



## New species for EU aquaculture

### Deliverable Report

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**Objective:** The aim of this deliverable is to identify opportunities for the new species based on a synthesis of the expertise developed in the socio-economic Work Packages of the DIVERSIFY project resulting in providing policy and strategy recommendations with the potential to make the European aquaculture sector more competitive, and to create more of a level playing field in relation to aquaculture production in developing countries. Apart from this, system dynamics simulation models that help predict international diffusion of the EU produced fish species of this study are developed. The models factor in the SME's international relations and other (e.g. cultural) linkages between geographical markets.

**Description:** Report on EU and international market development plans and recommendations. Conclusions regarding the best options for internationalization to help the industry/SMEs to shape their international expansion strategies. Suggestion for policies that may stimulate growth/internationalization, based on the potential bottlenecks identified. Assessment is based on the results of WPs 27, 28, 29 and the previous tasks of WP30.

**Deviations:** This deliverable is delayed by two months, since it was dependent on finishing other deliverables in other Group WP's and within this Group WP (GWP Socioeconomics).



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## Summary

Aquaculture consumption in the EU is concentrated on a limited number of species, in part cultured in the EU and in part cultured in other European countries or even in Asia, South America and Africa. The main objective of DIVERSIFY is to support diversification of the European aquaculture industry and help in expanding EU production, increasing new innovative aquaculture products and developing new markets.

This deliverable summarizes results of the entire Group-WP (Socio-economics) and presents an exploration of internationalisation strategies based on diffusion models per country (Part I), as well as strategy and policy recommendations for the selected species and countries (Part II).

The Socioeconomic GWP spans across WPs 27-30. Its objectives have been addressed in a number of Deliverables, as below:

- In *WP 27*, the competitive field and market developments in trends, certification and market demand developments have been described.
- In *WP28*, on the basis of consumer research in focus groups in selected EU fish markets (i.e. the countries France, Germany, Italy, Spain, and UK) more than 40 new product ideas have been developed for the new species. Scientists involved in the project have done all kind of studies in monitoring the quality of the new products and defining the organoleptic characteristics of the species. Ultimately, a technical assessment was made of the new products in this WP.
- In *WP29*, cross-cultural market segments were identified and characterised for their potential to adopt new fish products. A selection of the new products developed in WP28 were sensory tested in these market segments and for this selection ideal consumer value perceptions were identified by analysis of extrinsic product attribute combination. Ultimately, on the basis of the outcomes of the former tasks, the effectiveness of different types of marketing communication has been tested.
- In *WP30*, the input of the former WP's is transformed in business models for the new species. Next to that an online market test with greater amberjack as selected species has been performed and it has provided insights in the acceptance.

**Part I** of this Deliverable builds on the virtual market test reported in Deliverable 30.6. Based on consumer's willingness to buy and observed need for extra information assumptions regarding innovation and social contagion are made. It allows for modelling speed of adoption per country. Based on this and adoption levels /volume suggestions regarding which launch strategy to use in the EU are developed.

In **Part II** of this Deliverable, based on above mentioned results of the work done in the GWP, overall conclusions will be drawn. More specifically, an overview of the relevant trends that set the stage for the DIVERSIFY-species is provided as well as specific recommendations per species on how their market can be developed. This part ends with strategy and policy recommendations for further market development and expansion of the DIVERSIFY species.

The authors would like to emphasize that the outcomes of this GWP are not only applicable for the new species. Important outcomes of the socio-economic work might also give insights on how other aquaculture species or even wild catch species could be marketed in the five selected countries. Especially some of the generic consumer tests gave lots of insights for other species too. Next to that, the chosen approach might be usable or inspiring for market introduction or market development of other species.



# **Part I**

## **Exploration of internationalization strategies**



## Exploration of internationalization strategies

### 1.1 Introduction

A farmer of a new fish species may try and sell its products in the firm's domestic market, but he may also look at other markets in the EU or even worldwide. As markets are becoming more global and competitors more international, considering internationalization as a strategic component may not be a choice but rather a necessity. Harmonization of market regulations across the EU fuels this development.

The aim of this part of the Deliverable is to determine the best market opportunity and internationalization approach using diffusion modelling based on the results of Deliverable 30.6. Diffusion refers to the time for first purchase and spreading of a new product or innovation in a market from the perspective of the consumer (Sultan, Farley and Lehman, 1990; Peres, Muller and Mahajan, 2010). For the internationalization strategy part, we will account for two strategies: waterfall and sprinkler. The waterfall strategy refers to the sequential introduction of a product in different markets, whereas the sprinkler strategy concerns simultaneous introduction of the product in multiple international markets.

More specifically, in the DIVERSIFY project, five target fish markets were included and studied, i.e. France, Germany, Italy, Spain and UK. The research question now is: "Which internationalization strategy a provider can best use to launch its product in these countries and conquer the market?" To answer this question this study will draw on the results of Deliverable 30.6 regarding consumer acceptance of the new species/products in these countries and use it to analyze adoption and diffusion in these countries. Consistent with the empirical data of Deliverable 30.6 the effort will focus on internationalization for providers of *greater amberjack* (fillets) as an exemplary commercially viable product species.

### 1.2 Method

A three-stage approach was adopted and implemented:

First, briefly the results of Deliverable 30.6 are reviewed and discussed to determine the attractiveness of each country for the new species. This stage concerns a static view of the market based on the data regarding consumer adoption recorded in the online market test.

Second, diffusion models per country are estimated. The effort begins with estimating the parameters that are the input of these models. Specifically, it involves the identification of the initial adoption rate ( $p$ ) and social contagion factor ( $q$ ) (to be explained in more detail later). The resulting diffusion curves for each of the five countries are compared and conclusions drawn regarding the attractiveness of each market. Suggestions regarding order of entry of markets for the new species are also provided. Compared to the descriptive approach of the first stage this involves a much more dynamic perspective.

Third, the two different internationalization strategies are studied. Specifically, we study the required production volume to meet customer demand of a waterfall and a sprinkler approach. This information is important because entering a market makes sense only if production levels can keep up with market development. Up to date, production volume of farmed greater amberjack is extremely limited, and this information is important.



### 1.3 Static perspective on acceptance of greater amberjack in target countries

The results and conclusions reported in Deliverable 30.6 form the backdrop for the development of more detailed advice about internationalization strategies of providers of the new species.

The results of the (virtual) online market test reported in Deliverable 30.6 showed good acceptance of greater amberjack and its fillets in all five target markets (see **Table 1.1**). Two facts support this conclusion. First, the new product has the potential to make serious in roads because the percentage of first-time buyers was approximately 12.5% for each country, except France where the percentage of consumers that bought greater amberjack was slightly lower (10.0%), and Italy where it was significantly higher (16.2%). Although not every one of these first-time buyers might like the taste of the new fish and thus repurchase it, the specific result does suggest that the new product has potential. Second, a large group of consumers are willing to switch to the new species. Those that had not selected greater amberjack in the online market test received additional information and then were asked if they wanted to reconsider their decisions. A significant number of consumers switched towards the new species. Overall, 11.0% switched (see **Table 1.1**, last column second line). The highest levels of switching occurred in France and Spain, i.e. 14.7% and 13.8%, respectively. These potential extra buyers add to the notion that the new species would seem well received by the market, particularly as consumers had been confronted with alternative species too.

Aggregating the number of people that directly or indirectly (after receiving extra information about the new species) purchased greater amberjack, a total acceptance rate of 25% percent of consumers could be calculated. However, considering the variation in the percentage between countries a *difference between Mediterranean versus non-Mediterranean countries* was noted. The Mediterranean countries enjoy a higher level of acceptance than the non-Mediterranean countries, i.e.  $\pm 25\%$  versus  $20\%$ .

**Table 1.1.** Acceptance of greater amberjack by consumers in the five target countries.

Acceptance of greater amberjack	Country					Total
	UK	Germany	France	Italy	Spain	
1.Chosen greater amberjack	38 (12.0%)	39 (12.0%)	32 (10.0%)	52 (16.2%)	40 (12.5%)	201 (12.5%)
2.Not selected. but willing to switch	27 (8.5%)	30 (9.2%)	47 (14.7%)	28 (8.7%)	44 (13.8%)	176 11.0%
3.Not selected, but willing to consider	130 (41.0%)	142 (43.7%)	98 (30.6%)	160 (49.8%)	158 (49.4%)	688 42.9%
4.Not selected, indifferent to extra info	122 (38.5%)	114 (35.1%)	143 (44.7%)	81 (25.2%)	78 (24.4%)	538 (33.6%)
<i>Aggregate: % that chose &amp; switched to greater amberjack†</i>	<i>(20.5%)</i>	<i>(21.2%)</i>	<i>↔ (24.7%)</i>	<i>(24.9%)</i>	<i>(26.3%)</i>	<i>(23.5%)</i>
Total	317 100.0%	325 100.0%	320 100.0%	321 100.0%	320 100.0%	1603 100.0%

Source: Deliverable 30.6

†: sum of rows 1 and 2.



A dichotomy in the French market was noted also; the French are positive towards greater amberjack on the one hand, but have many people uninterested and even rejecting the new species too (44.3%). In contrast, the level of uninterested consumers in the Spanish and Italian market is rather low, only 24-25%.

Based on this, Italy and Spain were identified as most appealing markets for providers of greater amberjack to enter first. Actually, based on the most positive attitude of Italian consumers, the suggestion is *to first enter Italy, and then Spain* (see Deliverable 30.6).

Using diffusion modelling analyses, we will now develop a dynamic perspective on the expected diffusion of the new fish species in our five target markets.

## 1.4 Dynamic perspective on acceptance of greater amberjack in target countries

### 1.4.1 Diffusion modelling

A popular diffusion framework is the Bass model (1969). The Bass model considers the aggregate first-purchase growth of a category of a product introduced into a market with potential market size of  $m$  (i.e. maximum potential number of buyers). The social network into which it diffuses is assumed to be fully connected and homogenous. At each point in time, new adopters join the market as a result of two influences: external influences ( $p$ ), such as advertising and other communications initiated by the firm, and internal market influences ( $q$ ) that result from interactions among adopters (consumers) and potential adopters (consumers) in the market, the latter generally referring to as contagion. The probability that a consumer will adopt the innovation — given that s/he has not yet adopted it—is linear with respect to the number of previous adopters. The model parameters  $p$ ,  $q$ , and  $m$  can be estimated from the actual adoption data (Peres, Muller and Mahajan 2010).

The Bass (1969) model specifies the rate at which actors who have not adopted yet do so at time  $t$  as  $r(t) = p + qF(t)$ , where  $F(t)$  is the cumulative proportion of adopters in the population, parameter  $p$  captures the intrinsic tendency to adopt, and parameter  $q$  captures social contagion. Assuming that one starts with zero adoptions ( $F(0)=0$ ), the formula can be also be written as  $F(t)=[1-e^{-(p+q)t}]/[1+(q/p)e^{-(p+q)t}]$  (Van de Bulte and Stremersch, 2004). This implies that the curve is S-shaped when  $q > p$ , and more pronouncedly when the  $q/p$  ratio increases. A  $q$  higher than  $p$  refers to a difficult picking up of the market in the beginning but acceleration thereafter; it requires the provider to pay much attention to win over innovators to jump start the market. We will use this formula to compute the diffusion curves per country.

First the parameters for the model, i.e.  $p$  and  $q$  per country will be identified.

### 1.4.2 Parameter settings

**Table 1.2** provides an overview of the data collected and used to determine  $p$  and  $q$  for our diffusion models. The data of the upper part of the table are borrowed from Deliverable 30.6 (compare e.g. **Table 1.1**). In row A, the percentage of consumers that immediately chose greater amberjack in the online store experiment is shown. In row B the joint percentage of people is listed that (i) directly purchased greater amberjack and (ii) switched to it after receiving extra information. Also, those willing to consider the new species are indicated in row C.

**Table 1.2** also includes secondary data, for example regarding the market share of tuna in the respective countries (data taken from the experiment of D30.6). Since greater amberjack is similar to tuna, its market share may serve as a point of reference.



Also, the percentage of innovators in each national market is included in the table. Because Deliverable 29.4 identified innovators as the most likely first buyers, their percentage is important information for determining the value of  $p$ .

Finally, the maximum market size ( $m$ ), i.e. the percentage of consumers that may purchase and consumer greater amberjack is mentioned. It concerns the total market, i.e. 100% minus the percentage of consumer that explicitly expressed no interest in the new species.

In the lower half of **Table 1.2**, the total national fish consumption in 2016 per country is listed (EUMOFA 2017). It will be used later to determine required production volumes of the waterfall and sprinkler strategies of internationalization. As best estimate of the maximum greater amberjack market potential (in terms of the Bass model:  $m$ ) the market share of row B is used, averaging it with its closest competitor's market share, i.e. tuna. It is multiplied with each country's fish consumption to obtain the total required maximum volume in kg. Finally, each country's share in the five-country-international market is calculated. As the data of row I show, Spain represents the largest percentage (in volume) because it makes up almost half of the total market (of the five countries). Italy is second with approximately 22% of the 5-country total volume. Germany is by far the smallest market for greater amberjack (less than 4% in five country total), with France and UK holding middle positions.

**Table 1.2** Data for diffusion model estimation.

Parameter	Description	UK	G	F	I	S
A1. market share GA in experiment†	% of all consumers directly bought GA in experiment	12.0%	12.1%	10.0%	16.0%	12.5%
A2. market share GA in experiment†	% of innovators that directly bought GA in experiment	16.9%	20.4%	15.0%	22.5%	26.3%
B. market share GA after extra info provided†	% all consumers directly bought plus % switched to GA after extra info	20.5%	21.2%	24.7%	24.9%	26.3%
C. potential extra market share GA after extra info†	% consumers interested to consider GA after extra info	41.0%	43.7%	30.6%	49.8%	49.4%
D. market share Tuna in experiment†	% Tuna directly bought in experiment	13.9%	18.9%	17.2%	26.0%	27.0%
E. share of innovators in market†		39.1%	34.8%	37.8%	49.8%	40.3%
F. max. market coverage GA†	100 +/- % that was not interested in GA	61.5%	64.9%	55.3%	74.8%	75.6%
G. total fish consumption 2016 in country (kg)†		304.738	68.083	225.659	330.088	666.055
H. estimated market potential (vol.) GA ( $m$ )	$(A+D)/2 * G$ , i.e. (% market shares GA plus tuna)/2 *kg	52385	13666	47261	84038	177368
I. volume share of country in 5 country total		14.0%	3.6%	12.6%	22.4%	47.3%

† source: Deliverable 30.6; ‡ source: EUROFA 2017





### Identifying $p$ and $q$

From the above data the values for  $p$  and  $q$  of the Bass model are derived. A two alternative sets of  $p$ ,  $q$  values are distinguished: (i) a standard and (ii) a more innovator based one (see **Table 1.3**).<sup>1</sup>

*Standard.* As a proxy for  $p$  this approach uses the *percentage of all consumers* that immediately bought greater amberjack (see **Table 1.2**, row A1). As proxy for the contagion factor  $q$  it uses the joint percentage of switchers and those willing to consider/try the new species (from deliverable 30.6). It is multiplied by the percentage in the market potentially interested in the new species (100% minus those not interested in greater amberjack) (see **Table 1.2** row F). This part of the market may be affected by any word-of-mouth in the market.

*Innovator based/focused.* As proxy for  $p$  this approach only includes the *percentage of innovators* that bought first time around the new species in the experiment (see **Table 1.2** row A1). For the contagion factor it accounts for the innovators that were willing to consider and the non-innovative consumers that bought or were willing to consider the new species (from Deliverable 30.6). Again, the number was multiplied with the market potential for greater amberjack, i.e. 100% minus those not interested (see **Table 1.2** row F).

**Table 1.3** Proxies for  $p$  and  $q$  derived from the experimental data

Estimation	description	UK	G	F	I	S	
Standard	$p1$	% of all consumers bought first time around	0.120	0.120	0.100	0.162	0.125
	$q1$	% switchers and considerers *(100%- %uninterested consumers)	0.305	0.343	0.251	0.438	0.477
more innovator focused	$p2$	% innovators that bought first time	0.169	0.204	0.150	0.225	0.155
	$q2$	innovators that considered plus none that bought/switched/considered*(100%- %uninterested consumers)	0.338	0.375	0.275	0.475	0.524

### 1.5 Results: Estimated diffusion curves of target markets

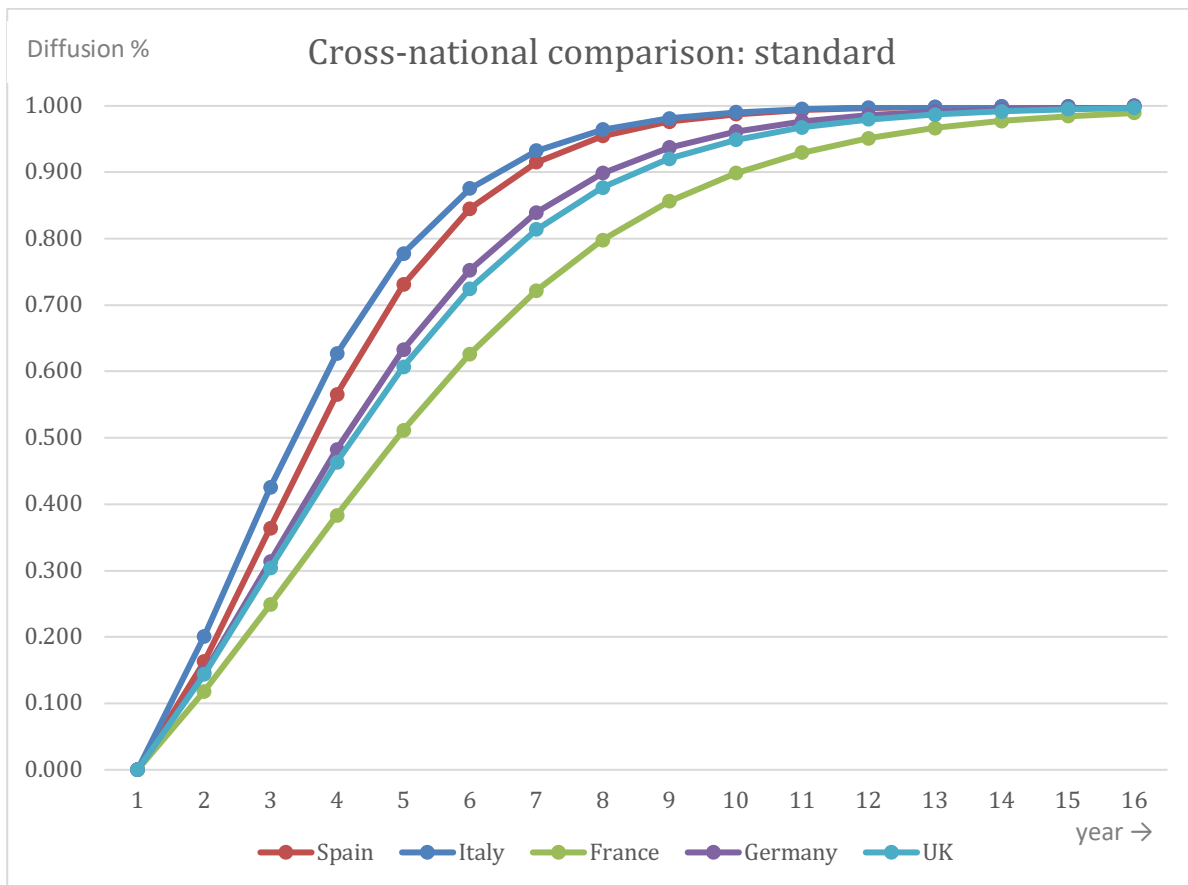
Using the above parameters for  $p$  and  $q$  and the formula of  $F(t)=[1-e^{-(p+q)t}]/[1+(q/p)e^{-(p+q)t}]$ , the standard and more innovator focused curves were estimated.<sup>2</sup> Below the curves for all five target countries are presented together in a single figure. **Figures 1.1** and **1.2** show results for (i) the standard  $p$  and  $q$  values, and (ii) for the innovator based/focused  $p$  and  $q$  values, respectively. The detailed calculations/results per country are reported in Appendix A.

<sup>1</sup> Diffusion studies have generally focused on durables and not food products and thus most information on  $p$ ,  $q$  values pertains to those products. Van der Bulte and Stremersch (2004) report a 10%–90% range of 0.001–0.083, and mean of .027 for  $p$  of durable products; and a 10%–90% range of 0.128–0.690 with a mean value of 0.419 for  $q$ . Sultan et al. (1990) in their meta-analyses reported similar values. For the  $q$  values we thus are close to the mean/mid-range. For  $p$  we are at the top of the range, which may not be strange given the fact that we are looking at food products which are rather affordable and similar to existing products on the market, i.e. Tuna.

<sup>2</sup> Given the simple model structure of the data Excel rather than system dynamics (software) was used.

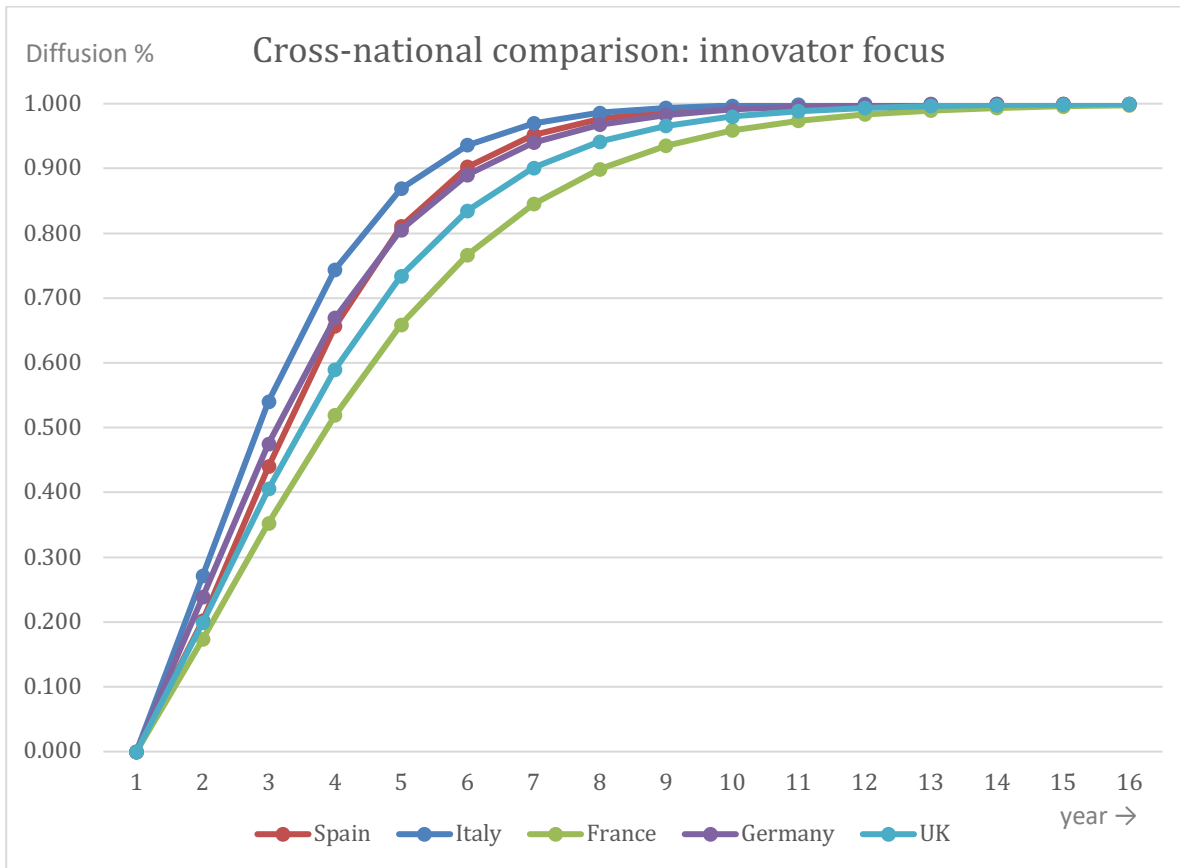


**Figure 1.1** shows the results for the exercise using the *standard*  $p, q$  values. All curves follow the standard pattern of evolving from zero to 100% adoption/diffusion (vertical axis: 0 and 1.0 respectively). Consistent with the results of Deliverable 30.6, Italy is found to be the market with most speedy adoption and fastest diffusion of the new species. Spain is the second most innovative market, i.e. second quickest take off and steepest curve. These two countries should be targeted first. The German, UK and French markets could be addressed next, although we do note that the size of the German market is limited in volume. Interesting is that the French market lags behind. This is caused by its low  $p$  and  $q$  values and ratio. The low set of initial adopters (see e.g., **Table 1.1**) gives it a slow start while the ration explains it less pronounced curvature.



**Figure 1.1** Diffusion curves for the five target countries using standard settings for  $p, q$

**Figure 1.2** shows the results using the more *innovator based/focused settings* for  $p, q$ . Here too, the Italian market is the most innovative and fastest diffusing one. However, accounting better for the innovators in the market place, now Spain and Germany ex aequo end up in second place. Like in **Figure 1.1**, it can be observed in **Figure 1.2** particularly that the French market lags behind. This is a new insight since in Deliverable 30.6, France seemed at least moderately attractive. As mentioned, the difference can be traced back to the market's low initial adoption rate and a much lower set of people willing to consider the new fish species after receiving extra information (i.e. low  $p$  and  $q$ ).



**Figure 1.2** Diffusion curves for the five target countries using innovator-oriented settings for  $p, q$

## 1.6 Internationalization strategies

### 1.6.1 Waterfall versus sprinkler strategy

Two different internationalization strategies are generally distinguished in the literature, i.e. waterfall and sprinkler (e.g. Peres et al. 2010). The waterfall strategy is used by a company to introduce a product sequentially in different markets. The sprinkler strategy is used when a company chooses to introduce a product simultaneously in multiple markets. The sprinkler strategy works particularly well for a company that wants to be a first mover or one that wants to preempt moves by competitors. It requires vast resources and production capacity. The waterfall strategy, in contrast, allows the company to take time to understand a market and make appropriate adjustment to its marketing mix in order to satisfy the specific needs of each market. It also requires serious resources but as markets are addressed one by one it is easier to control.

### 1.6.2 Exploring consequences for product capacity

Forecasting market diffusion is an important tool when planning to address a market through internationalization (Kim, Hong and Koo, 2013). It can help a firm understand and plan for the right production capacity at the right time. Below we forecast the effects of a waterfall and a sprinkler strategy respectively and



compute market volume development of each approach overtime. For the waterfall strategy, the focus should be on the first two countries to enter, i.e. launching in the Italian market at period (year) 1; and in the Spanish market in period (year) 2. Combining Italy and Spain is favorable based on the diffusion curves of these countries, but also given the cultural and retail linkages between the two countries. For the sprinkler strategy, we assume the immediate and thus simultaneous launch in all five targets in period (year) 1.

The estimations of market potential for greater amberjack in the countries are taken from **Table 1.3** and entered in the diffusion model presented above. It results in resulting market volumes for each period in time. The estimations use the standard values of  $p$ ,  $q$ .

The development of market demand (volume) of a waterfall strategy consecutively involving Italy and Spain are reported in **Table 1.4**. The table shows the results of launching in Italy in period t1 and in Spain in t2. We see that for year 1 a production capacity is required of 16.9 tons. In year 2, 64.6 tons are necessary, increasing to 165.7 tons in year 4.

**Table 1.4:** Waterfall internationalization strategy, market volume of greater amberjack development.

ESTIMATED REQUIRED PRODUCTION VOLUME (in kg)			
period	I	S	Total Volume
t1	16913	0	16913
t2	35714	28899	64613
t3	52689	64522	117211
t4	65367	100332	165700

**Table 1.5** shows the development of market volume for a sprinkler internationalization strategy. The example assumes launching the new species in all 5 target markets simultaneously. This sprinkler strategy requires a volume of 60.9 tons in year 1, increasing to a volume of 259 tons in year 4. A firm implementing this strategy should be able to step up production rapidly to match the development of market demand in the five markets. The firm should master its production well, and be able and willing to scale up efficiently.

**Table 1.5:** Sprinkler internationalization strategy, market volume of greater amberjack development

ESTIMATED REQUIRED PRODUCTION VOLUME (in kg)						
period	UK	G	F	I	S	Total Volume
t1	7535	2004	5587	16913	28899	60938
t2	15905	4291	11758	35714	64522	132190
t3	24273	6596	18107	52689	100332	201997
t4	31804	8648	24177	65367	129663	259658



## 1.7 Conclusions and discussion

The current results show the diffusion curves for greater amberjack in each of the five target countries of the DIVERSIFY project. The input for the models were the market research data from the online store test reported on in Deliverable 30.6. Consistent with results of this prior deliverable, current results show that Italy is the most innovative and attractive market with the fastest adoption and diffusion of the new species. Spain is the second most innovative and thus interesting market to consider. Italy and Spain are also the most interesting based on market volume; expected market potential are 84 and 177 tons annually, respectively. However, we should note that this conclusion may be limited to greater amberjack fillets and not processed products. Italian consumers had lower acceptability values for the different processed products developed (see deliverable 29.4).

Interestingly, the current results show the French market to be less attractive than we expected based on the static results of Deliverable 30.6. The dichotomy in the market between adopters and consumers who reject the new product, but also the lower percentage of initial adopter as well as low percentage of people willing to consider the new species played a much more significant role in the dynamic perspective, suggesting that diffusion in France may be more difficult and slower. This result should be compared and weighted against the large size of the French market. The German market is, in fact, more interesting – except that the latter country's market size (volume) is rather small. Still, Germany may be a wild card for launching the new species, particularly if production volume for farmed greater amberjack is and remains limited.

The results of the exploration of the two internationalization strategies, i.e. waterfall and sprinkler, provided important new insights regarding production volumes required for each alternative internationalization approach. Since current production levels of farmed greater amberjack are extremely limited this is important to consider. The results suggested that a sprinkler approach requires the ability to ramp up production quickly. It requires a tremendous production capacity, which is currently unavailable. Hence, the waterfall approach focusing on Italy and then (in year 2 or later) Spain, makes more sense. A benefit of this approach also is that the launch can be tailored to local conditions and offers the provider and its partner i.e. retailers the opportunity to learn from the launch in the (previous) lead country.

Still, in the short run production capacity may even be too low for the waterfall option involving both Italy and Spain. If so, the provider(s) may choose either a launch on a limited scale, e.g. in Italy only and, for example, limiting itself to a particular region before scaling up. Alternatively, the firm may decide to first experiment in a small volume country like Germany. Production location and market access may, of course, play a role in these decisions too.

The current results offer solid information to make these important internationalization decisions and ensure future growth for the firms making use of these opportunities. Nevertheless, due to the type of data available the results are specific to greater amberjack (fillets) and difficult to generalize to the other species and products of the DIVERSIFY project. A follow up study, e.g., DIVERSIFY II, could help address and cover this gap. The current findings clearly show the importance of extending general studies of consumer willingness to adopt new species to test market conditions where competing options are present. Positive results of such 'real life' tests bolster seller confidence and thus are an important step in successfully bringing new species and products to market.



# Part II

## Marketing strategies and policy recommendations



## 2. Introduction

### 2.1 Background

The EU-funded DIVERSIFY project contributes to the sustainable expansion of the European aquaculture industry by promoting species' diversification and a more consumer-oriented product development. The project has identified a number of new/emerging finfish species, with a great potential for the expansion of the EU aquaculture industry. The main emphasis in the project is on Mediterranean cage-culture, fish species suitable for cold-water, pond/extensive and fresh waters aquaculture. In addition, the new/emerging species were selected based both on their biological (e.g., fast growing) and economical (e.g. large finfish marketed at a large size and processed into a range of products) potential. The fish species to be studied include meagre (*Argyrosomus regius*) and greater amberjack (*Seriola dumerili*) for warm-water marine cage culture, wreckfish (*Polyprion americanus*) for warm- and cool-water marine cage culture, Atlantic halibut (*Hippoglossus hippoglossus*) for marine cold-water culture, grey mullet (*Mugil cephalus*) a euryhaline herbivore for pond/extensive culture, and pikeperch (*Sander lucioperca*) for freshwater intensive culture using recirculating systems. Most importantly, the above species cover the entire European geographic area and stimulate different aquaculture types.

At the start of the project, all species had a number of technical issues that needed to be solved to either allow for bringing the species to market, or for the expansion of their production. These issues were covered in the WPs dealing with Reproduction and Genetics (WP2-7), Nutrition (WP8-13), Larval husbandry (WP14-19), Grow out husbandry (WP20-23) and Fish health (WP24-26). The Socio-economics WP concentrated on describing the institutional and organizational context (WP27), new product development (WP28), marketing strategies based on consumer insights (WP29) and developing business models for the new species (WP30).

Although a great success has been achieved to solve these initial bottlenecks (see the final Species Manuals), at the end of the project, production of most of the studied species is still low and steady marketing support is needed to be able to compete with the production of species in non-European countries. This deliverable, therefore, summarizes all essential insights generated throughout the project's life span about how the market for these species can be developed, based on the insights obtained within the socio-economics work packages of the DIVERSIFY project.

Bear in mind when reading the strategy and policy recommendation that making predictions about customer adoption of the new fish species remain difficult, since consumer data collected used fish from alternative sources, or were simply based on virtual settings, *i.e.* description of the flavour/type of fish to consumers. Verification of results and extra market tests using actual products based on farmed species using DIVERSIFY results would be useful and necessary.

### 2.2 Aim of the deliverable and evolvement of species and products

The aim of this deliverable was to identify opportunities for the new species based on a synthesis of the expertise developed in the socio-economic Work Packages of the DIVERSIFY project (*i.e.* the Deliverables of WP27-30, as well as the papers published or under review, see **Table 2.1**). More specifically, on the basis of the synthesis carried out in this deliverable, policy and market strategy recommendations are provided with



the potential to make the European aquaculture sector more competitive, and to provide a level playing field with respect to production in developing countries.

**Table 2.1:** Overview of Deliverables and articles published or under review/ in preparation

Deliverable & Title		Related articles (published or in preparation)
D27.1	Report on external environmental factors that affect or will affect the production chains of meagre, greater amberjack, pikeperch, Atlantic halibut, wreckfish and grey mullet	
D27.2	Report on current certification schemes and standards and their business dynamics in the fish supply chain	
D27.3	Report on competitive analysis for the supply chains of meagre, greater amberjack, pikeperch, Atlantic halibut, wreckfish and grey mullet	
D27.4	Report on trend mapping for the European aquaculture, seafood sector and protein market in the (near) future	
D27.5	Report with results of international survey on industrial buyers' attitudes and perceptions regarding cultured fish	
D27.6	List of critical success factors for market acceptance	
D27.7	Report on the analysis of the business models and supply chains of the participating SMEs	
D28.1	Report with results of focus groups with consumers and experts regarding ideas for new products	Banović, M., Krystallis, A., Guerrero, L., Reinders, M.J. (2016). Consumers as co-creators of new product ideas: An application of projective and creative research techniques. <i>Food Research International</i> 87, 211-223.
D28.2	List of ideas for new product development	Alexi, N., Byrne, D.V., Nanou, E., Grigorakis, K. (2018). Investigation of sensory profiles and hedonic drivers of emerging aquaculture fish species. <i>Journal of the Science of Food and Agriculture</i> , 98 (3), 1179-1187.
D28.3	Report on product and process solutions for each species based on technological, physical and sensory characteristics	Lazo, O., Guerrero, L., Alexi, N., Grigorakis, K., Claret, A., Perez, J.A., Bou, R. (2017). Sensory characterization, physico-chemical properties and somatic yields of five emerging fish species. <i>Food Research International</i> 100, 396-406.
D28.4	Physical prototypes of new products from the selected species meagre, greater amberjack, wreckfish, pikeperch and grey mullet	





D28.5	Report on results of quality evaluation study on basic quality characteristics of the developed products	Grigorakis, K. (2017). Fillet proximate composition, lipid quality, yields, and organoleptic quality of Mediterranean-farmed marine fish: A review with emphasis on new species. <i>Critical Reviews in Food Science and Nutrition</i> 57, 2956-2969. Alexi N., Nanou E., Lazo O., Guerrero L., Grigorakis K., Byrne D.V. (2018). Check-All-That-Apply (CATA) with semi-trained assessors: Sensory profiles closer to descriptive analysis or consumer elicited data? <i>Food Quality and Preference</i> 64, 11-20.
D28.6	Report on results of sensory descriptive analysis of the developed products	Lazo, O., Claret, A., Guerrero, L. (2016). A comparison of two methods for generating describing attributes with trained assessors: check-all-that-apply (CATA) vs. free choice. <i>Journal of Sensory Studies</i> 31, 163-176.
D28.7	Report on correlation of technical quality with nutritional - rearing history	
D28.8	Technical assessment of selected species	
D29.1	Dataset of consumers' perceptions, attitudes, buying intentions, consumption, willingness to buy and pay, and value perceptions towards the selected species in the five countries investigated	Banovic, M., Reinders, M.J., Claret, A., Guerrero, L., Krystallis, A. "One Fish, Two Fish, Red Fish, Blue Fish" or How Ethical Beliefs Impact "Blue" Products Purchase Intention? <i>Article under review Journal of Business Ethics</i>
D29.2	Report on the segmentation analysis based on consumer value perceptions about the selected species in the five countries investigated (value-based segmentation task)	Reinders, M.J., Banović, M., Guerrero, L., Krystallis, A. (2016). Consumer perceptions of farmed fish: A cross-national segmentation in five European countries. <i>British Food Journal</i> 118, 2581-2597.
D29.3	Development of the actual product samples from the selected species for the sensory testing with consumers in the five countries investigated	Lazo O. (2018). Development of new products from aquaculture fish species. PhD Thesis, University of Girona, 13 <sup>th</sup> February 2018, Girona, Spain.
D29.4	Report on the actual products' sensory profiling in the five countries investigated	



D29.5	Development of the product mock-ups for use in the experimentation with consumers in the five countries investigated	Banovic, M., Reinders, M.J., Claret, A., Guerrero, L., & Krystallis, A. Take it or leave it: Impact of health and nutrition claims, country-of-origin and eco-label on consumer choice of new aquaculture products. <i>Article under review Food Policy</i>
D29.6	Report on the experimentation with product mock-ups in the five countries investigated and identification of the optimal intrinsic-extrinsic product quality profiles for targeted segments	
D29.7	Development of the stimulus (i.e. written and broadcasted information material) that will be used in the communication experiments in the five countries investigated	Banovic, M., Reinders, M., Guerrero, L. & Krystallis A. (2018). On the product processing effect: The impact of goal framing and priming on product attitude formation. <i>Journal of Consumer Behaviour</i> , in preparation.
D29.8	Report on the experimentation with the communication stimulus and evaluation of their effectiveness in changing consumers attitudes and behaviour towards the products coming from the selected fish species	
D30.1&2	30.1 - Report on value propositions for the producers and partners 30.2 - Report on indications of resources for creating customer value for the specific products	
D30.3	Guidelines to cultivate buyer-supplier relationships per species	
D30.4	Revenue (pricing & costs structures) model per species	
D30.5	New product marketing strategies per species and product	
D30.6	Report on results of test markets per species	
D30.7	Feasibility study	
D30.8	Report on EU and international market development plans and recommendations	

**Table 2.2** provides an overview of what has been done in the different stages of the project. For each stage, we refer to the relevant Deliverables. We started by putting efforts in translating the species into relevant consumer end products. At first, we generated, based on consumer focus groups, 43 new product ideas (Deliverables 28.1 and 28.2). These ideas were reduced to twelve by using expert assessments. Provided that wreckfish is not available as farmed fish, it was not possible to create prototypes out of this species and to conduct further consumer tests. Accordingly, the effort on new product development was only made on the available farmed fish species. Furthermore, Atlantic halibut was excluded from further market tests because the companies involved with producing Atlantic halibut developed their own marketing and product development plans. With the resulting four selected species (i.e., grey mullet, greater amberjack, pikeperch and meagre), 12 prototypes were developed, i.e., three for each species (Deliverable 28.4). Next, based on these results, 6 products were selected for a consumer sensory test using consumer panels in all five target countries (Deliverables 29.3 and 29.4). Except for the ready-to-eat salad from meagre and fillets rather than paté for pikeperch, the same products were also used to develop relevant value propositions (Deliverable 30.1 & 30.2). Based on the scores of sensory profile attributes, but also on scores of overall liking after visual inspection of mock-ups of the different products, the set of alternatives has been reduced to a final set of 3



products for two species (i.e. greater amberjack and grey mullet) (see Deliverables 29.5 and 29.6). Finally, after considering the results of consumer tests to examine the optimal intrinsic-extrinsic product attribute combinations in mock ups' labelling, as well as upon consultation with collaborating DIVERSIFY partners, it was decided that the product selected for the final studies on market communication and online market test should reflect the most versatile species in terms of processing possibilities. As a result, greater amberjack was selected to represent all products as it best reflects all the benefits of the DIVERSIFY production method (see Deliverables 29.7, 29.8 and 30.6).

**Table 2.2:** Product evolution over the six species

	<b>Deliverables</b>	<b>Greater Amberjack</b>	<b>Grey Mullet</b>	<b>Meagre</b>	<b>Pikeperch</b>	<b>Wreckfish</b>	<b>Atlantic Halibut</b>
List of ideas for new product development	D28.1; D28.2	43 ideas (not species specific)					
Developing physical prototypes of products	D28.4	<ul style="list-style-type: none"> <li>Frozen fish fillet (seasoned/ marinated)</li> <li>Fresh fish steak for grilling in the pan</li> <li>Ready-made fish tartar with additional soy sauce</li> </ul>	<ul style="list-style-type: none"> <li>Thin smoked fillets</li> <li>Fresh fish fillet with different 'healthy' seasoning and marinades</li> <li>Ready-made fish fillets in olive oil</li> </ul>	<ul style="list-style-type: none"> <li>Frozen fish fillets with different recipes</li> <li>Ready to eat salad with fish</li> <li>Fish burgers shaped as fish</li> </ul>	<ul style="list-style-type: none"> <li>Fish spreads / pate</li> <li>Ready-made fish tartar with additional soy sauce</li> <li>Fresh fish fillet with different 'healthy' seasoning and marinades</li> </ul>		
Products developed for sensory testing with consumers	D29.3; D29.4	<ul style="list-style-type: none"> <li>Fresh fish steak for grilling in the pan</li> </ul>	<ul style="list-style-type: none"> <li>Thin smoked fillets</li> <li>Ready-made fish fillets in olive oil</li> </ul>	<ul style="list-style-type: none"> <li>Ready to eat salad with fish</li> <li>Fish burgers shaped as fish</li> </ul>	<ul style="list-style-type: none"> <li>Fish spreads / pate</li> </ul>		
Business model development (value propositions)	D30.1+30.2	<ul style="list-style-type: none"> <li>Fresh fish steak for grilling in the pan</li> </ul>	<ul style="list-style-type: none"> <li>Thin smoked fillets</li> <li>Ready-made fish fillets in olive oil</li> </ul>	<ul style="list-style-type: none"> <li>Fish burgers shaped as fish</li> </ul>	<ul style="list-style-type: none"> <li>Fish fillets</li> </ul>		
Development of product mock-ups for consumer testing optimal intrinsic-extrinsic product quality profiles	D29.5; D29.6	<ul style="list-style-type: none"> <li>Fresh fish steak for grilling in the pan</li> </ul>	<ul style="list-style-type: none"> <li>Thin smoked fillets</li> <li>Ready-made fish fillets in olive oil</li> </ul>				
Product stimuli used in communication experiment	D29.7; D29.8	<ul style="list-style-type: none"> <li>Fresh fish steak – low processed product</li> <li>Smoked fillet – medium processed product</li> <li>Fish burger – high processed product</li> </ul>					
Online market test	D30.5; D30.6	<ul style="list-style-type: none"> <li>Fresh fish fillets</li> </ul>					



### 3. Setting the stage

In order to develop suggestions on how to further promote growth and market expansion, this chapter provides an overview of relevant trends, which as a whole set the stage for the market development of the DIVERSIFY species. The information provided is a summarization of the deliverables with respect to work packages 27, 28, 29 and 30 and the papers (published or under review). Therefore, more information about these trends and references can be found in the relevant deliverables.

#### 3.1 Trends in favour of the DIVERSIFY species

*(The key sources used are noted below each section.)*

##### Production does not meet demand

Though the EU is the fourth biggest producer of fisheries and aquaculture products, it is not self-sufficient in seafood and relies on imports, see **Table 3.1**. Only the categories ‘flat fish’ and ‘other marine fish’ are able to exceed 50 per cent, other are far below a self-sufficiency rate of 100 per cent.

**Table 3.1:** Self-sufficiency rate (in %) by commodity group provided by delivered by the European Market Observatory for Fisheries and Aquaculture Products, edition 2017.

	2006	2013	2014	2015
Flatfish	83	79	75	76
Freshwater fish	20	18	20	23
Groundfish	29	22	25	25
Miscellaneous aquatic products	7	20	18	7
Other marine fish	49	69	66	65
Salmonids	36	31	30	29
Tuna and tuna-like species	26	29	34	27

Aquaculture represents about 20% of EU’s seafood consumption. In terms of different beliefs and attitudes towards wild and farmed fish, no significant differences have been found across product samples under study, except for the belief that farmed fish is cheaper than wild fish, and the belief that wild fish tastes better than farmed fish. As such, there seems to be positive initial beliefs for local aquaculture products on the European market.

*Key sources: D27.4, D29.5 & D29.6*

##### Consumer’s preferences are changing

In terms of fish supply security (i.e. enough fish to feed EU consumers), aquaculture is considered vital for the future of fish consumption. Research within the DIVERSIFY project points to some relevant drivers of



consumer preferences for fish products and common denominators to market new aquaculture products across Europe:

*Markets converge.* In Southern Europe, fish consumption levels are higher and consumption habits are more traditional than in Northern and Western Europe. While the majority of South Europeans know how to prepare fish, consumers in Northern and Western Europe generally have less experience with whole fresh fish and prefer portioned and ready-to-eat products. However, fish markets across Europe seem to converge. Differences in eating preferences become smaller –this trend is driven by younger consumers and large international retailers and foodservice suppliers continuously gaining market share. Moreover, minority populations grow faster than native populations in most countries, so ethnic developments change the eating habits and assortments in supermarkets.

*Convenience.* Retailers in all countries indicated that the shelf space for fillets and processed fish is increasing in their product assortment, while traditionally whole fish was preferred. The studies carried out within the socio-economic work packages of DIVERSIFY showed an increasing demand for ready-to-eat and easy-to-cook value added fish products too. For instance, in France one of the retail buyers stated: “*we have focused most of our development on processed products, like fillets, steaks and smaller cut pieces*”. An aquaculture product that is flexible or has the ability to be “dressed up in different manners” and possesses the capacity to be prepared faster and easier would be the product that could surprise positively and fulfil consumer needs better. The demand for convenience foods is expected to increase still further over the long term.

*Environmentally friendliness.* Future potential for aquaculture also depends on whether farmed fish species are ethically treated in terms of its growing and catching techniques, as fish was seen as the “protagonist” that needs protection and (fish) welfare. This further suggests that aquaculture products with environmentally friendly claims would be more likely to be accepted by consumers, especially by specific more conscious segments. As environmentalism is positively perceived in some countries, this could also be considered as extra unique selling point when designing the final marketing strategy. Concerns about the environment and some unsustainable aquaculture practices just add to previous and have undoubtedly raised justified consumer concerns about aquaculture. In addition to this, sustainability certification is increasingly used as an industry quality indicator: important is how farms are managed, and how the supply chain is managed. Consumer research showed that a pro-environmental message and ASC logo both were important communication cues that positively affected consumers’ attitude towards a new fish product.

*Locality.* Additionally, results of this project reveal that the use of a country-of-origin (COO) label in general, and “produced in own (domestic) country” in particular stimulates EU consumer to think more positively about the product besides increasing the probability of its purchase. As previously found by Balabanis and Diamantopoulos (2004) consumer ethnocentrism (*i.e.* belief that one’s own culture is superior to other cultures) can be a strong predictor of COO evaluations.

*Healthiness.* The research further pointed to individuals who are concerned with their health and well-being as potential target group of consumers of new aquaculture products. Not only would their main expected motive fulfilment be keeping themselves and their family healthy, but also to fulfil their personal values of well-being and self-respect. This could be further traced to natural, unprocessed or minimally processed products, specifically the perceived absence of industrially processed fish, where health-giving properties would be a sign of a good aquaculture practice. More knowledge on these aspects would be crucial for the development of proper health claims that could transfer this perception into new aquaculture products.

*Taste:* still or nevertheless, this study has demonstrated once more the relevance as taste as one of the key drivers of consumer preferences.

*Packaging.* Fish packaging should be convenient. Furthermore, as indicated in the focus groups, transparent packaging and ability to see the product are those characteristics that the consumer would more



likely to seek after. These results further point out that packaging and package features should be always considered in combination with new product development, as certain features such as transparency make an appeal to consumer preferences and can be one of the important instances for aquaculture product differentiation.

*Accompaniments.* Finally, the focus groups with consumers further revealed the importance and need that new aquaculture products should be combined with sauces, marinades, herbs or other food products, but also preparation suggestions or recipes, in order to be more of more value by consumers. In line with this, the online store test showed that consumers like to have a comparison with a well-known product when buying new products as these species. Furthermore, previous studies on seafood and fish have shown that accompaniments with serving and cooking suggestions have an important impact on consumer seafood choice and fish consumption.

*Key sources:* D27.1, D27.4, D27.5, D28.1, D29.4, D29.5 & D29.6

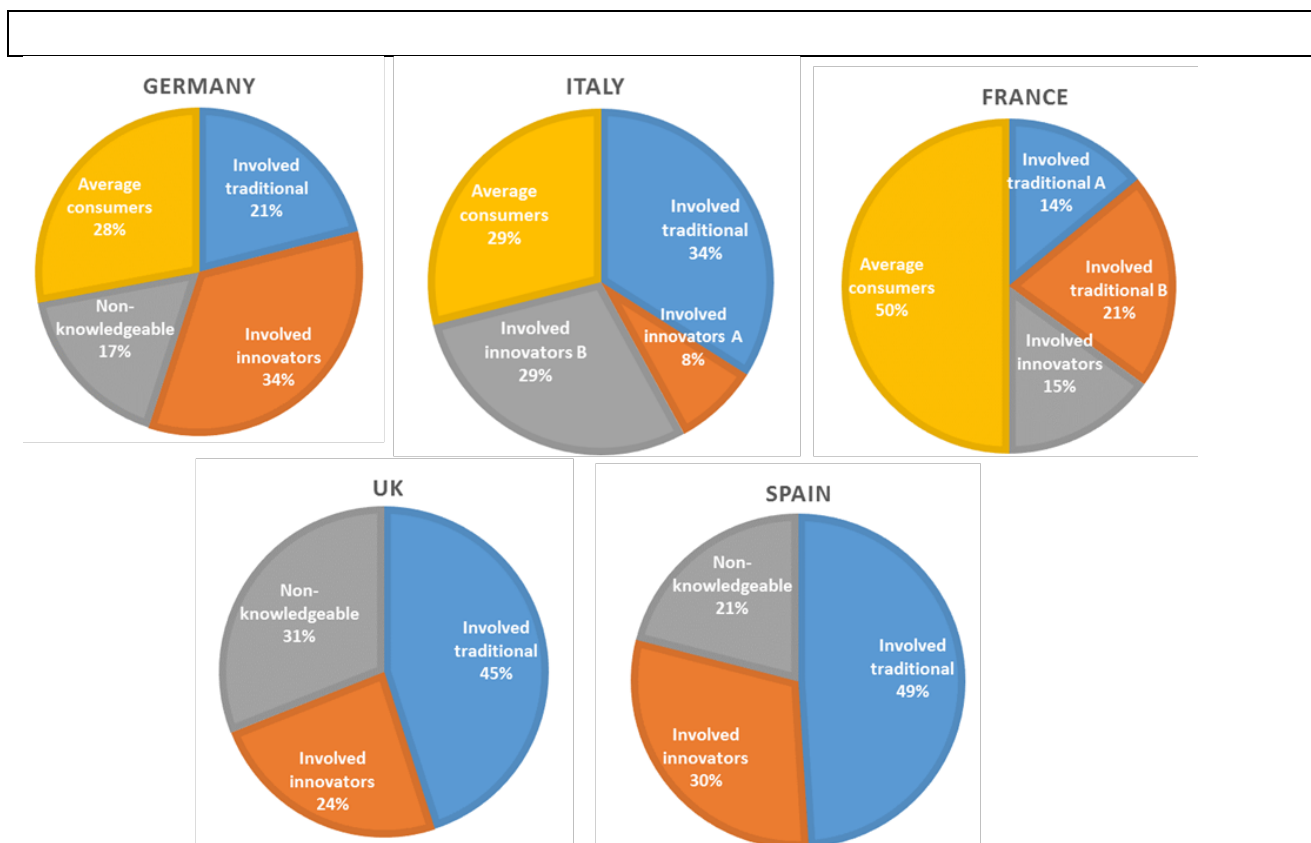
*Products can be marketed all over Europe, especially to involved consumers*

The segmentation study of WP29 within the DIVERSIFY-project revealed two main market segments across the top-5 EU fish markets, allowing for the identification of the target groups of potential consumers of the new fish products, i.e., the (involved) “traditionals” and the (involved) “innovators”. These two market segments have been profiled on the basis of the different geographic, demographic, psychographic and behavioural characteristics that allowed for better understanding of the needs and preferences of the each segment across and within the five countries examined, with the highest potential for maximized consumer value perceptions. The profile of those segments appears in **Table 3.2** and **Figure 3.1** presents the segmentations for the individual countries.

*Key sources:* D29.1, D29.2

**Table 3.2:** Profile description of two main market segments.

<p><b>Involved innovators:</b></p> <ul style="list-style-type: none"><li>- represent consumers who are very involved in and knowledgeable about fish products</li><li>- at the same time quite innovative, when it comes to new farmed fish species</li><li>- showed the highest perceived value in association with the new farmed fish species</li><li>- showed the lowest perceived costs in association with the new farmed fish species</li><li>- highest expected outcomes in terms of satisfaction and trust</li><li>- open to new experiences with regard to fish products, but even more of new fish species</li><li>- being highly aware of the environmental problem caused by overfishing and actually seeing the future in farmed fish production.</li></ul>	<p><b>Involved traditionals:</b></p> <ul style="list-style-type: none"><li>- are involved and knowledgeable about fish consumption</li><li>- see it more as a ‘cost’ that this consumption might bring, being ware of safety issues and efforts to attain the proper fish products.</li><li>- more conservative and reserved regarding the new experiences in fish products in general</li><li>- hold the strongest positive beliefs regarding farmed fish production</li><li>- being also aware of its possibilities both in connection to the environment but also regarding the hedonic aspects of fish consumption.</li><li>- prefer farmed fish to wild fish, as the former is better handled, safer and tastier than wild fish.</li><li>- see wild fish as endangered species,, but also as living organisms which might suffer pollution, containing heavy metals and parasites.</li></ul>
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**Figure 3.1:** Individual country segments

#### European fish farmers in favourable position

Thanks to trends like direct sourcing, traceability, sustainability and locality, European fish farmers have a good (start) position. Trends indicate that retailers increasingly try to source their products directly from fish producers as this is expected to ensure better transparency and control over the supply chain. The retail segment in particular is increasingly focussing its attention on the story underpinning the supplied products. Retailers are aiming to assure customers that the product they sell have been responsibly sourced. In contrast to large(r) international companies, European aquaculture farms could meet these wishes and needs. Many industrial buyers and retail category managers mention the importance of sustainability – either as environmental impact, animal well-being, transportation, waste management, social standards or feed ingredients. Sustainability certification for fish species is becoming increasingly important and is expected to become a market access requirement throughout Europe.

Local sourcing (*i.e.*, region) is also becoming more important in buying aquaculture products – something that will benefit EU farmed fish. Overall, product quality and price are consistently important buying criteria.

*Key sources: D27.1, D27.2, D27.3 D27.4, D27.5*

#### Support from Brussels and national governments

The European Commission intends to boost aquaculture through the Common Fisheries Policy reform, also with the support of the Common Market Organisation for Fishery and Aquaculture Products, and has published Strategic Guidelines presenting common priorities and general objectives at EU level. Four priority areas have been identified in consultation with all relevant stakeholders: reducing administrative burdens, improving access to space and water, increasing competitiveness, and exploiting competitive advantages due to high quality, health and environmental standards.





In general, governments in France, Germany, Italy, Spain and the United Kingdom are running campaigns promoting the health benefits of fish and seafood. The example of official recommendation from the UK Department of Health is to eat at least two portions of fish (140 g each) per week, one of which should be oil-rich. And in France The National Program of Nutrition & Health, set up by the French Ministry of Health and the National Institute for Prevention and Health Education (INPES; Institut National de Prévention et d'Éducation pour la Santé), stresses the importance of healthy eating and has defined nine rules (9 repères) for healthy eating. Two of these rules are related to fish consumption. The European Commission has run in these last years a promotion campaign in favor of aquaculture products named "Farmed in the EU".

*Key sources: D27.1*

### **3.2 Trends which could hamper growth**

*(The key sources used are noted below each section.)*

#### *Aquaculture in Europe is not without its drawbacks.*

Since all production systems (cage, extensive pond and intensive RAS) require high quality water, it is crucial that the water quality of both surface and groundwater and the marine environment meets high standards. Water pollution is a major threat to good water quality and affects fish farming from a technical point of view, but also in reputation. Since EU member states are committed to implement measures under the EU Water Framework Directive (WFD) to protect and restore aquatic ecosystems as a basis for ensuring the long term sustainable use of water for people, business and nature, the water quality was expected to improve. Yet, there are good examples of implementation of all aspects of the WFD as the Commission conclude in one of her implementations reports. However, they also showed that a more effort is needed to ensure achievement of WFD objectives in 2021 and 2027 cycles.

Prices of all protein sources for feed are expected to rise, due to increasing demand worldwide and due to legal requirement for more sustainable production. With growing demand for protein but limited availability of production inputs (e.g., feed and energy), the cost for producing protein will increase. Also, the scarce availability of production sites is expected to become a restriction for further production increase. For producers this trend implies that efficient production will be essential to remain competitive. Besides the production process, efficiency is also important in other aspects of the supply chain (e.g., logistics).

*Key sources: D27.1, D27.2, D27.4*

#### *Difficulties in matching buyer demands*

The buyers of aquaculture products demand very stable supply, both in terms of quality and quantity, matching their needs (e.g. distribution logistics). Current domestic production (wild and farmed) of the DIVERSIFY species is generally low. For some of the species there are still problems in the production phase and most of the species are relatively unknown.

Moreover, there are just not enough fish products in the assortment. Consumers like to have a certain range of products, and therefore prefer large assortments. Until now, fish product demands come in a limited range of species and product varieties. It is a challenge for smaller operators and independent farmers and



processors to introduce new products at the retail food level. Next to this, fish farmers in particular need to pay more attention to their marketing efforts and relationship building with channel partners.

From a buyers' perspective, certification is often necessary, but this is not (an) easy (process). Although there has been significant expansion in the aquaculture sector, there are still relatively few options for simple certification. Passing through a procedure can be lengthy and expensive for both the certifying body and the fish farmer, delaying its creation until a sufficiently large critical mass of fish are produced and placed on the market. Next to sustainability certification, there could also be a pressure on fish farmers and processors of farmed fish to comply with private standards. This depends on the market, how that market is structured, and on the type of product being sold. Large retailers and food firms may not be equally demanding of all their suppliers or product lines. Apart from that, retail is concentrating. The degree of concentration is low to medium in Italy and medium to high in France, Spain, Germany and the United Kingdom. This means that the retail market in these countries is dominated by a few large retailers.

*Key sources: D27.1, D27.4, D27.5*

#### *Competition can be expected*

The DIVERSIFY species face competition on price from cheap imports of other species arriving mostly from countries outside the EU, and from established European aquaculture species that for many years have been developing their position in this market. Growth can only be achieved by over-competing the alternatives. The main challenge on the demand side for the DIVERSIFY species is to compete with current substitutes. Unlike most DIVERSIFY species that are new for consumers, competing species are well known, as for example tuna, hake, sole, turbot, pangasius, carp, European sea bass and gilthead sea bream. Still much has to be done on awareness and recognition.

Apart from that, the environmental footprint of animal based proteins, such as fish (and meat), are relatively high in relation to insect- and vegetable-based protein products. In most countries of the EU veganism and, in general, vegetable-based protein food is expanding.

*Key sources: D27.3, D27.4*



## **4. Marketing information per species**

### **4.1 Introduction**

The project has identified a number of new/emerging finfish species, with a great potential for the expansion of the EU aquaculture industry. As a useful set of marketing tools that can be used to pursue a future marketing strategy of the products of the DIVERSIFY species, the so-called 4P's of the marketing mix (i.e., product, price, promotion and place) will be used as a structure to present the essential and summarized marketing information per species. The underlying and more elaborated results are published in the relevant GWP Deliverables and papers.

In the tables 4.1. till 4.6 per species you will find the key findings divided in three categories:

1. (Technical) Progress during project period: out of the scope of this GWP, major technical advances have been made since the project's started. Especially in the production phase. They are included here, while they are of great importance for the scope of the suggestions developed on how further promote growth and market expansion.
2. Market development: to present the essential information regarding the DIVERSIFY-species, we make use of a useful set of marketing tools that can be used to pursue the marketing strategy of the products of the DIVERSIFY species, is the so-called 4P's of the marketing mix (i.e., product, price, promotion and place).
3. Conclusion, i.e. the value proposition conceived in plain terms

The species are presented in alphabetical order. Deliverables are all available within DIVERSIFY's webpage.



## 4.2 Tables per species

<b>4.1 Atlantic Halibut</b>	<b>Key findings</b>	<b>References</b>
<b>Progress</b>	Atlantic halibut has made progress during the project, for example in first feeding of larvae. DIVERSIFY studies showed that the larvae can be fed and have good survival when dry feed was introduced 28 days post first feeding in small systems. Research concerning recirculation aquaculture systems (RAS) found that there are options for creating an environment where larvae had significantly higher growth than the control groups that were held in a flow through system.	Species workshop, technical leaflet
<b>Product</b>	Atlantic halibut is a large semi-fat flatfish rich in omega 3 fatty acids, with a characteristic flaky white meat and few bones. It has a reasonably good fillet yield for a marine fin fish species estimated at some 50% of the eviscerated whole fish weight.  Atlantic halibut competes on the market with <i>turbot</i> and <i>sole</i> , two species with favourable market positioning and relatively high prices.  A first priority should be product availability, since the current farmed production of Atlantic halibut is unable to meet the demand for this species, even considering captured fish.	D27.3, D27.5, D27.7
<b>Price</b>	Atlantic Halibut is a high-end product with a relatively very attractive margin. The Norwegian producer and researchers have brought back the main cost increasing factors, what makes that the return is very attractive.	D30.7
<b>Promotion</b>	Atlantic halibut has a very good reputation in the North European markets and a high market value.  Market development could be started in northern countries with nice recipes.	D27.3, D27.5, D27.7, D30.1/2
<b>Place</b>	Farmed Atlantic halibut has an excellent reputation, but is rarely available outside specialty restaurants. Atlantic halibut is sold mainly in restaurants (70%) and through retail (30%).  The United Kingdom's market of Atlantic halibut accounts for most of the world reported consumption, and there is expected to be 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.	D27.3, D27.5, D27.7, D30.1/2
<b>Conclusion</b>	Semi-fat fish rich in omega 3 fatty acids, attractive margin, market potential all over Europe but first priority is product availability.	



<b>4.2 Greater Amberjack</b>	Key findings	References
<b>Progress</b>	Progress has been made towards reliable production: a major effort was channelled toward the study of this species' reproduction, and reliable methods were developed for the production of fertilized eggs of adequate quantity and quality. For larval rearing, significant breakthroughs were achieved, allowing the production of large numbers of juveniles both at research/pilot and commercial scale.	Species workshop, technical leaflet
<b>Product</b>	<p>Greater amberjack is a large fish, with excellent flesh quality and unlike the other species, it showed high fillet fat reaching 4% in 1-1.5 kg fish and exceeding 12% in 15-20 kg fish and scores high on omega 3 fatty acids. In addition, it has a fast growth rate and an excellent fish/food conversion rate. This species has the potential to be interesting as a fresh product, frozen or further processed into added value products and already pride itself upon high consumer acceptability. However, currently it has a limited availability.</p> <p>There is no fish that can be considered a clear substitute for greater amberjack, with tuna being its theoretical closest substitute.</p>	D27.3, D27.5, D27.7, D30.1/2
<b>Promotion</b>	<p>For strong perceived added value in the consumer market, this species should be best kept far from canned tuna products and frozen products (for their low-price position). A strong margin can be reached and maintained only in fresh products or limited processed products (like smoked or precooked fresh products).</p> <p>This project showed that especially involved consumers (both traditional and innovators) are open for new species. Apart from this, consumers who care for quality and health, which is quite a substantial segment in the European food market, can be successfully targeted by emphasizing high omega 3.</p> <p>A selective market penetration strategy by keeping up the exclusivity of the product is necessary to remain the added value of the species.</p>	D27.3, D27.5, D27.7, D30.1/2, D30.5, D30.6
<b>Price</b>	Research shows that greater amberjack is a species that has all qualifications to stay in the highest market segment, because it has a good fillet yield and therefore a good margin	D30.7
<b>Place</b>	Market development should probably first focus on markets such as Spain, Italy and Greece, particularly as long as there is still low supply. Italy and Spain are also most interesting based on market volume. In these markets the wild catch of greater amberjack is more well-known. Given the characteristics of the species the aim should be to penetrate the whole European market with a total set of products from fresh to convenience. Germany may be a wild card for launching the new species, particularly if production volume is rather limited.	D27.3, D27.5, D27.7, D30.1/2, D30.6
<b>Conclusion</b>	Greater amberjack is a large fish with good market value and has a good base that offers multiple opportunities, including using omega 3's health promoting high values as a unique selling point.	



<b>4.3 Grey Mullet</b>	<b>Key findings</b>	<b>References</b>
<b>Progress</b>	Research shows that progress has been made regarding farming, e.g. spawning induction trials with GnRH $\alpha$ and metoclopramide with advanced stages of gamete maturation were successful, producing tens of millions of fertilized eggs. For larval rearing, algal addition to the tank water provides beneficial effects in terms of rotifer consumption, larval survival and growth.	Species workshop, technical leaflet
<b>Product</b>	<p>Grey mullet is a medium size omnivorous fish. Grey mullet aquaculture has the advantage of providing not only affordable whole fish and fillets, but also fish roe (“bottarga”), a high value product, 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 omnivorous feeding habits.</p> <p>The main competition for farmed grey mullet is its wild captured counterpart. Substitutes of grey mullet are white fish in general.</p>	D27.3, D27.5, D27.7, D28.7, D30.1/2
<b>Promotion</b>	The potential market is all over Europe, especially within segments of populations 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. For non-Muslim consumers this species could be presented as an authentic product from Mediterranean countries. Countries like Turkey and Egypt are important touristic countries, what gives opportunities to bring holiday tastes home.	D27.3, D27.5, D27.7, D30.1/2
<b>Price</b>	The future expansion of grey mullet farming is still limited because it depends mainly on wild fry until intensive rearing protocols are totally solved. However, positive results are shown using plant protein food rather than fish meal. It can help reduce feed cost significantly, allowing farmers to turn profitable more quickly and to be sold as an environmentally friendly cultured product. Financial feasibility is not available.	D30.7
<b>Place</b>	Grey mullet is very well known for people with an Arabic background. This is regarded an important segment to start distribution of these fish throughout Europe (distribution channels are currently lacking in EU). Given the limited presence and considering the option to target Islamic consumers, initial distribution using mongers located in areas with a large Islamic population could be considered. Second, by targeting the out-of-home market awareness for the species can be created and positive attitude to its taste developed.	D27.3, D27.5, D27.7, D30.1/2
<b>Conclusion</b>	Grey mullet from European waters is unique and could serve consumers all over Europe. It provides fish roe (“bottarga”), a high value product which can be used as a springboard to Europe. It is also a suitable candidate to use plant based alternative meal and oil feeding sources.	



<b>4.4 Meagre</b>	<b>Key findings</b>	<b>References</b>
<b>Progress</b>	The DIVERSIFY project has identified three different populations and sufficient genetic variation among the broodstocks of different locations in Europe that if managed properly assure a sufficient genetic variation for breeding programs. In addition, the muscle and liver transcriptome was described for the first time in the species and the first meagre linkage map was built based on SNPs and a preliminary QTL analysis for growth was performed.	Species workshop, technical leaflet
<b>Product</b>	Meagre is a white fish with “an attractive fish shape, good processing yield, good nutritional values, low fat content, excellent taste, firm texture suitable for a large variety of recipes”. Meagre 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. If properly fed, can provide a high content of w3 fatty acids including both, EPA and DHA.	D27.3, D27.5, D27.7, D28.7
<b>Promotion</b>	<p>Meagre has to compete (intensively) with other white fishes in the market. The main characteristic that should be stressed in promotion of meagre should be that as a marine fish provides higher contents of w3 and it has superior taste despite that is more lean. So consumers receive better taste with lower calories.</p> <p>Meagre is known by consumers under different local names. Hence, there is a serious marketing communication challenge to develop one name or specific meagre dish that will stimulate demand for meagre all over Europe.</p>	D27.3, D27.5, D27.7, D30.1/2
<b>Price</b>	In relation to sea bass and sea bream the production costs of meagre are higher but the quality of the final product is also higher. Financial feasibility is not available.	D30.7
<b>Place</b>	<p>For meagre we suggest a selective penetration strategy, what implicates that unique selling points are selected for distribution of the species. Starting in specialty stores or with online sales could make the product more exclusive, while introduction in retail could give a quick entrance in the market. In general, a market penetration strategy, starting in supermarkets gives the highest risks of coming in price competition.</p> <p>First, the regions where meagre is best known should be penetrated further, like France, Italy or Spain, 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 species local product that will remind consumers once back home of their holiday period.</p>	D27.3, D27.5, D27.7, D30.1/2



<b>4.5 Pikeperch</b>	<b>Key findings</b>	<b>References</b>
<b>Progress</b>	Research shows firstly that light characteristics and, to a lesser extent, temperature and fish density are directive environmental factors for pikeperch welfare and secondly that low light intensity and red light spectrum seem less stressful. This effect of light spectrum was confirmed in farm conditions. Finally, the effect of domestication level on stress responsiveness and immune response is suggested for a first time.	Species workshop, technical leaflet
<b>Product</b>	Pikeperch is easy to recognize based on its unique skin marks. In addition, it is a fresh water fish, with a neutral, mild taste - thus suitable for a wide range of preparation methods. It grows fast (in first year). An advantage is that fresh fillets can be prepared easily boneless, unlike carp, and that the species highly retains dietary DHA in its flesh. A w3 long chain polyunsaturated fatty acid (omega 3 LC-PUFA) essential for brain health, which is not provided by pangasius or carp. This species has no near substitutes, considering the mild taste of freshwater fish in general. The nearest substitutes could be pangasius and carp.	D27.3, D27.5, D27.7, D28.7
<b>Promotion</b>	<p>The main added value against competitors is, besides an attractive price, also the omega-3 rich meat and that the product is available fresh in cooled transport distance for the buying market (since the surplus demand is now met mostly with frozen pikeperch products from Russia). The target group for this species would be high-income groups or hedonic consumers, who are open for new products or with preference for good quality. These can be found at home (retail) but we foresee bigger chances in the out of home areas.</p> <p>Next to this: the skin of pikeperch is so beautiful that selling of the skin, should be considered, since fashion designers are always looking for new basic materials. Making a joint marketing strategy of a unique fashion product and unique meat could be considered as a unique selling point.</p>	D27.3, D27.5, D27.7, D30.1/2
<b>Price</b>	Due to the low supply, pikeperch is an exclusive fish, and prices are fairly high. Farms sell whole fish at approx. 9-10 euro/kg. The fillets in Germany/Benelux end consumer markets have a going rate of approx. 30-35 euro/kg, while in Switzerland it can reach approx. 50-60 euro/kg. Cannibalisation and high (not tailor-made) feed costs have negative impact on the margin. As soon as these issues are solved a nice margin can be realised.	D30.7
<b>Place</b>	Currently, pikeperch is still a niche product. The main markets are German speaking countries (Germany, Austria and Switzerland), where the species is well established and has a serious market share. Expansion could continue in countries like Denmark, Belgium and The Netherlands, and in	D27.3, D27.5, D27.7, D30.1/2





	Eastern European countries. It is anticipated to be easier to sell here than to consumers in saltwater fish oriented countries like the Mediterranean countries.	
<b>Conclusion</b>	A fresh water fish with expansion possibilities, since the biological characteristics make a broad scope of preparations possible. Moreover, the skin is unique, beautiful and could be attractive for fashion designers.	



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<i>4.6 Wreckfish</i>	<b>Key findings</b>	<b>References</b>
<b>Progress</b>	The research has focused on bottlenecks within reproduction and broodstock management, and larval rearing production technology and feeding. The reproductive cycle of wild-caught wreckfish was completed in captivity. Based on evaluation of mature fish from the fishery, the nutrient requirements for an appropriate broodstock diet have been determined. Major success was the successful larval rearing (during the project's last year), resulting in the production of a small number of hatchery-produced juveniles, which is very encouraging for the efforts to incorporate this species in the aquaculture industry.	Species workshop, technical leaflet
<b>Conclusion</b>	<p>Wreckfish is more or less the species odd one out. It is a large fish with excellent flesh quality and good reputation, but currently not (yet) available at all as a farmed fish. We conclude this section, therefore, with the following consideration for action: focus on production. When production bottlenecks get solved, a market orientation will require being developed in the long run in parallel with increasing production. Meanwhile, a brainstorming about a market positioning could be useful for the short run.</p> <p>In this overview wreckfish is not considered, since technical issues made that not enough product was available to make a marketing plan.</p>	



## 5. Conclusion

Based on the research done, in section 5.1 topics are proposed that should be addressed for further market development and expansion of the DIVERSIFY species. These topics support the fish industry including SMEs in shaping their international expansion strategies and can be divided into two blocks, one referring to building position in the market (marketing communication, segmentation, creating awareness and internationalization) and the other one is referring to cooperation. The section ends with some recommendations per species. In section 5.2 recommendations for policy makers are provided contributing to the sustainable expansion of the Europe's aquaculture sector.

### 5.1 Strategy recommendations

#### 5.1.1 *Build market position*

The European fish market has many opportunities that are underexploited by the European aquaculture sector yet. In the DIVERSIFY project, research has been done aiming at the future market development and expansion opportunities for a number of new, emerging finfish species with a great potential for the expansion of the European aquaculture sector. One topic that needs to be taken under consideration is how to build a market position for the new species by paying attention to marketing segmentation, communication and the rising of the level of consumer awareness. Marketing communication plays an essential role in building brand and/or product reputation. The introduction of new aquaculture species (and products) should therefore be accompanied by a well thought out communication strategy. There is a clear need for aquaculture industry to promote new products and persuade/engage consumers that they can find an excellent source of sustainable and quality health promoting food. Having said that:

- Use of a country-of-origin (COO) indication in general, and 'Produced in own (domestic) country' in particular makes EU consumers to think more positively about the product besides increasing the probability of its purchase. This study shows that locally produced products have added value for fresh fish products. Locally produced products also provide good branding opportunities, as locality could help to establish consumer identification with the brand.
- Although not considered by all consumers as important as COO and eco-friendly labels, the use of nutrition and health claims could nevertheless provide market opportunities. As shown in this project, some segments, "nutritious conscious", would be more likely to choose products that contain nutrition and health claims. Moreover, for the general public, the use of nutrition and health claims would actually help consumers making more informed choices, stimulating health-related behaviour.
- Overall, being certified becomes more important. Certification is a requirement for business-to-business buyers. Certification requirements are buyer dependent not country dependent. We would like to highlight certification with respect to sustainability too. This is becoming increasingly important and is expected to become a market access requirement throughout Europe and has importance for consumers too. For instance, the ASC logo currently does play an important role in consumers' fish product choices and may even become more important in the future. Having the required certificate(s) is a licence to supply.

Another key element in building market position is to address the right consumer segments for the new species. Involved fish consumers are most interested in new species. Involved traditionals generally prefer the



traditional fish products, which implies fresh products in the south of Europe and convenience, more processed, fish products in northern Europe. This segment is most open for aquaculture. Additionally, the segment of involved innovators are not only open for new species but also for new products. The fact that the two main groups of potential consumers of the new fish products, i.e., the involved traditionals and the involved innovators, are identified in substantial size in all research countries (France, Germany, Italy, Spain and UK), shows that a marketing approach for the species could be pan-European. In addition to this, the convergence of supermarkets makes that eating patterns change as well and that traditional buyers of fresh whole fish tend to buy fresh fillets too for convenience reasons. 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 organizing its supply chains. Concentrating 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 defense against substitute products.

Apart from this, still much has to be done on awareness and recognition. Looking at the products that are currently in the European market, a preference for white fish, large fillets and convenience products (especially in the Northern Europe) exists in consumers where fish species from aquaculture such as salmon dominate the market. However, in the Southern Europe, adopting species and fish consumption from aquaculture requires marketing and awareness raising campaigns as consumers still prefer wild over farmed fish. In line with this, most DIVERSIFY species are still not (well) known to consumers and professional buyers of supermarkets. The new species will face competition from established aquaculture species, when penetrating the market. Prices will be a crucial factor, besides quality, service and availability. It is suggested to put energy to overcome the bottlenecks and do not let lack of availability interfere with growth ambitions.

With respect to going abroad, the results of the exploration of the two internationalization strategies showed the importance of availability. The results suggested that a sprinkler approach requires the ability to ramp up production quickly. It requires a tremendous production capacity, which is currently unavailable. Hence, the waterfall approach focusing on one country and then (in year 2 or later) on another, makes more sense. A benefit of this approach also is that the launch can be tailored to local conditions and offers the provider and its partners, i.e. retailers, the opportunity to learn from the launch in the (previous) lead country. Still, in the short run production capacity may even be too low for the waterfall option involving two countries, e.g. Italy and Spain. But a solution could be either launching on a limited scale, e.g. in Italy only and, for example, limiting itself to a particular region before scaling up. Alternatively, one may decide to first experiment in a small volume country like Germany.

### 5.1.2 *Build together*

“If you want to go fast, go alone. If you want to go far, go together” (African proverb). European fish farmers are in favourable position thanks to direct sourcing, transparency, sustainability and locality. Consumers give added value to a locally produced aquaculture product. An encouraging trend is that at the supply side parties are looking increasingly to source directly from farmers.

Points of attention for farmers or producer organisations are that most buyers do not have the logistics to maintain the quality of fresh fish, so support till store can give a lot of added value to supermarket buyers. Furthermore, buyers need to be able to position the product and see where the product would fit in their



assortment. So, in approaching buyers, farmers should be open to provide full information on their entire production process, feed, and logistics (knowing that buyers prefer suppliers that decrease risks).

Suggestions for improvement refer to the second part of the African proverb (“...If you want to go far, go together”) and encompasses cooperation. After all, mainly engaged in resolving biological issues i.e. production bottlenecks and driving down costs, farmers and other consortium partners focused first and foremost on the parties directly before and behind them in the supply chain. They showed little awareness for and thus paid little attention to more distant, strategic parties and issues. They were focused on the next level in the supply chain and not (yet) on the end-customer. However, what ultimately determines the success of establishing markets for new fish species is the *cooperation* between farmers mutually (e.g., producer organisations) and other stakeholders, and market their product together. Mutual cooperation between fish farmers also provide opportunities for better alignment with feed suppliers.

Another level of cooperation refers to working buyer-driven. Marketers should consider involving consumers, retailers and mongers more in the co-creation of new aquaculture product ideas. The work done in DIVERSIFY shows for example that projective and particularly creative techniques should be considered ideal in the first stages of new product development, since these techniques provide a valuable pool of new ideas where the ‘voice of the consumer’ is loudly heard. Moreover, the chosen approach in this project, a customer-centric view was fully adopted all along, might be usable or inspiring for market introduction or development of other species. A few ideas for co-creation per species are delivered in this project. More ideas could be generated with local partners.

### 5.1.3 *Species overview*

We conclude this section with some remarks concerning the business opportunities of the DIVERSIFY species. Atlantic halibut and greater amberjack, seem to have the best opportunities to succeed. Both are good quality fillets/meat, a favourable cost structure, and already benefitting from a market position, which allow for a positive outlook and profit margin. Still, below we summarize the main recommendations for each species (in alphabetical order):

- **Atlantic halibut** is a very good aquaculture substitute for sole and turbot, and has therefore a good market potential in a large existing market for flatfish. The product can be sold as a high-end product since substitutes are wanted and very good priced too.
- **Greater amberjack** is attractive since it has good flesh characteristics. From a competitive viewpoint it has better qualifications than tuna, but the same product quality. For both species, growth in aquaculture production is needed to keep up with the growth in market demand.
- **Grey mullet** from European waters is unique and could serve consumers all over Europe. Grey mullet is very well known for people with an Arabic background and is regarded as an important segment to start distribution of these fish throughout Europe. It provides fish roe and is a suitable candidate to use plant based alternatives to fish meal and oil raw materials.
- **Meagre** is comparative to European sea bass and gilthead sea bream, but demand for meagre is still low as it is relatively unknown to the consumer. Problematic is the fact that meagre is known by consumers under different, local names. Hence, the main challenge is in marketing communication to stimulate demand for meagre all over Europe.



- **Pikeperch** is a fresh water fish with multi possibilities for preparations including the fact that the skin of pikeperch could be of value too. So, a marketing strategy for both the fish and the skin, could give an interesting business model. A niche positioning to justify high prices might remedy the unfavourable cost level.
- **Wreckfish** is relatively far in technical development to give relevant business model projections. In the market research studies this species was not considered.

## 5.2 Policy recommendations

Supporting further growth and market expansion of European aquaculture needs **removing barriers and increase promotion**.

Research in this Deliverable and D27.2 and D27.5 learns that there is not a on common certification program for aquaculture products all over Europe for all clients that is most accepted. Although there is a common ground, each business-to-business buyer has their own requirements for the products they buy and are not controlled whether they use the same certification grounds for all products they buy. **It is company policy that determines what certification qualifications are asked**. From a policy viewpoint, it is therefore very difficult to **create a level playing field** for all species sold in the EU. As such, more uniformity in sustainability and product certification could be valuable to give local production a chance in the European market. Since sustainability is getting more important for food products throughout Europe, the aquaculture sector could be helped with uniform requirements. Consumers' demand for sustainability will continue to grow and the responsible sourcing of fish will become even more important when selling fish in Europe. There are however still relatively few options for simple certification. The use of some type of official EU Ecolabel for responsibly farmed fish could be of high interest, also for the DIVERSIFY species. Furthermore, certification demands a high administrative burden. Providing clear guidelines for sustainable aquaculture and facilitate the certification process can help.

This study learns that there is a **market potential for increased fish consumption within the EU**. The PESTEL analysis in this project shows that a lot of countries have stimulation policies for fish consumption both for fresh fish and aquaculture (D27.1). Consumers in both the segmentation study and the focus group discussions (D28.1 and 29.2) confirm to be open to consume more and new fish products, different than and on top of what they consume now.

Especially **for new species of the DIVERSIFY project, positioning and reputation is a major point of attention** since farmed fish has to deal with an image, based on bad media reports about farming conditions at fish farms in Asian and African countries. Instead, **European aquaculture should start building a good positioning and reputation**, also given the fact that EU farmed fish is in a good position to be positioned as sustainable: they relieve pressure from the wild stocks and they provide more reliable and controlled supplies. Explicit positioning of local production could give added value to consumers, since consumers already give added value to aquaculture products from their own country. General communication for EU aquaculture has no added value for consumers.

All species have chances in their own target market. However, **positioning of the species in relation to the main competitor in wild catch or aquaculture products produced inside and outside the EU is necessary and needs support**. Support to do this is necessary, since most of the firms producing aquaculture don't have the means to compete with species like pangasius (on price) and salmon (in marketing). Overproduction of



other species like sea bass and sea bream, makes that alternatives, although far away in product characteristics might be preferred. The online market test found out that positioning the added value of the new species in relation to well-known species is essential. However, if this alternative is cheaper, price competition has to be conquered by quality and other added value. This added value needs communication and support.



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### *Part II*

References from Deliverables and papers are all available within DIVERSIFY's project webpage:

[www.diversifyfish.eu](http://www.diversifyfish.eu)

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## APPENDIX A

Country	Time		standard innovator focused				Power		standard innovator focused	
	period	e	p1	p2	q1	q2	1	2	F(t)1	F(t)2
France	0	2.718	0.100	0.150	0.251	0.275	1.000	1.000	0.000	0.000
France	1	2.718	0.100	0.150	0.251	0.275	0.680	0.627	0.118	0.174
France	2	2.718	0.100	0.150	0.251	0.275	0.462	0.393	0.249	0.353
France	3	2.718	0.100	0.150	0.251	0.275	0.314	0.246	0.383	0.519
France	4	2.718	0.100	0.150	0.251	0.275	0.214	0.154	0.512	0.659
France	5	2.718	0.100	0.150	0.251	0.275	0.145	0.097	0.626	0.767
France	6	2.718	0.100	0.150	0.251	0.275	0.099	0.061	0.722	0.845
France	7	2.718	0.100	0.150	0.251	0.275	0.067	0.038	0.798	0.899
France	8	2.718	0.100	0.150	0.251	0.275	0.046	0.024	0.856	0.935
France	9	2.718	0.100	0.150	0.251	0.275	0.031	0.015	0.899	0.959
France	10	2.718	0.100	0.150	0.251	0.275	0.021	0.009	0.930	0.974
France	11	2.718	0.100	0.150	0.251	0.275	0.014	0.006	0.951	0.984
France	12	2.718	0.100	0.150	0.251	0.275	0.010	0.004	0.966	0.990
France	13	2.718	0.100	0.150	0.251	0.275	0.007	0.002	0.977	0.993
France	14	2.718	0.100	0.150	0.251	0.275	0.005	0.001	0.984	0.996
France	15	2.718	0.100	0.150	0.251	0.275	0.003	0.001	0.989	0.997
Germany	0	2.718	0.120	0.204	0.343	0.375	1.000	1.000	0.000	0.000
Germany	1	2.718	0.120	0.204	0.343	0.375	0.601	0.529	0.147	0.239
Germany	2	2.718	0.120	0.204	0.343	0.375	0.362	0.280	0.314	0.475
Germany	3	2.718	0.120	0.204	0.343	0.375	0.217	0.148	0.483	0.669
Germany	4	2.718	0.120	0.204	0.343	0.375	0.131	0.079	0.633	0.805
Germany	5	2.718	0.120	0.204	0.343	0.375	0.079	0.042	0.752	0.890
Germany	6	2.718	0.120	0.204	0.343	0.375	0.047	0.022	0.839	0.940
Germany	7	2.718	0.120	0.204	0.343	0.375	0.028	0.012	0.899	0.968
Germany	8	2.718	0.120	0.204	0.343	0.375	0.017	0.006	0.937	0.983
Germany	9	2.718	0.120	0.204	0.343	0.375	0.010	0.003	0.961	0.991
Germany	10	2.718	0.120	0.204	0.343	0.375	0.006	0.002	0.977	0.995
Germany	11	2.718	0.120	0.204	0.343	0.375	0.004	0.001	0.986	0.997
Germany	12	2.718	0.120	0.204	0.343	0.375	0.002	0.000	0.991	0.999
Germany	13	2.718	0.120	0.204	0.343	0.375	0.001	0.000	0.995	0.999
Germany	14	2.718	0.120	0.204	0.343	0.375	0.001	0.000	0.997	1.000



Germany	15	2.718	0.120	0.204	0.343	0.375	0.000	0.000	0.998	1.000
Italy	0	2.718	0.162	0.225	0.438	0.475	1.000	1.000	0.000	0.000
Italy	1	2.718	0.162	0.225	0.438	0.475	0.517	0.463	0.201	0.271
Italy	2	2.718	0.162	0.225	0.438	0.475	0.268	0.215	0.425	0.540
Italy	3	2.718	0.162	0.225	0.438	0.475	0.138	0.100	0.627	0.744
Italy	4	2.718	0.162	0.225	0.438	0.475	0.072	0.046	0.778	0.869
Italy	5	2.718	0.162	0.225	0.438	0.475	0.037	0.021	0.875	0.936
Italy	6	2.718	0.162	0.225	0.438	0.475	0.019	0.010	0.933	0.970
Italy	7	2.718	0.162	0.225	0.438	0.475	0.010	0.005	0.964	0.986
Italy	8	2.718	0.162	0.225	0.438	0.475	0.005	0.002	0.981	0.993
Italy	9	2.718	0.162	0.225	0.438	0.475	0.003	0.001	0.990	0.997
Italy	10	2.718	0.162	0.225	0.438	0.475	0.001	0.000	0.995	0.999
Italy	11	2.718	0.162	0.225	0.438	0.475	0.001	0.000	0.997	0.999
Italy	12	2.718	0.162	0.225	0.438	0.475	0.000	0.000	0.999	1.000
Italy	13	2.718	0.162	0.225	0.438	0.475	0.000	0.000	0.999	1.000
Italy	14	2.718	0.162	0.225	0.438	0.475	0.000	0.000	1.000	1.000
Italy	15	2.718	0.162	0.225	0.438	0.475	0.000	0.000	1.000	1.000
Spain	0	2.718	0.125	0.155	0.477	0.524	1.000	1.000	0.000	0.000
Spain	1	2.718	0.125	0.155	0.477	0.524	0.516	0.474	0.163	0.202
Spain	2	2.718	0.125	0.155	0.477	0.524	0.266	0.225	0.364	0.440
Spain	3	2.718	0.125	0.155	0.477	0.524	0.138	0.107	0.566	0.657
Spain	4	2.718	0.125	0.155	0.477	0.524	0.071	0.051	0.731	0.811
Spain	5	2.718	0.125	0.155	0.477	0.524	0.037	0.024	0.845	0.903
Spain	6	2.718	0.125	0.155	0.477	0.524	0.019	0.011	0.915	0.952
Spain	7	2.718	0.125	0.155	0.477	0.524	0.010	0.005	0.955	0.977
Spain	8	2.718	0.125	0.155	0.477	0.524	0.005	0.003	0.976	0.989
Spain	9	2.718	0.125	0.155	0.477	0.524	0.003	0.001	0.988	0.995
Spain	10	2.718	0.125	0.155	0.477	0.524	0.001	0.001	0.994	0.997
Spain	11	2.718	0.125	0.155	0.477	0.524	0.001	0.000	0.997	0.999
Spain	12	2.718	0.125	0.155	0.477	0.524	0.000	0.000	0.998	0.999
Spain	13	2.718	0.125	0.155	0.477	0.524	0.000	0.000	0.999	1.000
Spain	14	2.718	0.125	0.155	0.477	0.524	0.000	0.000	1.000	1.000



Spain	15	2.718	0.125	0.155	0.477	0.524	0.000	0.000	1.000	1.000
UK	0	2.718	0.120	0.169	0.305	0.338	1.000	1.000	0.000	0.000
UK	1	2.718	0.120	0.169	0.305	0.338	0.627	0.573	0.144	0.199
UK	2	2.718	0.120	0.169	0.305	0.338	0.393	0.328	0.304	0.406
UK	3	2.718	0.120	0.169	0.305	0.338	0.246	0.188	0.463	0.590
UK	4	2.718	0.120	0.169	0.305	0.338	0.154	0.108	0.607	0.734
UK	5	2.718	0.120	0.169	0.305	0.338	0.097	0.062	0.725	0.835
UK	6	2.718	0.120	0.169	0.305	0.338	0.061	0.035	0.814	0.901
UK	7	2.718	0.120	0.169	0.305	0.338	0.038	0.020	0.877	0.942
UK	8	2.718	0.120	0.169	0.305	0.338	0.024	0.012	0.920	0.966
UK	9	2.718	0.120	0.169	0.305	0.338	0.015	0.007	0.949	0.980
UK	10	2.718	0.120	0.169	0.305	0.338	0.009	0.004	0.968	0.989
UK	11	2.718	0.120	0.169	0.305	0.338	0.006	0.002	0.979	0.993
UK	12	2.718	0.120	0.169	0.305	0.338	0.004	0.001	0.987	0.996
UK	13	2.718	0.120	0.169	0.305	0.338	0.002	0.001	0.992	0.998
UK	14	2.718	0.120	0.169	0.305	0.338	0.001	0.000	0.995	0.999
UK	15	2.718	0.120	0.169	0.305	0.338	0.001	0.000	0.997	0.999



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