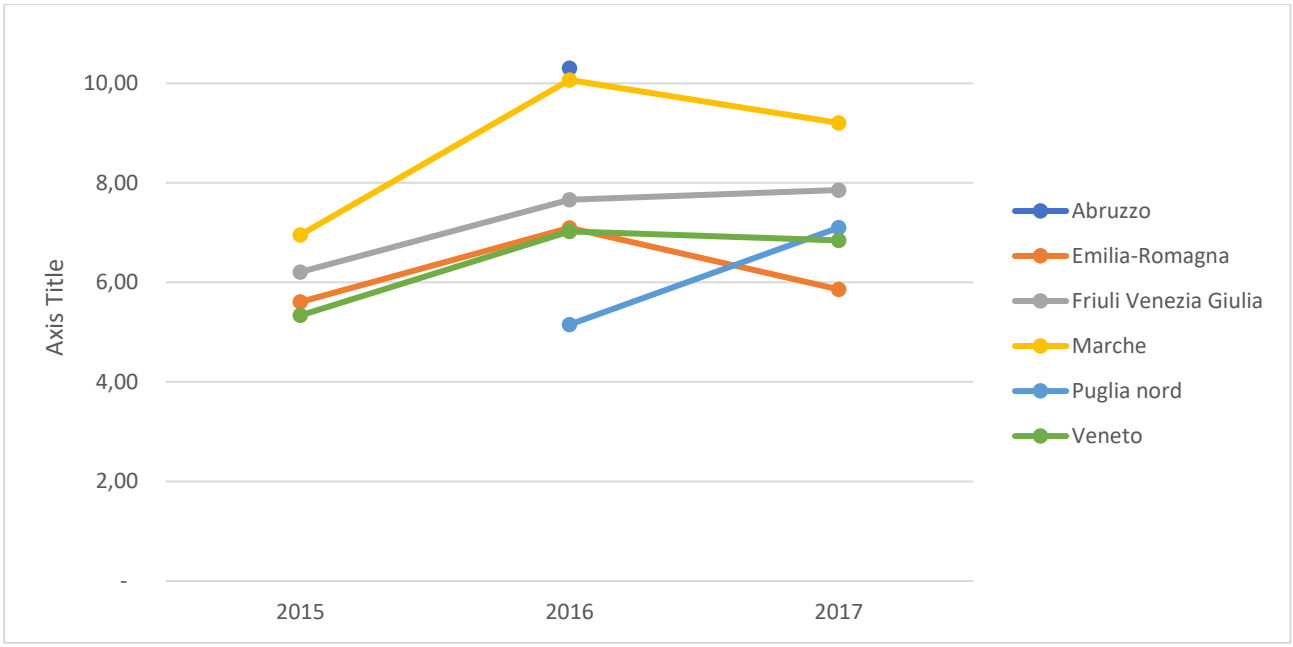


Figure 270: Price by region - PGP<12

- By PGP>12 lft Emilia-Romagna has data for the three years, Veneto only for 2017.
  0.7t were fished in 2015, 1,1t in 2016 and 0,2t in 2017. Prices moved from 7,74€/kg to 8,03€/Kg in 2016 and to 6,8€/Kg on 2017.
  Veneto fished 43Kg on 2017, worth 4,73€/Kg.

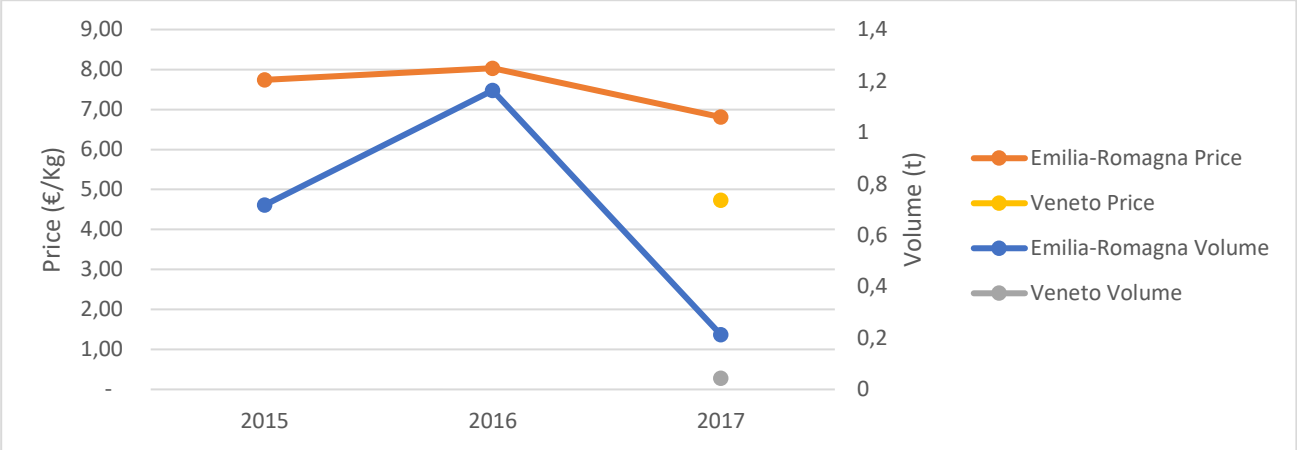


Figure 271: Price and Volume by region - PGP>12 lft

- PS is reported for Friuli Venezia Giulia only. Volume went up in 2016 (from 3,7t to 6,4t) and then strongly decreased to 0,6t in 2017. Price is following a linear increasing trend, starting from 5,36€/Kg to 7,66€/Kg in 2017.

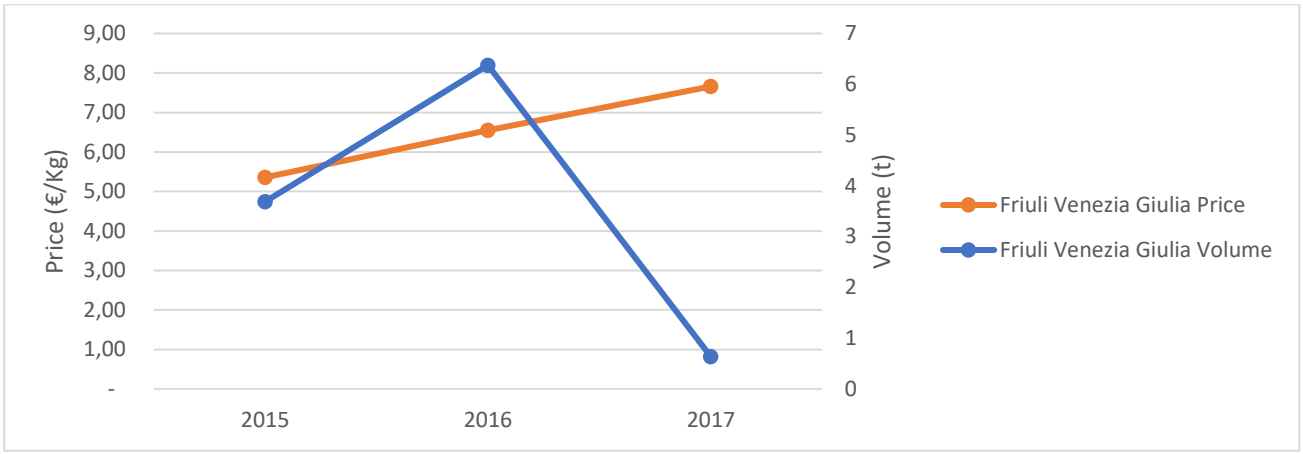


Figure 272: Price and Volume by region – PS

- TBB is reported for Friuli Venezia Giulia in 2015 at 64Kg (6,04€/Kg) and for Veneto (10Kg in 2016 at 7,73€/Kg).

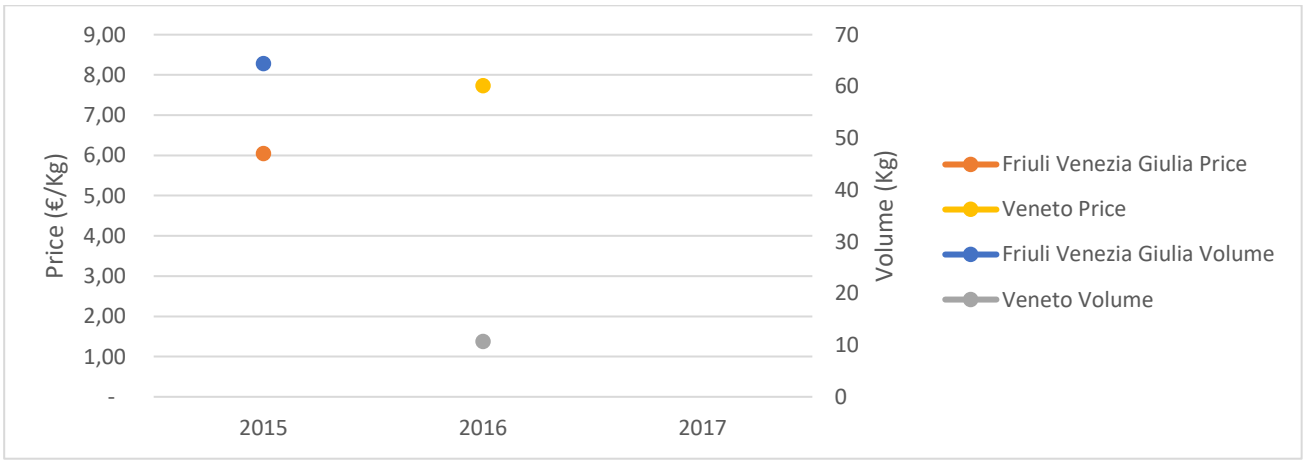


Figure 273: Price and Volume by region – TBB

- For TM fishing, only data from Emilia-Romagna are relevant. This region fished 10,7t in 2015 and 4,9t in 2016, with a price that moved from 3,88€/Kg to 5,33€/Kg.

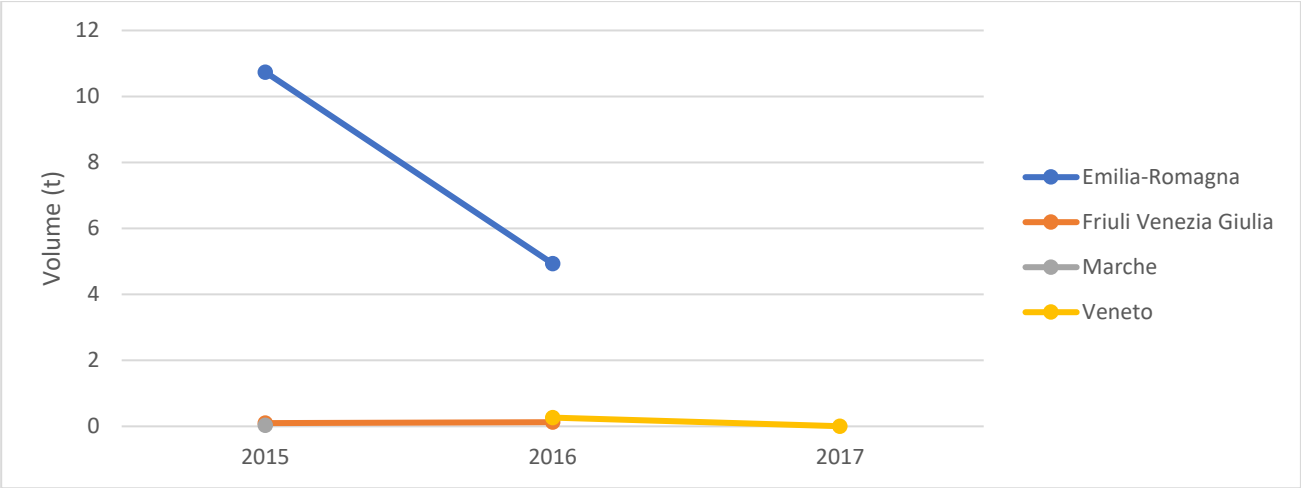


Figure 274: Volume by region - TM

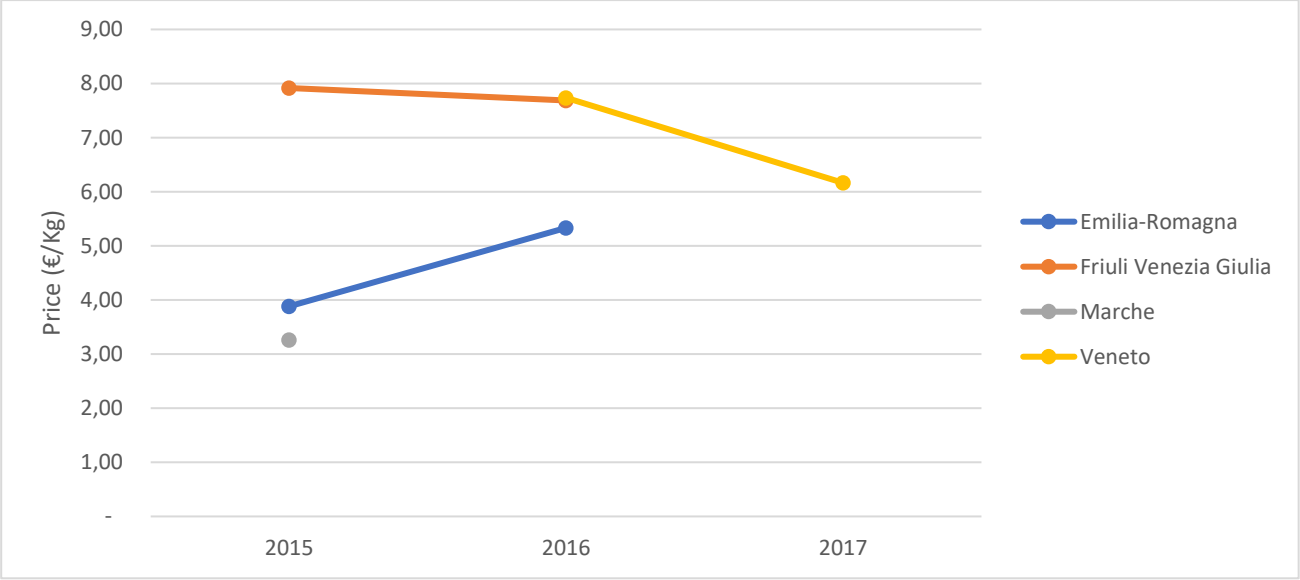


Figure 275: Price by region - TM

4.9 MUSKY OCTOPUS

By regional point of view

Musky Octopus is a species with relevant landing shares from various regions. Puglia Nord became the most contributive region during 2017 fishing 1.102t (+573t on 2016), passing above Veneto (473t in 2015, 578t in 2016, 552t in 2017).

Far below, in 2017 Abruzzo granted 164,5t, Marche 128t, Emilia-Romagna 42,4t and Molise 41,3t.

About prices, Molise has always been the most expensive (7,74€/Kg in 2015 and 8,70€/Kg in 2017). Then in 2017 follow Marche (6,16€/Kg, positive trend), Veneto (5,70€/Kg, slightly positive trend), Abruzzo (4,64€/kg), Emilia-Romagna (4,39€/kg, positive trend) and Puglia Nord (2,78€/Kg, strong negative trend from the 7,21€/Kg of 2015).

Table 66: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	281	196	164	3,84	4,99	4,64
∑ E.Romagna	60,8	67,2	42,4	3,60	3,69	4,39
∑ F.V.Giulia	37,5	25,1	14,4	4,30	6,13	5,72
∑ Marche	210	170	128	4,40	5,14	6,16
∑ Molise	37,5	53,5	41,3	7,74	8,03	8,70
∑ Puglia Nord	513	529	1.102	7,21	4,38	2,78
∑ Veneto	473	578	552	5,39	5,69	5,70

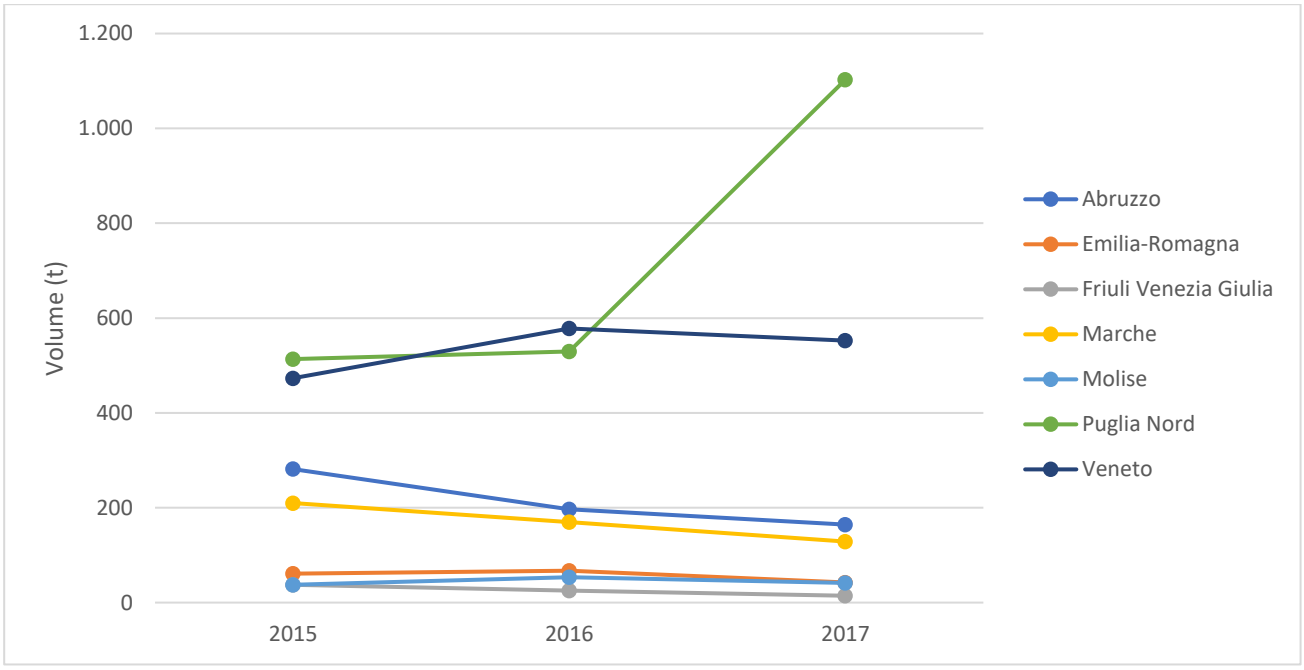


Figure 276: Musky Octopus Volume by region - PNRDA

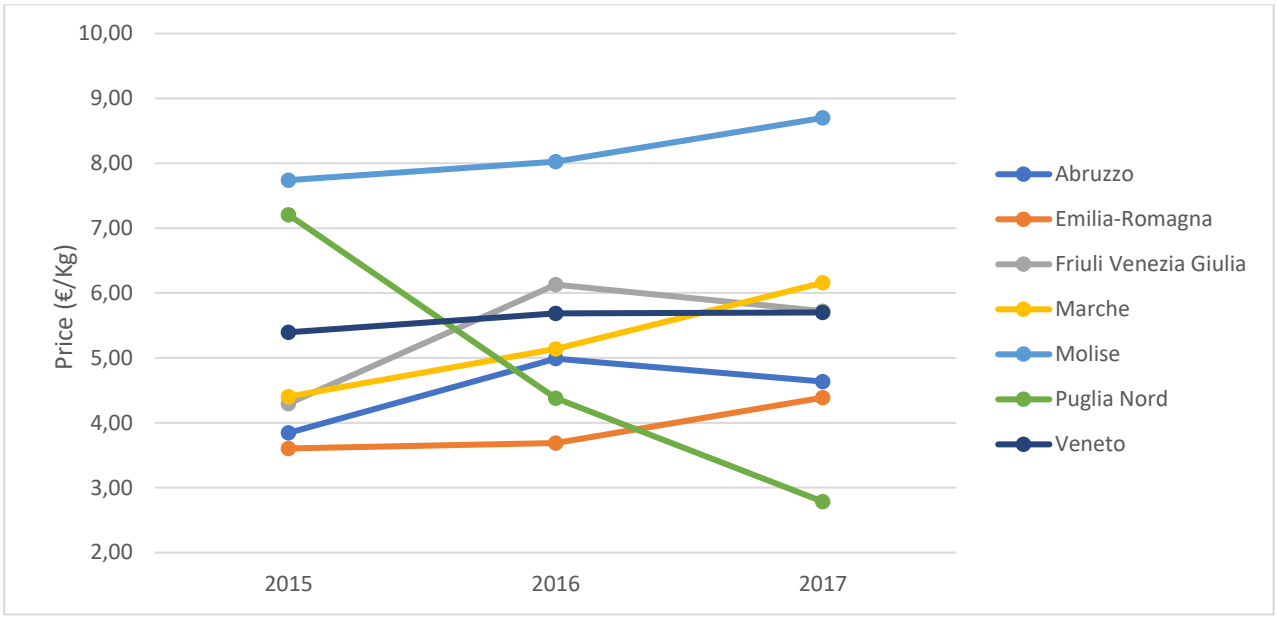


Figure 277: Musky Octopus Price by region – PNRDA

- Abruzzo is reported to use two different fishing techniques for Musky Octopus: DTS (which collected almost entirely the landings) and DRB.
  DTS granted 281t in 2015, 196t in 2016 and 164t in 2017. On the same period, price moved from 3,85€/Kg to 4,99€/Kg, before lightly decreasing to 4,64€/Kg.
  DRB granted 0,123t during 2017, with a slightly lower price than DTS (4,15€/Kg).

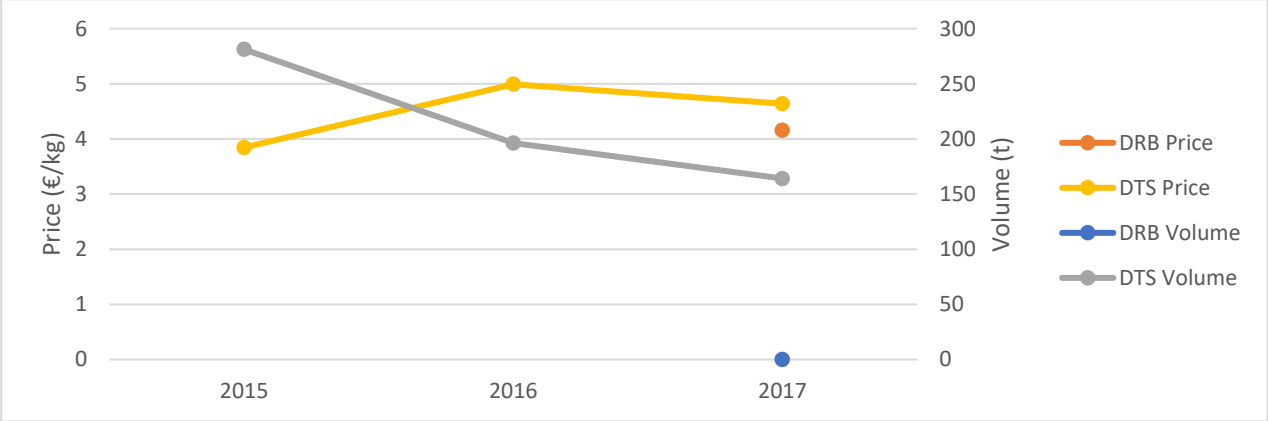


Figure 278: Price and Volume by techniques – Abruzzo – PNRDA

- In Emilia-Romagna the first method by importance is DTS. In this way 36,7t were fished on 2015, 47,7t in 2016 and 31,1t in 2017. TBB follows with a descending trend (23,8t, 19,4t and 11,3t).
  Price of DTS is higher than TBB: the minimum gap is +0,81€/Kg during 2016 while in 2017 increased at 1,18€/kg (4,70€/Kg for DTS, 3,52€/Kg for TBB).

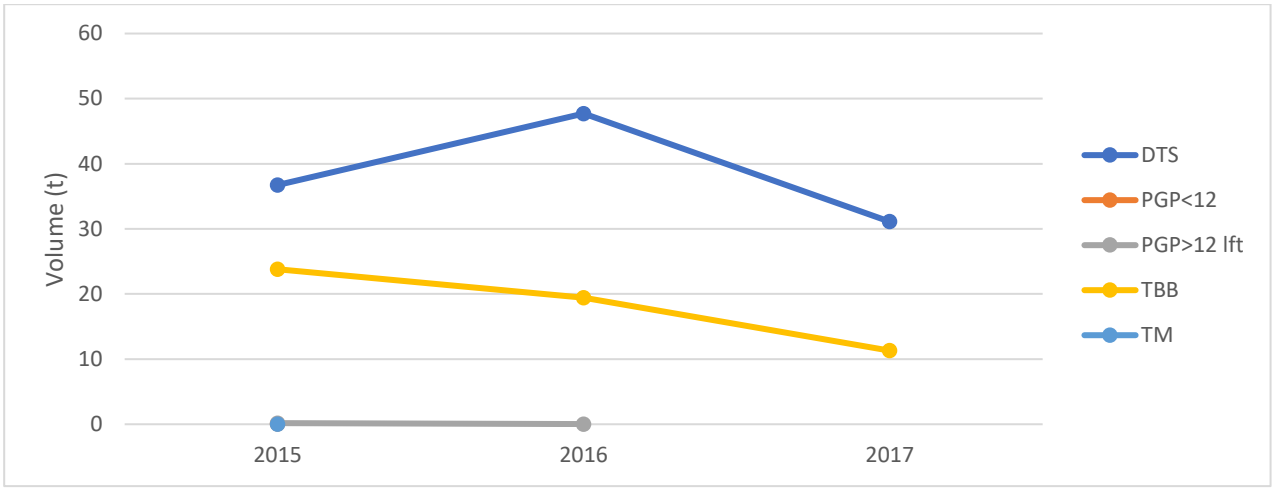


Figure 279: Volume by techniques - Emilia-Romagna - PNRDA

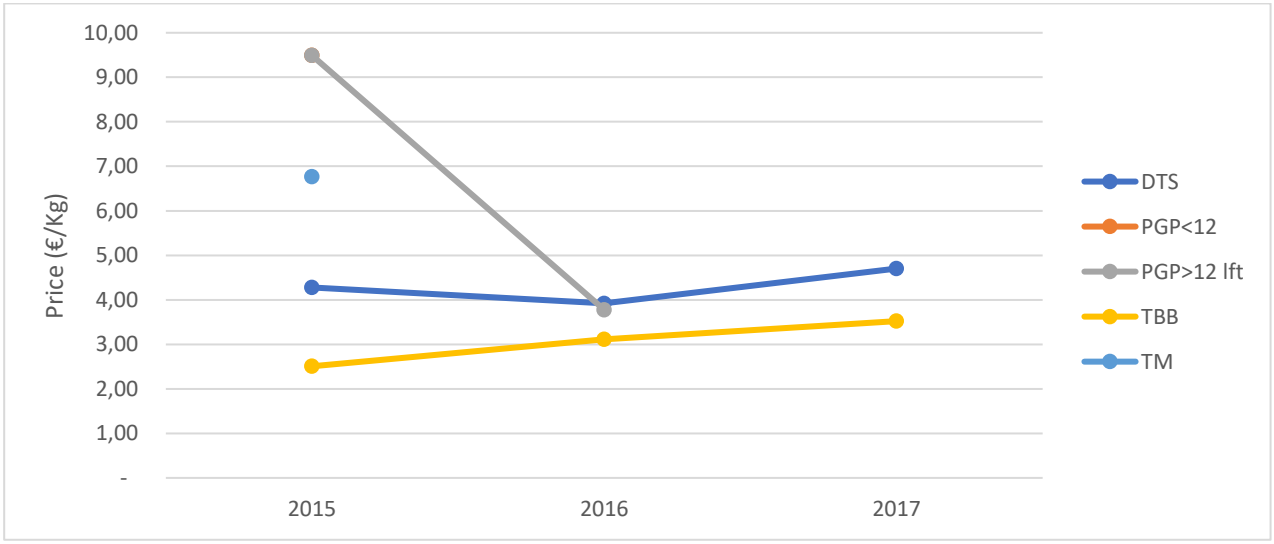


Figure 280: Price by techniques - Emilia-Romagna - PNRDA

- Musky Octopus is a sector of decreasing importance in Friuli Venezia Giulia.
  The main fishing technique is DTS, with a clear negative trend (31t in 2015, 12,9t in 2016 and 10,9t in 2017). Also relevant is TBB with 3,2t in 2015, 3,5t in 2015 and 2,8t in 2017. TM has been only reported for 2015 (2,8t) and 2016 (2,7t).

  Price of DTS Musky Octopus rose in 2016 from 4,21€/Kg to 6,32€/kg, then decreased to 5,65€/kg.
  TBB's price is on a progressive positive trend, passing from 4,23€/Kg in 2015 to 6,10€/Kg in 2017 (most expensive during that year). Price of TM has been the most expensive during 2015, then went almost equal to DTS in 2016.

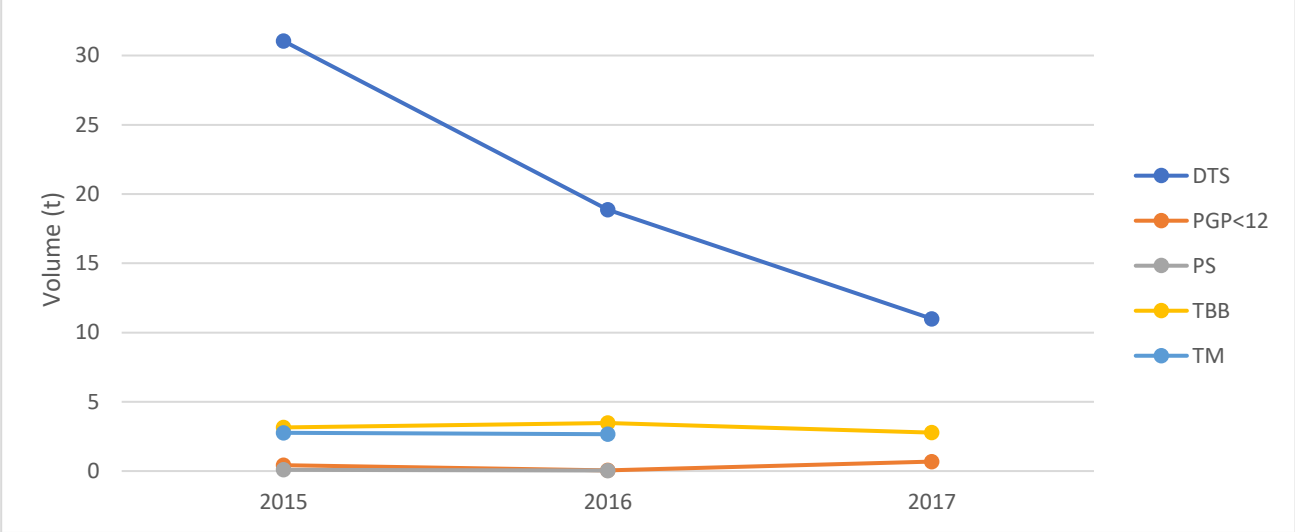


Figure 281: Volume by techniques – Friuli Venezia Giulia – PNRDA

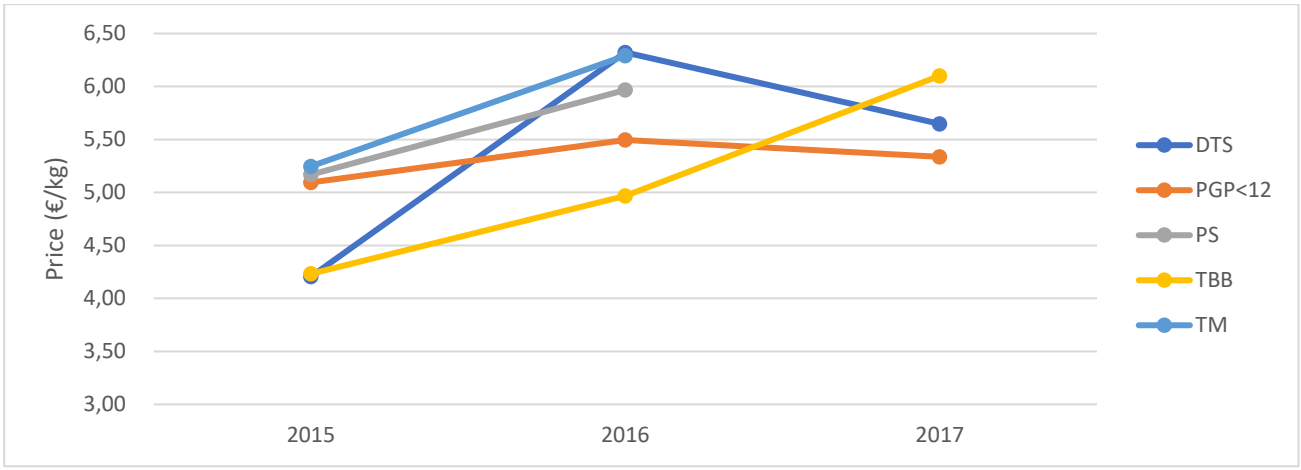


Figure 282: Price by techniques – Friuli Venezia Giulia - PNRDA

- In the Marche region, fishing by DTS is on a linear negative trend by volume. It granted 205t in 2015, 165t in 2016 and 125t in 2017. The price trend is upward: 4,40€/Kg in 2015, 5,18€/Kg in 2016 and 6,20€/Kg in 2017.
  The method TBB on its maximum moment (2016) admitted Marche to fish 4,8t of Musky Octopus at 3,71€/Kg. On 2017 price rose to 4,68€/Kg.

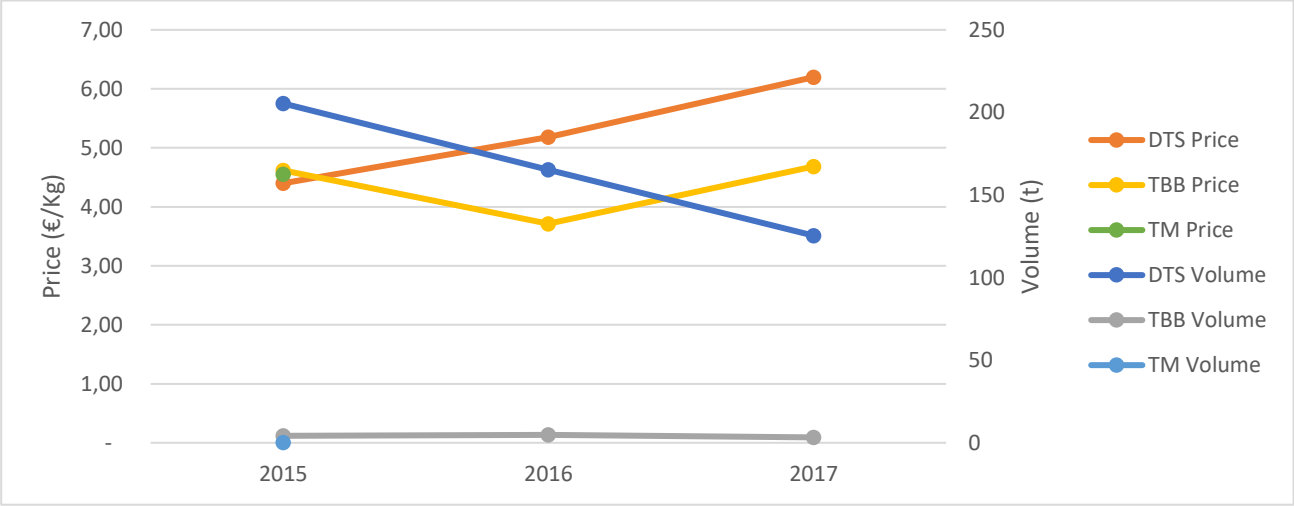


Figure 283: Price and Volume by techniques - Marche - PNRDA

- In Molise only DTS fishing is reported for EDT. Volume trend is uncertain as from the 37,5t of 2015 passed to 53,5t in 2016 and 41,3t in 2017.
  Price increased from 7,74€/kg in 2015 to 8,03€/kg in 2016, then moved to 8,70€/Kg.

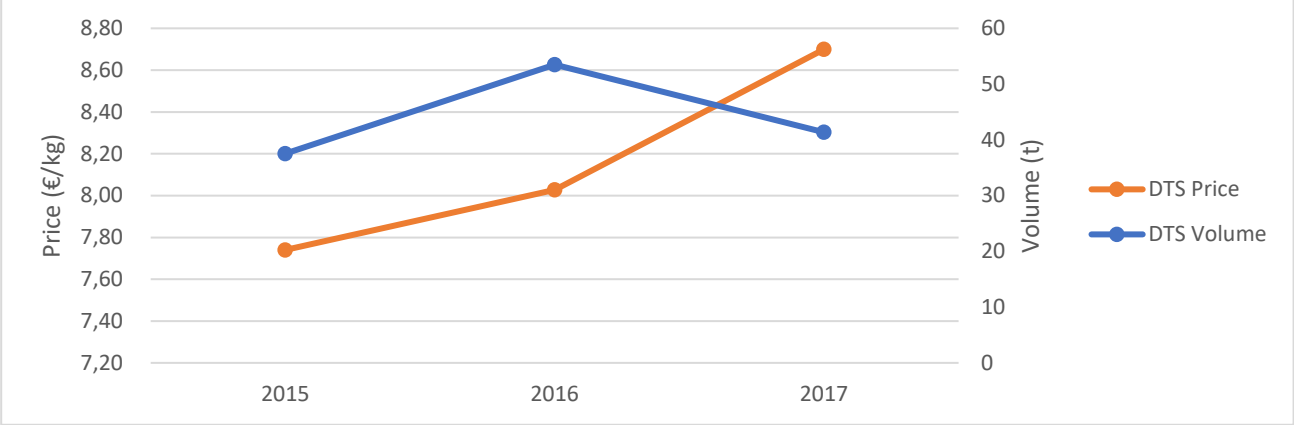


Figure 284: Price and Volume by techniques - Molise – PNRDA

- Only relevant techniques for Puglia Nord are DTS and PGP<12. DTS has been almost stable in 2015 and 2016 (512t and 529t), but in 2017 noticeably moved to 1.102t. Its price is deeply descending: 7,20€/Kg in 2015, 4,38€/Kg in 2016 and 2,78€/Kg in 2017.
  PGP<12's volume trend is negative, passing from 1,3t in 2015 to 0,2t in 2017. Price dropped from 8,79€/kg in 2015 to 5,24€/Kg in 2016 and then stabilized at 5,23€/Kg.

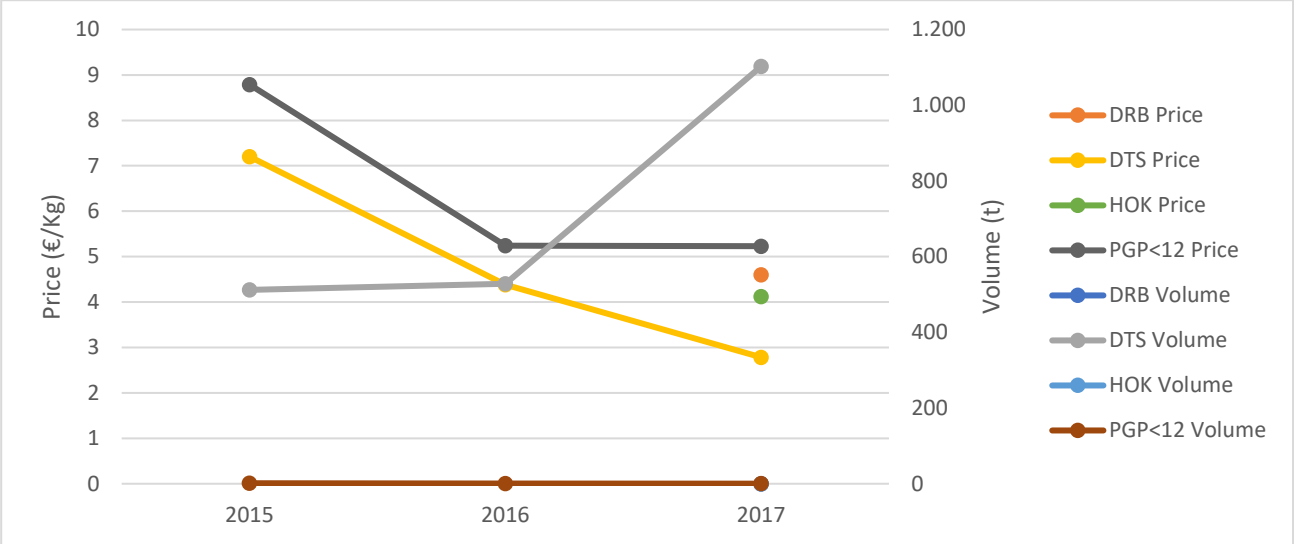


Figure 285: Price and Volume by techniques – Puglia Nord - PNRDA

- Even Veneto mostly fish Musky Octopus by DTS. With this technique 393t were fished in 2015, 463t in 2016 and 436t in 2017. Second by importance is TBB which collected 723t

in 2015 and grew to 115t in 2017. TM represented 7,9t in 2015, but then decreased to 0,4t in 2016 and 0,8t in 2017.

DTS's price has been the most expensive in the whole considered period, and its trend is upward (5,70€/kg in 2015, 6€/kg in 2016 and 5,93€/Kg in 2017).
TBB has also a positive trend, starting at 3,78€/Kg up to 4,86€/Kg in 2017.

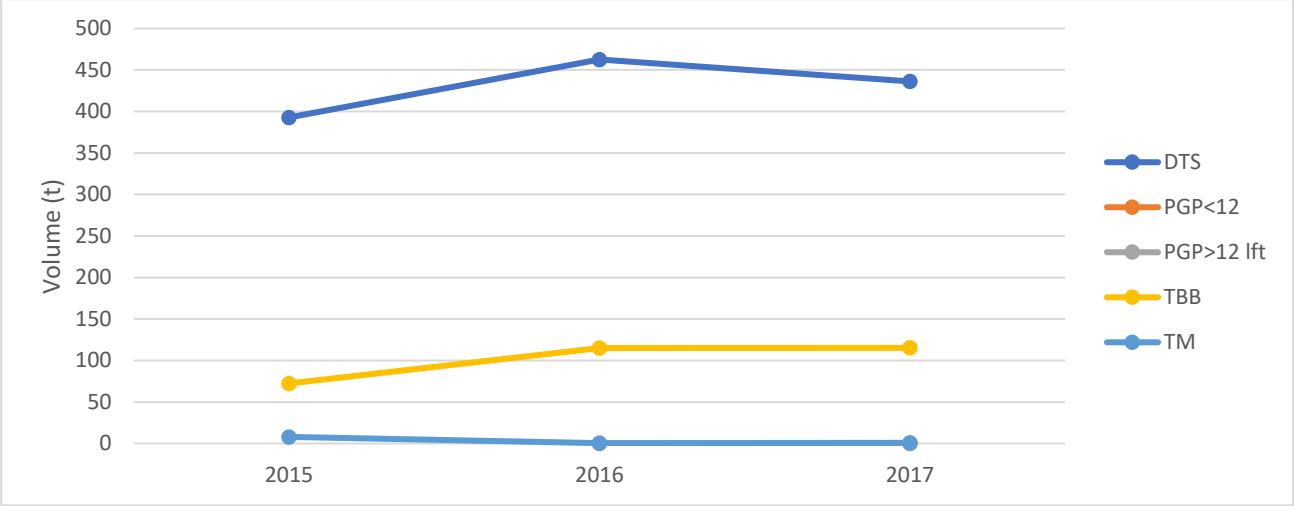


Figure 286: Volume by techniques - Veneto - PNRDA

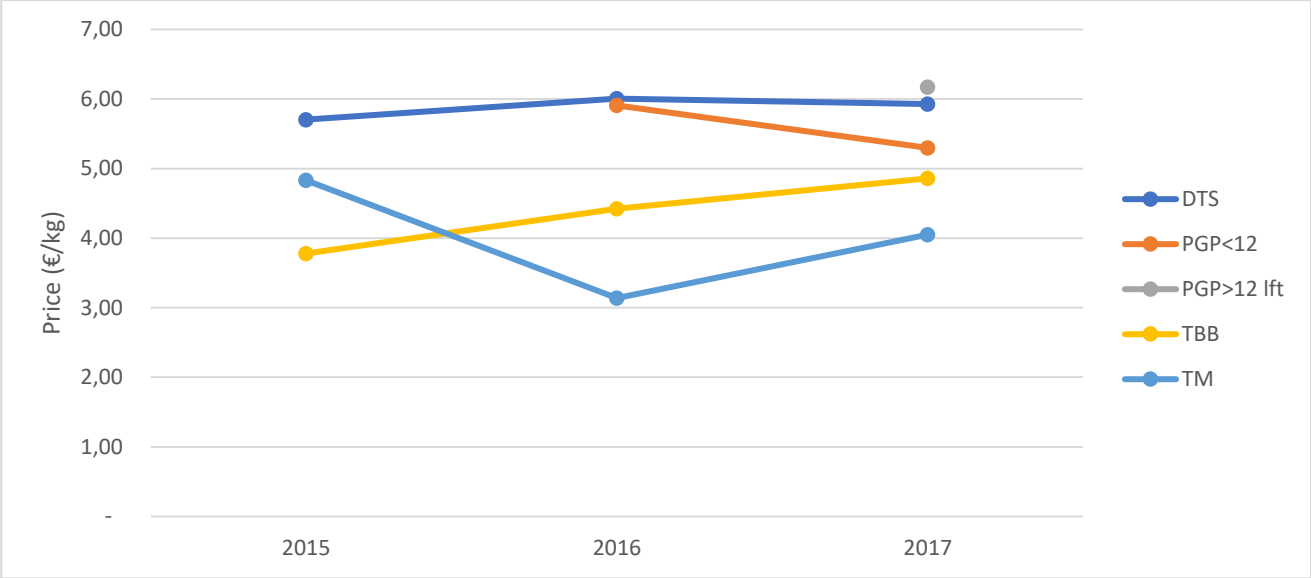


Figure 287: Price by techniques – Veneto - PNRDA

By fishing techniques point of view

DTS is by far the most relevant fishing technique. Its trend is positive since it started in 2015 at 1.497t, slightly decreased to 1.473t in 2016 and moved up to 1.911t in 2017.

On inferior relevance stays TBB with 103t in 2015, 142,5t in 2016 and 132t in 2017. TM collected only 0,82t in 2017, but in 2015 its volume was 10,9t.

Even PGP<12 has to be named for its volume (2t in 2015, 0,87t in 2016 and 1,17t in 2017).

Price of Musky Octopus fished by DTS decreased in the considered timeframe. In 2015 it costed 5,67€/kg, in 2016 5,20€/Kg and in 2017 4,06€/Kg. TBB price was inferior than DTS during 2015

and 2016, but crossed it in 2017 while hitting 4,77€/Kg. PGP<12 has a great variability as it passed from 7,30€/Kg in 2015 to 4,80€/Kg in 2016.

Table 67: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ DRB			0,13			4,19
∑ DTS	1.496	1.473	1.912	5,67	5,20	4,06
∑ PGP<12	2,09	0,87	1,17	7,30	4,80	4,85
∑ PGP>12 lft	0,17	0,03	0,10	9,49	3,78	6,17
∑ PS	0,09	39,56		5,17	5,97	
∑ TBB	103	142,5	132	3,53	4,23	4,77
∑ TM	10,9	3,06	0,82	4,94	5,88	4,05
∑ HOK			0,008			4,12

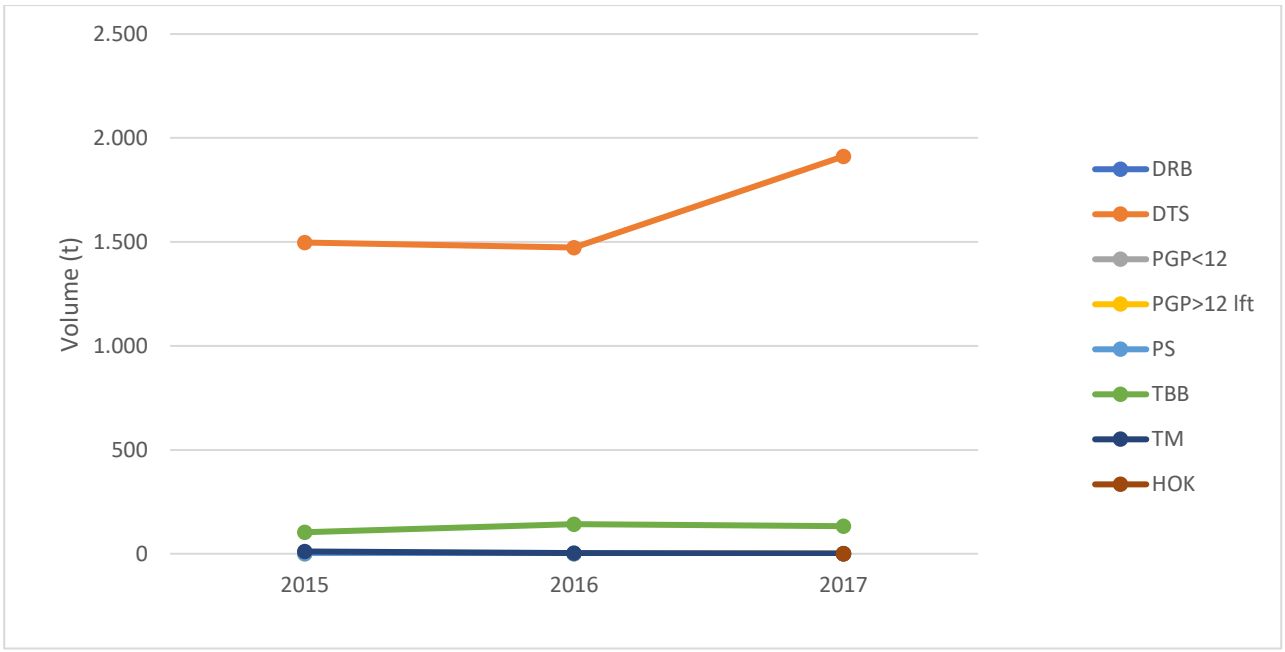


Figure 288: Musky Octopus Volume by technique - PNRDA

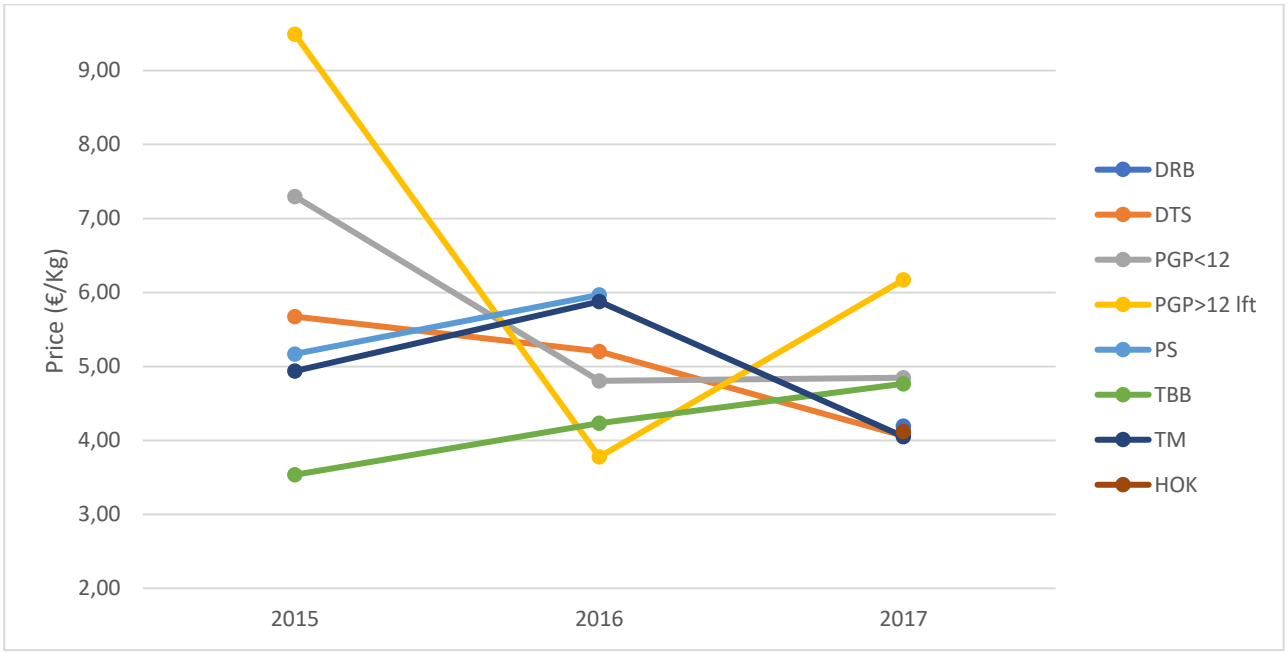


Figure 289: Musky Octopus Price by technique – PNRDA

- Data for DRB are available only for 2017. On that year Abruzzo produced 0,12t at 4,15€/kg while Puglia Nord 12Kg (at 4,6€/Kg).

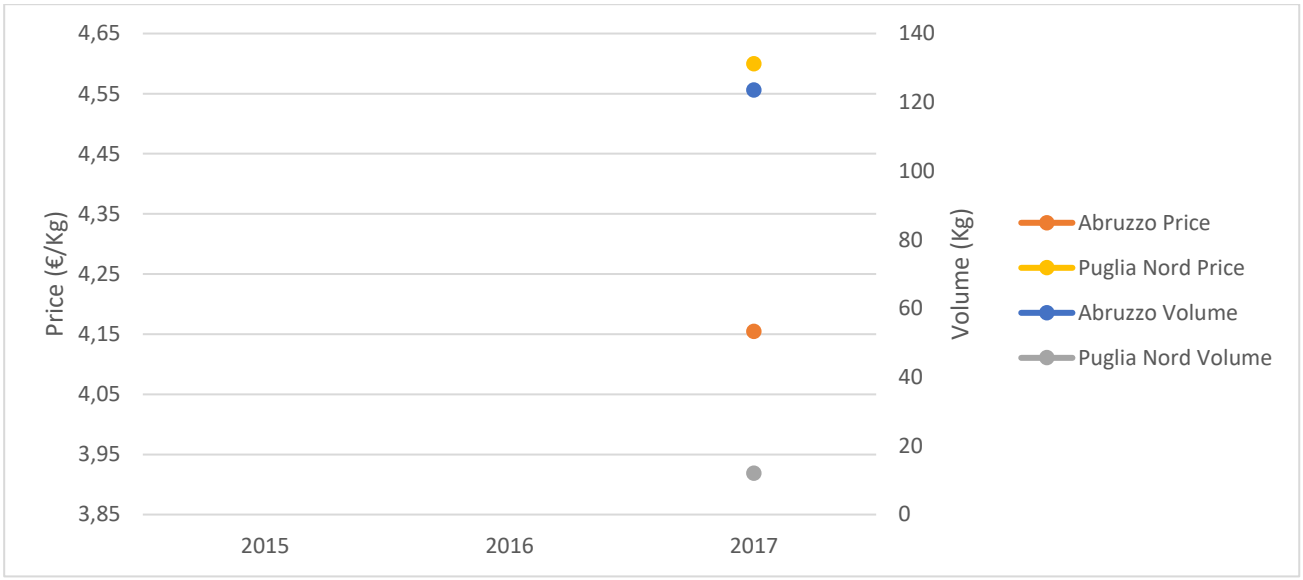


Figure 290: Price and Volume by region – DRB

- As already reported DTS is the most important technique for this species. Puglia Nord is the most important player on this method as it produced 512t in 2015 and 529t in 2016 before suddenly rising to 1.102t in 2017.
  Veneto is the second by contributions with 393t in 2015, 463t in 2016 and 436t in 2017.
  Follow Abruzzo (164t on 2017, negative trend), Marche (125t, negative trend), Molise (41t, positive trend) and then Emilia-Romagna and Friuli Venezia Giulia.

  Molise has been the most expensive market in the whole period, ending 2017 with an average of 8,70€/Kg. On the last available year down from Molise stay Marche (6,20€/kg, increasing trend), Veneto (5,93€/Kg, slight positive trend), Friuli Venezia Giulia (5,93€/Kg but low volume), Abruzzo (4,64€/Kg) and Emilia-Romagna (4,70€/Kg, +0,78€/kg on the previous year).

Price in Puglia Nord more than halved between 2015 and 2017. It started from 7,20€/Kg and decreased until 2,78€/Kg in 2017).

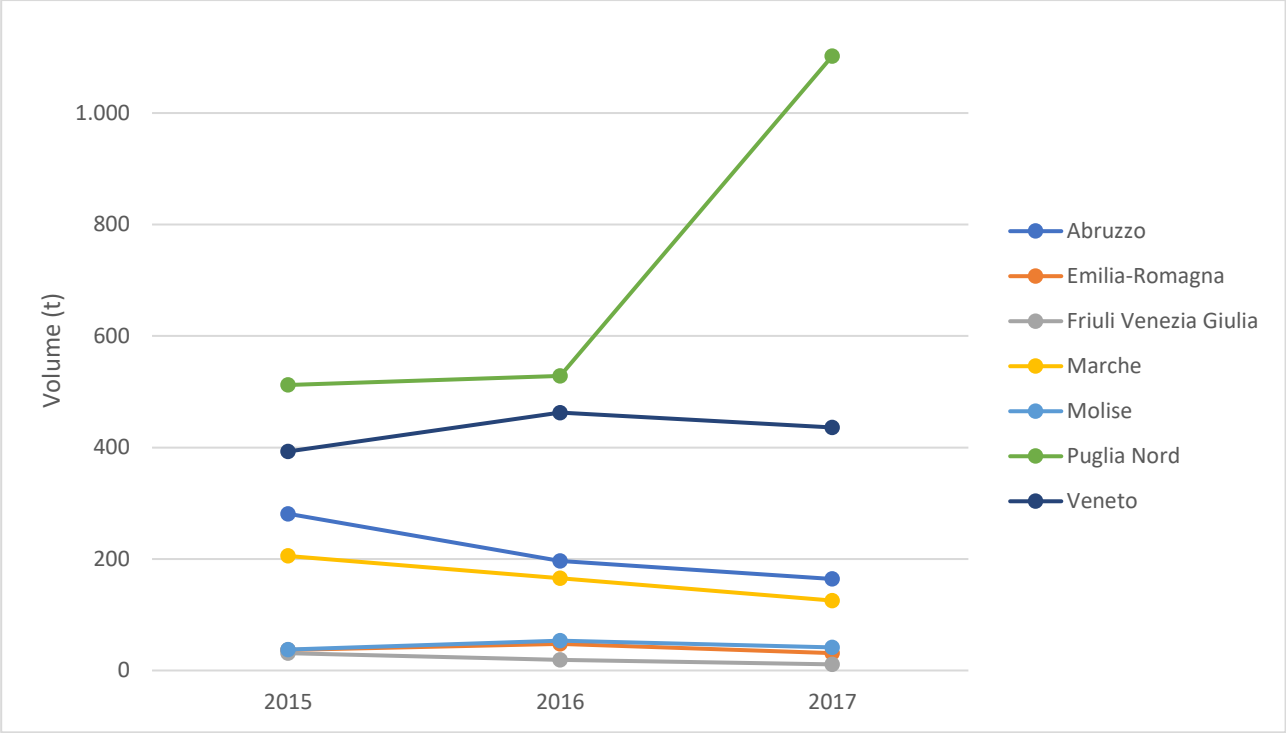


Figure 291: Volume by region – DTS

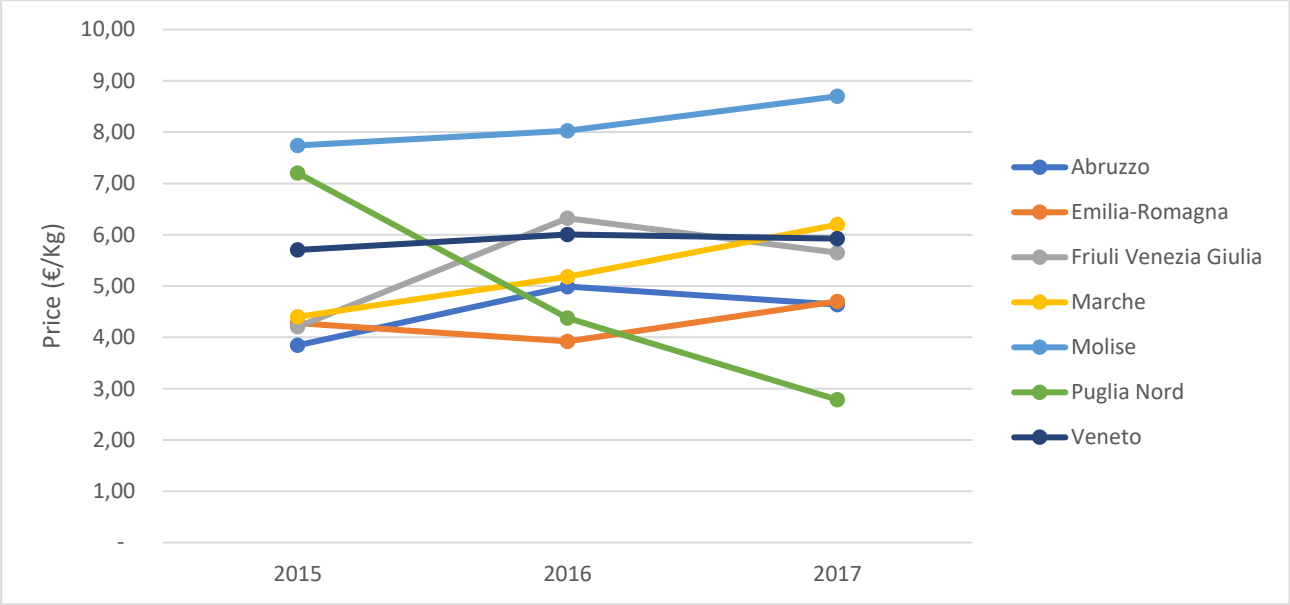


Figure 292: Price by region - DTS

- On 2015 and 2016 PGP<12 has been mostly used in Puglia Nord, collecting 1,3t and 0,5t. On 2017 with 0,2t has been passed by Friuli Venezia Giulia that collected 0,7t. All other regions produced less than 0,5t.

  Price in Nord Puglia drop in 2016 from 8,79€/kg to 5,24€/kg. During 2017 stabilized at 5,23€/Kg, very close to the 5,34€/Kg of Friuli Venezia Giulia.

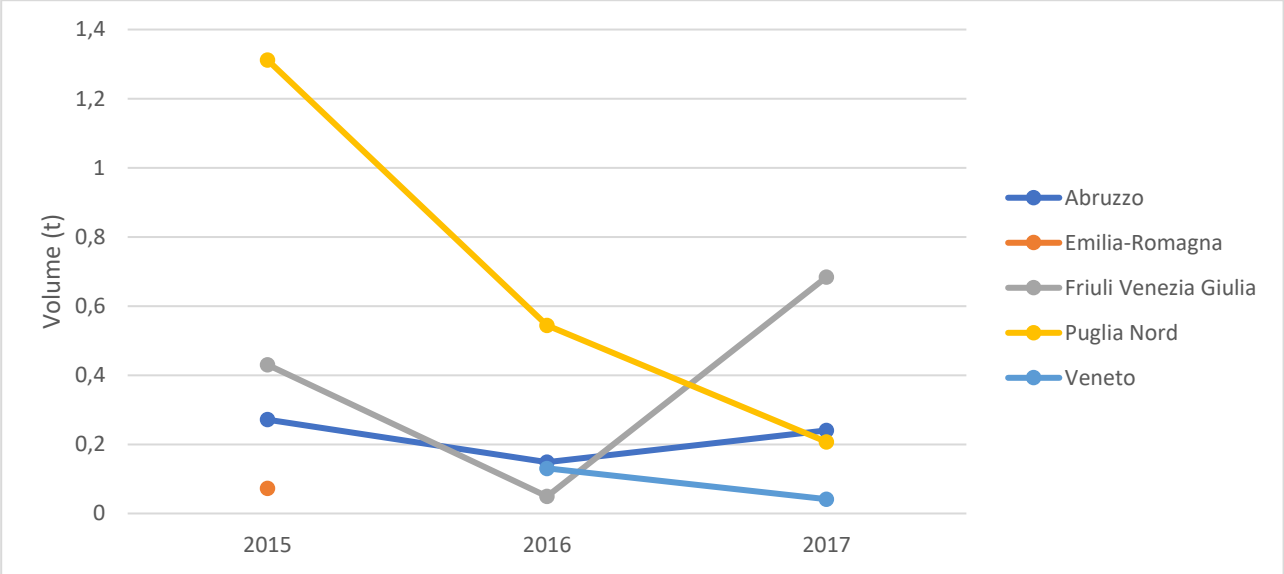


Figure 293: Volume by region - PGP<12

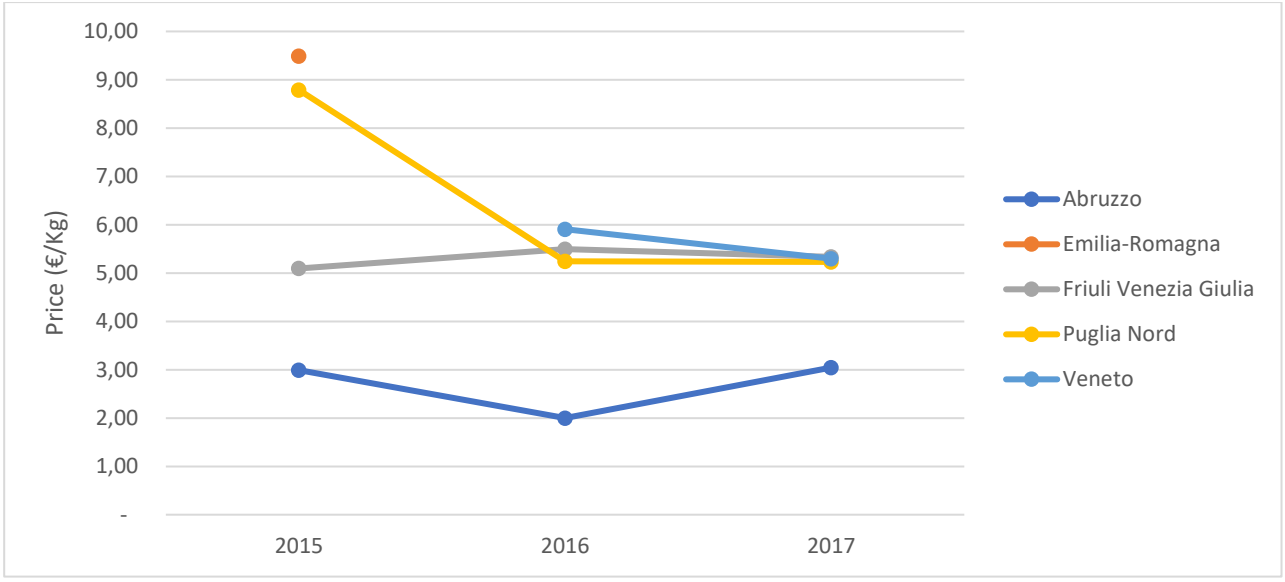


Figure 294: Price by region - PGP<12

- PGP>12's use is quite uncommon. Its highest point has been 0,17t in Emilia-Romagna in 2015 (at 9,49€/Kg) before a serious drop to 26Kg in 2016. In Veneto 105Kg were fished in 2017 and sold at 6,17€/Kg.

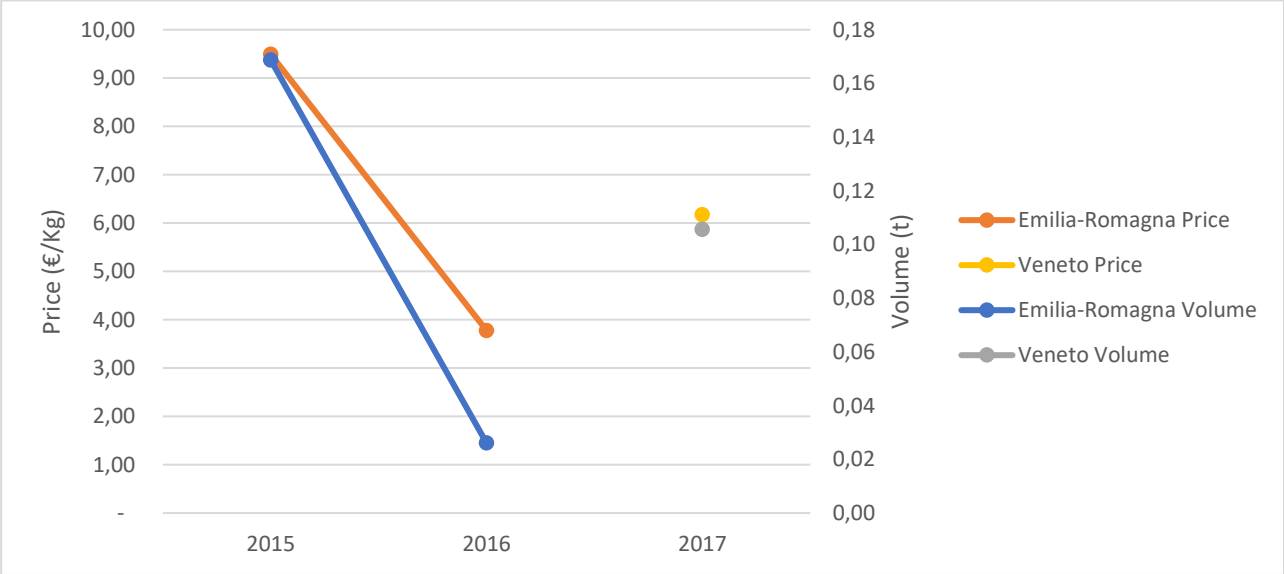


Figure 295: Price and Volume by region - PGP>12 lft

- PS is a barely productive fishing technique for Musky Octopus. On 2015 89Kg were fished in this way (for an average value of 5,17€/Kg) in Friuli Venezia Giulia. In the following year only 39Kg (while price grew to 5,97€/Kg).

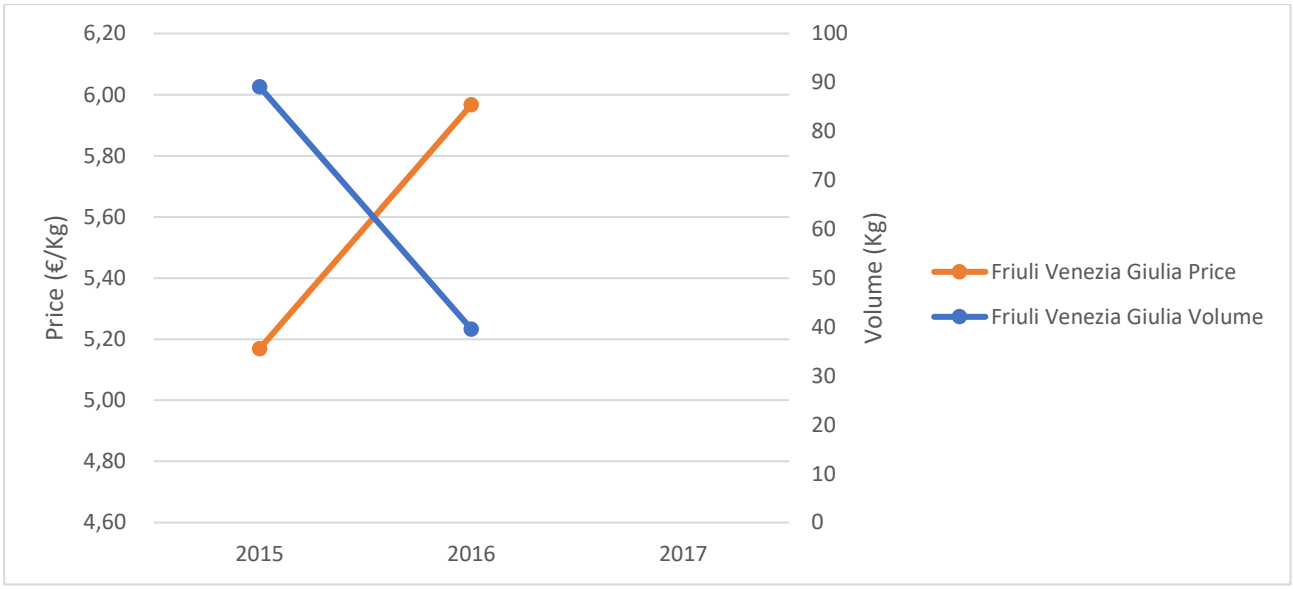


Figure 296: Price and Volume by region - PS

- TBB is the second most important technique for EDT.
  Veneto is the most important player. It increased its volume in 2016 from 72t to 115t and then stabilized at 115t in 2017.
  Emilia-Romagna in the three years decreased its production from 23,8t in 2015 to 11,3t in 2017.
  Follow Marche (4,2t in 2015, 4,8t in 2016 and 3,3t in 2017) and Friuli Venezia Giulia (3,2t in 2015, 3,5t in 2016 and 2,8t during 2017).

  All prices were reported in a positive trend but Marche, which decreased in 2016 from 4,61€/Kg to 3,71€/Kg before restoring to 4,86€/Kg. Between the others, Friuli Venezia Giulia resulted the most expensive (from 4,23€/Kg in 2015 to 6,10€/kg in 2017), chased

by Veneto (3,78€/kg in 2015 and 4,86€/kg in 2017) and Emilia-Romagna (2,51€/kg in 2015, 3,52€/kg in 2017).

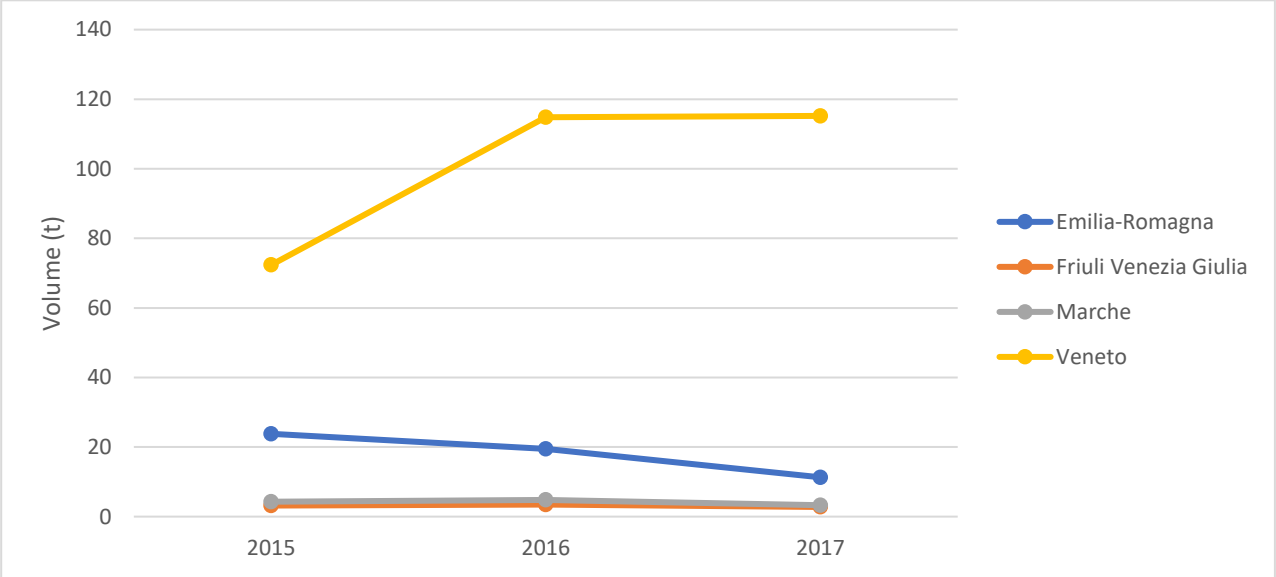


Figure 297: Volume by region - TBB

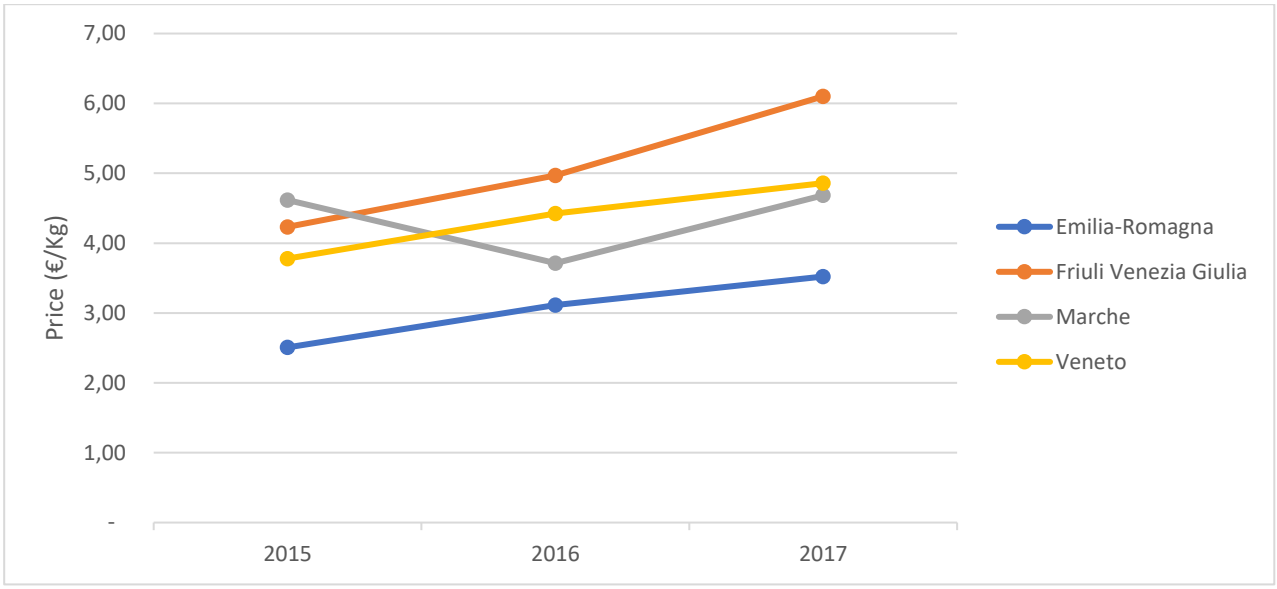


Figure 298: Price by region - TBB

- TM fishing decreased its volume along with the reduction of Musky Octopus fished in Veneto. 7,9t were there fished during 2015, then only 0,4t in 2016 and 0,8 in 2017. Its price firstly decreased, passing from 4,83€/Kg to 3,14€/kg in 2016, then moved up to 4,05€/Kg in 2017.

  Data are reported for Friuli Venezia Giulia only for 2015 (2,76t) and 2016 (2,66t). Price started in 2015 at 5,25€/Kg and ended at 6,29€/Kg in 2016.

  Marche and Emilia-Romagna respectively produced 0,19t (at 4,55€/Kg) and 27Kg (at 6,77€/Kg).

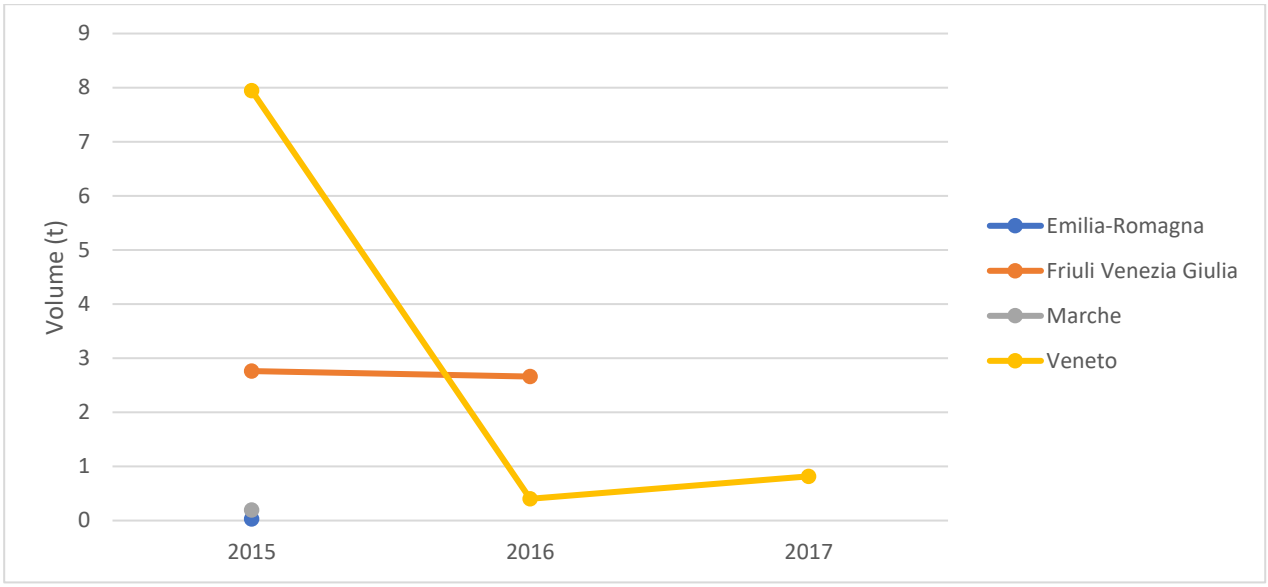


Figure 299: Volume by region - TM

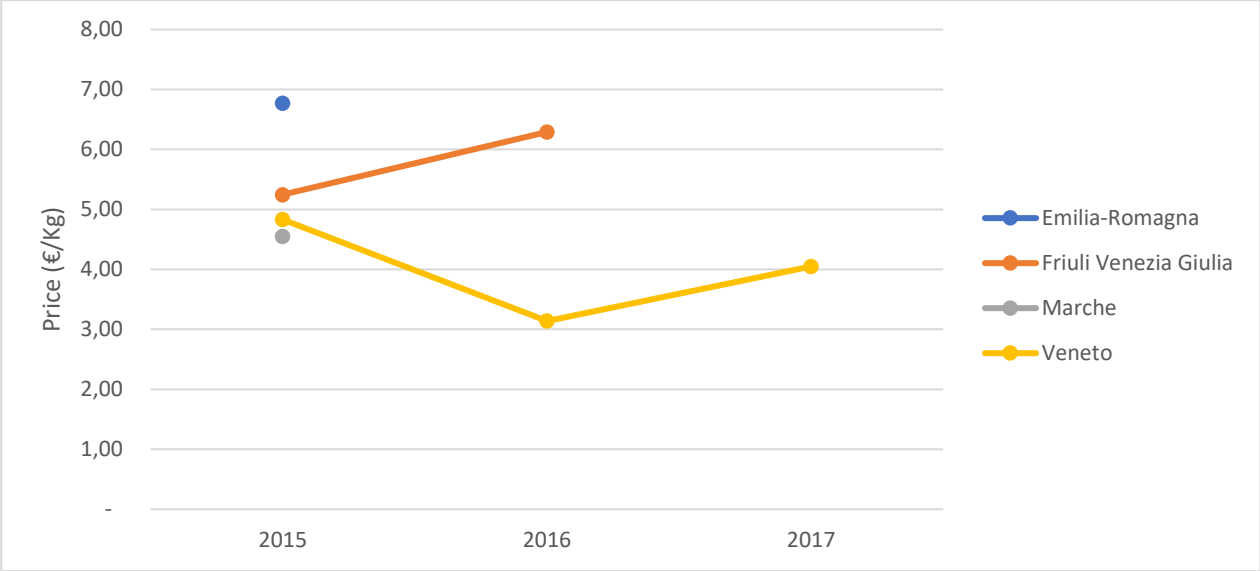


Figure 300: Price by region – TM

- Fishing by HOK has been only implemented in Puglia Nord, where yielded 8Kg sold at 4,12€/Kg.

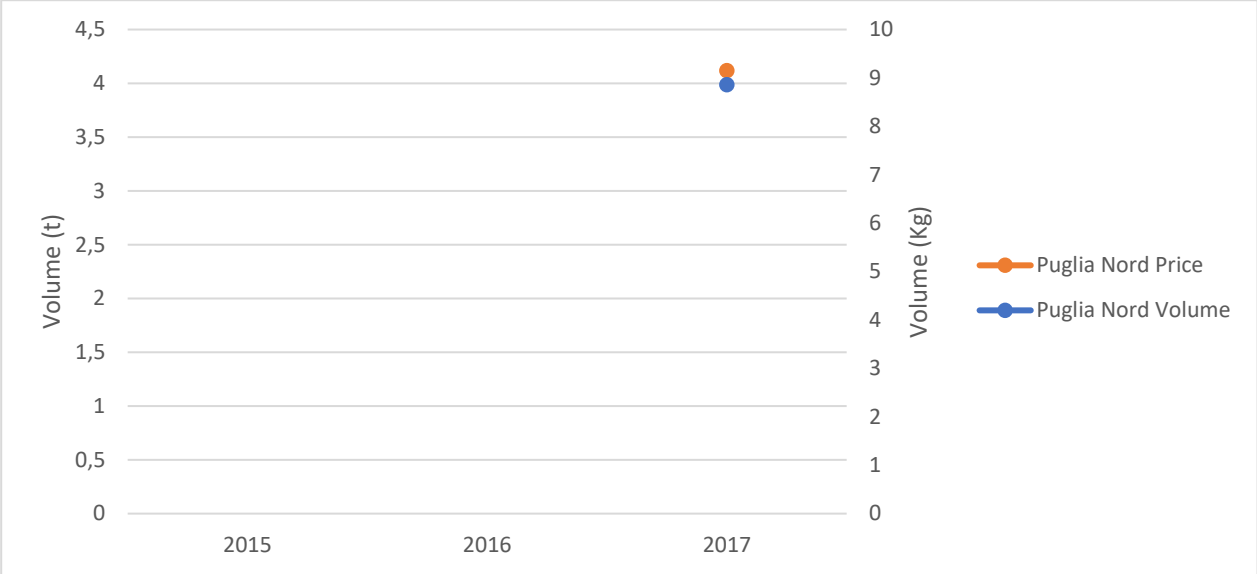


Figure 301: Price and Volume by region - HOK

4.10 CLAM

By regional point of view

The most relevant region for Clam is Marche. Its volume went from 6.641t on 2015 to 8.241t on 2016 and to 5.285t on 2017. The second most important, on descending trend, is Veneto (3.336t in 2015, 3.034t in 2016 and 2.385t in 2017. Then follow Emilia-Romagna (1.524t in 2015, 2.726t in 2016 and 2.195t in 2017), Abruzzo (2.054t, 1.282t and 1.668t) Puglia Nord (850t, 808t and 164,6t). Molise and Friuli Venezia Giulia lay below.

All prices converged on 2017 between 2,27€/kg and 2,33€/Kg. During 2015 they were more differenced (Marche 2,22€/Kg, Veneto 2,16, Puglia Nord 2,06€/kg, Emilia-Romagna 1,92€/Kg).

Table 68: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	2.054	1.282	1.668	2,04	2,51	2,27
∑ E.Romagna	1.524	2.726	2.195	1,92	1,97	2,30
∑ F.V.Giulia	129	62,5	2,7	2,13	2,06	2,42
∑ Marche	6.641	8.241	5.285	2,22	2,50	2,31
∑ Molise	114	71,1	98,8	3,01	2,67	2,28
∑ Puglia Nord	850	808	164,6	2,06	2,51	2,32
∑ Veneto	3.336	3.034	2.385	2,16	2,15	2,33

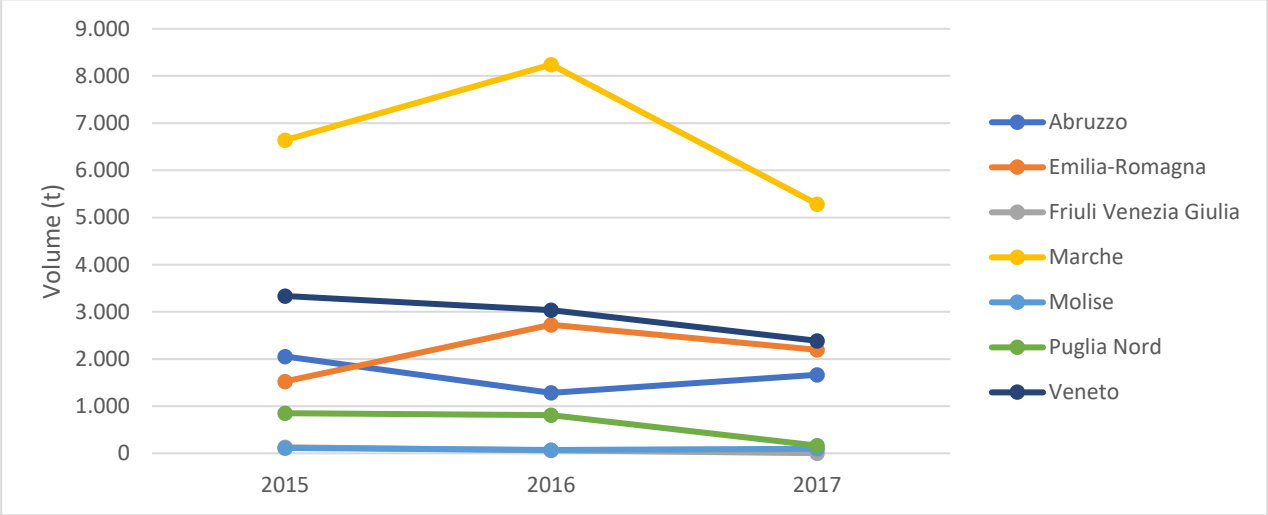


Figure 302: Clam Volume by region - PNRDA

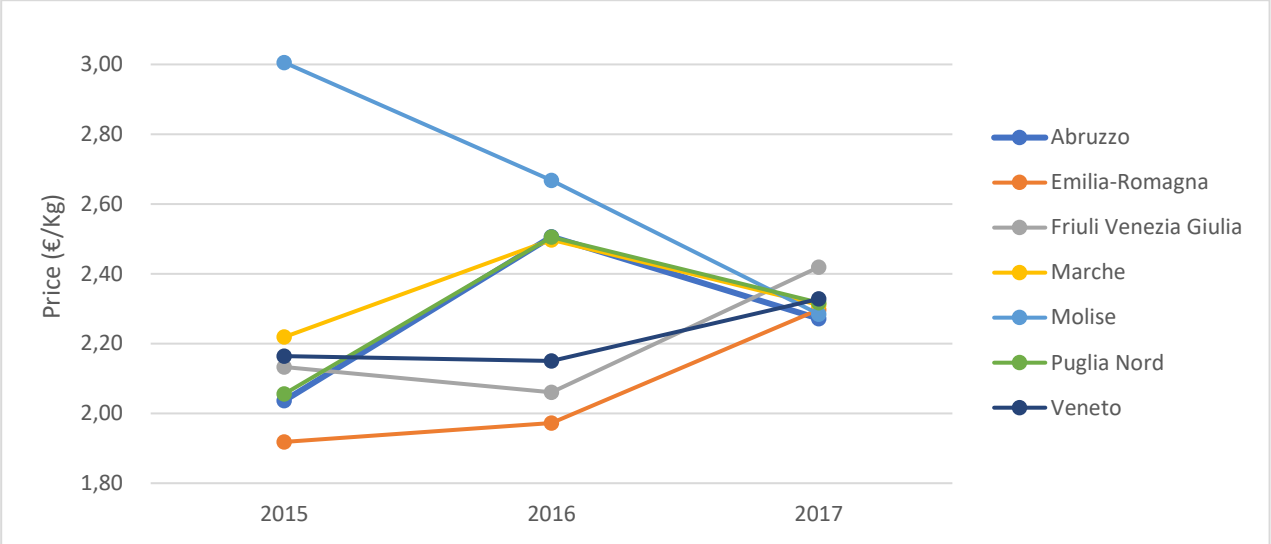


Figure 303: Clam average price by region - PNRDA

- On 2017 price of DTS and DRB were equal, at 2,27€/Kg.
  DRB had a first volume drop on 2016, from 2.054t to 1.282t, and then moved up to 1.667t.
  Its price had a maximum on 2016 at 2,51€/Kg.

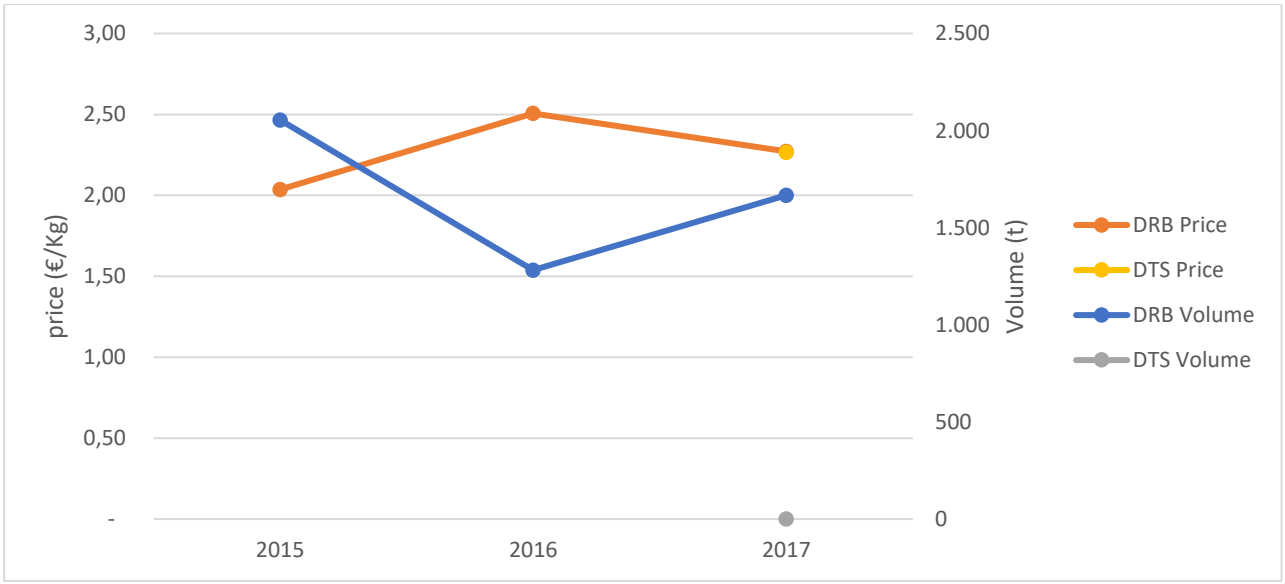


Figure 304: Price and Volume by techniques – Abruzzo - PNRDA

- Emilia-Romagna presented a strongly increased price on 2017 (2,30€/kg, +0,33€/Kg on the previous year). Its volume firstly increased (from 1.524t to 2.726t on 2016) and then decreased to 2.193t.

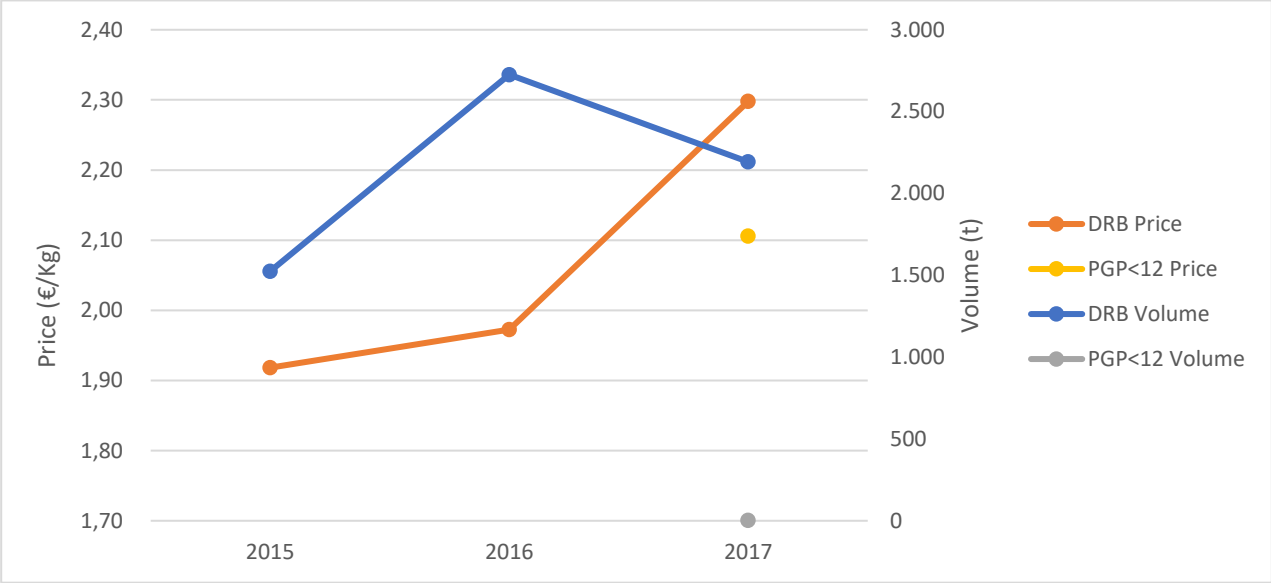


Figure 305: Price and Volume by techniques - Emilia-Romagna – PNRDA

- Friuli Venezia Giulia's volume is on freefall. If on 2015 129t were fished, on 2017 only 2,7t were collected.

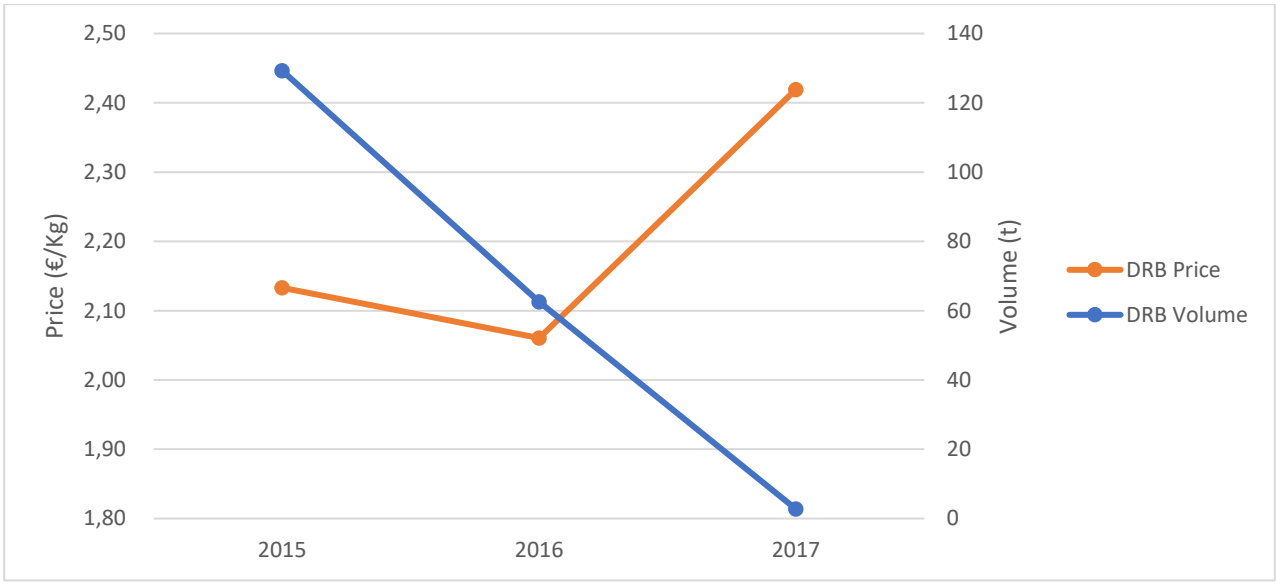


Figure 306: Price and Volume by techniques - Friuli Venezia Giulia - PNRDA

- Marche had a first moment of volume increase on 2016 (8.241t, +1.600t on the previous year) and then decreased to 5.283t. Price had slight fluctuations, starting 2015 at 2,22€/Kg and closing in 2017 at 2,31€/Kg.

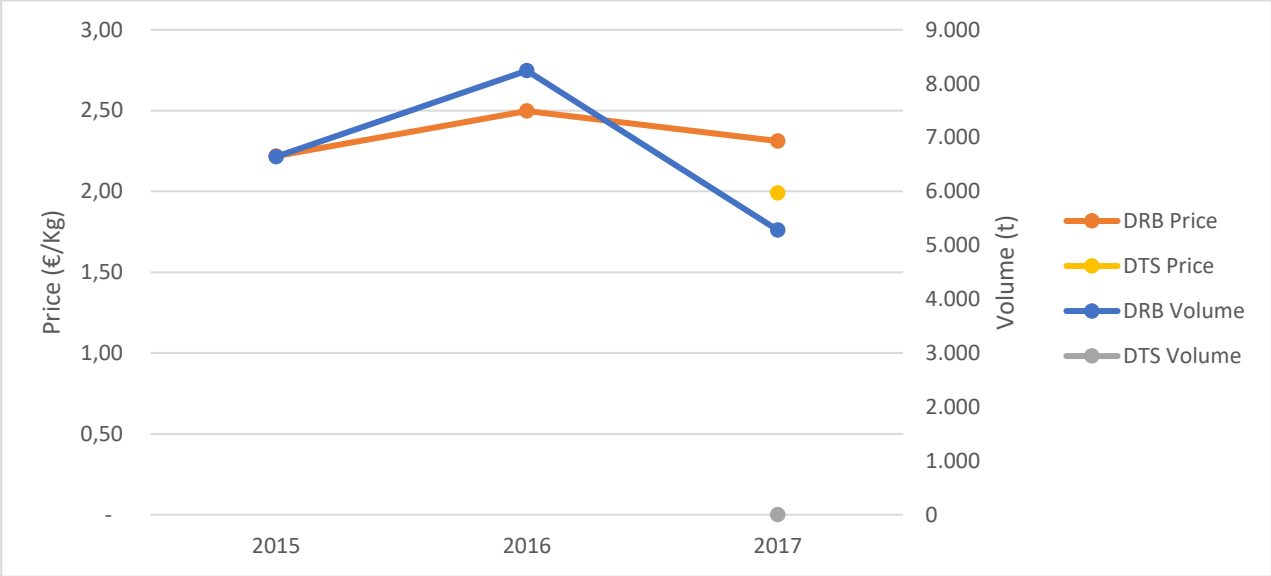


Figure 307: Price and Volume by techniques - Marche – PNRDA

- Molise's volume of DRB is decreasing. Starting from 114t in 2015 attested at 71t in 2016. Its price is sloped to 2,29€/Kg in 2017.1,4t were collected in 2017 at 2,13€/Kg.

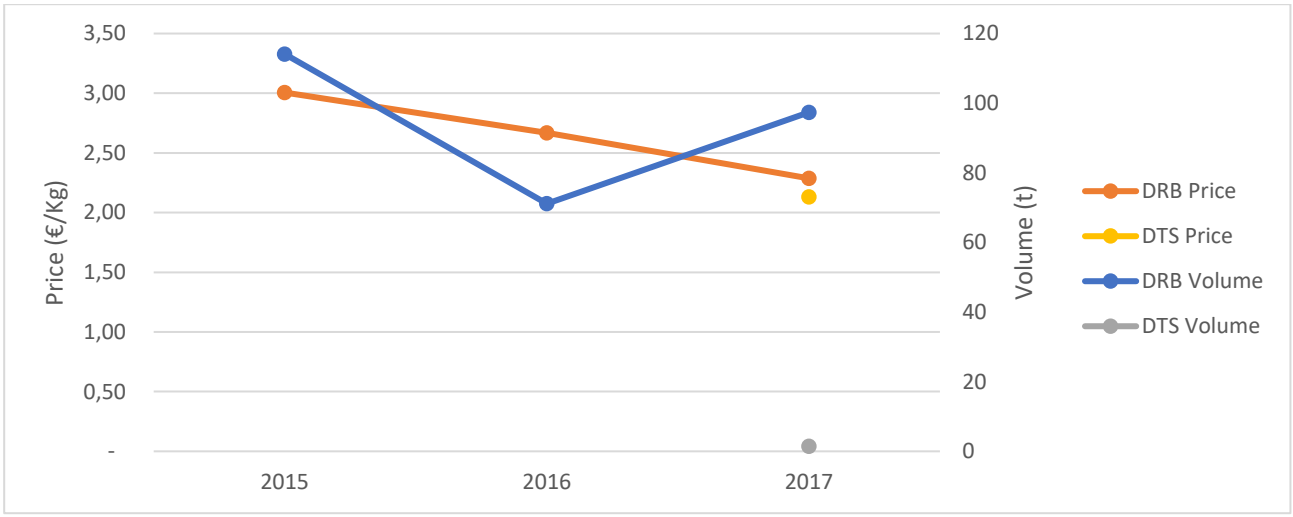


Figure 308: Price and Volume by techniques - Molise - PNRDA

- Puglia had a drop on 2017, when with 164t lost 644t on the previous year. Price is moving inside the 2-2,5€/Kg channel, closing 2017 at 2,32€/Kg.

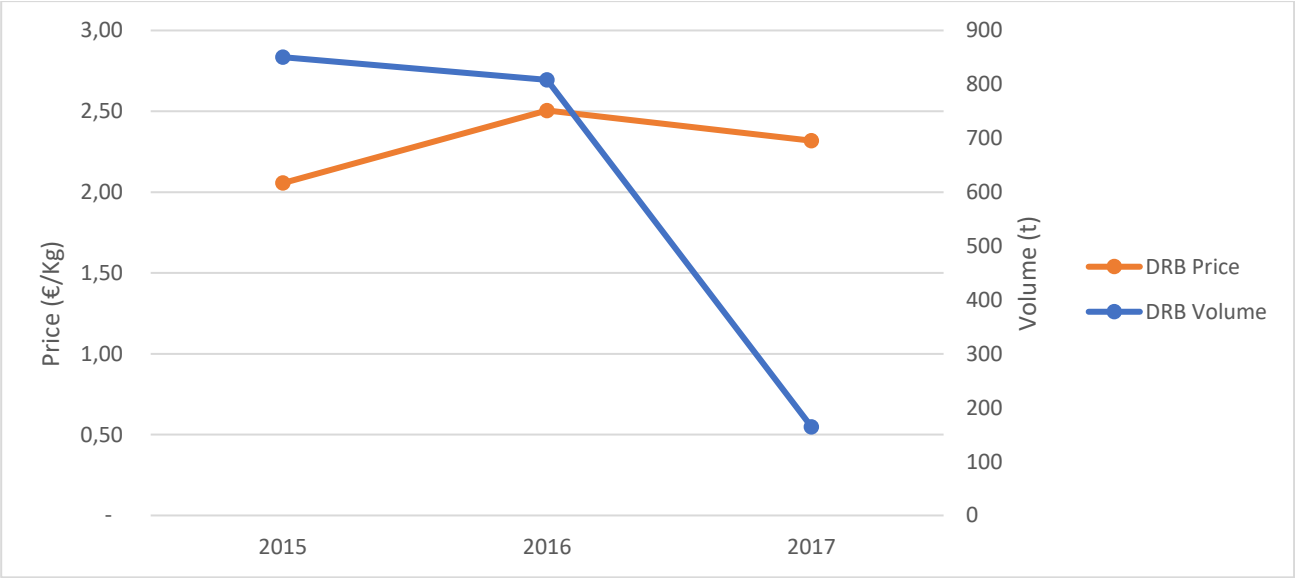


Figure 309: Price and Volume by techniques – Puglia Nord – PNRDA

- Veneto is also decreasing its production: if 3.335t were fished on 2015, they were 3.034t in 2016 and 2.385t in 2017. Price had a first reduction in 2016 (from 2,16€/Kg to 2,15€/Kg) and then rose to 2,33€/kg.

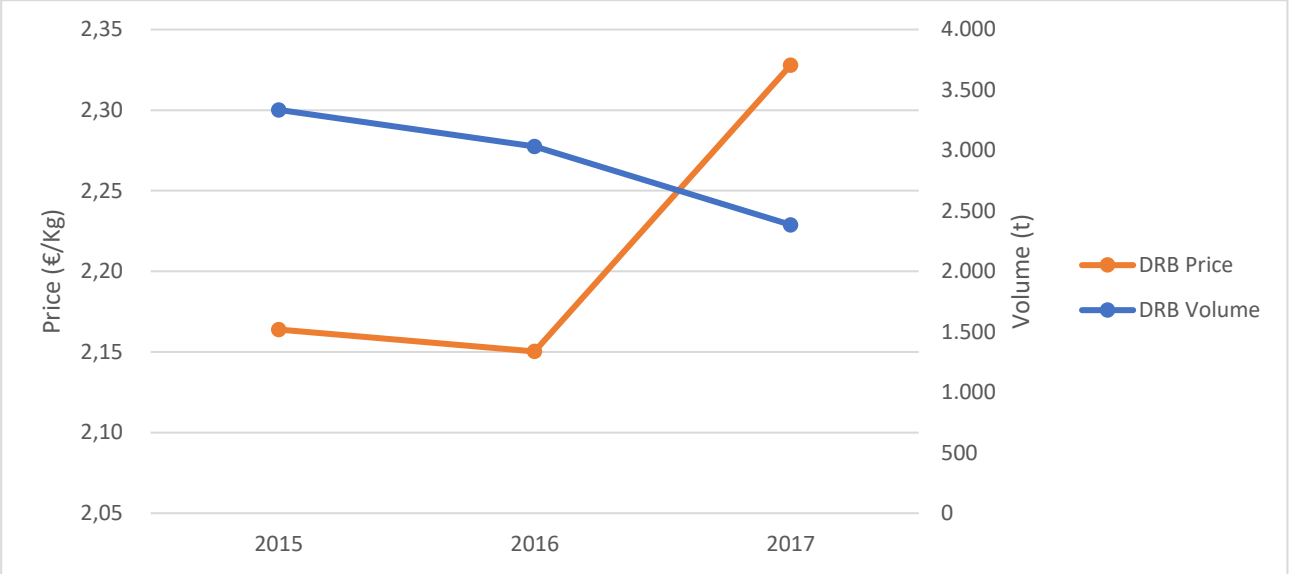


Figure 310: Price and Volume by techniques - Veneto - PNRDA

By fishing techniques point of view

Only three technique are reported from Clam. Between those, the only truly relevant is DRB which collected 14.650t on 2015, 16.225t on 2016 and 11.793t on 2017. Its price rose on 2016 to 2,34€/Kg (from the previous 2,15€/kg) and then decreased to 2,31€/Kg in 2017.

DTS collected 4,1t in 2017 (at 2,11€/Kg) and PGP<12 2,2t (at 2,11€/Kg).

Table 69: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/Kg)		
	2015	2016	2017	2015	2016	2017

∑ DRB	14.650	16.225	11.793	2,15	2,34	2,31
∑ DTS			4,1			2,11
∑ PGP<12			2,2			2,11

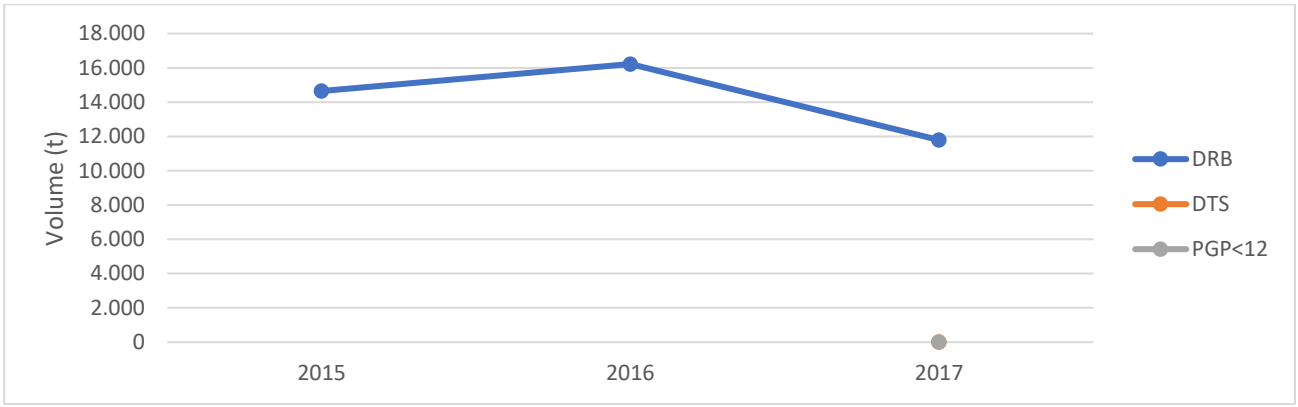


Figure 311: Clam Volume by technique - PNRDA

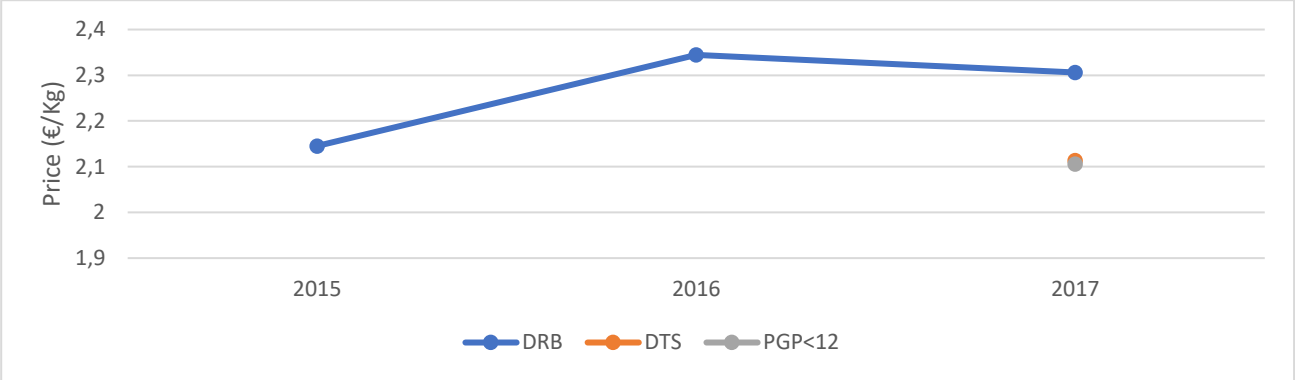


Figure 312: Clam average price by technique – PNRDA

- Marche are the most relevant region for DRB, with a relevant gap from the others. On 2017 it produced 5.283t of clam with this method, Veneto 2.385t, Abruzzo 1.667t, Molise 97t and Puglia Nord 164t.
  Price are generally close in 2017 (between 2,27€/kg and 2,33€/Kg). On 2016 Puglia was at 2,51€/Kg, Marche 2,50€/kg, Veneto at 2,15€/kg and Emilia-Romagna at 1,97€/Kg.

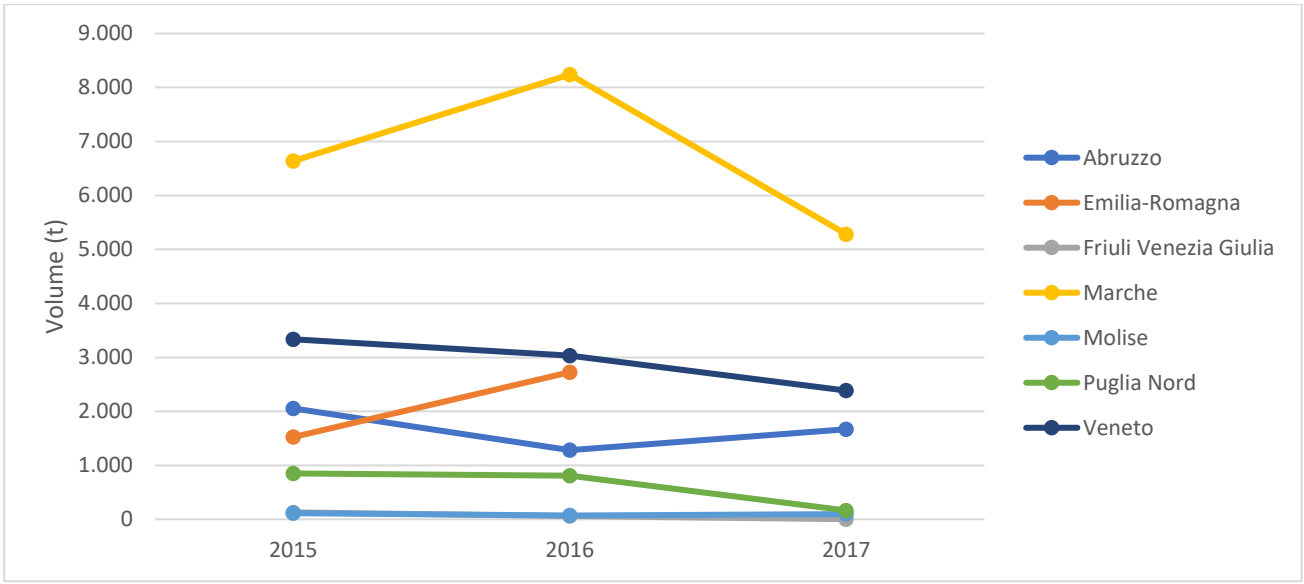


Figure 313: Volume by region – DRB

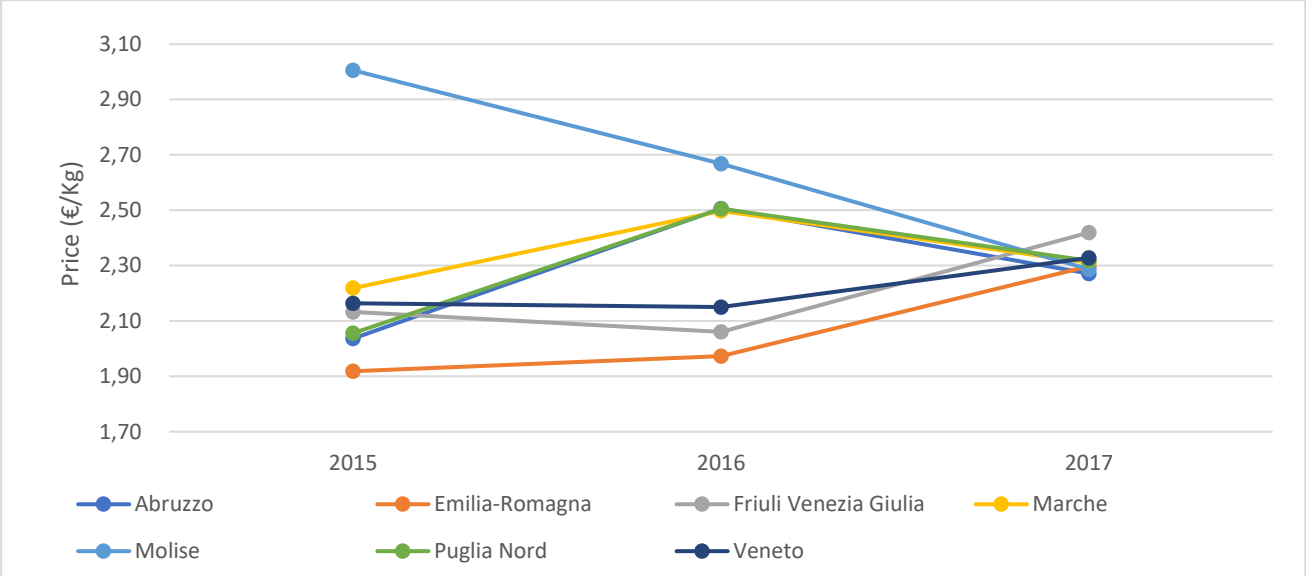


Figure 314: Price by region – DRB

- DTS is reported only for 2017. Marche produced in this way 1,56t at 1,99€/Kg, Abruzzo 1,1t at 2,27€/kg and Molise 1,4t at 2,13€/kg.

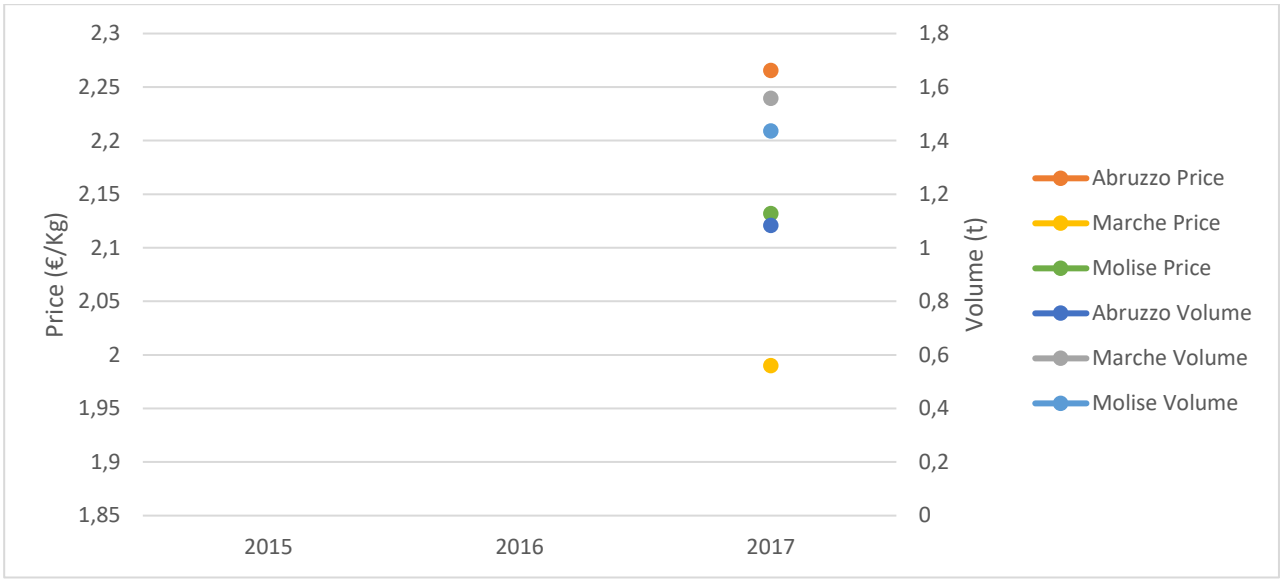


Figure 315: Price and Volume by region - DTS

- Only Emilia-Romagna practiced Clam fishing by PGP<12. During 2017 Emilia-Romagna fished 2,2t at 2,11€/kg.

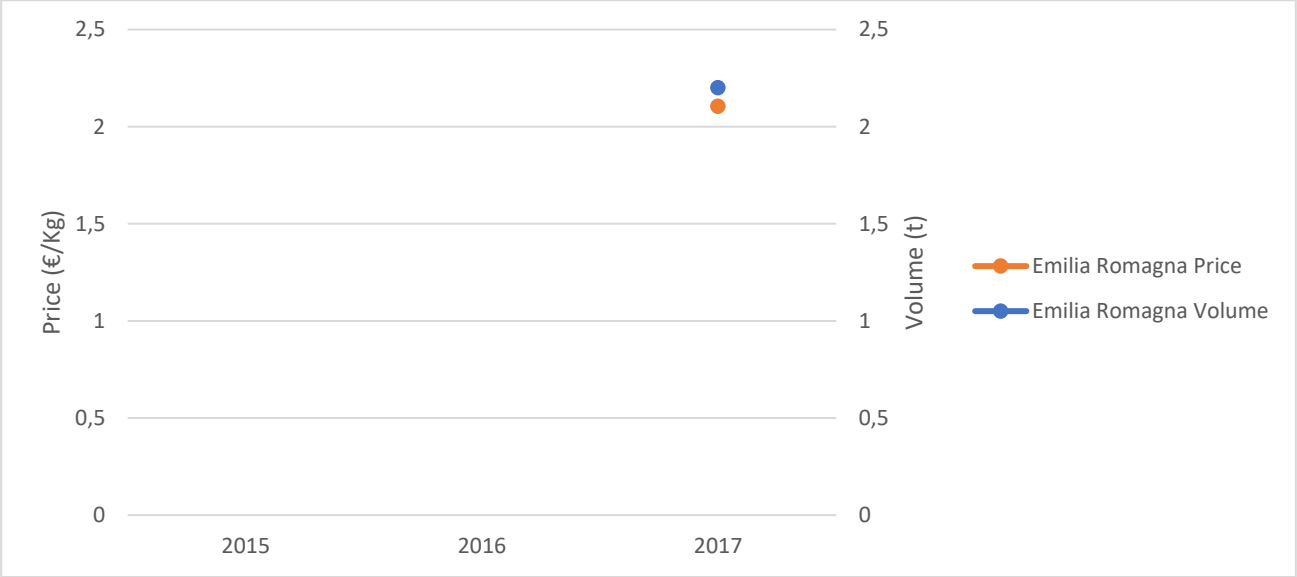


Figure 316: Price and Volume by region - PGP<12

4.11 MANTIS SHRIMP

By regional point of view

Speaking about volumes, Emilia-Romagna is the most contributing region to Mantis Shrimp landings. Its production is following a descendant trend, started in 2015 at 1.913t and continued until 2017 (1.586t).

Puglia Nord is also decreasing its effort: if on 2015 1.011t were fished, this value went down to 600t in 2017. Marche too suffered a negative trend, but in a more moderate inclination (from 803t to 644t, but in the last year only lost 8t).

Veneto is increasing its role, with three developing years in a row. If in 2015 293t of Mantis Shrimp were fished in Puglia Nord, on 2017 582t were.

Abruzzo presented a growing 2016 (passing from 207t to 280t) but then moved down to 154t. Molise followed the same pattern in a smaller scale, as it passed in 2016 from 86t to 105t before moving back to 100t.

Following a descending trend, on 2017 Puglia Nord and Veneto were the cheapest regions with 3,9€/Kg and 6,11€/Kg (starting on 2015 at 5,28€/Kg and 7,81€/Kg).

In the upper part of the chart do lay Emilia-Romagna (6,27€/Kg on 2017), Marche (7,74€/Kg), Abruzzo (8,51€/Kg) and Molise (8,68€/Kg).

Table 70: Average Price and total Volume fished by region, including all techniques – PNRDA

	Volume (t)			Price (€/kg)		
	2015	2016	2017	2015	2016	2017
∑ Abruzzo	207	280	154	6,16	6,58	8,51
∑ E.Romagna	1.913	1.760	1.586	6,13	5,99	6,27

∑ Friuli Venezia Giulia	96,06	94,7	53,7	7,25	7,15	8,06
∑ Marche	803	652	644	5,07	7,09	7,74
∑ Molise	86,2	105	99,9	7,20	7,40	8,68
∑ Puglia Nord	1.011	929	600	5,28	4,73	3,90
∑ Veneto	293	512	582	7,81	7,50	6,11

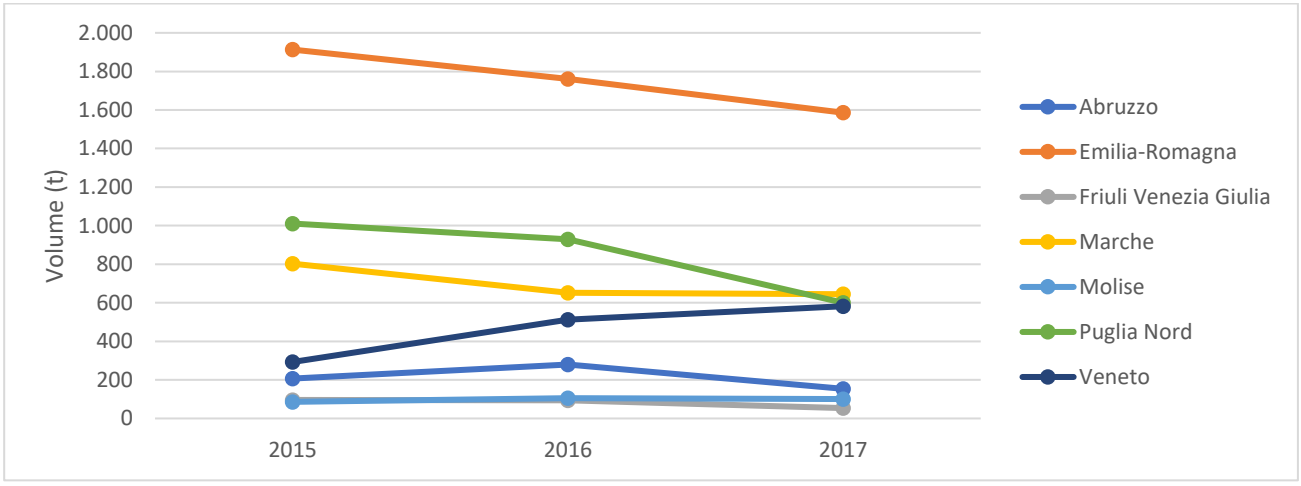


Figure 317: Volume by region - PNRDA

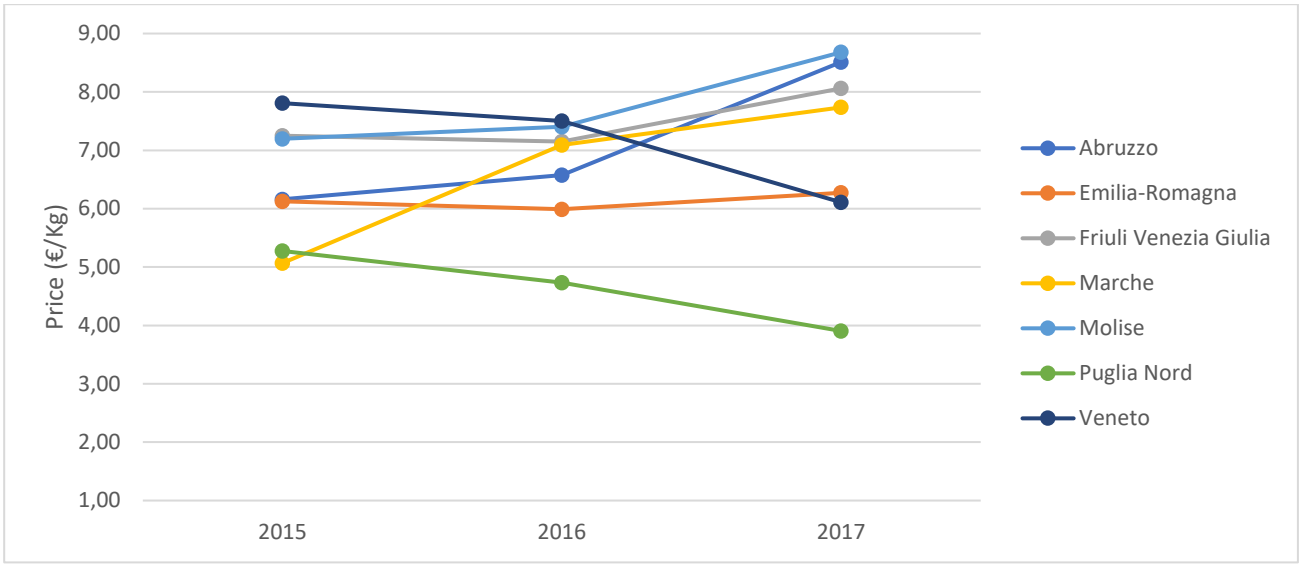


Figure 318: Price by region – PNRDA

- In Abruzzo a small component of PGP<12 fishing is present in 2015 (28,1t) and 2016 (35,6t), but the great part of the landings is collected by DTS (179t in 2015, 244t in 2016 and 114,8t in 2017). DRB is reported with maximum 40Kg/year.

  About prices, PGP<12 has been greatly more expensive than DTS, but in 2017 they came close at 8,64€/Kg and 8,47€/Kg. On 2016 they presented a price gap of 7,65€/Kg, 6,56€/Kg on 2015.

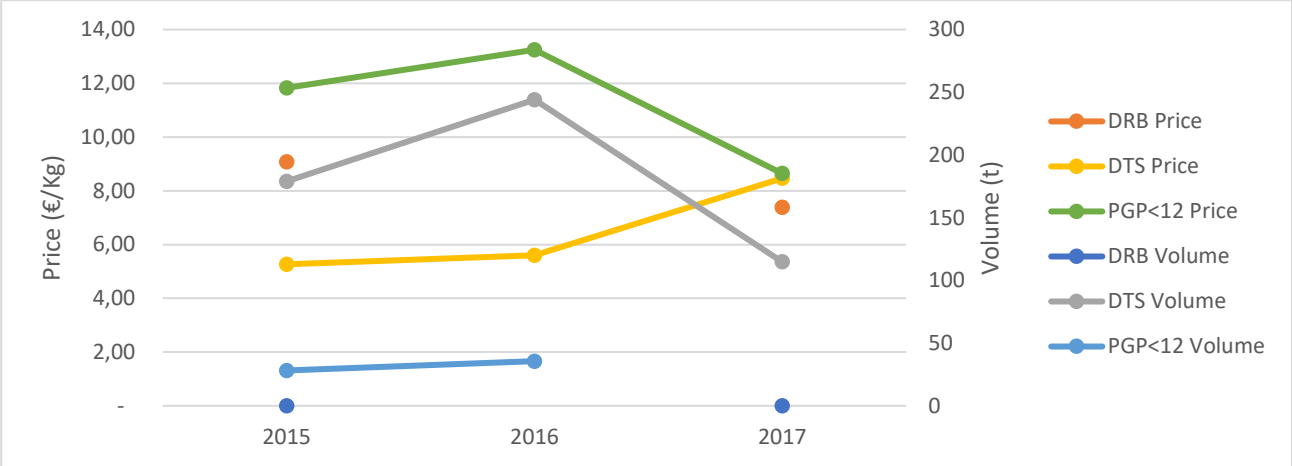


Figure 319: Price and Volume by techniques – Abruzzo – PNRDA

- Emilia-Romagna is specialized in DTS fishing, which, even if in descending trend, still conserved on 2017 85% of dominance with 1.360t. Highest reported value is 1.644t on 2015.

Among other techniques 110t were collected on 2017 by PGP<12, 60t by TBB, 41t by PGP>12 lft and 13t by TM.

Price of DTS Mantis Shrimp stayed quite stable on the considered period, firstly passing from 5,93€/Kg to 5,72€/Kg and then at 6,11€/Kg. PGP<12 is the most expensive with a 2017 average of 9,49€/Kg and TBB the cheapest at 4,57€/Kg (as it used to be in previous years).

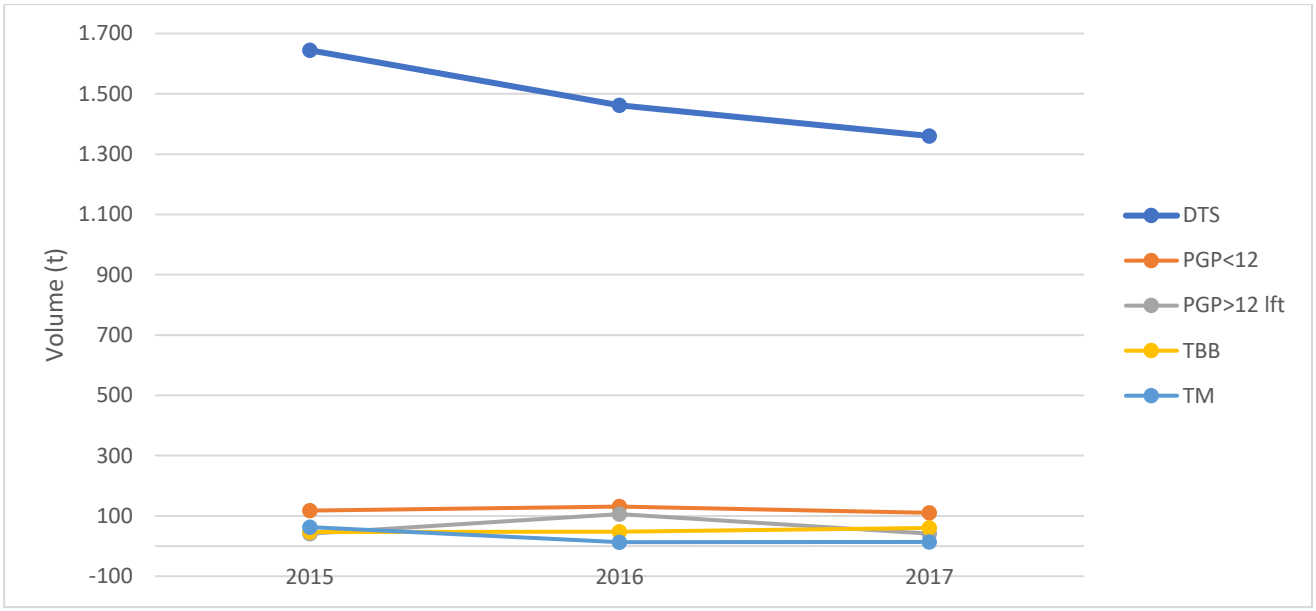


Figure 320: Volume by techniques – Emilia-Romagna – PNRDA

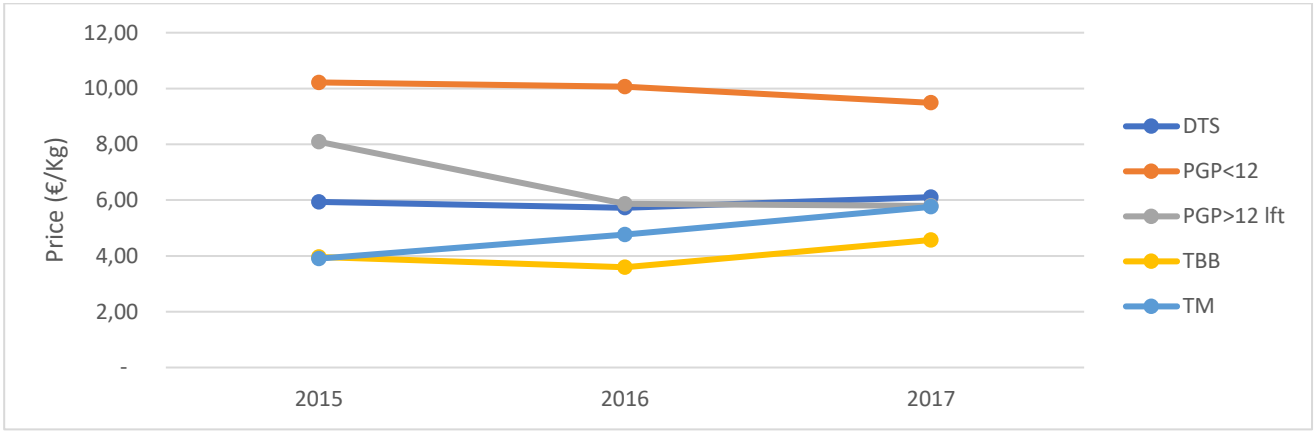


Figure 321: Price by techniques – Emilia-Romagna – PNRDA

- Even in Friuli Venezia Giulia DTS is the most productive technique. It granted 50t in 2015, 56t in 2016 and 44t in 2017.
  PGP<12 was the second most contributive technique in 2015 (23,5t) and 2016 (19,4t) but in 2017 has been passed out by TBB (5t, against 3,9t of PGP<12).
  TM has been almost not used in 2017, as it passed to 12Kg from the 8,4t of the previous year, probably due to the huge price increase of 2017 (10,38€/Kg, +3,85€/Kg on 2016).
  PGP<12's price is on a growing trend. It was at 7,11€/Kg in 2015, 7,54€/Kg on 2016 and went up to 8,38€/kg on 2017. DTS became cheaper than PGP<12 in 2016 (when hit 7,10€/kg), in the 2017 it rose to 8,02€/kg.
  TBB's price is moving accordingly to DTS, and progressively reducing the gap.

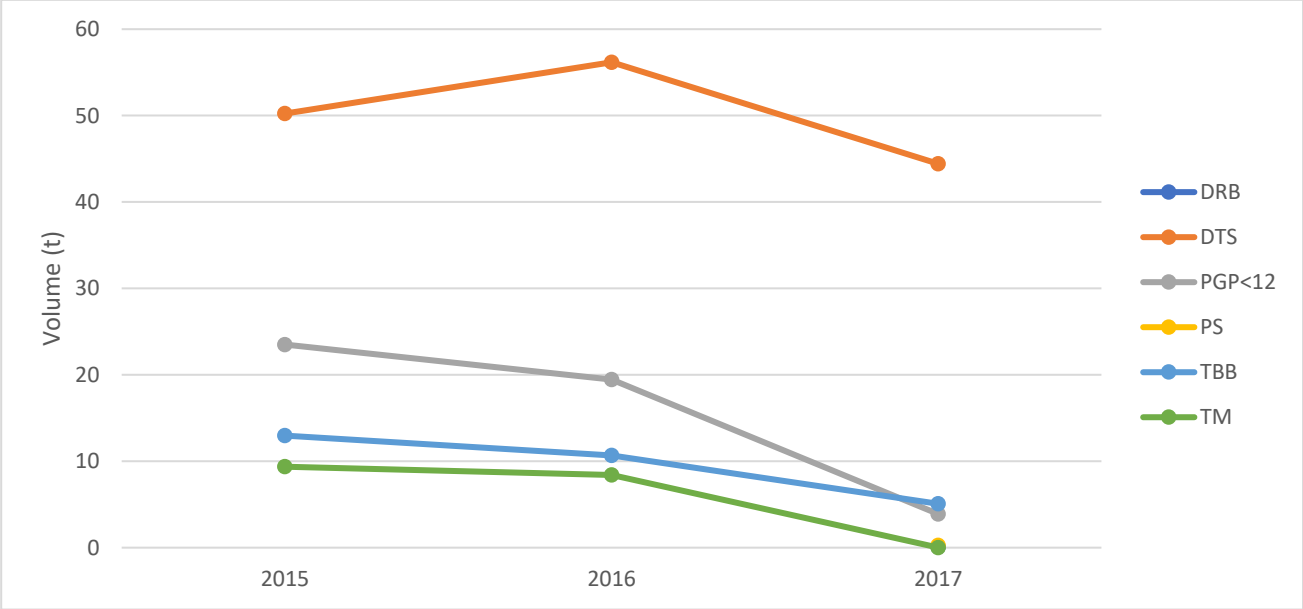


Figure 322: Volume by techniques – Friuli Venezia Giulia – PNRDA

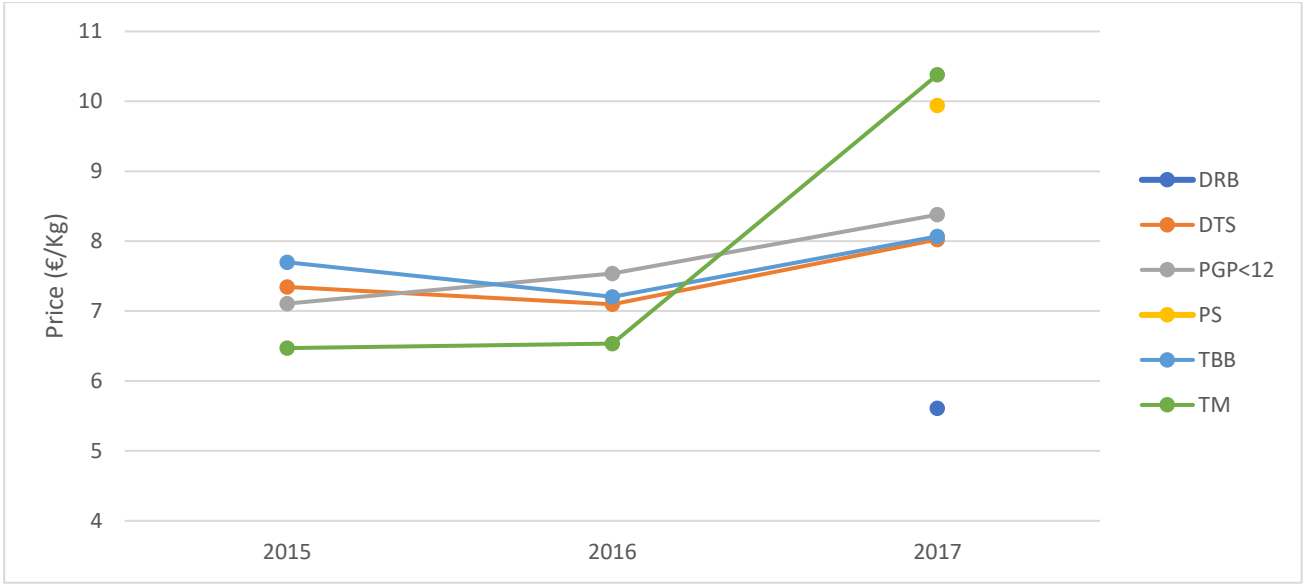


Figure 323: Price by techniques – Friuli Venezia Giulia – PNRDA

- Marche present three relevant fishing techniques.
  DTS is the most important in the whole period, with 498t in 2015, 423t in 2016 and 454t in 2017.
  PGP<12 has a slope trend that started in 2015 at 183,4t and in 2017 came to 136t.

Even TBB as a negative trend, but in a more inclined manner. It passed from the 110,8t of 2015 to the 44t of 2017.
All prices follow an increasing tendency. PGP<12 has always been the most priced (minimum gap of 2,05€/Kg in 2016) and reached 9,68€/Kg during 2017.

Price of DTS and TBB stay quite close for all the three years. During 2017 DTS had an average price of 7,26€/Kg and PGP<12 of 6,90€/kg.

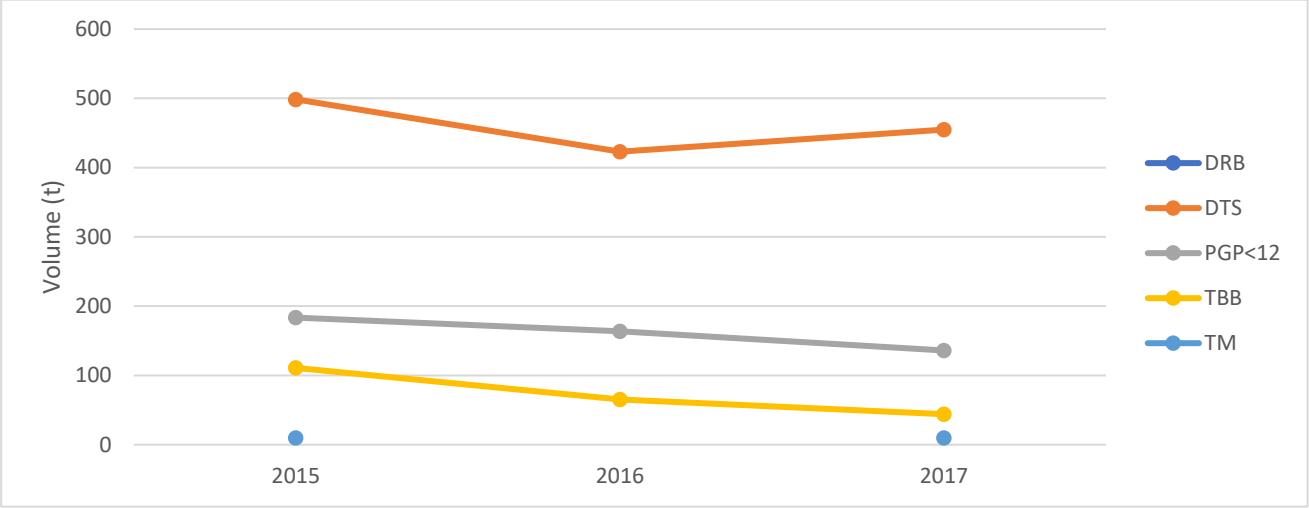


Figure 324:Volume by techniques – Marche – PNRDA

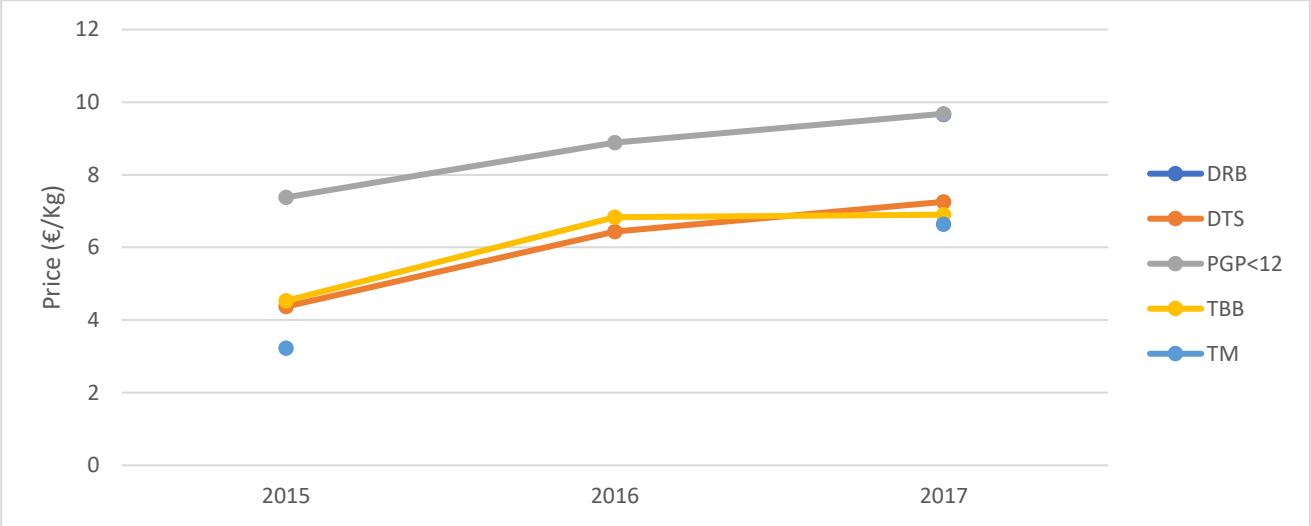


Figure 325: Price by techniques – Marche – PNRDA

- Molise's DTS fishing sector had an increase in 2016 passing from 80,5t to 99,7t, in the following year retraced to 91,2t. Price has been similar for 2015 (7,25€/kg) and 2016 (7,39€/Kg), while in 2017 moved up to 8,52€/Kg.
  PGP<12 is both on a progressive trend for volume and price. Volumes were 5,6t on 2015, 5,5t on 2016 and 8,7t on 2017. Its price went from the 6,5€/Kg on 2015 to the 7,66€/Kg of 2016 and the 10,35€/Kg of 2017.

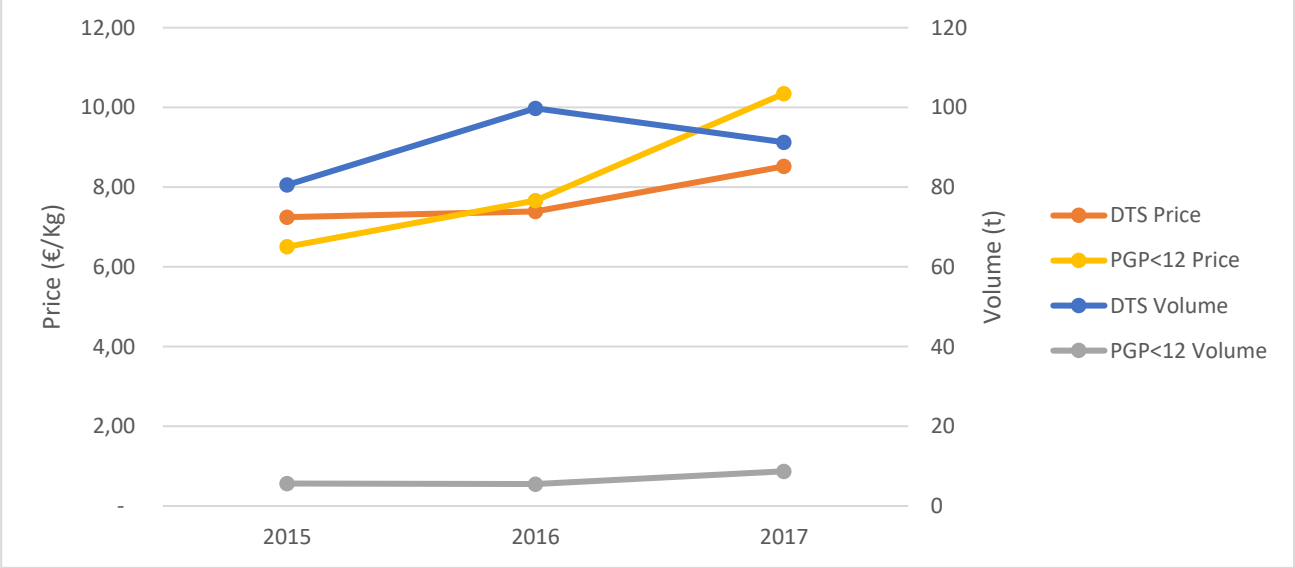


Figure 326: Price and Volume by techniques – Molise – PNRDA

- Puglia Nord has been the most contributing region for Mantis Shrimp fishing during 2015 and 2016. It's DTS based, with an increasing role of PGP<12.

DTS was the technique granting 993t on 2015, but on 2016 decreased to 876,4t and on 2017 523,7t. DTS is the cheapest (not considering HOK due to the not consistent volume) on the three years, costing 5,19€/Kg in 2015, 4,59€/kg in 2016 and 3,48€/kg in 2017. PGP<12 started from 17,3t in 2015 and arrived to produce 75,4t on 2017. Its price is decreasing as volumes are going upward. On 2017 1Kg of Mantis Shrimp fished by PGP<12 costed 6,83€.

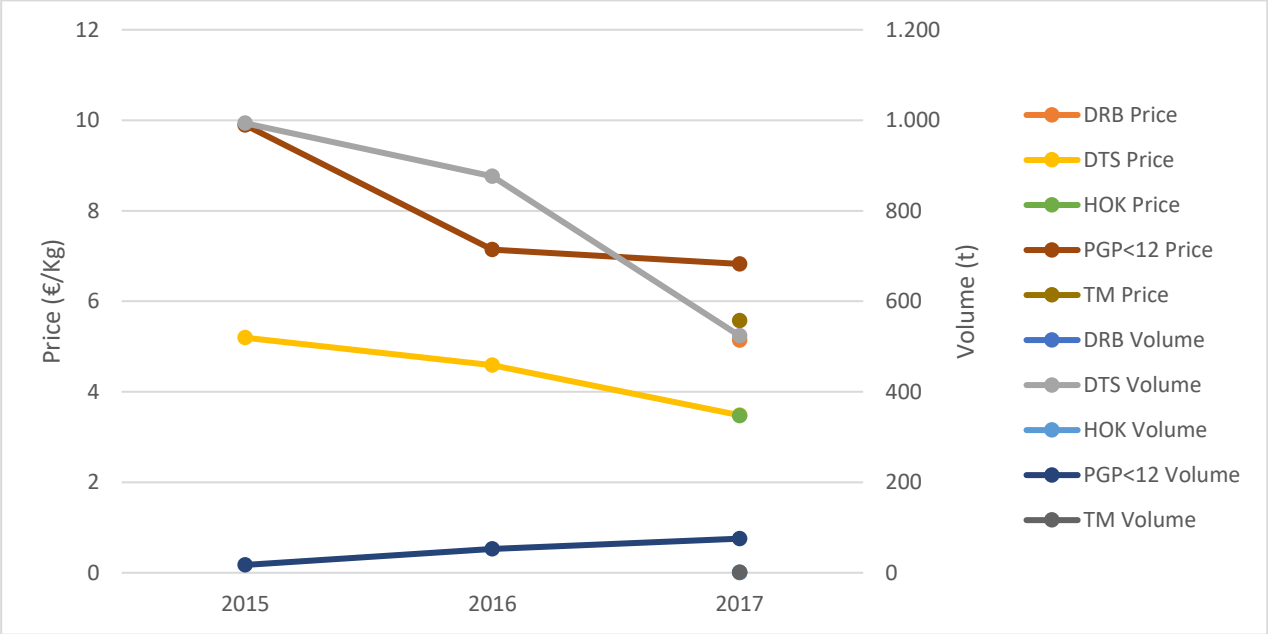


Figure 327: Price and Volume by techniques – Puglia Nord – PNRDA

- Veneto presented a developing MTS sector.
  DTS progressively increased its relevance, as from the 150t of 2015 got to the 378t of the 2017.
  Other techniques are here more important than in other regions. PGP<12 collected 84,7t in 2015, 181t in 2016 and 127,6t in 2017, while with TBB 57,2t in 2015, 49,4t in 2016 and 50,5t in 2017 were fished.
  Even TM is on positive trend, growing from 1,1t in 2015 to 15,4t in 2017.

  Speaking about prices PGP<12 has been relevantly more expensive than the others in 2015 and 2016, but in 2017 reduced its gap to +0,43€/Kg. DTS passed from the 7,23€/Kg of the 2015 to the 6,51€/Kg of 2016 and 6,17€/Kg of 2017.
  Both prices by TBB and TM are in a descendent trend. On 2017 Mantis Shrimp by TBB costed 4,93€/kg while by TM 3,44€/Kg.

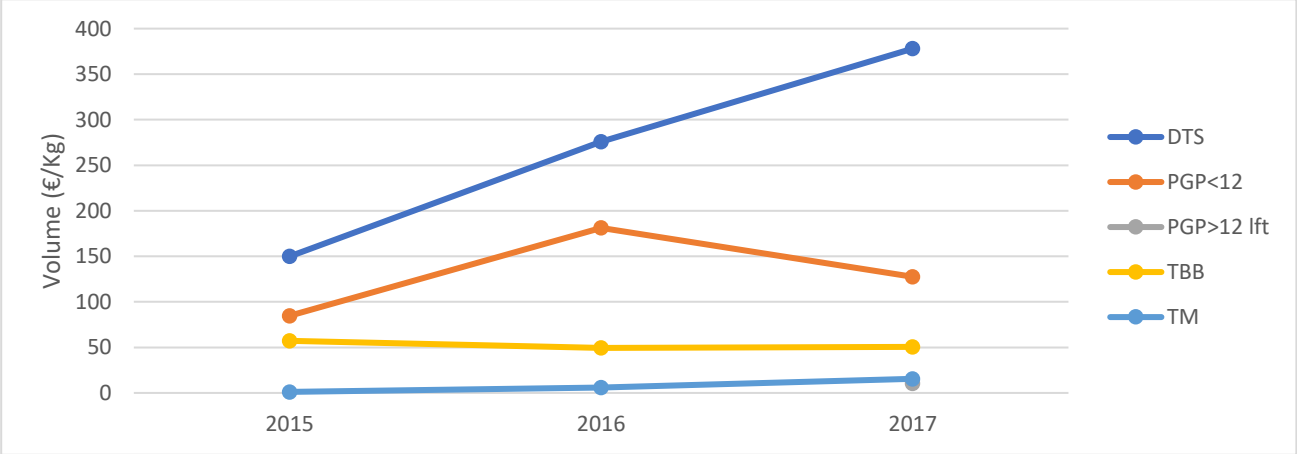


Figure 328: Volume by techniques – Veneto – PNRDA

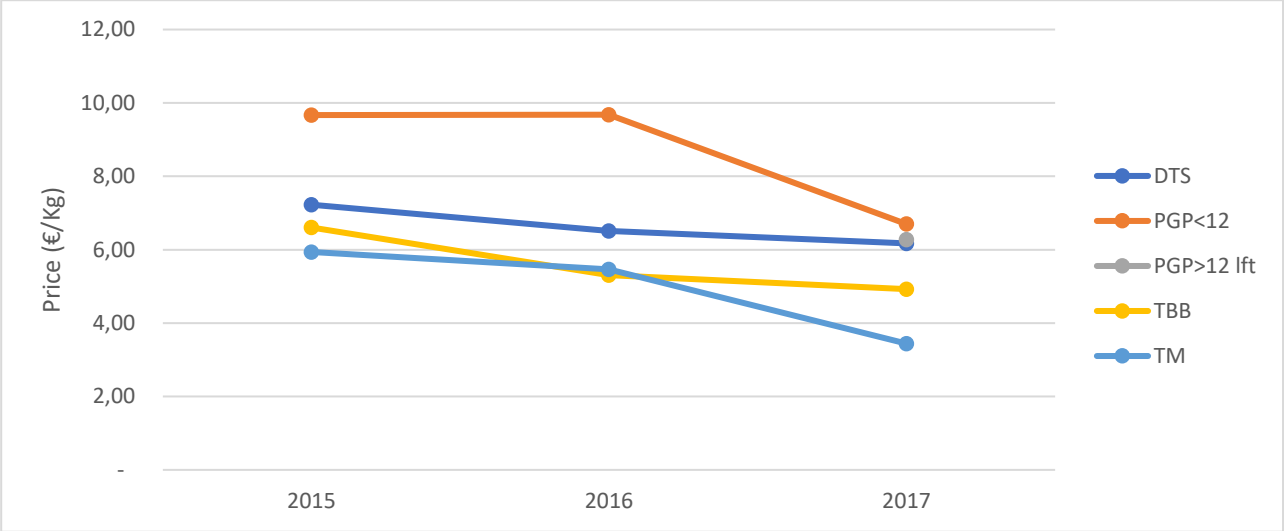


Figure 329: Price by techniques – Veneto – PNRDA

By fishing techniques point of view

Mantis Shrimp is mostly captured by DTS. Even if in descending trend it provided 2.967t during 2017, far above the 501t of PGP<12, the 178t of DRB or the 160t of TBB.

TBB and TM prices are always below the DTS price. DTS started in 2015 at 5,58€/Kg, moved to 5,64€/Kg and then to 6,02€/kg. PGP<12 is way more expensive, costing 8,87€/kg in 2015, 9,44€/kg in 2016 and 8,37€/kg in 2017.

Table 71: Average Price and total Volume fished by technique, including all regions - PNRDA

	Volume (t)			Price (€/kg)		
	2015	2016	2017	2015	2016	2017

∑ DRB	0,03		0,18	9,08		6,71
∑ DTS	3.596	3.437	2.967	5,58	5,65	6,02
∑ PGP<12	460	589	501	8,87	9,44	8,37
∑ PGP>12 lft	41,2	106	52	8,09	5,87	5,89
∑ PS			0,26			9,94
∑ TBB	228	173	160	5,12	5,52	5,44
∑ TM	83,5	27,33	39,4	4,14	5,46	5,06
∑ HOK			0,15			3,47

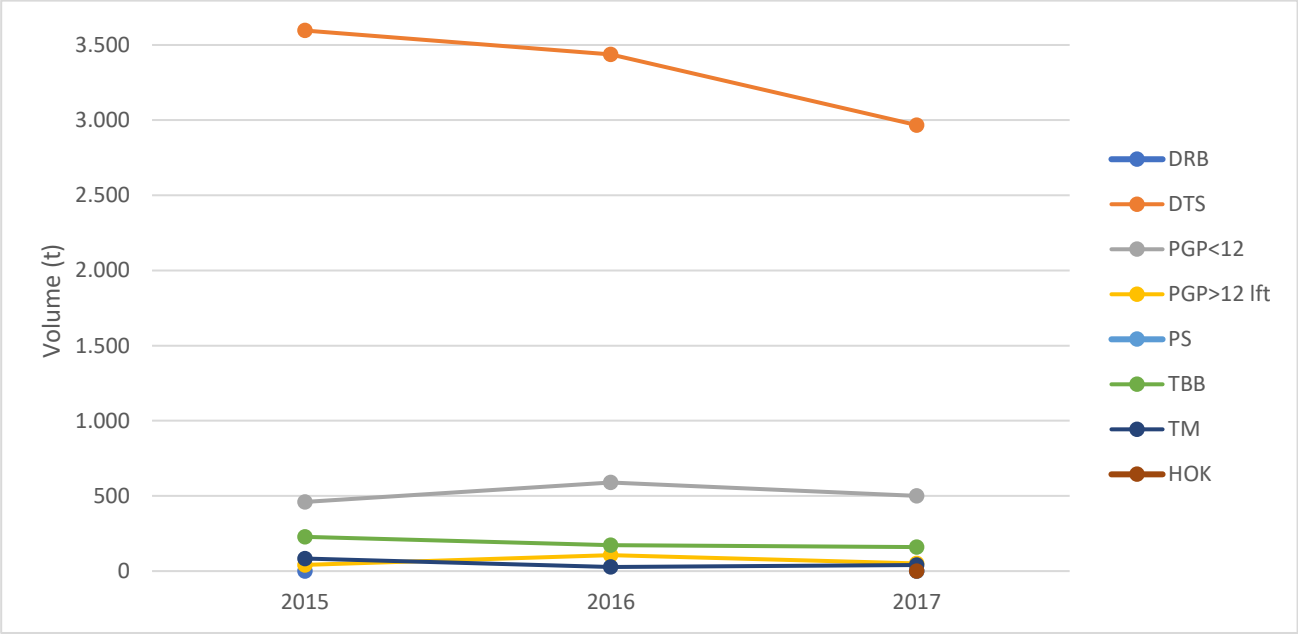


Figure 330: Mantis Shrimp Volume by technique - PNRDA

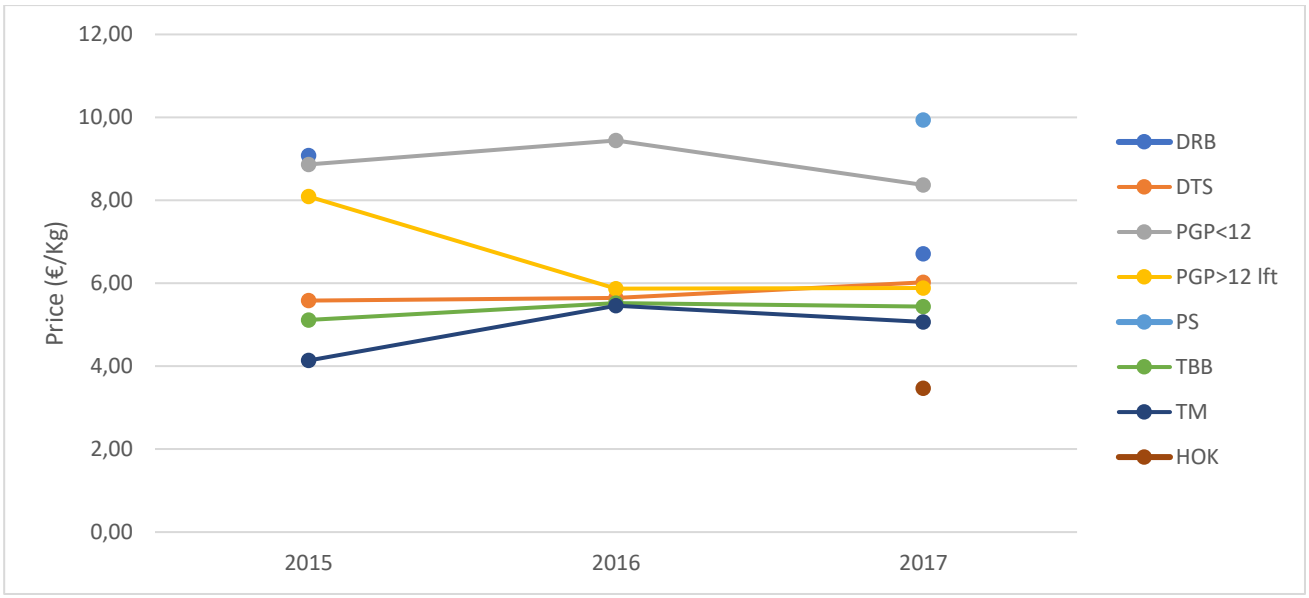


Figure 331: Mantis Shrimp average price by technique – PNRDA

- Data for DRB are discontinuous and show a commercially meaningless sector.
  Friuli Venezia Giulia produced the highest quantity in 2017 (72,5t at 5,61€/Kg).
  Abruzzo increased volume from 30Kg to 40Kg, while price decreased from 9,08€/Kg to 7,38€/Kg.
  Marche and Puglia Nord collected less than 35Kg each.

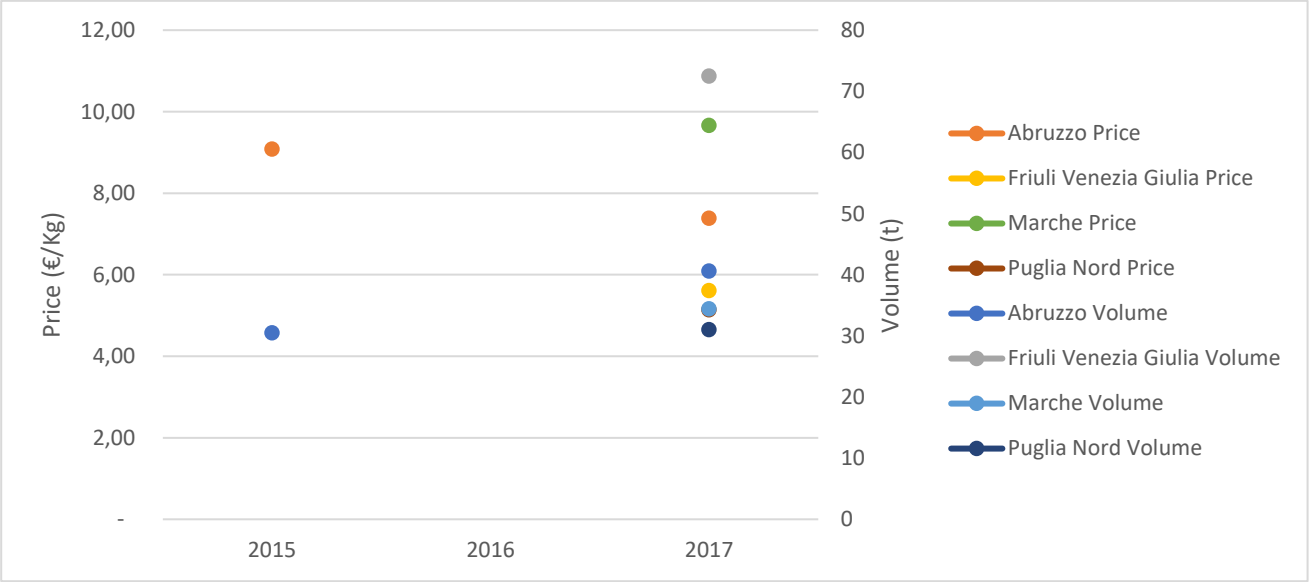


Figure 332: Price and Volume by region - DRB

- DTS is the most important technique. Emilia-Romagna is where it granted the most quantity (1.644t in 2015, 1.462t in 2016 and 1.360t in 2017). Puglia Nord is following a decreasing trend, passing from 876t to 524t during 2017. Marche recovered the negative 2016, closing 2017 with 455t.

Veneto's volume rose quite linearly from 150t in 2015 to 378t in 2017. Abruzzo during 2017 decreased its quantity, fishing 115t (244t on 2016).

Puglia and Veneto are the regions where price lowered between 2015 and 2017. On the last available year Mantis Shrimp costed 3,48€/kg in Puglia Nord and 6,17€/kg in Veneto. All other prices rose: during 2017 Emilia-Romagna costed 6,11€/Kg (5,93€/Kg on 2015), Marche 7,26€/Kg (from 4,37€/kg in 2015).
Abruzzo and Molise presented close both volume and prices, with only a 0,05€/Kg gap.

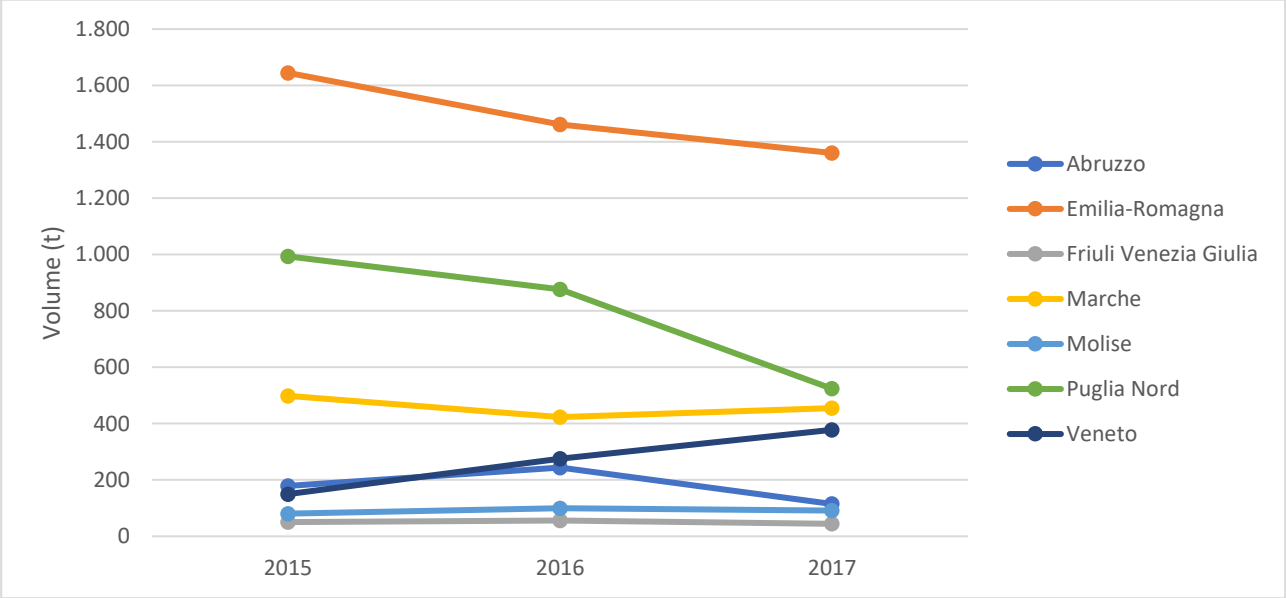


Figure 333: Volume by region - DTS

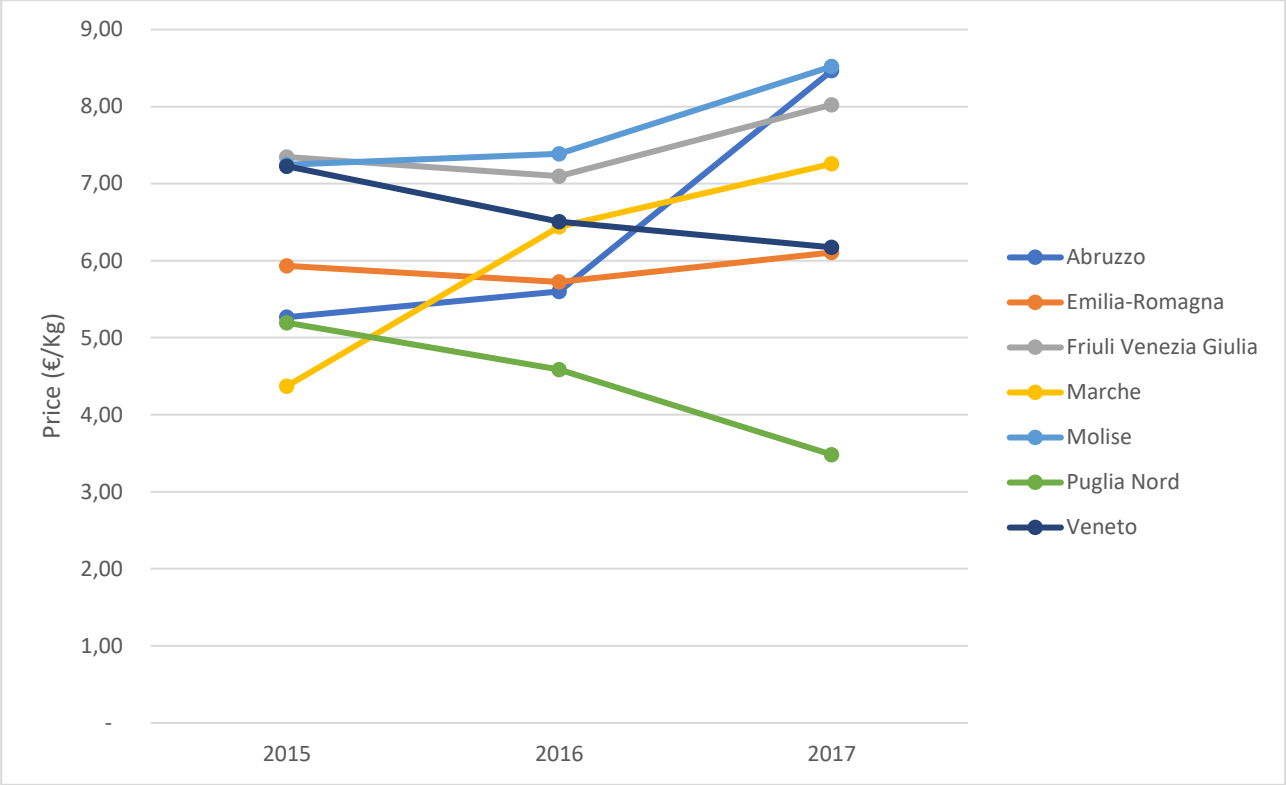


Figure 334: Price by region - DTS

- The most particular move for PGP<12 is the one from Abruzzo. It passed from 28,1t in 2015 to 333,6t in 2016 before retracing to 35,6t in 2017.
  On the last available year Marche produced 127,6t (on negative trend), Veneto 127,6t, Emilia-Romagna 110,4t, Puglia Nord (on strong positive trend) 75,4t and Molise 8,7t.

  Abruzzo had a price increase on the peak year, at 13,25€/Kg, before going down to 8,64€/Kg. The most expensive during 2017 has been Molise (10,35€/Kg), followed by

Marche (9,68€/Kg), Emilia-Romagna (9,49€/Kg), Friuli Venezia Giulia (8,38€/Kg), Puglia Nord (6,83€/Kg) and Veneto (6,70€/Kg)

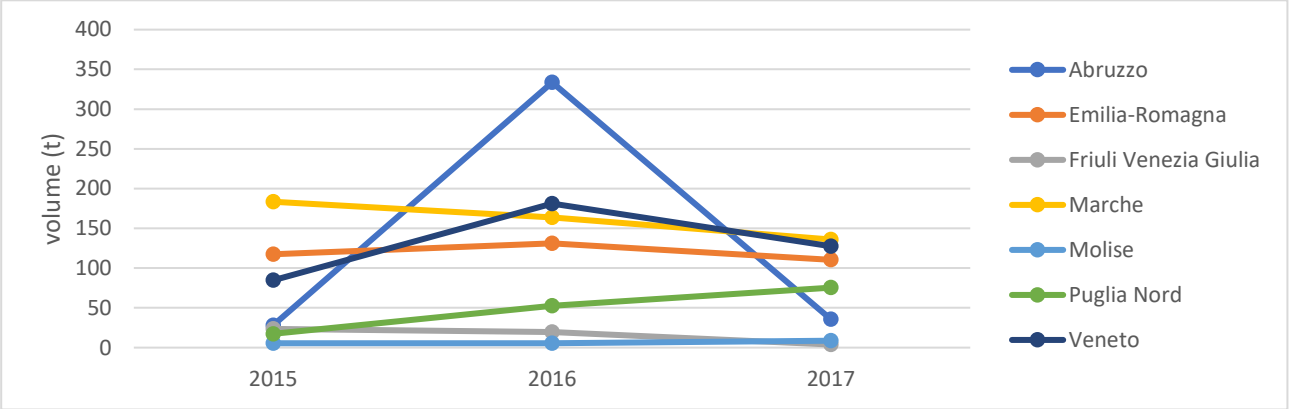


Figure 335: Volume by region - PGP<12

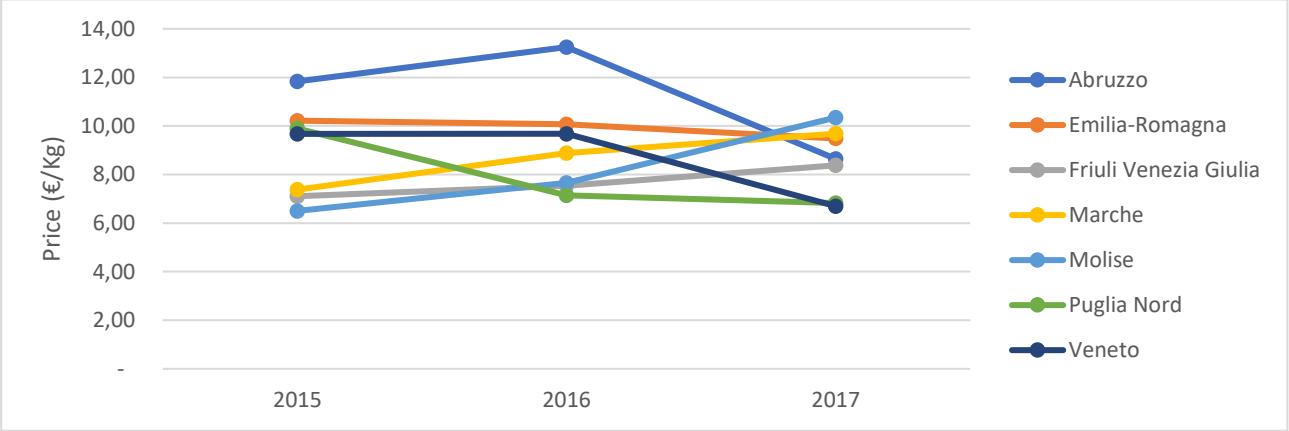


Figure 336: Price by region - PGP<12

- PGP>12 lft is reported in Emilia-Romagna and Veneto.

Data for Veneto are available only for 2017, when it produced 10,3t at 6,27€/Kg. Emilia Romagna had interesting volumes in 2016, with 106t, but data for 2015 and 2017 are way lower, at 41,2t and 41,6t. Its price decreased from the 8,09€/Kg of 2015 to the 5,87€/Kg of the 2016 and the 5,79€/Kg of 2017.

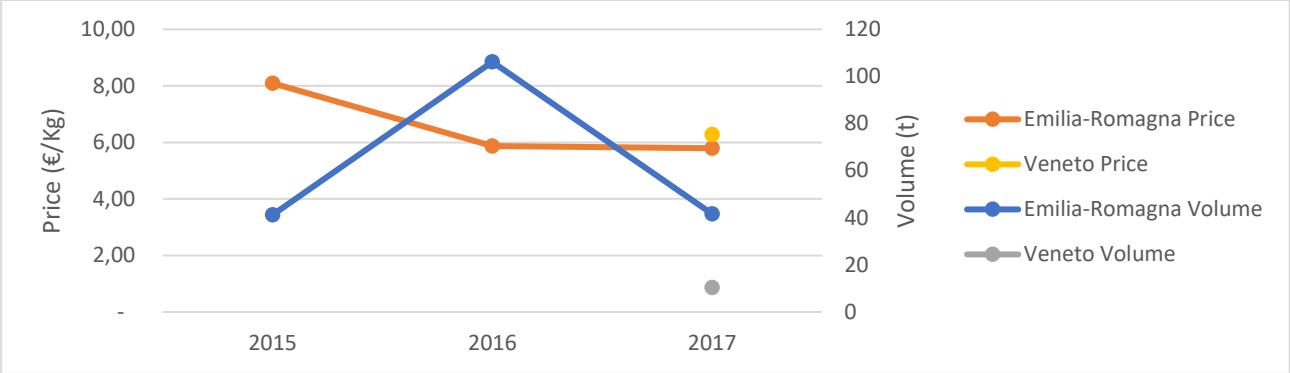


Figure 337: Price and Volume by region - PGP>12 lft

- PS is a secondary fishing technique for Mantis Shrimp. In Friuli Venezia Giulia with this method 0,26t were fished and sold at 9,94€/Kg.

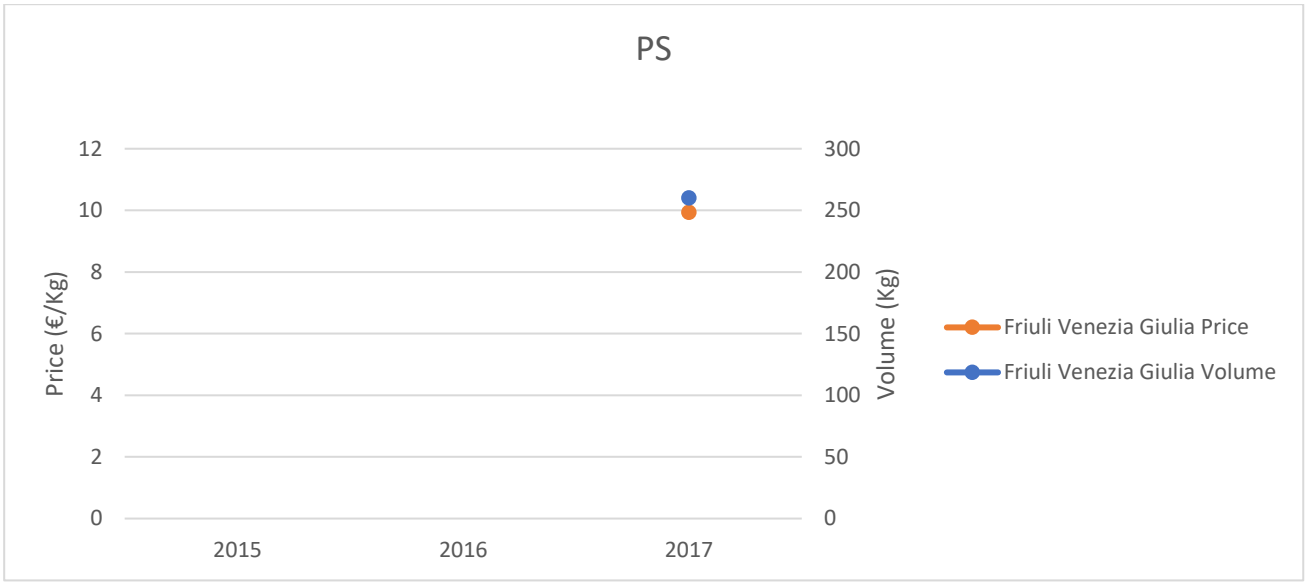


Figure 338: Price and Volume by region - PS

- TBB fishing had a lost Marche predominance. In fact, Marche provided 110,8t in 2015 and 65t in 2016, but in 2017 has been overwhelmed by Emilia-Romagna (60,2t, positive trend) and Veneto (50,5t).
  Friuli Venezia Giulia granted 12,9t in 2015, 10,6t in 2016 and 5t in 2017. It's also the most expensive region in the whole period, costing 8,07€/Kg in 2017 (7,70€/Kg in 2015).
  Price of Marche's Mantis Shrimp by TBB had an increase in 2016, passing from 4,53€/Kg to 6,83€/kg and then 6,90€/Kg in 2017.
  Price in Veneto constantly declined, costing 4,93€/Kg. Quotations for Emilia-Romagna in 2017 were at 4,57€/Kg, (slight increase on the previous years).

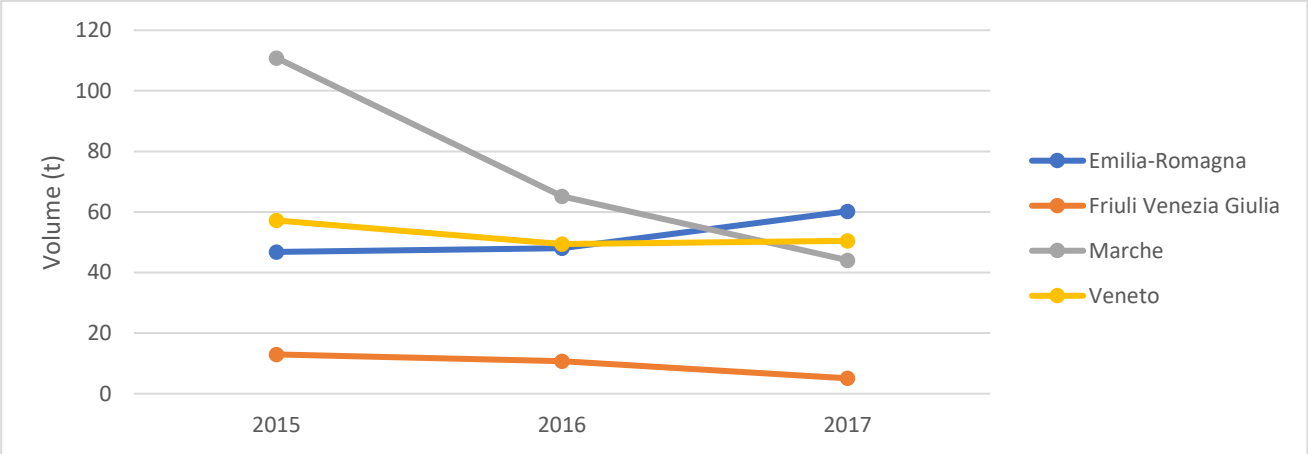


Figure 339: Volume by region - TBB

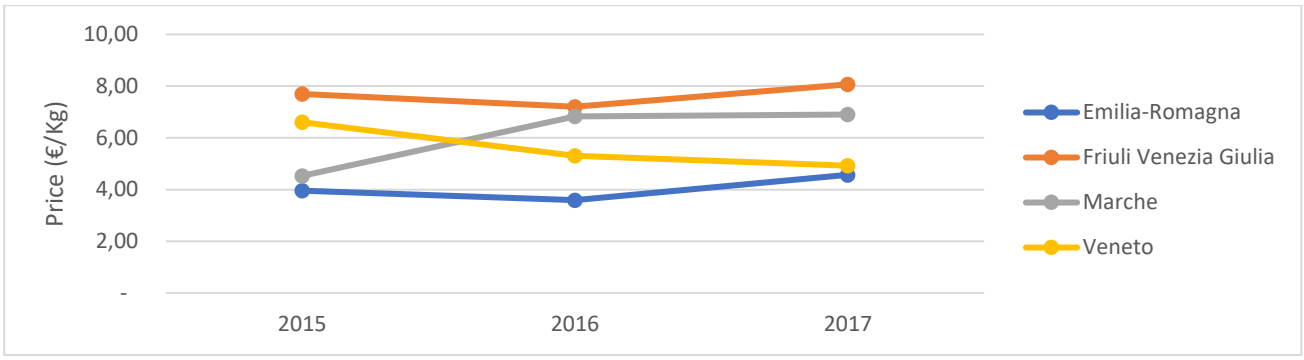


Figure 340: Price by region - TBB

- TM is also a secondary fishing technique for MTS. Emilia-Romagna produced 63t in 2015, but in 2016 this value decreased to 13t and 13,4t on 2017.
  Veneto is on progressive increase (1,1t in 2015, 5,8t in 2016 and 15,5t in 2017).
  Friuli Venezia Giulia was the second region by volume in 2015 and 2016 (at 9,9t and 8,4t), while in 2017 only 0,26t. The latter performance may be related with the increase in price (10,38€/kg in 2017).
  Emilia-Romagna's price is increasing, starting from 3,90€/Kg in 2015 until 5,76€/Kg in 2017.
  Veneto's decreasing, hitting 3,44€/Kg in 2017 from the 5,94€/Kg of the 2015.

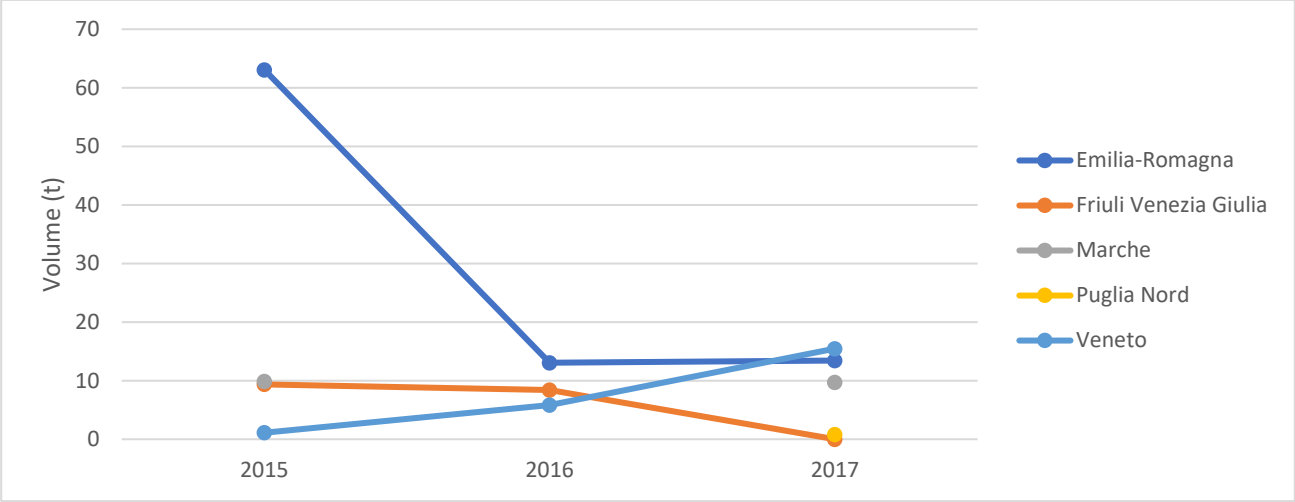


Figure 341: Volume by region - TM

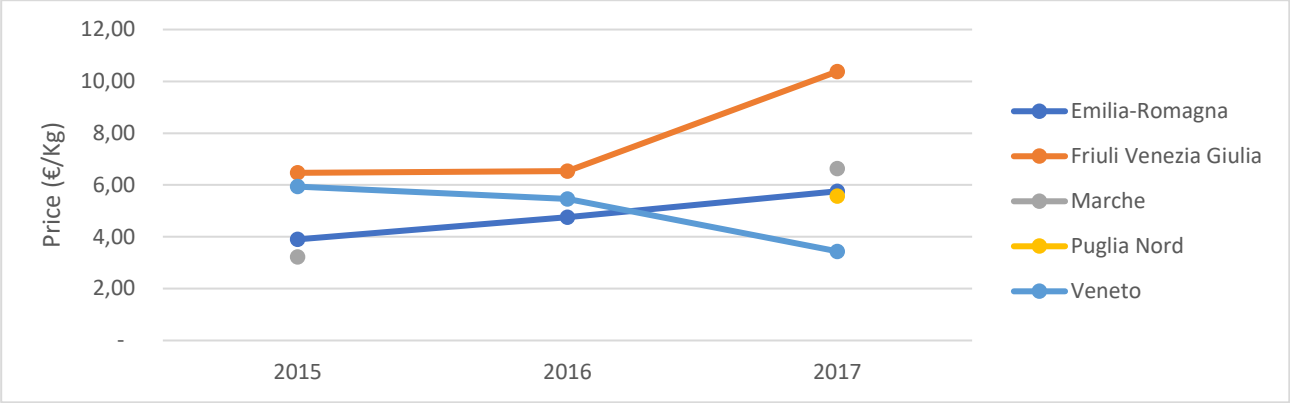


Figure 342: Price by region - TM

- HOK is only reportedly used in Puglia Nord. On 2017 0,15t were fished and sold at 3,47€/Kg.

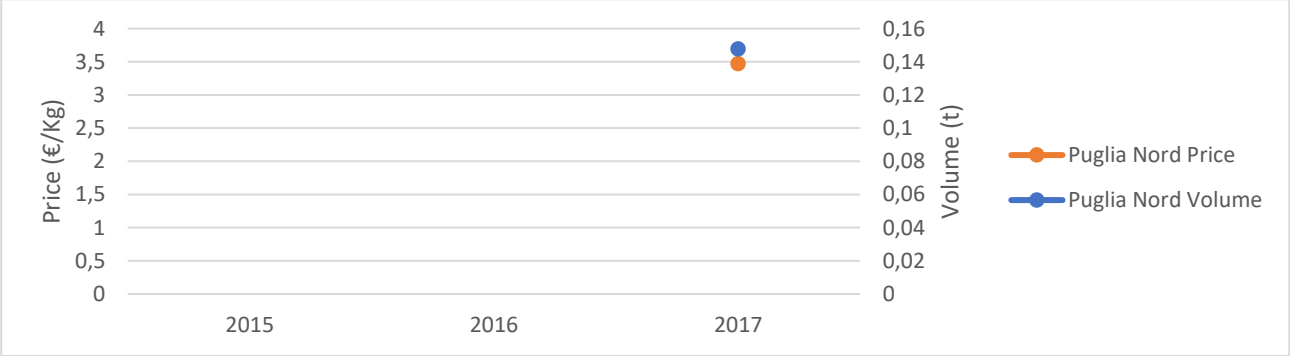


Figure 343: Price and Volume by region - HOK

5. FOCUS ON ITALIAN SUPPLY CHAIN RELATIONS[6]

5.1 INTRODUCTION

The Adriatic Sea counts with a high number of ports and coastal points of sale, which, at least in Italy, corresponds to a high number of institutional/official market sites. This means that along the Italian coast, it is possible to collect sale prices from a high number of points. However, not all the fish landed in this high number of ports is sold through institutional markets (which generally adopt auction systems). Depending both on region and on species, the share of fish that is sold through ex-vessel markets or directly exchanged between fishers and buyers can change a lot. For example, previous researches have showed that, in the case of small pelagics, only in the five markets of the Emilia Romagna region, the share of fish sold through markets can range from 0 to 100%.

In general, massive species, that is species that are sold, as other commodities, in large quantities and low prices, and which present low possibility of diversification or regional characterization, because they are sold in a high number of Adriatic regions and, with few differences, even in other European countries, are more commonly sold directly, from fishers (or fishers organizations in a few cases) to specialized wholesalers. This is especially the case of small pelagics (anchovies and sardines) and clams. In this case, the larger wholesalers can be present in more than a selling point and can have established relationships with several producers (fishers or organizations). These products have traditionally had a relevance for export too.

[6] Information used for this chapter has been collected from existing documentation and interviews with key stakeholders. For the small pelagic sector, the following stakeholders, all active in the Emilia Romagna Region, have been interviewed: two Producers' Organizations, two fishmongers, two managers of supermarkets, one wholesaler. For the clam sector: two Producers' Organization (one from Veneto and one from Marche region), two wholesalers and one processor (all from Marche region).

On the contrary, the market of demersal species, which are normally caught by demersal trawlers and small-scale fisheries, is characterized by different elements. These species are normally sold in relatively small quantities and have average prices higher that small pelagics and clams. Furthermore, they are often characterized by stronger regional and seasonal patterns. Species that are common in the South of the Adriatic are not available on the North and vice versa. Small quantities and regional distribution have fostered smaller trade circuits and less specialized wholesalers actors. At the same time, these species are more common to be sold through auctions.

If demersal species can be found in the supermarkets of coastal towns, it is less common to find them in largest inshore cities, where, due to the need to have constant availability of fish (at low price), imported products are often preferred. On the other hand, massive Adriatic products such as clams, anchovies and sardines are normally found even in inshore supermarkets.

5.2 SMALL PELAGICS

The main small pelagic species caught in the Adriatic Sea are anchovy and sardine.

The market of small pelagics, and in particular anchovies, was very good until 2006-2010, when a lot fresh anchovies were regularly exported to Spain. In that period, Spanish production was very low. Firstly, Cantabrian anchovy stocks collapsed; later, the Cantabrian anchovy fishery was closed, both in Spain and in France, in order to recover the stocks. This lack of competition increased the demand of anchovy from the Adriatic; catches increased and the stock was probably overexploited.

After the 2010, the anchovy fishery in the Cantabrian Sea restarted, both in Spain and in France. Needs of anchovies from Italy (and Croatia) quickly decreased. Cantabrian anchovy also acquired

an iconic status of sustainable and quality product, recognized with the MSC certification. Purchases from Spanish large retailers (in particular Mercadona), which were at the base of Italian export, stopped.

This caused a crisis for both fishers and wholesalers. Pelagic trawling vessels changed activity, producers organizations lost vessels, power and cohesion. Several wholesalers also went bankrupt.

Nowadays, few small pelagic trawlers remain compared to the state at the beginning of the century. Fishers also have few wholesalers, with whom they have established relationships. Large wholesalers represent the key stage for the connection between fisher and large retailers. It is normally large retailers that establish the price in both directions (to fishers and to retailers), which is highly integrated at Italian level.

Attempts to establish catch quotas have occasionally had success in some ports (e.g. Ancona, Pila), but initiatives to extend this practice at sea basin level have been repeatedly hindered, and now it seems that the sector has lost the capability to find shared management decisions.

Processed small pelagics

Italy is the second-largest EU producer of preserved and processed anchovies. According to the EUMOFA (2018) report on the processed anchovy sector, there are two scales of production of processed anchovy in Italy: the small-scale production, which deals with processing of Italian anchovy, marketed regionally; and the industrial scale production, partly based on imports, in particular from non-EU countries such as Albania, Morocco and Tunisia. About a quarter of the prepared or preserved anchovy available in Italy (production + imports) is exported.

Salted anchovy may be used as raw material for the production of preserved anchovy in oil in most of the cases (stakeholders estimate that 95% of the volume of salted anchovy available are used for the production of preserved anchovy) while it can be considered as a final product and marketed to consumer in a lower percentage (5%). Salted anchovy intended to final consumer is however a traditional product in Italy especially if the result of small-scale production.

Different types of oil can be used for preserved anchovy in oil: olive oil and sunflower oil, in particular. Processed anchovy is packaged in glass jars or metal cans. Several brands are present in the market. These are company brands and private labels (retailer brands). Only one protected geographical indications (PGI) exists for Italy, but is not related with the Adriatic production: PGI "Acciughe sotto sale del Mar Ligure" (registered in 2008).

Based on the EUMOFA survey, between 8 and 10 industrial companies operate about 75-80% of national production of prepared / preserved anchovy, the 20-25% remaining are operated by small-scale companies). Both industrial and small-scale producers reported concerns regarding the size of anchovy and the sustainability of stocks. Higher sizes are easier to process (filleting stage in particular) and allow better valorisation on the market. For industrial producers, 10-12 cm is a good size for processed anchovy. Regarding the PGI "Acciughe sotto sale del Mar Ligure", the specifications state that the minimum size for anchovy is 12 cm and the maximum size is 20 cm (35-50 fishes/kg). Based on interviews, the absence of sales under PGI in 2017 is due to the lack of volume of anchovy with the minimum size.

Prepared / preserved anchovies imported from third countries may be retailed on the national market under Italian brands.

Always according to EUMOFA analysis, at the industrial scale, the production of 1 kg of final product of preserved anchovy in oil involves 2,25 kg of fish. There is a significant loss of weight due to salting and filleting: 20-25% yield between the fresh anchovy and the salted fillet (25% for the price structure analysis below). For the small-scale production in the Ligurian area, the

production of 1 kg of final product of preserved anchovy in oil involves 2,1 kg of fish (35% yield between fresh anchovy and fillet.

The retail prices for preserved anchovy in olive oil is almost two times higher for Ligurian small-scale production (52,50 EUR/kg) compared to industrial production (27,60 EUR/kg). Fish price are higher for small-scale production due to the size of fish and the origin of the supply. Indeed, anchovy used for Ligurian small-scale production is from the Ligurian area while industrial production relies on anchovy from a larger range of origins (national and international). Production costs are higher for small-scale production operated in Italy compared to industrial production for which some stages are operated in third countries (respectively 20,18 EUR/kg and 7,57 EUR/kg). For small-scale production, a large share of production costs are for labour.

Adriatic small pelagics, and in particular anchovies, are rarely used for processed products. Several reasons can be enumerated, all contributing to this situation: anchovies caught with pelagic trawlers are of worse quality compared with fishes caught with purse seiners; Adriatic anchovies are often of smaller size compared with Sicilian ones and are less suitable for processing; processing costs are too high. However this is not always the case, since Rizzoli produce “Rizzoline” which are marketed as “certified Italian product” from the “Adriatic Sea”

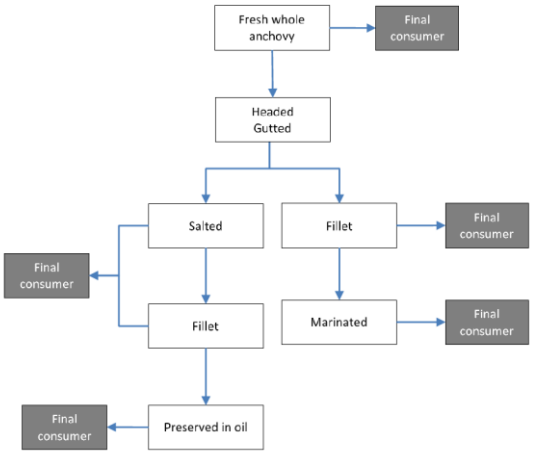


Figure 344. Scheme of the anchovy supply chain (Source: Eumofa)

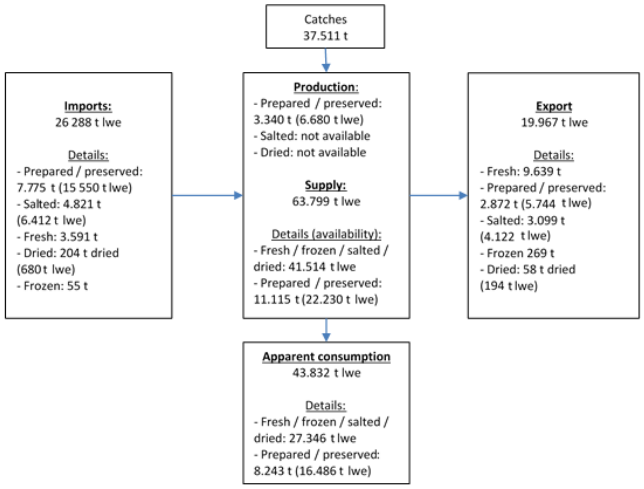


Figure 345. Supply balance sheet for anchovies (Source: Eumofa)

Price Formation

Fish size and quality elements (i.e. compactness, texture, integrity) are the main characteristics that may differentiate the price of small pelagics. Small differences in quality may be linked to the use of the gear and the availability of modern refrigeration cells on the boat. In this perspectives, newer vessels are advantaged.

Specific (i.e. higher) quality can be demanded depending on the request of the final retailer, and this information is transmitted through the wholesaler to the fisher. However, there are fishers that complains that is requests are not always recognized on prices. In this case, the capability to provide fish of good quality is linked to the reputation of the fisher and his long run relationships with wholesalers.

However, price is strongly related to the demand and supply at national and international level, not to local production. In particular, Italian pelagic trawlers are aware that Croatian production strongly affects the price. This is easy to see in the warm season, when Croatian purse seiners begin to fish, and Italian prices decrease (two thirds lower). At the same time, prices are higher when there is full moon, and purse seiners cannot fish.

Wholesalers normally communicate to the fishers (from which they buy small pelagics) which are the quantities needed for the following days. This does not correspond to any kind of contractual relationship, nor to any kind of agreement on the price for the following day, but this exchange of information can be useful to maintain the market as stable as possible. Relationships between fishers and wholesalers depends on long and established relationships, and it is not easy to change buyer

Price changes are immediately transmitted from fishers to retailers. Fishmongers update daily sale prices. On the other hand, supermarkets try to maintain prices a little more fixed, but they are subject to fluctuations and seasonal cycles.

Fisher are, sometimes, required to contribute to discounts, lowering prices, in order to promote the product.

Opinions on quality labels

The idea to certificate the pelagic trawling fishery of the Adriatic Sea has been cyclically suggested by different fishers groups, with the collaboration of scientists. However, this never concluded with anything due to difficulties at management level, to the nature of common resource of small pelagics (which need a management plan for the entire sea basin) and to the costs associated with certification. Divisions in the community of fishers and freeriding behaviour have made this process impossible to go on.

Nowadays, sustainable labels seem far from having the possibility to be applied, even if interest in these tools continue to be sometimes shown. In particular, the ONG CESTHA, which is partner of this project, and which is involved in a program with pelagic trawlers' owners to check the amount of bycatches realized by the fishery, is actively promoting the idea to develop a "shark free" label. This label would certificate that the fishery will not affect (as at the moment is doing) different species of elasmobranchs, which stocks are, at the moment, overexploited.

Wholesalers and retailers are at the moment very sceptical about any kind of sustainable certification, from the more known and globally widespread MSC label, to the more peculiar initiatives such as "shark free" labels. Transactions costs and bureaucracy may represent a limit for the use of similar brands. Furthermore, in the case of fresh, unpackaged products, a serious problem would be represented by the necessity to maintain the product lines (certified and not certified) separated.

Wholesalers do not seem interested in this approach to quality improvement, believing that the difference would not be appreciated by the consumers. Retailers, and in particular fishmongers, are sceptical too. Large retailers should be the first ones to move in this direction, but cost-benefit advantages have to be evaluated carefully.

5.3 CLAMS

Clam fishery is characterized by the existence of management consortia (Consorzio Gestione Molluschi/Vongole) established in 1996 to allow the co-management of this benthonic marine resource. Clams have in fact the possibility to be managed at local level, since decision taken in one consortium will not affect the resource state in other consortia. Fourteen consortia are at the moment working along the Italian coasts, twelve of which in the Adriatic Sea.

In this framework the consortia may adopt several management tools and, in the end, set the maximum quantity of clams that can sustainably taken from the sea, on yearly and monthly base.

Although the consortia could, in theory , work as a Producers Organization (PO), this has not happened and in some cases, beside the consortium, we find a local PO which area of competence is, less or more, superimposable to the area of one consortium or, sometimes, more than one consortium. This is, for instance, the case of PO Bivalvia, which area of competence corresponds to the two Venetian consortia for the management of clams: CO.GE.VO Venezia and CO.GE.VO Chioggia.

Thus, consortia are responsible for the sustainable management of the resource, and gather together all the clam fishers of the region. On the other hand, POs have to establish marketing plans in order to harmonize supply with demand. However, participation to PO is less

widespread. In other words, there are fishers that are members of a consortium which are not member of the PO, preferring to make independently their marketing choices.

Collaboration between OPs and consortia is key, since in this way marketing plans established by POs can be made restrictive to everybody, even to non-members, thanks to the landing rules established by the consortia.

POs can take different societal forms, being the more common “società cooperativa” as in the case of PO Bivalvia (Veneto Region), or less commonly “società consortile”, as in the case of “Organizzazione di produttori della pesca di Fano, Marotta e Senigallia” (Marche Region). However, not all the POs are exclusively related with only one kind of fishery. While OP Bivalvia are exclusively addressed to clams and other similar benthonic resources (such as razor clams), other POs may have other interests. For instance, the above-mentioned PO of Fano is mainly represented by clam fishers, but it also includes fishers using other gears (in particular small-scale fishers).

In the case of clam trade, Consortia and, where available, POs, have a strong relationship with a few very large, and somehow specialized, wholesalers which are involved all along the Adriatic coast. The largest ones (New Copromo and COPEMO) are located in the Marche region.

Large wholesalers have the role to communicate, every day, to POs and consortia, the quantity of clams that will be required the following day, on the base of the requirements of customers and the quantity of clams stocked. At the same time, every day, wholesalers communicate the price to their customers (in some cases weekly prices can be decided). However, only the following day, the final price with the fishers is decided, depending on the daily landings.

If, due to weather conditions, catches have been too low to satisfy all needs from wholesalers, POs (and consortia) share the supply according to the orders received the day before.

Some of the largest wholesalers are cooperatives of fishers (i.e. COPEMO) while others are enterprises with fishers among the owners (i.e New Copromo, that was originally born as a cooperative).

Trade channels are very complex, since fishers and POs may sell products to large wholesalers, small (local) wholesalers, or, in lesser quantities, directly to large retailers, fishmongers and HORECA enterprises. Large wholesalers take bulk quantities of clams from different areas and can mix and select them before selling (in this case the local origin of the product is lost). On the contrary, small wholesalers buy small packages of clams, maintaining the name and the origin of the producer. At the same time, large wholesalers may have different providers (including other wholesalers, in order to maintain the supply constant) and different customers. For them it is impossible to reach every kind of retailer, in particular in farther areas of the country; thus, a second level of wholesalers is normally required for a capillary distribution of the good. When POs have no production, due to regular fishery closures, they can work as intermediaries and provide clams for their customers buying them from fishers in other areas of the sea basin.

Large wholesale markets (i.e. Milan, Rome) represent an important point for the exchange between large wholesalers and customers, with the exception of large retailers that have direct relationships with the large wholesalers.

Large wholesalers sell an important share of clams abroad, especially to Spain and in minor quantity to Portugal and France (around 30-50% of the total quantity they trade is destinated abroad.) In the latest years, there is a problem with the size of clams. In fact, the size has decreased in the Adriatic Sea. The EU has allowed a dispensation to decrease the minimum size from 25 to 22 mm; however, this has caused a conflict with Spanish fishers that are pressing Spanish authorities to increase the controls on imports from Italy.

Italian wholesalers may sell to Spanish wholesalers or directly to large retailers (i.e. Mercadona).

In a very few cases (i.e. Giulianova Market), the exchange between fishers and wholesalers is realized through auctions, but prices do not change substantially compared to those decided through direct agreements.

OPs and wholesalers also have the role of depuration centres for clams fished in B zone. Thus, clams may take three destinations when they arrive on the port: they can be directly sold, they can be compulsorily put in the depuration tanks, or they can be maintained in the refrigeration cells. In some case, clams are depurated even if they come from A zones in order to clean them from sand. Depuration do not change the value of the clam.

Processed clams

Processed clams include several kinds of products and enterprises. Some industrial enterprises choose to produce undifferentiated, low cost, clam products, normally in glass.

On the other hand, there are more artisanal enterprises (e.g. Vongolà) that try new solutions to provide original products under vacuum, cooled or frozen, already spiced and flavoured with different preparations [redacted]

Finally, we have the case of OP Bivalvia, which is personally involved in the processing and sale of frozen clams, to be addressed to final consumers or HORECA partners.

Price is strongly related with size. Cleanness and closure are also important; for some restricted customers, uses and areas, colour is also important (e.g. fishmongers and restaurants in the South of Italy)

Price formation

Price of fresh product is quite variable, and continually change in a range between 1.9 and 2.4. The possibilities that POs have to regulate it are very small, since prices depend from quantities landed along the entire country and no one have enough market power to conditionate the excahnges. Wholesalers are in contact with several procedures and prices are integrated at national level.

Complete contracts, in this framework, are impossible. However, some large wholesalers may have contracted boats in every consortium in order to maintain a stronger relationship and to be surer of a guaranteed supply.

Prices have decreased recently, from 3 to even 1.7 €/kg, since production has increased in the entire Adriatic Sea. This has increased the conflicts with Spain, since prices are correlated. Considering transport costs, prices for Spanish buyers have decreased from 4 to 2 €/kg.

For the frozen products the situation is completely different, since contracts can be established with fixed prices for longer periods (i.e. one year). OP Bivalvia notices some increase in the sale price of frozen labelled clams (both organic and SMS)

Opinions on quality labels

At the moment, in Italy, the only customers that have shown interest in sustainable labels for clams (both MSC or Organic certification) and that sell these products bought from Bivalvia, are Bofrost and Naturasì. The first one is a supplier (house delivery) of frozen food products (including clams) with its own private label. On the contrary, NaturaSì is a large retailer specialized in organic products; in the latest case, clams are not sold with the private label of the retailer. As said, both retailers are selling certified frozen clams. [redacted]

At the moment, wholesalers of fresh products are not interested in promoting this kind of labels and think that the initiative should start from the large retailers. At the same time, large retailers think that consumers are not still sufficiently informed to be interested to these products. Large retailers of foreign countries (e.g. Migros in Switzerland) show a different attitude for sustainability labels.

[redacted]

6. FOCUS ON CROATIAN SUPPLY CHAIN RELATIONS

6.1 CROATIAN FISHERY

Maritime fishing can be divided into commercial, sports, recreational fishing and fishing for scientific purpose (Marine fisheries act NN 62/17, 130/17, 14/19). Commercial fishing is divided into the commercial fishing in the strict sense and small coastal fishing. Small coastal fishing is developed from the former category of fishing for personal needs.

The most important fishing tools used in Croatian part of the Adriatic are surrounding purse seine nets and trawl nets. Purse seine nets are used to catch small pelagic fish and 90% are caught using this fishing tool.

In 2018, the fishing fleet in Croatia had 7573 registered vessels, of which 7266 boats (vessels smaller than 12 meters of length) and 307 ships[7]. However, for the total catch, quantitatively, seiners are much more significant, ships that catch only with purse seine nets. They contribute in total with over 90% of the sea catch and are most effective for the catch of small pelagic fish.

The fishing fleet in Croatia is mostly small, old and ill-equipped. This is particularly the case with trawl vessels. However, significant progress is achieved in the seiners segment. In the last fifteen year, ten or more vessels were built and modernised, and are equipped with modern refrigerated storage capacities.

One of the biggest problems of Croatian fishery are landing sites. Although the number of landing sites is relatively big, there is lack of operative space for fish landing, especially during the tourist

[7] A ship is a vessel whose length is bigger than 12 m and the size of the vessel is bigger than 15BT

season when tourist ships use most of the port facilities. Also, landing sites are not equipped with basic infrastructure for fishing vessels. Most significant landing sites for small pelagic fish on the Croatian part of the Adriatic are Gaženica, Kali, Zadar, Novalja, Biograd na moru and Milna, for white fish Tribunj, Hvar, Poreč, Komiža and Mali Lošinj.

The biggest progress in fishery was achieved in the fish processing sector. In the last fifteen years, twenty new plants for salting, marinating, freezing and canning fish is opened. In the last few years, a substantial amount of money was invested in modernization of the canning industry. It was the retailers and fisherman that have mostly invested in the fish processing industry, and in recent years, foreign companies invested as well. Investing in the fish processing industry was firstly encouraged by the fishing ban of anchovies in Spain and France, and later by subsidies from the European Fisheries Fund. The additional motive is the fish stock, which is relatively stable.

6.2 THE ANALYSIS OF SECONDARY DATA OF CATCH AND FISH PRICES

Data on the catch in the fishing industry in the Republic of Croatia are collected systematically since 2002. The Agency in charge of collecting data is the Directorate for Fisheries of the Ministry of Agriculture of The Republic of Croatia.

Data on the catch (kg) are aggregated on a monthly basis and are shown according to species, fishing gear and fishing zones. Data on landing (kg) are aggregated on a monthly basis and are

shown according to species, fishing gear, counties and landing sites. Data on prices are aggregated on the annual basis and are shown according to the species[8].

Data of monthly price of targeted species at the initial purchase was additionally requested, as well as their wholesale and retail prices. However, the methodology of calculating monthly prices of catch at the initial purchase is not yet developed, so this type of data was not available. Also, no institution in Croatia follows the prices of fish and other marine organisms at wholesale and retail levels systematically, and therefore it is not possible to collect data series of those prices.

Based on collected data, an analysis of the catch (kg) according to species, fishing tools, fishing zones, and landing quantities according to species and landing sites on the yearly and monthly basis was done.

Small pelagic fish catch

Fishing of small pelagic fish (pilchard and anchovy) is the most important part of Croatian fishery. It comprises a total of 85% of the catch.

Catch of pilchard

The main fishing season starts in March and lasts till the end of November. Observed in quantity, the highest catch of pilchard is in the last quarter, that is, September to end of November. In the

[8] It is a case of gross approximation. The prices are based on the value of the catch and the quantities at the first purchase (landing the fish from the ship). The sold quantities, quality of the fish, type of buyer and season is not taken in account.

last few years, time limits to catch small pelagic fish at the beginning of the year is introduced, and therefore, there is no catch in that period.

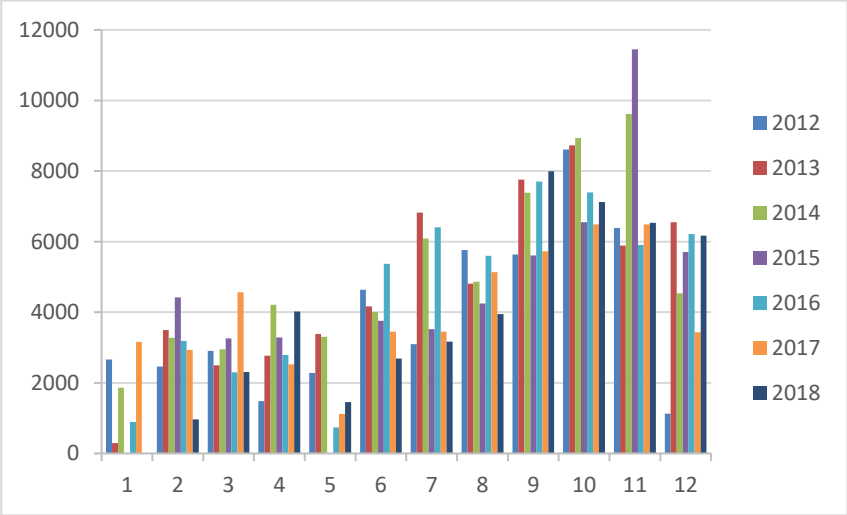


Figure 346. The catch of sardine by months from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Of all fishing tools to catch sardine, the most significant are purse seine nets for small pelagic fish. In the observed period, nearly 99% of sardine is caught with these nets.

Sardine is fished in the entire sea fishing waters of the Republic of Croatia. Observed by the fishing zones, the biggest catch of sardine is in zones B (32.17%), A (18.11%), E (16.98%) and G (14,90%), while in zone D, I and H there are no catch at all.

Records of fish landing according to landing sites have been collected since 2016. The biggest quantities of sardine is landed in two ports of the Zadar County, port Gaženica in Zadar and port Vela Lamjana in Kali. Other significant ports are in Pula (three landing sites), Milna, Rovinj, Vrsar,

Plomin, Biograd, Novalja and Sali. The landing is concentrated in the vicinity of the biggest plants for processing small pelagic fish, fishing cooperative Omega 3, Mirna d.d., Sardina d.o.o. and Mardešića d.o.o.

The catch of anchovy

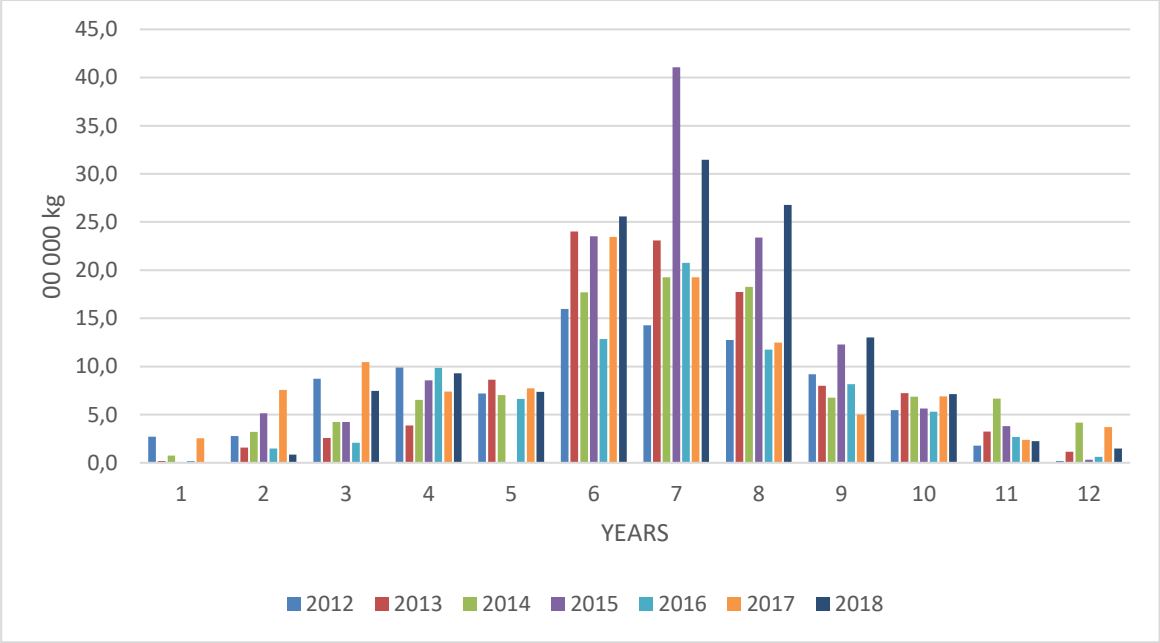


Figure 347. The catch of anchovy by months from 2012 - 2018. Source: Ministry of Agriculture of the Republic of Croatia

The biggest quantities of anchovies are fished in zone B followed by zones E, C, G, F, D and A, while the fishing in other zones is negligible.

The biggest quantities of anchovy, same as it is with the pilchard, are landed in the port of Zadar Gaženica (16.88%). The other important ports are Biograd (10,59%), Tribunj (9,66%), Plomin (6,01%), Kali (5,71%) i Vela Luka (4,23%)

The catch of selected white fish species

The catch of Bluefish (Strijelka)

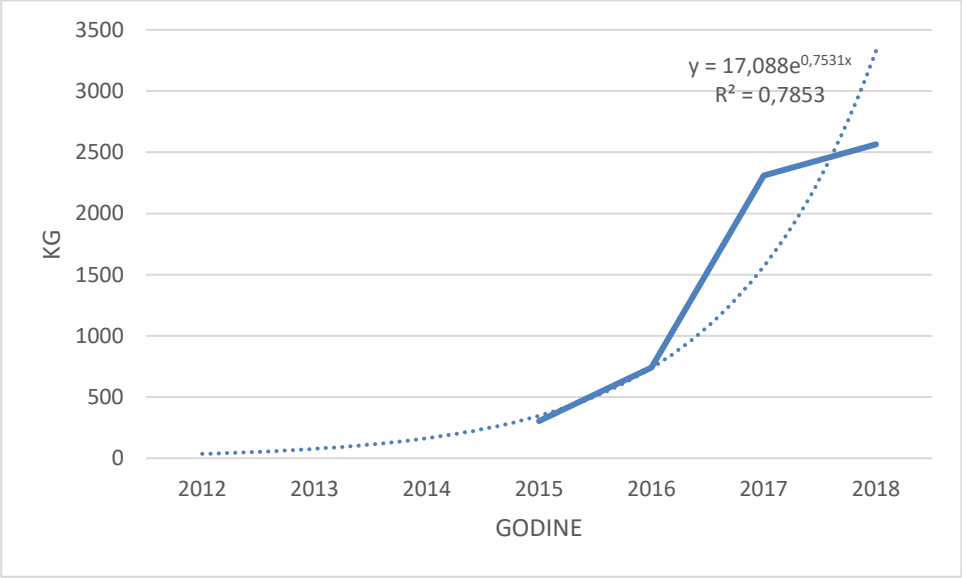


Figure 348. The catch of bluefish from 2015 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

A few years ago, bluefish was an unknown species in the biggest part of the Adriatic. It is a pelagic, predatory fish which spread very fast, due to sea warming in the last decade, from the southern part to the whole Adriatic sea. In the last few years, its commercial catch started. The catch growths exponentially in the period of 2015 -2018 from 300 kg to 2500 kg.

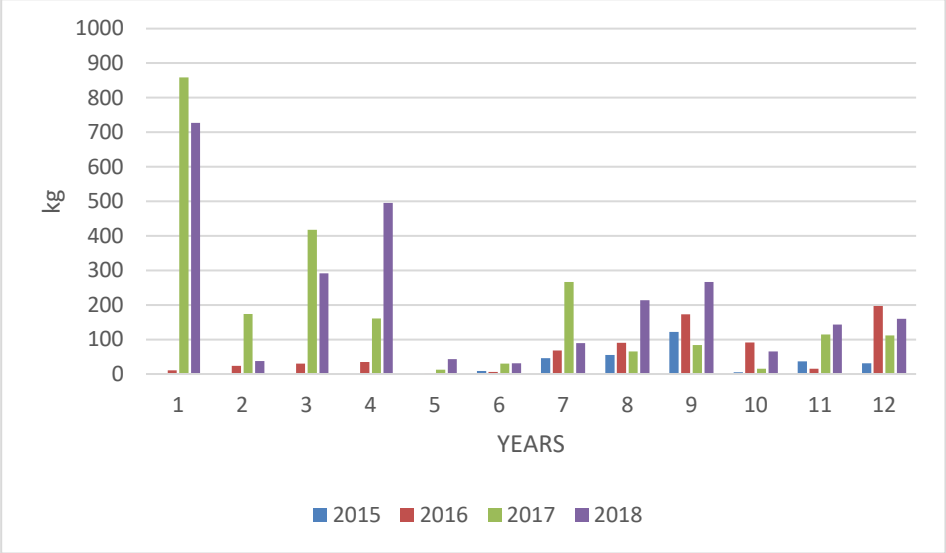


Figure 349. The catch of bluefish by months from 2012 - 2018. Source: Ministry of Agriculture of the Republic of Croatia

The biggest catch of the bluefish is in the first quarter of the year. However, the last two years, the catch season expanded to the whole year.

The most important tool to catch bluefish are single gillnets. In the observed period almost 60% of total catch was caught with this fishing gear. With gillnets, 8.65% of fish was caught, with single and triple gillnets 5.75%, with bottom trawl net 5.17%, and purse seine net 5.08%.

The bluefish is mostly fished in zone A, 68.76% of total catch, and then in zone G and zone E (15.46% and 10.67 % respectively).

Most important landing sites for bluefish are Tarska uvala (30.81% of total landing), then Umag (7.0%), Kaštel Kambelovac (5.63%) and Santa Marina (4.08%).

Table 72. The average yearly prices of bluefish from 2016 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	price kn/kg	price (%)
2015	29,80	100,00
2016	27,63	92,73
2017	28,58	95,91
2018	25,17	84,47

The price of bluefish in the observed period has decreasing trend with a price reduction of around 15%. In the beginning of the period the price was 29.80 kn/kg, and in 2018 it was 25.17 kn/kg. This can be explained with a greater commercial catch of this fish species.

The catch of Mullet

Mullet is also an important commercial white fish species. The total catch of mullet in 2018 was 105 tones, which is 2.48% of the total white fish catch in the Republic of Croatia.

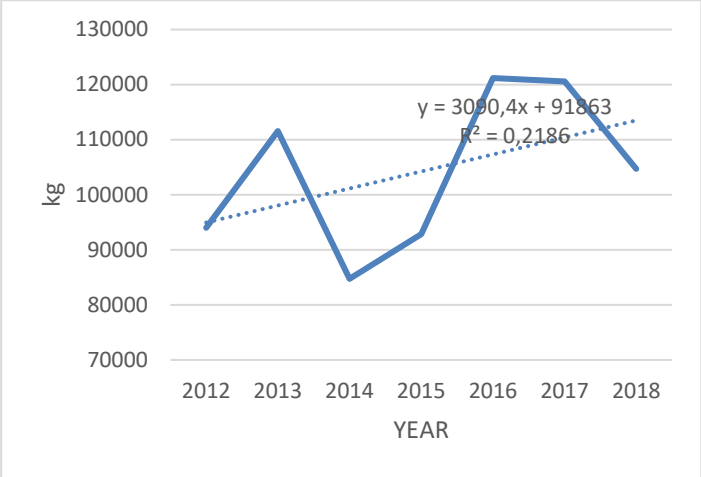


Figure 350. The catch of mullet in the period of 2012-2018. Source: Ministry of Agriculture of the Republic of Croatia

In the observed period the catch of mullet fluctuated from year to year. The lowest was 93 tonnes at the beginning of the observed period, and the highest amounted to 121 tonnes in 2016.

Mullet is mostly fished in Istria, in zone A (63.31% of the total catch), and then in zone G (14.35%), F (11.71%) and E (9.51%).

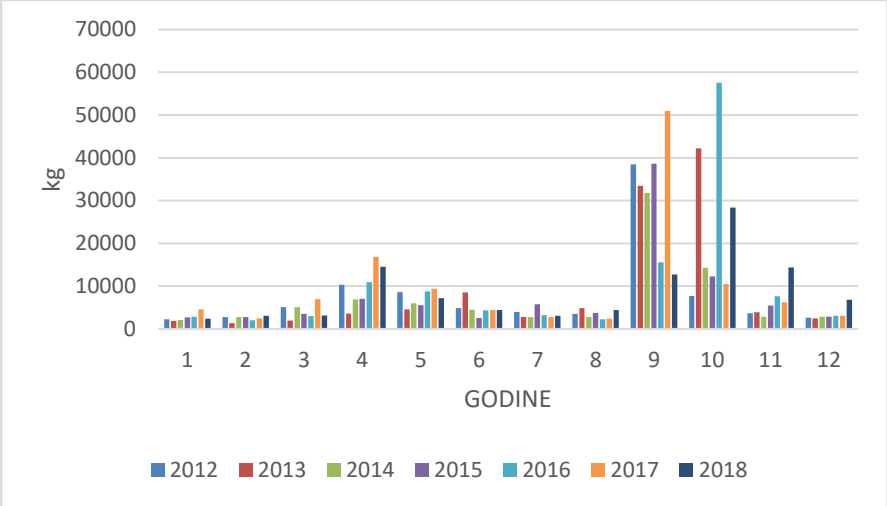


Figure 351. The catch of mullet by months from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Mullet is fished the whole year around, and the biggest catch is in the period of September to October.

The most important fishing tools for mullet are single gillnets was 37%, with purse seine nets (19%), plivarice oližice (16%) and purse seines (11%)

The most significant landing sites for mullet are Karigador (11.9% of total catch), Umag (9.52%), Poreč (8,92%) and Vrsar (8,62%).

Table 73. The average yearly prices of mullet from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Price kn/kg	Price (%)

2012	10,72	100,00
2013	9,77	91,14
2014	14,56	135,85
2015	13,46	125,61
2016	10,66	99,47
2017	11,56	107,87
2018	13,68	127,63

The price of mullet, same as the catch, is significantly varying in the observed period. The lowest price was recorded in 2013 when it was 9.77 kn/kg, and the highest in 2014, when it was 14.56 kn/kg, which is an increase by nearly 50%.

The catch of Prawns and Musky octopus

The catch of Prawns

Prawn is, commercially observed, the most important crustaceans in the Adriatic. In 2018, the catch of prawns accounted to 78.12% of total catch of crustaceans.

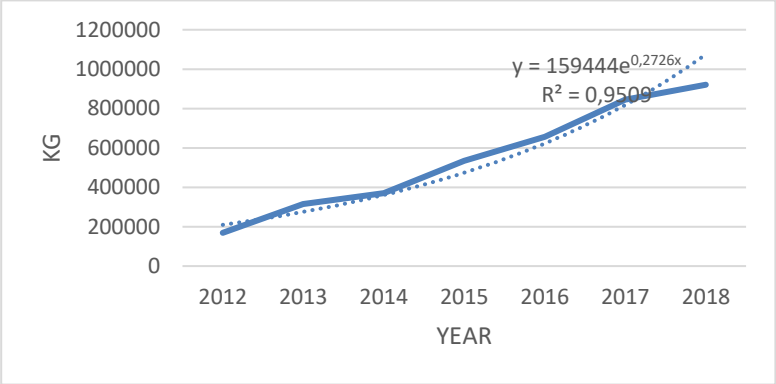


Figure 352. The catch of prawns from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

The catch of prawns in the observed period can be best described with the exponential trendline. In 2012, the catch was 169 tones, and in 2018 it increased to 920 tones, which is an increase of nearly five and a half times. Such increase in the catch of prawns is the consequence of increased quantity of prawns in the sea due to global sea warming.

Prawns are being fished throughout the year. The catch increases from the beginning of year to the end of summer, and subsequently increases in November and December.

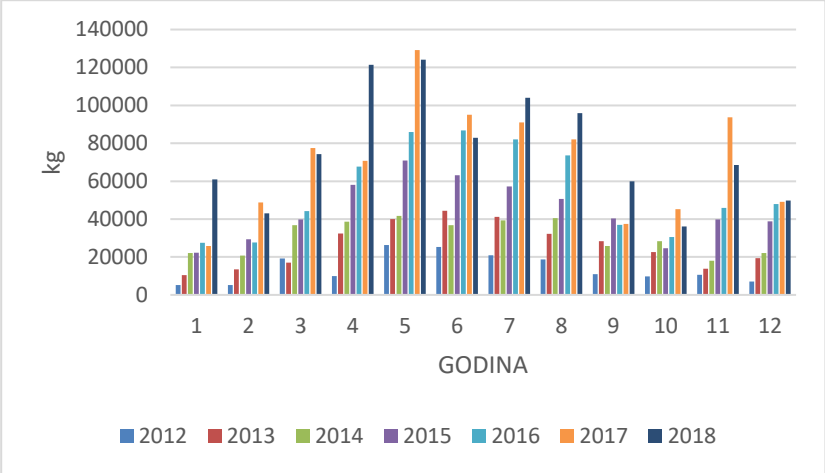


Figure 353. The catch of prawns by months from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

The demersal trawl net is the most significant tool to catch prawns. From 2012 to 2018, 99.94% of prawns was caught with this fishing tool.

Prawn is fished in the whole Adriatic, and the most significant fishing zones are C, with total of 68.13% of catch, then zone D (14.79%), G (8.10%), F (5.29%) and J (2.04%).

The most significant landing sites for prawns are Tribunj with 15.68% of total catch, then Primošten (11.04%), Vis (8.50%) and Dubrovnik (7.52%).

Table 74. The average yearly prices of mullet from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Price kn/kg	Price (%)
2012	40,25	100,00
2013	39,67	115,80

2014	34,26	100,00
2015	25,84	75,43
2016	23,04	67,26
2017	20,52	59,90
2018	20,22	59,03

The price of shrimp decreased in the observed period from 40.25 kn/kg in 2012 to 59.03 kn/kg in 2018. However, the retail price of shrimp did not decrease significantly over the observed period.

The catch of Musky octopus

Commercially observed, musky octopus are the most important species of molluscs, which are fished in the Adriatic. In 2018, 331 tonnes of mollusc are caught.

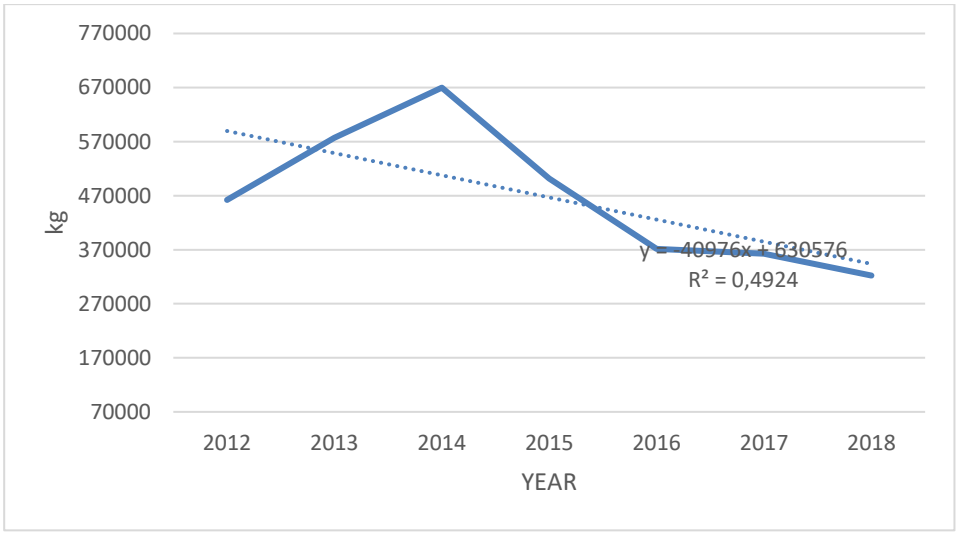


Figure 354. The catch of musky octopus from 2012– 2018. Source: Ministry of Agriculture of the Republic of Croatia

The catch of musky octopus in the observed period firstly increased to 669.7 tonnes in 2014, then decreased significantly, and at the end of the period reached 322 tonnes, which is twice as less compared to the biggest yearly catch. The decrease in catch is the consequence of overfishing of this species.

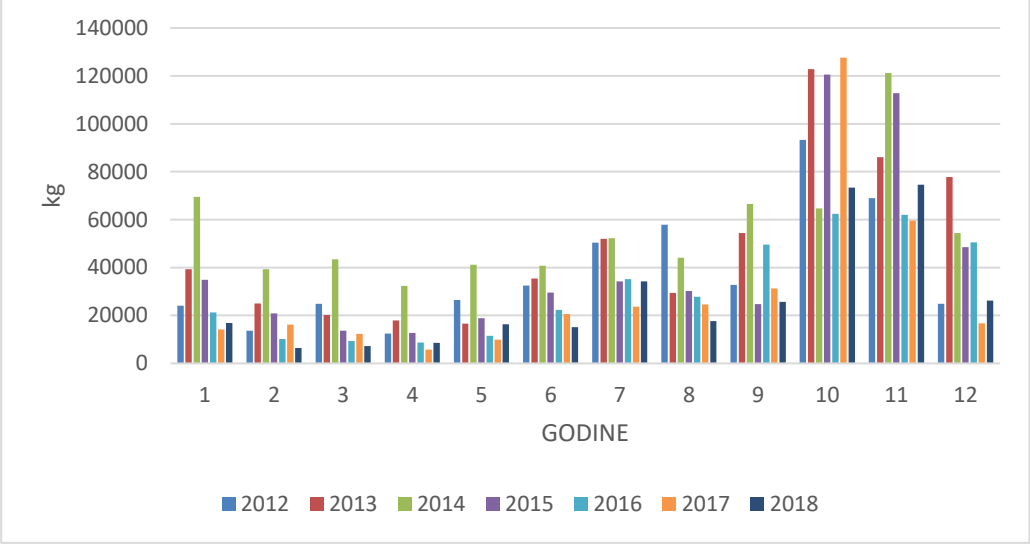


Figure 355. The catch of musky octopus by months from 2012 -2018. Source: Ministry of Agriculture of the Republic of Croatia

Musky octopus are caught throughout the year, and the biggest catch was recorded in the last trimester. However, in the last two years, the catch significantly decreased exactly in that period.

The most important tool to catch musky octopus is the demersal trawl net. 96.61% of the total catch in the observed period was caught with that fishing tool. The other fishing tool that is used is the boat dredges, accounting to 2.27% of musky octopus catch. It is a traditional fishing tool which is only allowed in Istria.

Musky octopus are fished in all of Adriatic, and the most important fishing zones are A, with 52.11% of total catch, then zone E (20.67%), C (9.46%), B (4.80%) and G (4.33%).

The most important sites for musky octopus landing are Novigrad, with 11.94% of the total catch, then Banjole (6.75%), Poreč (6.53%), Vrsar (6.06%), Krnica (5.80), Karigador (4.99%) and Dubrovnik (7.52%).

The purchase price of musky octopus fluctuated in the observed period. The lowest price was 17.92 kn/kg in 2014, and the highest was at the end of the period, 24.05 kn/kg. The price rises due to lesser catch.

Table 75. The average yearly prices of musky octopus from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Price kn/kg	Price (%)
2012	21,10	100,00
2013	20,86	98,87
2014	17,93	84,98
2015	18,05	85,57
2016	20,03	94,95
2017	20,74	98,30
2018	24,05	114,01

The targeted species of shellfish in this research are: variegated scallop, smooth Venus clam, small clam.

The catch of Variegated scallop

Table 76. The yearly catch of variegated scallop from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Catch kg
2012	108
2013	70
2014	74
2015	103
2016	22179
2017	15205
2018	24682

The catch of the variegated scallop has been systematically monitored since 2016. The biggest catch was 24.9 tonnes in 2018.

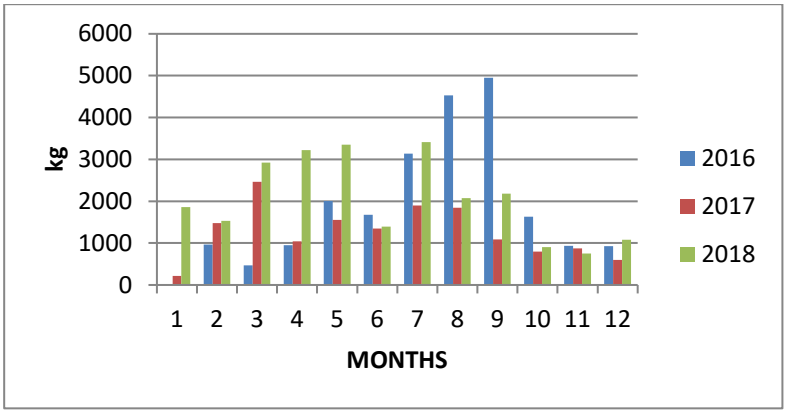


Figure 356. The catch of variegated scallop by months from 2016 -2018. Source: Ministry of Agriculture of the Republic of Croatia

The variegated scallop is fished throughout the whole year, and the biggest catch is recorded in the period from July to September.

The most important fishing tool to catch the variegated scallop is the trawl net, which accounted for 51.7% of the total catch, and dredge with 46.1% of the total catch.

Almost all commercial catch of this species is in zone A (98.40%), that is, in Istria. Therefore, the most significant landing sites are Umag, Istria, with 34.77% of landed quantities, Novigrad (24.77%), Karigador (22.30%), Vrsar (6.67%) and Pula (3.80%).

Table 77. The average yearly prices of variegated scallop from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Price kn/kg	Price(%)
2012	23,92	100,00
2013	21,55	90,10

2014	21,86	91,38
2015	15,25	63,77
2016	20,65	86,31
2017	20,65	86,33
2018	20,65	86,33

The prices of variegated scallop decreased in the observed period by 14%, from 23.92 kn/kg at the beginning of the period to 20.65 kn/kg at the end.

Small saltwater clam (kokoš)

The recorded catch of small saltwater clam is very small. In 2016, a catch of only 353 kg was recorded.

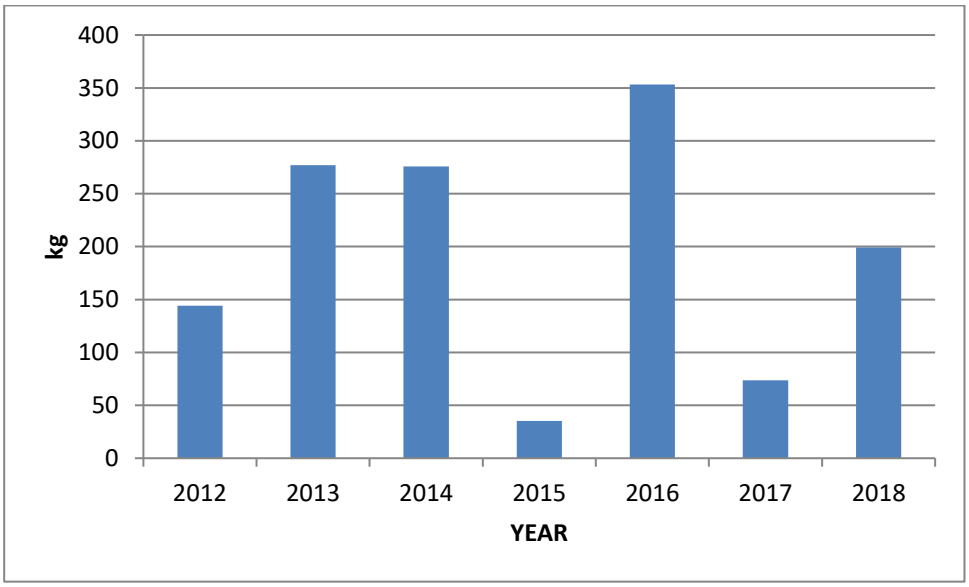


Figure 357. The catch of smooth saltwater clam from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Small saltwater clam is harvested throughout the year and there are no seasonal peaks.

The trawl net is mostly used for harvesting small salwater clam (43.11%), followed by set longlines (27.80%), and single gillnets (7.81%).

The small saltwater clam is mostly harvested in zones C (29.66%), E (25.13%), A (22.14%) and G (11.26%).

The most significant landing sites are Komiža with 57.98% of the total landing, then Rab (5.35%), Mali Lošinj (3.18%) and Tarska uvala (3.16%).

Table 78. The average yearly prices of mullet from 2012 – 2018. Source: Ministry of Agriculture of the Republic of Croatia

Year	Price kn/kg	Price (%)
2012	14,75	100,00
2013	10,10	68,48
2014	16,39	111,11
2015	17,76	120,40
2016	22,46	152,25
2017	32,41	219,70
2018	36,07	244,51

The recorded price of small saltwater clam increases greatly in the observed period from 14.75 kn/kg to 36.07 kn/kg in 2018, that is by 2.5 times.

6.3 THE ANALYSIS OF SUPPLY CHAINS OF THE ADRIATIC FISHERY PRODUCTS

A supply chain can be identified as a set of enterprises that collectively work on turning the raw material into the finished product. It encompasses all logistic processes, that is, movement of raw materials, semi-finished products and components from suppliers to manufacturers, internal transport, manipulation and storage, distribution of finished products from manufacturers to the consumer, and returning of goods and packaging of consumers and retailers to the manufacturers.

The supply chain consists of at least three companies: focal company, supplier and customer (basic supply chain). An extended supply chain additionally includes the supplier's supplier and the customer's customer. Members of the supply chain are interconnected with at least one upstream and one downstream flow.

Most of the supply chains of the Adriatic fishery products are of extended form i.e. they have more than three members. A great number of supply chains include foreign customers (processors and retailers) and end customers, since a great part of the produce from the Adriatic is exported. This analysis refers to the part of the supply chains on the domestic market as well as the relations between domestic export companies and the first foreign consumer.

As every other industry, the industry of the Adriatic fishery products consists of a great number of supply chains. It is not possible to analyse every chain separately. For the purpose of this analysis the supply chains of the Croatian fishery products are divided into two groups: supply chains of the small pelagic fish and supply chains of the white fish, prawns, molluscs and shellfish. These supply chains also cover the most significant commercial groups of the Adriatic fishery products in Croatia and all selected species from the PrizeFish Project.

The analyses of the supply chains are based on qualitative interviews with members of several supply chains, secondary sources of data and expertise. In the analyses, are not presented individual cases of a particular supply chain, but a summary of two above mentioned groups is given.

In order to explore supply chains of the small pelagic fish, interviews with the representatives of the following companies were conducted:

Confidential

For the purpose of analysis of the supply chains of fresh white fish, prawns, molluscs and shellfish, interviews with the representatives of the following companies were conducted:

Confidential

The analysis of supply chains of small pelagic fish (pilchard and anchovy)

Description of supply chains of small pelagic fish

Pilchard are partially sold for processing and feeding bluefin tuna, canning industry and a part ends on the fresh fish market. Anchovy are sold mostly marinated and salted and to the fresh market. Therefore, the supply chains of processed fish and tuna feeding fish are very important in distribution of small pelagic fish.

In Diagram 1, a concise review of supply chains of small pelagic fish on the domestic market is shown. Hereafter, different types of supply chains according to commercial products are analysed.

Pilchard and anchovy for the fresh market

Fisherman - fishmonger/restaurant - end consumer
Fisherman - wholesaler- fishmonger/retail chain/restaurant - end consumer/restaurant guest

It is possible to differentiate two types of supply chains in this market segment.

The short supply chain, "fisherman- fishmonger- end consumer", includes only one intermediary on the retail level. In this supply chain, the fishmonger purchases fresh fish on the landing site or, more often, fishermen personally deliver fish to fishmongers.

The more significant supply chain is the one that includes wholesalers. The wholesalers resell fresh fish to fishmongers, supermarket chains and to a lesser extent to restaurants. Namely, only a small number of restaurants in Croatia offer small pelagic fish dishes.

Fresh sardine and anchovy for export

Fisherman- foreign wholesaler
Fisherman -domestic wholesaler - foreign wholesaler/ foreign food processing company

Some fishermen occasionally sell fresh fish to foreign wholesalers. Usually these are Italian buyers purchasing sardine and anchovy during fishing ban in Italy.

Another export channel includes domestic wholesalers, who resell fish to foreign wholesalers and food processing companies.

Sardine for tuna feeding

Fisherman - tuna farm

Great quantities of sardine, nearly half of the total catch, according to estimates, are used to feed bluefin tuna. In the time of record catch (e.g. in 2015, 61 thousand tonnes of sardine were caught) this share was even higher. Tuna farms purchase all sardine offered in the market, with no regards to quality or size. However, they pay a lower price in relation to other buyers. With this type of sale, the fish is not delivered to the landing sites, but is directly delivered to fish farms.

Frozen sardine and anchovy

Fisherman - food processing company - foreign wholesaler/foreign food processing company/ foreign supermarket chain *Fisherman - food processing company - domestic wholesaler - domestic supermarket chain/foreign supermarket chains- end consumer*

Around 35% of the total catch of sardine and over 95% catch of anchovy goes to processing. Sardine is mostly canned and frozen, and anchovy is salted and marinated.

The most important buyers of frozen sardine are foreign wholesalers and food processing companies in Spain, Italy and France. Frozen anchovies are mostly sold in Italy.

Smaller quantities of frozen sardine (5%) are sold to domestic wholesalers. The wholesalers pack the purchased fish into small packages and sell to domestic and foreign supermarket chains.

Canned sardine (Konzervirana srdela)

Fisherman - processors - foreign wholesaler/foreign supermarket chain/ wholesaler representatives of food processing companies.

Fisherman - processors - domestic supermarket chain/large consumers/ end consumer/ guest

Fisherman - processors - domestic wholesaler - domestic and foreign supermarket chains/ large consumers

Sardines are the basic raw material for canning industry. Over 70% of the canned sardine is exported. The biggest part of the export is sold to foreign wholesalers and foreign supermarket chains. Some processors sell cans through their own representatives in foreign countries. Most canned sardines are sold in the countries in the region (former countries of the SFRY and Albania), then Czech Republic, Poland, Spain, Romania, Hungary, Switzerland, Sweden, the USA, Canada, Australia and others. Some processors open new sale channels in the far East, primarily in China.

Regarding domestic market, the processors sell canned fish to supermarket chains and big consumers. Another sale channel goes through wholesalers, who sell canned fish to domestic and foreign supermarket chains and big consumers (communal restaurants in kindergartens, schools, student dorms, hospitals, army, companies etc.)

Salted and marinated anchovies

Fisherman - processor - foreign wholesaler/ foreign supermarket chain

Fisherman - processor -fishmonger's/restaurants/ domestic supermarket chain

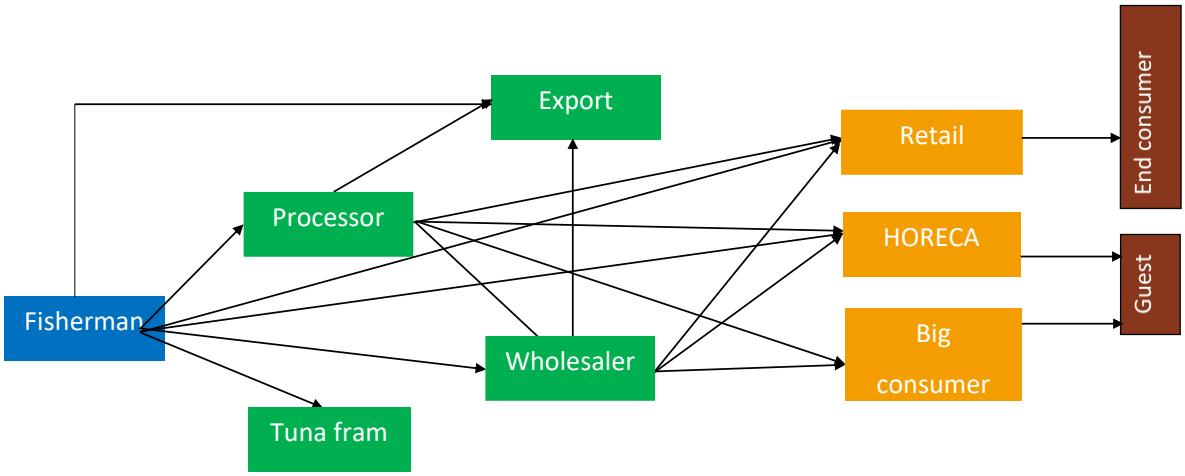
Fisherman - processor - domestic wholesaler- fishmonger's/ restaurants/domestic and foreign supermarket chains

Anchovy is used as a basic raw material for salting and marinating. Over 90% of total production of salted and marinated anchovy is exported.

The most important sales channel for salted and marinated anchovy includes fisherman - processor- foreign wholesaler/ foreign supermarket chains. In this sales channels the processors sell directly to foreign wholesalers or foreign supermarket chains. The biggest buyer of processed anchovies are Italians.

In the domestic market, small producers sell processed anchovy to fishmongers and restaurants, while larger producers sell to domestic retail chains and domestic wholesalers. Domestic wholesalers supply fishmongers, restaurants and local and foreign retail chains.

DIAGRAM 1. SUPPLY CHAINS OF SMALL PELAGIC FISH – MATERIAL CHANNELS



Relations between members of the supply chains

Generally, it could be said that there are no examples of integrated management of a supply chain of small pelagic fish in Croatia, and in most cases, every member of the chain primarily maximizes its own business goals and does not take into account the effectiveness of the whole chain. There are a few examples of successful integration of supply part of a chain (fisherman-processor), and sales part of a chain (processor-wholesaler-retailer). Integration of supply part of a chain happens by companies which have combined catch and fish processing. For example, Mišlov d.d. and Fishing cooperative Omega 3 own big ships and plants for fish processing.

Regarding sales part of a chain, an example is Mirna d.d., manufacturer of canned fish, a member of the Podravka d.d. Group, which sells their products on the domestic and foreign markets. [redacted]

A small degree of integration of supply chains of small pelagic fish can be explained twofold. On the one hand, most supply chains are newly formed and are in the start-up phase. Namely, in the last twenty years due to changes on the markets and generous European funds, many changes occurred within the sector. In the area of fish catch, capacity enlargement, modernization of the fleet and entry of new players occurred (some processors and retailers invested in new vessels). At the same time, a great number of fishermen left the business. A number of new players have emerged in the trade, and especially in processing. Likewise, a large number of companies have failed and left the business. On the other hand, there is no great pressure of the market on business rationalisation.

Namely, the market is dominated by favourable business conditions due to the conjuncture and increased demand in the common fish market and the generous fisheries fund.

The only significant progress in connecting members of small pelagic fish supply chains was done in the logistics sector by setting up effective cold chain SHIP-FACTORY. Most ships for catching small pelagic fish are technologically well equipped, they have ice machines and cold sea, and therefore can preserve targeted quality of fish until a landing site. The transport of fish from landing sites to factories is done by refrigerated trucks, so that the quality of fish is not lost during the transport. Ships that are not technically equipped to preserve the quality of the fish are supplied by processors with ice.

Key members of big supply chains of small pelagic fish are fishermen, processors, foreign wholesalers and supermarket chains. Hereafter, their relationships will be analysed.

There are different forms of cooperation between fishermen and processors. When it comes to fishing cooperatives i.e. producer organisations, the relationship between the co-operative (co-operative management) and the members of the co-op (fishermen) is regulated by co-operative rules. Those rules define fish quality, qualitative categories, ways of taking over fish from fishermen, inspection of fish, fish pricing, payment of fish and distribution of the rest of the income. The contract of fish sale is usually signed at the beginning of the work of the co-operative or by accession of a new member.

However, not all fishing co-operatives are successful, but unfortunately only a few. Most do not do well and cannot ensure a fair price for fishermen. On the other hand, the fishermen do not land all their fish to these co-operatives, but only those fish which they can't sell for a better price on the market.

Most fishermen are self-employed, that is, they are not connected with the buyers functionally or by ownership. The cooperation between fishermen and processors is weak, there is no contract on cooperation, and the business is based on verbal agreements. The conditions of the cooperation are discussed on joined meetings, once or twice a year, when they negotiate prices, ways of delivery and quality of fish.

The processors offer the fishermen long-term contracts, but they do not want them. They are only interested in the price, and not ways of payment, other benefits or services. Since fish is sparse, the fishermen do not want to have a binding contract with one buyer, and, if the opportunity arises, they sell the fish to higher paying customers. The buyers from Italy pay somewhat more for the fish than the domestic buyers, but on the other hand they demand that

the fish is packaged in Styrofoam packaging and that it is better assorted. This increases the expenses of delivery of fish and it is questionable if it is profitable to fishermen.

The fishermen are in most cases satisfied with their relationships with the processors. The price of fish is relatively good, the whole catch can be sold, and the payment is secure. Though, most complaints of the fishermen regard the purchase price, but also the evaluation of the fish quality. Fishermen, who work with successful cooperatives are more satisfied in relation to independent fishermen. They achieve a better price by 10 to 15%. On the other hand, the co-operatives a range of catch-related innovations to make them (the fishermen and the cooperative) more competitive in the market. Successful co-operatives offer their members also some additional services like short-term credits, co-financing in some investments, education etc.

In the view of the processors, the biggest problems in the relations with fishermen is the lack of continuity of delivery and low ability to adapt to demand. Bad weather, which often occurs, as well as temporary fish bans, have significantly reduced the catch. Due to the shortage of fish in the processing industry, often there is “gap time”.

The processing industry demands reliable deliveries, stable quality and prices that fit into their calculation when choosing fishermen they would work with.

The cooperation between the fishermen and bluefin tuna farming companies is similar to the relationship with the processing industry. There are no long-term contracts and most business is done by verbal agreements. Tuna farms purchase all offered fish, not graded, no matter what quality or size it is. However, they pay the lowest price. Ships that are not so well-equipped catch fish for tuna farms, as they cannot keep the high quality of the fish.

Basic requests of buyers of fresh fish is top quality of the fish, primarily freshness, appearance and size. The obtained prices are higher from those that are paid by the processing industry, but the quantities sold are also significantly smaller.

As it is mentioned, the most significant buyers of processed small pelagic fish are foreign wholesalers and foreign fish processing companies.

The processing companies do not have sales contracts with foreign buyers (wholesalers). The delivery is based on verbal agreements and purchase order, and the invoice has the function of a contract. Since the catch is decreasing, and so is the production of fish products, the main buyers often make fish reservations. There are sale contracts with supermarket chains.

There are long-term sales contract with the domestic buyers, whether they are wholesalers or retailers. Contract are made at the proposal of the buyers. Some wholesalers offer exclusive contracts to processing companies, but processors do not want to bind themselves.

The buyers demand a reliable delivery from the processing companies, consistent quality and competitive prices. Some domestic buyers demand introduction of MCS certificate, which would enable them to export canned fish to the west European markets (e.g. supermarket chain COOP). On the other hand, the most important for the processing companies is that their buyers respect agreed rules, regular payment and fair price for processed fish.

The processing companies have confidence in their buyers and they do not change them, even though the relationships are not always transparent. The buyers and the processing companies do not partake in investments together. There is no strategic planning on the chain level, as everyone is only looking out for their own interests.

Besides existing buyers, the processing companies look for new sales channels to sell their products at higher prices. The processing companies believe that it is not hard to find new buyers as there is less fish on offer. They think that they can keep the continuity of supplies to their buyers.

The dispute with foreign buyers most often arises at price negotiations. This is also partly influenced by the activities of the processors themselves. For example, when the offer on the foreign market is higher, some Croatian processing companies lower the price. The buyers then ask all the suppliers to lower the price. Domestic wholesalers, based on higher purchased quantities, try to achieve additional discount.

The suppliers, trading with supermarket chains, have distribution and sales contracts. They negotiate the price and other conditions of sales once a year. The suppliers place their offer and then negotiate with supermarket chains. Supermarket chains additionally ask a discount of the suppliers, as well as partaking in advertising and discount sales.

All respondents agree that there is a change in power in the supply chains of small pelagic fish. Before, supermarket chains had the biggest power, and now it is divided between the fishermen, processing companies, wholesalers and retailers. According to the evaluations of the respondents, the fishermen hold 60% power, the canning fish industry 10%, and retail 30%. In the frozen small pelagic fish industry, the power is equally divided among the fishermen, processing companies, wholesalers and retailers. It is the same in the industry of salting and marinating anchovies.

Determining prices

The first, that is, the ex-vessel price of small pelagic fish mostly depends on the quantity of the catch, the price of final products on foreign markets, characteristics of products (freshness, appearance, and size of fish) and the type of buyer.

As it is already mentioned, the biggest part of the small pelagic fish is purchased by domestic processing companies and tuna farms. Most processing companies have their own internal ordinance, which defines the purchase of fish, that is, quality and size of fish, packaging, fish assortment, treatment of fish on the ship etc. Some processing companies control the quality of fish to histamines and fat. The processing companies, regularly do not have quantitative limits in purchase of fish, but they are limited by price. Tuna farms purchase all offered sardine, but pay the lowest prices.

First price of fresh sardine range from 2 – 10 kn/kg. The sardine reaches the highest price at the fresh market, between 5 and 10 kn/kg. The price of sardine used in processing industry ranges from 2.75 – 4 kn/kg, and some co-operatives pay even 4.7 kn/kg for the premium quality. The price of sardine for feeding tuna is around 2 kn/kg. Sardine for feeding tuna is not assorted, does not have any request on size, and very often is damaged (bloody, ripped). Anchovy is paid from 4 – 10 kn/kg. Successful co-operatives pay their fishermen a higher price (10 – 15%) than other buyers on the market.

The first price of sardine at the fresh market changes often and mostly depends on the momentary quantity of catch. The ex-vessel prices of fish for processing are relatively stable and change mostly 2 – 3 times a year.

The first price is customary determined by the focal companies (processing company/wholesaler). When it comes to cooperatives, the price is formed in agreement between the management of the co-operative (management) and the members of the co-operative

(fishermen). All processing companies and wholesalers use the cost-oriented methods or pricing. They subtract the margins and pay the rest to the fisherman.

The fresh sardine in export reaches the price between 1.00 and 1.20 Euro/kg, and anchovy from 1.5 to 2.0 Euro/kg. The retail price of sardine on the domestic market ranges from 20 – 25 kn/kg, and anchovy up to 30kn/kg. Retail margins are between 60 and 80 %.

The wholesale prices of frozen sardine (whole) on domestic market is between 7 and 10 kn/kg, and anchovy 8 – 15 kn/kg. Retail prices of frozen sardine is around 16 – 18 kn/kg. There are often discounts, so the price can be even 50% lower.

The price of frozen sardine of premium quality, on foreign markets, ranges from 1.00 – 1.25 Euro/kg, and sardine for preserving from 0.50 – 0.60 Euro/kg. Frozen anchovy for the fresh market reaches 1.50 – 2.00 Euro/kg, and for processing 0.60 – 0.70 Euro/kg.

The purchase price of frozen fish is mostly influenced by the foreign markets, size of fish and the appearance of the fish. The price is differentiated according to market segments. For example, the highest price of frozen fish is achieved by sale of premium sardine for bait. The fishing tool does not affect the price of the product. The processing companies determine the price according to the cost-effective principle. When the fish offer is big on the export markets, Croatian processing companies lower the prices themselves.

Consumer trends, quality certificates, origin of fish, way of packaging and brand mostly influence the prices of fish cans. The Adriatic sardine reaches 30% higher price than the Atlantic one, on foreign markets.

Canned sardine reaches a wholesale price from 0.34 – 0.40 Euro/can (100 – 115g) on foreign markets, and retail price of around 1 Euro. Retail price of canned sardine on the domestic market

ranges from 4 – 10 kn/can. Sardine with supplements (olive oil, vegetables, chilli peppers etc.) are more expensive, by 5% to 20% compared to the price of a standard can.

The retail margins of canned sardine depend on the way of sale. If it is sold by so-called single custom pricelist of individual supplier, the rebate ranges from 20 – 30%. If the sale is done by the neto-neto price system, and this is the most often used model, when the retail brands are concerned, the retailer adds the margin on the price of the producer from 40 to 60 %. At discount sales, the producer lowers the price, and the retailer the margin.

Wholesale prices of salted and marinated anchovy on the domestic market are around 160 kn/kg, and marinated around 85 kn/kg. The retail margin, depending on the size of the packaging, is from 50 – 60%.

Opinion on the effects of the sustainable fishing label

In the interviews with the members of supply chains, one of the questions referred to the evaluation of the effects (benefits and risk) of the possible introduction of sustainable fishing label. Seven respondents, two fishermen, representatives of two fishing co-operatives, representatives of frozen fish wholesalers, representatives of fish canning factory and the owner of a fishmonger's took part in this evaluation.

The respondents mostly agree that the introduction of the sustainable fishing label would give the competitive advantage to the label holders, it would positively influence building and maintain a positive image of the company and the product on the market, and enable the sale of the products by higher prices. They somewhat less agree that the introduction of the sustainable

fishing label would ease sales and encourage the creation of strategic partnerships in the supply chains.

Fishermen, one fishing co-operative and a canning manufacturer are those who mostly believe in the effects of the label, while the owner of the fishmonger's shop was the most sceptic.

On the other hand, the respondents think that the introduction of the label, would increase administrative obligations and business expenses. Representatives of fishing co-operatives fisherman and fish canning processor mostly agree with the that statement.

Analysis of supply chains of white fish, prawns, musky octopus and shellfish

Description of supply chains

The targeted species of white fish and shellfish are mostly sold fresh. When the catch is large, red mullet and bluefish are filleted and/or are frozen. Musky octopus are sold fresh, and when the catch is very big, they are frozen. The processing of mentioned species has just started to develop. Fresh fish supply chains are of principal importance for the distribution of white fish and other marine organisms.

In Diagram 2, a concise review of supply chains of white fish, shrimp, cephalopods and shellfish is shown. Hereafter, the analysis of supply chains according to commercial species is given.

Fresh white fish and other marine organism

Fisherman – foreign wholesaler/ fish auction

Fisherman- domestic wholesaler – fish auction / foreign wholesaler/ foreign supermarket chain

Fisherman – restaurant/ fishmonger's- end consumer/ guest

Fisherman – domestic wholesaler – restaurant/fishmonger/ supermarket chain – guest /end consumer

Two types of supply chains are important for export of fresh white fish and other marine organism, short supply chain ("fisherman – foreign wholesaler"), and the chain that includes domestic wholesalers. The short supply chain, as a rule, is used by big ships as foreign retailers purchase great quantity of fish. Domestic wholesalers sell fresh catch on auctions (e.g. Foggia, Chioggia, Palermo, Barcelona etc.), to foreign wholesalers (e.g. Fiorital and Friulpesca) and in much smaller quantities to foreign supermarket chains. In autumn months (October – December), when the demand of tourists is smaller, and the catch fairly big, most of the catch is exported. Mostly exported are red mullet, mullet, musky octopus and shellfish.

The short supply chain: fisherman- restaurant – guest, is important for restaurants on the Adriatic coast. Moreover, some fishmongers purchase fresh fish directly from the fisherman. Most restaurants are open only during the tourist season, when the demand for fish products is bigger than the supply and when the restaurants pay the highest prices on the market. Restaurants purchase high- quality species of white fish and shellfish, and the premium prices are paid for bigger specimens of fish. Fishmongers mostly purchase prawns, cephalopods, red mullet of higher size and mullet.

The most important supply chain on the domestic market is the one that involves domestic wholesalers (e.g. Meduza, Žuvela, Oro Adriatica etc.). The wholesalers supply restaurants,

fishmongers and supermarket chains. The first sales of shellfish goes through dispatch centres under veterinary supervision, and when necessary, shellfish is cleansed in the depuration centre. Most shellfish is sold to wholesalers, who supply HORECA and retail chains.

Frozen prawn meat

The prawns are first cleaned, and then the meat (clean tails) is frozen. For frozen prawns tails two supply chains are significant:

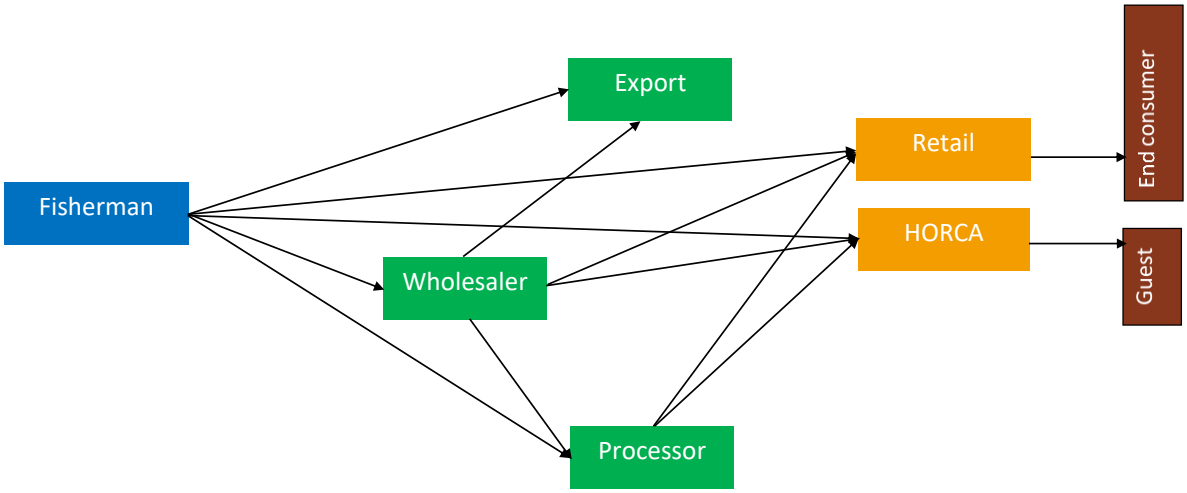
Fisherman – processing company – restaurant/supermarket chain
Fisherman – processing company/wholesaler – domestic supermarket - consumer

Prawns are processed by a big number of small companies and manufacturers. However, due to ever growing catch and favourable prices, larger processing companies started processing domestic prawns (e.g. HZM Horvat, Ledo). Small processing manufacturers mostly sell to restaurants and fishmongers. The biggest consumers of prawns are restaurants.

Derived prawns and musky octopus products

In the last few years, several new companies that package (clean, fillet) and process fish, and other marine organism, have emerged. Different innovative products are made, e.g. mullet fillets, prawns and cephalopods burgers, prawn salad, clam meat, fish marinades, soup stock, smoked fish and seafood etc. These products are sold for export or directly to restaurants and fishmongers. However, it is still a small production, without any particular economic importance.

DIAGRAM 2. SUPPLY CHAINS OF WHITE FISH AND OTHER MARITIME ORGANISMS



7.ANNEX: PROCEDURE FOR SPECIES SELECTION

7.1 THE SELECTION PROCESS

In order to select the main species to be targeted by subsequent PRIZEFISH activities, a consensus-building process among project partners has been activated.

As a first step of the process, based on the discussion started with all partners during the KOM, the Coordination Committee of the project drafted a first wide list of all species of interest in the Adriatic Sea. The initial list included 24 species belonging to 5 main groups - pelagics, crustaceans, demersal fishes, cephalopods and bivalve mussels (Table 6).

The Coordination Committee also agreed that the selection process should have taken into consideration the three pillars of the project. Thus, for each species, the following aspects have been assessed:

a) *the current sustainability conditions and the potential for their improvement (WP3);*
b) *the potential for processing innovation uptake (WP4);*
c) *the potential for value creation and market penetration (WP5).*

As a second step of the process, the assessment of each species was carried out under the responsibility of WP leaders (respectively WP3, WP4 and WP5 for the three aspects listed above), with the contribution of the partners involved in each WP.

The assessment was conducted through specific indicators and evaluation criteria combining both a quantitative and qualitative approach, according to the background information available (e.g. scientific documents, empirical evidence etc.) and partner experience and resulted in a score on a scale from 1 (low potential) to 5 (high potential).

Based on partner contributions collected, a score was attributed by each WP leader to each species, as described in the following sections of the document.

7.2 SUSTAINABILITY POTENTIAL ASSESSMENT (WP3)

Since the different fishing techniques can have a relevant impact, the potential of each species has been assessed based on the various fishing gears used. To do that, three main attributes of the potential impact that a gear could have were considered based on expert knowledge:

1. status of the target stock (based on last stock assessment available);
2. potential impact on the other commercial species ;
3. potential impact on ETP species (Endangered Threatened Protected species);
4. potential impact on the habitat.

The status of target stock as well as the potential impact on other commercial species (2) was evaluated referring to the F/FMSY indicator for stock assessment (when available). In the case there is not an official stock assessment, a preliminary Productivity Susceptibility Analysis (PSA) was carried out to understand the potential status of certain resources.

According to the assessment carried out (and reported in Table 6) the combination of gear/species with high sustainability potential are:

- *Scomber* spp. exploited with purse seine;
- *Trachurus* spp exploited with purse seine;
- *Squilla mantis* exploited with traps (in Italy);
- *Pomatomus saltatrix* exploited with set net (in Croatia);
- *Sepia officinalis* exploited with traps;
- *Mytilus galloprovincalis* exploited with hand harvesting.

It is important to stress that in some cases the combination of gear/species is relevant only for Italy or Croatia (eg. *S. mantis* or *P. saltatrix).*

7.3 PROCESSING INNOVATION POTENTIAL (WP4)

PO ISTRA and OMEGA3 perspective

Cooperatives business and marketing activity are in direct link with fishing activity to target and collateral species, and species of potential processing and marketing interest. According to analyse done in sense of price and quantity as a first index to judge, the remain index is the processing possibility.

Based on this evaluation, the main species of interest for adding value with processing and presentations are *bluefish, oyster, musky octopus, cuttlefish, red mullets, mullets, rays, queen scallop* in demersal resources.

Most of these species have seasonal character and low prices and quantity sufficient for Processing in terms of some production picks. It is worth to mention that plant capacity needs to work constantly with filled capacity, otherwise it makes pressure on production cost. That is a reason why Cooperative Istra chose several products; actually there is no financial neither productive sense to work with only one. Presentation and Processing is possible for most of it and idea is to get more value through processing.

In small pelagic, targets are sardine and anchovy because of highest quantity and their characteristics of target products.

Table 79. Commercial fishing catches in the Republic of Croatia in 2017 in tonnes (data from the Croatian Bureau of Statistics report)

Total catch	Total catch of fish	**Total catch of small bluefish**	Catch of bluefin tuna	Demersal fish	Crustaceans	Shellfish
69 476	66 974	62 538	635	3 801	1083	1419

From tables below based on quantity and prices plus seasonality issue we can conclude that

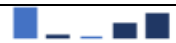
chosen products are of point of interest for processing. The goal is to make new added value on the product which can seasonally and by species fill the capacity of processing.

Table 80. The most economically significant species in 2017 catches

	Landing (kg)	Sales (kg)	Sales (EUR)
Sardines	48 332 980.86	47 901 195.89	approx. 17 940 440.2 EUR
Anchovy	10 880 238.01	10 525 253.51	approx. 9 648 511.1 EUR
Hake	927 895.89	785 406.66	approx. 3 079 091.3 EUR
Lobster	200 072.17	158 303.15	approx. 2 306 145.9 EUR
Shrimps	834 297.54	749 143.24	approx. 2 049 810.8 EUR
Solea sole	229 879.56	214 359.07	approx. 1 686 317.8 EUR
Red mullet	1 001 295.08	911 807.18	approx. 1 597 950.1 EUR
Musky octopus	362 551.05	326 739.00	approx. 903 581.4 EUR
Chub mackerel	1 945 485.59	1 968 683.64	approx. 718 877.8 EUR
Gilthead sea bream	164 544.51	114 895.38	approx. 638 790.3 EUR
Venus shells (*venus spp*)	102 114.39	65 090.90	approx. 606 274.6 EUR
John dory	34 473.17	26 740.70	approx. 524 902 EUR
Common scallop	72 752.53	66 730.80	approx. 470 600 EUR
Squid	74 691.78	48 423.45	approx. 458 298.4 EUR
Octopus	136 202.62	74 372.11	approx. 456 578.2 EUR
Gurnard	95 697.97	84 054.87	approx. 445 112.3 EUR
Oysters	158 516.45	163 591.60	approx. 413 828.4 EUR

Table 81 - Average prices (EUR) of economically most significant species

	2012	2013	2014	2015	2016	TREND
Sardines	0.38	4.05	0.39	0.38	0.38	
Anchovy	0.71	0.88	0.77	0.85	0.94	

Chub mackerel	0.52	0.59	0.56	0.50	0.37	
Horse mackerel	0.75	0.76	0.77	0.48	0.37	
Red mullet	1.63	1.88	1.78	1.70	1.72	
Shrimps	5.36	5.28	4.56	3.44	3.07	
Hake	3.55	3.53	3.71	3.83	3.69	
Musky octopus	2.81	2.78	2.39	2.40	2.67	
Oysters	3.13	2.31	2.17	2.67	2.95	
Norway lobster	11.51	12.08	11.06	11.95	12.69	
Solea sole	7.58	7.62	8.00	8.48	8.77	
Octopus	5.4	5.73	5.36	5.04	5.43	
Squid	7.77	8,91	7.21	8.43	7.74	
Gilthead sea bream	7.14	7.92	7.77	6.25	5.01	
Gurnards	5.32	5.81	4.93	5.23	4.68	
Venus shells	8.52	8.54	8.13	8.48	8.85	
Common scallop	7.18	7.40	7.04	6.98	6.90	
Anglerfish	6.06	6.32	6.47	6.85	6.33	
Bluefin tuna	5.74	5.33	6.94	10.03	8.87	
John dory	19,99	19.04	19.66	19.81	19.98	

Beside sardine, anchovy, red mullet, oyster, musky octopus with a significant quantity (but with variation) considering seasonality and locality, it is important to include some other species, like bluefish, cuttlefish, mullets, rays, queen scallop in demersal resources. Approach is to focus on main species and species which come locally and by season. This approach can make processing plant to live with product diversification and adding value to local fishing ground.

PO BIVALVIA perspective

WP4 focus is to innovate the tools and working processes to add value to the Adriatic fish products.

Op Bivalvia assigns an evaluation of the two categories that most interest the fishing of the company: clams with a 5 and hard clams with a 3. It takes into consideration the catches of the two exemplars from 2010 to today. The data are the set of daily reports of our fishermen collected by the Agriteco Research Institute.

Op Bivalvia innovates the process fishing only the previously ordered quantities of product and observing from two to five months of biological rest per year. We safeguard the molluscs also repopulating areas looking for restoring the natural standards.

In support of this product protection philosophy has been launched a pilot project. The intention is increasing the selectivity of the mechanisms for collecting the Adriatic clam. The current selecting tools placed in each vessel have a high selection capacity but, unfortunately, are not able to guarantee 100% separation between exemplars of commercial and non-commercial size. This is why we set ourselves the goal of testing new technological solutions to limit the collection of non-target organisms as much as possible.

Table 82 – OP Bivalvia catches by species

Vongole - *Chamelea gallina*			
Anno	Venezia	Chioggia	**Totale (t)**
2010	433,8	497,3	**931,1**
2011	668,5	782,2	**1.450,70**
2012	1.896,70	1.969,50	**3.866,20**
2013	1.851,80	1.922,10	**3.773,90**
2014	1.381,20	1.556,50	**2.937,70**
2015	1.608,20	1.912,90	**3.521,00**
2016	2.196,80	2.039,80	**4.236,60**
2017	2.510,00	2.460,20	**4.970,20**
2018	2.107,10	1.919,40	**4.026,50**

Fasolari - *Callista chione*			
Anno	Venezia	Chioggia	**Totale (t)**
2010	759,3	496,6	**1.256,00**
2011	740,5	491,2	**1.231,80**
2012	644,3	432,9	**1.077,20**
2013	560	406,2	**966,2**
2014	586,1	400,4	**986,5**
2015	524	365,7	**889,7**
2016	464,1	375,8	**839,9**
2017	415,8	404,9	**820,7**
2018	357,7	320,9	**678,6**

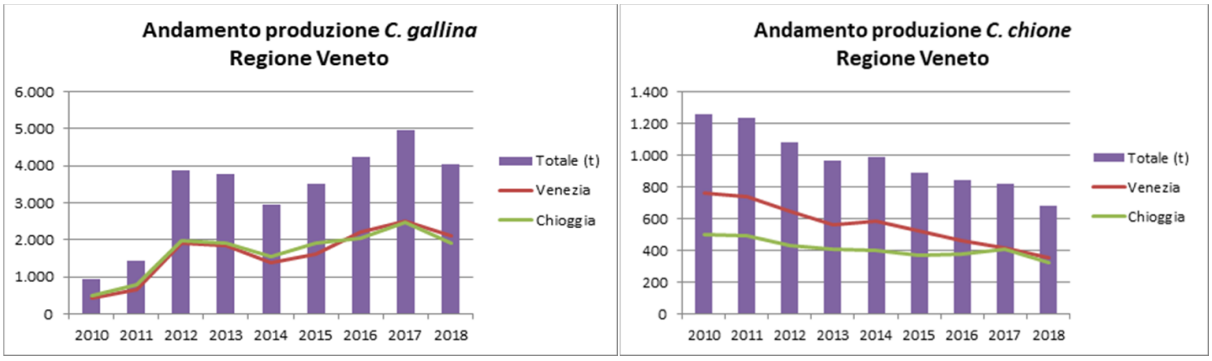


Figure 358 – OP Bivalvia catches by site

UNIBO food technology team perspective

In terms of lab/pilot scale testing, the choice of the most important species has been performed based on process innovation potentiality. It is important to underline that the selected processing technologies could permit not only the 'pre-study' of innovation potentiality of the actual minimally processed and ready-to-use products scenario, but also an important strategy to

decrease seafood waste bound to seasonality, giving added values to seafood species often unsold because of too high fishing amount in specific seasons, small size and morphological characteristics (e.g. high presence of bones).

In this direction, the preparation of mechanically deboned frozen flash could be very useful for the production of semi-finished seafood products to be further used for the production of sauces, fish hamburger, pasta filling etc. For this aim, mantis shrimp, mullets and red mullets received a high score (5) in terms of processing innovation at lab/pilot scale for their suitability to be mechanically processed for the production of frozen flash.

The sanitation effect of high-pressure pasteurisation (HPP) can be exploited for the preparation of refrigerated seafood tartare; using this technology, the shelf life of these products can be increased from 2-3 days to 2-3 weeks. For this purpose, deep water rose shrimps, spottail mantis squillids, norway lobster, mullet and cuttlefish received a high score for lab/pilot scale processing to be tested with HPP.

Modified atmosphere packaging (MAP) with novel gas mixture (e.g. argon, nitrous oxide) will be studied for the shelf-life increase of refrigerated fish fillets, particularly to protect the products from oxidation phenomena. Particularly, fatty blue fish like mackerel, horse mackerel and sardine (score from 3 to 5) will be minimally processed and packed in novel MAP system and subjected to shelf-life study.

Cold gas plasma (CAP) water will be applied to molluscs in order to test its capability to substitute conventional washing procedure for postharvest sanitation. For this, claim, mussel, oyster and razor claims received high score in terms of lab/pilot processing aims (respectively 5, 5, 3 and 3).

7.4 MARKET POTENTIAL ASSESSMENT (WP5)

WP5 aims at improving income and other economic benefits ensuing from Adriatic fisheries and particularly explore market opportunities for eco-labelled products.

The evaluation was based on information retrieved from the European Market Observatory for Fisheries and Aquaculture products (EUMOFA, www.eumofa.eu), that is a comprehensive market intelligence tool developed by the European Commission. EUMOFA enables direct monitoring of volumes, values and prices of fisheries and aquaculture products, from the first sale to retail stage, including imports and exports.

The economic importance of the species listed by the Coordination Committee was assessed considering their absolute economic value and its growth in the following stages of the supply chain: landings, imports and exports.

All data were updated to 2018, except those for landings that refer to 2016. The absolute economic value of each species was calculated as the average of the latest 3 years available, while its growth was calculated as the average annual growth over the latest 5 years available.

The commercial species were then ranked based on their absolute economic value and based on its growth at each stage of the supply chain (landings, import and export) in both Croatia and Italy (Tables 5 and 6).
Such list was then broken down into percentiles and the following scores were assigned:

- 1 for values below the 20th percentile
- 2 for values between the 20th and the 40th percentile
- 3 for values between the 40th and the 60th percentile
- 4 for values between the 60th and the 80th percentile
- 5 for values between the 80th and the 100th percentile

The total score was calculated as the sum of the scores of each column and the final market value assessment was ranked again based on percentiles.

As a result of the calculations performed, the species with the highest market value in Italy are:

- Cuttlefish

- Clam
- Squid
- Anchovy
- Hake
- Deep-water rose shrimp

While in Croatia, the species with the highest market value:

- Oyster
- Clam
- Shrimp, deep-water rose
- Cuttlefish
- Anchovy
- Hake

Table 83 - Market value assessment for main commercial species in Italy

Italia	Landings value	Landings growth	Import value	Import growth	Export value	Export growth	Total score	Market value
Cuttlefish	4	2	4	5	3	4	22	**5**
Clam	3	1	3	4	5	5	21	**5**
Squid	3	3	5	3	4	3	21	**5**
Anchovy	5	3	4	2	5	1	20	**4**
Hake	5	2	5	3	1	4	20	**4**
Shrimp, deep-water rose	5	5	1	5	3	1	20	**4**
Lobster, Norway	3	5	4	2	2	2	18	**3**
Mackerel	2	3	3	1	2	5	16	**3**
Ray	1	5	1	4	1	4	16	**3**
Sardine	2	4	2	1	4	2	15	**2**
Scallop	1	1	3	2	3	3	13	**2**
Mussel Mytilus spp	0	0	2	1	4	3	10	**2**
Horse mackerel, other	1	1	1	3	1	2	9	**1**

Oyster	0	0	2	4	2	1	9	**1**
Red mullet	4	2	0	0	0	0	6	**1**
Sole, common	2	4	0	0	0	0	6	**1**

Table 84 - Market value assessment for main commercial species in Croatia

Croatia	Landings value	Landings growth	Import value	Import growth	Export value	Export growth	Total score	Market value
Oyster	2	4	3	5	5	0	19	**5**
Clam	3	3	2	4	2	1	15	**5**
Shrimp, deep-water rose	3	4	2	3	2	0	14	**5**
Cuttlefish	2	2	3	3	2	1	13	**4**
Anchovy	5	2	4	0	0	2	13	**4**
Hake	5	1	0	2	0	4	12	**4**
Sardine	5	0	5	0	0	0	10	**3**
Squid	3	0	0	1	0	4	8	**3**
Scallop	2	0	0	1	5	0	8	**3**
Lobster, Norway	5	1	0	1	0	0	7	**2**
Sole, common	4	0	0	0	3	0	7	**2**
Ray	1	1	1	0	1	2	6	**2**
Horse mackerel, other	1	0	1	0	1	1	4	**1**
Red mullet	4	0	0	0	0	0	4	**1**
Mackerel	1	0	0	2	0	0	3	**1**
Mussel Mytilus spp	1	0	0	0	1	0	2	**1**

7.5 RESULTS: LISTS OF THE SPECIES OF INTEREST

In order to aggregate the results of the assessment carried out based on the three main pillars of the project, ad overall weighted average was calculated. The weights assigned to sustainability (in relation to stock and to gear), processing innovation at lab scale and market value (for both Croatia and Italy) were all equal to 1, while the processing innovation at PO scale was weighted 2 units, so as to account for the importance of current processing conditions for producers.

The results of the calculations and the subsequent ranking of the species are displayed in Table 7.

Three sub-groups of species have been identified, based on the overall relevance (resulting from for the two Countries involved in the project:

- species of "***common interest***" are those that are most relevant for both Countries;
- species of "***specific interest for Croatia***" are those that more relevant in Croatia as compared to Italy;
- species of "***specific interest for Italy***" are those that are more relevant in Italy as compared to Croatia.

As a final step of the process, the Coordination Committee validated these results and derived the following lists of species.

Table 85 – Species of common interest

English Name	Italian Name	Croatian Name	Latin Name	FAO 3-Alpha Codes
European Anchovy	Acciuga, alice	Inćun	Engraulis encrasicolus	ANE
Common Cuttlefish	Seppia	Sipa	Sepia officinalis	CTC
Deep-water Rose Shrimp	Gambero rosa	Kozica	Parapenaeus longirostris	DPS
Horse Mackerel	Suro, sugarello	Šarun	Trachurus mediterraneus	HMM

Mullets nei	Cefali	Cipli	Mugilidae	MUL
European Pilchard/Sardine	Sardina	Srdela	Sardina pilchardus	PIL

Table 86 – Species of specific interest for Croatia

English Name	Italian Name	Croatian Name	Latin Name	FAO 3-Alpha Codes
Bluefish	Pesce serra	Strijelka	Pomatomus saltatrix	BLU
Musky Octopus	Moscardino	Muzgavac	Eledone moschata	EDT
Queen Scallop	Canestrello	Kapica	Aequipecten opercularis	QSC

Table 87 – Species of specific interest for Italy

English Name	Italian Name	Croatian Name	Latin Name	FAO 3-Alpha Codes
Clam	Vongola, lupino	Kokoš	Chamelea Gallina	SVE
Spottail Mantis Squillid	Canocchia, pannocchia	Kanoća	Squilla mantis	MTS
Razor clams	Cappalunga, cannolicchio	Šljanak	Ensis minor	EQI