



# GLOBEFISH

## GLOBEFISH RESEARCH PROGRAMME



## Freshwater Fish for European Markets

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by

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**GLOBEFISH**

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This study describes the present state of the European freshwater fisheries industry, analysing the main species, such as carp, trout, eel, Nile perch, the catfish *Pangasius*, tilapia, northern pike, sturgeon, pike-perch and European perch, and all the European countries (EU-25 and other European countries). The first part of the study focuses on European market diversity, highlighting the top producers, exporters and importers of freshwater fish. Product development, distribution channels and changing consumer priorities and sophistication are emphasized. An overview of 25 member countries of the EU and 15 non-member countries describes production, trade and market conditions in the freshwater fisheries sector. The third part outlines the state of European freshwater aquaculture, and the fourth introduces the 10 most important freshwater species. A brief introduction of European legislation for freshwater fish farmers is presented in part six, and conclusions and recommendations are provided in the final part of the study.

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## Introduction

When analysing the overall state of European aquaculture and trade of freshwater fish, one has to take into account global trends in capture fisheries and aquaculture. According to the FAO report “The State of World Fisheries and Aquaculture”<sup>1</sup>, recent years confirmed the trends that had been already observed in the 1990s: capture fisheries production is stagnating (some 95 million tonnes in 2003), while aquaculture production is expanding. The global aquaculture sector is expected to increase from about 55 million tonnes today to more than 65 million tonnes in 2020, and new forecasts suggest aquaculture will grow to as much as 95 million tonnes by 2020. At the same time, while marine catches are stagnating and even declining, demand for fish products is increasing and this can only be filled by aquaculture products. These trends emphasise the growing importance of farmed fish all over the world, which can be seen in both production and trade.

In Europe, aquaculture is one of the oldest traditional farming activities, but the part of freshwater aquaculture is considerably less than that of marine aquaculture. European freshwater farming is less innovative, diverse and profitable than sea fish farming because of the industry’s fragmentation and competition between producers. As production methods have improved, the European farmers of freshwater fish have failed to adapt to the new situation, paying little attention to changes in consumer demand and market trends, or responding in an uncoordinated way. Slow growth in sales and little economic reward have been the result. However, the industry can offer significant opportunities if some common strategies towards industry convergence, product development and marketing activities are implemented.

This study describes the present state of the European freshwater fisheries industry, analysing the main species, such as carp, trout, eel, Nile perch, the catfish *Pangasius*, tilapia, northern pike, sturgeon, pike-perch and European perch, and all the European countries (EU-25 and other European countries). The first part of the study focuses on European market diversity, highlighting the top producers, exporters and importers of freshwater fish. Product development, distribution channels and changing consumer priorities and sophistication are emphasized.

An overview of 25 member countries of the EU and 15 non-member countries describes production, trade and market conditions in the freshwater fisheries sector. The third part outlines the state of European freshwater aquaculture, and the fourth introduces the 10 most important freshwater species. To highlight the market position of individual species, their strong and weak points, opportunities and threats, the SWOT analysis and BSG matrix have been applied. A brief introduction of European legislation for freshwater fish farmers is presented in part six, and conclusions and recommendations are provided in the final part of the study.

Annex 1 contains statistical data on aquaculture and landings of freshwater fish, while Annex 2 provides data on freshwater fish trade. All statistical data are based on FAO, Fishstat +, unless another source is indicated.

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<sup>1</sup> SOFIA “The State of World Fisheries and Aquaculture”, 2004

## 1. Overview of the European market

The European market for freshwater fish is complex. While Norway, Germany, Italy, France and Spain dominate in both production and trade volume, Finland, Estonia, Iceland and Norway are the countries with the highest per capita consumption of freshwater fish. Finland, Poland and Germany have the biggest production of freshwater fish, and Germany, France, Italy and Spain are the most important and prospective markets for freshwater fish sales.

**Table 1: Top producers of freshwater fish among EU-25 countries and other European countries**

	Countries	Volume (in tonnes)	%	Value (US\$ million)	%		Countries	Volume (in tonnes)	%	Value (US\$ million)	%
Top EU-25 producers	France	48,580	15	121	13	Top European producers, non EU-25 included	Russian Federation	107,867	18	276	17
	Germany	45,646	14	138	15		Norway	69,128	11	172	11
	Italy	42,200	13	155	17		France	48,580	8	121	7
	Poland	34,526	11	77	8		Germany	45,646	7	138	8
	Spain	33,810	10	78	9		Italy	42,200	7	155	9
	Denmark	32,205	11	84	9		Turkey	41,411	7	101	6
	Czech Republic	19,670	6	39	4		Poland	34,526	6	77	5
	United Kingdom	15,398	5	48	6		Spain	33,810	6	78	5
	Other	52,872	15	172	19		Other	188,643	30	531	32
	<b>Total EU- 25</b>	<b>324,907</b>	<b>100</b>	<b>912</b>	<b>100</b>		<b>Total</b>	<b>611,811</b>	<b>100</b>	<b>1,649</b>	<b>100</b>

### 1.1 Producers

In 2003, EU-25 aquaculture production of freshwater species amounted to 324 907 tonnes, with a production value of US\$ 912 million. This includes rainbow trout<sup>2</sup>, carp and eel as the main farmed species, supplemented by North African catfish, sturgeon and other species. If Norway, Iceland and Faeroe Islands<sup>3</sup> are included, the total European output of farmed freshwater fish reached 405 708 tonnes with an estimated production value of US\$ 1.1 billion.

As the table above shows, France (49 000 tonnes), Germany (46 000 tonnes) and Italy (42 000 tonnes) are the leading European producers with 42% of the production volume and 45% of the value in the EU-25 market. Those countries concentrate mainly on rainbow trout farming, together with Spain (34 000 tonnes) and Denmark (32 000 tonnes), which rank next. Poland (35 000 tonnes) and the Czech Republic (20 000 tonnes) are among the biggest aquaculture producers of carp. Outside the EU, Norway is the biggest producer of farmed trout with 69 000 tonnes valued at US\$ 172 million, and the Russian Federation is the major producer of farmed carp with 108 000 tonnes valued at US\$ 276 million. Turkey is becoming a competitive aquaculture producer of trout with its 41 000 tonnes and production value of US\$ 101 million.

<sup>2</sup> Trout is identified as a freshwater fish, but it is produced both in fresh and sea water. Being the biggest producer of trout, Norway practices trout production in sea water, while other European countries mostly cultivate trout in freshwater environment.

<sup>3</sup> Norway, Iceland and Faeroe Islands are regarded together with EU-25 in aquaculture production because of their significance in trout production and importance on the European-wide market. Whereas Norway and Iceland are EEA countries (European Economic Area), Faeroe Islands have bilateral trade agreements with EFTA (European Free Trade Association) countries.

In 2003 freshwater capture fishery was estimated at 319 000 tonnes. Finland dominated with 47 000 tonnes, followed by Germany (24 000 tonnes), Poland (24 000 tonnes), Hungary (6 500 tonnes), Spain (6 300 tonnes), Estonia (5 000 tonnes), the Czech Republic (5 000 tonnes) and other countries. Generally, the catch is not traded internationally, but consumed domestically in the countries of origin.

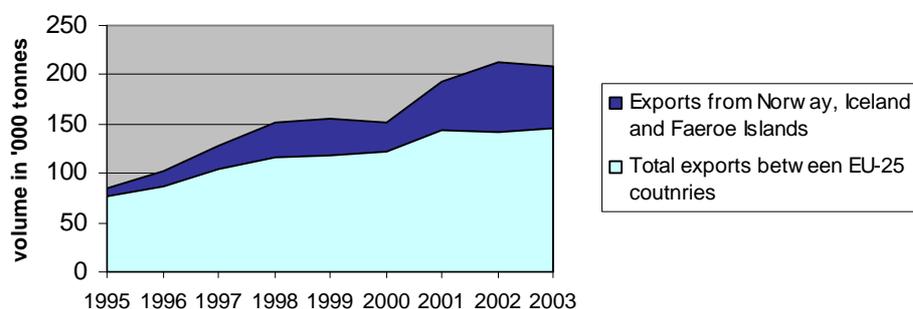
## 1.2 Trade

Whereas most of domestically produced freshwater species like carp, eel and trout are traded inside European countries, (with the exception of Norwegian trout, a large proportion of which is exported to Japan and the Russian Federation), other species like Nile perch, tilapia and Pangasius are imported from non-EU countries. Thus, analysis of the European trade includes both intra-EU trade and extra-EU trade.

### Exports

In 2003 the total exports of freshwater fish among EU-25 countries reached 146 330 tonnes, which is 3% more compared to 2002 and 48% more compared to 1995. Exports from Norway, Iceland and Faeroe Islands amounted to 62 531 tonnes in 2003, of which Norwegian exports were 53 730 tonnes. European-wide exports of freshwater fish including those of EU-25 + Norway, Iceland and Faeroe Islands are estimated at 209 000 tonnes.

**Figure 1: Freshwater fish exports within Europe**



At present, Norway is the biggest exporter in the European-wide freshwater fish sector, specializing in rainbow trout. In 2003 the country exported nearly 54 000 tonnes of trout (26% of the total volume of the European-wide freshwater fish exports) with a revenue of US\$ 179 million (20% of the total value in the respective sector). Norwegian trout was exported to Japan (27 000 tonnes), the EU markets (16 000 tonnes) and the Russian Federation (14 000 tonnes).

Denmark (30 413 tonnes), the Netherlands (28 177 tonnes) and Belgium (21 664 tonnes) are the three biggest exporters in the European Union, making up approximately 40% of the volume of European freshwater fish exports and 46% of the value. Whereas Denmark exports mostly trout, Belgium and the Netherlands are the two main entry ports for Nile perch and tilapia from other continents, which are then re-exported to European countries. The Czech Republic is the biggest exporter of carp (8 672 tonnes). Faeroe Islands (8 020 tonnes) and Sweden (7 469 tonnes) are other important exporters

of trout. Germany, Spain, France, Austria and Italy are among the top European exporters of various freshwater fish.

The table below shows volume and value of European freshwater fish exports by the main countries in 2003.

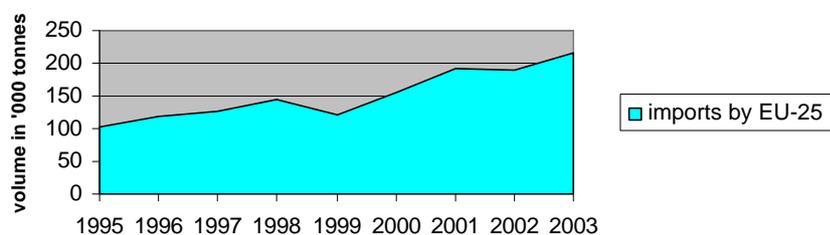
**Table 2: The biggest exporters of freshwater fish in 2003**

Country	Volume (in tonnes)	%	Value	%
Norway	53,731	26	179,181	20
Denmark	30,413	15	155,814	17
Netherlands	28,177	13	170,308	19
Belgium	21,664	10	92,592	10
Czech Republic	8,672	4	16,842	2
Faeroe Islands	8,020	4	24,263	3
Sweden	7,469	4	27,572	3
Germany	7,457	4	35,370	4
Spain	7,308	3	31,378	3
France	6,690	3	55,033	6
Austria	6,416	3	22,941	2
Italy	4,469	2	16,263	2
Other	18,501	9	80,095	9
<b>TOTAL</b>	<b>208,987</b>	<b>100</b>	<b>907,652</b>	<b>100</b>

## Imports

European imports of freshwater fish comprise both intra- and extra-European trade because large quantities of Nile perch, catfish and tilapia have been imported from Africa and Asia in the last few years. Over the last decade, the volume of freshwater fish imports increased by 55% and the value by 44%, reaching nearly 244 000 tonnes with a revenue of US\$ 983 million in 2003. Because of the ban on imports of Nile perch from Africa imposed by the EU, the volume of imports went down in 1999; however, it rapidly recovered afterwards. The value follows a similar curve, reaching its minimum of US\$ 549 million in 1999. It is likely that European imports of freshwater fish will continue to grow in the next few years, taking into account the rapid development of catfish imports from Vietnam.

**Figure 2: European imports of freshwater fish**



Germany is the biggest importer of freshwater fish in Europe, making up approximately 17% of volume (42 343 tonnes), and 18% of value (US\$ 177.5 million) of the total European imports of freshwater species. Being the most promising market, Germany imports significant quantities of Nile perch, trout, catfish, carp and eel. Belgium and the Netherlands import large quantities of Nile perch and tilapia, which are further exported to other European countries. Belgian imports amount to nearly 29 000 tonnes with a value of US\$ 119.5 million, while the Dutch imports of 27 000 tonnes are valued at nearly US\$ 123 million.

France is a very important market which imports 20 500 tonnes for US\$ 91.5 million. United Kingdom (13 757 tonnes), Italy (13 236 tonnes) and Austria (11 321 tonnes) are the next biggest importers, together making up 16% of the volume and 14% of the value of total European imports in the freshwater fishery sector.

Spain (9 866 tonnes), Finland (8 633 tonnes) and Denmark (8 489 tonnes) are other significant importers. While Spanish imports consist mostly of Nile perch and catfish fillets, Danish imports also include trout and eel. Finnish imports are dominated by rainbow trout. Outside the EU, the Russian Federation is an emerging market for freshwater fish imports, in particular rainbow trout, which reached 16 719 tonnes with a value of US\$ 33 million.

**Table 3: The biggest importers of freshwater fish in 2003**

Country	Volume (in tonnes)	%	Value (US\$ '000)	%
Germany	42,342	20	177,508	20
Belgium	28,861	13	119,532	13
Netherlands	27,253	13	122,770	14
France	20,522	9	91,544	10
United Kingdom	13,757	6	42,993	5
Italy	13,236	6	61,855	7
Austria	11,321	5	41,352	5
Spain	9,866	5	53,763	6
Finland	8,633	4	24,770	3
Denmark	8,489	4	44,326	5
Other	31,779	15	112,794	12
<b>TOTAL</b>	<b>216,059</b>	<b>100</b>	<b>893,207</b>	<b>100</b>

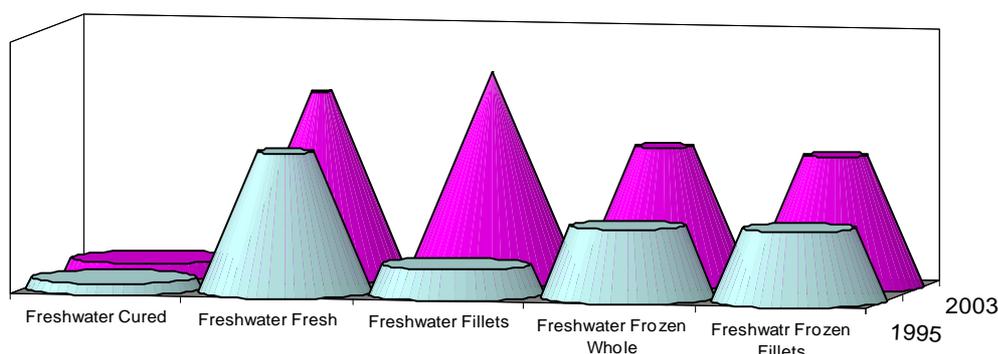
### 1.3 Trade by product form

It has usually been considered that in Europe freshwater species are often traded live or fresh/chilled. However, there are big differences in trade tendencies depending on the species. Whereas trout, carp and eel, which are mostly traded between European countries, are traded live and fresh, Nile perch, catfish and tilapia, which are imported from non-EU countries, tend to be traded as fresh and frozen filleted products.

**Table 4: Imports of freshwater fish by product form in 1995 and 2003**

Product form	1995	%	2003	%
Freshwater Cured	3,633	4	5,434	3
Freshwater Fresh	44,498	43	59,025	27
Freshwater Fillets	9,640	9	66,133	31
Freshwater Frozen Whole	23,011	22	43,617	20
Freshwater Frozen Fillets	22,977	22	41,809	19
<b>Total</b>	<b>103,759</b>	<b>100</b>	<b>216,018</b>	<b>100</b>

**Figure 3: Imports of freshwater fish by product form in 2003 compared to 1995**



**Table 5: Imports of freshwater fish by product form in 2003 compared to 1995 and 2002**

Product form	2003	2003/1995	2003/2002
Freshwater Cured	5,434	33%	5%
Freshwater Fresh	59,025	25%	9%
Freshwater Fillets	66,133	85%	19%
Freshwater Frozen Whole	43,617	47%	-6%
Freshwater Frozen Fillets	41,809	45%	24%

### Trends in imports

- The main trend observed was towards fresh filleted products: its share of the overall freshwater fish imports grew from 9% to 31% in the period 1995-2003. The quantity of fresh fillets increased by 85% in the respective period, exceeding 66 000 tonnes in 2003. All fresh fillets are not identified by FAO statistics, being placed under the category “freshwater fish fillets, fresh or chilled”, and probably include Nile perch and tilapia fillets as the major species.
- The share of live, fresh and chilled whole fish is declining: whereas in 1995 it was estimated to form 43% of freshwater imports, its share fell to 27% in 2003. However, by volume, the imports of live, fresh and chilled whole fish increased by 25% over the respective period, being still one of the most important product forms in trade accounting for nearly 59 000 tonnes in 2003. Trout, carp, eel and probably tilapia are the main species in this category.

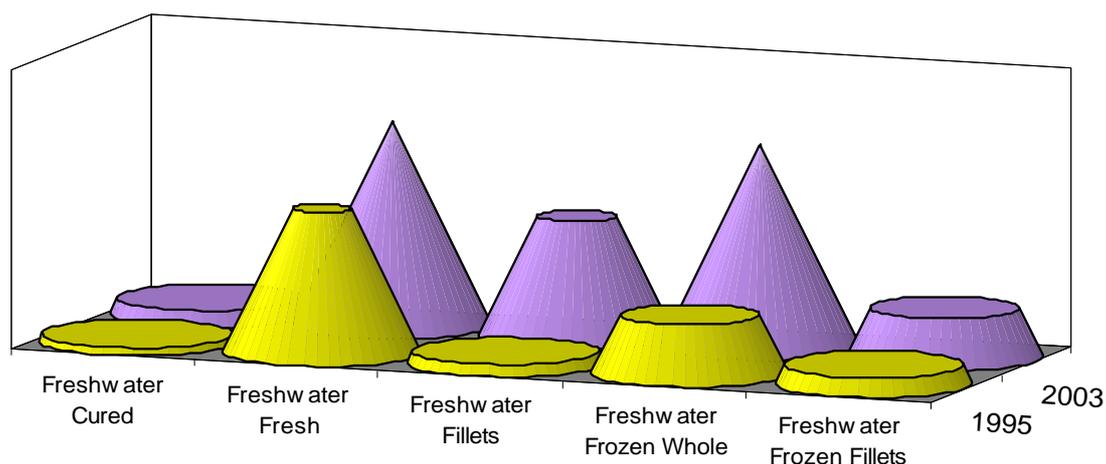
- Imports of frozen whole fish have remained stable accounting for 22% in 1995 and for 20% in 2003. In volume terms, there has been an increase of 47% reflecting the overall trend in freshwater fish imports. Non-identified frozen freshwater fish (mainly tilapia and Nile perch), trout and eel are the main fish species in this group, which amounted to 43 600 tonnes in 2003.
- The proportion of frozen fillets has also been relatively stable: it formed 22% in 1995 and 19% in 2003. The volume grew by 45% in the same period, reaching 41 809 tonnes at present, with Nile perch, Pangasius and tilapia being the major species. While Nile perch frozen fillets have given way to Nile perch fresh fillets in recent years, imports of frozen Pangasius fillets have rapidly increased.
- The share of cured fish (salted, marinated, dried and smoked) has decreased from 4% to 3% over the same period, with some 5 400 tonnes in 2003. Smoked trout and smoked eel are the principal products.

Regarding European exports of freshwater species, the situation looks much the same except for the trend for frozen whole fish. The overall exports increased from 85 400 tonnes in 1995 to nearly 209 000 tonnes in 2003.

**Table 6: Exports of freshwater fish by product form in 1995 and 2003**

Product form	1995	%	2003	%
Freshwater Cured	2,662	3	5,702	3
Freshwater Fresh	51,066	60	72,150	35
Freshwater Fillets	4,041	5	42,367	20
Freshwater Frozen Whole	20,828	24	71,314	34
Freshwater Frozen Fillets	6,806	8	17,326	8
<b>Total</b>	<b>85,403</b>	<b>100</b>	<b>208,859</b>	<b>100</b>

**Figure 4: Exports of freshwater fish by product form in 2003 compared to 1995**



**Table 7: Exports of freshwater fish by product form in 2003 compared to 1995 and 2002**

Product form	2003	2003/1995	2003/2002
Freshwater Cured	5,702	53%	9%
Freshwater Fresh	72,150	29%	4%
Freshwater Fillets	42,367	90%	11%
Freshwater Frozen Whole	71,314	71%	-22%
Freshwater Frozen Fillets	17,326	61%	19%

As seen from the table and figure above, the main trends for exports are as follows:

- As was the case with imports, the proportion of live/fresh fish in European exports is following a downward trend. The share of fresh fish went down from 60% to 35% over the period 1995-2003, while the overall volume increased by 29%. Exports were over 72 000 tonnes in 2003, exceeding those of all other product forms.
- Exports of fresh fillets continue to grow: around 42 400 tonnes in 2003, an increase of 90% over the last eight years. The share of this product form has increased from 5% in 1995 to 20% at present.
- Exports of frozen freshwater fish fillets have remained stable at 8% over the period 1995-2003. The overall quantity grew by 61% reaching 17 300 tonnes in 2003.
- Exports of frozen whole fish have shown an upward trend. The proportion of frozen fish increased from 24% in 1995 to 34% in 2003. The volume grew by 71% over the same period, reaching over 71 000 tonnes. It should be noted that the major part of this product form includes Norwegian exports of frozen trout to Japan and Russia (some 28 000 tonnes).
- The share of cured fish stayed at 3% over the 1995-2003 period. The volume rose by 53%, reaching 5 700 tonnes in 2003. Smoked trout represents 87% of this volume.

#### **1.4 Consumer preferences and trends**

At present, European producers of freshwater species are not yet fully aware of the variability in preferences among different consumer groups. A complex and multidimensional consumer society exists in the major European markets. It goes beyond the traditional price-seeking, convenience or timesaving aspects. There is also variability in choice of product and eating habits, and all those aspects depend on age, disposable income, life style, social and ethnic background and other demographic factors.

A simple example that highlights the complexity of the major markets is that Northern Europeans generally like both white and red meat fish while Southern Europeans have preference for red meat fish. Whereas consumers in Northern Europe mostly do not like to buy unprepared fish products, Southern Europeans have traditionally eaten freshly fried or grilled fish.

However, the following common aspects of consumer behaviour can be found when analysing the whole European market for freshwater fish:

1) **Middle-aged market:** At present, older people account for most of the consumption of the main freshwater species such as trout, carp and eel. Traditions, habits and the necessary time and skills to prepare live or fresh whole fish at home are among the reasons for dominance of this group. A recent study commissioned by OFIMER<sup>4</sup> (l'Office National Interprofessionnel Des Produits De La Mer et De l'Aquaculture) showed that French consumers of fresh fish were represented by the following categories:

- some 40% of the consumers were over 65 years old
- some 33% of the consumers were between 50 and 64 years old
- some 20% were between 35 and 49 years old
- the rest were younger than 35 years old

Although this study comprised fresh fish in general, this may be a good illustration of the French market of freshwater species since trout and carp are mostly sold live and fresh.

2) **Growing demand for value-added products:** Changes in social and demographic factors have increased demand for value-added and ready-to-cook products. More single-person households, decreased fertility and decline in marriage, as well as increased female participation in full-time work, have led to a decline in preparation of fresh fish at home. People often resort to ready complete meals and value-added products that can be simply frozen, cooked, smoked, etc. However, regarding processing of freshwater fish species, the most significant increase was observed in EU-25 production of fresh and frozen fillets and cured fish products (including salted, marinated, dried), as well as canned fish products.<sup>5</sup> In particular, European output of fresh fillets has increased by 28%, frozen fillets by 28%, canned fish products by 20% and cured fish products by 11% over the 2000-2003 period.

3) **Price as an essential factor:** Price is often a very important consideration for consumers, and however much they like fish, if it is too expensive they will not buy it or switch to another protein source like chicken and pork. Generally European consumers are price conscious, although this is relative, depending on product form and consumer group. Each market is unique, and whereas price is a major criterion for fish purchase in Germany, Italy and Spain are countries that are less price conscious. Recent studies have shown that Europeans spend on average 20% of their monthly income on food. There are large variations throughout Europe: while in Germany consumers spend about 8% of their income on food monthly, in Greece the figure is much higher - 37%.<sup>6</sup> It should be taken into account that in some countries many fish products have a price barrier; for example, German consumers are generally unwilling to cross the barrier of €3.00 per portion when buying fish.<sup>7</sup>

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<sup>4</sup> The study is based on interviews of 8 000 French families of various incomes living across the country. Bilan Annuel 2004: Consommation des produits de la peche et de l'aquaculture, p.35

<sup>5</sup> Author's estimation based on statistics of EU-25 freshwater fish production by product form, Fishstat+, FAO

<sup>6</sup> "Marketing – Product" available on [www.aquatt.ie](http://www.aquatt.ie)

<sup>7</sup> Case Studies for Developing a Marketing Concept for Fish Products (2005): "Consumer Demographics – The Single German" by Aquaculture Training and Technology Network, [www.aquatt.ie](http://www.aquatt.ie)

- 4) **Quality and Traceability:** Most consumers are aware of the benefits of healthy eating and recognize fish as a healthy light meal rich in protein. In addition to quality issues, consumers are increasingly concerned with conditions of fish production. Firstly, fish farming, like any intensive livestock production system, may provoke concerns for animal welfare. Then, all products imported into the EU have to meet strict hygiene standards (HACCP), and starting in 2006, will require full traceability to ensure product quality. This will include detailed records of the fish genetics, feeds, medications, harvest procedures, etc., which will be supplied to the trader to guarantee quality of the product. Producers of organic products that meet all the requirements have a good future in general, but low production, high production costs and the absence of common standards have discouraged many producers from organic production so far. Some consumers are prepared to pay a high premium for those products (up to 75%), being aware of the quality of the product they purchase, but at present such “eco-products” represent only about 1% of the overall fishery market in Europe.

A very interesting survey was conducted by the Waitrose Group in the UK in 2004.<sup>8</sup> The author performed a series of 500 in-depth interviews with shoppers to determine their shopping patterns, and she then identified 10 consumer groups. Even though the research was not specifically directed at fish products, it helps the industry to understand the general features of who is buying fish products. Those ten consumer categories were divided into “The Definite Consumers”, “The Probable Consumers” and “The Probable not Consumers”.

### **The Definite Consumers**

*“Continuous Convenience Eaters:* Those people do not have time and/or skills to prepare food and they live mostly on frozen and canned products. They are not really label readers, however good packaging is a definite plus to catch their eye and start them buying.

*Earth Mothers:* “Healthy food” is the logo of this consumer group. They tend to have a balanced diet and fish is eaten at least twice a week as it is seen as healthy and nutritious. They do not read what is on the packet and have no time to read the press reports, although traceability in the aquaculture industry can be promoted as a benefit to these consumers.

*Organic Disciples:* health conscious and anxious about everything they eat, especially salt, sugar and fat. They are good fish consumers, but are increasingly concerned about the media campaigns and environmental/ethical issues. However, if a product can be shown to be really organic they will pay the price. True traceability will become essential to these buyers.

### **The Probable Consumers**

*The Childless Carousers:* or yuppie sector are those who buy top-of-the-range, ready-to-cook meals and eat out as much as possible. These consumers can be categorized as Mark and Spencer types, with the potential for the industry to produce “designer products” complete with sauces for the microwave, making this an interesting market for value-added products.

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<sup>8</sup> The survey was commissioned by Christine Webber, [www.aquatt.ie](http://www.aquatt.ie) and [www.tnc-partners.com](http://www.tnc-partners.com)

*Food Faddists:* embrace the latest diets like a religion and are likely to stock up on the ingredients for the latest diet. When fish is in these diets they are the best customers - when it is out?

*Weekend Junkies:* eat healthy food throughout the week but resort to takeaways on the weekend. They are not particularly fish consumers, but probably eat fish more than once a week as it is seen as healthy and it is increasingly available in the popular takeaway outlets. However, in the UK the most popular takeaways are from Indian and Chinese sources, and curried fish is not as popular as chicken Vialdo.

*Chaotic Singles:* eat takeaways, restaurant or pub food or heat up ready meals. Food in general is not at the top of their agenda, but it can be when they are trying to impress a new potential partner or a guest. However, they are often partially health conscious, and will consume fish products from time to time. The problem from a fishery industry perspective is that increasingly large percentages of the adult consumer population fall into this category (over 60% in Germany).

### The Probably-not Consumers

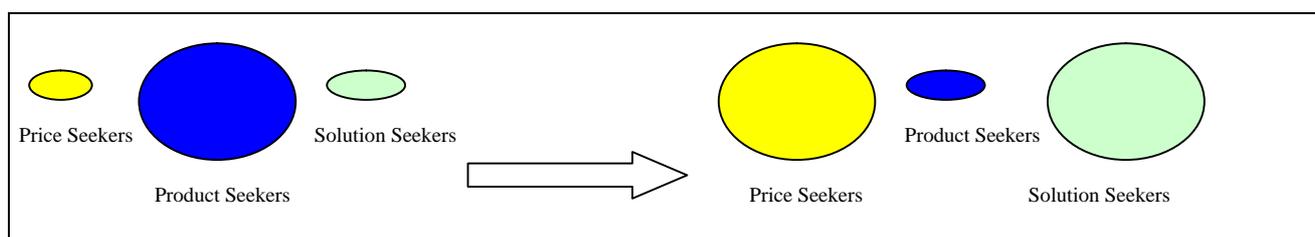
*Sandwich and Soup Students:* feel they do not have time or money to eat healthily. There is not much hope here for market development, and they fit to the next category as well.

*Return to Nesters:* they return home to raid the parents' refrigerator... and get their washing done at the same time. It is only when mum cooks the fish that they eat it, so it is the above group at the weekend.

*Monday Morning De-toxers:* In the gym or nibbling a salad on Monday, and back in the pub on Tuesday. Also see Brigit Jones's Diary, as they are not really a target market for fish.<sup>9</sup>

The study also showed that nearly all the consumers were reading the labels when they had time and that people had noticed more information being available on the package. Many people were often surprised at the information shown: an interesting fact is that 80% of the UK consumers did not know they were eating farmed fish before it was included on the label. Thus the use of specific labels describing geographic origin, production method and product quality should be promoted.

A curious observation was made by A. Slywotsky<sup>10</sup> in one of his marketing books. He stated that previously all the consumer categories could be roughly divided into three groups: Price Seekers, Product Seekers and Solution Seekers. While the second category had dominated over a long period, at present new market conditions reveal dominance of Price Seekers and Solution Seekers.



Probably this can also be applied to European consumers of freshwater fish species. When an average European fish consumer meets a range of similar products (like Nile perch fillets, Pangasius catfish

<sup>9</sup> "Assessment on the targeted market structure", [www.aquatt.ie](http://www.aquatt.ie)

<sup>10</sup> Based on "Profit Patterns: 30 ways to anticipate and profit from strategic forces reshaping your business" by A. Slywotsky and J. Morrison, 1999

fillets and tilapia fillets), price criteria will be important to him unless the products differ considerably. Solution seekers represent the growing category of consumers who prefer ready-to-cook fish products and complete meals.

Regarding average consumption of freshwater fish in Europe, it is estimated at 1.48 kg per capita. Consumption is highest in the Northern European countries: Finland (13 kg per capita), Estonia (4.7 kg per capita), Iceland (4 kg per capita), Norway (3.5 kg per capita) and Denmark (2.1 kg per capita).

Taking into account supply of freshwater fish, large markets like France, Germany, Italy and Spain, which have an estimated consumption of 1 kg per capita, generally have the most potential for trade in freshwater species. The table below represents European countries with the highest per capita consumption of freshwater fish.

**Table 8: Consumption of freshwater fish by country in 2003**

	Country	kg per capita
All European countries	Finland	13
	Estonia	4.7
	Iceland	4
	Norway	3.5
	Denmark	2.1
	Hungary	1.8
	Russia	1.8
	Czech Republic	1.7
	Switzerland	1.4
	Poland	1.3
	France	1
	Germany	1
	Italy	1
Spain	1	
EU-25 average		1.48

As seen from the analysis of consumer behaviour and preferences, it can be assumed that there is a potential market for new high quality fish products in Europe, but not necessarily in the sophisticated forms. “Convenient and interesting product, good quality and the right price” are the keywords of today’s consumers. Most consumers are eager to eat healthy fish but often replace it with other products because of time pressure and product price. In general, European producers of freshwater species have drawn little benefit from this trend. While at present there is a lack of

knowledge of what exactly consumers of trout, carp and other freshwater species want, there exists an ideal opportunity to supply simple value-added products while researching and forecasting further trends.

## 1.5 Distribution

The overall distribution of freshwater fish in the European market is based on the following main chains: distribution directly from farms, wholesale markets and distribution centres, which deliver fish to processing, catering and retail sectors as well as local markets in the countries.

- **Farm sales:** It can be a very profitable way of selling fish directly to retail chains and end consumers, avoiding the wholesale part. In some countries like Germany and France it has been a successful practice, giving the customers premium freshness and lower prices. In particular, in Germany nearly half of the trout producers sell the fish from farms to the consumer both in fresh and processed form. This form of direct sales is highly recommended if the location of the farms and conditions for fish sales are suitable.
- **Wholesale markets:** Probably more than 50% of freshwater aquaculture products enter the markets via wholesale markets in Europe. Some of the most important are Rungis (France),

Billingsgate (the UK), Mercamadrid and Mercabarna (Spain), Milan and Rome (Italy), Hollandse Visveiling IJmuiden (the Netherlands).

- **Distribution centres:** This is a growing sector comprising logistical markets and non-specialist auctions, which can assist companies using in-house marketing, local agents and agents for imports.<sup>11</sup> For example, in Germany the largest distribution centres for fish are located at Frankfurt Airport and Munich (for fresh fish), Bremen (for frozen reprocessed fish), Hamburg (especially for carp) and Cologne (fish imports from Rungis, France). Direct import of Nile perch organised by German importers is a good example of improving the distribution chain and thus getting better trade conditions for the product.

There are no official statistics on the distribution chains for freshwater fish, but according to market experts, the situation depends on the species and the time the fish has been introduced on the market. The most traditional species like carp and trout are traded live and fresh, thus fishmongers, fish markets and specialist retailers are the prime selling points for these species. Frozen and fresh fillets of Nile perch, one of the new imported freshwater species on the European market, are marketed both in traditional and modern retail. Frozen catfish and tilapia, which were introduced onto the market later, are traded mostly in the modern retail chains.

The growing role of supermarkets in seafood sales is evident, and many hyper- and supermarkets and discount chains have opened counters where fresh fish is available. However, not all chains follow this policy due to organisational reasons, e.g. in Germany many retail chains rely only on frozen and ready-meal fish products. In France, on the other hand, 80% of fish sales pass through the major retailers and they all have excellent fresh fish counters. Also in Italy more than 50% of seafood sales are made in supermarkets. Taking into account growing demand for fresh and value-added products, the role of modern distribution will be essential in marketing of freshwater fish.

To make a distribution chain more efficient the following recommendations might be useful for producers:

- 1) Direct marketing from producer to consumer/retailer is a very important issue for the European aquaculture industry. It is especially relevant for the trout and carp industries, which are characterized by a large number of small farms. If it can be arranged, this procedure shortens the distribution chain, thus resulting in significant savings.
- 2) Direct import of species is highly recommended in order to obtain better prices both for importers and consumers. Nile perch would not have been successful in Germany had the local importers not established contacts with African producers and started importing the product directly from Africa. This helped them to lower the price of the product to nearly half compared to the Nile perch unit value imported via Belgium or the Netherlands. Establishment of direct contacts with overseas producers requires complex procedures such as transport and quality control, and at present Belgium and the Netherlands have one of the most efficient logistic chains.
- 3) The processing sector is one of the major players in fishery distribution, and it is developing in accordance with the growing demand for value-added fish products. The sector is very important for distribution of freshwater fish; however, it is often difficult for a European producer to deal with except

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<sup>11</sup> [www.aquatt.ie](http://www.aquatt.ie)

for a small processor, e.g. a smoking house for trout or eel. The main difficulty is due to continuity of quantities needed to keep processing lines working. However, taking into account current market trends, it should be emphasised that most freshwater products have to be sold fresh. It means that simple processing, such as portion cutting and filleting dominate.

4) The catering sector and restaurants play an important role in the sales of fish products to the end consumer. Introduction of tilapia into the catering sector in the UK (e.g. as “fish and chips”) is an example of successful product marketing according to customer needs. Usage of pike-perch in the German catering sector represents another case of introduction of freshwater species into the catering sector. In the study conducted in France by OFIMER (l’Office National Interprofessionnel des Produits de la Mer et de l’Aquaculture), it was estimated that some 40% of trout volume was consumed in restaurants in 2004<sup>12</sup>, which is an indicator of the importance of this distribution channel.

## 2. Overview of the countries

### 2.1 EU-countries

#### Austria



#### Basic data 2003

**Population:** 8.2 million

**Freshwater fish aquaculture:** 2 233 tonnes

**Freshwater fish landings:** 372 tonnes

**Freshwater fish imports:** 11 000 tonnes

**Freshwater fish exports:** 6 400 tonnes

**Freshwater fish consumption:** 0.9 kg per capita

Austria is an important European market for freshwater fish imports, which have doubled over the last three years. Being a land-locked country, Austria has a small domestic freshwater fish industry, which is mainly based on traditional culture of trout and carp. Inland capture fisheries harvest 372 tonnes of various freshwater fish. Trout and carp are the most popular freshwater species as well as the main species in the Austrian aquaculture.

In 2003 the domestic production amounted to 2 200 tonnes valued at US\$ 10 million, and a small volume of various freshwater fish species came from professional fishery. Recently, Austria became among the ten top European importers of freshwater fish due to increasing imports of fresh Nile perch fillets.

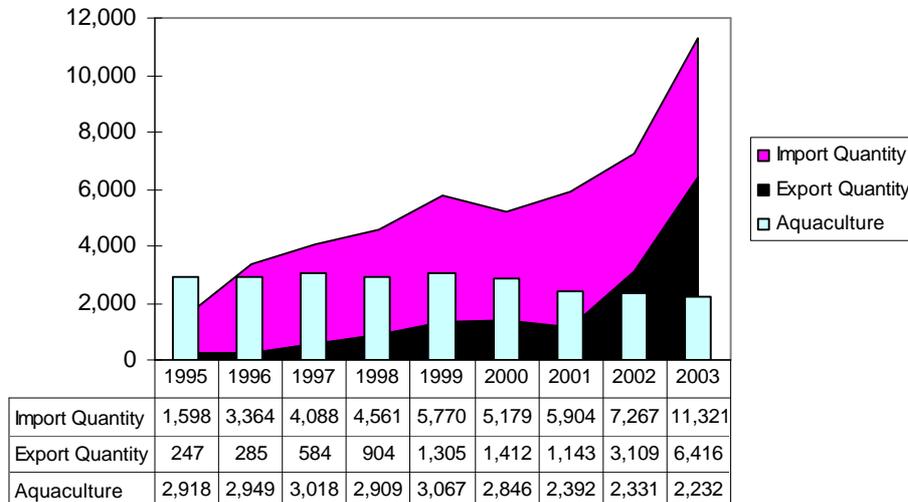
Total imports have increased significantly from less than 1 000 tonnes in 1995 to over 11 000 tonnes in 2003. The value of imports has risen from US\$ 11 million to US\$ 41 million over the same period.

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<sup>12</sup> OFIMER, Bilan Annuel 2004: Consommation des Produits de la peche et de l’aquaculture”, p.84

Austrian exports of freshwater fish have also been continuously increasing, reaching 6 400 tonnes with an estimated value of US\$ 23 million in 2003.

**Figure 5: Aquaculture, imports and exports of freshwater fish in Austria (in tonnes)**



### Trout

Rainbow trout is the main farmed species in Austria. According to FAO statistics, trout production has decreased from its peak at 2 100 tonnes in 1999 to 1 600 tonnes in 2003. FEAP reports higher figures: Austrian output of trout has been continuously stable at 3 400 tonnes. In 2003, 3 000 tonnes of portion-sized white meat rainbow trout were farmed in the country, supplemented by 400 tonnes of large rainbow trout over 1 kg.

Since the farming output is much less than demand, a stable volume of nearly 3 000 tonnes has been imported in the last several years. Seventy-four percent of the imported trout is live, but the tendency has started to change towards processed products (especially smoked trout), imports of which have doubled from 220 tonnes in 1999 to 420 tonnes in 2003.

### Carp

Historically, common carp farming in Austria is associated with convents and monasteries, as in the Middle Ages the monks adopted this fish for Lenten fare. At present, the biggest carp farming industry is located in Waldviertel, in the northwestern part of Lower Austria. In the last ten years, the national production of carp has decreased considerably due to the high production costs, from 860 tonnes in 1995 to 340 tonnes in 2003. However, carp is an important species in Austrian traditional cuisine and the country remains the fourth biggest carp importer in Europe. Imports of live carp have shown continuous growth for many years, with a decrease only in 2003. 1 340 tonnes of carp were imported from the Czech Republic and Hungary, which is 14% less compared to 2002.

### Nile perch

The Austrian market for African Nile perch has been developing fast in the last few years. In 2003 fresh Nile perch fillets represented approximately half of the Austrian imports of freshwater fish. Deliveries of this species directly from Uganda, Tanzania and Kenya took off in 2002, when Nile perch had become more familiar to Austrian consumers and distribution channels became established. While imports of Nile perch in 2001 were 1 200 tonnes, consisting mostly of frozen fillets, in 2003 they amounted to nearly 6 900 tonnes, with 90% being fresh fillets.

## Consumption

Freshwater fish account for approximately 10% of total fish and seafood consumption, so imports cover most of the domestic demand. Per capita consumption of 0.9 kg is relatively low compared to the average in Europe, which is estimated at 1.48 kg, but it is increasing as the result of greater health awareness and greater familiarity with seafood through travelling to seaside countries. While eel is not of significance on the Austrian market, northern pike, pike-perch, European perch and catfish (wels) are other popular freshwater fish species.

## Belgium



**Population:** 10.3 million

**Freshwater fish aquaculture:** 1 010 tonnes

**Freshwater fish landings:** 511 tonnes

**Freshwater fish imports:** 29 000 tonnes

**Freshwater fish exports:** 21 700 tonnes

**Freshwater fish consumption:** 0.9 kg per capita

Being one of the main entry points for fish imports and exports in Europe, Belgium is one of the most important fish trading countries. International fish trade has become increasingly important for the country and has continued to grow significantly during the past decade.

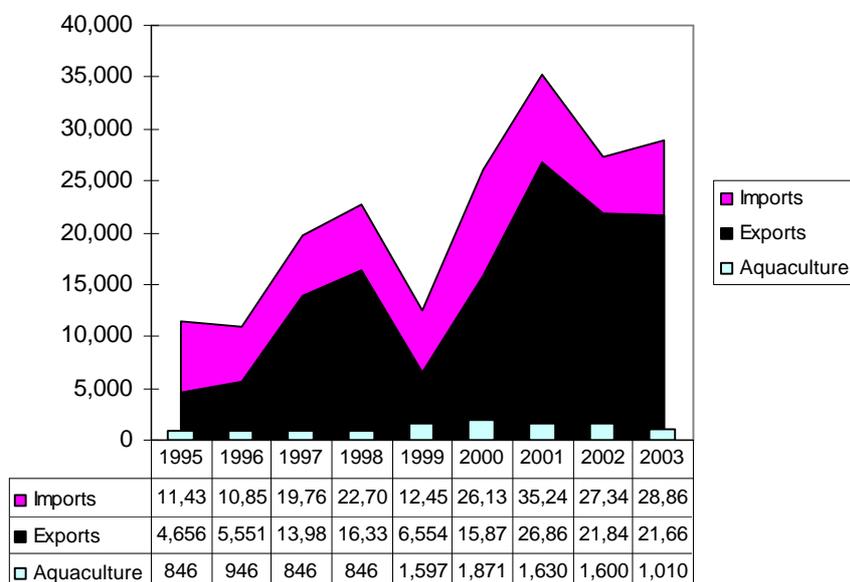
Belgium is the second largest European importer after the Netherlands, bringing in 12% of the total European freshwater fish imports both in volume and value. In 2003 Belgian imports of freshwater fish reached nearly 29 000 tonnes with an estimated value of US\$ 120 million.

The major part of the fish volume is delivered to the airports of Brussels, Ostende and Liege, from where it is immediately re-exported to other European countries by plane or by truck. Exports of freshwater fish amounted to 21 700 tonnes with a value of US \$ 92.6 million.

Aquaculture production in Belgium is rather small with an output of 1 000 tonnes of various freshwater fish species valued US\$ 3.4 million. Exotic tilapia (450 tonnes) and African catfish (450 tonnes) are the main farmed species, supplemented by common carp and rainbow trout.

Freshwater fish landings are estimated at 500 tonnes and include roach, sea trout, freshwater bream, northern pike, European perch, pike-perch and eel.

**Figure 6: Aquaculture, imports and exports of freshwater fish in Belgium (in tonnes)**



### Nile perch

Freshwater fish fillets, consisting mainly of Nile perch, form 67% of the Belgian total freshwater fish imports. In 1999 import of Nile perch from Africa was banned by the European Union, which resulted in the drastic decline of Belgian imports. The imports were resumed the following year, and there was a peak in Nile perch imports from Uganda, Tanzania and Kenya already in 2001 when 27 000 tonnes were delivered to the Belgian market.

In the last two years, imports of the species have decreased by nearly 30%, mainly because Germany and Austria started to import Nile perch directly from Africa. In 2003 total Belgian imports of Nile perch were estimated to be 14 000 tonnes, which is nearly half the volume reported in 2001. Fresh Nile perch fillets dominate the imports (77%), but the share of frozen fillets nearly tripled in the last two years. Belgium delivers Nile perch mainly to the Netherlands, Italy, Spain and France.

### Trout

Although domestic trout aquaculture production has decreased significantly, imports of trout continue to grow, making trout one of the most important freshwater species in the Belgian market. In 2003 over 4 000 tonnes of rainbow trout were imported, mainly from France, Italy and Denmark and around 900 tonnes were exported to Germany and Austria. The majority of rainbow trout are traded live.

### Carp

Belgium has a rather small market for common carp. In 2003 the national aquaculture output of carp amounted to 60 tonnes, supplemented by 750 tonnes of carp imports from the Czech Republic and Hungary. There was not much carp left for domestic consumption because 665 tonnes were further exported.

### **Eel**

Eel is another important species for the Belgian market. While eel imports constitute only 5% of the total Belgian freshwater fish imports, the value represents 8% of the total freshwater fish import revenue. In 2003, 1 300 tonnes of eel were imported, which is 17% more than in the previous year. In 2003 the Netherlands remained the main eel supplier (450 tonnes) to the Belgian market, followed by the USA (290 tonnes), Canada (250 tonnes), New Zealand (115 tonnes) and France (70 tonnes). Some 430 tonnes of eel were exported to other European countries.

### **Catfish**

Catfish (*Pangasius*) from Vietnam is rapidly gaining popularity on the Belgian market. At present, the country is the third biggest importer of Vietnamese catfish fillets after Germany and Spain. The import volume doubled from 1 900 tonnes in 2003 to 4 100 tonnes in 2004, and the import value increased from US\$ 4.9 million to US\$ 12.8 million over the same period.

## **Cyprus**



**Population:** 780 thousand

**Freshwater fish aquaculture:** 90 tonnes

**Freshwater fish consumption:** 0.01 kg per capita

Cyprus is not of importance for freshwater fish trade because the domestic consumption and trade is highly dominated by marine fish. Total aquaculture production was 1 800 tonnes in 2003, of which only 90 tonnes of rainbow trout were from the freshwater sector. International trade in freshwater fish species is limited to the import of 40 tonnes of rainbow trout and export of 128 tonnes of various freshwater fish.

## **Czech Republic**



**Population:** 10.2 million

**Freshwater fish aquaculture:** 19 670 tonnes

**Freshwater fish capture:** 5 127 tonnes

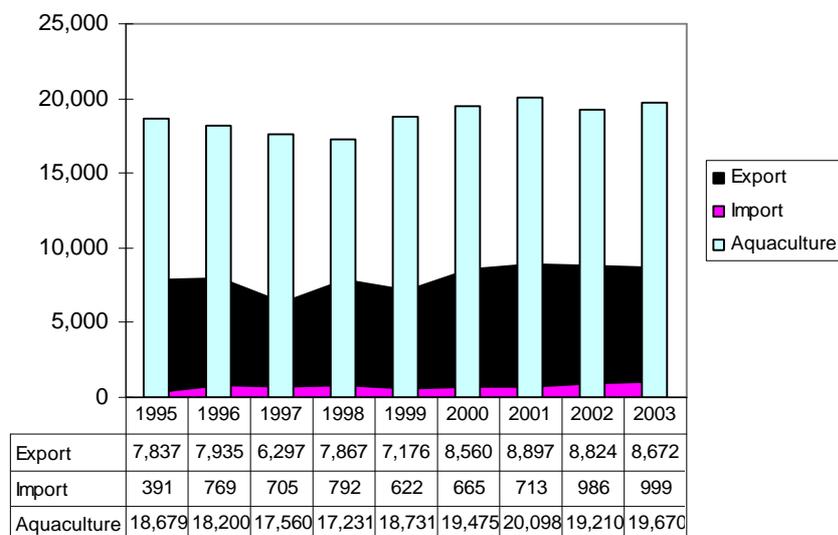
**Freshwater fish imports:** 1 090 tonnes  
**Freshwater fish exports:** 8 673 tonnes  
**Freshwater fish consumption:** 1.7 kg annually per capita

The Czech Republic is a very interesting market for freshwater fish, especially for carp and trout, as both species are traditionally consumed both at home and in restaurants. The country is the second biggest producer and the leading exporter of carp after Poland, and the country's aquaculture, 90% of which is based on carp production, has been stable during the last decade, reaching 19 700 tonnes worth US\$ 39 million in 2003.

Southern Bohemia, close to the Austrian border, is the most important fish farming region, where more than 70% of the total pond area is situated. Farmed output is supplemented by a further 5 100 tonnes of freshwater fish from commercial and recreational fisheries, including common carp (4 000 tonnes), grass carp, northern pike, pike-perch, wels catfish and rainbow trout.

The freshwater fish trade, which is mainly represented by carp, is highly export oriented, with nearly 8 700 tonnes having an estimated export value of US\$ 16.8 million, exported in 2003. While the volume of the exports has been stable at around 8 800 tonnes over the last three years, the export value has increased by 46% from US\$ 11.3 million in 2001 to US\$ 16.8 million in 2003.

**Figure 7: Aquaculture, imports and exports of freshwater fish in the Czech Republic (in tonnes)**



## Carp

The Czech Republic is the second largest European producer of carp after Poland. Common carp is the dominant species (88% of the total production), supplemented by grass carp and bighead carp. Carp are farmed using predominantly semi-intensive techniques, but some 25-30% of carp culture is based on an extensive culture method using natural food in the ponds.

Nearly 18 000 tonnes of carp were produced in the country in 2003. About half of production is consumed domestically and another half goes for export, making the Czech Republic the biggest exporter of carp in Europe.

In 2003 the total export volume of carp amounted to 8 524 tonnes with an export value of US\$ 16.3 million. Carp is traded predominantly live, and in 2003 the main trading partners for the Czech Republic were Germany (3 743 tonnes), Slovakia (1 615 tonnes), Belgium (656 tonnes), Austria (653 tonnes) and Hungary (400 tonnes).

A high proportion of natural food, allowing extensive production, and the depuration practice of holding the harvested fish in tanks with fresh water throughflow have enabled Czech carp to gain the reputation of being a good quality product in both domestic and external markets.<sup>13</sup> However, the image of carp is quite tired and consumption is small outside the traditional Christmas and Easter periods.

According to Czech market analysts, it has not been possible so far to sufficiently prepare the domestic market for carp. Some of the promotional campaigns for carp failed, being mainly used in women's magazines. As it was discovered later, only one third of the women in Czech families are decision makers regarding what is eaten for dinner.<sup>14</sup> It is also failing to attract younger consumers because most of the carp is sold live and younger people are reluctant to slaughter the fish at home.

No particular marketing strategy has yet been implemented to increase the popularity of this very national species. However, there has been some movement in the direction of changing market conditions: an increased proportion of carp is now being offered to the domestic market in some processed form (carp fillets and carp steaks). Domestically processed fish is not exported yet, but Czech processors have started exploring the market for opportunities.

## **Trout**

Another traditional species is rainbow trout, which is offered all year around at most of Czech fish mongers, markets, retail chains and restaurants. The farmed production of trout, which represents 4% of the total Czech aquaculture, has been in decline: over the last five years it went down by 20% amounting 570 tonnes in 2003. Over the same period imports of trout have increased by 24% reaching 700 tonnes in 2003.

At present, rainbow trout is the main imported freshwater fish, with the ratio of live to frozen trout being approximately 50:50. Czech consumption of fish is still relatively low at around 5.5 kg per capita. Freshwater fish consumption is estimated at 1 kg per capita, with carp and trout as the main popular species.

Domestic demand for some predatory species, especially pike, perch and sturgeon, is increasing, with higher prices paid for these species when compared to carp and trout.

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<sup>13</sup> Innovation and SME programme, University of Sterling, "Report on Assessment Visit to the Czech republic" 2005

<sup>14</sup> Based on International Carp Workshop "Carp in the EU" by [www.eurofish.dk](http://www.eurofish.dk)

## Denmark



**Population:** 5.4 million

**Freshwater fish aquaculture:** 32 200 tonnes

**Freshwater fish capture:** 1 380 tonnes

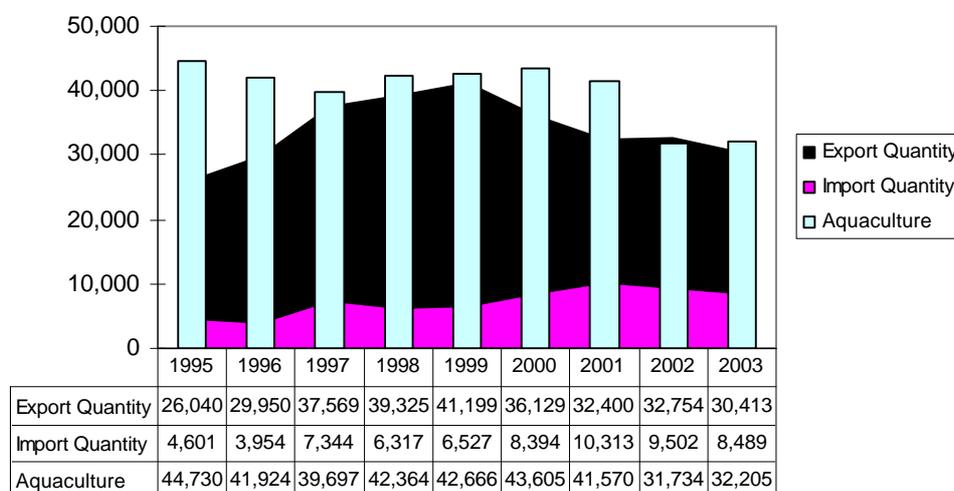
**Freshwater fish imports:** 8 489 tonnes

**Freshwater fish exports:** 30 413 tonnes

**Freshwater fish consumption:** 2.1 kg per capita

The Danish market might appear to be important for freshwater fish in general, but only for commerce, since 90% of produced freshwater fish are exported to other European countries. The Danish aquaculture sector is one of the strongest in Europe, with some 32 200 tonnes of freshwater fish valued US\$ 84 million produced in 2003. Although farmed production results in only 7% of the fish quantity consumed in the country, its value represents some 25% of the total value of the Danish fishery industry. The country is the biggest European exporter of rainbow trout and eel.

**Figure 8: Aquaculture, imports and exports of freshwater fish in Denmark (in tonnes)**



## Trout

Rainbow trout is the most important freshwater fish species in Denmark. According to FAO statistics, the annual aquaculture production of rainbow trout was 30 258 tonnes in 2003. Rainbow trout is farmed in freshwater ponds (75% of the total trout production) and in offshore and land-based marine aquaculture (25%). Production takes place in Jylland, with the biggest concentration of aquaculture

sites at Ringkoebing Amt.<sup>15</sup> Almost all trout (90%) goes for export, making Denmark the largest trout exporter in Europe.

In 2003, 22 100 tonnes of rainbow trout were exported in frozen form (6 750 tonnes), live (6 400 tonnes), fresh and chilled (4 500 tonnes), smoked (3 900 tonnes) and trout fillets (530 tonnes). While the overall exports of trout have decreased by 30% from 1999, exports of smoked trout have shown constant growth (+30% over the same period).

Germany, which imported over 14 000 tonnes of trout in 2003, is by far the most important market for Danish trade. Nearly half of this volume consists of fresh and chilled trout, which is sent to German smokehouses. The Netherlands and Russia are the next most important markets, each with the same volume of imports (1 000 tonnes of mainly frozen trout) in 2003. Sweden imports some 500 tonnes of frozen trout, while Italy and Switzerland import small quantities of smoked trout.

Danish consumers usually buy trout in hyper- and supermarkets because the major part of the national trout supply is represented by frozen whole portion-sized trout (400-450 g). “Blue trout” is a curious Danish speciality: the species is cooked in balsamic vinegar, which gives a blue colour to the trout’s flesh.

## **Eel**

Eel is another very important freshwater species for Denmark. Domestic production of eel fluctuates highly with a peak at 2 700 tonnes in 2000 and a minimum of 1 000 in 2001. In 2003 the output of farmed eel reached 1 800 tonnes, and a further 626 tonnes of eel came from inland rivers.

Around 1 500 tonnes of mostly live eel were imported from the Netherlands, Sweden and Norway. Denmark is also the biggest European eel trader, exporting 90% of its eel production. In 2003 exports of mainly live eel went primarily to Holland (1 600 tonnes), followed by Germany (960 tonnes) and Italy (260 tonnes). A small part of smoked eel is sold on the domestic market.

## **Estonia**



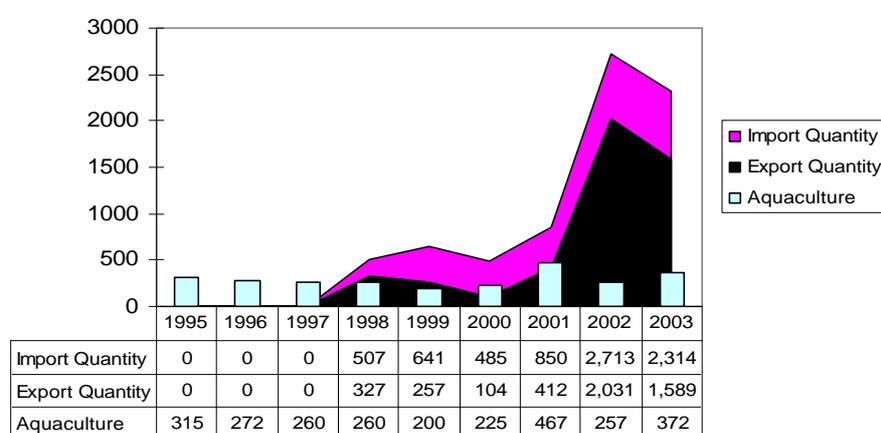
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<sup>15</sup> Danish Institute for Fisheries research, “Dansk dambrug ved en skillevei”, April 2005

**Population:** 1.3 million  
**Freshwater fish aquaculture:** 372 tonnes  
**Freshwater fish capture:** 5 000 tonnes  
**Freshwater fish imports:** 2 314 tonnes  
**Freshwater fish exports:** 1 589 tonnes  
**Freshwater fish consumption:** 4.7 kg per capita

The Estonian market for freshwater fish is relatively small, but consumption of freshwater fish figures prominently in the national cuisine where rainbow trout, pike-perch and European perch are the most popular species. Before the collapse of the Soviet Union, Estonia's annual aquaculture production was over 1 000 tonnes, but in the early 1990s it rapidly declined. In 2003 it reached 372 tonnes with a revenue of US\$ 1.4 million. Rainbow trout dominates the sector (80% of the total output), but carp, eel, crayfish and tench are also produced. Estonia has 25 aquaculture farms, employing 60 people.

**Figure 9: Aquaculture, imports and exports of freshwater fish in Estonia (in tonnes)**



### Trout

Rainbow trout is the only freshwater species imported into the Estonian market. The share of frozen trout developed very rapidly in 2002, when over 2 000 tonnes of frozen trout were imported, compared to only 455 tonnes in the year before. In 2003 supplies of frozen trout declined by 30%, reaching 1 470 tonnes. The share of fresh and chilled trout has been increasing, reaching 840 tonnes at present. Some 1 560 tonnes of mainly frozen trout is re-exported to other European countries. All fish and fish products are free from import and export custom tariffs or duties in Estonia.

All the freshwater fish landings (over 5 000 tonnes) are consumed domestically. These include various freshwater fish species, in particular pike-perch (1 800 tonnes), European perch (1 450 tonnes), European smelt (390 tonnes), roach (370 tonnes) and northern pike (200 tonnes).

## Finland



**Population:** 5.2 million

**Freshwater fish aquaculture:** 13 335 tonnes

**Freshwater fish capture:** 47 500 tonnes

**Freshwater fish imports:** 8 633 tonnes

**Freshwater fish exports:** 1 094 tonnes

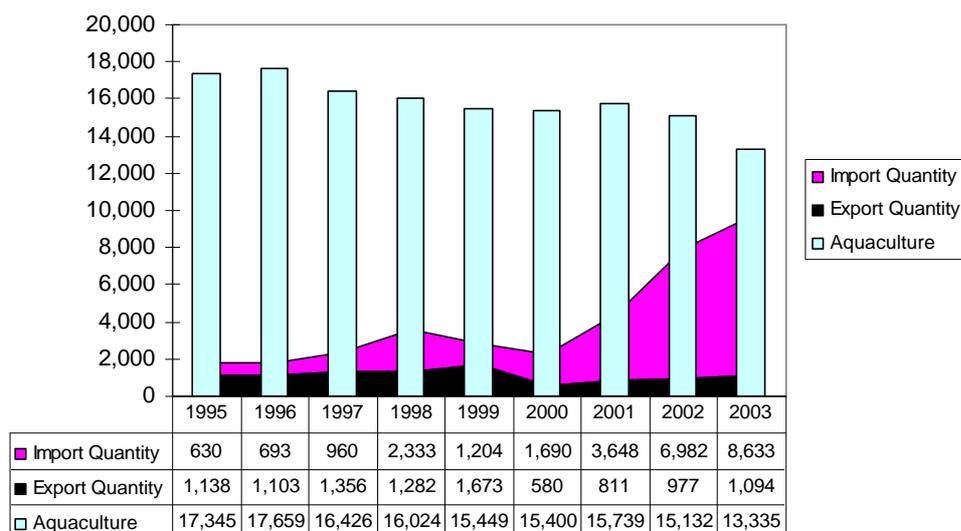
**Freshwater fish consumption:** 13 kg/capita

With its thousands of inland lakes and ponds, Finland has Europe's largest freshwater capture fishery, with a harvest of 47 500 tonnes. The main species are European perch (13 000 tonnes), northern pike (10 000 tonnes), roach (5 400 tonnes), vendace (5 300 tonnes), freshwater bream (2 800 tonnes), pike-perch (2 800 tonnes) and European whitefish (2 600 tonnes).

Finnish aquaculture, which began to achieve commercial value in 1970, has a stable production of more than 13 000 tonnes of fish annually, valued US\$ 46 million. Rainbow trout dominates the sector (97% of the total production), and the major part of the trout is produced in brackish water culture.

International trade of freshwater fish has been relatively limited; however, imports have been rising significantly: while in 1999 the total volume of freshwater fish imports accounted for only 1 200 tonnes, 8 600 tonnes were imported in 2003, primarily due to increase in supply of fresh and chilled rainbow trout. Finnish exports of freshwater fish have remained low at just over 1 000 tonnes.

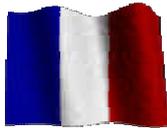
**Figure 10: Aquaculture, imports and exports of freshwater fish in Finland (in tonnes)**



## Consumption

Almost all captured fish are consumed domestically, which makes Finland the biggest consumer of freshwater fish in Europe (13 kg per capita annually). According to the Finnish Fish Farmers Association, rainbow trout has become the best selling fish. Large fish of 1-3 kg are preferred. Pike-perch and European perch are often served in the catering sector as well as prepared at home.

## France



**Population:** 61 million

**Freshwater fish aquaculture:** 50 700 tonnes

**Freshwater fish capture:** 2 400 tonnes

**Freshwater fish imports:** 20 522 tonnes

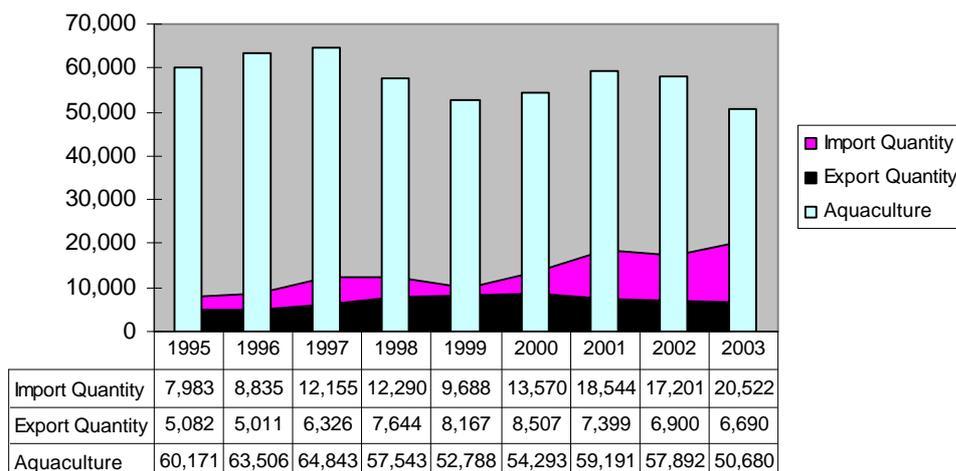
**Freshwater fish exports:** 6 690 tonnes

**Freshwater fish consumption:** 1.1 kg per capita

France is one of the leading markets for freshwater fish in Europe. In 2003 the country's freshwater fish aquaculture was the largest in Europe in terms of production volume, and after Italy and Germany, the third biggest in terms of production value.

The annual output has decreased from 60 000 tonnes in 1995 to 50 700 tonnes in 2003, and the production value has declined from US\$ 155 million to US\$ 127 million over the same period. Regarding freshwater fish trade, France is an import-oriented country with stable exports and rapidly increasing imports.

**Figure 11: Aquaculture, imports and exports of freshwater fish in France (in tonnes)**



## Trout

Rainbow trout is the favoured freshwater species in France. While Norway is the biggest producer of trout in sea water, France is the major European producer of trout in fresh water. There are about 300 trout companies that run nearly 500 farms. The 17 largest companies contribute more than 80% to the country's total production.<sup>16</sup> The biggest farms are situated in Bretagne (11 000 tonnes), Aquitaine (11 000 tonnes), Nord Pas de Calais (6 500 tonnes) and Normandie (5 000 tonnes). The French production of rainbow trout has declined from 44 000 tonnes in 1996 to 39 000 tonnes in 2003. Almost all the farmed trout was consumed domestically, but some 4 800 tonnes of mainly live trout were exported to Belgium and Germany and some 3 900 tonnes of live and fresh trout were imported. French consumers prefer pink-meat trout, which is sold as whole fish, fresh or chilled. Some local producers tried to develop trout fillets a few years ago, but those products turned out to be more expensive than salmon fillets and were not accepted by the French consumers. As a rule, trout is about 20 percent cheaper than salmon.

OFIMER (l'Office National Interprofessionnel Des Produits De La Mer Et De l'Aquaculture) analysed consumption patterns of different species in France. This was based on a series of interviews in which 8 000 French families with various incomes living in different parts of the country were asked about their habits in fish consumption at home and in restaurants. In-house fish consumption includes purchases from modern retail chains as well as from fishmongers, open markets and farms. Based on the answers from those families, a common projection was made on the overall consumption pattern of trout in France.

The highlights of the study:

1) **Less fresh trout is consumed at home:** during the last five years consumption of fresh trout has been declining, from 10 969 tonnes in 1999 to 6 135 tonnes in 2004. Sixty percent of consumption was represented by whole trout, and the rest was cut trout and fillets. Fresh trout is mostly consumed by the middle and upper-middle classes in the Paris area, and in the western, central and south-eastern parts of France. In 2004 the peak seasons for fresh trout consumption were April and September while the lowest season was December.

2) In-house consumption of smoked trout has increased by 14% from 1 248 tonnes in 1999 to 1 445 tonnes in 2004. Smoked trout is most popular in western parts of the country and in the Paris area, being consumed by the middle and upper-middle classes. December is the peak month for smoked trout consumption, with sales 2-2.5 times higher than in any other month of the year. Prices for different trout product forms found in retail are shown in Table 9:

**Table 9: Prices for different trout products in French retail**

Trout product form	Medium price (€/kg)
Trout fresh	7.6
Trout whole	6.6
Trout cut	9.1
Trout packed	8.3
Large-size trout (>400 g)	7.4
Portion-sized trout (<400 g)	7.9
Trout smoked	25.3

<sup>16</sup> FAO, Globefish market report "Trout - August 2004"

Source: OFIMER

3) The records of trout consumption in restaurants for 2004 show that restaurants bought 3 582 tonnes of fresh trout and 1 887 tonnes of frozen trout for medium prices of €5.5 and €5.1, respectively.

As is seen from the study, French consumption of trout has been declining, in agreement with an overall decline in fresh fish consumption. In particular, consumption of fresh salmon and whiting decreased by 24% and 33%, respectively, in the period 1999-2004. It might also be that French consumers have discovered Nile perch fillets: in-house consumption of Nile perch increased by 70%, from 2 302 tonnes in 2000 to 8 463 tonnes in 2004. Smoked trout is becoming more popular among French consumers. However, the figures give product weight and not live weight; therefore the study does not portray an accurate picture of French fish consumption.

### **Carp**

Carp has a relatively small, but stable market in France. In 2003 French aquaculture produced 4 700 tonnes of common carp, supplemented by a further 476 tonnes imported from the Czech Republic. Some 280 tonnes are exported to other countries in Europe. The species is consumed all over the country, and particularly in the East and North of France.

### **Nile Perch**

It is difficult to estimate a real market for Nile perch in France because the species is not specified either in the national or in the European trade statistics. It can be estimated that growing imports of freshwater fish fillets consist mainly of African Nile perch delivered via Belgium and the Netherlands. At present, Nile perch fillets represent the most important product imported, perhaps half of the total French imports of freshwater fish.

The imported quantity of the species tripled from 3 600 tonnes in 1999 to 11 000 tonnes in 2003. The acceptance of Nile perch has been good and stable due to the low product price and good quality. French consumers are very price conscious, and that has resulted in a preference for bigger fillets. Nile perch fillets are sold mostly fresh both in the supermarkets and in the big markets. The most important big wholesale markets are Rungis (a night market which delivers mainly to Paris and surroundings) and Boulogne (a day market which delivers all over France).

### **Other freshwater species**

Eel has almost no market in France. While 360 tonnes of eel were captured and 240 tonnes of eel imported, nearly 660 tonnes were exported, leaving no eel for domestic consumption. There is also farming of roach (2 000 tonnes), tench (1 000 tonnes) and catfish (360 tonnes).

## **Germany**



**Population:** 82.4 million

**Freshwater fish aquaculture:** 45 627 tonnes

**Freshwater fish capture:** 5 127 tonnes  
**Freshwater fish imports:** 42 342 tonnes  
**Freshwater fish exports:** 7 457 tonnes  
**Freshwater fish consumption:** 1 kg per capita

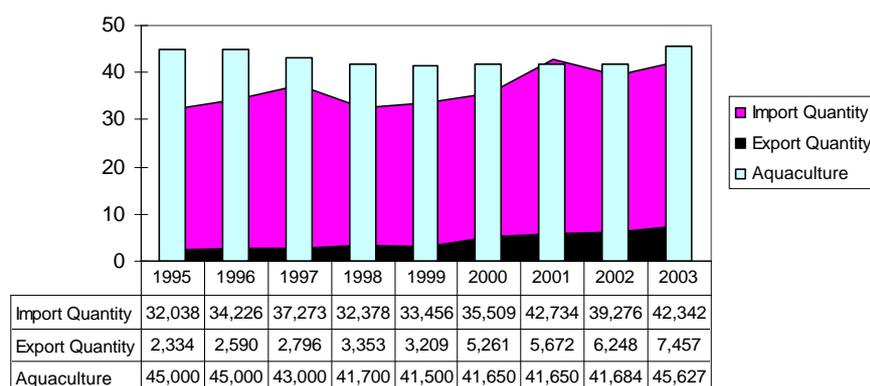
Being the biggest importer and the second biggest producer of freshwater fish, Germany is the most important market for freshwater fish in Europe. Rainbow trout, carp, Nile perch and recently the catfish *Pangasius* are some of the most appreciated species on the market. In 2003 the total production of freshwater farmed fish reached 45 600 tonnes after four consecutive years of stable annual production of 41 600 tonnes. Due to increase in carp production, output in 2003 grew by 9% compared to the year before. Production value was estimated at US\$ 139 million. The fishing activity from lakes, rivers and ponds amounted to a further 20 000 tonnes, with 17 000 tonnes of that coming from recreational fisheries.

Dominated by imports, the German market is the main European destination for freshwater fish since the demand greatly exceeds supply from domestic fish farming and landings. In 2003 imports of freshwater fish were over 42 000 tonnes, showing an increase of 7% compared to the year before.

Rainbow trout (18 000 tonnes) and freshwater fish fillets (16 000 tonnes) are the main imported products, supplemented by carp (4 800 tonnes) and eel (2 200). Imports of both fresh and frozen freshwater fish have tripled from 5 000 tonnes in 1995 to 16 000 tonnes in 2003. The share of frozen fillets was estimated at 67%, and the total value of German freshwater fish imports reached US\$ 178 million in 2003, which is 18% of the total European freshwater fish value.

Although German imports of freshwater fish are much higher than exports, the country is among the ten top European exporters of freshwater fish, supplying some 7 500 tonnes in 2003. German exports were stable until 1999, but have been increasing since then, reaching a value of more than US\$ 35 million in 2003.

**Figure 12: Aquaculture, imports and exports of freshwater fish in Germany (in tonnes)**



## Trout

Rainbow trout is the most popular freshwater species, with a high demand on the German market, and is consumed both at home and in restaurants. As in previous years, trout farming was the most

profitable aquaculture product: in 2003 trout production of 25 000 tonnes was valued at US\$ 79 million.

Around 18 000 tonnes of trout are imported from the neighbouring countries of Denmark (4 500 tonnes) and France (2 700 tonnes), and also from Italy (1 300 tonnes) and Spain (4 000 tonnes). Around half of trout imports are represented by live and fresh trout, while the rest includes frozen and smoked trout. Some 2 800 tonnes of rainbow trout (mostly frozen) are exported to other European countries. The domestic market is dominated by cheap portion controlled trout that comes freshly slaughtered to the consumer.

## **Carp**

Carp is part of the national German cuisine with a long tradition in production and consumption. Recently carp farming has rapidly increased despite the relatively high production costs and cheaper imports from Central European countries.

Carp aquaculture sites are mainly located in Bavaria, Saxony and Brandenburg. The total output of farmed common carp has grown by 35%, from 10 500 tonnes in 1999 to over 16 000 tonnes in 2003, with an estimated production value of US\$ 46 million. Germany is also the largest importer of carp in Europe - over 4 800 tonnes of live and fresh/chilled carp were imported in 2003, mostly from the Czech Republic. Hungary and Poland also deliver live carp to the German market.

German consumers enjoy carp mostly during the Christmas and New Year period. Traditionally, live carp of 1-2 kg are sold both in retail and by fishmongers, though the share of discounters and supermarkets is rising. Frankonia is the main market for carp in Germany, but consumers in Saxony and parts of the North like Hamburg, Schleswig-Holstein and Niedersachsen buy carp for Christmas.

## **Eel**

Although eel is not the most popular freshwater fish product in Germany, the country is the second biggest importer of eel in Europe. Domestic supply is rather low, consisting of 150 tonnes of farmed eel and 250 tonnes of eel caught in inland waters. Eel is delivered to the German market directly from the main producing countries.

Overall, eel imports have been declining, but in 2003 there was an increase of 6% compared to the year before. In 2003, 2 200 tonnes of eel were imported, primarily from the Netherlands (1 300 tonnes) and Denmark (430 tonnes). Half of the imported volume consisted of live eel; however, the share of live eel imports decreased by 25% in the last few years while deliveries of smoked eel rose by 35%. Consumption of eel has been declining for many years in Germany due to the species' weak image and high market price. Hot smoked eel is most popular, with sizes of 400-600 g per fish. Most eel is consumed in the northern parts of Germany with a peak around the Christmas season.

## **Nile perch**

Unlike other European countries, which import Nile perch fillets via Belgium and the Netherlands, German importers have established direct contacts with the main Nile perch producing countries: Tanzania, Uganda and Kenya. After the resumption of Nile perch imports from Africa following the

ban in 1999, the volume of imports of Nile perch fillets has more than doubled, from 2 100 tonnes in 1999 to 5 300 tonnes in 2003. In recent years tilapia was considered the main competitor to Nile perch on the German market, but the situation changed in 2004 when Vietnamese catfish (*Pangasius*) fillets gained a large market share.

Fresh catfish fillets are sold at a very low price of €2.50/kg, and frozen Nile perch fillets start at €3.10/kg. It should be taken into account that the average unit price of fresh Nile perch fillets imported directly from Africa is €3.80/kg, while that of fillets from the Netherlands is €6.80/kg.

### **Catfish**

Vietnamese *Pangasius* is being pioneered on the German market, and the country has experienced a real boom in catfish fillets in the last few years. In 2003, when Vietnam started to export frozen catfish to Europe, Germany imported 2 500 tonnes of frozen catfish. In 2004 the imported volume tripled to 7 400 tonnes. The value rose from US\$ 6.7 million to US\$ 22.5 million during that period. Catfish fillets have become very popular among consumers, and now a German discount retailer Lidl is carrying *Pangasius* fillets as well as the restaurant chain Nordsee and processor Deutsche See.<sup>17</sup>

Catfish, which is considered a “rising-star” product in Germany, has become a serious competitor for Nile perch and tilapia. Since German customers are price sensitive and quality oriented, cheaper catfish fillets of good quality may become the main freshwater species on the German market if imports from Vietnam continue at the present pace.

### **Tilapia**

The demand for tilapia in Germany is limited to particular ethnic groups, especially Asians and North Africans, and to ethnic restaurants. In the late 1990s, tilapia sales were high due to a promotional campaign by Germany’s development aid organisation (Protrade/GTZ). Although tilapia has characteristics suited for mass-market consumption (boneless fillets without a strong fishy taste, easy and quick to prepare), the overall quality of the product is lower than that of other freshwater species like Nile perch and catfish.

Nile tilapia is the most preferred species in Germany and it is used as a substitute for red fish. Frozen tilapia fillets, originally from China, Taiwan and Jamaica, are sold in supermarkets and discounters.

### **Consumption**

The trend observed in recent years on the German market shows that the share of frozen, canned and marinated seafood products is rising, while the share of fresh products is declining. This could be explained by the convenience of preparing “easy to cook” frozen products such as fish fingers and fillets and the relatively cheap prices. The trend towards a preference for a higher degree of fish processing, which had already started in previous years, has continued, primarily due to smoking.<sup>18</sup>

According to the FIZ, Hamburg, discounters are the prime source for selling fish in Germany, and their share increased from 40 to 45% in just the last year. Regular supermarkets accounted for around 36%

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<sup>17</sup> Intrafish, “*Pangasius* poised for EU market growth”, August 2005

<sup>18</sup> Binnenfischerei 2003, “Freshwater fisheries in 2003” by U.Bramick

of seafood sales, and fishmongers, open markets and home delivery for nearly 20%.<sup>19</sup> German market experts did a case study on consumer demographics in Germany in order to portray a typical German seafood consumer.<sup>20</sup>

The conclusions highlight the following interesting points:

- 60% of German seafood consumers are single
- German consumers spend on average €60 on fish products per person per year
- Germans like meaty fish – red meat, no bones, no smell
- Supermarkets focus on pre-packed and ready meals
- There is a price barrier of €3.00 per portion of mass product
- Some 70% of money spent on seafood is at restaurants
- Seafood dishes generate 8% of restaurant turnover

Although the study is not well documented, it gives an idea of what kind of customers dominate the seafood market and what products will be in demand. Quality, convenient product form and low price are the main criteria for Germans' choice of fish. Perhaps price should be placed first as the most important factor because only very low-priced products will be accepted by the average consumer at a local supermarket. Importance of price is reflected in the choice of distribution channels. As was previously mentioned, discounters are currently the leaders in fish sales, followed by supermarkets.

## Greece



**Population:** 10.6 million

**Freshwater fish aquaculture:** 2 700 tonnes

**Freshwater fish capture:** 2 721 tonnes

**Freshwater fish imports:** 3 360 tonnes

**Freshwater fish exports:** 1 200 tonnes

**Freshwater fish consumption:** 0.7 kg per capita

The Greek market is dominated by marine species, which is reflected in domestic production, trade and consumption. The Greek aquaculture sector produces mainly European seabass and seabream; however, there is also a small production of freshwater species like rainbow trout (1 900 tonnes), European eel (420 tonnes) and common carp (150 tonnes).

Although Greek imports of freshwater fish are relatively low compared to other main European countries, their volume has doubled in recent years from 1 240 tonnes in 1999 to 3 360 tonnes, with an

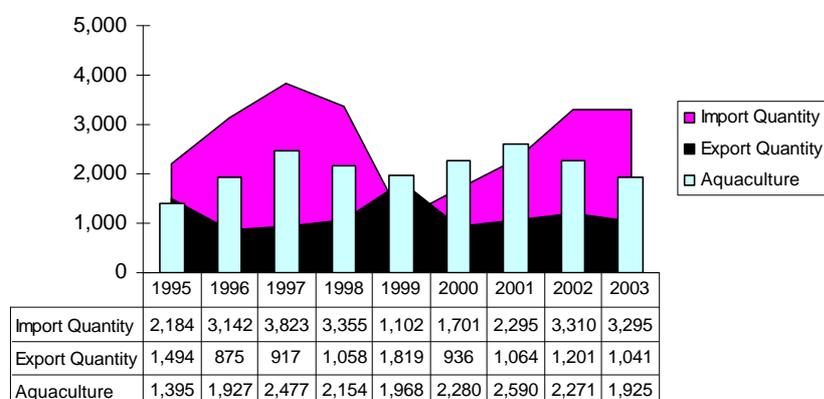
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<sup>19</sup> Seafood International, “Quality, choice, low price – Germans demand it all” by H. Neubacher, July 2005

<sup>20</sup> Case Study for Developing a Market Concept for Fish Products, “Consumer Demographics – The Single German” by H. Neubacher, published by Aquaculture Training and Technology Network, [www.aquatt.ie](http://www.aquatt.ie)

estimated value of US\$ 17 million in 2003. The national export of freshwater fish is stable, with an estimated volume of 1 200 tonnes valued at US\$ 9.6 million.

**Figure 13: Aquaculture, imports and exports of freshwater fish in Greece (in tonnes)**



### Nile perch

Frozen freshwater fish fillets are the main product category imported into Greece, amounting to 2 300 tonnes in 2003. Most of this consists of Nile perch fillets.

### Eel

Greece increased imports of frozen eel from the Netherlands from 230 tonnes in 2002 to 700 tonnes in 2003. The major part of the product (470 tonnes) was processed in domestic smoking facilities and exported back to Holland. Another 300 tonnes of live eel were sent to Italy (200 tonnes), Germany (60 tonnes) and other countries.

### Trout

Rainbow trout is the main freshwater species farmed in Greece. Its production used to be stable, but in the last three years it has decreased by 25%, amounting 1 900 tonnes. Less than 100 tonnes are imported and exported.

### Hungary



**Population:** 10 million  
**Freshwater fish aquaculture:** 11 870 tonnes  
**Freshwater fish landings:** 6 400 tonnes  
**Freshwater fish imports:** 623 tonnes  
**Freshwater fish exports:** 780 tonnes  
**Freshwater fish consumption:** 1.8 kg per capita

With a 3 kg per capita fish consumption, Hungary is not among the European fish-eating nations; however, freshwater fish has a long tradition in the Hungarian cuisine and comprises more than half of overall fish consumption. Carp is the most popular species and is used in the famous Hungarian fish soup, baked, fried and served with potatoes. Carp species represent 85% of the aquaculture production.

Hungarian aquaculture has been on the increase since the beginning of the last century in order to compensate for declining capture fisheries. At present, the farmed output amounts to 11 870 tonnes with a production value of US\$ 33 million.

In addition to carp, Hungarian farmers produce small quantities of pike-perch and northern pike, which are also caught in inland rivers and lakes. Freshwater fish landings from capture fisheries are estimated at 6 400 tonnes, including 3 800 tonnes of carp, 2 000 tonnes of cyprinids and almost 400 tonnes of northern pike and pike-perch.

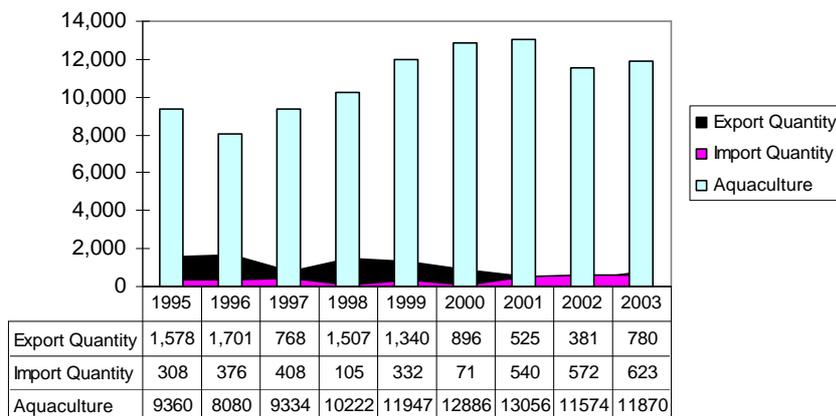
According to Hungarian market analysts, 70% of all fish are sold in towns and more developed regions of the country. Hyper- and supermarkets represent a very important distribution channel for fish, gradually changing consumers' habits.

Today's Hungarian consumers shop only once a week, buying larger quantities of fish. Freshness, quality and processing grade are the main criteria for Hungarians fish consumers.<sup>21</sup> Processed fish products, especially chilled fresh fillets, are increasingly in high demand.

**Figure 14: Aquaculture, imports and exports of freshwater fish in Hungary (in tonnes)**

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<sup>21</sup> Based on International Carp Workshop "Carp in the EU" from [www.eurofish.dk](http://www.eurofish.dk)



## Carp

Hungarian aquaculture had its peak production at around 28 000 tonnes in the 1980s, and then the output started to decline due to changes in the country's economy and consequent difficulties after the collapse of the Soviet Union. In the mid-90s, the farmed production started to increase again after conditions had stabilized. In 2003 the total carp yield amounted to 10 000 tonnes, showing a moderate increase of 3% compared to 2002. The major species were common carp (7 920 tonnes), silver carp (1 370 tonnes), grass carp (780 tonnes) and bighead carp (255 tonnes). In addition, 3 800 tonnes of various carp species were caught in the country's rivers and lakes.

While in the early 1990s the country exported some eel, at present Hungarian exports are represented by only one species, namely common carp. Over the last several years, carp exports dropped from 1 360 tonnes in 1998 to 780 tonnes in 2003. This significant decline in Hungarian carp export has been mainly caused by the dominance of Czech carp production. The main export countries for Hungary were Germany (216 tonnes), Serbia Montenegro (200 tonnes), Belgium (140 tonnes), Italy (90 tonnes) and Czech Republic (87 tonnes).

## Other freshwater fish

Catfish is the second most important freshwater fish in Hungary. Domestic production of the North African catfish (*Clarias gariepinus*) and wels catfish amounted to 990 tonnes and 100 tonnes, respectively, in 2003. The market for rainbow trout is rather small with a local production of 28 tonnes and imports of 180 tonnes.

Some marketing efforts were introduced in order to boost consumption of freshwater fish. The year 2002 was declared "Year of the Fish" in Hungary. Over 50 events took place throughout the country to illustrate the culinary variety of fish and to make consumers familiar with recipes for the preparation of freshwater fish.

## Ireland

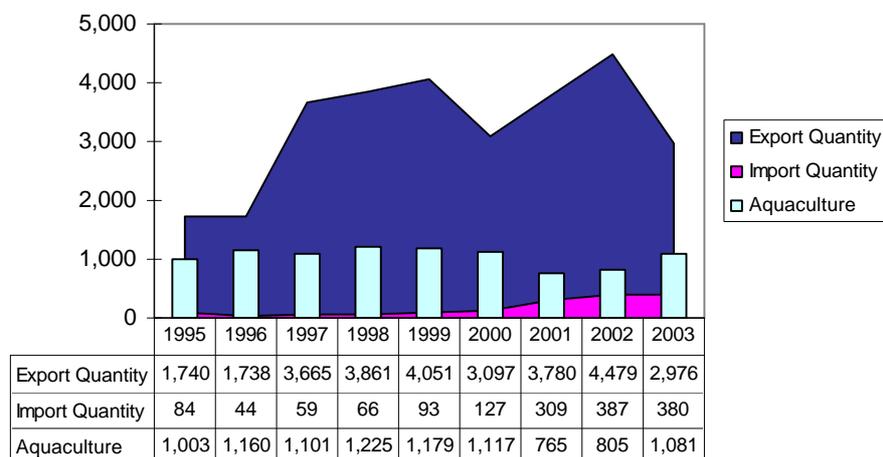


**Population:** 4 million  
**Freshwater fish aquaculture:** 1 081 tonnes  
**Freshwater fish landings:** 120 tonnes  
**Freshwater fish imports:** 380 tonnes  
**Freshwater fish exports:** 2 976 tonnes

Ireland has almost no market for freshwater fish, exporting all its production abroad. The Irish aquaculture industry is dominated by shellfish and finfish, with a total production of nearly 62 400 tonnes and a production value of US\$ 101.5 million in 2003. Of this output, the freshwater fish sector is represented only by rainbow trout with a yield of 1 081 tonnes.

A further 370 tonnes of trout are produced in sea water. Freshwater fish landings are negligible and include 81 tonnes of eel and 36 tonnes of sea trout.

**Figure 15: Imports and exports of freshwater fish in Ireland (in tonnes)**



According to FAO statistics, Ireland imported only 380 tonnes and exported almost 3 000 tonnes of freshwater fish, which is somewhat puzzling. Since Ireland neither produced nor captured significant amounts of freshwater fish, the exports could hardly exceed the imports. The reason for this might be underestimated catches of sea trout or misclassification of salmon as a freshwater species.

## Italy



**Population:** 58 million  
**Freshwater fish aquaculture:** 42 200 tonnes  
**Freshwater fish capture:** 4 700 tonnes  
**Freshwater fish imports:** 13 236 tonnes  
**Freshwater fish exports:** 4 469 tonnes  
**Freshwater fish consumption:** 1 kg per capita

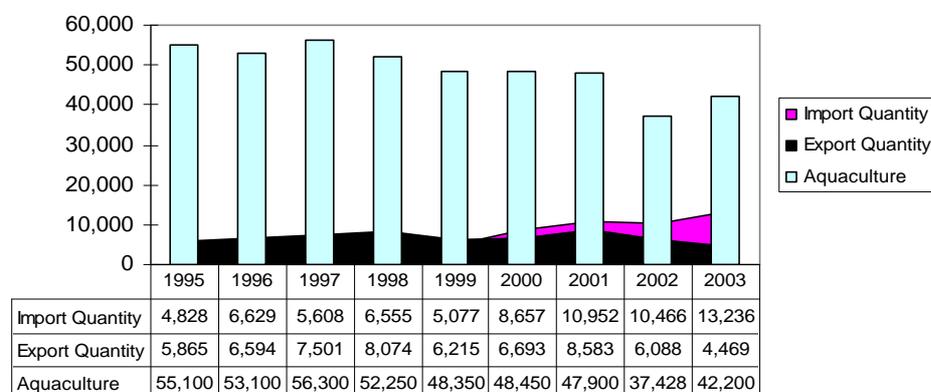
## Production

In Italy consumption of sea fish predominates because of the country's easy access to marine resources. Nevertheless, Italy is the third largest European producer of freshwater farmed fish after France and Germany. Rainbow trout is the main species in Italian aquaculture, accounting for 90% of the total production. According to the Italian Fish Farming Association, there are about 1 000 fish farms in the country. Nearly 620 of them are located in northern regions (especially Veneto), 220 in central regions (especially Abruzzo) and 160 in the South. Those freshwater farms produce about 72% of the Italian aquaculture output. Over the last several years, the national output of farmed freshwater fish declined from 56 000 tonnes in 1997 to 37 000 tonnes in 2002. However, the following year it increased by 12%, amounting to 42 200 tonnes with a value of US\$ 155 million. Rainbow trout production reached 38 000 tonnes, supplemented by European eel (1 350 tonnes), sturgeon (1 000 tonnes) and common carp (650 tonnes).

## Trade

Italy is one of the best markets for freshwater fish in Europe with stable consumption and growing imports. National imports of freshwater fish remained stable at around 5 000 tonnes until 1999, and then started to grow, reaching over 13 000 tonnes in 2003. This could be explained by the introduction of Nile perch on the Italian market, which reaches Italy largely via Belgium and the Netherlands. Products under the category "freshwater fish fillets", which consists predominantly of Nile perch fillets, form the major part of Italian imports. Total exports of freshwater fish, with rainbow trout as the main product, decreased from 8 500 tonnes in 2001 to 4 500 tonnes in 2003.

**Figure 16: Aquaculture, imports and exports of freshwater fish in Italy (in tonnes)**



## Trout

Trout holds the leading position among freshwater species in Italy (0.6 – 0.7 kg per capita consumption). According to FAO figures, there were 38 000 tonnes of trout produced in the country in 2003, though the Italian Fish Farming Association indicates higher production figures (44 000 tonnes). In 2003 some 3 670 tonnes of rainbow trout were exported mainly to Germany, Belgium and the Netherlands, and 463 tonnes of trout were imported. Trout is traded mostly as live, 1-1.5 kg whole fish. The species is well liked in grilled and baked form as well as in antipasti and salads.

## Eel

“*Anguille in umido*”, or eels, gently stewed in an aromatic tomato sauce flavoured with white wine and garlic, is one of the most famous Italian recipes for eel.

Italy is an important market for eel. Though domestic production of eel has declined significantly from 2 800 tonnes in 1998 to 1 350 in 2003, Italy is still the third biggest producer of farmed eel in Europe. Eel farms are concentrated in Veneto, Lombardy and Emilia-Romagna, with minor production in the Lazio and Puglia regions. A further 520 tonnes of eel are supplied from the capture fishery.

In addition to the farmed eel, Italy imported some 900 tonnes of live eel from Denmark, Greece and the Netherlands in 2003, of which 300 tonnes were re-exported. Veneto, Lazio and Southern Italy are the most traditional markets for eel in Italy. The species is especially favoured in the South, where 561 tonnes of eel were consumed in 2004. Italians in the northwestern and central regions consumed 188 tonnes and 171 tonnes, respectively, while a small quantity of 66 tonnes were purchased in the eastern part of the country.

### Nile Perch

Nile perch (*Lates niloticus*) or *pesce persico*, as it is called in Italian, has been increasingly in demand on the Italian market in recent years. There are few direct deliveries from Africa as most of the Nile perch fillets are imported from Belgium and the Netherlands. The product is imported mostly fresh since the distribution service is now efficient: it takes only 24 hours to deliver fresh fish fillets from airports of the Netherlands and Belgium. Imports of Nile perch have grown considerably from slightly over 1 000 tonnes in 1999 to nearly 7 700 tonnes in 2003. The species has become popular in all parts of the country with a little less consumption in the South. In 2004, 6 600 tonnes of Nile perch were consumed in Italy, which is equal to 0.1 kg per capita.

**Table 10: Consumption of the most popular freshwater species in Italy**

Products	Volume in tonnes					Value in €million				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
<b>Freshwater fish</b>	<b>31,895</b>	<b>29,270</b>	<b>27,188</b>	<b>29,767</b>	<b>29,838</b>	<b>221,263</b>	<b>216,596</b>	<b>208,581</b>	<b>227,000</b>	<b>236,005</b>
Eel	1,522	1,342	1,104	886	984	16,264	15,855	11,226	11,041	13,696
Nile perch	2,593	3,904	3,828	5,048	6,618	28,954	42,297	43,652	50,553	59,892
Salmon	6,304	6,359	6,537	6,843	7,015	54,079	53,712	54,246	54,898	57,280
Trout	6,461	6,242	4,701	5,181	5,028	30,040	29,887	23,588	28,527	27,208
Salmon trout	13,819	10,937	10,342	10,896	9,236	83,330	71,072	69,815	74,001	67,850
Other freshwater fish	1,196	494	677	911	961	8,597	3,769	6,053	7,977	10,080

### Sturgeon

Italy started to farm sturgeon in the 1980s on small fish farms in the Brescia region close to Milan. At present, the country is the most important producer of farmed sturgeon in Europe with an annual output of 1 000 tonnes. However, the species has not gained wide acceptance in the mass market despite intensive promotional campaigns. Sturgeon is available in both fresh (whole and fillets) and processed forms.

### Catfish

The Vietnamese Pangasius is rapidly entering the Italian market, which is presently the fourth largest importer of catfish fillets in Europe. While in 2003 Italy imported 434 tonnes of frozen catfish fillets (valued at US\$ 1 million), in 2004 the volume reached 1 755 tonnes (valued at US\$ 3.4 million). Pangasius is available in the supermarkets in frozen and fresh forms.

## Latvia



**Population:** 2.3 million

**Freshwater fish aquaculture:** 673 tonnes

**Freshwater fish capture:** 775 tonnes

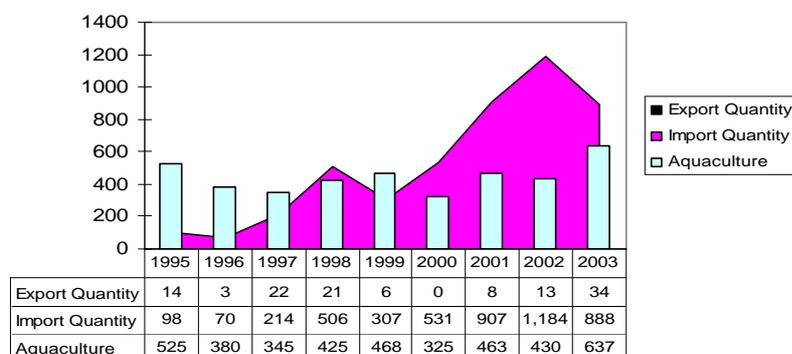
**Freshwater fish imports:** 888 tonnes

**Freshwater fish exports:** 34 tonnes

**Freshwater fish consumption:** 1 kg per capita

Latvia has a small market for freshwater fish, with nearly 1 450 tonnes coming from aquaculture and capture fishery and some 900 tonnes from imports. During the past decade, the aquaculture sector has become unprofitable due to expensive pond maintenance and unfavourable weather conditions. In 2003 the total farmed output amounted to 673 tonnes with a production value of US\$ 833 000. Common carp dominates the sector making up 95% of the total aquaculture output. The main freshwater species caught in the country's rivers and lakes are freshwater bream, northern pike, European smelt, pike-perch and European perch.

**Figure 17: Aquaculture, imports and exports of freshwater fish in Latvia (in tonnes)**



Latvian freshwater fish trade is import-oriented with rainbow trout as the main species imported. While most trout imports in the late 1990s were in frozen form, at present fresh and chilled trout account for 65%. Some 220 tonnes of live carp were also imported in 2003.

## Lithuania

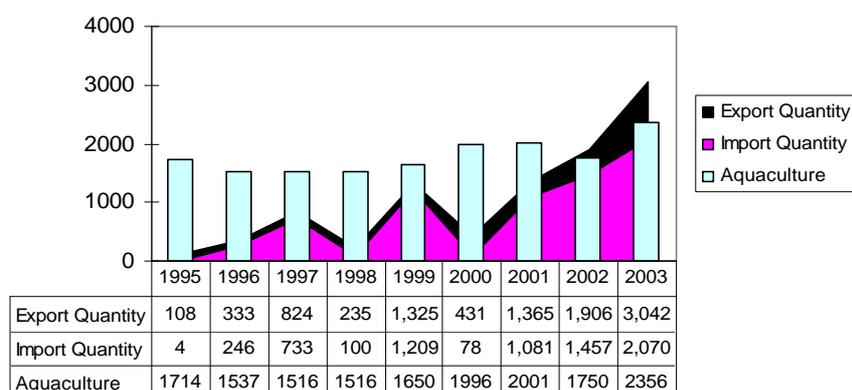


**Population:** 3.6 million  
**Freshwater fish aquaculture:** 2 360 tonnes  
**Freshwater fish capture:** 2 212 tonnes  
**Freshwater fish imports:** 2 070 tonnes  
**Freshwater fish exports:** 3 042 tonnes  
**Freshwater fish consumption:** 1 kg per capita

## Carp

Carp is the most important freshwater species on the Lithuanian market. Farmed output of common carp has risen by 27% from 1 650 tonnes in 1999 to 2 260 tonnes in 2003, reaching a production value of US\$ 3.7 million. With the ongoing development of aquaculture, the exports of carp have increased significantly. While only 100 tonnes of live carp were traded in 1995, 1 100 tonnes of the species were exported in 2003. The destinations for Lithuanian carp were Poland (850 tonnes), Latvia (215 tonnes) and Hungary (30 tonnes).

**Figure 18: Aquaculture, imports and exports of freshwater fish in Lithuania (in tonnes)**



In 2003 Lithuania imported 1 450 tonnes of mostly frozen freshwater fish fillets and exported 1 600 tonnes of the same product. Other important freshwater species from Lithuanian rivers, lakes and ponds are roach (760 tonnes), freshwater bream (455 tonnes), European smelt (375 tonnes) and European perch (112 tonnes).

## Luxemburg



**Population:** 469 thousand  
**Freshwater fish landings:** =0.5 tonnes  
**Freshwater fish imports:** 1 656 tonnes  
**Freshwater fish exports:** 1 752 tonnes

Until 2000 Luxembourg was combined with Belgium in European statistics, with Belgium accounting for more than 90% of the market. In 2003 Luxembourg imported 1 358 tonnes of mainly fresh Nile perch fillets and less than 100 tonnes of trout. Exports were estimated at 1 600 tonnes of fresh and chilled freshwater fish fillets.

## Malta



**Population:** 397 thousand

**Freshwater fish landings:** -

**Freshwater fish imports:** 73 tonnes

Malta has neither freshwater fish production nor exports. Only 73 tonnes were imported in 2003, of which 36 tonnes were Nile perch fillets.

## Netherlands



**Population:** 16.4 million

**Freshwater fish aquaculture:** 7 500 tonnes

**Freshwater fish capture:** 5 127 tonnes

**Freshwater fish imports:** 27 253 tonnes

**Freshwater fish exports:** 28 177 tonnes

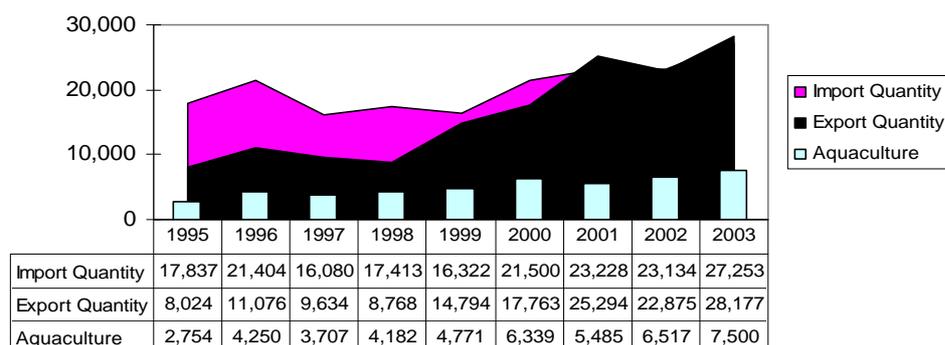
**Freshwater fish consumption:** 0.7 kg per capita

Being a trading nation for centuries, the Netherlands is the major European entry point for import and export of fish, with large quantities of fish products distributed daily. However, domestic consumption of fish is rather low due to national culinary traditions and price sensitivity. The output of Dutch aquaculture, which is dominated by marine farming of blue mussels, has generally decreased in recent years. While in 1998 the production of farmed fish was over 120 000 tonnes, it was only 67 000 tonnes in 2003. Freshwater fish species accounted for 7 500 tonnes, or 11% of the total farmed production. Though the volume of farmed freshwater fish is still small compared to the volume of caught fish, it is steadily growing. Around 70 companies are active in freshwater fish farming, producing eel (4 200 tonnes), North African catfish (3 200 tonnes) and small quantities of trout (100 tonnes) and turbot (75 tonnes).

The Netherlands is the main European transshipping point for imports of freshwater fish, especially Nile perch, tilapia and eel. In 2003 over 27 000 tonnes of freshwater fish with an import value of almost US\$ 123 million were imported. The main species were Nile perch (73% of the total imported freshwater fish volume), eel (10%), rainbow trout (7%), and various other freshwater fish (10%). Nevertheless, the domestic market absorbs only a small share of imports: nearly 80% of products are

re-exported, most having undergone further processing. The total volume of exported freshwater fish reached over 28 000 tonnes in 2003 with an estimated value of US\$ 170 million. The major species are Nile perch (67% of the freshwater fish exports), eel and rainbow trout (5% each) and various other freshwater fish (24%). At present there are 120 wholesale/importing companies and 280 processing companies. Value adding is a major factor in the Dutch fishery industry, which is famous for the quality and freshness of its products. Dutch imports and exports of freshwater fish have been constantly increasing, reaching at present some 27 700 tonnes for imports and 28 600 tonnes for exports.

**Figure 19: Aquaculture, imports and exports of freshwater fish in the Netherlands (in tonnes)**



The increase of freshwater fish trade in recent years has happened in conjunction with developments in the way the fish is handled. Initially the fish was simply packed in cardboard boxes, but modernisation of the processing, packaging and transport of the products has made a positive contribution to the quality of the finished product. Thanks to the country's efficient supply chain, 95% of all incoming fish is cleared through customs and veterinary inspection within 24 hours and then dispatched immediately to other countries.<sup>22</sup>

## Eel

The farmed eel sector is very successful in the Netherlands and the country is the biggest European producer, trader and consumer of eel. Eel aquaculture has developed significantly from 1 535 tonnes in 1995 to 4 200 tonnes in 2003, and at present there are 40 farms producing eel, almost all located near IJsselmeer, in the northern part of the country. The Netherlands has stable annual imports of 2 500 tonnes of eel, with Denmark as the major supplier (1 190 tonnes), followed by France (480 tonnes), Italy (233 tonnes), New Zealand (170 tonnes), Sweden (94 tonnes) and the UK (92 tonnes). Nearly 1 323 tonnes of eel are exported to other European countries. Live eel dominates both imports and exports, accounting for 80% of the total eel volume traded in the Netherlands in 2003. The main importers of eel from the Netherlands were Germany (660 tonnes), Belgium (245 tonnes), Italy (160 tonnes) and France (70 tonnes). Smoked eel, or "gerookte paling" in Dutch, is a national speciality, which is greatly favoured by local consumers, and there are approximately 22 companies involved in eel processing.

## Nile perch

<sup>22</sup> based on [www.dutchfish.nl](http://www.dutchfish.nl)

Import statistics seem to indicate that the Netherlands is the most important market for Nile perch in Europe, but in reality the domestic consumption of this species is very small. The Netherlands was the first country to import Nile perch from Africa in the early 1990s. At present, half of the Nile perch volume from Africa is shipped to the Netherlands, from where it is immediately re-exported to other European countries. There are around 10 companies involved in the direct imports of Nile perch from Africa, and most of them are either specialized in Nile perch trade or have at least one department entirely dedicated to trade in Nile perch.<sup>23</sup>

It is difficult to estimate exactly how much Nile perch is traded because the general code for freshwater fish fillets in trade statistics also includes tilapia and catfish. Import statistics indicate rapidly increasing quantities of Nile perch fillets delivered to the Netherlands. While before the ban in 1999 the peak import of Nile perch fillets was at 5 700 tonnes in 1996, in 2003, 14 500 tonnes were imported. Most of the traded Nile perch comes from Tanzania (around 10 000 tonnes), followed by Uganda (2 600 tonnes) and Kenya (1 800 tonnes). Dutch imports reflect the overall trend in the EU, changing from frozen to fresh fillets in recent years. In 2003, 80% of the imported fillets were fresh, whereas in 1998 the proportion of fresh and frozen fillets was reversed. Italy remains the main market for re-exports of Nile perch fillets from the Netherlands, followed by Spain and France. In 2003 some 18 800 tonnes were re-exported from the Netherlands, of which some 6 600 tonnes were sent to Italy, some 4 200 tonnes to Spain, 3 400 tonnes to France and 2 200 to Germany.

The Dutch Fish Marketing Board shows other figures for Nile perch export: “In 1997 around 400 000 kg of fresh Nile perch fillets were exported from Holland to other European countries each week. In 2001 this figure had risen to 700 000 kg. Only 5% of the total import remains in Holland. The rest is exported to the USA, Spain, Italy, France, Germany, Belgium and Scandinavia”.<sup>24</sup>

## **Tilapia**

The Netherlands started to breed tilapia in 1999 and after a hesitant start, the farmed output of the species reached 300 tonnes in 2003. Today the Netherlands has four tilapia farms where the fish is produced under well-supervised conditions. According to various taste tests, Dutch tilapia is among the top quality selection.<sup>25</sup> Tilapia production is estimated to reach 2 000 tonnes in 2005 and 4 000 tonnes in 2006. Dutch fish traders import fresh tilapia from Zimbabwe and Zambia weekly, and the fish arrive in the Netherlands within 24 hours of being caught. Part of the catch is destined for the Dutch market, but the majority is re-exported mainly to France, Spain, Italy and Germany. Besides fresh African tilapia, the Netherlands also imports deep-frozen tilapia from Thailand and Taiwan. Tilapia is available fresh for most of the year at fishmongers and supermarkets, which makes the fish popular, especially at times when other fresh fish are difficult to buy.

## **Catfish**

Dutch farmers have succeeded in breeding and raising North African catfish, which is less expensive than other catfish farmed in Europe. In 2003 there were 20 companies producing 3 200 tonnes of

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<sup>23</sup> FAO “The world market of Nile perch”

<sup>24</sup> DutchFish “There is no export without import” available at [http://www.dutchfish.nl/uk/persinfo\\_import\\_export.asp](http://www.dutchfish.nl/uk/persinfo_import_export.asp)

<sup>25</sup> Freshness from Holland, Fish news, 4<sup>th</sup> edition, April 2004

catfish, which is double the output in 1999. Some 90% of the production is processed into fresh fillets; the remaining 10% is smoked. Around 80% of Dutch catfish is exported to Germany and the rest goes to Belgium and France. At present Pangasius from Vietnam is rapidly entering the Dutch market. While in 2002 the Netherlands imported 215 tonnes of Vietnamese catfish, in 2004 the imported volume amounted to 763 tonnes. According to Dutch exporters, the market for Pangasius is developing very well. Together with tilapia, Pangasius is becoming very popular on the Dutch market as a cheaper alternative to sea-caught whitefish, which is currently in low supply due to diminished catch quotas. Catfish and tilapia are frequently sold by fishmongers as well as in supermarkets.<sup>26</sup>

## Poland



**Population:** 38.6 million  
**Freshwater fish aquaculture:** 34 526 tonnes  
**Freshwater fish capture:** 20 200 tonnes  
**Freshwater fish imports:** 6 660 tonnes  
**Freshwater fish exports:** 2 413 tonnes  
**Freshwater fish consumption:** 1.3 kg per capita

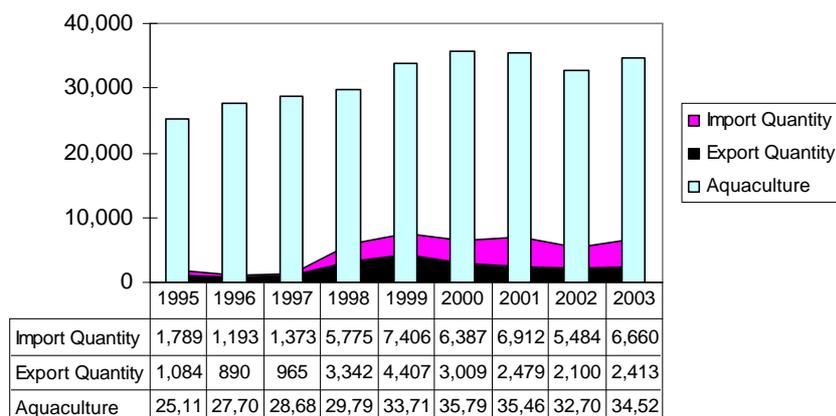
Carp and trout have always been traditional species on the Polish market, but eel is also gaining popularity. Being among the main European freshwater fish producers, Poland has over 1 000 aquaculture farms with annual production of 34 526 tonnes valued at US\$ 77 million in 2003. Carp and trout are the main farmed species, accounting for 56% and 37% of the total farmed production, respectively. In recent years Polish farmers started to cultivate sturgeon and catfish, producing 300 tonnes of each in 2003. Domestic aquaculture production is supplemented by 20 200 tonnes of various freshwater fish from Czech rivers and basins.

According to “Fish Market” magazine, consumption of freshwater fish in 2004 was 1.31 kg per capita. This included 0.51 kg of carp and 0.25 kg of trout. Freshwater fish is recognized as healthy by the Poles, but it is too expensive for the ordinary consumer to buy on a regular basis. Consumption of freshwater fish by rich families is 2.5 times higher than by ordinary ones.

### Figure 20: Aquaculture, imports and exports of freshwater fish in Poland (in tonnes)

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<sup>26</sup> “Pangasius takes over from plaice in the Netherlands” by Seafood International, July 2005



## Carp

Carp still remains the most favoured freshwater species in Poland regardless of its weakened image and the slightly decreasing consumption from 0.54 kg per capita in 2002 to 0.51 kg per capita in 2003. During the last decade, Poland has been the leading European producer of carp, farming 20 500 tonnes of common carp with a production value of US\$ 47.5 million in 2003.

There are over 300 carp farms producing carp which use mainly semi-intensive pond culture. Production of common carp is generally stable with slight fluctuations between 22 000 tonnes (in 2001) and 19 000 tonnes (in 2002). Grass carp production is stable at about 1 500 tonnes annually.

Demand for carp is high especially around the Christmas and New Year period, and the farmed output of carp, which is all consumed domestically, has to be supplemented by imports from other European producers. In 2003 Poland imported 1 330 tonnes of live carp from Lithuania (815 tonnes) and the Czech Republic (486 tonnes).

At present, the carp market faces certain difficulties: on the Polish market nearly 90% of the carp, which is available in retail shops, is sold live and the remaining 10% is in processed forms (fillets, portions). Consumers in Poland, as in many other countries, do not like to kill and clean fish at home. Several Polish companies have started to offer added-value products such as carp fillets and carp steaks, but those convenience products remain too expensive for the ordinary consumer.

## Rainbow trout

Trout is the second most popular freshwater fish on the Polish market with a stable consumption of 0.25 kg per capita. Trout farming has been very successful, with production increasing from 5 800 tonnes in 1996 to 13 000 tonnes in 2003. The country has 150 farms producing rainbow trout and most of it (70%) is produced in the North (Gdansk). Polish imports of trout are also showing an upward trend, reaching 2 500 tonnes in 2003, from 664 tonnes in 1999. Some 84% of the imported trout volume was in frozen form.

## Sturgeon

Over the last few years, farmers in Poland have introduced sturgeon as a new aquaculture fish. In 1998 the production of sturgeon started with 70 tonnes and at present it amounts to 300 tonnes. Sturgeon aquaculture is not expected to compete with traditional species, but many see it as a valuable supplement, increasing the range of species offered by the domestic aquaculture sector.

### **Catfish**

Catfish is another relatively new species cultivated by Polish fish farmers. In 1999 production of North African catfish was about 100 tonnes, and in 2003 it reached 300 tonnes. Catfish production is expected to increase steadily over the next decade as some farmers look into more intensive ways of growing this fish, although more effort is needed to promote catfish on the Polish market.

### **Eel**

No eel is produced in Poland. The species is considered as being very expensive for the average Polish consumer and therefore it has no special impact on the market. In 2003 imports of fresh/chilled and frozen eel were 103 tonnes and 776 tonnes, respectively. Most of the frozen eel was imported from China (574 tonnes) and the Netherlands (140 tonnes), while small amounts of fresh and chilled eel were delivered from Germany (30 tonnes), the Netherlands (28 tonnes) and the Russian Federation (38 tonnes).

## **Portugal**



**Population:** 10.5 million

**Freshwater fish aquaculture:** 960 tonnes

**Freshwater fish landings:** 13 tonnes

**Freshwater fish imports:** 4 328 tonnes

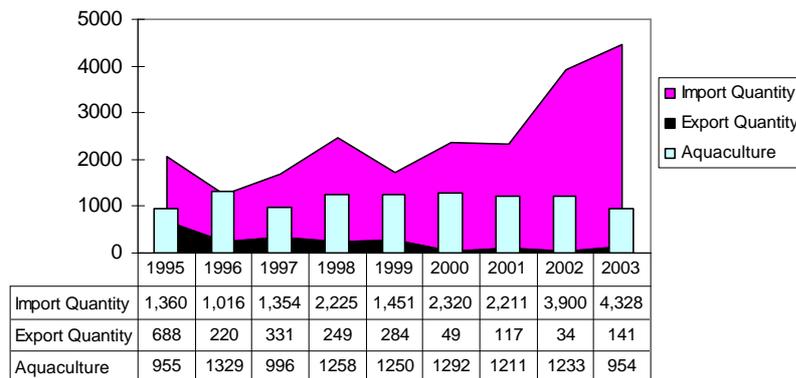
**Freshwater fish exports:** 141 tonnes

**Freshwater fish consumption:** 0.5 kg per capita

Portugal has one of the smallest freshwater fish markets in Europe. The aquaculture sector is dominated by marine fish (especially seabass and seabream), with a total production of 8 000 tonnes in 2003. Rainbow trout and sea trout accounted for about 950 tonnes of this.

Portugal has increased its imports of freshwater fish in recent years. Nile perch (3 600 tonnes) was the main species traded, supplemented by a small amount of trout (380 tonnes). Seventy-two percent of the Nile perch fillets were in frozen form, though the share of fresh Nile perch fillets has tripled in the last three years.

**Figure 21: Aquaculture imports and exports of freshwater fish in Portugal (in tonnes)**



## Slovakia



**Population:** 5.4 million

**Freshwater fish aquaculture:** 880 tonnes

**Freshwater fish capture:** 1 646 tonnes

**Freshwater fish imports:** 1 810 tonnes

**Freshwater fish exports:** 423 tonnes

**Freshwater fish consumption:** 0.7 kg per capita

With 0.5 kg per capita consumption, carp is the dominant freshwater species in Slovakia. Over 1 000 tonnes of carp were caught in the country's lakes and rivers, and 1 600 tonnes of carp were imported from the Czech Republic in 2003. Other freshwater species consumed in Slovakia are imported. Rainbow trout, small quantities of grass carp, European perch, freshwater bream, pike-perch and northern pike come from commercial and recreational fisheries.

## Slovenia



**Population:** 2 million

**Freshwater fish aquaculture:** 1 147 tonnes

**Freshwater fish capture:** 200 tonnes

**Freshwater fish imports:** 86 tonnes

**Freshwater fish consumption:** 0.7 kg per capita

Slovenian farmers produce predominantly rainbow trout (860 tonnes) and common carp (200 tonnes). Freshwater imports are among the lowest in Europe, consisting mainly of rainbow trout (75 tonnes).

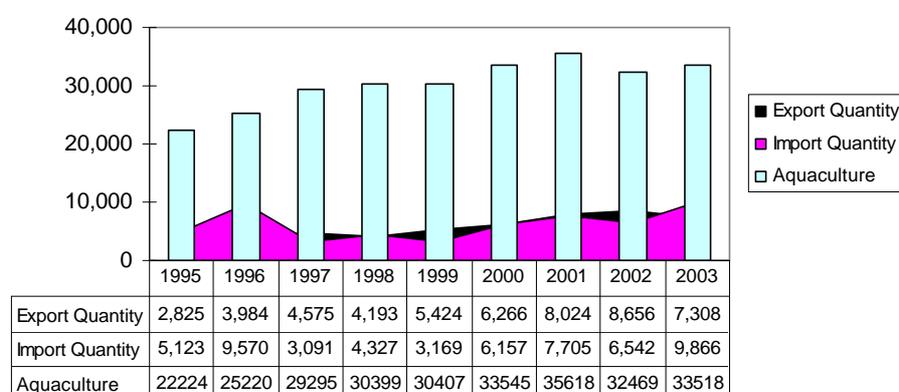
## Spain



**Population:** 40.3 million  
**Freshwater fish aquaculture:** 33 518 tonnes  
**Freshwater fish landings:** 6 274 tonnes  
**Freshwater fish imports:** 9 866 tonnes  
**Freshwater fish exports:** 7 300 tonnes  
**Freshwater fish consumption:** 1 kg per capita

Being the European leader in seafood consumption, Spain is a very good market for certain freshwater fish species, especially trout, Nile perch and Pangasius, but there are also good opportunities for eel.

**Figure 22: Aquaculture, imports and exports of freshwater fish in Spain (in tonnes)**



## Trout

Rainbow trout is the most common freshwater fish and has been favoured by Spanish consumers for a long time. White meat and red meat portion-sized trout have almost equal market shares. Trout represents nearly the entire inland production of freshwater fish, accounting for 33 110 tonnes in 2003. Trout production has been steadily growing; in 2003 the output grew by 5% compared to the previous year. Pink portion-sized trout dominates production (70% of the total trout output). Trout accounts for 80% of the total Spanish exports of freshwater fish. Over the last five years, trout exports have nearly doubled, although there was a decline in 2002 caused by production decrease and price fall. In 2003 the total volume of exported trout reached 5 950 tonnes, with 60% being represented by frozen trout. Nearly 700 tonnes were imported in the same year. Trout consumption is among the highest in Europe, estimated at some 0.7 kg per capita.

## Nile perch

With an estimated consumption of 0.2 kg per capita, Spain is at present the major market for Nile perch fillets. Even though the direct deliveries from Africa are small, imports of fresh and frozen Nile perch fillets via Belgium and the Netherlands have been growing rapidly over the last few years. The peak of Nile perch imports was in 1996, when 8 230 tonnes of freshwater fish fillets were imported to the

country. Several cases of salmonella, cholera and fish poisoning in Uganda, Tanzania and Kenya resulted in a European ban on all fish shipments from Lake Victoria. When the three African countries ensured compliance with the EU requirements, the imports of Nile perch were quickly resumed. In 2003 the total Spanish imports of freshwater fish fillets amounted to 7 940 tonnes, showing an increase of 40% compared to the volume in 2002. Fresh fillets dominate Spanish imports of freshwater fish (64%), and this product form is expanding most rapidly.

The demand for small fillets is particularly high and most Nile perch fillets are sold through conventional markets. Mercamadrid, Mercabarna, Valencia Merca Oyarzun, La Lonja de Vigo, Granada Malaga and Murcia are the main wholesale fish markets in the country. Supermarkets are very important in fish promotion, but they mainly buy fish from Spanish wholesalers. The rest of the fish is sold in the catering sector.<sup>27</sup>

### **Catfish**

Spain is experiencing a real boom in Pangasius catfish from Vietnam. The volume of frozen Pangasius fillets has increased from 941 tonnes in 2003 to 6 903 tonnes in 2004. Vietnamese catfish has been greatly appreciated by Spanish consumers due to its good quality, low price and convenient product form. At present, Spain is the second biggest market for Pangasius after Germany, and the species is the main competitor for Nile perch.

### **Eel**

Juvenile eel is a delicious, expensive dish in Spanish cuisine, especially in the Basque region. Eel is usually salted and covered with olive oil, served in salads or with other fish, in numerous recipes. Some 300 tonnes of eel are produced by the country's mariculture farms. Over 600 tonnes of mainly fresh eel were imported, and 300 tonnes of mostly live eel were exported in 2003.

### **Sweden**



**Population:** 9 million

**Freshwater fish aquaculture:** 3 251 tonnes

**Freshwater fish capture:** 3 940 tonnes

**Freshwater fish imports:** 6 244 tonnes

**Freshwater fish exports:** 7 470 tonnes

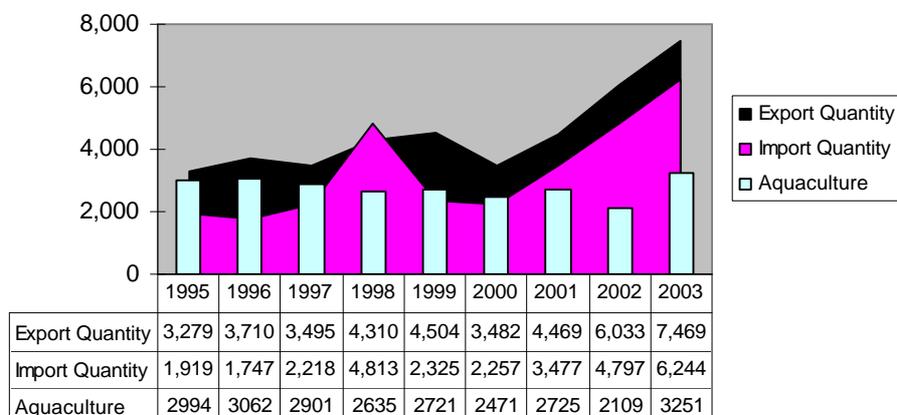
**Freshwater fish consumption:** 0.7 kg per capita

Because most of the Swedish production is exported, the country has a relatively small market for freshwater fish. In 2003 nearly 3 000 tonnes of rainbow trout were farmed in fresh water and 1 000 tonnes in sea water. Aquaculture supplies 170 tonnes of eel. Carp, Nile perch and catfish have no market in Sweden.

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<sup>27</sup> Based on "Nile perch: a competitor for European Inland Aquaculture" by S. Boserman, EIFAC, 2001

**Figure 23: Aquaculture, imports and exports of freshwater fish in Sweden (in tonnes)**



In addition to farmed production, nearly 4 000 tonnes of various freshwater species including whitefish (1 700 tonnes), eel (565 tonnes), pike-perch (450 tonnes), European perch (260 tonnes) and northern pike (200 tonnes) are captured. Swedish imports and exports of freshwater fish have both been increasing in the last few years. Rainbow trout represents 80% of the freshwater fish trade, accounting for 5 070 tonnes of trout export and 5 910 tonnes of trout import in 2003. The species is traded mostly fresh and chilled.

## United Kingdom



**Population:** 59.6 million

**Freshwater fish aquaculture:** 14 300 tonnes

**Freshwater fish capture:** 3 430 tonnes

**Freshwater fish imports:** 13 757 tonnes

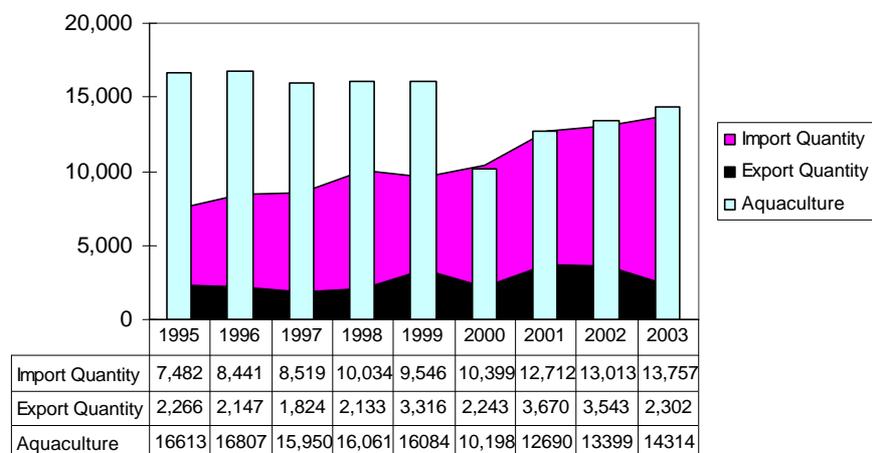
**Freshwater fish exports:** 2 300 tonnes

**Freshwater fish consumption:** 0.5 kg per capita

The United Kingdom has a relatively low interest in freshwater fish. Trout and tilapia are the main consumed species in the UK. Freshwater fish farming is dominated by rainbow trout production, which amounted to 13 800 tonnes with a revenue of US\$ 41.5 million in 2003. Although production of trout occurs throughout the UK, it is more concentrated in Southern England, Yorkshire and Scotland. Small quantities of carp, tench, arctic char, freshwater bream and brook trout are also farmed.

Eel is traded, but there is no domestic market for this species. Almost all the eel volume landed in the UK (590 tonnes) and imported (190 tonnes) in 2003 was exported, mainly to the Netherlands (413 tonnes) and Spain (190 tonnes). Small quantities of carp (90 tonnes) were imported in 2003.

**Figure 24: Aquaculture, imports and exports of freshwater fish in the UK (in tonnes)**



## Tilapia

Eighty percent of the freshwater fish imports to the UK market comprise not identified “frozen freshwater fish”, and according to market experts, a large part of this volume is represented by tilapia. Tilapia is not identified as an item in either national, or international statistics, being included under other freshwater fish species.

The United Kingdom (in particular London) is considered as the main European market for tilapia due to the large communities of Africans, Asians and Chinese, who have a steady demand for tilapia. There has also been an increase in consumption of tilapia among non-ethnic markets. Taiwan Province of China, China, Indonesia, Thailand and Zimbabwe are the main suppliers of tilapia to the UK market. In 2003 some 11 200 tonnes of frozen tilapia were imported, which is 35% more compared to the volume imported in 1999 (7 300 tonnes).

Red tilapia from Jamaica in fresh form is especially appreciated on the UK market. Whole Jamaican tilapia has been exported to the UK for more than a decade, but fillets were introduced on the market only recently.<sup>28</sup> Tilapia often appears on the menus of Asian and African restaurants in big cities, as well as being prepared at home.

## 2.2 Non-EU countries

### Norway

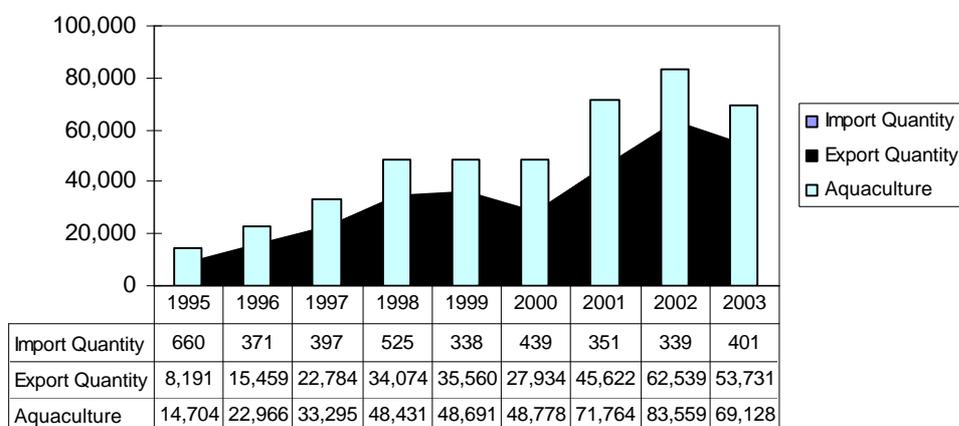


<sup>28</sup> “World Tilapia Farming 2002” by C. Alceste and D. Jory

**Population:** 4.6 million  
**Marine production:** 69 130 tonnes  
**Freshwater fish capture:** 400 tonnes  
**Freshwater fish imports:** 401 tonnes  
**Freshwater fish exports:** 53 731 tonnes

Norway is the leading producer of trout with an output of nearly 70 000 tonnes, although it should be mentioned that the entire yield is farmed in sea water. The trout is initially grown in fresh water and later is placed in large cages in the sea. Norwegian production of trout has been booming in the last decade: the output increased from 14 700 tonnes in 1995 to 69 128 tonnes in 2003. Over the same period, the value rose from US\$ 57.3 million to US\$ 171.7 million.

**Figure 25: Farmed rainbow trout production, imports and exports in Norway (in tonnes)**



Most of the trout production is exported worldwide. Japan is the main destination for the Norwegian trout, importing 27 300 tonnes in 2003. Over 14 000 tonnes were exported mostly in frozen form to the Russian Federation. The EU imported 16 364 tonnes of trout, of which 50% were in frozen form. The following European countries were the main importers of the Norwegian rainbow trout in 2003:

- Finland - 6 600 tonnes
- Latvia - 2 300 tonnes
- Estonia - 2 100 tonnes
- Sweden - 2 050 tonnes
- France - 685 tonnes
- Denmark - 464 tonnes
- Lithuania - 445 tonnes
- Germany - 228 tonnes

## Iceland

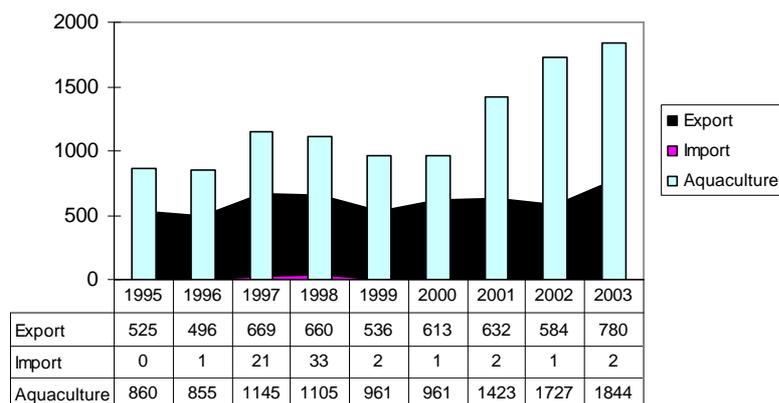


**Population:** 294 thousand

**Freshwater fish aquaculture<sup>29</sup>:** 1 850 tonnes  
**Freshwater fish exports:** 780 tonnes  
**Freshwater fish consumption:** 4 kg per capita

Arctic char (1 664 tonnes), most of which is farmed in brackish water, is the main species in Icelandic aquaculture. Some 180 tonnes of rainbow trout were also produced in 2003.

**Figure 26: Aquaculture, exports and imports of freshwater fish in Iceland (in tonnes)**



The Icelandic freshwater fish market is export oriented, selling 780 tonnes of trout abroad in 2003. There is still much trout left for domestic consumption, which is estimated at some 4 kg per capita.

## Switzerland

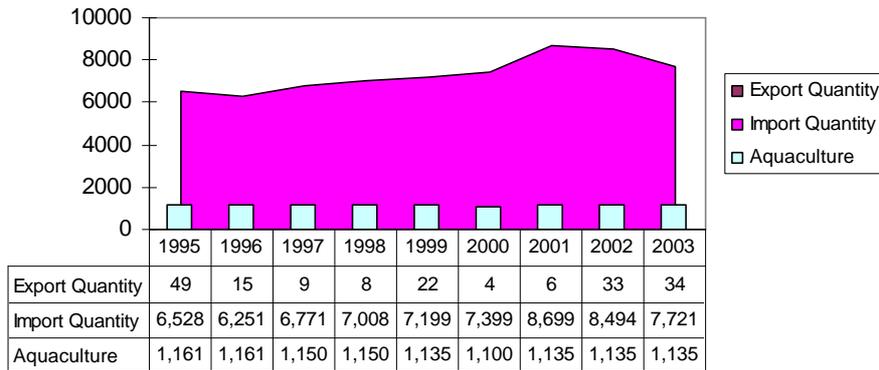


**Population:** 7.4 million  
**Freshwater fish aquaculture:** 1 135 tonnes  
**Freshwater fish landings:** 1 800 tonnes  
**Freshwater fish imports:** 7 721 tonnes  
**Freshwater fish exports:** 34 tonnes  
**Freshwater fish consumption:** 1.4 kg per capita

Switzerland has a stable market for freshwater fish with European perch and rainbow trout being the most popular species. Domestic production is concentrated on trout with a stable annual output of 1 100 tonnes in recent years. The major species from Swiss lakes are whitefish (990 tonnes), perch (485 tonnes), roach (160 tonnes), northern pike (47 tonnes) and pike-perch (22 tonnes). In 2003 Switzerland imported 5 800 tonnes of various freshwater fish fillets, which mainly included Nile perch and European perch fillets. The national exports of freshwater fish are very low, consisting of only 34 tonnes of frozen fish fillets. Switzerland is a big caviar importer, with 60 tonnes of caviar and caviar substitutes imported in 2003, for a value of US\$ 5 million.

**Figure 27: Aquaculture, imports and exports of freshwater fish in Switzerland (in tonnes)**

<sup>29</sup> Rainbow trout and arctic char are produced in brackish water in Iceland.



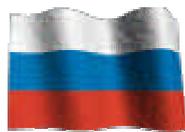
## Perch

European perch, which often appears on the menu in Swiss restaurants, is mostly imported. In 2003, 485 tonnes of perch were supplied from Swiss lakes, but according to market experts, only 10-15% of the perch is produced domestically. No official statistics on perch imports are available, but it might be assumed that the imported volume of perch is between 3 500 and 5 000 tonnes. Perch is imported mostly in the form of fillets, while small quantities of the species are imported whole and cut. Small-sized fillets (15 g) with skin on are eaten in French-speaking Switzerland, and medium-sized fillets (40g) are preferred in the German-speaking part of the country.

## Trout

Rainbow trout dominates the Swiss aquaculture sector with a stable annual production of 1 100 tonnes over the last decade. In 2003 trout production was valued at US\$ 10.6 million, which is 25% less than the value in 1995. Some 1 000 tonnes of rainbow trout are imported into Switzerland to meet the demand.

## Russia



**Population:** 143.4 million

**Freshwater fish aquaculture:** 95 122 tonnes

**Freshwater fish landings:** 140 000 tonnes

**Freshwater fish imports:** 16 719 tonnes

**Freshwater fish exports:** 221 tonnes

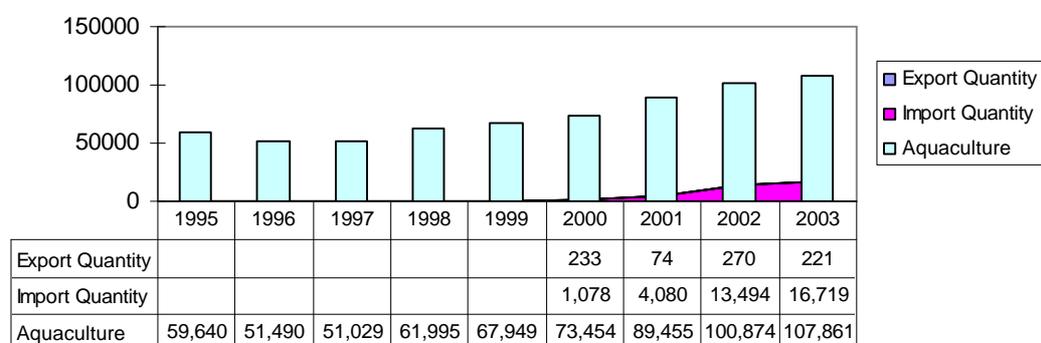
**Freshwater fish consumption:** 1.8 kg per capita

Russia represents a huge and very interesting market for freshwater fish, which has been expanding rapidly. The Russian aquaculture sector is the largest in Europe both in terms of produced volume and value. In 2003 nearly 108 000 tonnes of freshwater fish were farmed, with a production value of US\$ 276 million. Freshwater capture fisheries provide some 140 000 tonnes annually, which is the highest in Europe. Carp and trout are the most popular freshwater species, but freshwater bream, catfish and pike are also in demand.

Russian trade of freshwater fish is import-oriented, with rainbow trout as the dominant species. Supply of frozen, fresh and live trout from Norway has been booming since 2000. While Russia imported 3 800 tonnes of trout in 2001, in 2003 the volume reached nearly 16 600 tonnes. Seventy-nine percent of the imported trout volume was frozen, 19% was fresh and chilled, and the rest was live. At present Russia is considered the second biggest market for Norwegian trout after Japan.

In Russia fish is sold mainly through open markets and traditional grocery shops (75% of total fish sales), although super- and hypermarket chains are expanding rapidly (9% of the total retail sales in Russia and 30% in Moscow). According to market experts, the new retail outlets in Russia have the potential to take control of 35-50% of total retail sales by the year 2015. For Moscow the figures could be even higher, 50-70%.<sup>30</sup>

**Figure 28: Aquaculture, imports and exports of freshwater fish in Russia (in tonnes)**



The most important species captured in Russian rivers and lakes are freshwater bream (28 000 tonnes), roach (16 000 tonnes), other cyprinids (20 000 tonnes), whitefish (14 000 tonnes), northern pike (10 000 tonnes), European perch (8 000 tonnes), pike-perch (6 000 tonnes) and wels catfish (6 000 tonnes).

## Carp

The common carp has been a part of the Russian fish diet for centuries. The species is used in the famous Russian fish soup called “ukha”, and can be fried or stewed and served with potatoes and vegetables. The country is the biggest carp producer outside countries of the European Union, with 45 000 tonnes of common carp, 33 000 tonnes of silver carp and 1 000 tonnes of grass carp being farmed in 2003. The total carp production of 79 000 tonnes was valued at US\$ 176 million. Carp is sold mostly live whole through open markets and specialized shops. Consumption of carp is estimated at 0.5 kg per capita and the species is consumed throughout the country.

## Trout

Rainbow trout is another important species competing with salmon on the Russian market. Domestic production of 6 080 tonnes is much lower than demand, thus imports of good-quality trout from

<sup>30</sup> [www.businessanalytica.com](http://www.businessanalytica.com)

Norway are increasing. Trout arrives on the Russian market mainly in frozen form and a major part of the imported volume is delivered to Russian processing plants. Modern retail chains sell an increasing amount of live and fresh/chilled trout due to modern facilities and more efficient distribution. There has also been a growing demand for smoked and salted trout.

## Eel

Russia has almost no market for eel. Eel catches have been declining during the last decade, reaching 54 tonnes in 2003. An additional 134 tonnes of frozen eel were imported, and 88 tonnes of frozen and fresh eel were exported in the same year.

## Turkey



**Population:** 68.9 million

**Freshwater fish aquaculture:** 40 217 tonnes

**Freshwater fish landings:** 23 088 tonnes

**Freshwater fish imports:** 36 tonnes

**Freshwater fish exports:** 2 115 tonnes

**Freshwater fish consumption:** 0.9 kg per capita

Turkey is emerging as a significant market for freshwater fish, and the country has a good chance of becoming an important trader. The Turkish aquaculture sector is one of the biggest on the European continent, producing 80 000 tonnes of fish, of which half are freshwater fish, mainly rainbow trout. Over 23 000 tonnes of various freshwater fish were caught in the country in 2003. Carp is the main species, accounting for more than half of Turkish freshwater capture fishery, supplemented by pike-perch, tench, wels catfish, North African catfish and other various freshwater fish species.

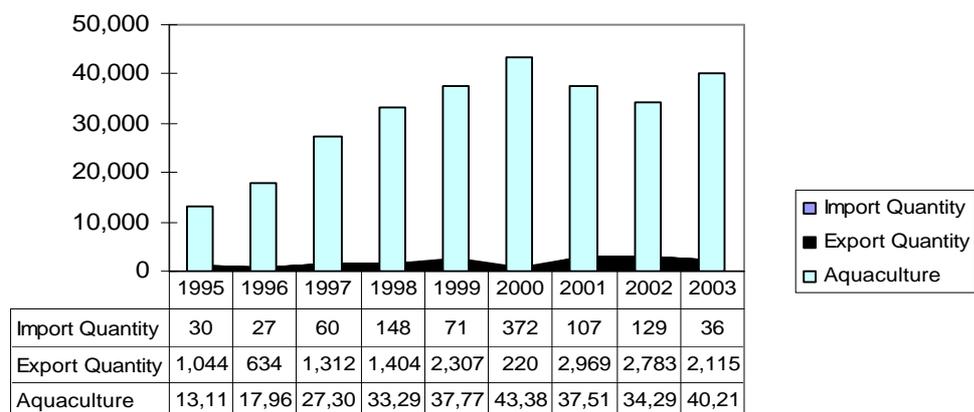
## Trout

Trout is the most preferred farmed freshwater fish because of its delicious taste and because the water temperatures of rivers and reservoirs in Turkey are suitable for its production. Trout farms are mainly concentrated in the Aegean region, where approximately 25% of the total is produced.<sup>31</sup> The production of trout has increased from 12 700 tonnes in 1995 to 39 700 tonnes in 2003, with a production value of US\$ 100 million.

**Figure 29: Aquaculture, imports and exports of freshwater fish in Turkey (in tonnes)**

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<sup>31</sup> "Turkey: Fishery profile" available at [www.eurofish.dk](http://www.eurofish.dk)



## Albania



**Population:** 3.5 million

**Freshwater fish aquaculture:** 360 tonnes

**Freshwater fish landings:** 1 085

**Freshwater fish imports:** 138 tonnes

**Freshwater fish exports:** 28 tonnes

**Freshwater fish consumption:** 0.4 kg per capita

Output from all freshwater bodies was estimated at 1 445 tonnes in 2003; carp (665 tonnes), rainbow trout (70 tonnes), bleak (230 tonnes), pike-perch (30 tonnes) and eel (20 tonnes) were the main species.

## Bosnia and Herzegovina



**Population:** 4 million

**Freshwater fish aquaculture:** 6 375 tonnes

**Freshwater fish landings:** 2 000 tonnes

**Freshwater fish exports:** 268 tonnes

**Freshwater fish consumption:** 2 kg per capita

Rainbow trout (3 800 tonnes) and common carp (1 900 tonnes) are the major species in the Bosnian aquaculture sector. A further 2 000 tonnes of various freshwater fish species were landed in 2003.

## Bulgaria



**Population:** 7.5 million  
**Freshwater fish aquaculture:** 4 450 tonnes  
**Freshwater fish landings:** 1 800 tonnes  
**Freshwater fish imports:** 175 tonnes  
**Freshwater fish exports:** 250 tonnes  
**Freshwater fish consumption:** 0.8 kg per capita

Bulgaria has a small traditional market for freshwater fish. With 850 tonnes from aquaculture and 1 500 tonnes from capture, carp is the most consumed freshwater species in the country. The national aquaculture sector accounted for 4 450 tonnes in 2003, with cyprinids (1 600 tonnes) and various freshwater fish (1 800 tonnes) being the main farmed species. A smaller production came from aquaculture of catfish (80 tonnes), pike-perch (60 tonnes) and northern pike (50 tonnes). International trade in freshwater fish is very low with some 175 tonnes imported and 250 tonnes exported.

## Croatia



**Population:** 4.5 million  
**Freshwater fish aquaculture:** 3 240 tonnes  
**Freshwater fish exports:** 450 tonnes  
**Freshwater fish consumption:** 0.6 kg per capita

Croatia, like other Central European countries, specializes in carp culture, with an output of 2 320 tonnes of carp in 2003. Farmed rainbow trout (790 tonnes) and catfish (70 tonnes) were also produced. Croatian exports comprised 400 tonnes of live carp and 50 tonnes of live trout.

## Macedonia



**Population:** 2 million  
**Freshwater fish aquaculture:** 1 272 tonnes  
**Freshwater fish capture:** 150 tonnes  
**Freshwater fish imports:** 146 tonnes  
**Freshwater fish consumption:** 0.8 kg per capita

Macedonian farmers produced 880 tonnes of trout, 300 tonnes of carp and 40 tonnes of eel in 2003. In the same year small amounts of carp (66 tonnes) and trout (80 tonnes) were imported.

## Moldova



**Population:** 4.5 million  
**Freshwater fish aquaculture:** 2 638 tonnes  
**Freshwater fish landings:** 343 tonnes  
**Freshwater fish imports:** 22 tonnes  
**Freshwater fish consumption:** 0.7 kg per capita

Several carp species are produced in aquaculture. Among the 2 638 tonnes of carp species produced in 2003, silver carp dominated. All the carp output is consumed domestically (0.6 kg per capita).

## Romania



**Population:** 22.4 million  
**Freshwater fish aquaculture:** 7 270 tonnes  
**Freshwater fish landings:** 7 790 tonnes  
**Freshwater fish imports:** 322 tonnes  
**Freshwater fish consumption:** 0.7 kg per capita

The fish farming sector in Romania annually produces some 7 270 tonnes of fish, comprising 5 760 tonnes of carp, 1 000 tonnes of trout and small quantities of northern pike and pike-perch. Capture freshwater fisheries produce goldfish (2 350 tonnes), European bream (1 800 tonnes) and other not specified species (1 300 tonnes). Carp is the main freshwater species in Romania, and all the carp output is consumed domestically. In 2005 a market study on fish consumption, undertaken by the Natural Resource Institute (NRI), Greenwich, and the Know-How-Fund from the UK, analysed Romanian consumer behaviour and tested the results by actual marketing attractiveness. The main conclusions from the consumer survey were as follows:

- 98% of the Romanians consumed fish
- The typical expenditure on a purchase was US\$ 2.00
- Carp was the favourite fish
- Portion size and price were important considerations for consumers
- Fish was purchased mainly on special occasions, not on a regular basis

Carp in Romania is transported live from the farms to the main population centres where it is held in tanks and the consumer then buys a whole fresh fish. The problem is that most fish are 2-3 kg in size and cost US\$ 2-3/kg, making them too expensive for many consumers. A test filleting programme was initiated so that 200-300 g portions were available that were sold at US\$ 1.00 per piece. With a typical extraction rate of 45%, a single fish yielded US\$ 5.00/kg and the 10 kg of portions made for the first trial were sold out in one hour. There was even a market for the heads, bones and trimmings for soup. This procedure raised the income per kg by over 30%, even after allowing for the cost of filleting.<sup>32</sup>

## Ukraine

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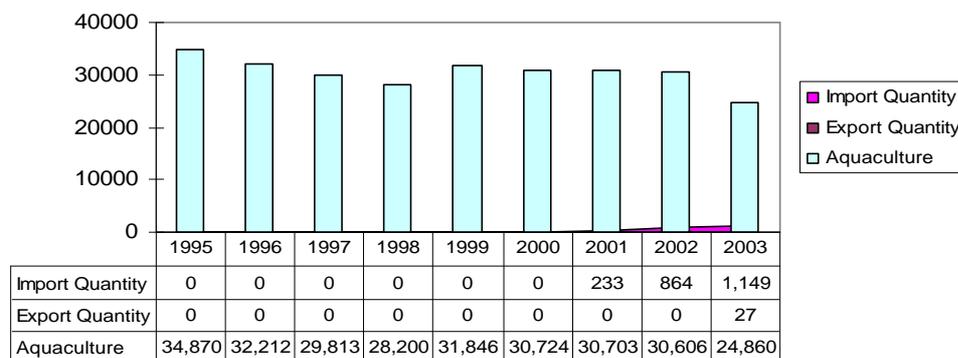
<sup>32</sup> Marketing Section, [www.aquatt.ie](http://www.aquatt.ie)



**Population:** 48 million  
**Freshwater fish aquaculture:** 24 840 tonnes  
**Freshwater fish landings:** 12 660 tonnes  
**Freshwater fish imports:** 1 150 tonnes  
**Freshwater fish consumption:** 0.8 kg per capita

The Ukrainian aquaculture sector is almost entirely represented by carp farming. In 2003, 24 500 tonnes of carp were produced (99% of the total aquaculture output), whereas the remaining 340 tonnes consisted mainly of goldfish, pike-perch, freshwater bream and European perch. The country's annual landings from freshwater capture fisheries of 12 660 tonnes include bleak (3 500 tonnes), freshwater bream (2 680 tonnes), roach (3 060 tonnes), pike-perch (1 070 tonnes), goldfish (1 230 tonnes) and white bream (714 tonnes).

**Figure 30: Aquaculture and imports of freshwater fish in Ukraine (in tonnes)**



There is a very limited international trade of freshwater fish on the Ukrainian market. In 2002 the country started to import frozen trout, and at present the volume of imported trout amounts to 1 150 tonnes. Almost all the carp produced by Ukrainian farmers is consumed domestically. Only 27 tonnes of live carp were exported in 2003. Consumption of carp is estimated at 0.5 kg per capita.

## Serbia and Montenegro

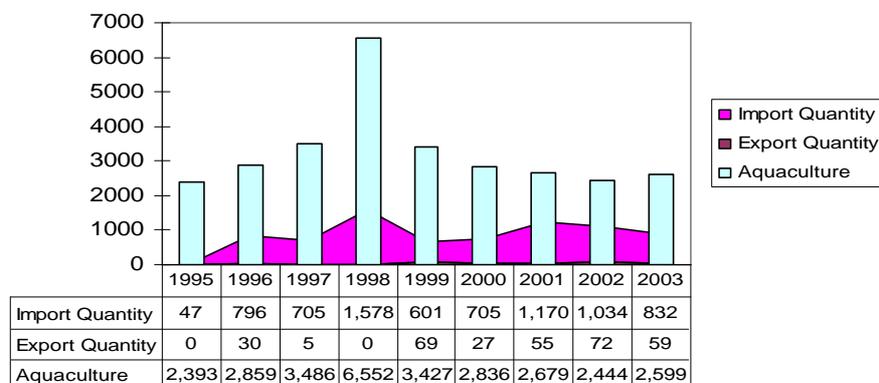


**Population:** 10.8 million  
**Freshwater fish aquaculture:** 2 600 tonnes  
**Freshwater fish landings:** 570 tonnes  
**Freshwater fish imports:** 832 tonnes  
**Freshwater fish exports:** 59 tonnes  
**Freshwater fish consumption:** 0.4 kg per capita

With a production of 2 599 tonnes, common carp is the most favoured freshwater species in Serbia and Montenegro. The country has a very small production of eel (6 tonnes) and landings of various

freshwater fish (570 tonnes). A further 600 tonnes of live carp were imported, and 59 tonnes of carp were exported in 2003. Imports of trout are estimated at 240 tonnes.

**Figure 31: Aquaculture and imports of freshwater fish in Serbia (in tonnes)**



### 3. Overview of the resources

Due to the complexity of the industry, it is difficult to analyse the trends for each species in the same market. While the original idea was to limit this study to the European Union, the results would not accurately represent the overall situation on the market.

Carp and eel are produced in the EU, but much of the trout is concentrated in Norway, the Faeroe Islands and Iceland. By considering only EU aquaculture, a large part of production would be missing. Thus, total trout production is a combination of EU and EEZ (Norway, Iceland and Faeroe Islands) output, whereas carp and eel production data are limited to the EU market.

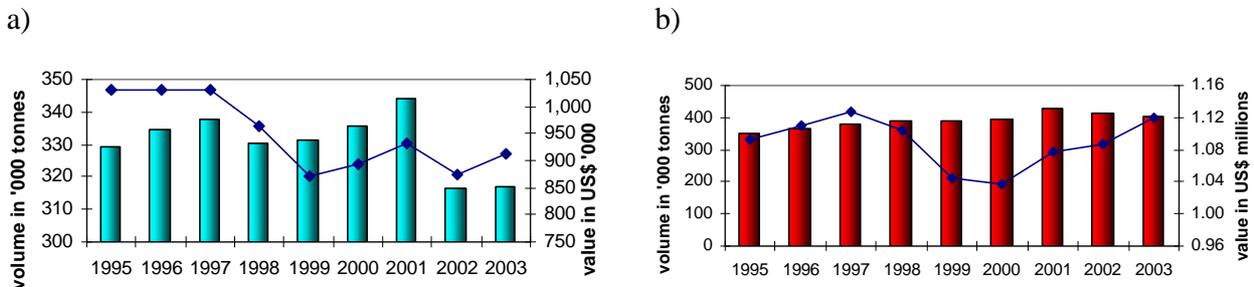
#### 3.1 Status of European freshwater aquaculture

Production of freshwater fish is a very important sector in European aquaculture, but compared to marine aquaculture, it is less profitable and diverse. Whereas European marine aquaculture reached 1 million tonnes in 2003, with a revenue of US\$ 2 billion, the freshwater sector amounted to 317 000 tonnes, with a value of US\$ 912 million. When Norway, Iceland and the Faeroe Islands are included, the overall output of freshwater fish production is estimated at 397 000 tonnes, with a revenue of US\$ 1.1 billion.

When analysing the dynamics of EU freshwater aquaculture (Figure 32a), it is evident that there was a significant drop in production in 2002. This was caused by an unforeseen collapse in trout prices, which reached their lowest level in September 2001, forcing some producers to decrease their trout output. According to FAO figures, the overall volume fell by 8% from 344 000 tonnes in 2001 to 316 000 tonnes in 2002, due to a decrease in trout production mainly in Italy and Denmark. However, the Danish Aquaculture Organisation declared an unchanged output of some 32 000 tonnes of trout per year over the last decade, so the actual decline may be less. The value of the EU freshwater fish production reached its minimum of US\$ 871 million in 1999. After a growth in production and value

until 2001, the overall volume has stabilized at 317 000 tonnes, with an estimated value of US\$ 912 million.

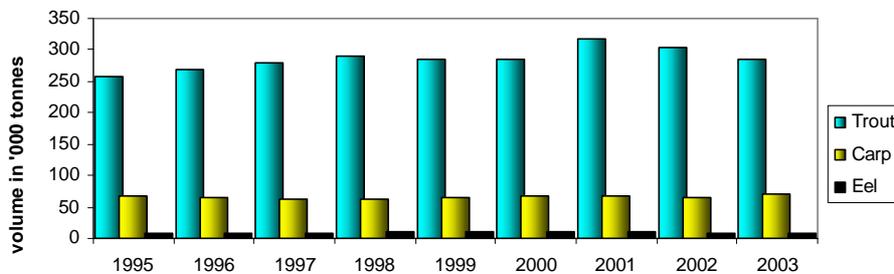
**Figure 32: Production and value dynamics of freshwater fish aquaculture in the EU (Figure a) and in the EU + EEZ countries (Figure b)**



Production of freshwater fish in EEZ countries together with the EU production (Figure 32b) seems to be more stable due to the increasing output of rainbow trout from Norway, the Faeroe Islands and Iceland.

The peak of 420 000 tonnes was observed in 2001, and then declined by only 2-3% in the next two years reaching 397 000 tonnes in 2003. The main reason behind this trend was a drop in Norwegian trout production by 17% from 2002 to 2003 as a consequence of price collapse, which had an effect especially on big producers. The value, which was lowest in 2000, at US\$ 1.036 million, has increased since then, reaching US\$ 1.119 million in 2003. European freshwater aquaculture is based on trout, carp and eel. Whereas trout represents 74% of the overall volume, carp accounts for 18%, eel for 2%, and other species for the rest (Figure 33).

**Figure 33: Aquaculture production by major species (EU + EEZ countries)**



Production of trout increased by 12% during the 1995-2003 period, from 260 000 tonnes in 1995 to 297 000 tonnes in 2003, with a peak of 323 000 tonnes in 2001, followed by a decline of 2% in 2002 and by 6% in 2003. Trout is the most profitable freshwater aquaculture product in Europe, with an estimated annual value of US\$ 811 million.

Carp production has been stable at around 70 000 tonnes per year. In 2003 nearly 71 000 tonnes were produced in the EU, which is a 10% increase over the year before. Carp production was valued at US\$ 165 million in 2003. The output has been stable for many years, with hardly any increase in demand and consumption.

The eel sector is a small but very lucrative industry, with an estimated production of 8 800 tonnes and a revenue of US\$ 68 million in 2003. Because landings of eel are declining, eel farming is the only way

to maintain the species on the market. Other freshwater species represent 2% of the overall European freshwater fish production. They include North African catfish, wels, roach, sturgeon, tench, tilapia, northern pike, pike-perch and goldfish. Imports of Nile perch and catfish fillets have been rapidly expanding in many European countries. Product convenience and price are the main factors behind the popularity of those species.

European freshwater aquaculture is dominated by numerous small producers, often family-owned micro-enterprises. The industry is highly fragmented and this impacts both on the main marketing aspects such as product design, distribution, price and promotion, and on the regulatory framework. So far there is a lack of cooperation and vertical integration that would link producers to the end consumers through the marketing chains, with producers being at a disadvantage. As a result, the industry does not influence European legislation and is missing out on important technical and commercial information such as in-depth marketing studies and information on consumer preferences and demand. At present, direct marketing would seem to be the best approach for European trout and carp producers.

While a typical product supply chain in perishable foods will see a 300% mark-up from producer to end user, a shorter chain would increase the returns to all parties involved in the supply chain. Still, producers have to remember that there is a general price barrier of €3.00 per person in some countries, which consumers are not willing to cross when purchasing fish products. In a situation where production costs are high compared to profits, direct marketing is one of the best strategies for producers to maximize profits. There is unlikely to be major growth in either trade or consumption in the near future unless concerted action is undertaken in order to change the current trend.

## 4. Overview of the main species

### 4.1 Carp



#### **Basic data 2003:**

**European aquaculture production:** 71 000 tonnes

**European landings:** 10 304 tonnes

**Main producers:** Poland, Czech Republic, Germany

**Importing countries:** Germany, Slovakia

**Main consumption markets:** Hungary, Czech Republic, Poland, Germany

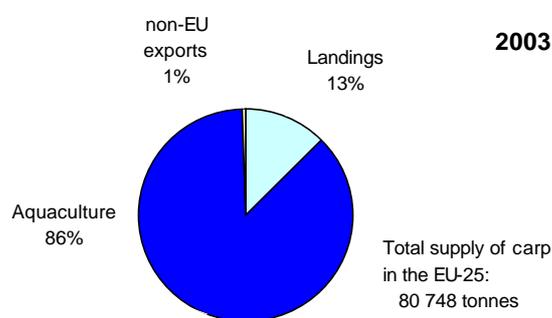
Carp is the most traditional freshwater fish species in Europe, with the second biggest market share after rainbow trout. In 2003 the total European carp production reached 71 000 tonnes, excluding 80 000 tonnes of carp produced in the Russian Federation. The species is characterized by stable output and slightly upward trade. As the fish are sold mostly live, the carp market is facing certain challenges, in particular consumers' reluctance to process fish at home.

#### **Production**

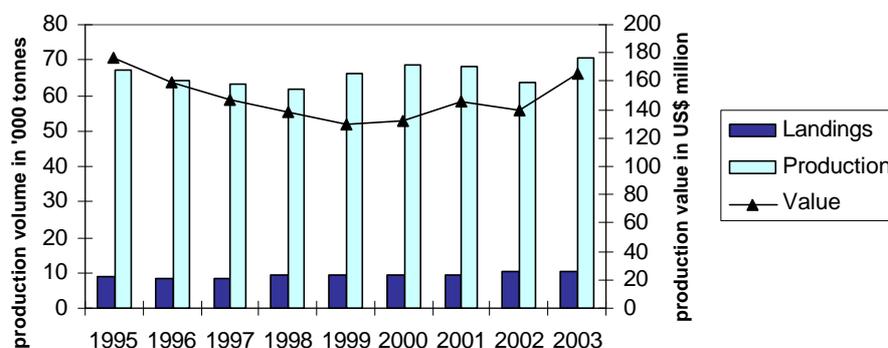
Carp farming has the longest tradition in aquaculture. Its history goes back to China, where it was introduced around the year 500 BC and which is at present the largest carp producer in the world (over 2 million tonnes in 2003). In Europe, the first carp were raised because of religious requirements and carp farming was considerably expanded during the Middle Ages. On the European market, carp is the second most popular freshwater farmed species after trout. Common carp (*Cyprinus carpio*) is responsible for 90% of carp production; the rest comprises bighead carp (*Hypophthalmichthys molitrix*), silver carp (*Hypophthalmichthys nobilis*), grass carp (*Ctenopharyngodon idella*) and crucian carp (*Carassius carassius*).

On the European market, 87% of carp supply comes from aquaculture production and 13% from landings. Figure 34 illustrates the shares of carp aquaculture, landings and non-EU exports in 2003.

**Figure 34: Carp supply by aquaculture and landings on the EU-25 market**



**Figure 35: European landings, farmed production and value of carp**



Over 70 000 tonnes of common carp, with an estimated value of US\$ 165 million, were farmed in Europe in 2003, which is 10% more compared to the output in the previous year. European carp production has been fluctuating slightly over the last decade, reaching a minimum of 61 500 tonnes in 1998 and a maximum of 71 000 tonnes in 2003. Poland is the leading European carp producer, farming more than 20 000 tonnes of common carp annually. The Czech Republic, which has been Poland's main competitor for a long time, producing 16 000 tonnes annually, is now facing competition from German farmers.

In 2003 carp output amounted to some 16 900 and 16 200 tonnes for the Czech Republic and Germany, respectively. Hungary, where carp is dominant in fish consumption, produced nearly 8 000 tonnes of

the species in 2003. France has a relatively small, but stable carp output, on average 5 300 tonnes annually. Lithuania considers carp as its main aquaculture species and the country has increased carp production by 30% over the last 5 years.

**Table 11: The main producers of carp in Europe (in tonnes)**

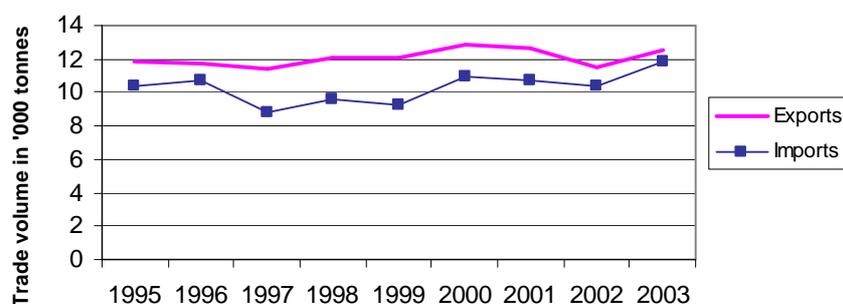
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Poland	19,720	21,400	19,700	19,441	21,368	22,600	22,000	19,000	20,500
Czech Republic	16,300	15,940	15,170	15,061	16,448	17,106	17,421	16,596	16,935
Germany	14,000	12,000	12,000	10,700	10,500	10,500	10,500	11,373	16,221
Hungary	7,355	5,788	6,420	7,069	8,158	8,656	8,226	7,735	7,924
France	5,000	5,005	5,755	5,655	5,655	5,650	5,430	5,200	4,700
Lithuania	1,714	1,537	1,516	1,516	1,650	1,921	1,957	1,676	2,259
Others	3,211	2,640	2,446	2,103	2,571	2,233	2,433	2,280	2,251
Total	67,300	64,310	63,007	61,545	66,350	66,433	67,967	63,860	70,790

Outside Europe, the Russian Federation is the largest carp producer, with 80 000 tonnes farmed in 2003. Other countries producing carp are Ukraine (24 600 tonnes), Romania (5 760 tonnes) and Serbia and Montenegro (2 600 tonnes).

## Trade

Both carp exports and imports have been showing moderate growth, except in 2002. Due to economic consequences of the price fall in September 2001, which had an impact on both trout and carp industries, many carp producers had to reduce their exports in order to not lose profitability. However, in 2003 exports rose by 9% and imports by 13% compared to the previous year.

**Figure 36: Carp exports and imports in Europe**



Almost all carp produced in Europe is traded among the European countries, with the exception of 556 tonnes that the Czech Republic and Hungary exported to Serbia Montenegro in 2003. The total volume of exports reached 12 557 tonnes in 2003 with a value of nearly US\$ 26 million.

The Czech Republic is the main carp exporter to the European market with half of its carp production sold abroad in 2003 (8 500 tonnes). The Czech exports of predominantly live carp went to Germany (3 700 tonnes), Slovakia (1 600 tonnes), Belgium (660 tonnes), Austria (650 tonnes) and Hungary (400 tonnes). Lithuania, with its small but growing production, has started to export live carp to Poland (850 tonnes) and Latvia (200 tonnes). Hungary consumes the major part of its carp yield domestically, leaving less than 800 tonnes for exports to Germany and Austria.

**Table 12: The main exporters and importers of carp in Europe (in tonnes)**

Exporting country	2003	%
Czech Republic	8,524	68
Lithuania	1,120	9
Hungary	780	6
Belgium	665	5
Austria	413	3
Germany	331	3
France	279	2
Poland	254	2
Others	221	2
Total	12557	100

Importing country	2003	%
Germany	4,807	40
Slovakia	1,691	14
Poland	1,351	11
Austria	1,334	11
Belgium	748	6
France	476	4
Hungary	476	4
Italy	295	2
Others	712	6
Total	11890	100

Carp imports amounted to 11 856 tonnes in 2003, valued at US\$ 24.5 million, with Germany being responsible for 40% of this volume as the biggest carp importer in Europe. Over the last five years, German imports of common carp have increased by 25% reaching 4 800 tonnes in 2003. Although several years ago the country experienced stagnation in the carp sales sector<sup>33</sup>, Germans now seem to consume more carp since both production and imports of the species have noticeably increased. The Czech Republic is the dominant supplier of carp to the German market. Slovakia is another “carp eating nation”, which imports some 1 600 tonnes of live carp annually from Czech farmers and wholesalers. Poland has raised its carp imports significantly from some 500 tonnes in 1999 to 1 350 tonnes in 2003. Austria, where carp is one of the most consumed species, imports on average some 1 300 tonnes annually. Belgian imports of carp fluctuated highly over the last five-year period with a minimum at 190 tonnes in 2002 and a maximum at 750 tonnes in 2003.

## Market

As Central European countries have limited access to coastline, farmed carp is one of the most popular species in Hungary, Slovakia, Poland, Czech Republic and Romania. Consumers in Germany and Austria also appreciate carp, with consumption peaks in the Christmas and Easter periods. However, carp sales in Europe are facing certain challenges. First, carp is traditionally sold live or fresh/chilled and the majority of European consumers are reluctant to slaughter and clean fish at home. Then, carp is seen as a meal for older people, who invest a lot of time and skill in preparing it. Those two factors are considered to be the main constraints in the carp sector at present. Increased numbers of processors have started to offer added-value products like carp steaks and boneless fillets as well as other easy-to-cook products, but no particular marketing strategy has been implemented in order to increase the popularity of the species. Those added-value products have also turned out to be rather expensive for the majority of consumers, especially in Poland and the Czech Republic. However, a Romanian programme for turning carp into fillets and portions serves as an excellent example of adjusting the product to consumer needs.

In this post-communist country, many people have little disposable income and this factor remains the main obstacle to purchase of fish. An average expenditure is US\$ 2.00 and the fish is bought mainly

<sup>33</sup> EuroFish, International Carp Workshop “Carp in the EU”, 2001

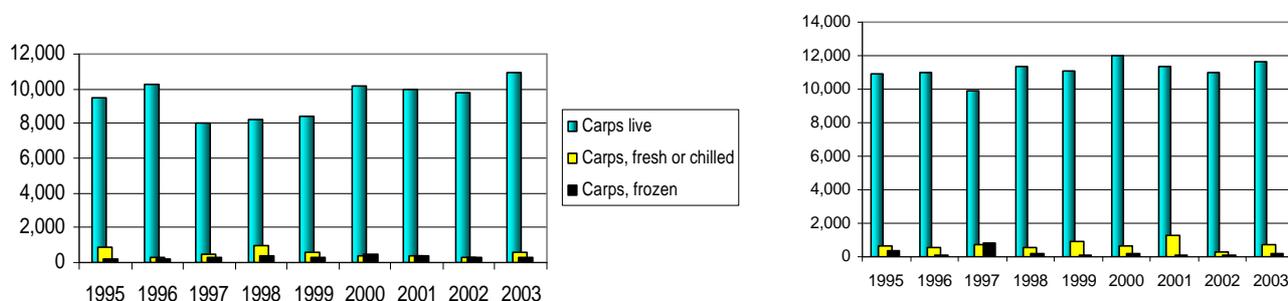
for special occasions. As carp is sold live as a whole fish (2-3 kg for a price of US\$ 2-3 /kg), it remains too expensive for the ordinary Romanian consumer. A test filleting programme was initiated which made 200-300 g portions that were available at a price of US\$ 1.00 per piece. With a typical yield of 45%, a single carp yielded US\$ 5.00 /kg, and the 10 kg of portions made during the first trial were sold out in one hour. There was even a market for the heads, bones and trimmings for soup. The income per kg rose by over 30%, even after allowing costs for filleting.<sup>34</sup>

As is seen in Figure 37, carp is traded mostly live (93% of the traded volume). The share of fresh and chilled carp is estimated at 5-6%, and that of frozen products at 1-2%. While the trade pattern will continue to be dominated by live carp for some time, the share of exports of fresh and chilled carp showed a moderate increase in 2003, after a decline the year before.

**Figure 37: Intra-European trade of carp by product form**

**1) Carp imports**

**2) Carp exports**



Traditional distribution, i.e. fishmongers, specialized fish shops and open markets, are the prime channels for carp sales to the end consumer in Europe. Small quantities of carp are also found in super- and hypermarkets, but these are usually carp value-added products like frozen steaks and carp fingers.

Per capita consumption of carp is highest in the producing countries: Hungary (1.3 kg per capita), Czech Republic (1.3 kg), Poland (0.5 kg) and Germany (0.3 kg). The table below shows a range of carp prices in wholesale, retail and open markets in Poland. According to the Polish national statistics, wholesale carp prices have increased by 15% over the last two years.

**Table 13: Carp prices in Poland in 2002-2004 (in Polish zloty/kg and in €/kg)**

	2002		2003		2004	
	PLN/kg	€/kg	PLN/kg	€/kg	PLN/kg	€/kg
Wholesale	6.9	1.7	7.87	1.98	8.11	2.04
Open market	8.61	2.2	8.65	2.17	8.87	2.23
Retail	10.04	2.6	10.95	2.75	11.64	2.93

Source: “Rynek Ryb: stan i perspektywy”, Kwiecien 2005

<sup>34</sup> Marketing Research, available at [www.aquatt.ie](http://www.aquatt.ie)

## 4.2 Trout



### Basic data 2003:

**European-wide aquaculture production** <sup>35</sup> (inc. Norway, Iceland and Faeroe Islands): 297 400 tonnes

**EU-25 aquaculture production:** 218 900 tonnes

**European landings:** 5 850 tonnes

**Producers:** Norway, France, Italy, Spain, Denmark, Germany

**Importing countries:** Germany, Finland, Sweden, Belgium, France

**Main consumption markets:** Finland, Norway, France, Germany, Italy, Spain

Although trout is produced both in fresh and sea water, it is generally identified as a freshwater species. Norway, which produces trout entirely in sea water, is considered as a part of European-wide aquaculture and trade because of its leading importance in the sector. Iceland and the Faeroe Islands are also included under European-wide production because of growing trout yield and special trade agreements with the European Union. This section focuses on both EU-25 and European-wide trout production and trade, including statistics for rainbow trout, lake trout, sea trout and brook trout, where rainbow trout represents 99% of production and trade volume.

Being the number one freshwater species in Europe, trout represents the most valuable branch of aquaculture, with a total aquaculture production of nearly 300 000 tonnes and production value of US\$ 811 million in 2003. These figures reflect European-wide trout farmed production including EU-25 and other EEA countries (Norway, Iceland and the Faeroe Islands) because of the leading importance of the Norwegian trout industry.

At present, overall exports of trout, including intra- and extra-European trade, have reached nearly 107 000 tonnes with an estimated value of US\$ 381 million, while trout imports account for 54 000 tonnes valued at US\$ 194 million. However, despite its leadership on the market, trout's image has often been considered as very conservative, and little innovation or marketing effort has been undertaken by trout producers and traders.

Prior to 1989, rainbow trout was considered to be part of the trout genus, having the scientific name *Salmo gairdneri*, but it is now classified as a member of the Pacific trout family, *Oncorhynchus mykiss*. Native to western North America and northeastern Asia, rainbow trout may be the world's most widely farmed species. Because it tastes good and is relatively easy to cultivate, trout is now farmed in more than 70 countries worldwide with a total annual production of more than 500 000 tonnes.

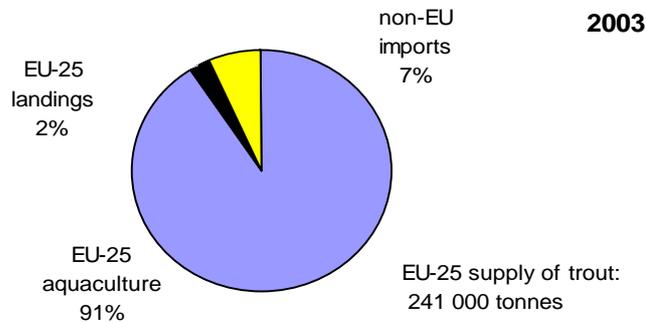
Although Chile is the largest trout producer in the world (110 000 tonnes), the centre of trout farming is Europe, showing a stable production of around 215 000 tonnes during the last ten years. The top countries are France (39 000 tonnes), Italy (38 000 tonnes), Spain (33 000 tonnes) and Denmark

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<sup>35</sup> Being the principal trout producer, Norway is represented as an EEA country under European-wide aquaculture production and trade. Although the Faeroe Islands is not a member of EEA, it is also included together with Norway and Iceland due to its growing trout production and bilateral trade agreements with EFTA countries, <http://secretariat.efta.int/>

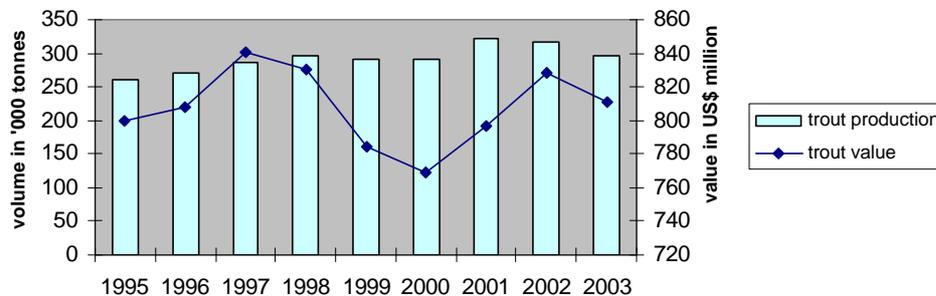
(30 000 tonnes). In 2003, EU-25 production of trout was estimated at nearly 220 000 tonnes, of which 200 000 tonnes were farmed in fresh water. The value of the trout farmed production in EU-25 was US\$ 613 million. Some 5 850 tonnes of trout were landed from recreational and sport fisheries, and 16 000 tonnes of trout were imported to the EU from Norway.

**Figure 38: Aquaculture production, landings and non-EU imports of trout in the EU-25**



The trend of trout production in EU-25, including Norway, Iceland and Faeroe Islands, is illustrated in Figure 39. The total production volume of farmed trout reached a peak at 323 000 tonnes in 2001, followed by moderate declines of 2% in 2002 and 6% in 2003. The value grew by 4% from 2001 to 2002, and then decreased by 3%, reaching US\$ 811 million in 2003.

**Figure 39: European-wide trout aquaculture production (in tonnes) and its value (in US\$ million)**



Source: FAO

Rainbow trout can be farmed in both salt and fresh water. Norwegian farmers specialize in production in sea water, while other Scandinavian countries practice both sea and freshwater trout culture. In Norway rainbow trout is initially grown in freshwater farms followed by placement in marine cages.

France remains the biggest producer of trout inside the EU, followed by Italy. French production was fluctuating between nearly 39 000 tonnes (1999) and 46 000 tonnes (2001), followed by a decline to around 39 000 tonnes in 2003. Italian production, which exceeded the French output until 2000, amounted to 38 000 tonnes in 2003. Spain and Germany are other large trout producers, with stable yields at around 30 000 tonnes and 25 000 tonnes, respectively. Danish output of trout is still high (30 000 tonnes in 2003), but it has been gradually declining from 43 530 tonnes in 1995 to

29 687 tonnes in 2003. Almost all the countries except Norway showed a decrease in production from 2001 to 2002, which might have been caused by the collapse in prices on the market, reaching its lowest level in September 2001.

**Table 14: Average annual production of trout by the major European countries**

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Norway	14,704	22,966	33,295	38,431	48,691	48,778	71,764	83,559	69,128
France	48,924	50,625	50,482	44,498	38,602	41,143	46,462	45,246	39,365
Italy	50,000	48,000	51,000	48,000	44,000	44,500	44,000	33,770	38,000
Spain	22,000	25,000	29,000	30,000	30,000	33,133	35,384	32,422	33,113
Germany	25,050	25,024	25,028	25,030	25,027	25,027	25,026	24,184	23,275
Denmark	43,530	40,274	37,808	39,696	39,729	40,681	39,220	30,213	29,687
The UK	16,134	16,328	15,950	16,563	17,113	10,911	13,154	14,319	14,820

*Source: FAO*

There are three product forms of rainbow trout:

- Large-sized rainbow trout (41% of total rainbow trout production)
- White rainbow trout
- Pink rainbow trout

Trout is usually farmed to a portion size (max 400 grams). If the fish is grown longer, it can reach over 1 kg in weight – this product is known as large trout. Norway specializes in production of only large-sized trout (1– 5 kg) in sea water.

All portion-sized trout in Europe are spawned and grown in fresh water. Rainbow trout can have a pink or white colour, reflecting the colour of the flesh. Pink meat trout is more expensive than white meat since the colour depends on additional food and environmental conditions. About half of the portion-sized rainbow trout in Europe has white meat (Italian, Danish, German and Spanish production); the other half has pink meat (Norway). Those differences in trout colour can be adjusted to different market requirements. It has been observed that consumers in France, Ireland and Portugal prefer pink meat rainbow trout, while customers in Germany and Austria prefer white meat trout.

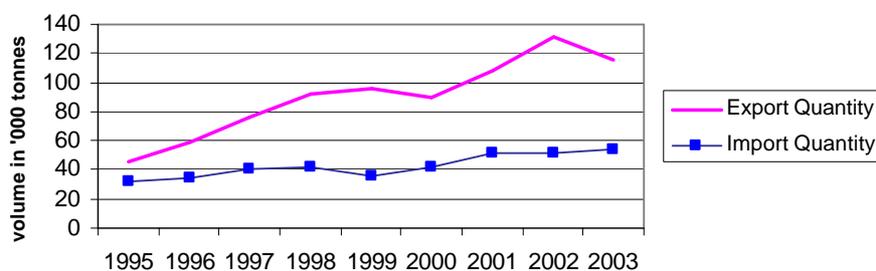
## **Trade**

Even though international trade of trout is much less than that of salmon, there has been an upward trend in trout trade, with nearly 107 000 tonnes of trout exports and 56 000 tonnes of trout imports in 2003. The export volume tripled from 41 000 tonnes in 1995 to 123 000 tonnes in 2002. In 2003 trout exports declined to 106 500 tonnes due to economic consequences of a price fall, with many countries reducing their export volumes.

Norway and Chile are the two biggest trout exporters worldwide. According to FAO figures, Norway exported some 53 500 tonnes of trout in 2003, but the Norwegian Seafood Export Council reports the export of 66 875 tonnes for that year. Most of Norwegian trout is exported to Japan (27 300 tonnes), Russia (14 000) and EU countries (16 364 tonnes). In Europe, the major importers of Norwegian trout

are Latvia (2 300 tonnes), Estonia (2 100 tonnes), Finland (6 600 tonnes), Sweden (2 000 tonnes) and the UK (800 tonnes).

**Figure 40: Trout exports and imports in the European-wide market (in '000 tonnes)**



Denmark is the next biggest exporter of trout after Norway (19% of total trout exports in Europe). Over the last five years Danish exports have declined by 30%, reaching some 22 000 tonnes in 2003. Danish trout is mainly sold to Germany, the Netherlands and Russia. The Faeroe Islands has rapidly become the third largest exporter of trout in Europe, increasing its trout exports from 900 tonnes in 2000 to 8 000 tonnes in 2003 due to growing production. Spain's exports had been steadily rising until 2002, reaching 7 300 tonnes, but then the volume dropped to nearly 6 000 tonnes in 2003. Denmark and Italy were hit particularly hard by the price fall and their exports of white meat trout have declined.

**Table 15: The main exporters and importers of rainbow trout in the European-wide market (in tonnes)**

Exporting country	2003	%
Norway	53,476	48
Denmark	22,097	19
Faeroe Isld	8,000	7
Spain	5,949	5
Sweden	5,909	5
France	4,753	4
Italy	3,669	3
Others	10,778	9
Total	115,000	100

Importing country	2003	%
Germany	17,929	32
Finland	7,774	14
Sweden	5,068	9
Belgium	4,048	7
France	3,898	7
Austria	2,908	5
Poland	2,457	4
Estonia	2,310	4
Others	9,108	16
Total	55,500	100

The total European trade of trout is increasing. Over the last few years, the volume of imported trout has risen from 36 805 tonnes in 1999 to 55 500 tonnes in 2003. Germany is the most important European market for trout with stable imports of around 18 000 tonnes annually. While Denmark exports mostly to the German market, Germany also imports trout from France and Spain. Finland is another relatively big importer of trout in Europe.

Outside the EU, the Russian Federation is experiencing a boom in trout imports. The volume of imported frozen trout from Norway has increased from 1 000 tonnes in 2000 to 16 600 tonnes in 2003. Trout is highly appreciated in Russia, where market prices for the fish are even higher than in Japan.

## Market

Trout is the most consumed freshwater species in Europe, and Finland and Norway are the countries with the highest per capita consumption of trout (3.9 kg and 3.4 kg, respectively). France, Germany, Italy and Spain have the largest market for trout. Traditional trout products are generally purchased by older customers, who have the necessary skills and time to prepare fish at home; however, there has been a growing trend towards trout fillets and other value-added products.

At present, trout producers receive rather low prices. Because the European trout industry is represented by a large number of small companies, competition is mainly about price. Discounters and big retail chains try to win customers' attention by setting special action prices. This is a dangerous policy, which can quickly lead to expectation of low prices by customers and drive prices down. The only way to consolidate the trout industry is for small producers to join in associations or cooperatives. This would help control the overall marketing strategy, including product price, promotion activities and distribution policies.

Regarding distribution channels, in some countries like Germany and France trout producers deliver their fish directly to retail chains without going through a wholesaler. In Germany nearly half of the produced trout is sold from the farm to the consumer in fresh and processed form. Another weakness of the trout sector is that small companies find it difficult to develop new trout products or produce them in sufficient quantities.

The growing popularity of boneless trout fillets, snack products and complete ready meals with vegetables and sauces provides some possibilities. While traditional trout products are still in demand by current consumers, new value-added products would attract new consumers.

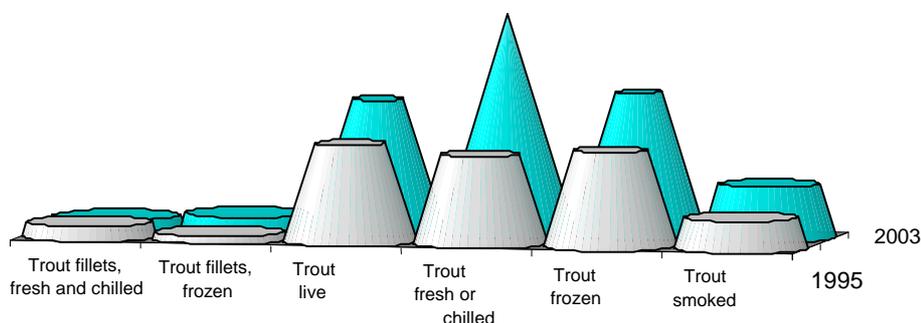
Trout is traded as whole fish in fresh and chilled form (38% of European trout imports in 2003), in live form (23% of trout imports) and as frozen whole fish (25% of trout imports). The share of smoked trout is estimated at 9%, whereas frozen and fresh trout fillets make up 3% and 2% of European trout imports, respectively.

Compared to 1995, the category of fresh trout imports has increased by 142%, reaching nearly 21 000 tonnes in 2003. Live trout imports and frozen whole trout imports grew by 34% and 49% in the same period, while smoked trout increased by 71%. Details are shown in Table 16.

**Table 16: Trout imports by product form in 2003 compared to 1995 and 2002**

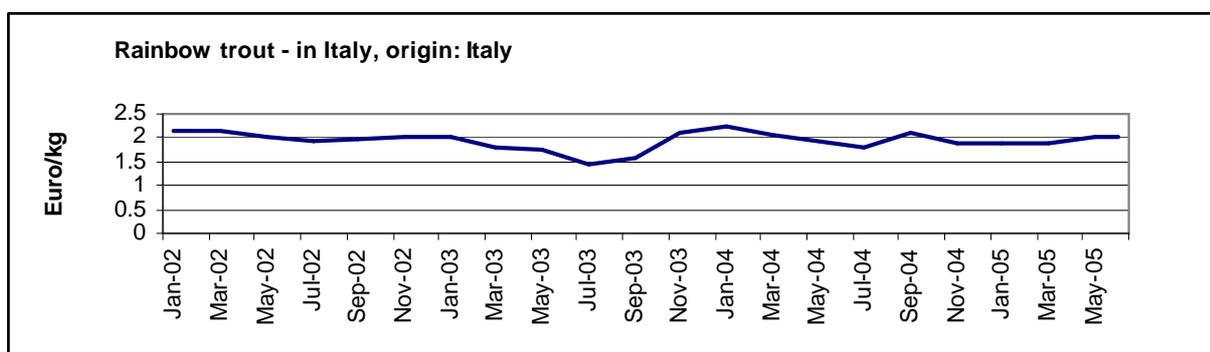
	2003	% share of total imports	% 03/95	% 03/02
Trout fillets, fresh and chilled	999	2	-29	-46
Trout fillets, frozen	1,440	3	103	1
Trout, live	12,506	23	34	21
Trout, fresh or chilled	20,731	38	142	13
Trout, frozen	13,650	25	49	-13
Trout, smoked	5,109	9	71	16
Total	54,435	100		

**Figure 41: Trout imports by product form in 2003 as compared to 1995**



The distribution pattern of trout comprises both traditional and modern retail, with live and fresh trout sold by fishmongers and in open markets, and frozen trout sold predominantly in supermarkets. The situation varies according to the market: in Denmark it is very difficult to find fresh trout in supermarkets, but in France it is widely available in modern retail. Some fresh whole trout and trout fillets can also be found in hyper- and supermarkets (France, Italy, Spain) but as a rule, frozen trout products are easier to find there (e.g. in Denmark, Germany, Netherlands).

**Figure 42: Trout ex-farm prices in Italy (January 2002 – May 2005)**



**Table 17: Price range for trout products in the French retail sector in 2004**

Trout product forms	Medium price (€/kg)
Trout fresh	7.6
Trout whole	6.6
Trout cut	9.1
Trout packed	8.3
Large-size trout (>400 g)	7.4
Portion-sized trout (<400 g)	7.9
Trout smoked	25.3

Source: OFIMER

### 4.3 European eel (*Anguilla anguilla*)



**European aquaculture production:** 8 800 tonnes

**European landings:** 3 844 tonnes

**Main producers:** The Netherlands, Denmark, Italy

**Importing countries:** The Netherlands, Germany, Denmark, Belgium

**Main consumption markets:** The Netherlands

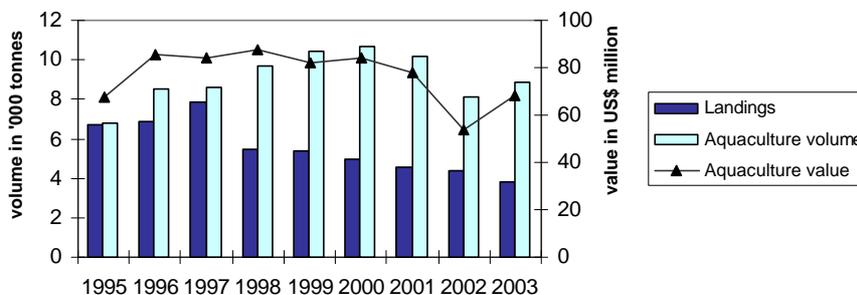
Eel is a delicacy species that has a small niche market in Europe. The eel industry is very valuable, with a production of nearly 9 000 tonnes and a revenue of US\$ 68 million. Eel is consumed in many European countries, but the fish is especially appreciated in the Netherlands, Germany and Mediterranean countries.

#### Aquaculture

Eel is one of the most mysterious species in European aquaculture. Before the beginning of the last century, the only fact known about eel was that glass eels (the earliest stage of eels) arrive in rivers from the sea. Very little was known about where the eel spawned and bred and what the earliest larval stages looked like. At present, eel is distributed in nearly all European river systems and in the coastal waters of Europe and North America. However, for more than a decade, fewer glass eels have been reaching the European coasts and natural migration into inland waters hardly ever takes place. Scientists warn that the world's eel may be facing extinction, and European eel stocks across Europe have shown a continuous decline for many years in all European waters, with catches reaching some 3 800 tonnes in 2003, whereas in 1970, the catches amounted to 17 000 tonnes. Factors behind the European eel collapse are illegal commercial exploitation and increasing pressure on breeding stocks from loss of habitat, pollution and invasive parasites.

The American eel (*Anguilla rostrata*) and the Japanese eel (*Anguilla japonica*) are also threatened with extinction. There is a growing concern over the sustainability of the eel fishery, and the European Commission has decided to regulate it. In 2003 the EC expressed alarm over the threat posed to eel stocks, and the first urgent measures were applied in 2004 in order to reduce the exploitation of glass eel. The main European glass eel fisheries are along the Atlantic coasts of Portugal, France, Spain, and Morocco and in the Bristol Channel in the UK.

**Figure 43: Landings, farmed production and value of eel in Europe**



China, which farms mainly the Japanese eel, is the leading eel producer worldwide (164 000 tonnes), followed by Taiwan (35 000 tonnes) and Japan (21 000 tonnes). In Europe, the Netherlands, Denmark and Italy together account for almost 90% of European farmed eel. In 2003 there were 180 farms producing 8 800 tonnes of eel with a revenue of US\$ 68.4 million.

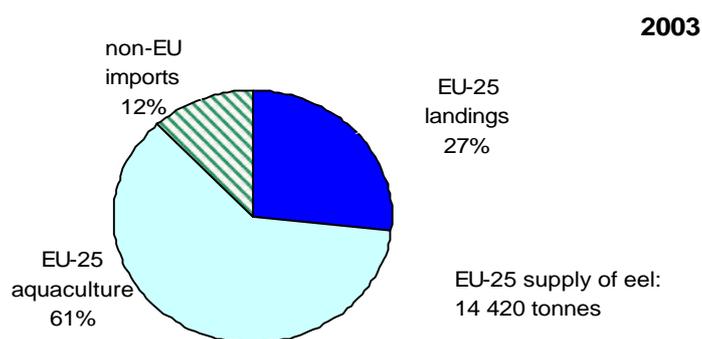
Eel farming depends on the supply of glass eels from wild capture, and they are later grown on to market size in ponds and tanks. The total quantity of glass eel collected in Europe was around 245 tonnes. The bulk went to China and Spain for consumption, with only 15% going to the European eel farming sector.<sup>36</sup>

**Table 18: The main aquaculture producers of eel in Europe (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Netherlands	1,535	2,800	2,443	2,634	3,228	3,700	4,000	3,868	4,200
Denmark	950	1,400	1,689	2,468	2,717	2,674	2,100	1,166	1,941
Italy	3,000	3,000	3,100	3,150	3,200	2,700	2,500	1,699	1,550
Greece	659	584	545	681	518	602	639	433	506
Others	675	719	828	752	776	982	912	917	644
Total	6,819	8,503	8,605	9,685	10,439	10,658	9,239	8,083	8,841

In 2003 the total supply of eel on the EU-25 market was estimated at some 14 420 tonnes. Sixty-one percent of this volume (or 8 840 tonnes) came from European aquaculture, 27% (or 3 844 tonnes) from landings and 12% (or 1 735) from non-EU imports, mainly from China, Canada, the USA and New Zealand. Exports of eel to non-EU countries (Lebanon, Korea, Ukraine and the USA) amounted to only 7 tonnes.

**Figure 44: Supply of eel by aquaculture production, landings and non-EU imports in the EU-25 market**



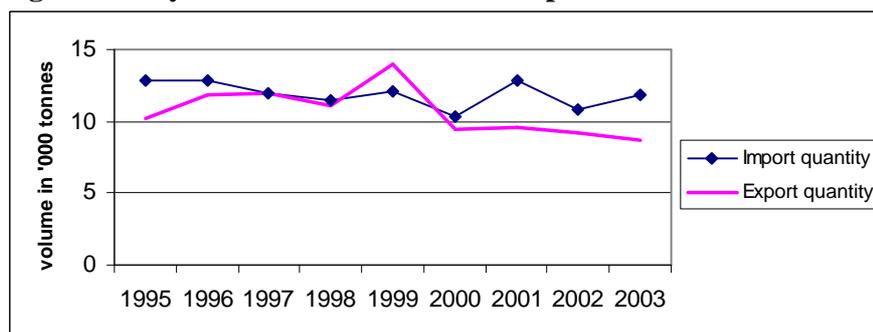
## Trade

Eel is mostly traded inside Europe. Some 1 735 tonnes were imported to the EU from China, Canada, the USA and New Zealand, representing 12% of the total eel supply in Europe. Therefore the import

<sup>36</sup> “Concern over European eel population”, May 2003, IntraFish

line in Figure 45 shows a mix of intra- and extra-EU imports of eel, while the export quantity shows only intra-European trade (extra-European exports of eel are negligible). The volume of eel imports has fluctuated over recent years, reaching 11 814 tonnes in 2003, which is 8% more compared to the year before. Eel exports have been declining, except for a peak at 14 000 tonnes in 1999. The volume of eel exports amounted to 8 700 tonnes in 2003. Although the volume of eel trade is small, its revenue is impressive. In 2003 the value of eel imports amounted to US\$ 105 million, and the value of eel exports was US\$ 111 million.

**Figure 45: Dynamics of eel trade in Europe**



The Netherlands and Denmark are the most important markets for eel in Europe. Denmark is the biggest exporter (nearly 3 100 tonnes) and the third biggest importer of eel (around 1 500 tonnes) after the Netherlands and Germany. Denmark exports mainly live eel to the Netherlands (1 550 tonnes), Germany (400 tonnes), Italy (260 tonnes) and Sweden (100 tonnes). Danish exports of fresh and frozen eel go to Germany (280 tonnes and 270 tonnes, respectively, in 2003). Eel imported into the Danish market comes from the Netherlands (700 tonnes), Sweden (300 tonnes), Norway (170 tonnes) and Germany (200 tonnes), mostly in live form. Smoked eel is imported from Germany and Sweden (a total of some 70 tonnes). While in Denmark almost no eel is left for domestic consumption, the Netherlands has the highest per capita eel consumption in Europe estimated at 0.4 kg. In 2003 the Dutch importers bought live eel mainly from Denmark (1 220 tonnes), France (480 tonnes), Italy (230 tonnes), Ireland (120 tonnes) and Sweden (90 tonnes), while frozen eel was imported from New Zealand (170 tonnes) and Turkey (50 tonnes).

**Table 19: Eel trade: the volume of imports and exports by major countries (in tonnes)**

Exporting country	2003	%
Denmark	3,084	36
Netherlands	1,323	15
Greece	884	10
UK	682	8
France	658	8
Belgium	429	5
Germany	428	5
Sweden	370	4
Spain	317	4
Others	511	5
Total	8686	100

Importing countries	2003	%
Netherlands	2,744	23
Germany	2,194	19
Denmark	1,542	13
Belgium	1,315	11
Italy	929	8
Poland	899	8
Greece	700	6
Spain	623	5
France	241	2
Others	627	5
Total	11814	100

Italy has had stable imports of approximately 1 000 tonnes of eel over the last decade. It is also the third largest European producer of eel. Live eel accounts for 95% of the imported eel volume. Another important market for eel is Germany, where the fish is traditionally eaten around Christmas time. However, eel consumption has been declining for many years due to the high market price. In 2003 Germany imported nearly 2 200 tonnes of eel (1 300 tonnes from the Netherlands and 430 tonnes from Denmark). Half of the imported volume consisted of live eel; however, the share of live eel imports has declined by 25% in the last few years, while deliveries of smoked eel have risen by 35%.

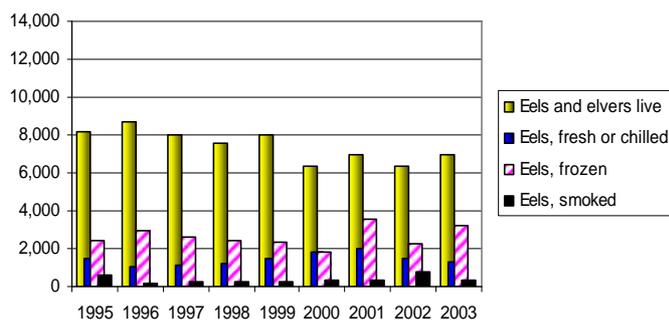
## Market

Today, the European eel sector is mostly based on older consumers because of the high market price and consumption traditions. Since eel farming is based on deliveries of glass eel, which have been constantly declining, a considerable enlargement of the eel market is unlikely. Still, some new product forms, such as eel fillets, should be developed in order to increase popularity of eel. Preferences in eel consumption differ throughout Europe. In Northern and Central European countries eel is consumed mostly smoked. Hot smoked eel is most popular in Germany with sizes of 400-600 g per fish, while small-sized smoked eel is a Dutch speciality.

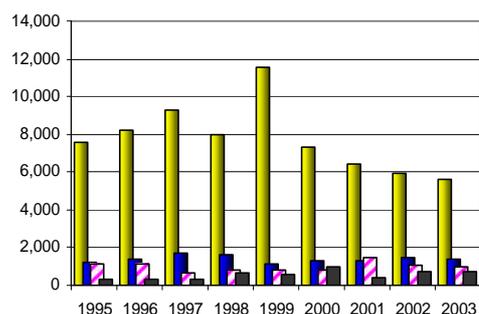
Belgians and Portuguese stew eel, the French cook eel with white wine and spinach, and in Southern England eel is popular as “jellied eel” prepared with jelly and vinegar. In Italy eel is a famous delicacy, which was even mentioned by Dante Alighieri in his famous “La Divina Comedia” and in his Fiore Sonetto CXXV. Italians enjoy cooked eel cut into small pieces with traditional polenta and tomato sauce. Marinated eel and “zuppa di anguilla” (eel soup) are other Italian specialities. In Spain glass eel is prepared fried as “frittura”, served with fresh vegetables in salads. Asian restaurants and sushi-bars across Europe offer marinated eel fillets placed on top of rice rolls, and grilled eel is a Japanese speciality.

**Figure 46: European eel trade by product form (in tonnes)**

**a) Eel imports (intra + extra-European trade)**



**b) Eel exports (intra-European trade)**



Live eel is the main product category traded, primarily due to importance of live glass eels that are included in the data.<sup>37</sup> In 2003 it constituted 59% of eel imports and 64% of exports. Whereas imports of live eel are relatively stable, live eel exports as well as total eel exports are decreasing.

<sup>37</sup>The eel farming industry depends on supply of wild glass eel (elvers). Although some attempts were made to breed glass eel in farms, wild glass eels represent the only possibility to further the farming of eel.

European imports of frozen eel (3 240 tonnes or 27% of eel import volume) are three times higher than exports (981 tonnes or 11% of eel export volume) due to additional supply of frozen eel from China, the USA, Canada and New Zealand. In recent years the fresh and chilled eel trade has shown a downward trend, accounting for 11% of European eel imports and 15% of European eel exports in 2003. In the smoked eel category, European exports have recently increased by 50% to 754 tonnes, which is however below the volume of nearly 1 000 tonnes in 2000.

During the peak of consumption in December, eel is found in both traditional and modern retail, being available at fishmongers, in markets and supermarkets. During the year live/fresh eel is mostly found at fishmongers and in specialized fish shops, while frozen eel is sometimes found in supermarkets.

**Table 20: Prices for eel and glass eel products in Europe**

	Eel, fresh <sup>38</sup>	Eel, smoked <sup>39</sup>	Glass eel	Glass eel, cooked
Price in € per kg	11.2-14.4	53.2	420	540

#### 4.4 Sturgeon



**Landings in the Caspian states:** 1 600 tonnes

**European aquaculture production:** 1 700 tonnes + 2 200 tonnes (Russia)

**Producers:** Iran (landings), Russia (landings + aquaculture), Italy (aquaculture)

**Importing countries:** France, Germany, Switzerland, Spain

**The main consumption markets:** Switzerland, Russia, France, Italy

Sturgeons are the most unique and valuable fish in the world. Twenty-seven species and sub-species have been identified so far. In the Caspian Sea, the following species produce caviar: beluga (*Huso huso*), Russian sturgeon (*Acipenser gueldenstaedtii*) and Persian sturgeon (*Acipenser persicus*), which produce ossetra caviar, and sevruga sturgeon (*Acipenser stellatus*).<sup>40</sup> Sturgeon usually live in large river systems, lakes, coastal waters and inner seas throughout the Russian Federation, Islamic Republic of Iran, Kazakhstan, Azerbaijan, Bulgaria, China, Turkey, Turkmenistan, Ukraine, other European countries and North America.

<sup>38</sup> Prices for fresh eel are referred to Billingsgate market in the UK, August 2005

<sup>39</sup> Prices for smoked eel and glass eel are referred to Mercabarna market, Spain, August 2005

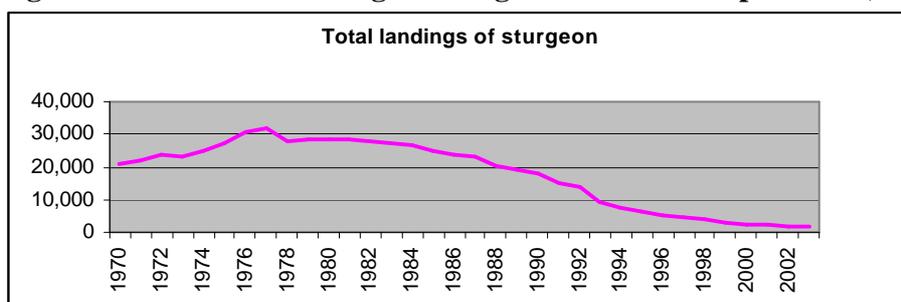
<sup>40</sup> The Russian sturgeon and the Persian sturgeon are very similar from a morphological point of view. Both species are being used for the production of caviar called Ossetra (CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora)

## Landings and aquaculture

Beluga is the largest sturgeon in the world and the rarest species in the Caspian Sea. It can live up to 100 years, grow to 6 meters in length and weigh as much as 1500 kg. The female beluga requires 20 years to mature and each mature female can then produce 10 to 15 kg of caviar. Beluga caviar is considered by many connoisseurs to be the best caviar available, and it is the most expensive in the world (up to US\$ 23 300/kg). It is also the largest grained (3.5 mm in diameter) of the sturgeon caviar. Russian sturgeon and Persian sturgeon reach some 2 m in length and can weigh 65-115 kg, with an average life expectancy of 38 years.

Ossetra caviar, with a colour varying from golden yellow to light brown, is famous for its delicious nut-like flavour. Ossetra grains are smaller than beluga ones (2-3 mm in diameter). Sevruga sturgeon grows up to 1.5 meters, weighs on average 10 kg and lives up to 30 years. Sevruga caviar is the most abundant of the three caviar types, has the smallest grains (less than 2 mm in diameter). All these sturgeon species are classified as “endangered” by the IUCN (International Union for the Conservation of Nature and Natural Resources) Red List.<sup>41</sup>

**Figure 47: Decline in landings of sturgeon from the Caspian Sea (in tonnes)**



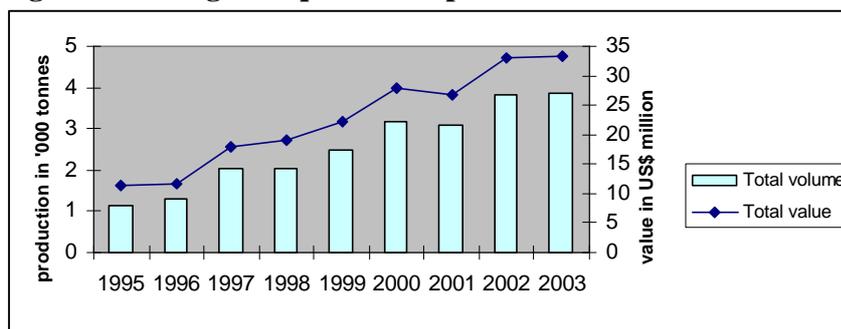
Source: FAO

The status of sturgeon resources in the Caspian Sea is alarming. Almost all sturgeon species are threatened to some degree and some of them are critically endangered. The total landings of sturgeon have decreased by 95%, from 31 000 tonnes in 1977 to 1 600 tonnes in 2003. While the decline has resulted partly from illegal fishing, pollution and habitat degradation, the most valuable sturgeon species are also beset by significant international demand. The Russian Federation was the largest sturgeon producer until 1998 (1 500 tonnes), followed by the Islamic Republic of Iran (1 200), but Iran now holds the leading position (463 tonnes) and Russia ranks second (391 tonnes). Azerbaijan and Kazakhstan are the other two major sturgeon producers, capturing some 100 tonnes and 90 tonnes, respectively, in 2003.

At the same time, farming of sturgeon has been expanding. Attempted first in Europe and North America, sturgeon aquaculture became successful in the Soviet Union in 1930. Over the last ten years, the total sturgeon production has increased significantly from 500 tonnes in 1993 to nearly 3 900 tonnes in 2003. The total value has increased from US\$ 6 million to US\$ 33 million. The Russian Federation is the biggest farmed sturgeon producer (2 200 tonnes), followed by Italy (1 000 tonnes), Poland (300 tonnes), Spain (225 tonnes) and France (115 tonnes).

<sup>41</sup> Available at <http://www.redlist.org>

**Figure 48: Sturgeon aquaculture production and value**



Source: FAO

## Trade

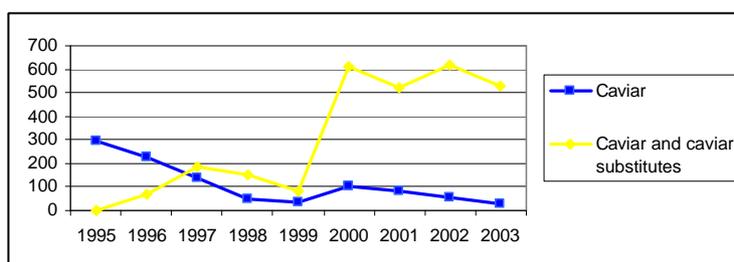
Most of the Caspian caviar production goes for export, and Iran and Russia are the primary suppliers. Since the sturgeon industry is poorly controlled and extremely profitable, illegal trade remains the major method of selling caviar. Illegal products are usually accompanied by false documents, have suspect packaging and are sold at low prices. From 1998, international trade in all species of sturgeon has been regulated under CITES, and all sturgeons and sturgeon parts and derivatives, including caviar, that are traded internationally require the issuance of CITES permits and certificates.<sup>42</sup>

It is difficult to present an accurate picture of caviar trade because the official figures include only legal flows. Furthermore, some countries cited as exporters do not export the real caviar. Several countries like Switzerland, Norway, Denmark, Sweden, Iceland and Greenland apparently do not distinguish between the roe of sturgeons and that of other fish.

The trade data in Tables 21 and 22 represent estimates for the main caviar importing and exporting countries based on FAO statistics. The selection in Table 21 showing the main exporters of caviar was based only on pure “caviar” product, as is evident from the very high prices paid for the product. The only exception was made for Iran, the biggest pure caviar exporter, where the product is designated as “caviar and caviar substitutes”.

**Table 21: The main exporting countries and caviar exports (only from Caspian states) in 1995-2003**

Exporting country 2003	Volume in tonnes	Value in US\$ '000
Azerbaijan	7	2,300
Belgium	5	2,400
France	8	5,000
Germany	8	8,000
Italy	10	3,200
Iran	55	33,200
Kazakhstan	10	3,200
Luxemburg	2	2,700
Russia	15	2,500



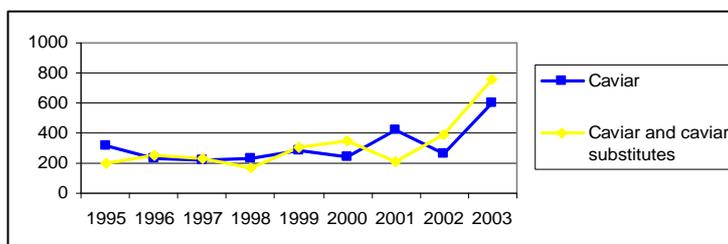
<sup>42</sup> <http://www.cites.org>,

Iran, Russia, Azerbaijan and Kazakhstan are the biggest caviar exporting countries as well as the main producers. Turkmenistan is not listed; however, Russia and Kazakhstan allocate a portion of their yearly sturgeon catch and export quotas to that country. The official exports of caviar from the Caspian states may be roughly estimated at around 80 tonnes in 2003.

Iran exports some 55 tonnes of caviar and caviar substitutes, and it can be assumed that part of the volume is represented by pure caviar because the value of those 55 tonnes is more than US\$ 33 million. Russia follows with its 15 tonnes of caviar for a value of US\$ 2.5 million. Kazakhstan and Azerbaijan are other significant caviar exporters with 10 tonnes for US\$ 3.2 million and 7 tonnes for US\$ 2.3 million, respectively. Some European countries like Belgium, France, Germany, Italy and Luxemburg re-export a certain amount of caviar after importing it from the Caspian states. That intra-EU trade can be roughly estimated at some 50 tonnes.

**Table 22: The main importing countries and caviar imports in 1995-2003**

Importing country 2003	Volume in tonnes	Value in US\$ '000
Austria	42	1,700
Belgium	38	2,800
France	441	13,600
Germany	20	10,291
Italy	8	1,400
Luxemburg	3	2,300
Spain	27	4,250
the UK	103	3,000
Switzerland	60	5,217



The above graph, showing the dynamics of caviar imports, may be subject to dispute because it shows imports of 600 tonnes for 2003. France is included in this figure with its 440 tonnes of product referred to as caviar, which is either caviar from different (cheaper) sturgeon species, or caviar substitutes. The European imports of caviar are hard to estimate. France is reported to have imported 440 tonnes of caviar but the value of US\$ 13.6 million for the product is too low, so it may be that 25 tonnes is pure caviar and the rest is caviar substitute. Germany is the second most important market for caviar, with 20 tonnes of caviar for US\$ 10.3 million imported in 2003. Switzerland, which is the centre for caviar imports and exports in Europe, imported 60 tonnes of caviar and caviar substitutes with a value of US\$ 5 million.

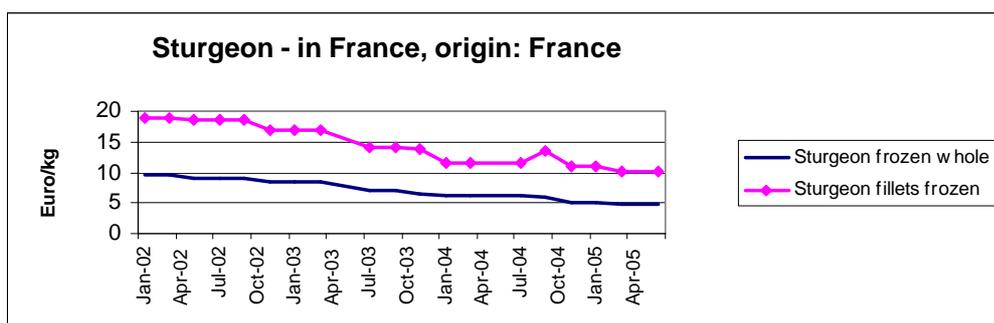
## Market

On the European market caviar is sold fresh or pasteurised in glass jars or metal tins. Christmas is a peak time of year for caviar consumption. While France, Germany, Belgium and Spain are the main markets for caviar, Switzerland has the highest caviar consumption. Beluga caviar is considered to be the most expensive – it is retailed at 4 500 to 5 500 Euros/kg. Ossetra caviar is sold at prices ranging from 1 900 to 2 900 Euros/kg. Sevruga caviar ranges from 2 100 to 2 500 Euros/kg. French caviar made from *Acipenser baeri* costs about 1 800 to 2 400 Euros/kg.<sup>43</sup> Sturgeon is not often found in the

<sup>43</sup> <http://www.caviar-caviar.com>

European retail because this fish has been introduced on the market relatively recently and it is expensive. France has a small market for sturgeon, as well as Italy, where smoked sturgeon is particularly popular in the northern regions. Figure 49 shows the price trend of whole frozen sturgeon and sturgeon fillets of French origin on the French market. Over the last three years, prices for frozen fillets went down from almost 20 Euros/kg at the beginning of 2002 to 10 Euros/kg in April 2005. Prices for whole frozen sturgeon also showed a downward trend from 10 Euros/kg in January 2002 to less than 5 Euros/kg in April 2005.

**Figure 49: Sturgeon prices in France**



#### 4.5 Catfish



**European aquaculture production:** 5 500 tonnes (North African catfish)

**Main producers worldwide:** Vietnam (255 000 tonnes of Pangasius)

**Importing EU countries:** Germany, Spain, Belgium, Italy, France, the Netherlands

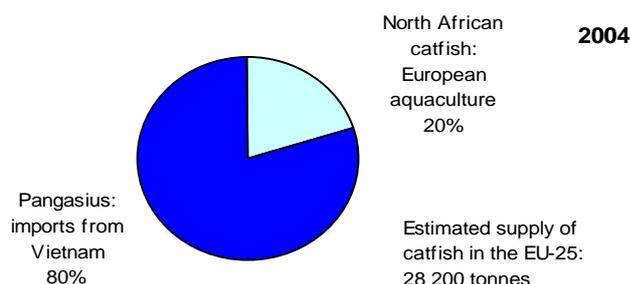
**The main consumption markets in the EU:** Germany, Spain, Belgium, Italy.

Until recently, Europe had only a small market for catfish. North African catfish (*Clarias gariepinus*) produced in the European Union was the dominant species. Negligible quantities of European catfish (*Silurus glanis*) and channel catfish (*Ictalurus melas*) supplemented the market. In 2004 the situation had completely changed when huge quantities of catfish from Vietnam (now being marketed as Pangasius) were exported to Europe, opening up a new future for Pangasius.

*Pangasius hypophthalmus* or basa, as it is called in Vietnam, has become the first successful exported catfish product in the history of catfish farming. In 2004 the volume of exported Pangasius amounted to 22 400 tonnes with a value of US\$ 67 million. In the EU-25, the estimated supply of catfish species in 2004 included 22 422 tonnes of Pangasius catfish from Vietnam (80%) and some 5 750 tonnes of North African catfish from European aquaculture (20%).<sup>44</sup> The main focus in this analysis is Pangasius catfish due to the rapidly growing importance of this fish.

<sup>44</sup> Because the data for farmed North African catfish are not available yet, a projection of 5 750 tonnes is based on an average annual increase of North African catfish production by 24% in the last few years.

**Figure 50: Estimated supply of catfish in the EU-25 in 2004**

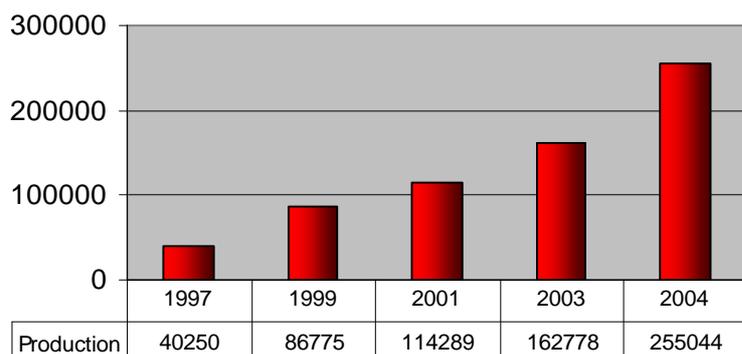


## Production

While the US catfish industry is the most famous worldwide with an output of 300 000 tonnes, Vietnam is becoming a strong player with a booming output of Pangasius catfish in the last few years. Originally designed to alleviate poverty for small holders, Pangasius aquaculture in Vietnam has become a really large-scale production in a very short time.

According to the Vietnamese national statistics, the farmed output has risen from 40 250 tonnes in 1997 to 255 044 tonnes in 2004, and the country has a target to reach one million tonnes of Pangasius production and a turnover of US\$ 641 million by the year 2010.<sup>45</sup> Catfish farming has expanded significantly, from the Cuu Long (Mekong) Delta provinces of An Giang and Dong Thap, to neighbouring provinces Can Tho, Vinh Long, Tien Giang, Soc Trang, and to several central and northern provinces. At present, there are around 30 catfish manufacturing and processing plants, whereas two years ago there were just 16 plants.<sup>46</sup>

**Figure 51: Catfish production in Vietnam (in tonnes)**



Source: VASEP

The facts that Pangasius needs only half a year to grow from egg to market size and that the species does not require any special breeding conditions are the main advantages for Pangasius production.

<sup>45</sup> [www.intrafish.com](http://www.intrafish.com) "Lower prices hit Vietnamese producers", August 2005

<sup>46</sup> [www.intrafish.com](http://www.intrafish.com) "US offers to reassess catfish case", August 2005

This fish does not require well-oxygenated water or a high protein content feed. Furthermore, Pangasius can be farmed in high-density culture, e.g. 200 tonnes per 3 000 cubic meters of farm water, which is unacceptable for salmon.<sup>47</sup>

European importers consider the product to be of high quality. Vietnamese catfish has a relatively firm texture, which does not disintegrate when cooked. It has an attractive taste and low fat content. Pangasius can grow up to 10 kg, but it is usually slaughtered after 6 months when it reaches 1-1.5 kg. At this weight, the fish is divided into two fillets of about 175 g each. Catfish is ready processed and frozen already 3 hours after slaughtering.<sup>48</sup>

It is important that the fish does not have any off-flavour or muddy taste, which is still a problem for the American channel catfish. In the two testing sessions, which were recently held in the Southern USA, Vietnamese Pangasius were clearly preferred over American channel catfish by the public. The tests were held at Mississippi State University and in Baton Rouge, Louisiana, and comprised the public's opinions on aroma, taste, texture, nutritional value and appearance of the two sets of fillets.

In the first session, three of four tasters preferred the Vietnamese Pangasius, while in the second testing 49.5% preferred the Vietnamese product and 46% chose the US catfish.<sup>49</sup> The results were surprising for the American catfish farmers, known for their opposition to improving the quality of channel catfish.

## **Trade**

In July 2003, the US International Trade Commission issued its final determination concluding that catfish imports from Vietnam had materially injured the US catfish industry, dumping the fish on the American market at lower than market price (Vietnamese catfish costs only half the price of American channel catfish on the US market).

The ITC's affirmative determination enabled the Department of Commerce (DOC) to issue an antidumping order imposing duties in the range of 37-64% and to prohibit the marketing of the Vietnamese product as "catfish" in the USA.<sup>50</sup> Many Vietnamese processors faced the threat of reduced markets with following losses in production and prices, but others had anticipated the decision and quickly adapted to the changed market conditions.

Whereas Pangasius producers continued to export the species to the USA, huge volumes of production were also directed to the European market, and this mitigated the impact from antidumping tariffs. At present Europe is the biggest market for Vietnamese Pangasius, comprising over 22 400 tonnes in 2004.

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<sup>47</sup> Based on "Dawning of the Cats", by Herby Neubacher

<sup>48</sup> "Vietnam satser paa sjoemat" by F. Gregersen, available at [www.fiskeforskning.no](http://www.fiskeforskning.no)

<sup>49</sup> "Basa 'better' than catfish" by Seafood International, September 2005

<sup>50</sup> US-Vietnam Trade Council, available at [www.usvtc.org](http://www.usvtc.org)

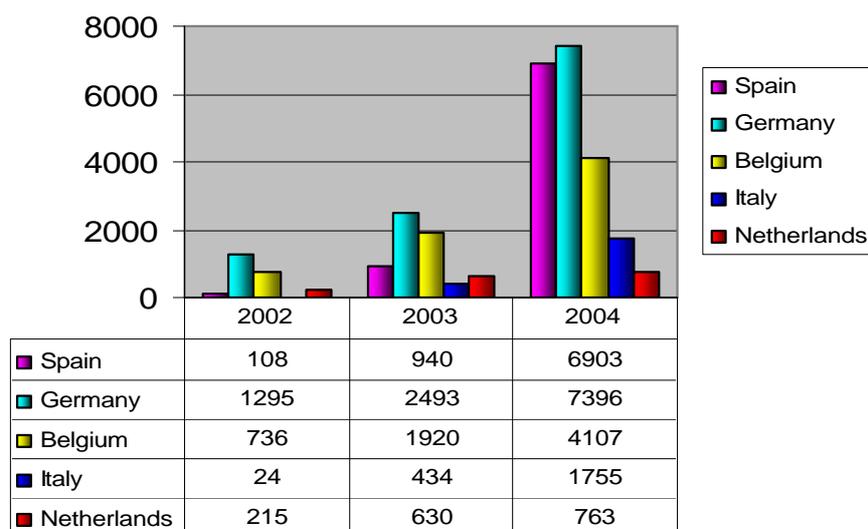
**Table 23: The main destinations for Vietnamese catfish worldwide**

	2003		2004	
	Volume (in tonnes)	Value (US\$ million)	Volume (in tonnes)	Value (US\$ million)
USA	8 931	24.2	14 220	43.1
<b>EU</b>	<b>6 680</b>	<b>17.8</b>	<b>22 422</b>	<b>67.1</b>
Japan	464	1.1	932	3
China	7 207	15.5	18 275	44.5
Asia	4 919	9.5	11 358	23.5
Other	5 103	13.8	15 755	47.9
Total	33 304	81.9	82 962	229.1

Source: VASEP

Meanwhile, most importers agreed to pay the imposed tariffs in order to speed up sales to the US market, while at the same time developing new international markets in the EU, Asia and Oceania. Now Europe is the most promising market for Vietnam, where catfish export figures showed the greatest increase from 6 680 tonnes in 2003 to 22 422 tonnes in 2004. The respective import value grew from nearly US\$ 17.8 million to US\$ 67.1 million.

**Figure 52: The main European importers of catfish from Vietnam (in tonnes)**



Source: VASEP

## Market

Pangasius is taking an increasing market share in Europe, where Germany is at present the leading market for the species. In 2004 Germany imported 33% of the total European imports of Pangasius fillets, amounting to 7 400 tonnes. The fish has been very well received by consumers, and now the German discount retailer Lidl is carrying Pangasius fillets as well as the restaurant chain Nordsee and

processor Deutsche See.<sup>51</sup> The most recent data show that in the first six months of 2005, Germany imported some 5 000 tonnes of Pangasius. Spain is another promising market for Vietnamese catfish with import volumes at 6 900 tonnes in 2004. Belgium (4 107 tonnes) and Italy (1 755 tonnes) are rapidly increasing their catfish sales, whereas the Dutch imports of Pangasius amounted to 763 tonnes, probably due to Nile perch dominance on the market. France imported 543 tonnes of Pangasius in 2004, after trial imports of 9 tonnes the year before.

At present, Pangasius is exported to Europe mostly in form of frozen high quality fillets, but on the Vietnamese domestic market the species is represented by many value-added products. Vietnamese producers offer Pangasius steaks, fillet portions, rolls, skewers and balls.

Some companies have up to 160 Pangasius products such as Pangasius paste (to use in their consumers' own recipes), Pangasius red sausages coloured by addition of spices, Pangasius stuffed with lemon leaves, Pangasius with curry and beer and even Pangasius with strawberries. Recently, Vietnamese producers have also presented Pangasius fillets in different colours: white, light pink, pink and yellow. Export of value-added Pangasius products is the next step on the agenda of Vietnamese producers.

While the impetuous introduction of Pangasius fillets on the European market had pushed the prices down, the increasing demand in 2004 has led to prices increasing up to 50% compared to 2003. However, the unit value of Pangasius fillets is now at US\$ 2.5/kg due to large production scale and lower prices for raw materials. Compared to the unit value of tilapia (US\$ 8/kg) and Nile perch (US\$ 4.6/kg), Vietnamese catfish has the leading position on the European freshwater fish and whitefish market.

**Figure 53: Pangasius export average unit value**



Source: VASEP

Pangasius is an important strategic product for Vietnamese export as well as for the domestic market. However, increasing competition from Asian countries can be anticipated in the future. Bangladesh, Thailand and Indonesia have already entered the catfish sector, and China has started to build farms for

<sup>51</sup> Intrafish, "Pangasius poised for EU market growth", August 2005

Pangasius production. This can result in increasing pressure on prices and tougher conditions for producers. The factors behind the success of Pangasius are its good quality, convenient product form, low price and minimum production costs compared to other freshwater species. According to market experts, Pangasius has every chance of becoming the major product on the European freshwater fish market if the growth in production and imports holds.

Taking into account that Vietnam has the ambitious target of reaching one million tonnes of production in the next five years, and the European ready acceptance of the species, there should be a bright future for Pangasius in Europe.

#### 4.6 Northern pike



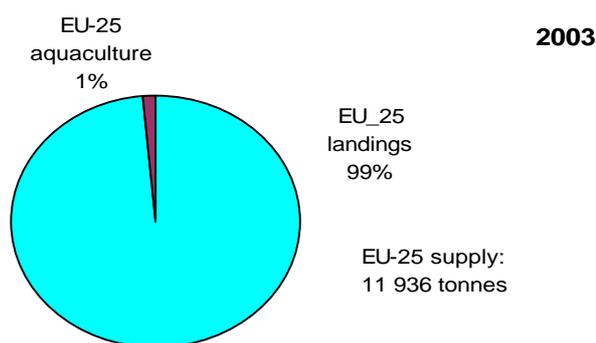
**European landings:** 11 772 tonnes

**Capture countries:** Finland, Poland, Germany, Sweden, Estonia

**The main consumption markets:** Finland, France

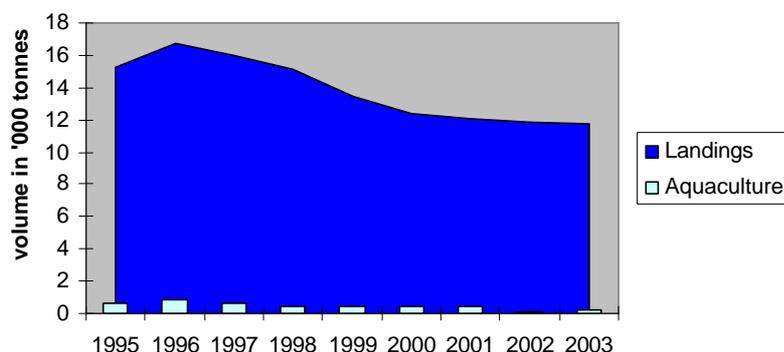
Northern pike (*Esox lucius*) is a highly predatory freshwater fish that lurks in the shallows of clear lakes. Pike is also a popular sport fish because of its fighting ability and willingness to strike aggressively at a variety of lures and baits. Northern pike is the most widely distributed freshwater fish in the world, found in northern Asia, Europe and North America. The EU-25 supply of northern pike was estimated at nearly 12 000 tonnes in 2003, predominantly from capture fisheries (99%) and aquaculture (1%) (Figure 54).

**Figure 54: Supply of northern pike on the EU-25 market**



In Europe, northern pike is mostly caught in Finland (86% of the total northern pike landings). The Finnish landings of northern pike have been stable over many years, amounting to more than 11 000 tonnes a year on average, though a slight decrease was observed in 1997 and 2002. Poland, Germany, Sweden and Estonia are other northern pike producers capturing less than 500 tonnes annually.

**Figure 55: Landings (capture) and aquaculture of northern pike in Europe**



Outside the EU, Russia is the biggest producer of pike (10 000 tonnes in 2003). Belarus and Turkey capture 336 tonnes and 237 tonnes, respectively. Some 160 tonnes were farmed in Europe in 2003. Farming of northern pike has not been successful since pike do not accept artificial food.

**Table 24: The main producers of northern pike (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Finland	11,831	12,345	12,377	11,649	11,663	10,449	10,428	10,102	10,097
Poland	245	1,076	280	226	262	363	311	354	362
Germany	317	288	306	304	336	322	309	309	296
Sweden	394	360	338	302	322	290	242	234	202
Estonia	72	139	105	131	152	177	199	218	200
Others	2432	2493	2622	2559	680	735	634	641	615
Total	15291	16701	16028	15171	13415	12336	12123	11858	11772

There is no registered international trade of northern pike. Due to irregular supply, pike is seldom found in retail or in catering. If offered, the fish is usually sold chilled, whole and gutted in sizes of 500 g to 4 kg (even though it grows to sizes of 25 kg and over).<sup>52</sup> Finland has the biggest consumption of pike, estimated at 1.9 kg per capita in 2003. Germany, Poland and Russia are other markets where pike is served. In France, a popular dish served on special occasions is baked pike stuffed with vegetables and herbs. Another French speciality is small bolls made of pike's meat.

#### 4.7 Pike –perch



**European landings:** 7 127 tonnes

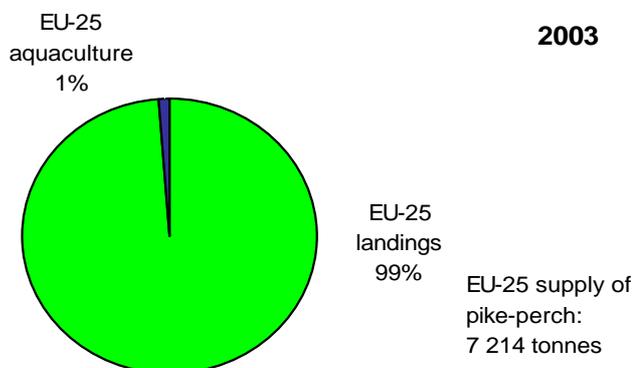
**Capture countries:** Finland, Estonia, Germany, Poland

**Main consumption markets:** Finland, Russia, Estonia

<sup>52</sup> FAO, GlobeFish Research Programme “The market for freshwater fish in Europe” 1998, p.13

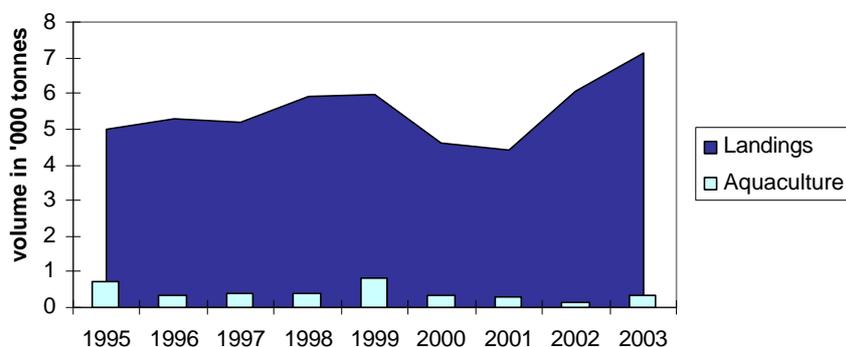
Pike-perch (*Stizostedion lucioperca*) is native to Eastern Europe, where the species is common. Almost all pike-perch supply on the European market comes from landings (99%) with only 1% coming from culture.

**Figure 56: Supply of pike-perch on the EU-25 market**



European landings of pike-perch were 7 121 tonnes in 2003, showing a growth of 35% from 4 600 tonnes in 2000. Finland (2 800 tonnes) and Estonia (1 880 tonnes) are the main countries for pike-perch landings. Relatively large quantities of pike-perch are caught in the Russian Federation (5 716 tonnes), Turkey (1 750 tonnes), Kazakhstan (1 450 tonnes) and Ukraine (1 070 tonnes).

**Figure 57: Pike-perch capture in Europe (in '000 tonnes)**



**Table 25: The main producers of pike-perch (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
EU countries									
Finland	2,346	2,476	2,630	3,241	3,188	1,824	1,786	2,671	2,796
Estonia	657	726	460	891	771	677	517	977	1,882
Germany	570	546	560	491	524	508	494	524	541
Poland	440	512	480	381	537	546	478	509	519
Sweden	351	312	366	334	346	327	267	398	451
Netherlands	79	100	89	61	104	161	254	302	301
Others	542	592	602	508	512	564	599	692	637

<b>Total EU</b>	<b>4985</b>	<b>5264</b>	<b>5187</b>	<b>5907</b>	<b>5982</b>	<b>4607</b>	<b>4395</b>	<b>6073</b>	<b>7127</b>
Non-EU									
Russian Federation	4,221	6,215	6,104	5,390	5,320	6,128	5,711	6,041	5,716
Turkey	5,877	8,042	1,500	3,000	1,906	1,633	1,644	1,850	1,751
Kazakhstan	6,089	5,570	4,000	2,900	2,500	2,000	1,628	1,718	1,449
Ukraine	512	811	955	965	986	1,171	1,722	1,963	1,069
<b>Total</b>	<b>21172</b>	<b>25902</b>	<b>16791</b>	<b>18162</b>	<b>16694</b>	<b>15539</b>	<b>15100</b>	<b>17645</b>	<b>17112</b>

There is no registered international trade of pike-perch. The species is preferred in Estonia (1.4 kg per capita) and in Finland (0.5 kg per capita), but is also consumed in Germany, Poland, Sweden and the Netherlands. In Germany pike-perch fillets were successfully introduced in the catering sector, where the species is served with vegetables.

#### 4.8 European perch



**European landings:** 16 774 tonnes

**Capture countries:** Finland, Russia, Estonia

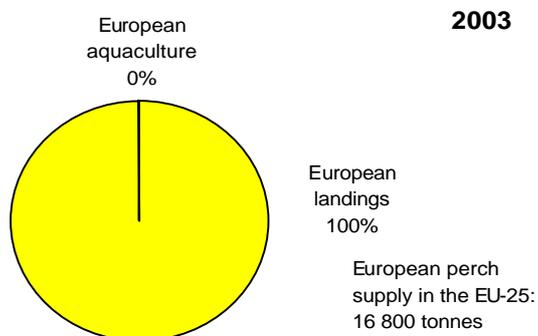
**Importing countries:** Switzerland, France

**The main consumption markets:** Switzerland

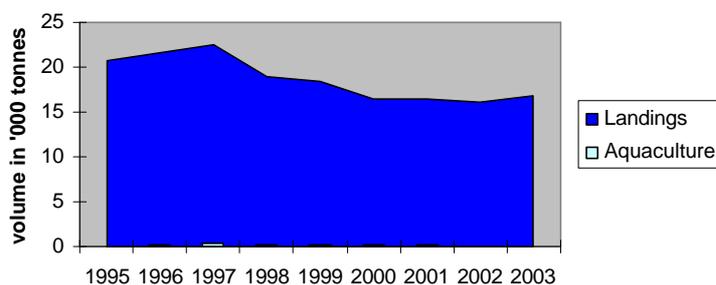
All the volume of perch (16 774 tonnes) is caught in European rivers and lakes. Finland with 13 000 tonnes is the biggest supplier of European perch (*Perca fluviatilis*), followed by Estonia (1 450 tonnes), Poland (980 tonnes), Germany (500 tonnes) and Sweden (265 tonnes). Perch is also captured in the Russian Federation (8 000 tonnes) and Switzerland (485 tonnes).

Aquaculture production of perch is rather small: only 22 tonnes were produced in the Czech Republic. Ukraine, Russia and Romania farm a further 116 tonnes. Figure 58 shows that the entire supply of pike-perch (16 800 tonnes) in the EU-25 comes from European capture fisheries.

**Figure 58: European perch supply in the EU-25**



**Figure 59: Landings of European perch (in '000 tonnes)**



The EU market for perch is undersupplied. Switzerland is the biggest importer. Perch is not identified as a separate species in the European statistics, but according to various sources, Swiss annual imports are estimated to be from 2 000 to 5 000 tonnes of perch fillets. Perch, or *Egli*, is a typical dish in the Swiss cuisine. Small-sized fillets with skin on (15 g) are preferred in the French-speaking part of the country, medium-sized fillets (40g) in German-speaking Switzerland and large-sized ones (100-150 g) in Lorraine.<sup>53</sup>

**Table 26: European capture of perch by country (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Finland	16,876	17,647	17,860	14,721	14,694	13,374	13,395	12,981	13,080
Poland	952	1,169	1,584	1,172	1,124	922	1,119	1,057	981
Estonia	1,007	1,030	1,202	1,052	976	841	686	824	1,445
Germany	948	764	782	822	714	501	541	478	504
Sweden	343	267	386	371	301	231	201	250	265
Other	577	679	675	708	582	470	518	526	449
Total	20,703	21,556	22,489	18,846	18,391	16,399	16,460	16,116	16,774

#### 4.9 Nile perch



**Worldwide production:** 290 000 tonnes

**Main producers:** Uganda, Tanzania, Kenya

**Importing European countries:** Belgium, the Netherlands

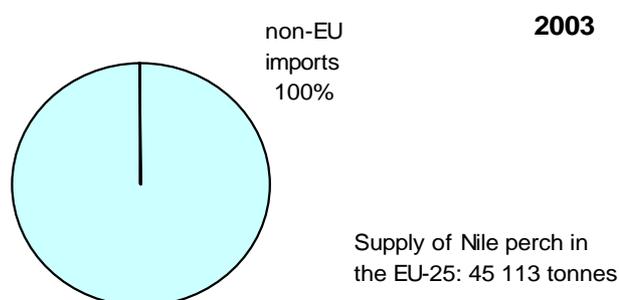
**Consumption markets in Europe:** Spain, Italy, Germany

Nile perch is an emerging product on the European market, rapidly gaining popularity due to its quality and convenient product form. The species has a delicate flavour and firm, but flaky flesh. Fresh and

<sup>53</sup> “The markets for freshwater fish in Europe”, Globefish Research Programme, 1998

frozen boneless fillets have had a good response from European consumers, especially those who do not have time to prepare elaborate dishes but appreciate a simple healthy meal.

**Figure 60: Nile perch supply in the EU-25**



### Production

Nile perch (*Lates niloticus*), also known as Lake Victoria perch, is a large freshwater fish found extensively in the rivers and lakes of Africa. It is a predator that can weigh up to 200 kg and grow 2 meters in length. In the late 1950s, Nile perch was introduced into Lake Victoria, the second largest freshwater lake in the world with an area of 68 000 sq km. The area of the lake is divided into the national waters of the bordering countries, with the United Republic of Tanzania<sup>54</sup> owning 49%, Uganda 45% and Kenya 6% of the area.

By the mid-1980s, Nile perch catches started to increase rapidly, and over the last ten years, the annual volume of landings reached on average more than 300 000 tonnes. This substantial fishery not only provides local people with a major source of revenue, but it also supplies export markets with 45 000 tonnes of the product worth an estimated US\$ 170 million.

**Table 27: Landings of Nile perch in the three main producing countries (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Uganda	92,722	81,253	91,706	98,800	89,203	87,257	88,881	90,698	112,804
Tanzania	155,860	121,161	152,000	150,000	100,000	90,000	96,000	92,000	98,500
Kenya	102,546	97,145	73,555	76,663	103,014	109,815	78,534	58,432	54,700
Others	16,376	12,458	11,983	13,720	14,065	15,833	19,000	16,142	23,895
Total	367,504	312,017	329,244	339,183	306,282	302,905	282,245	257,272	289,899

Most of the fishing in the three countries is undertaken from small boats and canoes, using either paddle or outboard power. In Uganda, which became the largest Nile perch producer in 2003, industrial fishing techniques are forbidden, but in Kenyan and Tanzanian waters there is some limited use of pair trawling from industrial scale vessels.<sup>55</sup> Until 2002 Tanzania was the biggest producer of Nile perch, having peak production of 152 000 tonnes in 1997. After that the catch continuously declined reaching

<sup>54</sup> Hereinafter: Tanzania

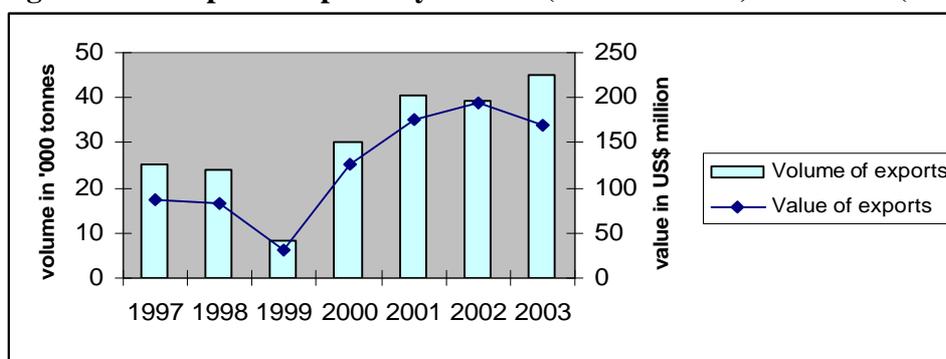
<sup>55</sup> from [www.megapesca.com](http://www.megapesca.com)

92 000 tonnes in 2002; in 2003 it was nearly 99 000 tonnes. Landings in Uganda amounted to 113 000 tonnes in 2003 (a 20% increase compared to 2002), making the country the biggest producer of Nile perch (40% of the total Nile perch landings). Landings from Kenyan waters declined significantly, from 110 000 tonnes in 2000 to 55 000 tonnes in 2003. The fish are landed at numerous small landing sites on the shore or off-lying islands, where they are bought by traders or directly by processors. Only the best quality fish are selected for export processing.

## Trade

It is difficult to analyse how much Nile perch volume is exported to each European country, as the species is not specified in EU trade statistics. The graph (Figure 61) showing dynamics of exports and the table (Table 28) describing the main importing countries are based on the FAO report “The world of Nile perch”.

**Figure 61: Nile perch exports by volume (in ‘000 tonnes) and value (in US\$ million)**



In March 1999, a suspect case of fish poisoning with pesticides was discovered in Uganda. The European Union subsequently imposed a ban on imports of Nile perch in April 1999, which impacted the Nile perch sector immediately. The EU demanded a comprehensive monitoring programme, which would determine levels of various pesticides and trace elements in fish, water and sediments from the lake. Exports to the EU declined to less than 10 000 tonnes, although over time this loss was partially offset by increased sales to other markets. Fish processing plants, many of which were already operating at less than 50% capacity, had to further reduce their production and the landed prices for Nile perch fell.<sup>56</sup> When the ban was lifted in 2000, the fish exports quickly resumed. Tanzania was the first to ensure compliance with EU requirements and the ban was lifted for the country in February 2000; however, it took a longer time for Uganda and Kenya, with the ban being removed in August and December 2000, respectively.

In 2003 the Nile perch trade in European markets amounted to 45 000 tonnes with an estimated value of US\$ 170 million. Nile perch is traded mostly as fresh fillets (80% of the total volume) and frozen fillets (20%), and the exports of fresh fillets have been increasing rapidly. While in 1997 the volume of fresh Nile perch fillets was estimated at some 14 000 tonnes, in 2003 it exceeded 36 000 tonnes. Exports of frozen Nile perch fillets, on the other hand, are stable and much lower than before the ban. Tanzania is the main exporting country and in 2003 it supplied 27 000 tonnes of Nile perch worth

<sup>56</sup> Based on “Standards and Agro-Food Exports from Developing countries: Rebalancing the Debate” by S. Jaffee and S. Henson, available at [http://www.proses.sciences-po.fr/documents/Jaffee\\_Henson\\_Standards.pdf](http://www.proses.sciences-po.fr/documents/Jaffee_Henson_Standards.pdf)

US\$ 100 million, thus accounting for 60% of total EU imports of the species. Uganda is second with 13 000 tonnes of Nile perch exported to the EU in 2003, with Kenya supplying the remaining 5 000 tonnes.

**Table 28: African exporters of Nile perch and the main European countries importing the species directly from Africa in 2003 (in tonnes)**

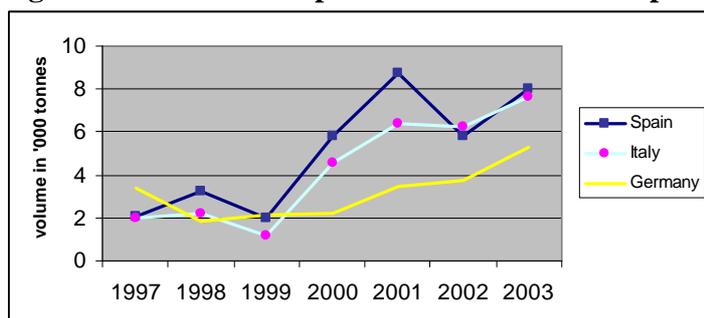
Importing countries*	2003	%
Netherlands	14509	32
Belgium	13371	30
Austria	5638	12
Germany	4197	9
Greece	2291	5
Spain	1704	4
Luxemburg	1263	3
Italy	740	2
Others	1400	3
Total	45113	100

Exporting countries	Volume in tonnes	%	Value in US\$ '000	%
Tanzania	26956	60	99701	59
Uganda	13062	29	51049	30
Kenya	5086	11	19134	11
Total	45113	100	169884	100

\*Countries, importing directly from Tanzania, Uganda and Kenya

The most important European markets for Nile perch are Belgium and the Netherlands where 60% of the product export volume arrives, and Germany and Spain where Nile perch is mostly consumed. Belgium is the main entry point for Nile perch into the EU, and from there a huge part of the product is redirected to other European countries by plane. In 2003 Belgian imports of Nile perch fillets were estimated at some 14 000 tonnes (nearly half of the imports reported in 2001), most of which went to the Netherlands, Italy, Spain and Northern France. Still, around 120 tonnes of Nile perch are consumed domestically in Belgium per month. The Netherlands is another big transshipping point for African Nile perch, importing 14 500 tonnes in 2003, but almost all the volume is immediately sent to other countries by plane or by truck. Consumption of Nile perch in the domestic market is very small, estimated at some 20 tonnes of Nile perch fillets a week. Dutch trade in Nile perch reflects the overall trend in the EU, changing from frozen fillets to fresh fillets in recent years.

**Figure 62: The most important markets for Nile perch fillet imports in the EU (in tonnes)**



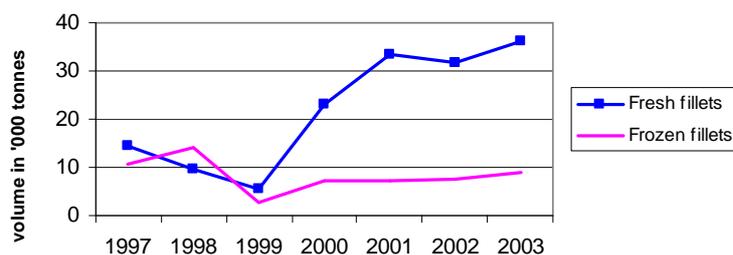
## Market

Spain seems to be one of the best markets for Nile perch in Europe due to the country's high imports and fish consumption tradition. In 2003 Spain imported some 8 000 tonnes of Nile perch fillets, of which 5 000 tonnes were fresh and 3 000 tonnes frozen. The peak of imports was in 2001 when almost 8 800 tonnes of Nile perch fillets were supplied to the Spanish market. The year after, Nile perch imports decreased by 35% and at present they have stabilized again at 8 000 tonnes. Consumption of Nile perch is estimated to be as high as 150 tonnes per week. Fillets are usually sold through conventional markets, although supermarkets are very important channels for promoting the fish. The average unit value of fresh Nile perch fillets is €4.60-4.70/kg for all exporting countries, which is much higher than in Germany.

Italy is another important market for Nile perch even though the national consumption of marine fish is four times higher than that of freshwater fish. However, the situation for Nile perch or *Pesce persico* is quite interesting at present. According to ISMEA, Nile perch is the third favourite freshwater species after salmon and salmon trout. After lifting the EU ban, the imports increased rapidly from some 1 000 tonnes in 1999 to 7 770 tonnes in 2003. ISMEA reports that when the export from African countries resumed in 2000 after the ban, Italians consumed 2 600 tonnes of Nile perch for a value of €29 million. In 2004 the volume of Nile perch purchases increased to 6 600 tonnes valued at €60 million. The species is preferred in the Northeast, Northwest and Centre of Italy, with a slightly lower consumption in the South. Almost all Nile perch fillets imported to Italy are fresh due to reliable supplies from the Netherlands twice a fortnight. The unit value is €4.80/kg. Fresh Nile perch fillets are sold mostly through super- and hypermarkets.

Germany is an important market for freshwater fish in general, with Nile perch, tilapia and catfish from Vietnam competing for customer preference. Germany imports Nile perch fillets directly from Tanzania, Uganda and Kenya rather than via Belgium and the Netherlands due to a rather big difference in the product unit value (€6.80/kg from the Netherlands and €3.80/kg directly from Africa). The imports of fresh Nile perch fillets have increased by 40% from 2 100 tonnes in 2000 to 5 300 tonnes in 2003.

**Figure 63: European imports of Nile perch by product form**



European imports of fresh Nile perch fillets have risen considerably over the past year from 14 453 tonnes in 1997 to 36 161 tonnes in 2003. Frozen fillets, however, are stable, showing at present a lower volume (8 952 tonnes) than before the ban in 1999 (10 671 tonnes). The reasons behind the rapid expansion of fresh fillets are improved logistical system (special charter flights) and better handling of distribution.

Whereas several years ago Nile perch was the leading species on the European freshwater fish market, in 2003 the situation had totally changed. Vietnamese catfish fillets of good quality have been rapidly emerging in many European countries, leaving little space for Nile perch competition. Price remains the main weakness for Nile perch. While its export unit value ranges from €3.80/kg to €6.80/kg depending on the country, the export unit value of Pangasius is currently about €2.3/kg. This is the most crucial factor because the majority of European consumers (especially in Northern Europe) are price conscious and they are unwilling to cross a price barrier of €3.00 per portion when purchasing fish.

The reason behind the current price of Nile perch on the EU market is an elaborate supply chain, with the Nile perch exports from Africa going via Belgium and the Netherlands. Thus, direct contacts with African producers, as well as improved quality and product traceability, would be the best way to achieve more competitive prices for Nile perch fillets in Europe. The unit value of fresh Nile perch fillets imported on the European market showed a strong growth until 2002 with a peak at nearly €5/kg, but after catfish supplies started arriving from Vietnam in 2003, the unit value of Nile perch went down to €3.80/kg. It should also be taken into account that in 2003 the value of the Euro increased against the US dollar.

#### 4.10 Tilapia



**Worldwide production:** 1.7 million tonnes

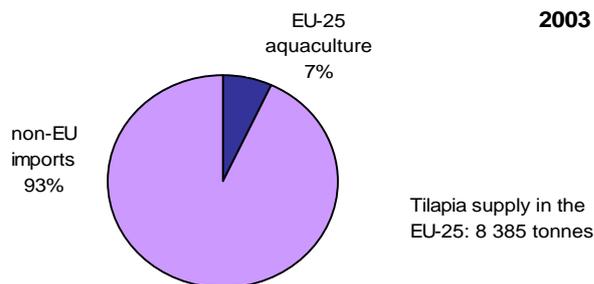
**The main producers:** China, Egypt, Philippines, Indonesia, Zimbabwe, Central Africa

**Importing European countries:** the Netherlands, Belgium

**The main consumption markets in Europe:** the UK, France, Belgium, Germany

Tilapia, which has been dubbed “the aquatic chicken” because of its high adaptability and tolerance to farming conditions, is a new species on the European market. Originally from Africa, tilapia has been cultivated for centuries, and during the last 50 years, interest in tilapia’s aquaculture potential has led to nearly worldwide production and distribution. Large-scale commercial culture of tilapia is limited to several species: Nile tilapia (*Oreochromis niloticus*), Mozambique tilapia (*O.mossambicus*), blue tilapia (*O.aureus*) and red tilapia, which is a hybrid of the first three species. Of these, the Nile tilapia is by far the most commonly used species in fish farming.

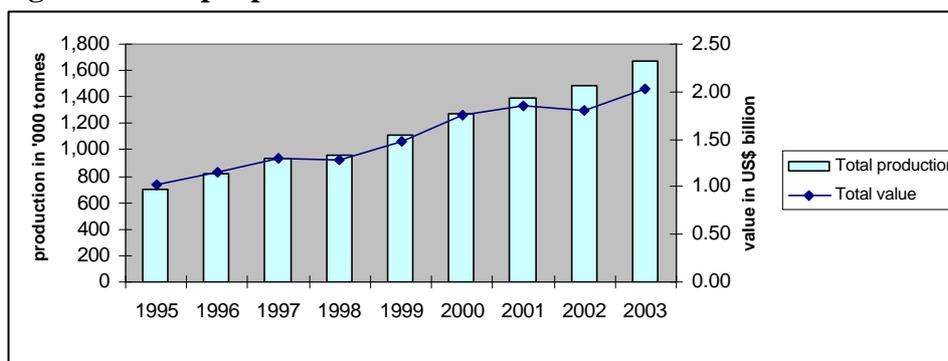
**Figure 64: Tilapia supply on the EU-25 market**



## Production

Major tilapia producing countries are located in Asia, but tilapia production in Latin American countries is rapidly growing. Over the last decade, the global production of tilapia has doubled due to growth in aquaculture. In 2003 the total tilapia production worldwide amounted 1.7 million tonnes with an estimated value of more than US\$ 2 billion. Among the biggest producers, China ranks first with its production of 800 000 tonnes in 2003, as compared to some 315 000 tonnes in 1995. Egypt has raised its output by more than 10 times over the same period reaching 200 000 tonnes in 2003. Philippines, Indonesia, Thailand, Taiwan and other countries have shown a constant growth of tilapia farming with an increase of at least 30% over the last 10 years. In Europe, tilapia farming is limited to less than 600 tonnes cultivated in Belgium (450 tonnes) and Spain (127 tonnes).

**Figure 65: Tilapia production and value worldwide**



**Table 29: The major tilapia producers worldwide (in tonnes)**

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
China	314,903	394,303	485,459	525,926	561,794	629,182	671,666	706,585	805,859
Egypt	21,969	27,854	30,416	52,755	103,988	157,425	152,515	167,735	199,557
Philippines	81,954	79,415	91,834	72,023	83,832	92,579	106,746	122,399	129,996
Indonesia	74,125	75,473	73,222	65,894	74,005	85,179	105,106	109,768	123,748
Thailand	76,383	91,038	91,580	73,809	76,621	82,581	84,510	83,807	97,309
Taiwan	46,293	44,756	42,158	36,126	57,183	49,235	82,781	85,059	85,351
Brazil	12,014	15,700	16,845	24,062	27,104	32,459	35,830	42,003	62,558
Others	78,214	84,034	102,307	103,474	123,568	145,533	148,541	167,129	171,969
Total	705,855	812,573	933,821	954,069	1,108,095	1,274,173	1,387,695	1,484,485	1,676,347

## Trade

Tilapia is not registered as a separate commodity in the European Union or in the national trade statistics of many countries. Figures below are extracted from the FAO GlobeFish report<sup>57</sup>, indicating available statistics from Taiwan Province of China, where tilapia is identified. For other countries, where the imported product is likely to be tilapia, the category “freshwater fish not identified” was used.

**Table 30: Frozen tilapia imports into the EU (in tonnes)**

	1996	1997	1998	1999	2000	2001	2002	2003
China	86	45	74	132	573	1863	198	988
Taiwan	1 476	1 856	2 833	4 042	5 087	5 543	7 382	6 277
Jamaica	2							49
Brazil	21	10	11	9	0.3		107	425
Ecuador	14	37	39		48	55	28	69
Others	223	128	84	194	180	240	91	
Total	1 822	2 076	3 041	4 376	5 889	7 702	7 806	7 808

Frozen tilapia imports have been stable over the last few years at an estimated 7 800 tonnes annually. Taiwan Province of China accounts for 80% of total EU imports. Other suppliers of tilapia to the EU are China, Brazil, Ecuador, Jamaica and Zimbabwe. Tilapia is imported mainly in whole frozen form, although there has been an increase of fresh tilapia fillets from Zimbabwe. Both fresh and frozen fillets ranging from 100-200 g are sold in France, Belgium, Germany and the Netherlands.

**Table 31: Fresh tilapia fillet imports into the EU (in tonnes)**

	1996	1997	1998	1999	2000	2001	2002	2003
Zimbabwe			18	54	30	364	284	385
Jamaica	1.5		25	38	81	77	91	49
Brazil					0.4		8.5	
Ecuador	14				0.1	2		
Others	11	17	0.1		18			
Total	27	17	37	92	129	443	384	434

## Market

While tilapia is increasingly popular in the USA, showing strong growth in production, imports and consumption, the European market is much weaker for this fish. In the US, tilapia marketing is provided by the Tilapia Marketing Institute (TMI), which is boosting tilapia demand by identifying the most favourable attributes of the species and matching these to the needs of target markets.

In Europe, no similar activities have yet been undertaken on such a scale, except active investments in tilapia farming in the UK by the Commonwealth Development Corporation in former UK colonies. It is relatively difficult for non-EU tilapia producers to market their product due to the influence of large

<sup>57</sup> FAO GlobeFish “Tilapia Market Report”, March 2005

retail chains and generally low prices for freshwater aquaculture products. Consumer awareness of tilapia is low, and thus it may be necessary to promote tilapia with consumers and wholesalers.

Being traditionally considered an inexpensive substitute for whitefish, tilapia competed mainly with cod and haddock, but recently the situation has changed. Increasing popularity of African Nile perch fillets and a boom in Vietnamese catfish in 2004 make it more difficult for tilapia to compete on the European market. Some tilapia producers (especially Taiwan and Uganda) have ambitious strategies to increase their market share in Europe. In July 2005, Taiwan resumed the export of tilapia to the EU after a suspension in March 2003, when some shipments were discovered to contain excessive amounts of chemical residues.

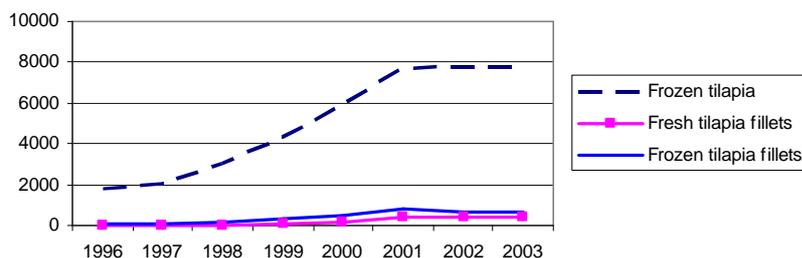
Uganda's tilapia farmers, in collaboration with Norwegian experts, have started a project to produce a fast-growing strain of tilapia. The target is to yield 10 000 tonnes of tilapia from January 2006 and 30 000 tonnes from January 2009.<sup>58</sup>

The UK is considered as the main market for tilapia due to the large Asian and African communities. The highest demand is observed in the big cities (especially London), though tilapia consumption is also slightly increasing among non-ethnic populations. London is the largest market for tilapia in the EU, with tilapia fillets already appearing in the popular fish and chips. Supermarket chains such as Sainsbury and Tesco import tilapia products including fresh fillets from Jamaica.<sup>59</sup> Jamaican red tilapia in the fresh form is highly appreciated in the UK, especially as fillets.

France and Belgium are other relatively important markets for tilapia, followed by Germany, where, however, the market situation for tilapia has drastically changed. Good quality and cheap catfish fillets from Vietnam leave almost no space for more expensive tilapia. A smaller quantity of tilapia is marketed in Austria, Italy, Switzerland, Denmark and Sweden.

At present, the total market of tilapia in Europe is estimated at 10 000 tonnes and the fish is not expected to gain a considerably large share compared to the volume of Vietnamese catfish and Nile perch.

**Figure 66: European imports of tilapia by product form**

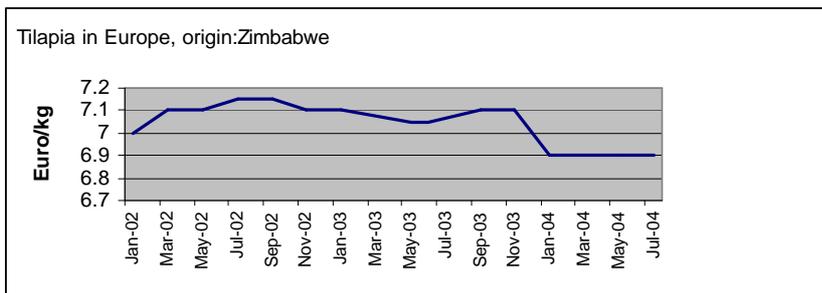


The graph below shows the prices for fresh skinless tilapia fillets, originally from Zimbabwe, on the European market. In the first four months of 2004 the price reached €6.9/kg, the lowest in two years, due to increased competition from other freshwater species (e.g. catfish from Vietnam).

<sup>58</sup> Worldfish Report, n 247, July 2005

<sup>59</sup> "Tilapia Markets", Report of the Workshop on the Promotion of Sustainable Commercial Aquaculture, FAO

**Figure 67: Fresh tilapia fillet prices in Europe**



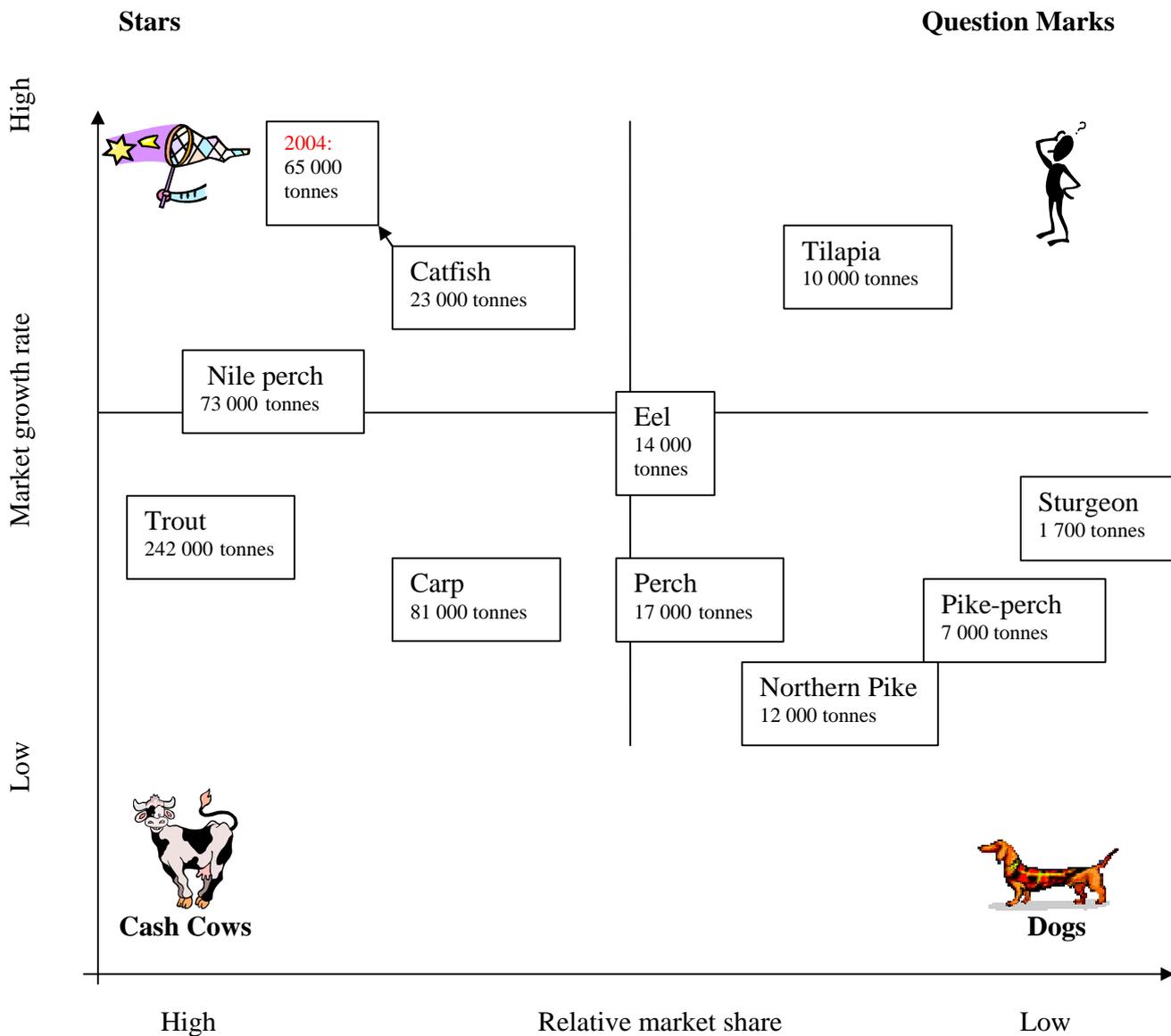
## 5. BCG matrix and SWOT – analysis

### 5.1 BCG matrix applied to the freshwater fish species on the EU market

In order to understand the overall picture of the European freshwater fish market and the positions of single species, the main species have been classified according to the BCG matrix.<sup>60</sup> The matrix shows four categories based on combinations of market share and market growth. Relative market share (horizontal axis) serves as a proxy for competitive advantage, displaying available quantities/supply of the species, and market growth rate (vertical axis) serves as a proxy for industry attractiveness, showing how rapidly trade of the species is developing. While in the original BCG matrix the products are sorted out by cash usage and cash generation, in the present portfolio the species are mainly based on quantity, taking into account their revenue.

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<sup>60</sup> The BCG matrix is a portfolio planning model developed by Bruce Henderson of the Boston Consulting Group in the early 1970s.



Whereas quantity of carp, trout, eel, pike, perch, sturgeon and pike-perch are presented in live weight, the volume of Nile perch, catfish and tilapia is in product weight. To calculate the corresponding quantity of Nile perch, catfish and tilapia, the following indicative conversion factors have been applied:



increase of sales and generation of cash. The second assumption is that a growing market requires investment in assets to increase capacity and attract new customers, thus resulting in consumption of cash. The four categories are<sup>61</sup>:

**1. Dog products** – (*Low market share/low market growth rate*): These products have low market share which is not growing or even shows a negative trend. Thus the products neither generate nor consume a large amount of cash. Dog products may be linked to low profits, and the prognosis for investments is generally low. Unless some new competitive advantage can be introduced it is likely that these products will not be able to compete and will not attract the resources to improve the product's position within the market. Generally, alternative attractive investment decisions could probably be found elsewhere. The following species have been classified as “Dog products”: **perch** (17 000 tonnes), **northern pike** (12 000 tonnes), **pike-perch** (7 000 tonnes) and **sturgeon** (1 700 tonnes). They are all captured from wild fisheries and have almost no international trade. The species are sold on the domestic markets in the countries of origin and may have a limited supply, depending on natural resources.

*“Dog species” may contribute to the overall supply of freshwater fish in the countries they come from or serve a strategic need. If the market shows a continuous downward trend for those products, it is advised to focus attention and resources on other segments that can provide better returns.*

**2. Question Marks** – (*Low market share/high market growth rate*): Initially the volume of the product sold is relatively low and significant market expenditures are required to raise market awareness and stimulate volume sales. If the initial investment decisions were sound, and sales follow on faster than for other competing products, the product will move into “Star” category as increases in relative market share are achieved. If such investments are not made, then the product will at best maintain a static market position and in time, lose market position to other competitive products. **Tilapia** has been considered as a “Question Mark” product, reaching an estimated 10 000 tonnes imported into the EU in 2003. While popular in the UK, tilapia has a somewhat vague position among freshwater fish species on the European market, competing with more dynamic catfish and Nile perch.

*The following strategies are available for those products:*

- *If the objective is to turn the “Question Mark” product into a “Star” product, it is advised to make a major investment decision and gain a disproportionate share of new sales;*
- *If the stakes are too high, divest and exit from the opportunity;*
- *An alternative and lower risk strategy that may be best suited for tilapia is to use more limited resources and focus on key market niches in which the product can play a leading role.*

**3. Stars** – (*High market share/high market growth rate*): “Stars” are successful products for which there is significant market demand. Like “Cash Cow” products, “Star” products are in market leading position, but unlike “Cash Cows”, “Stars” must have sales that continue to grow at a high rate in order to maintain their market positions. “Stars” are therefore the prime candidates for investment.

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<sup>61</sup> Based on “Boston Matrix- Refresher”, available at [www.market-modelling.co.uk](http://www.market-modelling.co.uk)

Sustaining high sales growth requires that new users for the product be found as well as penetrating further into existing markets. African **Nile perch** and Vietnamese **Pangasius** catfish are the “Star” products in the EU market. At present, Nile perch is a leading freshwater fish species with 73 000 tonnes valued at nearly US\$ 170 million in 2003. Pangasius comes next, but if the imports from Vietnam continue to grow at the current rate, Vietnamese catfish will be the most dynamic species on the European market. While 23 000 tonnes of catfish valued at US\$ 18 million were imported in 2003, in 2004 the volume of imports tripled reaching 65 000 tonnes with a value of US\$ 67 million.

*The appropriate strategies for “Stars” are those that protect existing market share and result in increased volume supply into the market, e.g. improved distribution, cost efficiencies and product enhancement. When the market growth slows, “Stars” would become “Cash Cow” products.*

**4. Cash Cows** – (Relatively high market share/low market growth rate): “Cash Cows” have a big market share and are likely to be in the mature phase of their life cycle. As leaders on the market, these products are well established and sales will have grown to a stable maximum level. Pricing and promotional strategies appropriate to “Cash Cow” products should be aimed at maintaining their market share. Generally, attempting to increase market share may be a costly and unsuccessful strategy, but there may be other good reasons for attempting it. **Trout** and **carp** are the “Cash Cow” products on the European freshwater fish market. Trout is the leading species both in terms of volume and value. There are 285 000 tonnes of trout produced in Europe (including Norway) with a production value of US\$ 635 million, of which 50 000 tonnes are exported to Japan, Russia and other non-EU countries. Adding some 7 300 tonnes of trout from wild fishery, the available supply of trout on the EU market is estimated to be 242 000 tonnes. The estimated supply of carp is 80 000 tonnes, of which 71 000 tonnes are farmed. The value of carp production is US\$ 165 million. **Eel** is positioned between “Cash Cows” and “Dogs”. The product has a low market share (around 14 000 tonnes) and market growth rate, but its production value is high (US\$ 69 million). Eel has a small niche in the market and traditional customers.

*“Cash Cow” product units have strong image and generate significant profits, with very little investment. The market growth rates for “Cash Cow” products have slowed. The most likely potential threat to the maintenance of stable business conditions may be the introduction of low cost substitute products offering more benefit to the customer. If a new competing product is successful, the original product will experience less attention from customers. The best strategy for “Cash Cow” products should include maintaining their market share and existing customers, creating better product forms and evaluating the distribution chain.*

### **Criticism of the BCG matrix**

The Boston Matrix is not without its disadvantages, especially when it is applied in a specific market such as fisheries. Attention has been drawn to the following shortcomings of the technique:

- While the original BCG matrix often maps the product units within the same organisation, the portfolio of the fishery products on the overall EU market is much more complex. Profitability of the species serves numerous international companies, unlike the situation where products from different categories supplement each other’s revenue for the overall profitability of the company.

- The matrix is not multivariate in nature. The underlying “market growth rate” and “relative market share” data are the only factors in industry attractiveness and competitive advantage. Many other important factors like product strengths and customer needs are overlooked.

- The matrix depends heavily upon the breadth of the definition of the market. A unit may dominate its small niche, but have very low market share in the overall industry. In such a case, the definition of the market can make the difference between “Dog” and “Cash Cow”.

This BCG matrix is a guide to positioning different interacting elements into a common system and a clue to investment and management, but not to a certain strategy. However, the matrix can still serve as a simple tool for viewing the current situation on the European freshwater fish market and may serve as a starting point for discussing resource allocation for various products.

## 5.2 SWOT-analysis of the main freshwater species on the European market

	Carp	Trout	Eel	Nile perch	Tilapia	Catfish	Perch	Pike	Pike-perch	Sturgeon
Strengths	well-known product, traditional consumers, stable production	number one consumed product, the largest supply	little supply, declining landings	good quality, good price	good quality, stable demand in ethnic markets	good quality, the best price, increasing supply	Small, but traditionally established domestic market in producing countries			
Weaknesses	sold in live form, no particular marketing strategy	high fragmentation of trout producers, small companies	old-fashion image	several bans on the species export, distribution via Belgium and the Netherlands	poor labelling, no particular marketing strategy,		irregular supply is possible since all these species come from landings, except sturgeon  Almost no international trade			
Opportunities	value-added products, low-cost production	catering, direct sales	niche group	direct contacts with African producers	direct contacts with Asian and African producers	value added products, new markets	catering distribution			
Threats	no new consumers	falling price	declining eel stocks	cheaper catfish	catfish and Nile perch		decline in catches			

### Carp

- **Strengths:** The main advantage for carp is a stable traditional market in Central European countries with their big population. There carp is considered as the most important species among freshwater fish, with the highest demand around the Christmas and New Year period. Carp production shows a stable, slightly upward trend and the main carp producing countries seek to maintain and increase its production in the future.
- **Weaknesses:** Carp suffers from an old-fashioned image, and the species is not popular among young consumers because it requires a lot of time and special skills to prepare. Another

negative aspect which influences demand is that carp is traditionally sold live. The majority of consumers find it difficult to clean and slaughter fish at home and therefore choose other species. Furthermore, carp contains many small bones that are not appreciated by consumers. No particular marketing strategy has yet been implemented to increase carp consumption and consumer awareness of the species.

- **Opportunities:** Value adding to carp is a crucial initiative that should be considered by carp producers. Polish carp producers experienced negative feedback from consumers after some new value-added carp products were presented on the market. The majority of Polish customers found them too expensive, and the forecasted sales did not materialize. It is still important to remember that value adding entails not only the use of complicated ingredients, sauces or special design, but also some simple forms. A trial development of carp in fillets and portions in Romania is an excellent example of creating a product that meets market needs and fills a niche previously not exploited.
- **Threats:** It is difficult to attract new consumers in the carp sector. As mentioned in “weaknesses” (Section 5.2), young people tend to choose other species, which could have a noticeable impact on the carp sector in the future.

## Trout

- **Strengths:** Trout is one of the most traditional and popular species in Europe, and its production and trade are the largest on the European freshwater fish market. As with carp, trout consumption is mostly based on older customers, who have time to prepare the product. There are well-established markets for trout in almost all big European countries.
- **Weaknesses:** The image of trout is often considered as tired since the market is dominated by cheap portion controlled fresh whole trout of 150-200 g, and few value-added fresh/chilled trout products have been offered. The species has many small bones, which can be a serious hindrance for family consumption, especially for children. No particular marketing strategy towards product diversification and promotion has been undertaken. However, the main difficulty of the trout industry is its fragmentation into a large number of small producers, which do not have enough resources or power to implement a common centralized strategy for trout product development.
- **Opportunities:** Introduction of value-added products could be a good way to increase trout consumption. Boneless trout fillets, snack products and complete ready meals with vegetables and sauces are some of the possibilities. Regarding fragmentation of the industry, the only solution would be for small producers to come together in associations on a cooperative basis. This would help to control the overall marketing strategy, including promotion activities and distribution policies. To improve the logistics of distribution channels, direct marketing from trout producers to customers is an economic necessity for the European trout industry. Germany and France are good examples, where trout producers deliver their fish directly to retail chains, avoiding the wholesale part.
- **Threats:** At present, price is the main factor in competition among trout producers and distributors. Many big retail chains and smaller discounters often use low price offers to attract customers. This is a dangerous practice that can quickly lead to expectation of the lowest possible price by customers and can drive existing prices down. Until small producers unite in

associations and consolidate their marketing activities according to the market's needs, the trout industry risks encountering further difficulties.

## Eel

- **Strengths:** Eel is considered as a delicacy and has a niche market in Europe. Due to its particular taste, texture and flavour, eel has no competitor on the fish market. Eel production is valued at over US\$ 68 million.
- **Weaknesses:** The species has an old-fashioned image since consumption of eel is traditionally based on older consumers. High market price is another obstacle that makes it difficult to increase consumption. In addition, eel is a fatty product that does not appeal to modern consumer tastes.
- **Opportunities:** Some innovative methods in product form and marketing should be undertaken to increase eel popularity. Production of larger eel portions and eel fillets, and development of some new recipes may be some possible solutions. Eel is also used in Asian restaurants and sushi-bars as an ingredient (e.g. in sushi rolls), or as a separate dish (barbequed/grilled eel).
- **Threats:** Constantly declining eel stocks may put eel farming in danger in the future since eel farming depends on the supply of elvers, which have to be caught and grown in farms.

## Nile perch

- **Strengths:** Good quality and convenient product form stand behind the Nile perch's success on the EU market. Nile perch has a delicate flavour and firm, but flaky flesh. Fresh and frozen boneless fillets have got a good response from European consumers, especially those who do not have time to prepare an elaborate fish dish, but appreciate a simple healthy meal.
- **Weaknesses:** First, the price of Nile perch fillets is high compared to other similar products such as catfish and tilapia fillets. The majority of European consumers are price conscious (for example in Germany, they are unwilling to cross a price barrier of €3.00 per portion when purchasing fish). The current price of Nile perch on the EU market is mostly caused by the elaborate supply chain, in which Nile perch exports from Africa go via Belgium and the Netherlands. Another obstacle concerns traceability. Nile perch exports were banned by the EU four times during the last 7 years, when some bacteria were found. African producers managed to provide the required quality controls, but recently a film about the Nile perch industry emerged in several European countries. The documentary attempted to give a close-up look at the reality of poverty and other problems, using the Nile perch industry to show the negative side of globalisation, and this has weakened the image of Nile perch.
- **Opportunities:** Direct contacts with African producers can be a good way to achieve more competitive prices for Nile perch fillets on the EU market. The experience of German importers shows that the price of fresh Nile perch fillets can be decreased by nearly 50% when importing directly from Africa. Improved quality and product traceability, emphasized by the main retail chains, can overcome the weaknesses mentioned above. According to Dutch importers, quality and cleanliness of the processing factories in Tanzania are impressive as was shown by numerous photos on the websites of the main Dutch distributors. Regarding product

development, the main emphasis should be on the export of fresh fillets because it is difficult for Nile perch to compete with Vietnamese catfish.

- **Threats:** Pangasius, which is of a good quality and cheaper, is a serious competitor for Nile perch. Representing the same product category on the market, catfish has the advantage of attracting price-conscious European consumers, if no particular marketing strategy for Nile perch is implemented.

## Catfish

- **Strengths:** Very good quality and cheap price are the main factors behind the rapid development of Pangasius catfish marketing in Europe. The species does not have any off-flavour or “muddy taste”, which is a problem for the US catfish producers. Vietnamese Pangasius is highly suitable for aquaculture production: the species grows very fast and does not depend on special breeding conditions. Thus, low-cost production in Vietnam helps to maintain very low prices, while the quality is considered superior according to European importers.
- **Weaknesses:** European producers of carp are going to expand its production, and in some countries consumers might choose the domestic product. Still, it will not have any serious impact on Vietnamese catfish volume.
- **Opportunities:** Vietnamese producers are planning to achieve an annual production of Pangasius of 1 million tonnes within several years. In addition, they intend to expand their product range by creating some value-added products. New markets in Europe are also on the agenda of Vietnamese exporters. Pangasius is becoming a fully traceable quality monitored product. The producers will introduce a new brand called “Top-Quality Pangasius from Vietnam”.
- **Threats:** At present Pangasius is the leading species in Europe by market growth rate. However, competition is increasing: China and Bangladesh have started to build up farming sites for Pangasius production.

## Tilapia

- **Strengths:** Traditions of tilapia consumption and good quality of the product create a stable demand for tilapia in ethnic markets. The species has been especially successful in London and other big cities in the UK, where large ethnic groups of Asians and Africans are located. The highest demand for tilapia is in Chinese, Taiwanese and African restaurants. Active investments in tilapia farming were undertaken in the UK, and some African countries (especially Uganda) have started tilapia production targeting high-end markets.
- **Weaknesses:** The main disadvantage for tilapia is its poor diversification. An ordinary European customer is not aware of tilapia due to poor labelling and insufficient information about ways the species can be prepared. Promotion or other marketing activities need to be substantially improved. Non-EU tilapia producers find it relatively difficult to market their product due to the market power of large retail chains and the generally low prices for freshwater aquaculture products. High market price is another obstacle (€6.9 /kg for fresh skinless tilapia fillets).

- **Opportunities:** In addition to consumption in ethnic restaurants, tilapia has become common in the catering sector in the UK, for example in the popular fish and chips eateries. To overcome hard competition tilapia needs a clearer product differentiation. Value-added tilapia products should be considered, including complete meals with sauces/fresh vegetables presented in attractive forms, which could be produced in low cost countries to supply developed countries. This could reduce production cost. In addition, it may be advisable to establish direct contacts with tilapia producers as most tilapia exports go via the Netherlands.
- **Threats:** While tilapia is very popular and widely accepted in the USA, it has a much weaker position on the European market. Previously it was considered as the main competitor for cod and haddock, but at present it is hard for tilapia to win a bigger market share because of active penetration of Vietnamese catfish and Nile perch. Developing a niche market might be a possible solution for tilapia if suitable market strategies are applied in the future.

### European perch, Northern pike, pike-perch and sturgeon

- **Strengths:** These species have a small, traditionally established market in producing countries. The species form a niche market with relatively small, but stable demand.
- **Weaknesses:** The image of European perch, pike-perch and northern pike is less visible on the market due to the presence of many other freshwater species. Since perch, pike-perch and northern pike are caught in rivers and lakes their supply may be irregular. The species are not traded internationally, except European perch.
- **Opportunities:** Introduction of pike, pike-perch and perch in the catering sector may be a good opportunity to increase consumption of these species. Germany has been successful in using pike-perch in the catering sector, where pike-perch fillets served with vegetables and sauerkraut has become a successful dish.
- **Threats:** Possible decline in catches can have an impact on the species' supply.

## 6. EU legislation

European aquaculture producers face a complex regulatory network that can be divided into horizontal legislation relevant to all foodstuffs and vertical legislation relevant for specific foodstuffs, e.g. fish products. In order to highlight the most important regulatory aspects for freshwater fish producers, the main focus will be EU legislation related to traceability of fish products, animal health and hygiene standards, sanitary and hygiene, marketing and import regulations. There are Regulations (legally binding in all European Union member states) and Directives (requirements which must be re-enacted in member states' domestic legislation). The legislation is constantly being updated and can be reviewed at [http://europa.eu.int/comm/dgs/fisheries/index\\_en.htm](http://europa.eu.int/comm/dgs/fisheries/index_en.htm)

### 6.1 Traceability

Regarding the EU legislation for food safety and traceability, a number of legislative requirements and changes that aim to improve food traceability are being introduced across Europe. The new legislation builds upon existing European law and recognises that certain requirements apply to all food

businesses, and that specific requirements are needed for certain foods and businesses. The legislation covers the following important documents:

- **European Parliament Regulation (EC) No 178/2002** lays down the general principles and requirements of food law, established the European Food Safety Authority (EFSA, <http://www.efsa.eu.int/>) in 2002, and lays down the procedures in matters of food safety. From January 2005, this Regulation also places a clear responsibility on food and feed businesses to: ensure that food is safe, establish systems to ensure that they can trace food throughout the food chain, withdraw or recall food from the market where it does not comply with food safety requirements, notify authorities of any action they have taken to secure withdrawal or recall of food or feed. This Regulation also covers the safety of animal feedstuffs to ensure that this does not indirectly cause illness or harm when humans consume animal products.
- The general hygiene requirements concerning food, effective from January 2006 (Regulation 852/2004 [2]) and the specific hygiene requirements concerning food of animal origin, effective from January 2006 (Regulation 853/2004 [3]).
- The organisation of official controls on products of animal origin intended for human consumption, effective from January 2006 (Regulation 854/2004 [4]).
- The rules regarding animal health for the organisation of the production, processing and distribution of products of animal origin applicable from January 2005 (Directive 2002/99 [5]).

## 6.2 Legislation on fish diseases

Applied particularly to the aquaculture sector, here are two main directives regarding the spread of fish diseases in aquaculture.

**Council Directive 91/67/EEC of 28 January 1991** concerns the animal health conditions governing the placing on the market of aquaculture animals and products. It sets the animal health rules for the aquaculture sector. The main aim is to avoid the spread of contagious diseases by introducing the concept of approved zone (disease free areas for a certain disease) and limiting the movement of live animals between zones of different status. Farms can also enjoy a specific animal health status, by a procedure of Community approval. The requirements of the directive also apply to imports of aquaculture animals and products from third countries. An inspection system is established in order to verify compliance with this Directive.

**Council Directive 93/53/EEC of 23 June 1993** introduces minimum Community measures for the control of certain fish diseases, while Commission Decision 2002/308/EC of 22 April 2002 establishes lists of approved zones and approved farms with regard to one or more fish diseases, viral haemorrhagic septicaemia (VHS) and infectious haematopoietic necrosis (IHN) (Text with EEA relevance) (notified under document number C (2002) 1500).

## 6.3 Marketing

**Council Regulation (EC) No 2406/96 of 26 November 1996** establishes common marketing standards for certain fishery products. The standards refer to the level of freshness (Extra, A, B) as well as to the

size and weight of the products, indicating the allowed minimum sizes. It also indicates the rules for packaging, presentation and labelling. In addition, it states the marketing rules for the same products coming from third countries.

**Council Regulation (EC) No 104/2000 of 17 December 1999** sets up standards on the common organisation of the markets in fishery and aquaculture products. This regulation, which replaces 3759/92, establishes a common organisation of markets in fishery products, comprising a price and trading system and common rules on competition. In particular, it includes provisions dealing with marketing standards and consumer information, the conditions for the recognition and operation of producer and interbranch organisations, a system of prices and intervention mechanisms (financial compensation for withdrawals, carry-over aid and private storage aid).

**Council Regulation (CE) 2065/2001 of 22 October 2001**, concerns new rules as regards informing consumers about fishery and aquaculture products and includes the following aspects:

- Species commercial designation: list of commercial designations accepted by each Member State
- Production method: 'caught' or 'caught in freshwater' or 'farmed'
- Indication of the catch area: corresponding to FAO areas for fish caught at sea; reference to member state or third country for fish caught in freshwater or farmed fish
- Scientific name: not mandatory in product labelling
- Traceability: commercial designations, production method, catch area and scientific name are mandatory on commercial documents accompanying the goods.

## 6.4 Sanitary and hygiene

**Council Directive 91/493/EEC of 22 July 1991** lays down the health conditions for the production and the placing on the market of fishery products. It establishes the sanitary rules to be applied for the production and marketing of fishery products intended for human consumption. It covers fresh and processed products. The annexes provide detailed information related to the conditions applicable to factory vessels, the requirements during and after landing, the general conditions for establishments on land, the special condition for handling fishery products on shore, health control and monitoring of production conditions, packaging, traceability, storage and transport.

## 6.5 Imports

The **Commission Decision 97/296/EC of 22 April 1997** is based on the previously mentioned Council Directive 91/493/EEC of 22 July 1991. The document presents the list of third countries from which the import of fishery products is authorized for human consumption.

**Commission Decision 2001/699/EC of 19 September 2001** concerns protective measures with regard to certain fishery and aquaculture products intended for human consumption and origination in China and Vietnam (notified under document number C (2001) 2701).

**Commission Decision 2001/699/EC of 16 August 2001** lays down special conditions governing imports of fishery products originating in Uganda (Text with EEA relevance, notified under document number C (2001) 2524)

At the start of 2005, the EU launched an **export help service for developing countries**. This new programme involves an on-line Expanding Export Helpdesk, which is intended to help developing country producers seeking export to EU markets. The service is available in English, French, Spanish and Portuguese. It is intended to facilitate deals and traders, and provides a large database of trade statistics. It includes import tariffs, requirements and taxes in the Member States, customs documents, trade statistics as well as trade offers and requests. The service is available at <http://export-help.cec.eu.int>

## 7. Conclusions and recommendations

*Every industry/market is reshaped by patterns of strategic change that can drastically shift profit and power across the landscape. Sometimes the patterns build up slowly, sometimes they move rapidly – but change is always occurring. The ability to anticipate how the market's landscape is changing, connect symptoms to causes, and then create strategies is the most important aspect in market planning.... A. Slywotsky, D. Morrison*

European freshwater fish farming is not big compared to the marine aquaculture sector, but it is still an important part of European aquaculture. However, it has to be admitted that it is less important, diverse and profitable than marine aquaculture. At present, the European freshwater fish market is facing certain constraints in terms of the industry's fragmentation, low profitability for producers and sluggish sales growth of some traditional farmed species. The following conclusions have been made based on the analysis of the markets and the species.

1) The European freshwater fishery industry is characterized as **stagnant and highly fragmented**. Its high fragmentation is the result of numerous small producers that have traditionally been operating throughout Europe without common strategies and approaches for similar products. As production methods improved, the European farmers of freshwater fish did not adapt to the new situation, paying little attention to changes in consumer demand and market trends, or responding in an uncoordinated way. At present, the structure of the industry is a disadvantage for producers and an obstacle to product development, which can only be resolved by **convergence** of the industry. Producers should develop efficient links through associations or cooperatives, which will allow them to influence market aspects on a major scale.

2) Once growing and profitable, the European freshwater fish industry, as represented by the majority of trout and carp producers, has become mature and less financially rewarding. This situation has not come about as the result of one bad year, but rather good and bad years over the past decade. The situation is rather a paradox: while improving production technologies and investing solid funds, the freshwater fishery industry does not provide any significant economic reward to its producers. In reality, **low profitability** of the industry is connected to the industry's fragmentation and **overabundance of the same product** and business design within the industry. All the players compete in the same way, trying to lower product price in order to increase market share. A new

business design with a set of commonly accepted standards should be implemented, based on market differences and consumer needs.

3) Freshwater fish producers have to take a harder look at consumers. There is a substantial shortage of studies on market structure of the sector, and in particular, **consumer differences** and behaviour. Consumer variability provides enormous opportunity for freshwater fish producers who have underestimated consumers' priorities. These priorities must be matched perfectly and very cost-effectively, providing new benefits for buyers and profits for suppliers. In addition, some previous attempts to promote carp failed because it was addressed to the wrong consumers. Producers do not know who is buying their fish, and how to reach not only the end consumers, but also the decision makers.

4) Farmed species suffer from the lack of **promotion** and appropriate market instruments targeted to increase consumption. Producers have little or no influence on promotion and it is too expensive for each individual producer or trader to promote farmed products like trout and carp. United producer and trade associations will have more power on the market scene when choosing promotion methods and strategies. The case of the Norwegian Seafood Export Council and its teamwork in salmon marketing should be an example for European trout and carp producers regarding brand creation and promotion. It should be noted that lack of promotion together with increasing production could result in lower prices as a consequence of too much supply in the face of slowly growing demand. Common promotion methods should be organised in order to reach not only the end consumers, but also large-scale decision makers (advisers and sources of authority such as famous cooks and restaurant chefs).

5) Convergence of the industry will also have a significant impact on **distribution** aspects: until producers have significant power, the major retailers will remain out of reach and products will have to be channelled through local retailers and wholesalers. Only major producers can really take on direct sales to multiple retail outlets and supermarkets. Channel compression or squeezing by reducing the intermediary level is another important step in distribution optimisation.

6) **International trade** of freshwater fish is limited mostly due to the high transportation costs compared to product value. It is recommended that the local market potential should be investigated better in terms of new product forms (e.g. the introduction of carp fillets in Romania), and perhaps other new markets, especially Eastern European countries like Russia and Ukraine, should be sought. However, in many cases, local markets offer the best alternative for marketing of freshwater fish, but they can also be unstable because an increased supply can result in lower prices due to the limited demand.

7) Over time, changing market conditions create a shift from one set of customer priorities to another. Each market has its individual trends and preferences, but common tendencies towards increasing demand for **fresh and frozen processed products** have been observed. Simple fresh fillets are becoming consumer favourites, whereas whole live and fresh fish have experienced declining demand. Smoked fish products and ready-to-cook value-added products are also increasing their share in European consumption of freshwater species.

*A brief outlook for each freshwater fish species, based on the previous description of the markets, the species and SWOT analysis, follows.*

8) Taking into account the fact that the European **trout** industry is very mature, compared to that of the new species like Nile perch, tilapia and Pangasius, there are significant opportunities in the markets where trout is well known and favoured, such as France, Italy, Spain, Germany, Finland, Belgium, Austria and Sweden. Russia is an example of a new rapidly emerging market for trout, which can probably also be discovered in Ukraine, Hungary or Bulgaria. Generally, it is recommended that the European trout industry should implement a business design innovation based on **differentiation** (through superior product quality, product performance, efficiency in targeting different consumer segments), **rapid prototyping** (introduction of new products according to the current trends) or **leveraging internal capabilities** (R&D in farming techniques, i.e. in intensive production technology, higher technical level of farming, focus on recreational and sport fisheries).<sup>62</sup> Developing one or a combination of several strategies will lift the trout industry out of its traditional mode of business.

9) The **carp sector** appears to be a more mature industry with slower rates of market development compared to the trout industry. While the basic common set of strategies for differentiation, rapid prototyping and leveraging internal capabilities can be applied to the carp sector, **local markets** will provide the best opportunities. The carp industry in the Czech Republic, Poland and Germany could find additional markets by **simple processing** of existing products. Effective promotion campaigns and marketing activities should be organised as a part of product differentiation to boost carp demand, while the technical level of aquaculture and improved economic conditions for increasing production should be investigated as a part of leveraging internal capabilities.

10) **Nile perch** and **tilapia** are presently experiencing tough competition from Pangasius. Vietnamese product has much lower price than Nile perch and tilapia, which are in the same product category of convenient white fish fillets. Nile perch and tilapia have been “**caught in the middle**”, achieving neither premium price, nor superior product appearance, nor superior product focus or niche. As Vietnamese Pangasius is entirely represented in the form of frozen fillets, European importers of Nile perch and tilapia should concentrate on superior product differentiation, providing **fresh products in attractive forms**. Channel squeezing is another important option for importers of Nile perch and tilapia; however, the market opportunities should be regarded carefully, analysing all threats from the main competitors.

11) **Pangasius**, which is a rising star on the European market, is opening up a new catfish industry in Europe. Because Pangasius is the first successful catfish traded internationally, its emerging industry is setting up new standards such as product name, design, product form and colour, and production methods. It is extremely important for Pangasius producers and importers to create a common **dominant design** (a set of common rules and standards for Pangasius production recognized worldwide) that competitors and market players must adhere to when they enter the market and produce similar species under the Pangasius name. China, Bangladesh, Thailand and Indonesia have already started to look for Pangasius success, thus it is important that the dominant design of the Pangasius industry has an impact on enforcing and encouraging standardization. It is probable that in the future the species may become a commodity product like poultry, especially if competition is on the basis of costs and production scale.

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<sup>62</sup> Based on the context of strategies in mature industries, “Change Dynamics and Competitive Interaction”, Bocconi University, Milan.

12) Wild caught freshwater species like **European perch, northern pike, pike-perch and sturgeon** are found in a mature industry which is limited to the local market in the countries where the species are landed. There is probably no need for significant market expansion, unless there are possibilities in some neighbouring markets. Traditional retail and HORECA sector can provide the best opportunities for distribution of these species.

## Annex 1: European aquaculture production (in tonnes)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Austria	2,918	2,949	3,018	2,909	3,067	2,846	2,392	2,331	2,232
Belgium	846	946	846	846	1,597	1,871	1,630	1,600	1,010
Cyprus	98	105	105	100	66	78	83	80	90
Czech Republic	18,679	18,200	17,560	17,231	18,775	19,475	20,098	19,210	19,670
Denmark	44,730	41,924	39,697	42,364	42,666	43,605	41,570	31,734	32,205
Estonia	315	272	260	260	200	225	467	257	371
Faeroe Islands	72	535	1,435	1,433	2,034	1,206	3,001	10,034	9,199
Finland	17,345	17,659	16,426	16,024	15,449	15,400	15,739	15,132	13,335
France	60,231	63,546	64,883	57,549	52,794	54,299	59,191	57,892	50,680
Germany	45,050	45,024	43,028	41,730	41,527	41,677	41,676	41,707	45,646
Greece	2,277	3,227	3,398	3,042	3,185	3,329	3,727	2,976	2,697
Hungary	9,360	8,080	9,334	10,222	11,947	12,886	13,056	11,574	11,870
Iceland	860	855	1,145	1,105	961	961	1,423	1,727	1,844
Ireland	1,473	1,850	1,101	2,271	2,256	2,477	1,742	1,693	1,451
Italy	55,100	53,100	56,300	52,250	48,350	48,450	47,900	37,428	42,200
Latvia	525	380	345	425	468	325	463	430	637
Lithuania	1,714	1,537	1,516	1,516	1,650	1,947	1,979	1,710	2,307
Malta	3	<0.5	-	-	-	-	-	-	-
Netherlands	2,754	4,250	3,707	4,182	4,771	6,339	5,485	6,517	7,500
Norway	14,704	22,966	33,295	48,431	48,691	48,778	71,764	83,559	69,128
Poland	25,111	27,700	28,680	29,791	33,711	35,795	35,460	32,709	34,526
Portugal	964	1,334	1,003	1,264	1,252	1,296	1,218	1,237	959
Slovakia	1,617	954	1,254	642	870	864	981	810	850
Slovenia	727	742	790	751	1,091	1,054	1,108	1,167	1,147
Spain	22,377	25,409	29,550	30,615	30,644	33,846	35,876	33,224	33,810
Sweden	5,917	6,301	5,067	4,665	4,684	4,050	4,657	3,715	4,311
United Kingdom	16,617	16,811	15,950	16,563	17,209	11,024	13,263	14,488	15,403
<b>Total aquaculture output</b>	<b>352,384</b>	<b>366,656</b>	<b>379,693</b>	<b>388,181</b>	<b>389,915</b>	<b>394,103</b>	<b>425,949</b>	<b>414,941</b>	<b>405,078</b>
of which:									
<b>EU-25 production</b>	<b>336,748</b>	<b>342,300</b>	<b>343,818</b>	<b>337,212</b>	<b>338,229</b>	<b>343,158</b>	<b>349,761</b>	<b>319,621</b>	<b>324,907</b>
Other countries									
Albania	40	73	7	16	105	105	22	360	360
Belarus	5,463	6,038	4,322	4,727	4,824	6,716	4,666	6,523	5,393
Bosnia and Herzegovina								4,425	6,375
Bulgaria	4,350	4,685	5,370	4,160	7,680	3,644	2,935	2,253	4,450
Croatia	3,432	2,379	2,725	3,205	3,307	3,391	4,666	3,460	3,240
Macedonia, Fmr Yug Rp of	928	684	608	807	1,295	1,343	873	997	1,272
Moldova, Republic of	1,401	1,067	1,202	1,129	815	990	1,189	1,765	2,638
Romania	16,290	11,030	9,282	7,720	7,227	8,294	8,952	7,638	7,269
Russian Federation	59,990	51,640	51,096	62,075	68,052	73,562	89,576	100,884	107,867
Serbia and Montenegro	2,397	2,861	3,488	6,555	3,434	2,841	2,686	2,448	2,605
Switzerland	1,161	1,161	1,150	1,150	1,135	1,100	1,135	1,135	1,135
Turkey	13,113	19,290	29,300	35,580	39,470	45,346	38,754	35,143	41,411
Ukraine	34,870	32,212	29,813	28,200	31,846	30,724	30,703	30,606	24,860

## Landings of freshwater fish (in tonnes)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Albania	251	355	179	723	740	850	1,414	1,089	1,085
Andorra	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Austria	404	450	465	451	432	439	362	350	372
Belarus	630	741	465	431	966	524	902	5,828	6,894
Belgium	511	511	511	511	536	511	511	511	511
Bosnia and Herzegovina	1,500	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Bulgaria	736	1,008	1,808	2,263	2,455	833	1,623	1,419	1,807
Channel Islands	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
Croatia	371	440	415	10	10	17	34	25	19
Czech Republic	3,929	3,524	3,321	3,952	4,190	4,654	4,646	4,983	5,127
Cyprus	65	64	70	70	70	78	70	60	56
Estonia	3,619	3,792	3,640	4,882	4,000	4,070	3,487	5,846	5,046
Faeroe Islands	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Finland	63,215	64,383	64,528	55,556	55,441	48,218	48,215	46,716	46,901
France	4,904	4,998	6,388	4,978	2,395	2,518	2,513	2,468	2,427
Germany	24,704	24,422	24,698	24,556	24,747	24,112	24,196	24,083	23,975
Greece	3,637	2,887	2,438	2,408	2,854	3,030	2,804	2,591	2,721
Hungary	7,314	7,606	7,406	7,265	7,514	7,101	6,638	6,750	6,536
Iceland	250	250	250	250	250	91	72	113	115
Ireland	3,675	3,675	3,699	3,875	797	260	110	122	117
Isle of Man	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
Italy	10,651	7,301	7,374	5,080	5,798	4,785	5,756	4,487	4,699
Latvia	1,010	1,047	984	826	965	964	910	857	725
Liechtenstein	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lithuania	1,262	1,293	1,714	1,874	1,923	1,893	2,070	2,241	2,209
Luxembourg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Macedonia, Fmr Yug Rp of	208	78	130	131	135	208	128	148	162
Malta	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Moldova, Republic of	709	603	569	491	309	344	387	565	343
Netherlands	4,147	2,193	2,324	1,569	2,359	2,346	2,349	2,412	2,366
Norway	558	434	671	527	632	453	465	472	390
Poland	28,056	25,223	18,530	17,586	18,589	21,980	22,029	23,670	24,246
Portugal	3	<0.5	<0.5	<0.5	31	30	39	56	14
Romania	8,722	5,755	3,872	4,149	5,230	4,737	5,082	4,572	7,789
Russian Federation	107,588	118,960	120,076	132,218	111,489	132,860	119,979	134,471	139,580
Serbia and Montenegro	1,074	1,235	1,066	869	828	672	570	937	569
Slovakia	1,950	1,414	1,364	1,361	1,396	1,368	1,531	1,746	1,646
Slovenia	316	289	302	269	243	226	206	226	195
Spain	6,175	6,286	6,296	6,250	6,248	6,303	6,275	7,556	6,274
Sweden	4,457	4,231	4,337	3,216	3,105	2,978	2,689	3,318	3,943
Switzerland	1,588	1,834	1,847	1,803	1,829	1,639	1,697	1,521	1,792
Ukraine	6,326	7,734	4,902	4,833	3,990	3,992	4,564	4,107	12,660
United Kingdom	1,382	4,076	3,703	5,378	5,317	7,538	2,622	2,949	3,432
<b>EU 25 landings</b>	<b>176,780</b>	<b>170,773</b>	<b>165,292</b>	<b>153,030</b>	<b>150,074</b>	<b>146,383</b>	<b>140,979</b>	<b>144,817</b>	<b>144,478</b>
<b>Landings, included other countries</b>	<b>305,646</b>	<b>310,737</b>	<b>302,163</b>	<b>301,888</b>	<b>279,073</b>	<b>293,772</b>	<b>278,945</b>	<b>301,265</b>	<b>318,743</b>

## Annex 2: European export of freshwater fish (in tonnes)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Austria	247	285	584	904	1,305	1,412	1,143	3,109	6,416
Belgium	4,656	5,551	13,989	16,338	6,554	15,878	26,865	21,843	21,664
Cyprus	6	1	2	2	5	1	-	77	128
Czech Republic	7,837	7,935	6,297	7,867	7,176	8,560	8,897	8,824	8,672
Denmark	26,040	29,950	37,569	39,325	41,199	36,129	32,400	32,754	30,413
Estonia	.	.	.	327	257	104	412	2,031	1,589
Faeroe Islands	63	499	1,255	852	1,806	916	2,293	7,620	8,020
Finland	1,138	1,103	1,356	1,282	1,673	580	811	977	1,094
France	5,082	5,011	6,326	7,644	8,167	8,507	7,399	6,900	6,690
Germany	2,334	2,590	2,796	3,353	3,209	5,261	5,672	6,248	7,457
Greece	1,494	875	917	1,058	1,819	936	1,064	1,201	1,041
Hungary	1,578	1,701	768	1,507	1,340	896	525	381	780
Iceland	525	496	669	660	536	613	632	584	780
Ireland	1,740	1,738	3,665	3,861	4,051	3,097	3,780	4,479	2,976
Italy	5,865	6,594	7,501	8,074	6,215	6,693	8,583	6,088	4,469
Latvia	14	3	22	21	6	-	8	13	34
Lithuania	108	333	824	235	1,325	431	1,365	1,906	3,042
Luxembourg	.	.	.	.	.	752	828	2,074	1,752
Malta	.	.	5	-	-	-	-	-	-
Netherlands	8,024	11,076	9,634	8,768	14,794	17,763	25,294	22,875	28,177
Norway	8,191	15,459	22,784	34,074	35,560	27,934	45,622	62,539	53,731
Poland	1,084	890	965	3,342	4,407	3,009	2,479	2,100	2,413
Portugal	688	220	331	249	284	49	117	34	141
Slovakia	320	296	307	350	349	310	205	277	423
Slovenia	5	-	6	17	4	37	1	11	6
Spain	2,825	3,984	4,575	4,193	5,424	6,266	8,024	8,656	7,308
Sweden	3,279	3,710	3,495	4,310	4,504	3,482	4,469	6,033	7,469
United Kingdom	2,266	2,147	1,824	2,133	3,316	2,243	3,670	3,543	2,302
<b>Total exports</b>	<b>85,409</b>	<b>102,447</b>	<b>128,466</b>	<b>150,746</b>	<b>155,285</b>	<b>151,859</b>	<b>192,558</b>	<b>213,177</b>	<b>208,987</b>
of which:									
<b>EU-25 exports</b>	<b>76,630</b>	<b>85,993</b>	<b>103,758</b>	<b>115,160</b>	<b>117,383</b>	<b>122,396</b>	<b>144,011</b>	<b>142,434</b>	<b>146,456</b>
Other countries									
Albania	51	7	16	17	53	13	22	16	28
Belarus	265	174	205	-	60	16	63	56	10
Bosnia and Herzegovina	.	.	.	.	.	.	.	55	268
Bulgaria	.	.	.	.	254	203	243	278	249
Croatia	627	988	604	595	406	270	1,097	478	451
Macedonia, Former Republic of Yugoslavia	.	.	.	18	3	2	-	2	10
Moldova, Republic of	-	-	-	-	-	-	-	-	-
Romania	-	1	-	8	4	1	1	1	-
Russian Federation	.	.	.	.	.	233	74	270	221
Serbia and Montenegro	.	30	5	-	69	27	55	72	59
Switzerland	49	15	9	8	22	4	6	33	34
Turkey	1,044	634	1,312	1,404	2,307	220	2,969	2,783	2,115
Ukraine									

## European imports of freshwater fish (in tonnes)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
Austria	1,598	3,364	4,088	4,561	5,770	5,179	5,904	7,267	11,321
Belgium	11,438	10,851	19,764	22,703	12,458	26,133	35,240	27,346	28,861
Cyprus	76	4	-	5	13	9	31	20	41
Czech Republic	391	769	705	792	622	665	713	986	999
Denmark	4,601	3,954	7,344	6,317	6,527	8,394	10,313	9,502	8,489
Estonia	.	.	.	507	641	485	850	2,713	2,314
Faeroe Islands	-	-	-	-	-	2	5	38	-
Finland	630	693	960	2,333	1,204	1,690	3,648	6,982	8,633
France	7,983	8,835	12,155	12,290	9,688	13,570	18,544	17,201	20,522
Germany	32,038	34,226	37,273	32,378	33,456	35,509	42,734	39,276	42,342
Greece	2,184	3,142	3,823	10,355	1,102	1,701	2,295	3,310	3,295
Hungary	308	376	408	105	332	71	540	572	623
Iceland	-	1	21	33	2	1	2	1	2
Ireland	84	44	59	66	93	127	309	387	380
Italy	4,828	6,629	5,608	6,555	5,077	8,657	10,952	10,466	13,236
Latvia	98	70	214	506	307	531	907	1,184	888
Lithuania	4	246	733	100	1,209	78	1,081	1,457	2,070
Luxembourg	.	.	.	.	.	1,004	1,451	2,591	1,565
Malta	-	-	64	54	393	264	61	24	73
Netherlands	17,837	21,404	16,080	17,413	16,322	21,500	23,228	23,134	27,253
Norway	660	371	397	525	338	439	351	339	401
Poland	1,789	1,193	1,373	5,775	7,406	6,387	6,912	5,484	6,660
Portugal	1,360	1,016	1,354	2,225	1,451	2,320	2,211	3,900	4,328
Slovakia	1,361	1,909	1,234	1,397	1,631	1,632	1,619	1,594	1,810
Slovenia	43	39	26	82	56	50	12	49	86
Spain	5,123	9,570	3,091	4,327	3,169	6,157	7,705	6,542	9,866
Sweden	1,919	1,747	2,218	4,813	2,325	2,257	3,477	4,797	6,244
United Kingdom	7,482	8,441	8,519	10,034	9,546	10,399	12,712	13,013	13,757
<b>Total exports</b>	<b>103,835</b>	<b>118,894</b>	<b>127,511</b>	<b>146,251</b>	<b>121,138</b>	<b>155,211</b>	<b>193,807</b>	<b>190,175</b>	<b>216,059</b>
of which									
<b>EU-25 imports:</b>	<b>103,175</b>	<b>118,522</b>	<b>127,093</b>	<b>145,693</b>	<b>120,798</b>	<b>154,769</b>	<b>193,449</b>	<b>189,797</b>	<b>215,656</b>
<b>Other countries</b>									
Albania	10	26	9	-	25	26	23	57	134
Belarus	-	-	-	1,360	1,942	245	1,750	1,409	476
Bosnia and Herzegovina	.	.	1	8	192	98	458	324	5
Bulgaria	-	7	-	-	7	3	3	2	175
Croatia	.	5	2	40	2	-	-	9	42
Macedonia, Fmr Yug Rp of	.	.	.	40	69	89	-	173	146
Moldova, Republic of	19	26	62	1	1	2	1	28	22
Romania	-	3	-	53	71	105	53	159	332
Russian Federation	.	.	.	.	.	1,078	4,080	13,494	16,719
Serbia and Montenegro	47	796	705	1,578	601	705	1,170	1,034	832
Switzerland	6,528	6,251	6,771	7,008	7,199	7,399	8,699	8,494	7,721
Turkey	30	27	60	148	71	372	107	129	36
Ukraine	.	.	.	.	.	.	233	864	1,149

### Top importers of freshwater fish in 2003

Country	Volume (in tonnes)	%	Value (US\$ '000)	%
Germany	42,342	20	177,508	20
Belgium	28,861	13	119,532	13
Netherlands	27,253	13	122,770	14
France	20,522	9	91,544	10
United Kingdom	13,757	6	42,993	5
Italy	13,236	6	61,855	7
Austria	11,321	5	41,352	5
Spain	9,866	5	53,763	6
Finland	8,633	4	24,770	3
Denmark	8,489	4	44,326	5
Other	31,779	15	112,794	12
<b>TOTAL</b>	<b>216,059</b>	<b>100</b>	<b>893,207</b>	<b>100</b>

### Top exporters of freshwater fish in 2003 (in tonnes)

Country	Volume (in tonnes)	%	Value (US\$ '000)	%
Norway	53,731	26	179,181	20
Denmark	30,413	15	155,814	17
Netherlands	28,177	13	170,308	19
Belgium	21,664	10	92,592	10
Czech Republic	8,672	4	16,842	2
Faeroe Islands	8,020	4	24,263	3
Sweden	7,469	4	27,572	3
Germany	7,457	4	35,370	4
Spain	7,308	3	31,378	3
France	6,690	3	55,033	6
Austria	6,416	3	22,941	2
Italy	4,469	2	16,263	2
Other	18,501	9	80,095	9
<b>TOTAL</b>	<b>208,987</b>	<b>100</b>	<b>907,652</b>	<b>100</b>

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