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New growth, new products – A market survey of aquaculture species

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SUMMARY – In the framework of the EU Concerted Action MASMANAP, a qualitative survey of the diversification of products based upon aquaculture species was undertaken in eight countries. The UK and France highlight important developments in aquatic product innovation through raw material processing, presentation and packaging. New products are commonly found to be based on the well-established species such as salmon, trout and, to a lesser extent, mussels and shrimps. In other countries the development of new products is more limited and is constrained by retention of more traditional consumption preferences. Spain represents an intermediate case with significant consumption of fresh seafood, some traditional processed products, mussels and some development of new products based on trout and salmon. A growing trend towards convenience food is evident in most European countries, but is especially strong within the UK and, to a lesser extent, France.

Key words: Aquaculture, markets, product diversification, processing, packaging.

RESUME – *"Nouveau développement, nouveaux produits – Une étude de marché sur les espèces aquacoles". Dans le cadre de l'action concertée européenne MASMANAP, la diversification des produits issus des espèces aquacoles a fait l'objet d'une étude qualitative dans 8 pays. Le Royaume-Uni et la France montrent un important développement de produits nouveaux, en termes de transformation, de présentation et de conditionnement, basés essentiellement sur les espèces dont l'élevage est largement développé, comme le saumon, la truite, et, à un moindre niveau, les moules et les crevettes. Dans les autres pays, le développement de nouveaux produits est limité parce que les modes de consommation traditionnels restent dominants. L'Espagne représente un cas intermédiaire, avec une consommation en frais très importante, en parallèle avec des produits aquacoles traditionnellement transformés à base de moules, et un développement de nouveaux produits (saumon, truite). On observe une tendance, dans tous les pays, au développement de produits prêts à la consommation, tendance particulièrement affirmée au Royaume-Uni, et à un moindre niveau en France.*

Mots-clés : *Aquaculture, diversification des produits, transformation, conditionnement.*

Introduction

Task 4 of the EU Concerted Action MASMANAP, "Marketing survey of new aquaculture products", attempted to assess the existing presence and potential market entry of farmed aquatic products. This was approached in a number of ways including observation of current species and new additions to the range of species farmed, assessing market differentiation of aquaculture products across a range of criteria, and the diversification of products through processing, presentation and packaging. This paper is primarily concerned with the latter category of diversification mechanisms. The data have been gathered from the individual reports of each country participant in the MASMANAP CA and has been synthesised by the authors.

No official data collection procedures were found to exist in any country which gathered information at the level of detail required. Consequently this significant deficiency had to be overcome by each partner generating relevant data through a combination of *ad hoc* observation, continuous market surveillance, secondary data – notably contemporary trade press, and selected industry contacts. Within the operational resource constraints of MASMANAP it was agreed that no realistic attempt could be made to estimate the size (by volume or value) of the markets concerned; neither was price data gathered as this too expanded the task beyond the available resources. Whilst these additional components must await future research, the data generated has been schematised in the form of a grid in order to summarise the findings for each country (Appendix 1). Some variations are

also found within the terminology employed in different markets, especially in respect of fresh and chilled. Whilst "fresh" is more often used to refer to fish sold on ice and "chilled" commonly refers to prepacked fish, the two terms are sometimes interchanged and thus we have tended to regard them as synonymous but, where appropriate, do differentiate in respect of the type of packaging used.

The results of the survey are qualitative and allow identification of the main trends in new product development (NPD) based on farmed aquatic products. The varied level of detail presented for each country necessarily reflects the different rates of adoption and diffusion of these products within the markets observed. These value-added products are most advanced in the UK and France, whilst in the more laggardly locations such trends are barely perceptible. The wide range of situations is discussed and facets of fish consumption characteristics are explored along with the supply chains concerned.

Before discussion, some clarification of a "new product" is required. The concept of new products is difficult to define, simply because it means different things to different people in different markets. Products may be new to consumers or different groups of consumers, perhaps because they have never been exposed to them before, although they are present elsewhere within that country. In other instances, entire national markets may not have been targeted and so a later "new" product launch may in fact be quite familiar to consumers elsewhere. Products themselves may be regarded as new in terms of the degree of technical innovation. In many cases the creation of a new product simply results from a minor modification to an existing product, for example perhaps just offering a new pack size. Such evolutionary innovations constitute the vast majority of new product launches and only a comparatively small number might be regarded as truly radical innovations. These are dependent upon the adoption of a quite different technology, such as vacuum skin packaging (VSP) or modified atmosphere packaging (MAP). Whatever the nature of the new product its development and launch onto the market will take varying periods of time, and more importantly, the diffusion of that innovation throughout the market will also depend upon the consumers' propensity to adopt and the degree of superior satisfaction that its consumption delivers. Given these varied interpretations of the new product, reported perceptions of their presence may also tend to obscure actual market entry across different countries. This in itself though is significant, because it highlights the importance of dependence upon consumers' perception of new product launches rather than just the producer's launch statistics.

NPD from aquaculture – A cross-country comparison

France

Seafood processing in France is a highly dynamic industrial segment and this activity is reflected more generally in the market for processed food products. Especially within the last three years a large number of new added-value products from both cultured and captured fish supplies have been launched on the French market. The retail survey performed in 1999-2000 and the trade press analysis show two main trends in the diversification of products from farmed species: (i) *new processing techniques* employed across a range of product forms, these include different types of cuts, pre-cooked seafood, ready-to-eat dishes, more varied smoking processes and an ever-expanding range of products based on smoked salmon and trout, delicatessen, etc.; and (ii) *new packaging* since there have been significant developments in fresh products with VSP or MAP, and user-friendly presentations based upon individual portions, fresh cuts and/or pre-cooked, sold with a separate sauce, etc.

The survey of the main supermarket chains, and extended through the trade press, showed that the new products issued from farmed species are mainly found in the delicatessen[1] self-service stall (or traditional stall). Although to a lesser extent, some were also found within frozen foods and fewer

[1]Delicatessen goods are called "traiteur" products in France and include various ready-to-eat products. In supermarkets, they are mainly sold in the self-service stall but may also be sold by vendors in traditional stalls. Traiteur products are also sold in traditional outlets including delicatessens and fishmongers. In restaurants they are often served as starters. Traiteur seafood products are mainly surimi-based products (70%, source CFCE 2001), but also include smoked fish, seafood terrines, patés, pastes (including the Greek-style taramassalata), marinated products and more recently, ready-to-eat dishes.

still amongst canned products. Note should also be made of the innovation in fresh uncooked products: cuts including fillets, steaks, cutlets, brochettes (kebabs), joints, medallions, etc. The differentiation of fresh/chilled products began several years ago and these were sold either loose in traditional fresh fish stalls or pre-packed in self-service counters. In addition, the development of new packaging techniques such as VSP and MAP, which have longer shelf-life, encouraged and extended the product range in self service outlets and more recently has extended to minced fish, carpaccio and sushi.

A summary of the wide range of processing modes adopted is shown in Fig. 1.

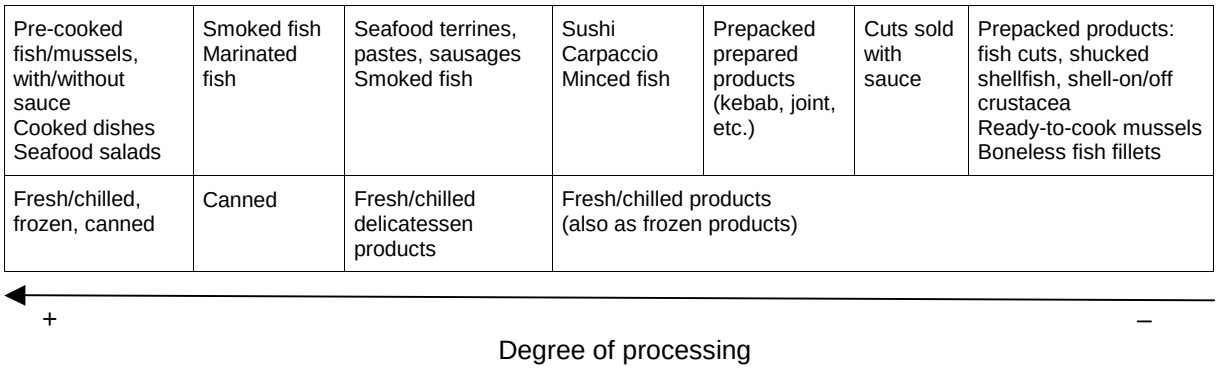

Fig. 1. The processed product range in France.

The range of modes of preservation for these new products spans the full extent of technical options available: canned, frozen, cooked, smoked, salted-marinated and fresh/chilled either loose, VSP or MAP.

In terms of the raw material, the range of species used has expanded over time as output of each species has increased. Salmon is by far the leader and is used in all types of preparation. Trout and mussels also constitute the basis of a number of products; trout being used in a similar way to salmon but in a more restricted number of products. Mussels, in addition to the few traditional preserved marinated products, are increasingly available in ready-to-cook or ready-to-eat dishes. A few new products are based on shrimps and to a lesser extent, oysters, where the main innovation is focused on easy-opening systems for fresh products. Other more marginal examples also exist such as freshwater crayfish and eels.

Packaging also shows variety and should be recognised as a no-less important means of innovation. Technical progress such as VSP and MAP extend shelf-life and their creation of new fresh products effectively enables development of new market segments. The core VSP and MAP products are commonly over-wrapped with a cardboard box which provides additional protection, better presentation in the cabinet, and an opportunity to communicate information regarding the product, ingredients, storage and preparation in addition to any promotion activity.

This initial survey shows that a very wide range of new products based on aquaculture species has been launched on the French market recently. It is noticeable that the new products are primarily based upon traditional farmed species (mussels, salmon and trout) which are available in large volume and so have prices competitive with other value-added products. The fish processing industry uses salmon both in isolation and in combination with captured whitefish, a strategy which lessens the constraint of variable raw material supply, provides greater cost control and utilises the complementary advantages of appearance and taste.

Hitherto the farmed origin of aquaculture product has not commonly been highlighted amongst the information communicated to consumers on the package of processed food. Nonetheless this is due to change in January 2002 with the adoption of new EU labelling legislation. Indeed whilst the species is commonly specified for salmon, it is usually not for the whitefish which is mentioned as "fish", or "marine fish". For shrimps, or freshwater crayfish, some processed products are proposed both with

wild and farmed animals. No processing is observed yet with higher unit value species like seabass, seabream and turbot. Increasingly the farmed species are used as "aquatic food raw material", exactly like capture fisheries products, and are following the same trends in the evolution of the processing sector and the market, reflecting the increased market share of processed seafood and ready-to-use fresh seafood.

Germany

The German market is dominated by easy-to-consume products: canned fish, frozen fish, marinades, salads, cooked dishes, and the consumption of fresh products is limited. Canned products and marinades constitute the first segment, a traditional and stable market focusing mainly herring. There is a tendency to develop ready-prepared products, thanks to the market pull for convenience products and the marketing push by large fish distributors, and this is evident in both the at home and out of home consumption markets. One of the noticeable trends of the German market is the increased consumption of tropical shrimps and salmon, which represents an opening for more farmed products. Unfortunately the German contributors found no information about the degree of innovation in processing shown in these markets.

Greece

In Greece the farmed products, almost exclusively, belong to the *Sparid* like species (i.e. bass, bream and relatives like puntazzo) and are sold as fresh/chilled whole products. There have been some efforts to supply fillets, fresh or frozen to the German and Swiss markets but the volumes sold remain marginal at the moment. Diversification towards radically new species might provide the opportunities for subsequent processing of the cultured product, but only once the industry is convinced of the need to expand to new markets with a variety of products.

There is a trend however towards the processing of seafood for ready-to-cook products and ready-meals as well as delicatessen type produce. In addition, processing such as smoking, marinating and canning appears to be increasing but unfortunately there are no definitive figures to quantify this growth. At present the processing industry is almost exclusively based on "wild" products; in general it relies upon anchovies, scomber, herring, sardines, tuna, and squid/octopus, etc. The market targeted is primarily the Greek domestic sector, mainly the urban and suburban areas supplied through supermarkets. However exports of these products are steadily increasing to the EU and, less so, the US.

Italy

In the Italian market for aquatic food products, fresh items currently dominate (52%), but there is a trend towards increased consumption of frozen products and cooked dishes. Imported farmed species such as sea bass, turbot, sea bream and salmon are also consumed in increasing quantities by Italian consumers. The survey of the range of products based upon farmed species shows that only salmon is processed in a wide range of presentations. Marine fish, and traditional farmed species as trout, carp, sturgeon, mullet, eels, are found on the fresh fish market, mainly whole or filleted. All species can be found frozen whereas canned products include trout and salmon, and smoked products based on trout and salmon are available.

Salmon products exist under all the possible forms: fresh whole or cut (fillets and other different types of cuts), fresh prepared meals, frozen (again as whole, with various cuts, or prepared), canned, and smoked with various products. New techniques of packaging allowing a longer shelflife (VSP and MAP) are widely used for these value-added products. Mussels are presented fresh whole, frozen whole and as prepared dishes, including VSP products. Unfortunately there is seemingly little information regarding the country of origin of these processed products in Italy.

Norway

Norway is one of the leading global players in farmed fish production and, given the small

domestic population, exporting is a major concern. In general, the aquaculture products are sold with a low degree of value adding. The bulk of the quantities is exported fresh or frozen with little processing. For salmon and trout, some production of fillets does take place.

For salmon, about 80% of the production is exported fresh head-on, around 10% frozen head-on, and 9% as fresh and frozen fillets. In addition, smaller amounts are sold smoked, marinated or otherwise preserved. This indicates little product differentiation, and the reason seems to be that the customers prefer to prepare the salmon according to local preferences. Another significant limitation to product innovation for export results from the present EU trade agreement which places lower tolls on fresh, head-on salmon than for processed salmon. About 95% of the exported trout is sold frozen, head-on whilst the remainder is mainly frozen fillets and negligible quantities of fresh fillets.

Concerning the domestic market, there has been a tradition of delivering fresh products to the market that have not undergone considerable value-added processes. Thus innovation in this respect has been rather marginal hitherto in terms of market presence, although there is research activity for new preservation and conservation technologies, which include MAP.

Portugal

No diversification of products based upon aquaculture species is found in the Portuguese market. This is probably related to the importance of fresh products in the consumption of aquatic food products (65%) and the limited supply from aquaculture products (4%).

Spain

The Spanish market for aquatic food products is characterised by the dominance of fresh food; frozen and preserved products play only a limited role. The aquaculture products consumed in Spain are mainly sourced from domestic production: mussels, trout, other shellfish (including oysters, carpet shell, etc.) and species developed more recently such as sea bass, sea bream and turbot. Imported farmed species, mainly salmon and shrimps, are also favoured and are supplemented with mussels, marine fish (sea bass, sea bream and turbot) and some freshwater fish species.

Mussels are consumed under different presentations, from fresh to ready to eat, and they have a traditional market with canned products. This is the case also for some other bivalves (clams, cockles). Interestingly, there are some new processed products, like Muselina', promoted by FROM, that consist of canned pâté with mussel and pork meat, directed to children. Rainbow trout exhibits the largest product range of all the species farmed within Spain. Starting from the traditional format of fresh whole fish, the sector has promoted diversification of products in order to differentiate output including portions, fillets, steaks, eggs, pâté, and smoked variants. In the case of imported salmon, whose consumption is roughly the same as trout, it is mainly sold fresh, or smoked. Recently salmon (and to a lesser extent trout) has been included in tapas with various recipes such as marinated, small pieces and mixed. There is some development of ready-to-eat dishes, processed from wild fish and also from trout and salmon. For farmed marine fish, the consumption is normally in a fresh form, mainly of piece-size, or family size. No development of processed products is expected for these species in the immediate future.

The United Kingdom

The market for aquatic food products in the United Kingdom (UK) is characterised by the limited market share of the fresh and chilled products (c. 25%). However the survey performed in UK showed that the range of products based upon aquaculture species is very wide, including a great variety of presentations (fresh/chilled, frozen, smoked and canned). Many types of cuts (whole, H&G, fillet, loin, medallion, steaks, slices, kebab, sushi, etc.) are present as is the mode of preparation (from basic raw products to ready-to-eat dishes) and with varied packaging (loose, tray, VSP, MAP). The most prominent species in terms of diversification of products is salmon and, to a lesser extent, trout. Mussels are available fresh loose, but also as fresh (MAP and VSP) cooked dishes, and frozen loose and cooked dishes, canned whole and prepared, smoked whole and prepared. Scallops also appear fresh loose and VSP. Turbot is available only whole loose at the moment.

The expansion of the market and the diversification of products has been especially rapid within the past 3-5 years. Many of the technical solutions to fish consumers' wants have been adopted from capture-based fish processing operations and have been successfully applied to farmed fish. Indeed this trend has been accelerated through a number of mergers and takeovers within the fish farming and fish processing sectors. Vertical integration has accelerated this trend. Aquaculture producers have seemingly latched on to the concept of adding value in much the same way as has been done previously within the fish and wider food markets more generally.

As noted above, within the UK salmon exhibits the largest product range and to a large extent may be regarded as something of a foretaste of the other products we might expect to see launched in the future. Salmon accounts for over 90% of the volume and value of aquaculture product in the UK at present. Salmon has diversified most of all within the fresh/chilled sectors where a number of added value products incorporating increasing levels of technical sophistication have succeeded on the market. Salmon products have evolved from variations on the whole fish concept through fillet and portion options into ready meals and deli-level products. Salmon has been able to trade upon its strong traditions of smoked product in order to facilitate the launch of numerous added value variations. These have expanded from the concept of smoked sides/slices through to niche-orientated innovations with hot and cold smoke versions of product flavoured and spiced in a number of ways.

In comparison to the capture sector, aquaculture products still retain a disproportionately high percentage of products marketed in a raw-material format. To some extent this simply reflects the high unit value basis of aquaculture supplies – the very reason why such species have been selected for early inclusion in the culture selection process. However as prices continue to decline through the increased supply of farmed product and declining production costs in real terms, it can be expected that an increasingly large proportion of cultured product will be subject to some form of transformation.

Virtually all of the fresh/chilled and smoked options have been marketed in frozen forms too, although in some cases traditional consumer preferences have curtailed expansion in this direction. Nonetheless, as with capture-based aquatic food products, the convenience of frozen has opened up a number of additional market opportunities. This is most evident in the catering sector where buyers seek to purchase many of the delivered meal attributes in the purchased product. Rather lesser emphasis has been placed upon the canned product sector. This is not surprising given the traditional orientation of such products to more low-unit-value raw material sources, notably pelagic species. Nonetheless there are significant and increasingly important market segments which have attracted some interest from aquaculture producers. More recent examples of these canned products are evident with the addition of salmon fillets and various sauces and more novel accompaniments such as malt whisky. In addition there is a long tradition of canned and marinated shellfish which might readily be extended as aquaculture output expands.

Product innovation is also fuelled through the activities of the UK supermarkets which are generally recognised to be more proactive compared to many of their continental counterparts. At the same time the UK food consumer has established an appetite eager for new consumption experiences and has moved quite radically away from the traditional, more conservative character of the not too distant past. Collaboration between supermarkets, producers and processors has increased in conceptualising, creating and delivering new products. Supermarkets have perceived profit through the value-addition route afforded by aquatic food NPD and thus have shown enthusiasm to sate the emergent hunger for new aquaculture products. These factors have combined with the growing range of aquaculture raw materials to create a dynamic UK market which appears to have many more launches in store.

Discussion

This rapid overview of the diversification of aquaculture-based products highlights the wide range of situations across the different countries and key characteristic features are depicted in Table 1. The UK and France are shown to be especially important in the development of new products, through processing, presentation and packaging. So far these are mainly based on the well-established species of salmon, trout, and to a lesser extent mussels. At the time of the survey, the markets in other countries evidenced much more limited development of new products.

Table 1. Features of the market of aquaculture products in the eight countries

	Apparent consumption of aquatic food products† (kg/cap, eq. landed weight)	Share of farmed products in the total consumption (volume) ††	Features and trend in the presentation of aquaculture products
France	28	27%	Development of various processed foods with established species (salmon, mussels, trout, shrimps), mainly fresh, also frozen and canned
Germany	14	12%	Little development of ready-to-eat dishes
Greece	24	15%	Mainly fresh whole products Little development of ready-to-eat dishes
Italy	26	22%	Mainly fresh whole products Little development of frozen ready-to-eat dishes
Norway		15%	Mainly fresh whole fish Traditional smoked or marinated salmon
Portugal	46	4%	Mainly fresh items
Spain	52	17%	Mainly fresh items Traditional processed mussels Development of new products upon trout Little development of ready-to-eat dishes
UK	17	10%	Development of various processed food with established species (salmon, trout and mussels)

†Calculated by Girard (this volume) in MASMANAP.
††Estimated by Paquotte (this volume) in MASMANAP.

The development of new products may be attributed to a wide range of phenomena related to the push of the goals of the firm and their internal financial, human and technical resources in addition to the pull of the market. In respect of the latter, the survey highlights a number of factors which include the national characteristics of consumption of aquatic food products and more general trends in the food market. This is particularly so in respect of consumers' willingness to accept more innovative products and, for aquaculture, will also be determined by its share of the aquatic foods market. Further stimulus to the adoption of new aquatic food products will come from the proactivity of supermarkets and the associated supply chains.

Although some of these aspects have been examined in other papers of the present seminar, notably Papageorgiou (this volume), the focus here is to consider the differences observed between the countries in the development of new products issued from aquaculture. An initial observation is that the development of new products seems to have little relationship to the volume of consumption. For example the UK shows a rather low level of consumption (Table 1), yet is the most innovative market for new products. The estimated share of farmed products in the consumption of aquatic food products varies broadly among the European countries, from 4% in Portugal to 27% in France in terms of volume. Indeed the countries with only a limited supply of farmed products, such as Portugal, may be less likely to develop a wide range of processed foods upon aquaculture products, unless these are imported.

The Southern European countries and Norway show a consumption pattern consisting mainly of fresh items, which obviously is reflected in consumers' preference for fresh farmed fish (Fig. 2). At the other extreme, the dominant share of the UK market is in the preserved form; this partially explains the significant developments in new processed products based upon farmed species.

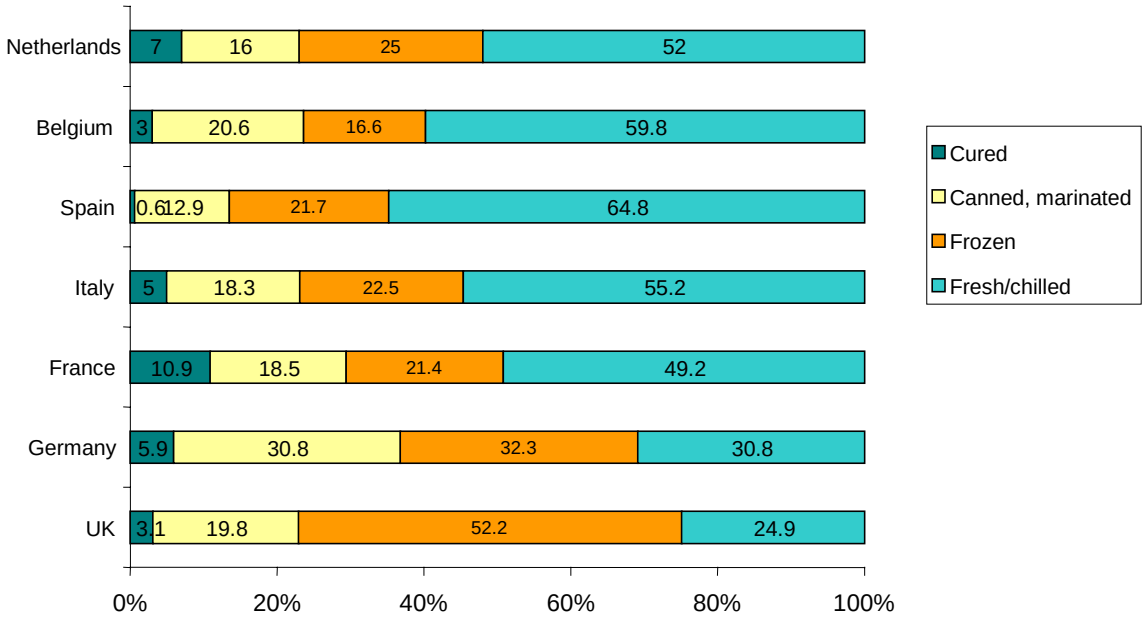

Fig. 2. Presentation of fisheries and aquaculture products on the markets (source: CFCE, Centre Français du Commerce Extérieur from inquiries, panels and professional estimations).

Another explanatory factor is the market share of supermarkets. Their in-house food technology and marketing resources accompanied with a sophisticated logistics infrastructure helps to promote the development of aquaculture-based foods with convenience and other attributes sought be their customers. This is most notable in the UK and France where the market share of supermarkets for fisheries and aquaculture products reaches the highest levels in Europe, estimated at 70% and 66% respectively by CFCE (2000).

Deli-food is one segment of the convenience products which has been studied recently by CFCE for OFIMER. This investigation found that deli-food is getting very developed in some European countries, amongst which the UK ranks first. Within deli-products, prepared meals play an important role, and this again is best typified within the UK (Fig. 3). Unfortunately no comparable data could be found to estimate the share of prepared meals upon aquatic food products.

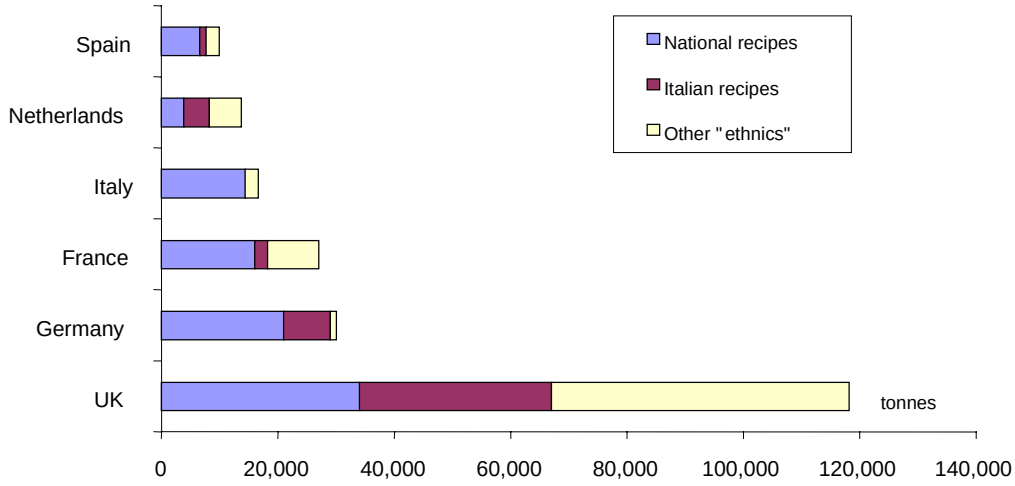

Fig. 3. The market of prepared meals in six European countries (source: CFCE, 2001, from Datamonitor).

The conclusion of this deli-seafood investigation (Table 2) suggests that there are opportunities for innovative value added products in very dynamic markets such as the UK and France. However in addition there are also emergent opportunities elsewhere, such as Italy, Germany and Spain where the market is already developing and consumer characteristics support the prognosis of scope for further growth.

Table 2. The market of deli-seafood (excluding smoked and canned products) (source: CFCE, 2001, for OFIMER)

	Estimated size of the market (t)	Market trends	Main features
UK	40,000†	Very dynamic	Ready-to-eat meals, sushi, sandwiches Mainly sold in supermarkets self-service Mainly under supermarkets' brands
France	45-50,000†	Very dynamic	Surimi, read-to-eat meals, salads Mainly self-service in supermarkets (not hypermarkets)
Germany	33,000†	Developing	Mainly salads, with herring (served at traditional counter) Dynamic segments: terrines (in catering), surimi
Spain	5-6,000	Developing	Mainly ready-to-eat meals, frozen Fresh surimi Salads for catering
Italy	2-3,000	Developing	Most dynamic segment: salads (at-home and out-of-home) Good prospect for fresh surimi

†Excluding sandwiches.

Moreover, the development of away-from-home consumption, and notably the take-away and fast food restaurants, plays a very active part in the expansion of the deli-food market. The importance of away from home consumption of aquatic food products in the UK (Fig. 4) is another key factor in explaining its current lead position for added value products.

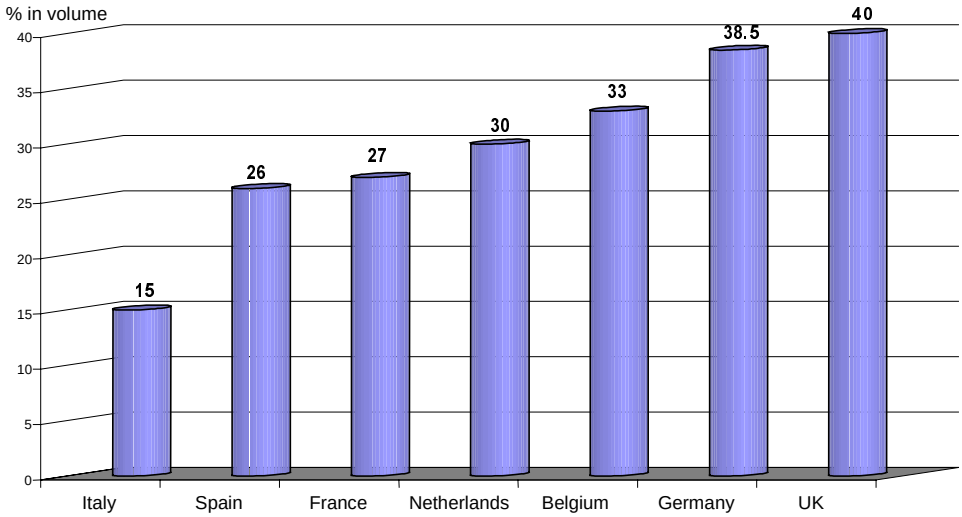

Fig. 4. Share of away-from-home consumption for the aquatic food products (source: CFCE from panels and professional estimations; France: OFIMER/GIRA).

Conclusion

This qualitative survey of the diversification of products based upon aquaculture species in eight countries has shown quite significant differences between the markets surveyed. The UK and France currently exhibit the widest and most innovative range of new products based on the adoption of processing, presentation and packaging technologies. These have been applied primarily to the established aquaculture species of salmon and trout, and to a lesser extent mussels. All of these species are at a development stage that provides sufficient volume at viable cost to permit use as an added-value product. In other countries the development of new products is limited at present. Traditional consumption characteristics are still dominant, for example fresh fish preferences in Norway, Greece and Italy, and traditional preserved fish in Germany. In addition, adoption of new aquaculture products is hampered by the small share of the market which aquaculture species occupy, especially so in the case of Portugal. Spain represents an intermediate case with a high level of fresh seafood consumption, some traditional processed products using mussels and some development of new products based upon salmon and trout. Italy, to a lesser extent, also shows a diversification of products based on salmonids. A trend towards more convenience foods can be observed in most of the countries, but is particularly pronounced in the UK and, to a lesser extent, France.

Notwithstanding the varied rates of diffusion of NPD within the aquaculture based aquatic foods market it would seem reasonable to expect that the broad patterns of evolution and integration witnessed within other food product categories will emerge here too. In the case of many species, aquaculture has yet to realise its fuller potential and the current stage of development still places greater comparative emphasis upon more elementary product forms. Hitherto these have commonly represented the more profitable option in the short-run at least and are commonly the market channel most familiar to producers. However as production expands, and as producers need to contemplate species/product diversification decisions which address the finite limits of environmental production capacity, it seems logical that consideration will increasingly focus upon the scope for building added value into aquaculture products. This in turn will tend to accelerate the pace of NPD throughout European markets and elsewhere too.

In the case of salmon this scenario has already been played out and is likely to be followed as declining prices associated with increased production enable absorption of processing costs and generate the opportunity to create added value. Trout has already moved to advanced position although the limits of product size, rather than other technical factors, may remain a constraint to wider adoption. Non-salmonid candidate species also exist and, like their counterparts elsewhere such as tilapia and Channel catfish, can be expected to launch in an increasingly wide array of product forms. The scale and frequency of such product innovations will continue to reflect prevailing price differentials between those targeted at the top of the market such as turbot, halibut, etc., and those with a product range which extends down to provision of a basic raw material intended for incorporation as a component of an added value product. Such candidate species might include tilapia and African catfish. Between these possible positioning extremes a range of intermediate species is currently on the cusp of expansion. Cod and haddock are notable for their traditional dominance within many international markets, but as wild supplies continue to decline and culture technology advances, it is apparent that there are many established niches simply waiting to be filled. In the longer term there seems little reason to doubt that the map of new products based upon aquaculture is destined to become more complex and as such, an increasingly important component of the market for aquatic foods.

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Appendix 1: MASMANAP Task 4 "Marketing survey of new aquaculture products"

Grid for the survey of the product range of aquaculture-based raw materials

Packaging: L - loose; T - tray/overwrap; MAP - modified atmosphere;										
VSP – vacuum skin; CL - club can; CH - hansa can; x: not available										
			SPECIES							
			Salmon	*Trout*	*Eels*	*Halibut*	*Cod*	*Turbot*	*Mussels*	*Scallops*
FRESH/CHILLED										
Whole	round									
	gutted									
H&G										
Fillets	single	Skin/on								
		Skin/off								
	b/fly	Skin/on								
		Skin/off								
	cutlets	Skin/on								
		Skin/off								
	sark	Skin/on								
		Skin/off								
Loin		Skin/on								
		Skin/off								
Medallions										
Steaks										
Portions										
Kebabs										
Sushi										
Analogue										
FRESH/CHILLED										
Prepared fish		pre-cooked								
		uncooked								
	In sauce	pre-cooked								
		uncooked								
Prepared meal		pre-cooked								
		uncooked								
Other										
FROZEN										
Whole	round									
	gutted									
H&G										
Fillets	single	Skin/on								
		Skin/off								
	b/fly	Skin/on								
		Skin/off								
	cutlets	Skin/on								
		Skin/off								
	sark	Skin/on								
		Skin/off								
Loin		Skin/on								
		Skin/off								

			Salmon	*Trout*	*Eels*	*Halibut*	*Cod*	*Turbot*	*Mussels*	*Scallops*
Medallions										
Steaks										
Portions										
Kebabs										
Sushi										
Analogue										
Prepared fish		pre-cooked								
		uncooked								
	In sauce	pre-cooked								
		uncooked								
Prepared meal		pre-cooked								
		uncooked								
Other										
CANNED										
Whole	round									
	gutted									
H&G										
Fillets	single	Skin/on								
		Skin/off								
	b/fly	Skin/on								
		Skin/off								
	cutlets	Skin/on								
		Skin/off								
	sark	Skin/on								
		Skin/off								
Loin		Skin/on								
		Skin/off								
Medallions										
Steaks										
Chunks										
Paste										
Analogue										
Prepared fish		pre-cooked								
	In sauce	pre-cooked								
Prepared meal		pre-cooked								
Marinade										
Other										
SMOKED: ho-hot; co-cold										
Whole	round									
	gutted									
H&G										
Fillets	single	Skin/on								
		Skin/off								
	b/fly	Skin/on								
		Skin/off								
	cutlets	Skin/on								

			Salmon	*Trout*	*Eels*	*Halibut*	*Cod*	*Turbot*	*Mussels*	*Scallops*
		Skin/off								
	sark	Skin/on								
		Skin/off								
Loin		Skin/on								
		Skin/off								
Medallions										
Steaks										
Slices										
Kebabs										
Sushi										
Pate										
Prepared fish		pre-cooked								
		uncooked								
	In sauce	pre-cooked								
		uncooked								
Prepared meal		pre-cooked								
		uncooked								
Gravadlax										
Other										