



Deliverable Report

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Objective: A competitive position analysis will be carried out for the selected species using Porter's Five Forces model. This model offers insight into the market structure and competitive situation of DIVERSIFY's six selected species, including different products and market segments.

Deviations: The time required for the completion of these deliverables was probably underestimated in the DOW. In addition, the partners responsible were involved in the preparation of 3 more deliverables that were due at the same time (Mo 12), which made working on all deliverables at the same time difficult. The 2-month delay of this deliverables will not affect the implementation of other Tasks in the DOW.



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1. Competitive analysis of DIVERSIFY's species

1.1 Introduction

This report reviews the key forces of competition in the European market for DIVERSIFY's six species. These forces will determine the competitive position of such products. Using Porter's Five Forces model of Competitive Position Analysis (Porter, 1985; Porter, 1998), an analysis has been carried out for the selected species. For each step of the value chain, current suppliers, customers, substitutes, rivalry and potential entrants into the market are described. The analysis of these Five Forces provides strategic insight into the market structure and competitive situation on the market of the selected species, including different products and markets.

Each of DIVERSIFY's species has the potential improve its position in the markets and to offer added value. Their biological and economical potential can stimulate the growth of the European aquaculture industry. For each species, economic potential is analysed in relation to observed socioeconomic bottlenecks. The six species considered in the DIVERSIFY project are sourced through aquaculture and capture fisheries in different countries and quantities around the world, as presented in Table 1 with the most recent available FAO data (FAO, 2014).

Table 1. Aquaculture and fisheries production of DIVERSIFY's selected species (FAO, 2014). Main producing countries and world totals.

Atlantic halibut		Greater amberjack		Meagre	
Aquaculture	2012	Aquaculture	2012	Aquaculture	2012
Norway	1.741	Spain	2	Egypt	8.319
United Kingdom	100	Total (all countries)	2	Spain	646
Iceland	13			Greece	600
Total (all countries)	1.854			France	450
				Italy	140
				Total (all countries)	10.221
Fisheries	2012	Fisheries	2012	Fisheries	2012
Canada	2.885	Libya	580	Mauritania	3120
Norway	2.185	USA	544	Egypt	2454
Faroe Islands	141	Italy	342	France	930
Spain	84	Spain	212	Greece	300
United Kingdom	72	Taiwan	166	Guinea-Bissau	240
Total (all countries)	5.637	Total (all countries)	2.249	Total (all countries)	7.351
TOTAL (Aq. +Fish.)	7.491	TOTAL (Aq. +Fish.)	2.251	TOTAL (Aq. +Fish.)	17.572



Pikeperch		Wreckfish		Flathead Grey mullet	
Aquaculture	2012	Aquaculture	2012	Aquaculture	2012
Tunisia	212		0	Egypt	99.651
Netherlands	120	Total (all countries)	0	Egypt	30.000
Denmark	110			Republic of Korea	5.839
Czech Republic	68			Israel	2.338
Ukraine	66			Taiwan	1.206
Total (all countries)	802			Total (all countries)	141.731
Fisheries	2012	Fisheries	2012	Fisheries	2012
Kazakhstan	5.550	Portugal	410	China	112.271
Russian Fed.	4.242	Spain	217	Republic of Korea	4.752
Finland	3.451	USA	140	USA	4.454
Estonia	828	Greece	75	Mexico	4.005
Turkey	593	Argentina	30	Venezuela	1.384
Total (all countries)	17.643	Total (all countries)	884	Total (all countries)	130.139
TOTAL (Aq.+Fish.)	18.445	TOTAL (Aq.+Fish.)	884	TOTAL (Aq.+Fish.)	271.870

1.2 Methodology

A Porter Five Forces analysis has been performed for each species. This exercise analyses the level of competition within the industry and allows for business strategy development. It draws upon industrial organization (IO) economics to describe the forces that determine the competitive intensity and, therefore, suitability of the product for a market. This analytical work is related to its principal innovator, Dr Michael E. Porter of Harvard University (Porter, 1985). The five forces are: *Bargaining power of suppliers*, *Bargaining power of buyers/customers*, *New entrants*, *Substitute products* and *Intensity of competitive rivalry*.



Figure 1. Graphical representation of Porter's Five Forces model.

Bargaining power of suppliers. The bargaining power of suppliers of the fish and their products is based on the quantities they can supply (the larger the volume the higher the bargaining power), on supplier strategies



(strategic skills) and the level of differentiation (differences of the products with respect to other products on the same market).

Bargaining power of buyers/customers. It describes the ability of buyers to put the supplier firm(s) under pressure. The higher the buyer concentration and buying volume, the higher the bargaining power of buyers. The more differentiated a product is and the higher the decision making incentives, the lower the bargaining power. Furthermore, buyer's bargaining power increases when many buying alternatives exist on the market.

New entrants. Profitable markets that yield high returns attract new firms. The threat of new entrants that will compete with present suppliers is higher if a product cannot be protected and thresholds to introduce a new product are low. This can result in many new entrants, which eventually will decrease profitability for all firms presently in the industry.

Substitute products. The more differentiated a product, the lesser the chance that buyers or consumers will perceive other products as substitutes. Any new candidate product entering a market will face successful and less successful products. For every new candidate product, the existence of current products increases the propensity of customers to switch to other species based on relative price or quality performance.

Intensity of competitive rivalry. For most industries, the intensity of competitive rivalry is the major determinant of their competitiveness, through factors such as innovation, level of promotion expenses, strength of competitive strategies and firm concentration ratios.

All these factors together determine the competitiveness of any product on a given market.

2. Market competitiveness for meagre (*Argyrosomus regius*) products

2.1 Suppliers power

Meagre's total aquaculture production quantity in 2012 was 10,221 t, of which 81% were produced in Egypt (FAO, 2014), however, entirely sold in its domestic market. Modern meagre farming started in France and Italy, followed later by Spain, which is now the second largest producer. Other meagre producing countries are Greece, Cyprus and Croatia, amongst others. Meagre production in Europe peaked in 2010 and has decreased thereafter because of problems in its commercialisation.

Table 2. Meagre aquaculture production in t (FAO, 2014)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Egypt	0	0	0	0	0	0	0	0	2.031	2.272	12.246	12.092	8.319
Spain	0	0	0	3	16	347	489	251	1.123	1.348	1.853	1.006	646
Greece	0	0	0	0	0	0	0	0	0	0	0	582	600
France	33	35	165	100	147	267	282	282	555	418	400	472	450
Italy	0	0	131	0	696	186	172	192	109	102	45	138	140
Cyprus	0	0	0	0	0	0	0	0	0	0	12	40	36
Croatia	0	0	0	0	0	0	0	0	0	0	2	39	25
Portugal	0	0	0	0	0	0	23	27	15	44	38	15	5
Total	33	35	296	103	859	800	966	752	3.833	4.184	14.596	14.384	10.221



Meagre obtained through capture fisheries totalled 7,351 t in 2012, with Mauritania being the largest supplier, followed by Egypt and France. Meagre is a fast growing fish, reaching up to 2 m in length and 50 kg in weight.

Meagre production in Egypt is carried out in land-based ponds, but in the rest of the Mediterranean it is grown in sea cages. Production techniques and management of meagre farms are very similar to those required for European sea bass and gilthead sea bream. Furthermore, meagre is placed on the market by farms/traders that often also produce and/or trade European sea bass and gilthead sea bream. For example COSA SRL, an Italian fish farm, farmed and traded its first meagre in 1995, after almost twenty years of experience with European sea bass. In 2008, it already supplied to markets in New York, Hong Kong and Singapore (COSA, 2014).

Meagre is a white fish that offers lean fillets with excellent texture and mild flavour. The rapid growth rate of this fish allows producers to farm them to a much larger size than other farmed potentially competitor fish, such as European sea bass or gilthead sea bream, allowing for filleting and further processing. Therefore, the supplier power of meagre is quite large, since there is a solid base of production for a selected market.

2.2 Buyers power

Buyers of farmed fish (processors, intermediate clients, multiple-retailers, supermarkets and wholesalers) produced in European countries occupy a strong position within fish supply chain. In general, there is a clear trend towards food retail consolidation. Multiple-retailers and supermarkets have strong buyer power because they also have retailer power. In most developed national markets, supermarkets now dominate the supply of food products to consumers (SANCO, 2012). These companies are aware of the variety of suppliers of white fish and have the capacity to source their product portfolio from a variety of them, from either inside Europe or through imports from third countries, to fulfil their own processing or selling requirements.

Buyers of aquatic products in the EU, especially multiple-retailers and some supermarkets, are medium to large companies with a much larger bargaining capacity than suppliers (fish farms), favouring a strong imbalance in negotiation power that can lead to unfair commercial practices. The imbalance of bargaining power is especially acute in aquatic products with respect to other value chains because of the fragmentation on the supply side.

Meagre (and its processed products) is in general little known by European consumers because of the small quantities of this fish that are presently placed on the markets, either from capture fisheries or from aquaculture. Sales are restricted to local markets in the most popular fish markets of Italy and Spain. However, even these markets are not well developed. Besides retail, commercial catering, medium class and ethnic restaurants are looking with increasing interest to this new fish species, and there are potentialities for further sales on these segments in most European countries.

Sales of wild meagre are marketed local-to-local. For example, in France, fisheries in the west regions near the Gironde mouth, sell meagre in local fish auctions (where this fish fetches €2 to €7/kg, depending on the size and on the fishing gear) and is mainly later sold either to restaurants or to independent fishmongers in the region (FAO, 2010).



2.3 Substitutes

Marketing of farmed meagre occurs through several ways. Fresh, whole head-on, ungutted or gutted, depending on the end market; over 50% is sold at sizes from 1 to 2 kg; a third at sizes above 2 kg. Meagre is also sold frozen or smoked. Small-sized meagre (400–700 g) are not considered optimal for marketing as they have a proportionately large head, more bones and little flesh. In Spain, small sized meagre (less than 1 kg) are considered too dark (*negra*), and considered unappealing (FAO, 2010). Whole meagre are sold to independent fishmongers as well, who cut the fish into slices or fillets. There are some sales in supermarkets, as have been identified in Italy and Spain (FAO, 2010).

Substitutes for whole meagre are European sea bass and gilthead sea bream, which are today positioned as middle-priced species. Total sales vary greatly according to the prices at which these fish are offered to end buyers, and to the price for substitutes (FAO, 2007). Competition between farmed meagre and wild meagre is limited mainly due to the small quantities fished and because of the difference in sizes, as wild meagre generally attains 20 to 40 kg while farmed meagre rarely is taken beyond 4 kg. This size difference converts both origins of meagre into completely different commercial products. However, the small competition with wild meagre only occurs in two regions in western Europe: southern Spain-Portugal, and west France. Wild meagre is mainly sold through to local businesses (restaurants) (FAO, 2010). White fish, in general, is also a competitor against which meagre has to measure itself.

Meagre is an excellent raw material for the seafood processing industry. It grows fast, can attain large sizes and can be available year round. Once processed, meagre competes with salmon and *Pangasius* (a catfish farmed in southeast Asia), also often used for processing, which are all actually transformed into a large variety of end products.

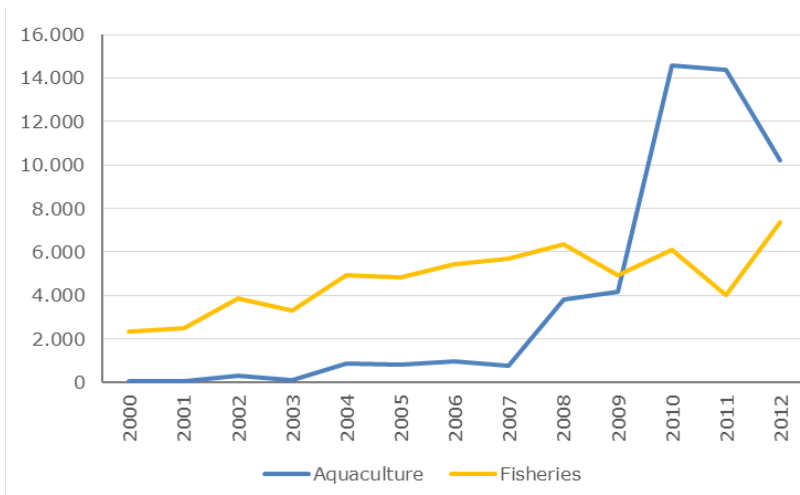


Figure 2. Meagre production volumes in 2012 measured in t (FAO, 2014).



2.4 New entrants

More products with the same characteristics entering any market have a significant direct impact on the volumes available, on the bargaining power of suppliers and thus on prices offered to their producers. Product development and strategic orientations can be used to prevent vulnerability on any market. Meagre aquaculture production is expected to grow fast in the medium term and offering a variety of products is important to spread market risks and prevent early market destabilisation. Quite probably, ex-farm prices will get under the pressure as soon as supply is increased, even in favourable markets, such as Spain, Italy or Portugal. Furthermore, this risk can be considerable given the fact that European sea bass and gilthead sea bream farms can easily switch to farming meagre and increase its supply.

2.5 Rivalry

From a marketing perspective, meagre has several attractive characteristics that place it in an advantageous position when compared to other fish:

- It has a lean flesh, even when grown intensively with high fat diets (Hernández et al., 2009).
- It has a high dressing percentage, low adiposity, healthy muscular lipid content (FAO, 2010).
- It has a long shelf life. The shelf life of filleted fish is in general shorter than that of whole fish, however, because of meagre's lower level of muscular fat allows preservation for longer periods of time under appropriate conditions (Poli et al., 2003).
- It reaches relatively large commercial sizes rapidly, attaining 2.5 kg in 24 months (around 1 kg per year), depending on culture conditions, and showing excellent Feed Conversion ratios (Les Poissons du Soleil, pers. comm.).

Nowadays, European sea bass and gilthead sea bream are beginning to be marketed as processed products, but their fillets and cuts are very different to meagre's. However, European sea bass and gilthead sea bream already have advantages in market development and reputation by end-consumers. However, given the large demand on the European fish market, there is still room for the supply of meagre, provided it is price competitive, and initiates product development and promotion to create a positive image. For reputation building, a handicap exists with the fact that meagre is a species known by consumers under different names, and thus requires local reputation building. For example, the following meagre names are common in EU countries (FAO, 2010):

France: maigre (most common name), courbine, aigle or grogneur.

Spain: corvina; yet corvina also refers to other species of the Sciaenidae family.

Portugal: corvina.

Great Britain: meagre, croaker and drum.

Italy: ombrina bocca d'oro; figao, figou, Figaro. Regions: Liguria; ombra, ombreta, ombria; Veneto and in Friuli-Venezia Giulia; Toscana; ombrina; Marche, Abruzzo, Lazio, Sicilia; vocca d'oro in Campania and Puglia; umbrina di canale in Sard

Meagre shows good marketing potential and can be processed into portions (fillets, loins) to supply the growing segment for portion sized ready-to-cook products, provided large commercial size is attained (>2 kg) (Hernández et al., 2009). Many fish species have been consumed for quite some time in the form of fillets (salmon, perch, sole, cod, trout, halibut, ling, hake and swordfish), whilst others, such as European sea bass and gilthead sea bream have been consumed whole up until now, and filleting is still seldom and



hesitantly done. Specifically in the case of Spain, although the format with the greatest future seems to be filleted fish, consumers prefer whole fish. According to professionals in fish sales, the consumption of fillets will continue to increase in the future, due to new lifestyle habits as people have less time to cook, and the younger generations' increasing habit of consuming convenient products (GIAUC, 2006). In this sense, meagre shows good marketing potential, as both its size and its body shape allow for optimal filleting and processing (Hernández et al., 2009).

For product development, it is important to determine for nutritional purposes the lipid and fatty acid content of both farmed and wild fish. Other body parts (such as liver or skin) could still be interesting to analyse for possible use in other food or nutraceutical applications (Sinanoglou et al., 2014).

2.6 Considerations for actions of meagre

Since meagre is best known in southern France, Portugal, Italy and Spain, market orientation for meagre needs to be developed starting in those regions. First, these markets have to be penetrated further, but later on the expansion to other EU countries can be done. Since these countries are also very important touristic destinations, this fish could be marketed as a special local product that will remind consumers once back home of their holiday period. This has been done before with olive oil and other local dishes like pizza, pasta and paella. Meagre is a product that can serve a broad market such as retail, commercial catering, medium class restaurants and ethnic restaurants including sushi restaurants. Product development and strategic market orientations can prevent the vulnerability associated to a single market.

Meagre production is expected to grow fast in the medium term and building a portfolio of products is important to spread market risks. Product development is also recommended as meagre is an excellent raw material for the seafood processing industry. New product development could support market development.

3. Market competitiveness for greater amberjack (*Seriola dumerili*) species products

3.1 Suppliers power

Greater amberjack aquaculture production is still in a trial and error phase and no significant farming occurs, even though there have been farming attempts in Europe for several decades stocking wild juveniles. FAO (2014) reports 2 t of aquaculture production in Spain in 2012, while there is also some minor production in Malta. Market price –mainly for capture fisheries greater amberjack- reaches values over 14 €/kg. This species was introduced in aquaculture in the 1960s in Japan and decades later in the Mediterranean because of its high growth rate, excellent flesh quality and high commercial value (Mylonas et al., 2004; Papandroulakis et al., 2005; Takakuwa et al., 2006).

The major bottlenecks for the acceptance of greater amberjack by the EU aquaculture industry are the lack of reliable reproduction and the unavailability of the required numbers of juveniles. In captivity, reproduction has been problematic (Kozul et al., 2001), but recently captive-reared broodstock have reproduced after hormonal treatments (Mylonas et al., 2004), and in some cases also spontaneously (Jerez et al., 2006). In addition, some knowledge has been acquired on the nutritional requirements of reproduction, in order to



identify possible nutritional deficiencies in the fish and to obtain information to formulate a more suitable broodstock diet (Rodríguez-Barreto et al., 2012). Therefore, for greater amberjack only a handful of producers presently exist, resulting in practically no supplier power.

3.2 Buyers power

Very little information is available due to the very small presence of this species on the market. Greater amberjack is commercialized locally and unprocessed. What is known is that its flesh is very tender, and people that know greater amberjack position it above the most reputed competing products. The development of buyer power after introduction of the species will depend on many factors: the market chosen, the quality of the product, the value proposition for the product and the pricing of the product.

3.3 Substitute products

There is no fish that can be considered a clear substitute for greater amberjack, being tuna its theoretical closest substitute. Since tuna is a well-known species, with a wide product assortment in all price categories, adequate positioning of greater amberjack will be important since initial launching on the markets.

Due to the difficulties for its reproduction in captivity, global consumption of greater amberjack is currently limited to fish captured from the wild (Hamasaki et al., 2009). Wild captured greater amberjack totalled 2,249 t in 2012, with Libya, the USA, Italy and Spain as the main fishing countries (FAO, 2014). It is a globally distributed species, with a high quality meat (Andaloro & Pipitone, 1997; Cummings et al., 1999; Thompson et al., 1999) and, therefore, good reputation already exists although only for those who know it.

3.4 New entrants

A very limited commercial activity with hatchery-produced individuals presently exists in Malta, though interest exists and efforts have been made by various aquaculture companies in Spain, Greece, Italy and Cyprus (Dr. Nikos Papandroulakis, HCMR, personal communication). However, as long as greater amberjack production does not overcome its technical bottlenecks it will not be possible for new entrants to arrive in the market.

3.5 Rivalry

From a marketing perspective, greater amberjack has the following attractive characteristics:

- Excellent flesh quality
- Worldwide market availability
- High consumer acceptability (Nakada, 2000).

Greater amberjack has a fast growth rate (*i.e.*, short time to market size). Fish of 90 g reached 1 kg in a year, and 6 kg in a period of 2.5 years (Jover et al., 1999; Mazzola et al., 2000). Its large size makes this species very suitable for product diversification and development of value added products. Therefore, as soon as



greater amberjack is introduced in the market, and the positioning in relation to tuna is clear, this species has market potential given its attractive characteristics.

3.6 Considerations for actions of greater amberjack

Greater amberjack is a large fish with high quality flesh and good market value. These characteristics are a good base that offers multiple opportunities. This species has the potential to be interesting as a fresh product, frozen or further processed into added value products. In Europe, there has been interest to farm it, but production levels are miniscule. Therefore, a consumer oriented market introduction of cultured amberjack is necessary. Market orientation could facilitate demand-driven production by developing markets insight in potential countries such as Spain, Greece and Italy. In addition, market development is necessary for market growth through preserved formats and added value, once production increases.

4. Market competitiveness for pikeperch (*Sander lucioperca*) species products

4.1 Suppliers power

Pikeperch total aquaculture volume was 802 t in 2012, of which 26% is farmed in Tunisia, while other relevant producing countries are the Netherlands, Denmark and the Czech Republic (FAO, 2014).

Table 3. Pikeperch aquaculture production (t) in the main producing countries and world total (FAO, 2014).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Tunisia	40	58	56	51	59	90	192	196	198	227	189	172	212
Netherlands	0	0	0	0	0	0	0	80	80	80	100	120	120
Denmark	0	0	0	6	10	49	36	47	49	104	52	66	110
Czech Rep.	40	31	42	55	48	47	47	48	58	58	48	67	68
Ukraine	4	1	5	134	120	67	70	94	69	120	83	86	66
Romania	12	36	38	41	30	32	30	93	49	45	57	42	50
Germany	0	0	0	0	0	2	2	3	3	3	5	39	50
Hungary	34	25	27	23	34	28	30	32	28	40	39	46	44
Tajikistan	0	0	0	0	0	0	0	0	0	18	15	20	42
Bulgaria	19	-	35	59	0	0	0	1	12	23	18	16	19
Austria	2	3	2	2	2	2	2	2	3	2	3	11	10
Croatia	7	5	8	7	7	8	13	16	7	6	7	8	7
Total	363	366	227	397	321	341	436	627	576	747	642	720	802

Pikeperch from fisheries totalled 17,643 t in 2012, with Kazakhstan being the largest producer (5,550 t), followed by the Russian Federation and Finland. Pond pikeperch farming began to develop in Western Europe (e.g. France) in the second half of the twentieth century. It was produced in monoculture (summer fry) or in polyculture with carp (fall fry). From the beginning of the twenty-first century, recirculation aquaculture systems (RAS) were established in western Europe for farming pikeperch, but ten years later there were less than ten of these facilities working (FAO, 2014b). The use of RAS for the production of



pikeperch is considered necessary, because year-round production of pikeperch and relatively high growth rates (*i.e.*, production of 1.2 kg fish in 15 -18 months from non-selected strains) require constant high temperatures (24-26°C), which are only feasible in RAS. These RAS also allow for high densities of 80-100 kg/m³ (Dalsgaard et al., 2013).

The production costs and the amount of work involved in pikeperch farming are similar to those of other fish. Pikeperch has an average market weight of 750 g. Under optimal conditions, pikeperch can reach its selling weight in around seven months (Aqua resources AG, 2014). Supplier power for pikeperch is quite high at the moment, since a few producers dominate the market of chefs who are really interested in the product.

4.2 Buyers power

Pikeperch are sold mainly as whole fish to restaurants (via wholesalers), and only in small amounts to retailers. For restaurants, pikeperch is often processed and the dorsal muscle is sold alone. This fish is consumed in all European inland countries (western, eastern and northern parts) and is very appreciated. The main importers of pikeperch include countries of Western Europe, such as Germany, Austria and France (FAO, 2014b). Pikeperch is mainly sold fresh (Thefishsite.com, 2014) and is becoming increasingly popular around the world at restaurants. At present, surplus demand is covered mainly with frozen pikeperch arriving from Russia (Aqua resources AG, 2014).

Pikeperch is sold either as whole fish at a weight of 600-3000 g or as filets of 100-800 g to markets in Europe and North-America. The market value is high, around 8 to 11 €/kg ex-farm gate as whole fish (Dr. P. Fontaine, P9. UL, personal communication). Restaurants prefer fish weighing between 2 to 4 kg, for which they pay higher prices. Wholesale prices for pikeperch fluctuate significantly, but usually range from 4.6-10.3 €/kg (whole fish) with a mean of about 6.9 €/kg. In some countries, such as Germany and France, prices can be as high as 18.5 €/kg (FAO, 2014b). Given the scarcity of the product and the popularity of pikeperch, the buyer power is presently rather low.

4.3 Substitute products

Pikeperch has a neutral taste and has no near substitutes, considering the mild taste of freshwater fish in general. The nearest substitutes can be Pangasius and carp. For carp, competition is more local in Eastern Europe and seasonal, whereas Pangasius is distributed year-round throughout Europe and competing on price. Next to that, farmed pikeperch faces also competition from wild fisheries of the same species (Fig. 3). Cultured pikeperch demand has been strengthened by the strong decline of wild catches from Russia, Estonia and Finland: in past decades, it has been declining from 50,000 t in 1950 (FAO, 2009) towards ~17.000 t currently (FAO, 2014). However, fisheries are still more significant in volume compared to aquaculture.

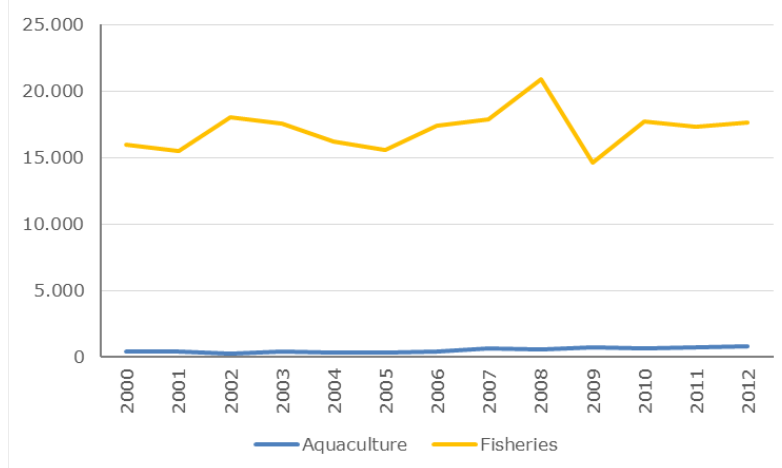


Figure 3. Pikeperch production volumes in 2012 measured in t (FAO, 2014).

4.4 New entrants

Numerous commercial production operations for pikeperch have been planned and/or are under construction in Belgium, Czech Republic, Denmark, France, Germany, Hungary, Italy, Poland, Portugal and the Netherlands. Over the last decade, 10 new farms have been built in Europe to produce pikeperch using RAS, producing an estimated 300-400 t each (Fontaine et al., 2012). However, pikeperch is still today difficult to rear to appropriate filet size (2+ kg round weight) (Meyer, 2013).

4.5 Rivalry

From a marketing perspective, pikeperch has the following attractive product characteristics (Meyer, 2013):

- Neutral taste
- Fast growth (in first year)
- High price
- Well-known and accepted species

Pikeperch flesh has a mild taste, thus lending itself to different forms of preparation. Its filets can be boneless, unlike carp, which competes on the same market segment (Dr. P. Fontaine, P9. UL, personal communication). Pikeperch farming still finds itself shadowed by trout farming (Aqua resources AG, 2014). The expansion of pikeperch culture depends on the technological improvement of farming in RAS.

4.6 Considerations for actions of pikeperch

There is already a market for pikeperch in Europe and North America, showing strong demand. To keep up the high market value, product development and market development is necessary for an orderly growth. Therefore, potential markets and consumer segments have to be identified to maintain or increase the added value. The main growth market of pikeperch are countries in western Europe, such as Germany and France, where surplus demand is met mostly with frozen pikeperch products arriving from Russia. Although the



frozen market is mainly a price market, current buyers of these products could be interested for fresh products supplied by European farms. Already, the production capacity of this fish is expected to grow fast in the coming years.

5. Market competitiveness for Atlantic halibut, (*Hippoglossus hippoglossus*) species products

5.1 Suppliers power

Farmed Atlantic halibut production in 2012 totalled 1,854 t, of which 1,741 t were produced in Norway (94%) (FAO, 2014). Smaller quantities were harvested in the United Kingdom and Iceland.

Table 4. Atlantic halibut farmed production in t (FAO, 2014).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Norway	0	0	424	427	631	1.197	1.185	2.308	1.587	1.568	1.610	2.767	1.741
UK	1	80	187	187	187	272	233	147	206	189	139	83	100
Iceland	34	93	120	95	0	0	110	31	39	49	72	33	13
Total	35	173	731	709	818	1.469	1.528	2.486	1.832	1.806	1.821	2.883	1.854

Captures of wild Atlantic halibut are stable around 6,500 t per year; nevertheless, this species is classified as endangered on the IUCN red list. Last year a complete ban was imposed on Icelandic fisheries and stocks along the Norwegian coast are under strict regulation. This situation is leading to a higher market demand for Atlantic halibut than cannot be met by fisheries alone (Dr. B. Norberg, P7. IMR, personal communication). Research and cultivation efforts of Atlantic halibut started in the 1980's, but after ten years of farming, production has stabilised around 2,000 t per year and growth expectation have not been met.

Atlantic halibut culture can be achieved in land-based tanks (with or without RAS) and in flat-bottomed floating sea cages. Atlantic halibut feeds and grows well at temperatures ranging from 8 to 15° C, and in areas where these temperatures are maintained for most of the year they can reach a market size of 3 to 4 kg in 24-27 months at sea (The Halibut Hyperbook, 2002).

The current farmed production of Atlantic halibut is unable to meet the demand for this species even considering captured fish. For this reason, supplier's power is high.

5.2 Buyers power

Demand for Atlantic halibut is estimated to be 10 times higher than supply. Demand in the United Kingdom is high and represents 41% of total world reported consumption. Germany is the second market with 38%, followed by USA with 9%, France with 7% and Sweden with 4% (Epsilon Aquaculture Limited, 2002).



Farmed Atlantic halibut has an excellent reputation, but is rarely available outside specialty restaurants due to low annual production. Atlantic halibut is sold mainly in restaurants (70%) and through retail (30%). Ten percent is processed into fillets and steaks (Dr. B. Norberg, P7. IMR, personal communication).

Wild Atlantic halibut placed on the market are mainly 5 to 10 kg fish. Farmed Atlantic halibut can achieve a premium price for even larger fish (Dr. B. Norberg, P7. IMR, personal communication). With a good fillet yield and portioning characteristics, there is also a market opportunity for smaller fish. Restaurants commonly use fresh Atlantic halibut, for which they are currently paying about 11.6 €/kg for eviscerated fish, or the equivalent of about 23.0 €/kg for skinless boneless portions. By the time halibut reaches the consumer, its value can reach 60 €/kg in restaurants and around 20 €/kg in retail outlets (Epsilon Aquaculture Limited, 2002). Since demand exceeds supply of Atlantic halibut, buyer power is low.

5.3 Substitute products

Atlantic halibut competes on the market with turbot and sole, two species with favourable market positioning and relatively high prices. Maintaining the positioning of Atlantic halibut as a highly appreciate fish remains an objective.

Competition with wild captured Atlantic halibut exists but even both productions added are unable to meet market demand. The similar quality Pacific halibut has maintained a higher level of supply, albeit with some fluctuations over periods of several years. Controlled by the International Pacific Halibut Commission, current quotas for this species in 2000 amounted to 28,000 t. The much inferior Greenland (or “black” or “mock”) halibut was not utilised until the early 1960’s, but reached a production peak of almost 180,000 t in 1971, and is still available at a level of some 80,000 t/year (Epsilon Aquaculture Limited, 2002).

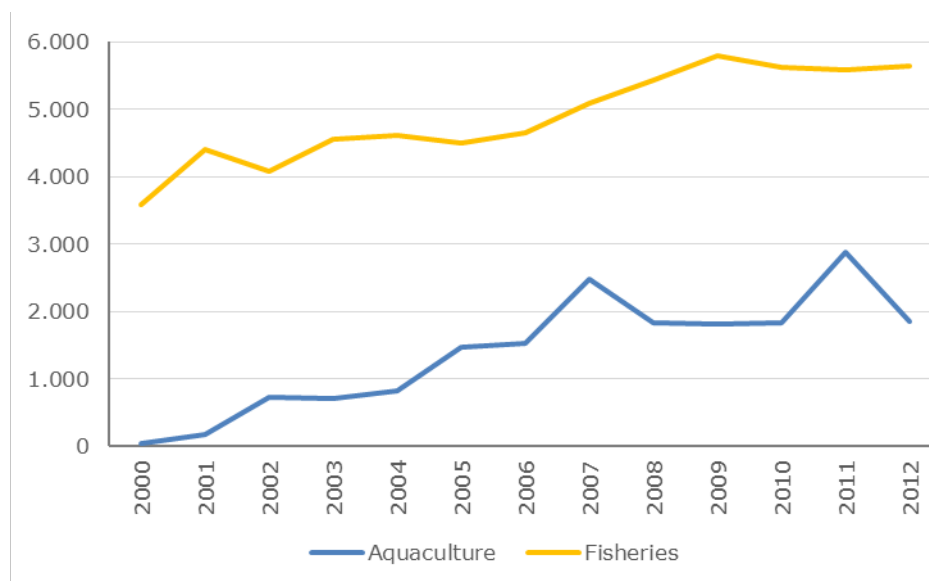


Figure 4. Atlantic halibut production volumes in 2012 measured in t (FAO, 2014).



5.4 New entrants

Even though considerable investment has taken place in Norway, the United Kingdom and Iceland for the farming of Atlantic halibut, production has stagnated since 2007 at a level lower than expected considering the attractiveness of the market for this fish. The main obstacle is the unavailability of sufficient juveniles for the stoking of farms because of difficulties in hatchery techniques. Furthermore, there is a need to decrease on-growing time to reach commercial sizes. For these reasons, new entrants presently pose a small risk to actual farming producers.

5.5 Rivalry

Atlantic halibut is a semi-fat fish rich in omega-3 fatty acids, with a characteristic flaky white meat and few bones. In terms of product diversification, Atlantic halibut is traditionally marketed as large steaks or cutlets. It can be smoked or marinated in the typical Scandinavian style (Dr. B. Norberg, P7. IMR). Atlantic halibut has a reasonably good fillet yield for a marine fin fish species estimated at some 50% of the eviscerated whole fish weight (Epsilon Aquaculture Limited, 2002).

There is a good niche for farmed Atlantic halibut in the foodservice sector, which is using farmed European sea bass as a substitute (Epsilon Aquaculture Limited, 2002).

5.6 Considerations for actions of Atlantic halibut

Atlantic halibut is a large fish with a very good reputation in the north European market and a high market value. Demand exceeds the current production capacity. Therefore, a first priority is product availability. There is a necessity for a market development strategy. The United Kingdom's market of Atlantic halibut accounts for most of the world reported consumption, and there is a good niche for farmed Atlantic halibut in the foodservice sector where there is a preference on the use of fresh fish. A market orientation aimed at the food service market of the UK could be a start. Besides that, the good fillet yield of Atlantic halibut confers this fish reasonable processing opportunities.

6. Market competitiveness for wreckfish (*Polyprion americanus*) species products

6.1 Suppliers power

No aquaculture production of wreckfish has been reported until 2012 (FAO, 2014). Capture of wild wreckfish accounted for 884 t in 2012, mainly from Portugal, Spain, the United States of America and Greece.

Farming of this fish is in an initial phase of development. The first successful experiments on wreckfish reproduction in Europe took place at the Institute of Aquaculture Hellenic Centre for Marine Research in Crete (Greece). Since 2009, the Spanish institutions Instituto Español de Oceanografía (IEO) of Vigo, and the Instituto Galego de Formación en Acuicultura (IGaFA) in Illa de Arousa, have cooperated on the



development of the production of wreckfish. Research carried out so far has focused on reproduction and on-growing (TheFishSite, 2012).

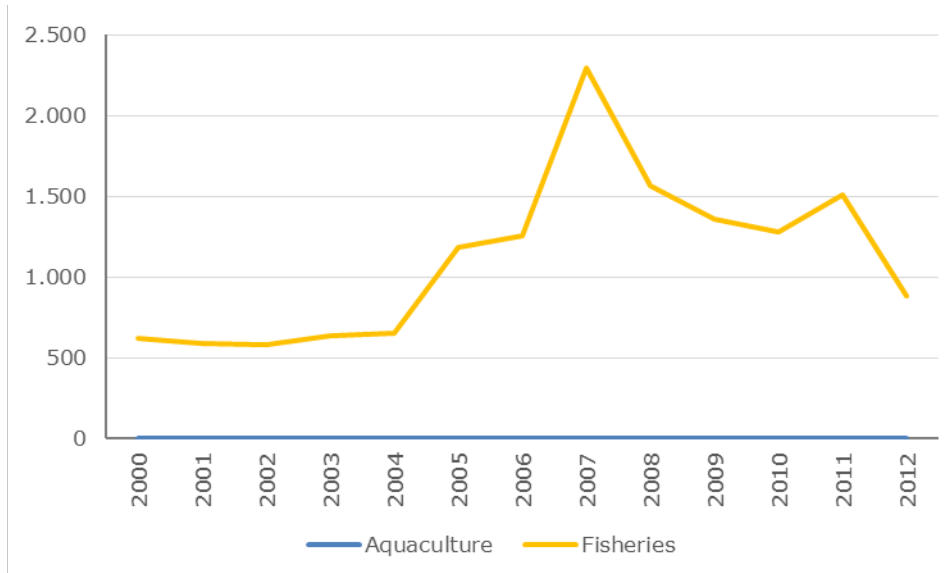


Figure 5. Atlantic halibut production volumes in 2012 measured in t (FAO, 2014).

Wreckfish can reach sizes up to 100 kg with a fast growth from 1 to 5 kg in a period of 10 months (Rodriguez-Villanueva et al., 2011). Being able to attain large sizes in a short time opens possibilities for processing (The FishSite, 2012). Furthermore, its global distribution offers a global market for exports (Dr. J. B. Peleteiro Alonso, P8. IEO). Presently, market prices for wreckfish are high and attractive for production.

Since wreckfish production is in a very early phase it is too early to speak of any supplier power.

6.2 Buyers power

In 2013, at Vigo's (Spain) fish market of 19,268 kg of wreckfish were sold with a value of € 290,375. Almost 100% came from the Azores (Portugal). In general, wreckfish of 5 to 10 kg are locally sold eviscerated to restaurants, local markets, while larger fish (10-25 kg) are sent whole to large markets like Mercamadrid or Mercabarcelona (Spain).

Wreckfish is a much appreciated fish in most markets and fetches high prices. Buyer's power is relatively low as both consumers and businesses demand them and supply is short.

6.3 Substitute products

The nearest competitor for wreckfish is hake. Hake has a medium size and moderate price on the market. Availability is high, but quality varies greatly depending on its sourcing. If production bottlenecks were



solved for wreckfish, and production and demand grew gradually, this species could be interesting for the high price segment of the market, encountering few substitutive products.

6.4 New entrants

New entrants to the supply of wreckfish are not expected, as present producers are virtually inexistent. Market development will be required to compete with wild wreckfish.

6.5 Rivalry

As there is no farming of this species rivalry can be considered inexistent.

6.6 Considerations for actions of wreckfish

Wreckfish is a large fish with excellent flesh quality and good reputation, but not available today as a farmed fish. When production bottlenecks get solved, a market orientation will require being developed in the long run in parallel with increasing production. Meanwhile, a market positioning will be necessary for the short run.

7. Market competitiveness for grey mullet (*Mugil cephalus*) species products

7.1 Suppliers power

The total world farmed grey mullet added 141,731 t in 2012 (FAO, 2014). Egypt being the main producing country with more than 91% and an extraordinary strong growth from 1998 till 2007, reaching 252,000 t/year and decreasing thereafter to 129,650 t in 2012 (FAO, 2014c).

Table 5. Grey mullet aquaculture production volume in 2012 measured in t (FAO, 2014).

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Egypt	80.530	96.924	113.027	135.609	132.651	156.441	231.619	252.507	209.313	209.980	116.029	114.001	129.651
Rep. Korea	993	1.453	3.926	4.100	4.442	5.501	5.660	4.921	6.159	5.606	4.680	4.869	5.862
Israel	1.661	1.633	1.824	1.705	1.792	2.108	2.087	1.983	2.121	2.048	2.125	2.169	2.338
Taiwan	1.468	1.516	2.824	2.077	2.341	2.320	2.591	2.718	1.265	2.036	2.555	2.417	1.665
China	629	540	411	148	577	548	766	481	513	646	811	773	824
Greece	548	491	298	402	509	391	635	471	395	276	350	394	390
Italy	3.000	3.000	254	3.000	96	73	95	601	458	482	478	358	380
Singapore	0	0	40	58	67	172	277	193	310	451	519	307	299
Tunisia	297	395	302	314	360	351	361	379	367	388	354	262	275
Saudi Arabia	0	35	20	22	18	0	0	12	10	10	38	40	40
Guyana	0	0	0	0	0	0	0	0	0	35	35	19	7
Total	89.127	105.987	122.932	147.435	142.853	167.905	244.091	264.266	220.911	221.958	127.975	125.610	141.731



Wild grey mullet from fisheries topped 130,139 t in 2012, of which China accounts for 86% (122,271 t).

Farming of grey mullet has been practiced for centuries, but production of this fish in Europe has been small and non-intensive (Nash & Koningsberg, 1981; Pillay, 1993). Since the early 1960s, grey mullet has been cultured in semi-intensive ponds together with tilapia and carps in Egypt. Grey mullet is today a very important aquaculture species in this country, where its farming has been traditional in the *hosha* system in the Nile delta region for centuries. In Taiwan, nearly 40 percent of the total commercial production (fisheries and aquaculture) grey mullet has been pond reared since the 1960s, being cultured with carp in ponds. Traditional “vallicoltura” (or “valli”) methods employed for raising mullet are now advanced, especially in Italy (FAO, 2014c). Grey mullet can be cultured in earthen ponds, coastal lagoons, “valli” and deserted Salinas that exist throughout the EU Mediterranean countries. Grey mullet females can be grown to 1.9 kg in 2 years (Dr. W. Koven P4.IOLR, personal communication).

Still today, the grey mullet farming is a capture-based aquaculture, relying exclusively on the capture of wild fry (ca 1,000,000,000) that are grown out to market weight (600 to 1200 g) in captivity.

Unfortunately, mullets in general have a negative consumer’s image in most parts of Europe because of their filter feeding activities in harbours and other not very clean waters that provide them an unpleasant taste. Mulletts raised in clear waters are of excellent quality and taste, but this bad image fact needs to be addressed.

The supplier’s power of grey mullet farmers is low due to the high quantities produced, the small size of its favourable markets and its low image outside these, having its reflection in the low price of this fish.

7.2 Buyers power

The market for grey mullet is restricted to certain regions in the Mediterranean where it is well established. It is also consumed in many Asian countries. However, it is not a desired fish in many other countries, such as non-Mediterranean and Western Europe and the United States of America. Most, if not all, of farmed mullet is consumed in the producing countries where increasing demand exists. There is no known export market.

Grey mullet is usually sold fresh, but salted and fermented mullet is considered as a delicacy in Egypt and some other Arab countries (FAO, 2014c).

7.3 Substitute products

The main competition for farmed grey mullet is its wild captured counterpart. Substitutes of grey mullet are whitefish in general. Grey mullet is very well known for people with an Arabic background and is regarded an important segment to start distribution of these fish throughout Europe.

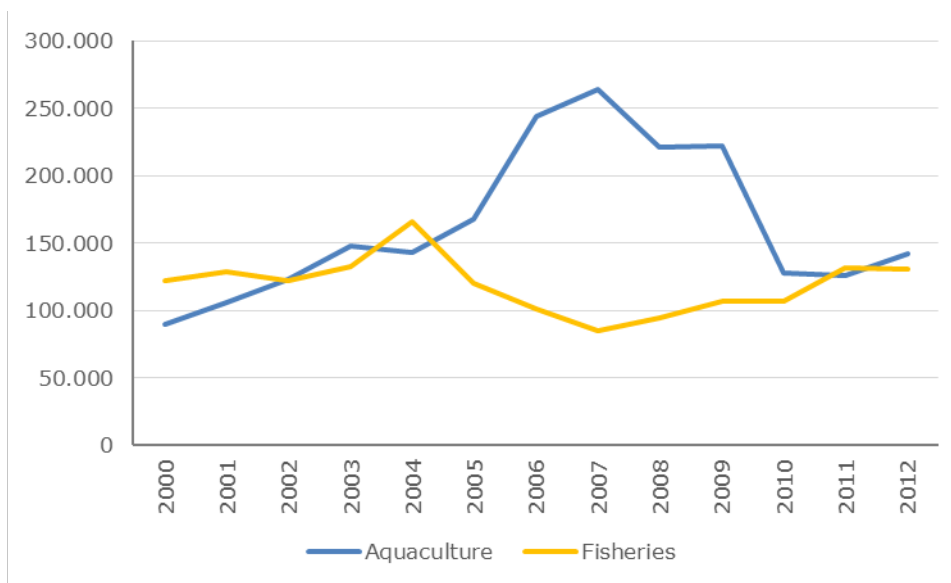


Figure 6. Grey mullet production in 2012 expressed in t (FAO, 2014).

Most of the reported increase in grey mullet production is a result of the increased production from Egypt, which is the largest producer (92 percent in 2012). There are no clear trends in production in the other major countries rearing this species (Republic of Korea, Italy, Taiwan Province of China and Israel) (FAO, 2014c).

7.4 New entrants

The future expansion of grey mullet farming is limited because it depends mainly on wild fry. Egypt, the largest producer of cultured mullet, has only one experimental mullet hatchery that annually produces a few hundred thousand fry. While most of the cultured mullet in Italy originates from hatchery-produced fry, limited fry availability restricts potential limits expansion of the activity. The future is therefore uncertain and the investment in this activity is declining which makes the risk of new entrants small.

Even though there is a desire of aquaculture producers to export their product, grey mullet with its limited potential, is becoming less attractive; the substitution of this fish with higher market potential is becoming a trend (FAO, 2014c).

7.5 Rivalry

Grey mullet aquaculture has the advantage of providing, not only affordable whole fish and fillets, but also fish roe (“bottarga” in Italian), a high value product (>100 €/kg), with a market that is expanding around the Mediterranean. Furthermore, grey mullet has a great biological and economical potential for product diversification and development of value added products supported by its herbivorous feeding habits (Dr. Bill Koven (IOLR)).



Current market development occurs without any marketing effort by the aquaculture industry. The European market demand for grey mullet is likely to increase in the coming years, due to the demand from immigrant population originating from North Africa, Middle East and Asia (Dr. Bill Koven (IOLR)).

7.6 Considerations for actions of grey mullet

Grey mullet is a medium size herbivorous fish for which the market is well developed around the Mediterranean. The potential market is all over Europe, especially within segments of population of North African, Middle Eastern or Asian origin. Market and new product development are necessary for growth in the middle-long run in the native European market and the immigrant market.

8. Analysis of competitive forces

8.1 The bargaining power of suppliers

The bargaining power of suppliers for the species selected in the DIVERSIFY project is presently low because of the small quantities produced, or their complete inexistence. Status of production and favourable conditions of access to the markets are key to the industries competitiveness. Growth in production and sales will depend upon the capacity of producers and processors to offer products in demand, namely fillets, at good prices. The strategy the producers will deploy will be decisive for their competitiveness. A question to be addressed is for which markets to produce. Will these markets be local and offering a single product to traditional fishmongers, or will producers be aiming to selling throughout Europe? Some species can be marketed all over Europe, were others will remain local. These decisions will configure production size, product assortment and price.

8.2 The buying power of buyers

The buying power of buyers, customers of fish farmers, is high for all fish because the former have many sourcing alternatives. Presently, all fish have substitutes that can fulfil consumer demand. Getting access to markets at the *right* price with the *right* product is a key factor in the success of any aquaculture project (FAO, 2007). Supermarkets and multiple-retailers are nowadays the main distributors of fish throughout Europe. For the higher quality farmed fish products, hotels and restaurants offer a more favourable outlet.

Key success factors for supplying retailers, and somehow controlling buyer's power, are good service and permanent supply through well planned production, handling, transporting and marketing operations, as has been shown for European sea bass (FAO, 2007).

Price competitiveness is probably the primary enticing factor, as it was for the success of Nile perch as well as it has been proven with the boom in Pangasius sales. Most communication efforts of supermarkets and multiple-retailers are based on advantageous prices and the sales promotions. Well organized and advertised price promotions can generate a three-to-five times sales increase. Furthermore, as is the case with European sea bass, salmon and others, these are often commercialised under the umbrella of retailers' private brands.



DIVERSIFY's deliverable 27.2 on current certification schemes and standards and their business dynamics in the fish supply chain addresses the problematics with the conditions that producers need to fulfil and to be able to sell under such quality label.

8.3 Substitute products

The six DIVERSIFY species are bound to enter very tight existing fish markets. In these, well-developed products and marketing strategies make competition fierce and many products can act as substitutes. Even in the case of well-known species with strong product development substitutes still exist. Three market segments can be potentially occupied by the new species given the right price and volume: large volume with low prices, medium volume with medium prices, and the exclusive segment with high prices. For each species, the key question is, what volume and for what prices can it be delivered to a certain market?

For aquaculture producers, prices are determined by their production costs and the decision on the selection of a market segment will depend on the development of production and processing as well as efficiency in organising its supply chains. Betting exclusively on price competition against competitors is a risky decision and means addressing a single market segment. A better option is to diversify in market segments and products by processing these into added value products. This strategy spreads the risks and is a better defence against substitutive products.

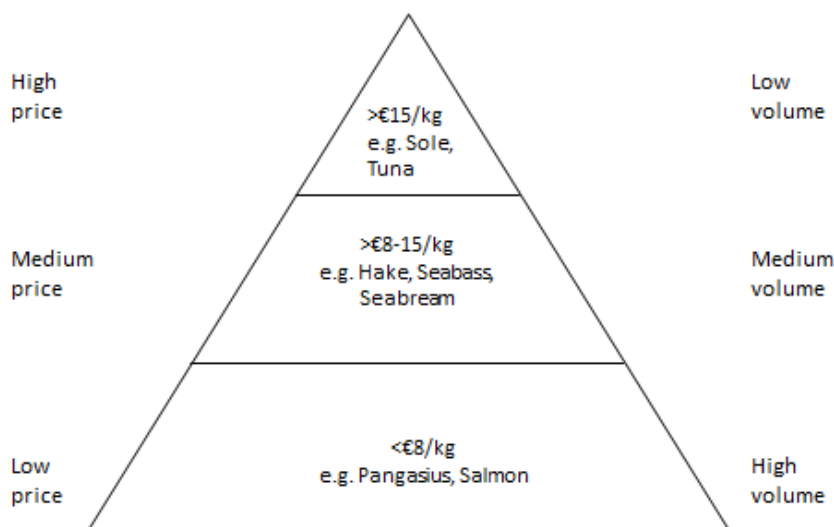


Figure 7. European retail market for fresh fish divided in three segments (prices from FAO, 2014).

8.4 Intensity of competitive rivalry

For most industries, the intensity of competitive rivalry is the major determinant of the competitiveness of an industry and has to do with factors such as innovation, level of advertising expense, powerfulness of competitive strategies and business consolidation ratios. For the new species of DIVERSIFY these can be



offset against market performance of the rivalry products. Previous analyses showed that performance can be counteracted against the status of other products at the moment of introduction in the market with availability in volume throughout the year, overall appetite for fish in the specific country (FAO, 2007). These characteristics differ for each species. Market performance of other farmed fish is good, as for Nile perch, Pangasius, Atlantic salmon and rainbow trout, whereas market performance is moderate for European sea bass, gilthead sea bream and tilapia, and market performance is considered to be low for farmed cod.

The following actions could be considered for the DIVERSIFY species:

Meagre

Meagre is a large fish with excellent taste, but it is not well known by consumers and for the European market it is still a niche product. Substitute fish are European sea bass and gilthead sea bream that have been commercialised throughout Europe for years slowly gaining market share. Meagre producers and retailers should develop a marketing plan considering taking advantage from the reputation of European sea bass, for example. Competing only on price is not recommendable, therefore additional consumer demands need to be addressed.

Market orientation for meagre can target the major markets for European sea bass and gilthead sea bream and are located in southern Europe, where both species have their place in the fishing and gastronomic traditions (FAO, 2007). Therefore, meagre could start marketing first in Italy, Spain and France, but also benefit from the reputation of European sea bass for the northern European markets. In northern Europe consumers do not demand whole fish and prefer filleted products.

Production should focus on fish of around 1 to 2 kg. Small-sized meagre (400–700 g) are not considered suitable for marketing. Product development is also recommended as meagre is excellent raw material for the seafood processing industry as it has excellent fish growth and conversion ratio and is year round available. New product development could support market development.

Reputation building needs to start preferably with a common European name to create scale efficiencies in marketing. Meagre should consider its positioning with regard to gilthead sea bream and European sea bass for both fresh fish and processed.

Greater amberjack

The greater amberjack is a large fish with high flesh quality and good market value. Substitute fish is tuna that is offered at all segments like fresh, frozen and canned. The challenge for greater amberjack is to differentiate itself enough from tuna and to compete in price. In Europe, production levels of this species are negligible. A consumer oriented market introduction is necessary. Market orientation could facilitate demand-driven production in potential countries like Spain, Greece, Italy and Cyprus. Finally, market development is necessary for growth while preserving added value on price, once production is increased.

Pikeperch

A market presently exists for pikeperch in Europe and North America, showing strong demand. Substitute fish are pangasius and carp. Even though pangasius is getting well known in Europe at affordable prices, pikeperch is acknowledged as being more tasteful but at a higher price.



To maintain pikeperch market value high, product development and market development are necessary alongside organised growth. Therefore, potential markets and consumer segments have to be identified to maintain or increase the added value for further development. The main markets for further growth of pikeperch are western European countries as Germany, Austria and France, where extra demand is met mostly with frozen pikeperch imported from Russia. Already, the production capacity of this fish is expected to grow in the coming years once technical bottlenecks on RAS are solved.

Atlantic Halibut

Atlantic halibut is a large fish with a very good reputation in the north European market and a high market value. Demand exceeds the current production capacity. Therefore, product availability needs to be the first priority. Substitutes are sole and turbot that are targeted at the top segments of the markets. However, a market development strategy is required for the long run for a sustainable Atlantic halibut industry. Consumption of Atlantic halibut in the UK accounts for most of the consumption of this species. A good niche for farmed Atlantic halibut exists in the foodservice sector that prefers fresh fish, therefore market orientation could be focused on the UK food service market as a start. Because of the good fillet yield of this species, the processing of Atlantic halibut is also an option.

Wreckfish

Wreckfish is another large fish with excellent flesh, but not available today as farmed. The main substitute product is hake. A market orientation needs to be developed in parallel to production. Market positioning in relation to other species is necessary for the short run, and for the long run, its market potential will require to be identified.

Grey mullet

Grey mullet is a medium size herbivorous fish for which some small niche market are well developed around the Mediterranean. Substitutes are other whitefish in general. Grey mullet is very well known for people with an Arabic background and is regarded an important market segment to start the distribution of these fish. Its potential market is all over Europe, especially within segments of immigrant population of North African, Middle Eastern or Asian origin. Market and new product development will be necessary for growth in the middle-long run in grey mullet's native European market and for the immigrant market.

9. Conclusions

This document reviews the Key Forces of Competitive Position for the DIVERSIFY species in the fish markets. On the supply side, strategic questions are to be addressed, as for example to what market the producers should aim, production size and other issues as quality and product diversification, in order to obtain a competitive position.

The main challenge on the demand side for the DIVERSIFY species is to compete with current substitutes. Price will be a crucial factor, besides quality and service. The new species will face competition on price from cheap imports mostly from third countries outside the EU, and from established aquaculture species that for many years have been developing their position.

Market orientation should decide on the assortment of products for sale and the range of species, but this differs between Mediterranean countries and Northern Europe. In addition, other marketing mix questions such as the use of packaging and brands need to be analysed. When it comes to products, origin and



distribution patterns, the European market is to be considered as diverse, with great variations between countries. Each national market has its own characteristics, though some common traits may be found in neighbouring countries.

This competitive analysis reflects that most of the DIVERSIFY species are not well known today as farmed fish, although some are as wild captured fish. In all cases, farmed production is relatively small in relation to the wild catch. Meagre and Atlantic halibut are the only candidate species with a significant farmed production sold in the European market. However, the other species are relatively unknown.

Regarding market development, much has to be done on brand awareness and recognition. Competing species are well known, as for example tuna, hake, sole, turbot, pangasius, carp, European sea bass and gilthead sea bream. This competitive analysis shows that if the objective of the candidate fish species is to penetrate the market with value added products they must face long established products, like new greater amberjack in front of established tuna markets, or pikeperch for carp.

The main challenge on production development for the new species is to choose appropriate buyers and the selection of market segments in which these species and their products can have a competitive advantage.



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