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SEA BASS AND SEA BREAM SUPPLY CHAIN STUDY: FROM TURKEY TO EUROPE

RESPONSIBLE SEAFOOD
CONSUMPTION FOR THE BENEFIT
OF PEOPLE, OCEANS AND CLIMATE

MAY 2021

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Sea bream in the cage © Tahsin Ceylan_Turkey

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Large fish farming unit of sea bass and sea bream © Aerial-motion / Shutterstock / WWF

SUMMARY

Under WWF's EU co-funded Fish Forward II project ('Responsible seafood consumption for the benefit of people, oceans and climate'), this report aims to raise awareness of the impacts of seafood consumption and increase behaviour changes in both European corporates and consumers towards more sustainable options.

The European Union (EU) is the largest importer of seafood in the world. It imports large quantities from developing countries, but there is frequently a lack of knowledge about the sustainability of the imported seafood products. This report focuses on farmed sea bass and sea bream (SBSB) from Turkey, which has the European Union (EU) and United Kingdom (UK) market as its primary destination. The report serves as an exemplary study to highlight the interdependency between European consumption of seafood and its production in source countries. Given that Turkey has become one of the world's leading producers of farmed SBSB, and that the EU and UK are its most important international seafood trade partners, there are compelling reasons to focus on this specific supply chain.

This report provides a comprehensive snapshot of the supply chain for Turkish SBSB exports to Europe, with a focus on the UK and Austrian markets. Qualitative surveys covering production methods, traceability, certification schemes, climate change mitigation/adaptation, labour conditions and gender ratio were conducted with Turkish

aquaculture industry players. Interviews with UK and Austrian retailers and their suppliers were also conducted to understand retailers' expectations of their supply chains and thus to compare production reality in Turkey versus market requirements in the EU and UK.

The report shows that the Turkish SBSB aquaculture sector is on par with its European counterparts in terms of technical organisation and supply chain proficiency, industrial scale, compliance with European legislation, and knowledge of European market requirements. Environmental sustainability has been recognised as a key requirement for European market access, and the sector has adapted to the conditions of environmental certification schemes. However, as with other global aquaculture industries, there are challenges which the Turkish farmed SBSB industry needs to address. This report identifies existing and future challenges, and provides relevant stakeholders in Turkey, the EU and the UK with recommendations for moving further towards environmental sustainability and social responsibility.

CHALLENGES AND RECOMMENDATIONS

TOPIC	CHALLENGES	TARGET AUDIENCE	RECOMMENDATIONS
PRODUCTION MANAGEMENT	1. Partial third-party sustainability certification	Turkish producers (all sectors)	Increase amount of certified product
		Certification standard owners	Strictly implement mass balance of certified farms or companies
	2. Maintaining traceability data	Turkish producers (hatcheries, grow-out farms)	Adopt digitalised technologies in real-time and networked management and monitoring systems
PRODUCTION INPUTS	3. Consistent application of humane slaughter methods (i.e. stunning)	Turkish producers (grow-out farms)	Develop approach to ensure procedures and methods are improved in line with retailer requirements
		Retailers	Request verifiable evidence of the harvest of the fish to ensure the use of stunning machines
CLIMATE CHANGE		Demonstrating sustainable and traceable aquaculture feed sourcing	All relevant stakeholders in the supply chain
	Turkish producers (feed manufacturers and grow-out farms)		Be transparent on sourcing of feed
	Retailers		Work with suppliers to develop strategy for alternative ingredients
SOCIAL	Lack of tangible adaptation and mitigation policies and practices	Turkish management authorities	Develop and implement bold national climate change adaptation and mitigation policies which will cover the SBSB sector
		Turkish producers (all)	Develop strategic approaches to reduce carbon footprint
		Retailers	Develop strategic approaches to reduce carbon footprint
SOCIAL	1. Preserving scale diversity in the sector	Turkish management authorities	Develop policies to enable a level playing field and healthy balance of scale diversity
		Turkish producers (small-scale SBSB grow-out farms)	Develop alternative business models to differentiate products from mass production
	2. Consistently meeting social requirements of EU and UK markets	Turkish producers (all)	Be prepared to uptake certification standards (e.g. ASC) with stricter requirements
	3. Lack of full implementation of health and safety requirements	Turkish producers (all)	Make health and safety practices part of standard operating practices
	4. Underrepresentation of women in aquaculture operations	Turkish producers (all)	Actively recruit qualified women and undertake projects that serve to support women
	5. Sector employees not members of worker associations or unions	Turkish management authorities	Promote awareness of the rights of workers and work with relevant stakeholders to address this issue
6. Lack of social responsibility projects and policies	Turkish producers (all)	Awareness of corporate social responsibility should be increased within the SBSB supply chain sectors	
	Civil society organisations	Work with Turkish producer organisations and the Corporate Social Responsibility Association of Turkey to support awareness raising	

Implementation of the recommendations will allow key SBSB supply chain stakeholders to address specific challenges identified in this report. It is also recommended that additional research should be undertaken to closely investigate specific topics and support the Turkish SBSB industry for further improvement.

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ACRONYMS

3PL	Third-party logistics	HMP	Health management plan
ASC	Aquaculture Stewardship Council	HMRC	Her Majesty's Revenue and Customs
BAP	Best Aquaculture Practices	IFS	International Featured Standards
BRC	British Retail Consortium	ILO	International Labour Organization
BRCGS	British Retail Consortium Global Standard	ISO	International Organization for Standardization
BSCI	Business Social Compliance Initiative	MAF	Ministry of Agriculture and Forestry
CFM	Compound feed manufacturing	MAP	Modified atmosphere packaging
CoC	Chain of custody	MEP	MacAlister Elliott & Partners
EEZ	Exclusive Economic Zone	OIE	The World Organisation for Animal Health
EU	European Union	RAS	Recirculated aquaculture system
FAO	United Nations Food and Agriculture Organization	SBSB	European sea bass and gilthead sea bream
FFDR _m	Forage fish dependency ratio for fish meal	TL	Turkish lira
FFDR _o	Forage fish dependency ratio for fish oil	TRIX	Trophic index
GFCM	FAO General Fisheries Commission for the Mediterranean	Turkstat	Turkish Statistical Institute
GHG	Greenhouse gas	UFAS	Universal Feed Assurance Scheme
GLOBALG.A.P.	Global Good Agricultural Practice	UK	United Kingdom
GMO	Genetically modified organism	VHP	Veterinary health plan
HACCP	Hazard analysis and critical control points	WWF	World Wide Fund for Nature

SECTION 1

INTRODUCTION

As the world's largest importer of wild and farmed seafood (EUMOFA, 2020), the European Union (EU) has significant impacts on people, oceans and climate (Swartz *et al.*, 2010, Asche *et al.*, 2015, Crona *et al.*, 2015). Consumption patterns, consumer behaviours, sourcing policies of retailers and food services providers (e.g. canteens, restaurants, seafood outlets) and government regulatory requirements all have a substantial influence on how seafood is produced in source countries, particularly in developing countries outside the EU.

While traditional whitefish species like Atlantic cod, haddock and European hake are still popular seafood choices in the EU, there is an upward trend in the consumption of farmed European sea bass (*Dicentrarchus labrax*) and gilthead sea bream (*Sparus aurata*). Global production of farmed European sea bass and sea bream (SBSB) has grown significantly over the last decade, with an increase of 86%¹ for sea bass and 68%² for sea bream between 2008 and 2017. Although the EU's Mediterranean member states do farm SBSB, developing countries like Egypt, Tunisia and particularly Turkey have been responsible for the majority of the increased production of these two species.

The EU imports SBSB to meet consumer demand. Key consuming countries include Spain, Portugal, Greece, Italy and the UK, and the world-leading producer and non-EU exporting country is Turkey. According to the Turkish Statistical Institute (Turkstat), Turkish production in 2018 reached 116,915 tonnes for sea bass and 76,680 tonnes for sea bream. The UK, and to a lesser extent Austria, are leading European export markets for Turkish SBSB.*

Turkish SBSB supply chains to export markets like the EU are complex, linking input procurement (e.g. fish feed, hatchery reared-fry/juvenile), grow-out, packaging/processing, exporters, transportation, retailers and consumption. Although they deal with two different species, SBSB export supply chains follow similar patterns.

WWF's EU co-funded Fish Forward II project ('Responsible seafood consumption for the benefit of people, oceans and climate') aims to change the behaviour of European consumers and corporates, by increasing public awareness of the implications of seafood sourcing and consumption on people and oceans, both in developing countries and in Europe.

86%
INCREASE IN GLOBAL
PRODUCTION OF FARMED
EUROPEAN SEA BASS AND

68%
INCREASE OF FARMED
GILTHEAD SEA BREAM
BETWEEN 2008
AND 2017

* While European production of farmed SBSB is relatively stable, production in Turkey is still on the rise, as are EU imports of both species from Turkey: these increased by 15% from 2018 to 2019. At the same time the import prices of both decreased on average by 4%: farmed sea bass prices decreased by 9% to 3.78 EUR/kg, while farmed sea bream remained stable at around 3.90 EUR/kg. However, in the first semester of 2020, EU apparent consumption of sea bass and sea bream was down by approximately 6%, with sea bass reporting the strongest decline. Source: www.eumofa.eu/documents/20178/415635/EN_The+EU+fish+market_2020.pdf/fe6285bb-5446-ac1a-e213-6fd6f64d0d85?t=1604671147068

SECTION 2

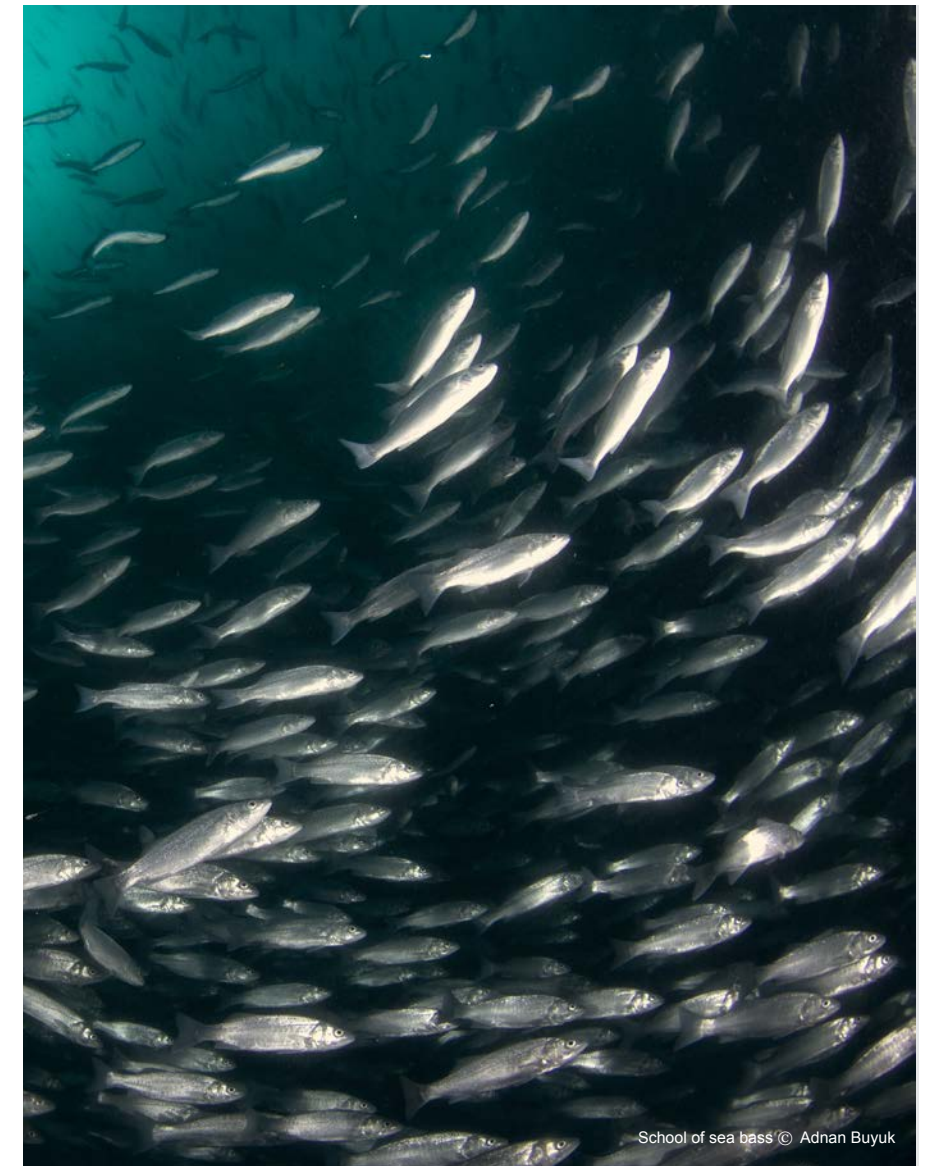
OBJECTIVES

This report aims to highlight the importance of seafood producers gaining access to European markets, as well as of European retailers purchasing power with these sources. The Turkish SBSB supply chain is an excellent example of how a developing country has managed to position itself as an important seafood exporter to Europe, and illustrates how the Turkish SBSB industry strives to meet European market expectations concerning environmental sustainability and social responsibility.

The report provides an overview of the supply chain for Turkish SBSB exports to Europe, with a specific focus on the UK and Austrian markets. It maps the path of farmed Turkish SBSB from the hatcheries and feed sector, through to SBSB farms, logistics companies and exporters to European retailers; and quantifies the volume and value of SBSB exports to the EU market in general as well as to the UK and Austria specifically.

Moreover, the study discusses the sustainability of the Turkish SBSB supply chain to Europe, taking environmental and social aspects into consideration and providing information on production methods, traceability, certification schemes, climate change mitigation/adaptation, labour conditions and gender ratios within the SBSB industry.

Finally, the report highlights the sustainability expectations of EU retailers (e.g. their sourcing policies); it addresses these directly through interviews with the SBSB sector, as well as by assessing the legislative framework and the existence of certification schemes in Turkey. This enables the identification of current barriers in the SBSB export market, and the steps that need to be taken to overcome them.



School of sea bass © Adnan Buyuk

SECTION 3

METHODOLOGY

The study is divided into Turkey and Europe (i.e. Austria and UK) sections. The Turkey section sheds light on the environmental and social aspects of SBSB production in Turkey. The Europe section, in turn, surveys the conditions and requirements set by the Austrian and UK markets to address the environmental and social issues identified.

The main SBSB supply chain actors involved in this study were input suppliers (feed manufacturers and hatcheries), producers (cage and land-based farms), processors, exporters, transporters and third-party certification bodies.

Surveys were conducted in the Turkish provinces of Muğla and İzmir, where most of the SBSB industry is located. Primary data for the study was collected through face-to-face interviews using unstructured survey questionnaires. Bespoke questionnaires were designed for each section of the Turkish supply chain, but all were asked questions covering food safety and traceability, environment, working conditions and gender, social responsibility and climate change. An open-ended questions approach (i.e. unstructured survey design) was adopted to allow surveyors to gather respondents' opinions in depth, without limiting their answers to given choices.

Surveys are clearly a valuable tool to gather qualitative information on various environmental and social topics, and to develop a deeper understanding of the SBSB sector in Turkey. However, surveys have their limitations in assessing environmental and social impacts, and further in-depth research needs to be conducted on the various topics addressed in this study.

For the UK and Austrian sections, all surveys were completed via phone-based interviews with key sustainability managers at the major retailers/suppliers.³ This was also supported by an extensive review of purchasing policies – these are available online for many retailers.

Table 1 shows the breakdown of companies surveyed within the SBSB supply chain. Care should be taken when interpreting the survey coverage, due to the vertical integration of supply chain components and the presence of large-scale companies owning multiple farms and sites in Turkey.

Table 1. Breakdown of companies surveyed in the study

SUPPLY CHAIN COMPONENT	NUMBER SURVEYED
Feed manufacturer (Turkey)	5
Hatchery (Turkey)	6
Grow-out (Turkey)	10
Packaging and processing (Turkey)	7
Packaging and processing (UK)	3
Exporter (Turkey)	1
Transportation (Turkey)	2
Retail (UK and Austria)	3
Total	37
Other	
Certification	4

Information gathered from survey questionnaires was analysed using descriptive statistics (i.e. frequencies and averages) and content analysis. Due to the open-ended and qualitative nature of the questions only exploratory and descriptive data analyses were carried out in this study.

SECTION 4

AN OVERVIEW OF THE TURKISH SEA BASS AND SEA BREAM FARMING SECTOR

4.1 PRODUCTION AND STRUCTURE

Although freshwater aquaculture started in the 1970s in Turkey, marine SBSB aquaculture emerged later in the mid-1980s. Today, Turkey is the world's leading country for SBSB farming, with steadily increasing production reaching over 193,000 tonnes in 2018 (Figure 1) and constituting nearly 62% of the total Turkish aquaculture production of 314,537 tonnes.

In Turkey, Muğla and İzmir provinces on the shores of the Aegean are the heart of the SBSB industry (Figure 2). They contributed 49% and 37% respectively of the overall production of farmed SBSB in Turkey in 2018 (193,595 tonnes). SBSB is also farmed in Mersin and Hatay provinces on Turkey's Mediterranean coast, while a few farms on the Black Sea coast produce sea bass along with large rainbow trout.

According to the latest figures from Turkey's Ministry of Agriculture and Forestry (MAF, 2019) 426 farms were engaged in mariculture (sea bass, sea bream, meagre, rainbow trout, bluefin tuna, mussels, etc), of which 380 were rearing sea bass and sea bream. This number also included land-based marine SBSB farms.

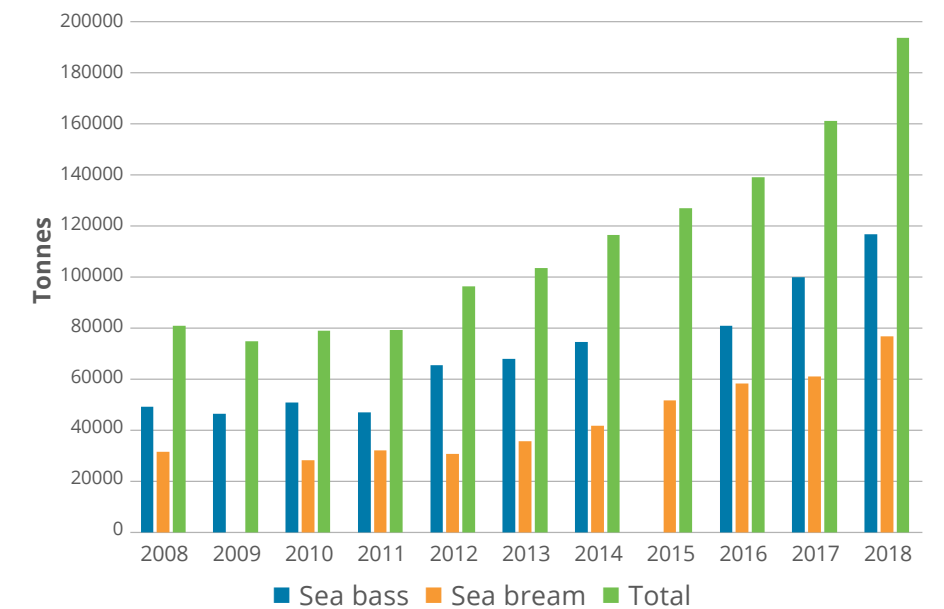


Figure 1: Trend in production of farmed SBSB in Turkey (Source: Turkstat, 2018)

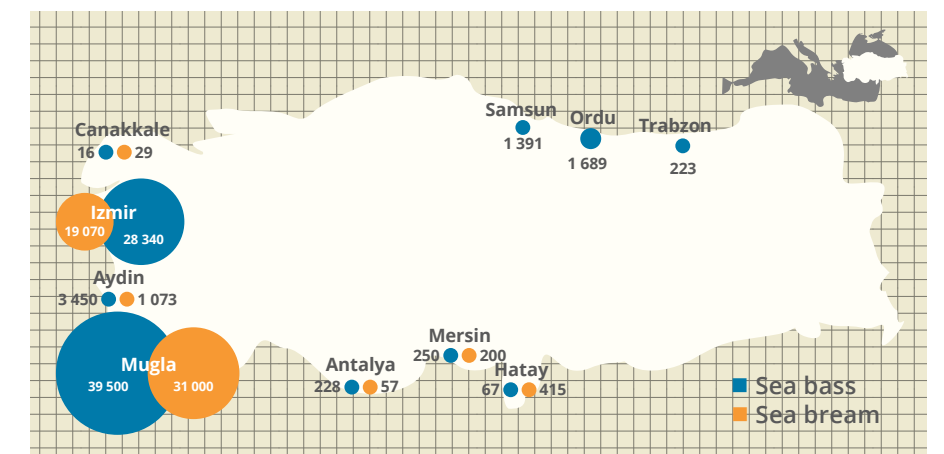


Figure 2: Geographical distribution and production volumes (tonnes) of SBSB farms in Turkey in 2015 (Based on figures from Turkstat, 2016; in: Rad and Şen, 2016)

Small-scale farms with an annual capacity of 1-100 tonnes are generally land-based onshore operations (Image 1), using earthen ponds and wells with underground saline water. Despite their number their contribution to overall national SBSB production is not significant (3%). By contrast, large-scale farms ($\geq 1,000$ tonnes) account for nearly 60% of overall production.

The most evident trend in the development of Turkish SBSB farming in the last 10-12 years has been the relocation of cage farms from onshore to offshore sites for environmental reasons. According to the amendment of Environmental Law No. 2872 in 2007, marine cage farms cannot be set up in closed bays and estuaries where there are naturally sensitive or archaeological sites. This concerns areas with a depth of less than 40m, which are less than 0.6 miles from the coastline, and where the water current is less than 0.1 m/s (Yücel-Gier *et al.*, 2009).



Image 1: Land-based farms in Muğla province (Rad, 2019)

The amendment resulted in a shift of SBSB farms to offshore sites and an uptake of offshore technology. The high capital investment required for the establishment of offshore facilities (e.g. cages and sophisticated mooring systems) along with market dynamics (e.g. competition in domestic and international markets and lower profit margins) pushed the companies to consolidate and increase in scale. The result was the emergence of vertically integrated and large-scale ($\geq 1,000$ tonnes) companies. Today, a single large-scale vertically integrated company can run its own hatchery, feed factory and processing unit, and operate several grow-out sites.

Polyethylene offshore cages with a diameter of 20-50m are used in offshore sites (Image 2). The depth of nets used in cages can vary from 7-20m depending on the diameter of the cage and production stage. For better logistics and feed management, fully automatic feed barge systems are commonly used by large-scale farms in offshore sites (Image 2).

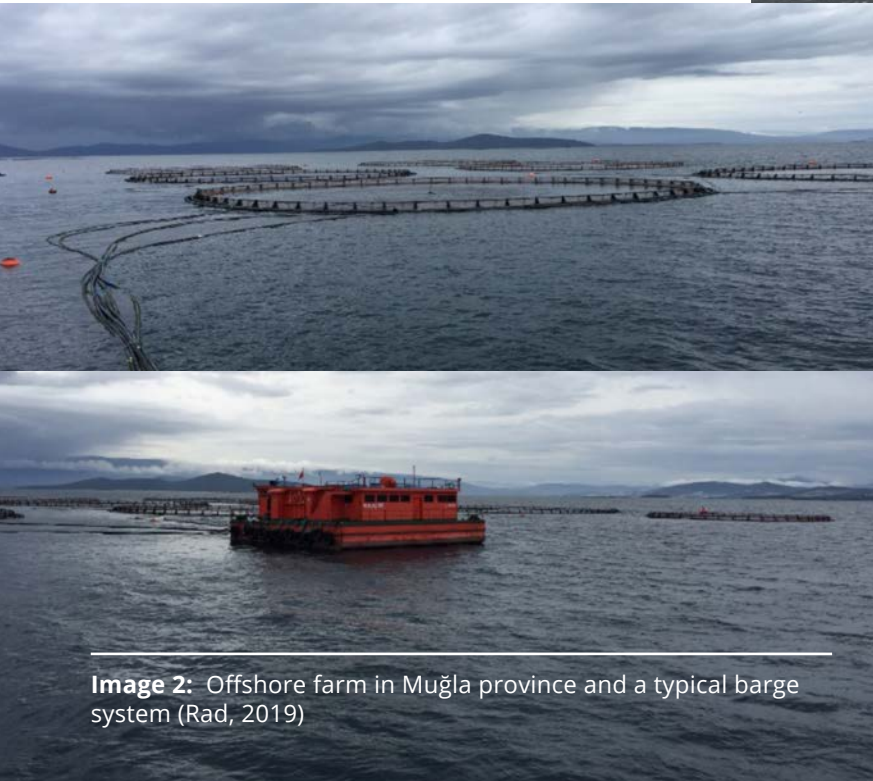


Image 2: Offshore farm in Muğla province and a typical barge system (Rad, 2019)

Currently there are 19 marine hatcheries (Image 3) in Turkey supplying SBSB fry to grow-out farms. Most of the marine hatcheries are located in Muğla and Izmir provinces, where grow-out farms are concentrated. Turkish marine hatcheries are licensed in theory to produce about 776 million fry per year. Turkey is not only self-sufficient in the production of SBSB fry, but is also an exporter of fry to Gulf countries (e.g. Saudi Arabia, Oman) and Tunisia.

The fish feed production sector has also grown rapidly in Turkey in parallel with the development of aquaculture. The number of fish feed manufacturers rose from 10 in 2007 to 24 in 2017. As with the rest of the SBSB industry, the major fish feed producers are based in Muğla (4) and Izmir (5) provinces. In 2016, over 461,000 tonnes of fish feed was produced in Turkey (Emiroglu, İsgören *et al.*, 2019).



Image 3: SBSB hatchery (Rad, 2019)

4.2 PRODUCTION PROCESS

In cage culture, the SBSB production process consists of pre-grow-out and grow-out phases (Figure 3). The production cycle begins with stocking of hatchery-reared fry. The common practice is to start with fry of 2-5g. However, depending on the availability of size classes in hatcheries, smaller fry (0.8-2g) can also be used for initial stocking. Cages with a diameter of about 20m with a net of 7m (+1m freeboard) are commonly used in pre-grow-out phases. General husbandry practices including feeding and grading are the main activities until juveniles reach a mean weight of about 20g. Juveniles reaching 20g are vaccinated and weaned to about 40-60g in three to six months. At this point they are graded and transferred to grow-out cages. Grow-out cages are larger, with a diameter of 30-50m. Nets of 12m (+1m freeboard), 18m (+1m freeboard) or even 20m (+1m freeboard) are used depending on the size of the cage and the water depth. As the fish grow in size, nets with larger meshes are used.

In small- and medium-scale farms with a single production cycle the stocking of fry in cages starts

around March or April. Grading and vaccination are usually completed by November. In large-scale farms with multiple production cycles initial stocking, grading, vaccination and transfers from pre-grow-out to grow-out cages is a continuous process year-round. Cage farms mainly use Dyneema nets, double nets and sieve systems, and divers frequently check the nets as a precaution to reduce escapes.

SBSB are harvested when they reach a weight of 300-350g, which is the most common market size sold. Harvesting time (i.e. pre-grow-out and grow-out) varies depending on the initial size of the fry, environmental parameters and management practices of the farm. In Muğla, sea bass reaches a size of 350g in about 16 months, while sea bream grows faster during grow-out season and reaches a size of about 300g in 12 months.

Although 300-350g is the most common market size, sea bream and particularly sea bass can be grown larger depending on market demand. Harvest size of sea bass can be as variable as 200-400g, 400-600g, 600-800g and >1kg. For large sea bass, the harvesting time can be 24 months or longer.

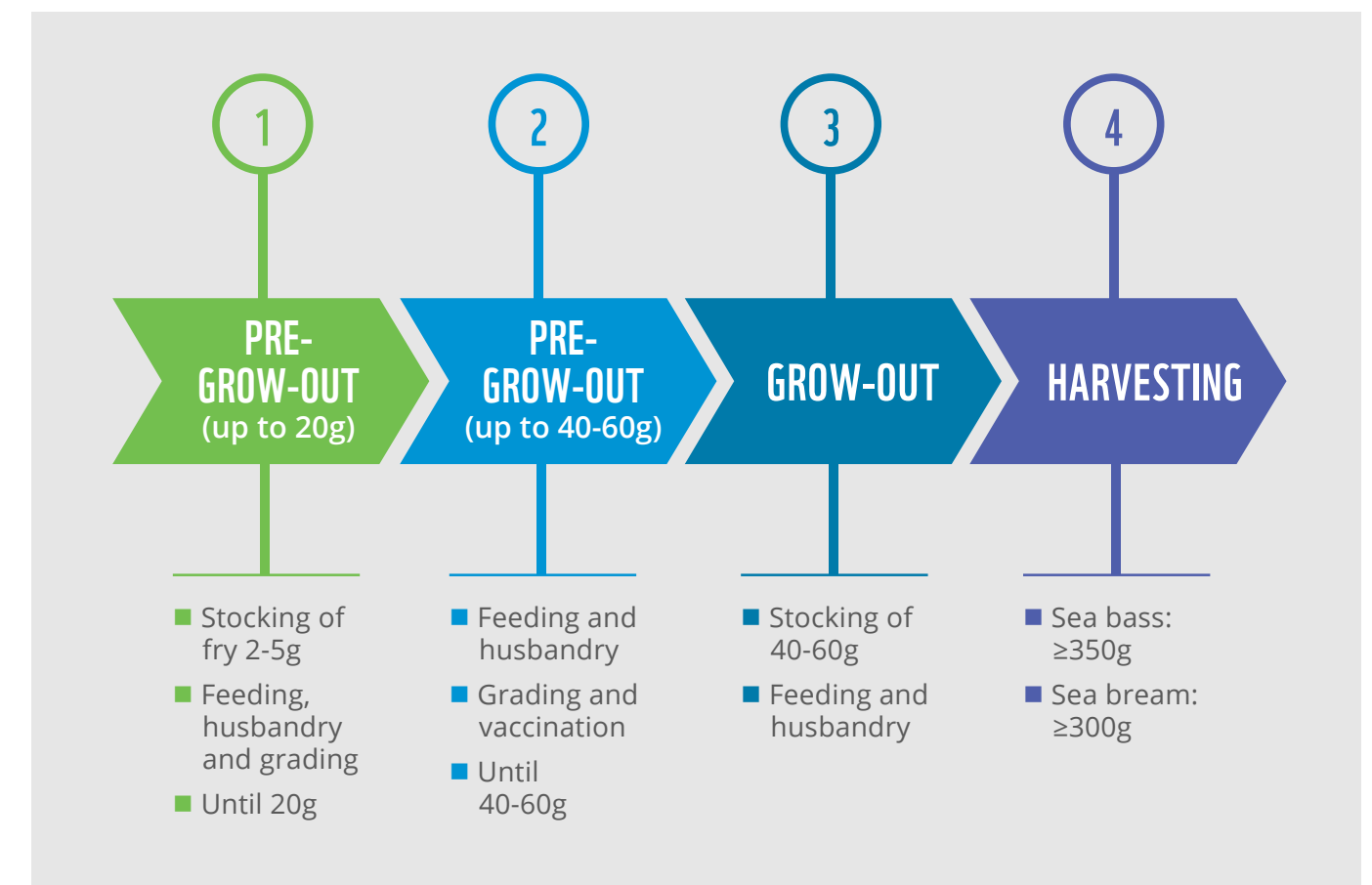


Figure 3: Schematic production process of SBSB

SECTION 5

TREND OF TURKISH SBSB TRADE TO THE EU AND UK

5.1 AN OVERVIEW OF TURKISH SBSB EXPORTS

EU member countries and the UK are among the top 10 export destinations for Turkish seafood. Exports are mainly farmed species including sea bass, sea bream and rainbow trout. EU countries such as the Netherlands and Germany, and non-EU countries such as the UK, Russia, Lebanon, the US and Japan have become important markets in recent years (Table 2).

The breakdown of Turkish exports of farmed seafood by species shows the leading position of SBSB (Figure 4). The geographic diversity of export destinations for Turkish farmed products (Table 2) also reveals that the SBSB subsector is fully integrated with international markets, and particularly the EU market.

Table 2. Top 10 export destinations for Turkish seafood in 2018 by volume (Source: Anadolu news agency, 2019).

	COUNTRY	IMPORTS (TONNES)
1	Netherlands	22,018
2	Italy	20,422
3	Russian Federation	14,749
4	Greece	14,225
5	Spain	11,236
6	Germany	10,710
7	Lebanon	9,532
8	UK	9,486
9	USA	5,505
10	Japan	4,787

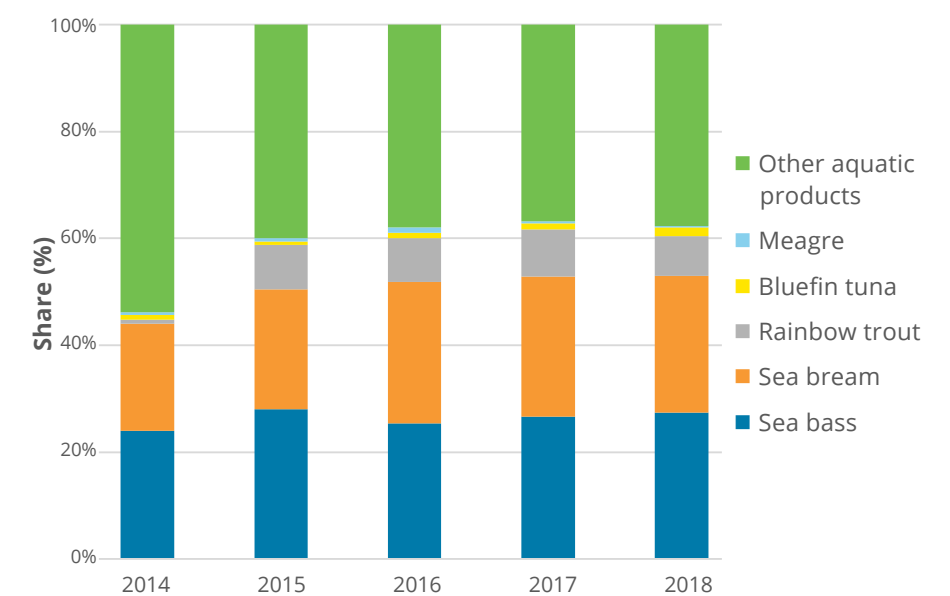


Figure 4: Breakdown of Turkish exports of aquatic products (aquaculture and capture fisheries; percentage share) (based on data from Aegean Union of Exporters).

In total 48,685 tonnes of sea bass and 45,310 tonnes of sea bream were exported in 2018 from Turkey to international markets. Traditionally, Turkish SBSB exports have been mainly fresh/chilled whole fish. However, with increasing quantities of fresh/chilled whole SBSB going into the main markets (southern EU – e.g. Italy, France, Spain) and falling prices, the industry has been exploring new markets, focusing on well-developed north European markets (e.g. Austria, Germany, UK) for value-added products (VAP) and fish fillets. In recent years Turkish producers have been investing in new processing facilities to boost the supply of processed SBSB products. So far these have mostly been in the form of fresh or frozen fillets, and vacuum-packed products (e.g. fillets, gutted whole fish). Though still a niche market, this trend is also visible in the composition of exported SBSB. In particular, fresh and frozen sea bass fillets are now among the main export items along with the fresh/chilled SBSB (Figure 5).

48,685 TONNES OF SEA BASS AND 45,310 TONNES OF SEA BREAM WERE EXPORTED IN 2018 FROM TURKEY TO INTERNATIONAL MARKETS.

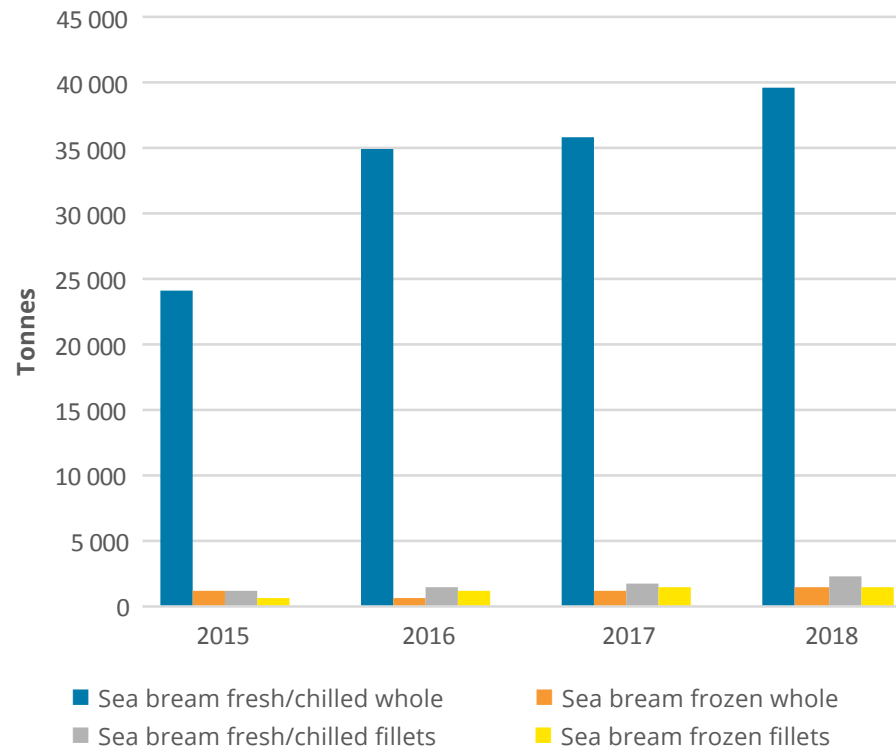


Figure 5a: Total exports of Turkish sea bream products in tonnes (based on data from Aegean Union of Exporters).

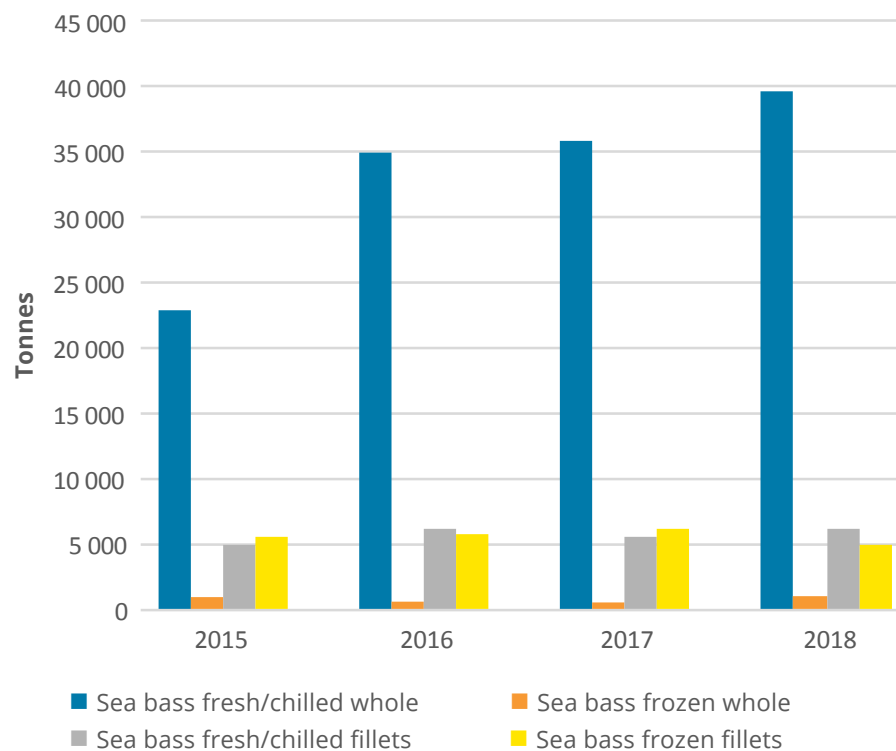


Figure 5b: Total exports of Turkish sea bass products in tonnes (based on data from Aegean Union of Exporters).

5.2 TRADE IN SBSB BETWEEN TURKEY AND THE EU AND UK

As is shown in Figure 6, exports to international markets including the EU and UK have accounted for between 41% to 54% of total Turkish SBSB production since 2014. Europe is a major traditional market for Turkish SBSB products, receiving nearly 76% of the total international exports (93,995 tonnes) of SBSB in 2018. Export volumes to the EU and UK steadily increased from 35,476 to 71,159 tonnes between 2014 and 2018 (Figure 7). The remaining 52-59% is sold on the domestic market. In 2018, 99,600 tonnes of SBSB – accounting for 51% of total production – were consumed domestically, reflecting the fact that farmed SBSB is also an important species in Turkey (MAF, Fisheries statistics and Aegean Union of Exporters).

Despite the increase in quantity of SBSB exported to the EU and the UK, the growth in value of SBSB has shown a downward trend since 2017 (Figure 7). Unbalanced supply and demand patterns and consequent oversupply very often lead to falling prices in domestic and international markets. This trend has been well documented by the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) for import prices of SBSB to the EU between 2015-2019 (EUMOFA, 2020). Prices of SBSB also show marked seasonal variability throughout the year, with falling prices during summer months (July-September) due to the harvest of cages and the entry into the market of high volumes of fish. When there is plenty of SBSB for sale, price-cutting by wholesalers in international markets and limited producer bargaining power also accelerate the weakening of prices. This is a very common problem for the SBSB farming sector throughout the Mediterranean.

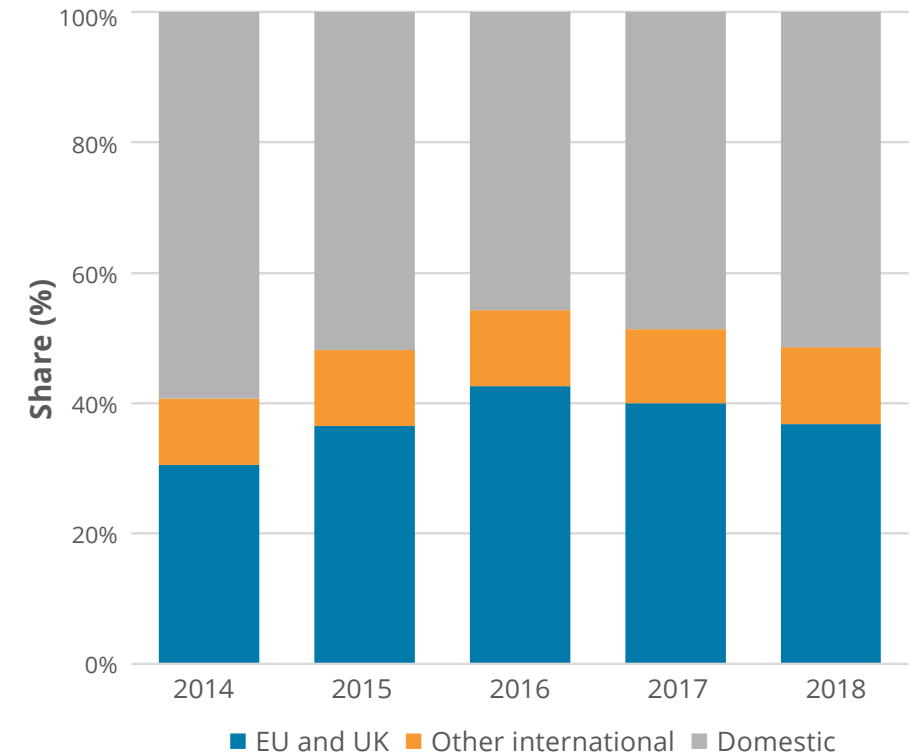


Figure 6: Shares of domestic consumption of Turkish SBSB production and exports (based on data from MAF, Fisheries statistics and Aegean Union of Exporters).

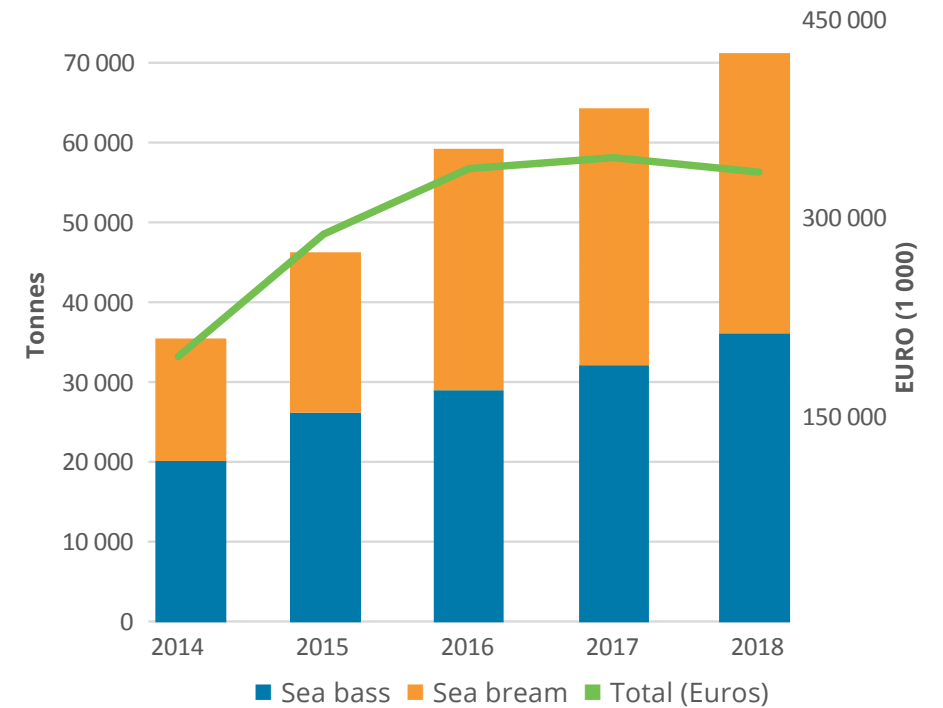


Figure 7: Trend of Turkish SBSB exports to the EU from 2014 to 2018 by volume (tonnes) and value (euros) (based on data from Aegean Union of Exporters).

5.3 TRADE IN SBSB IN THE UK

The United Kingdom has become an important export market for Turkish SBSB in recent years. The UK is among the top 10 export destinations for Turkish seafood (Table 2) and was responsible for 12% (8,793 tonnes)⁴ of total Turkish exports of SBSB to the EU in 2018 when it was still part of the bloc. Even so, the growth in volume of exports to the UK has been smaller than the average growth rate for the EU. The negative trend in value of Turkish exports of SBSB in 2018 is more clearly visible in its exports to the UK than to the EU (Figure 8). This negative trend is again due to lower prices of SBSB in international markets in 2018.

Historically, UK imports came mainly from Greek sources, reflecting the fact that the country dominated production. In recent years though, imports have switched from Greek to Turkish sources, particularly for sea bass (Figure 9).

12%
OF TOTAL TURKISH EXPORTS OF SBSB TO THE EU WAS EXPORTED TO THE UK IN 2018.

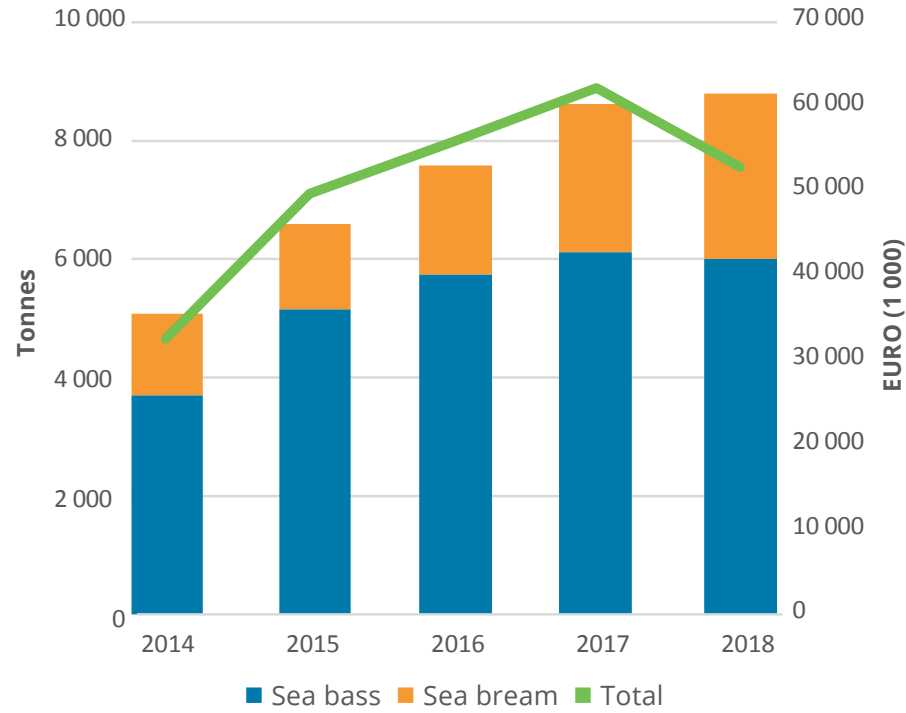


Figure 8: Trend of Turkish SBSB exports to the UK from 2014 to 2018 by volume (tonnes) and value (euros) (based on data from Aegean Union of Exporters).

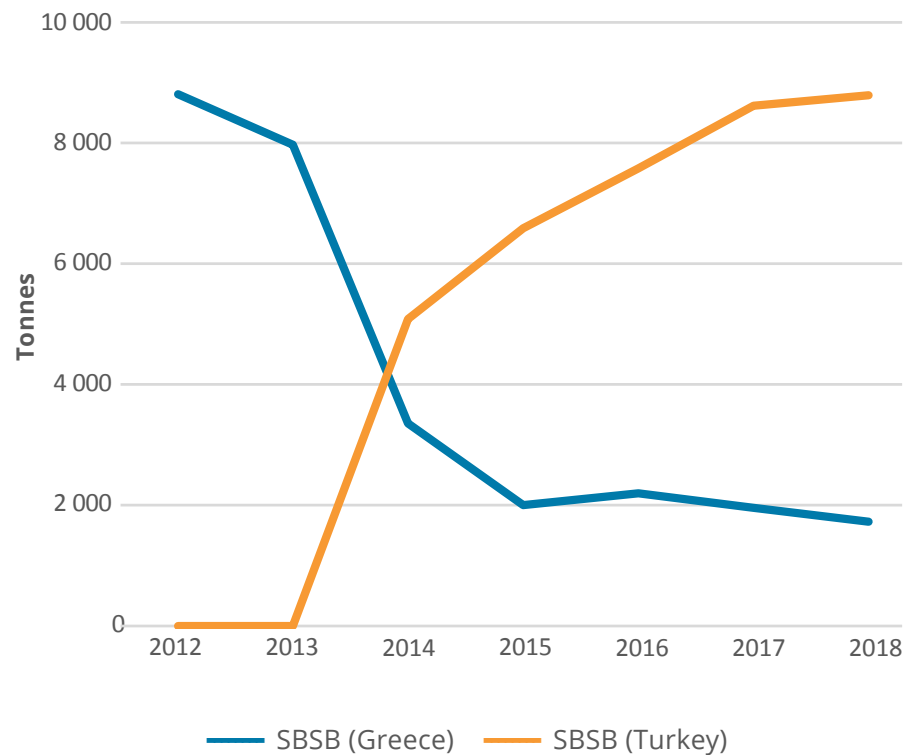


Figure 9: Trend of exported Turkish and Greek SBSB volumes to the UK from 2012 to 2018 (based on data from Eurostat).

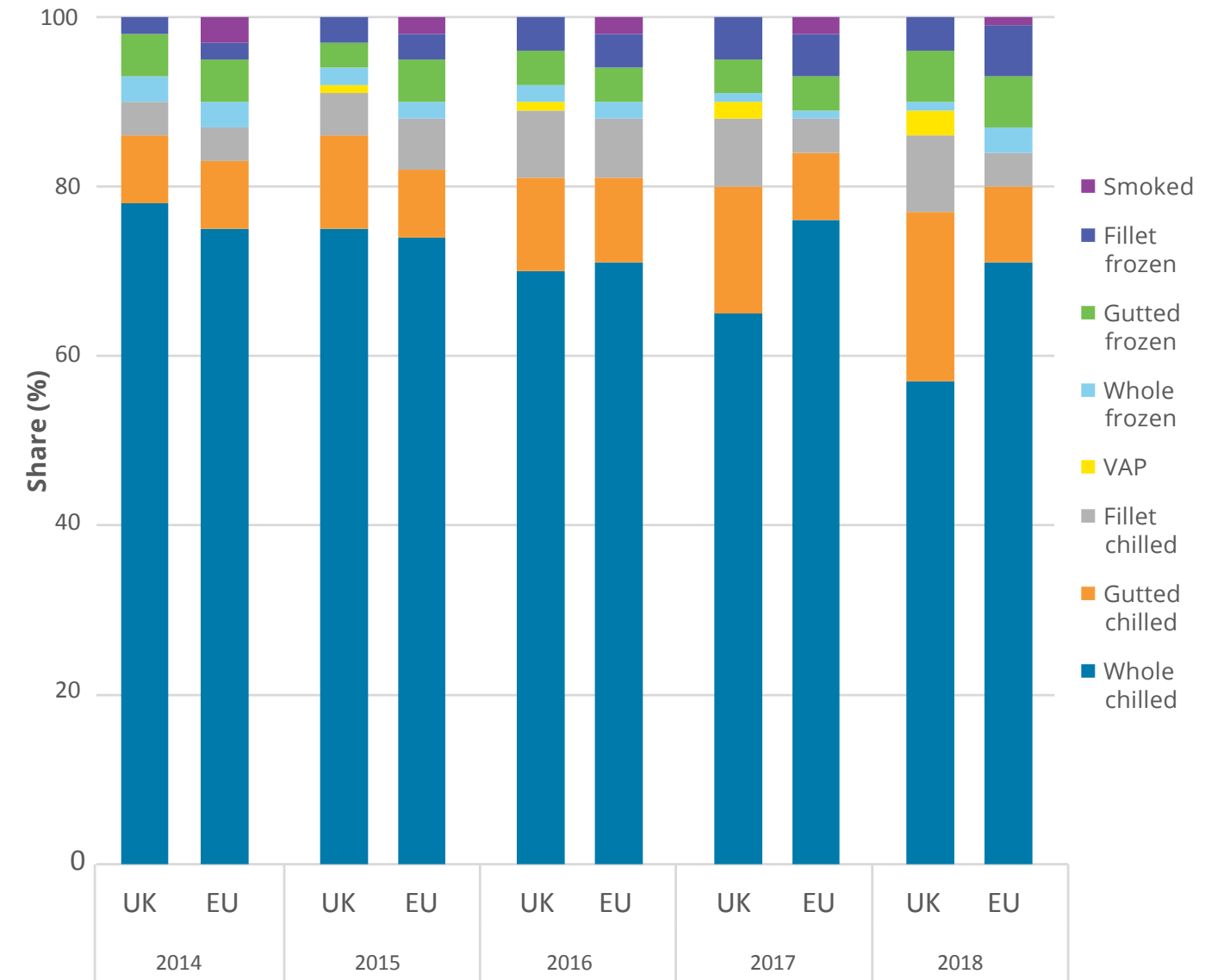


Figure 10: Turkish SBSB exports from 2014 to 2018 to the UK and EU by product form (based on data from Eurostat).

In summary, the UK is currently thought to import around 7,202 tonnes of European sea bass and 3,319 tonnes of gilthead sea bream a year from Greece and Turkey.⁵ Of this volume, 83% of the sea bass now originates in Turkey, with a similar percentage for sea bream. Despite its relatively recent growth in production, Turkey is now the dominant supplier of SBSB to the UK market.

The UK currently receives around 9,000 tonnes of SBSB every year (2018) from Turkey, and the total has continued to grow. The split between these products is approximately 70% sea bass and 30% sea bream (Figure 8), reflecting a strong UK market for the former.⁶

Regarding product forms entering UK and EU markets (Figure 10), it must be noted that this data is available only as an average across both sea bass and sea bream.

The following general trends can be ascertained from the data above:

- The EU imports significantly higher levels of whole fresh product than the UK (71% compared to 57%).
- The UK has a small but growing trend for other product forms, particularly whole gutted.
- VAP is a very small part of sales in the UK.
- Eurostat figures suggest that a greater proportion of sea bream than sea bass enters the UK as whole chilled (rather than other chilled product forms).

5.4 TRADE IN SBSB IN AUSTRIA

Austria is not a major market for Turkish SBSB, and other EU countries like Croatia, Greece and Italy also export SBSB to Austria (Figure 11). Germany and Hungary do so too; however, they are only re-exporting states and they produce no SBSB domestically.

Recent Turkish imports have been fluctuating, from a high of 848 tonnes in 2017 to a low of 356 tonnes in 2018. Nevertheless, Turkey is already the main supplier in terms of total SBSB production. Interestingly, Croatia – a relatively small producer – has recently been an important supplier to the Austrian market, particularly in 2018.

Imports of fresh and frozen Turkish SBSB in Austria are set out in Figure 12. In the past two years sea bream imports have been higher than sea bass, and fresh imports have been more popular than frozen.

It needs to be emphasised, however, that Austria is a very small consumer of SBSB. For comparison, the country imports only 2% of the amount of sea bass and 8% of the amount of sea bream the UK imports annually (and the UK is considered a relatively small market).

With regards to the Austrian supply chain for SBSB products, the small quantity imported made it difficult to gather good quality data.

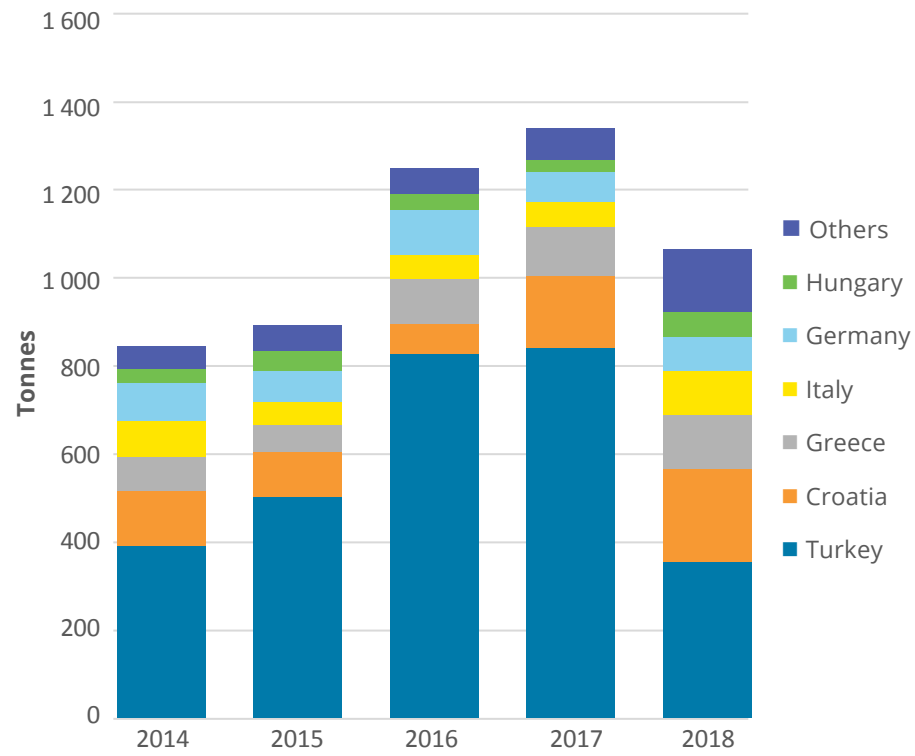


Figure 11: Imports of SBSB (tonnes) from 2014 to 2018 to Austria by export country (note: Germany and Hungary are re-export countries) (based on data from Eurostat).

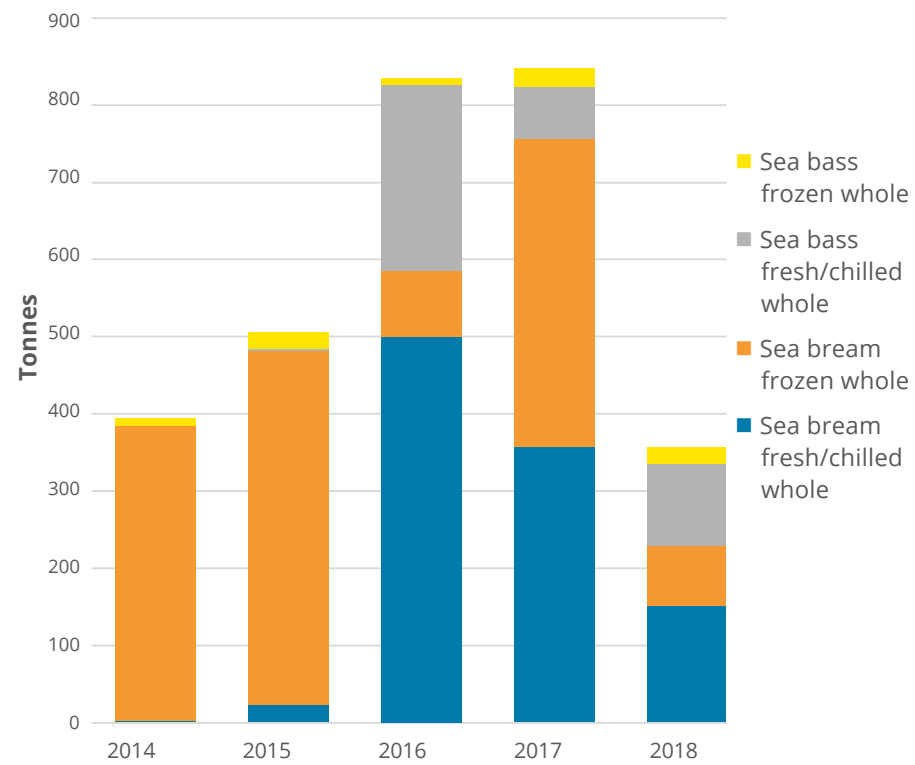


Figure 12: Imports of Turkish SBSB (tonnes) to Austria by frozen and fresh/chilled categories (based on data from Eurostat).



Sea bass and sea bream, Istanbul © Claris Chu / WWF

SECTION 6

MAP OF THE SBSB SUPPLY CHAIN FOR EXPORTS TO THE EU AND UK

Figure 13 summarises the supply chain network of SBSB from Turkey to the final markets in the EU and UK. This network starts with the major suppliers and producers of SBSB in Turkey and ends at retail outlets (e.g. supermarkets, hotels, restaurants, fishmongers) in Europe, with a focus on the UK.

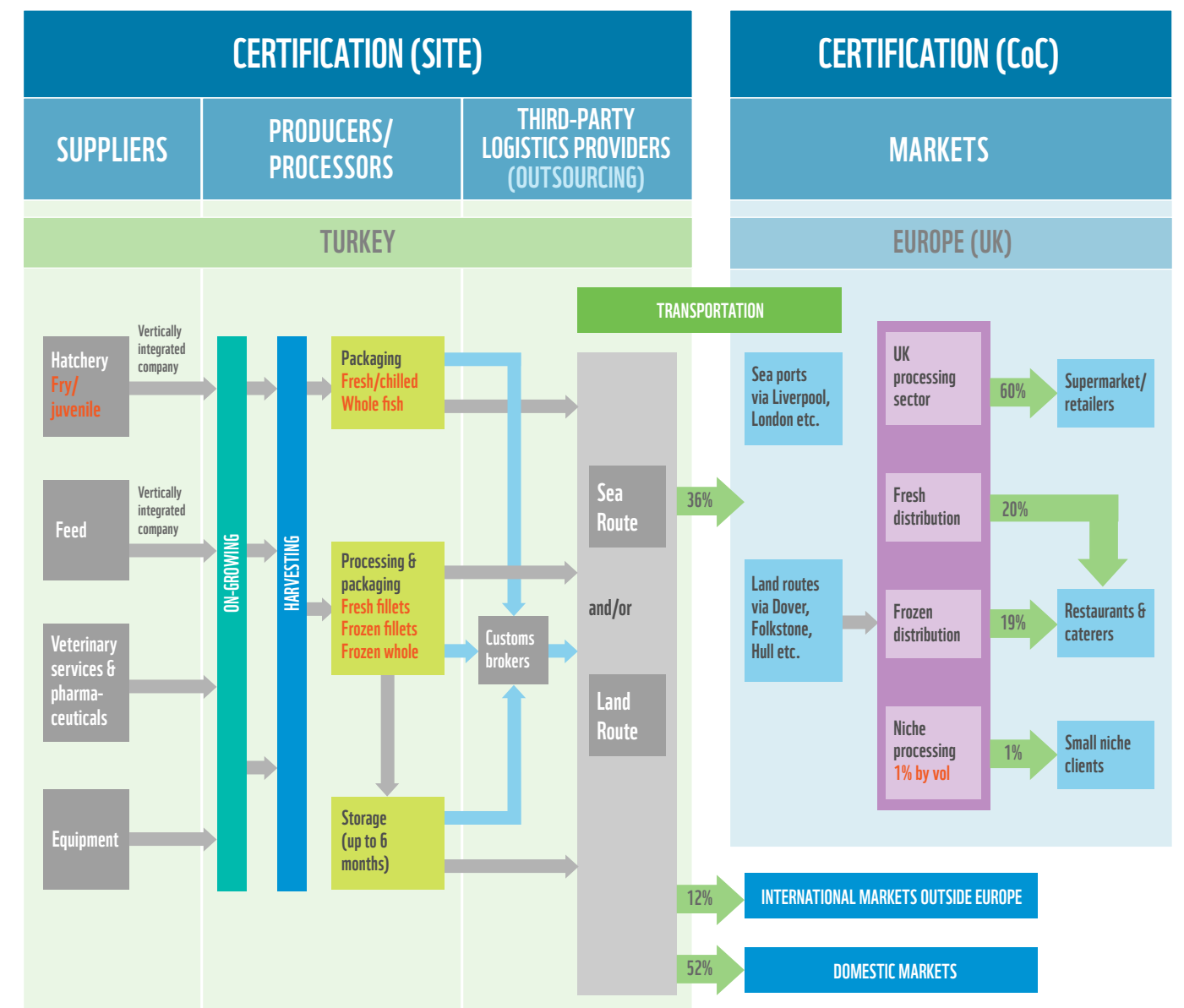


Figure 13. Map of the Turkish SBSB supply chain

6.1 TURKISH SUPPLY CHAIN

The SBSB supply chain between Turkey and Europe can be divided into four parts: suppliers (i.e. feed and fry), producers/processors, third-party logistics providers (e.g. customs brokers, transportation), and final markets. Traditionally, Turkish SBSB exports have been mainly fresh/chilled whole fish – however, increasing quantities of gutted fresh/chilled SBSB are today going into the main markets.

6.1.1 SUPPLIERS

Major primary suppliers of SBSB in Turkey are hatchery (fry/juvenile) producers, feed producers, veterinary services and pharmaceutical products (and other equipment suppliers). Large-scale producers/processors have vertically integrated with the hatcheries and feed producers to reduce costs.

6.1.2 PRODUCERS/PROCESSORS

Major Turkish SBSB producer/processor companies are responsible for grow-out, harvesting, packaging, processing and warehousing operations within the same integrated facilities. Product is processed in one of two ways:

1. Fresh-chilled whole SBSB goes to the packaging operations to be transported directly to the final markets (domestic or international).
2. The products are processed as fresh/frozen fillets or frozen whole, which are then mostly transported to the markets after packaging. Frozen products are kept in cold-storage facilities for a maximum of six months when supply exceeds demand.

6.1.3 THIRD-PARTY LOGISTICS (3PL) PROVIDERS

Processed products are then transported to domestic and international markets by truck and/or sea. Before trucks and ships are loaded for international destinations, customs clearance operations must be completed. The producers/processors do not do this themselves: they use outsourced 3PL providers, who are also used for the transportation operations.

On average 48% of Turkish farmed SBSB products are exported. Of these, 76% go to EU countries and the UK (Figure 13).

6.1.4 EMERGENCE OF LARGE-SCALE VERTICALLY INTEGRATED SBSB COMPANIES

International markets for SBSB are very competitive, with the major players being Turkey and Greece. Tough price competition and falling profit margins have resulted in consolidation in the sector, which enables producers to take advantage of economies of scale. This has led to the dominance of large-scale farming operations, which tend to be vertically integrated companies in major producing countries such as Turkey. These companies control two or more stages of the supply chain.

According to industry sources, it would not be economically viable to be only an exporter or trader in the current market environment. Therefore, an exporter needs to control one more stage of the supply chain, either as a producer or processor – although there are few companies that exclusively export seafood. According to feedback from these companies, they tend to be involved in exports of frozen products targeting markets in the Middle East.

Export routes to major European markets are illustrated in image 4. While trucks are used for exports to northern Europe and the UK, both land and sea routes are used for exports to southern Europe (e.g. Italy). The duration of shipments to the UK is reported to be about six days, and around four days to Italy. It is worth mentioning that, unlike for EU markets, it is cost-effective to export frozen SBSB fillets to the US by sea.



Sea bream © F_N / Shutterstock



Image 4. Land-based export routes of Turkish SBSB to main markets in Europe.

6.2 FINAL MARKET – UK SUPPLY CHAIN

Turkish SBSB mainly enter the UK by road, as chilled whole or value-added product (personal communication). If entering by sea, this occurs at several east coast ports with ferry services to the European mainland. The main ports for UK imports from Turkey are Portsmouth, Dover, Felixstowe and Hull. Some frozen product will also enter the country in containers. This could occur at any of the major container ports around the UK such as Southampton, Felixstowe or Liverpool (Figure 13).

The majority of the chilled product is destined for UK supermarkets, where it is sold either as whole chilled or further processed into fillets or VAP. It is estimated that the UK retail sector accounts for around 60% of all SBSB sold in the UK market. In the UK, supermarkets sub-contract the supply of fresh product out to several major processors (five UK processors responded to our survey). Commonly, a supermarket will only deal with processing suppliers for its whole fresh fish product range. These processing companies are ultimately responsible for ordering the product from Turkish suppliers, rather than the supermarkets directly (although they obviously play a key role in selecting the local suppliers to be used).

IT IS ESTIMATED THAT THE UK RETAIL SECTOR ACCOUNTS FOR AROUND

60%

OF ALL SBSB SOLD IN THE UK MARKET.

For the majority of these UK processors, product is requested in fresh whole form and is then processed and prepared to each retailer's requirements. For a number of reasons, this approach is preferred to having product delivered already processed (e.g. filleted) by the Turkish producer. First, client requirements often vary considerably throughout the year – for example, retailers may request different sizes or presentations. Others may require an increase in filleted quantities at a certain time of year. More important, however, is the packaging factor: other than fish which will be sold directly on fresh fish counters, all the chilled product will undergo some form of branded packaging. This can include modified atmosphere packaging (MAP) or 'vac-packing'. In recent times, it has become more and more common for retailers to change this packaging on a regular basis. For this reason the process is managed by a centralised 'processor/distributor' in the UK: rather than sending new packaging requirements to processors in Turkey on a regular basis, it is easier for the UK processor to be in control so they can react to new retailer packaging requirements quickly.

Although this system still remains the most common method of importing chilled product to the UK, there has been some increase in processed product in recent years. One example is an increasing amount of gutted chilled product being sent to the UK, and there has also been a smaller increase in the volume of fillets. This reflects the fact that processing costs are significantly cheaper in Turkey than in the UK, so by completing the processing in Turkey and then the packaging in the UK some costs can be saved. This trend is seen as likely to continue.

It is clear from discussions with both retailers and processors, as well as the import data provided, that the UK is a stronger market for processed products than traditional EU countries (e.g. Spain, Italy and France). The UK consumer is not used to handling whole fish, and this is clearly reflected here. A further move to 'convenience packaging' is considered likely in the future as a method of attracting more people to try SBSB. Interestingly, these VAP have shown only limited growth in terms of imports. Again, though, the market for VAP is definitely growing in the UK, but most of this growth is occurring at UK processors rather than at Turkish suppliers.

Once product has been prepared by the processors it is then sent by vehicle to a retailer's distribution centre, from where it is picked up and distributed among the retailer's stores. Product entering the UK is usually presented to the end consumer in the supermarket within two to three days.

UK retailers do not stock significant volumes of frozen SBSB products. A few VAP exist (e.g. breaded), and some frozen fillets can be found, but examples are limited

for these species. However, it is common for processors to purchase quantities of frozen whole SBSB. In most cases, these are stored and used during periods of supply disruption to allow orders to be completed. Often, product is defrosted and used to complete fresh chilled orders, with some processors investing a lot of time and effort to design defrosting systems which can ensure product quality is not affected – water bath systems are now commonly used for this purpose (personal communication).

Outside of the retail market, the remaining 35% of SBSB in the UK is mainly purchased by catering companies, restaurants and pubs. Again, the majority will be supplied through at least three major processors/distributors. Two distributors represent most of the supply market for chilled product, and they operate through a number of regional sites which deal with specific client areas (south-east, south-west, etc). Product is purchased and arrives in the UK through the same channels as for retailers, but it is then sent to each UK site individually to allow them to complete the relevant orders.

Orders are taken on a day-by-day basis, usually by phone, and are prepared overnight for delivery the next day by van. The distribution companies often deal with huge numbers of orders of relatively small quantities, and client requirements can vary considerably (e.g. one chef requires something slightly different to another). Access to whole chilled product is of paramount importance, since it offers the necessary flexibility to the processors. Again, these processors will also often buy whole frozen product to store and use in case of supply disruption.

One area of variation from the retail sector is that catering companies, restaurants/pubs and fishmongers often require frozen product rather than fresh. This is often due to a lack of chilled storage space, or they have such small product quantity requirements that it is more economical to buy frozen and defrost as required. This is particularly common for smaller catering units in schools/company canteens, which tend to be serviced by the major companies specialising in frozen product only. These companies, however, do not process product directly but import it already frozen and packaged. Product is then stored in giant freezer facilities for onward distribution to clients – for this reason they are actually considered distribution companies and not processors. These companies account for a major portion of the processed frozen SBSB products which enter the UK market.

The two major UK sectors for SBSB from Turkey have now been discussed. A third much smaller sector also exists, in the form of niche buyers who mainly supply high-end restaurants or hotels. These buyers tend to buy relatively small amounts of fish from UK wholesalers – however, they only represent a minor part of the UK supply chain.

SECTION 7

GOVERNANCE OF AQUACULTURE AND AQUACULTURE PRODUCTS IN TURKEY

The General Fisheries Commission for the Mediterranean (GFCM) regards sustainability as a multidimensional concept encompassing environmental, economic and social dimensions, as well as overarching governance aspects (GFCM, 2013). In the context of good governance, building an efficient regulatory and administrative framework is a key element of the GFCM's strategy for the sustainable development of Mediterranean and Black Sea aquaculture (GFCM, 2018).

Governance of aquaculture and aquaculture products in Turkey falls under multiple regulatory frameworks and government bodies. Under the Ministry of Agriculture and Forestry, the Directorate of Fisheries and Aquaculture is the main public authority responsible for the regulation and governance of aquaculture activities in Turkey. Aquaculture and capture fisheries are regulated by Fisheries Law 1380 (1971) and its amendment Law No. 3288 (1986). In addition, Aquaculture Regulation No. 25507 (2004) specifically covers the licensing of farms, aquatic animals' health, animal welfare, environmental aspects and protection. Efficient use of national water resources, assuring development of sustainable aquaculture, environmental protection, production of quality and safe food, planning of aquaculture investment and effective monitoring are the main objectives of this regulation.

However, other ministries – including the Ministry of Environment and Urbanisation, the Ministry of Health, the Ministry of Culture and Tourism, and the Ministry of Transportation and Infrastructure – are also involved in the siting, licensing and monitoring of marine aquaculture activities. Additionally, fish farms have to comply with other legislation such as Environmental Law No. 2872 (1983) and

associated regulations for environmental protection, the Food Hygiene Regulation, the Hygiene Rules for Food of Animal Origin Regulation, the National Residue Control Programme and also regulations governing marine navigation. Some of the legislation covering aquaculture operations and products is summarised in the following section.

7.1 SITE ALLOCATION AND ENVIRONMENTAL MONITORING

Implementation of the amended Environmental Law No. 2872 means cage farms cannot be set up in closed bays and estuaries where there are sensitive natural or archaeological sites. A potential site for offshore marine cage farming should have a depth of $\geq 40\text{m}$. SBSB cage farms should be at least 1km from the shore.

Environmental Law No. 2872 and associated regulations set the general legal basis and framework for environmental protection in Turkey. A major element of this legislation is the need for an environmental impact assessment (EIA) to establish an aquaculture farm. The EIA determines whether a project can be approved, needs amending before approval, or must be rejected. In 1993, detailed EIA regulations were put in place. These regulations were again extended and revised in 1997, 2002, 2003 and lastly in 2008 to accommodate adaptations in accordance with the EU EIA Directives 85/337/EC and 97/11/EC (Yücel-Gier et al., 2009).

Environmental monitoring of SBSB farms is regulated by Environmental Law No. 2872, the Regulation for Water Pollution Control (2004), the 'Notification on the monitoring of fish farming facilities (2009)' and the 'Notification to identify the closed bays and gulfs qualified as sensitive areas where fish farms are not allowed (2007)'. Accordingly, the water column surrounding cages should be monitored every year from May to August for pH, current, turbidity, salinity, temperature, dissolved oxygen, ammonium nitrogen, total nitrogen, total phosphorus, chlorophyll-a, total organic carbon and trophic index (TRIX).

According to the same legislation, benthic flora and fauna and *Beggiatoa* sp. bacteria must also be monitored every three years. The water quality and benthic analyses should be carried out by accredited laboratories.

7.2 SEAFOOD SAFETY AND TRACEABILITY

The EU requires all food business operators, feed producers and primary producers of animals to have in place a 'one-up and one-down' traceability system (Regulation (EC) No. 178/2002). Based on Goulding (2016), "traceability is defined by the Codex Alimentarius Commission as 'the ability to follow the movement of a food through specified stage(s) of production, processing and distribution'".

Following the adaptation process with the EU *acquis* on food safety, veterinary and phytosanitary policy and in line with relevant EU regulations (No. 178/2002, 852/2004, 853/2004, 854/2004, 882/2004 and 183/2005), food safety issues in Turkey are governed by Law No. 5996 on Veterinary services, Plant health, Food and Feed (2010). This law aims to ensure food and feed safety, public health, animal health and welfare, consumers' interests and environmental protection.

Based on Law No. 5996, the Turkish Food Codex Regulation was developed in 2011 to set the standards for food production and good manufacturing practices to protect consumer health and to establish fair domestic and international trade. The regulation also sets the rules and procedures for technical and hygienic production, processing, storage, handling, packaging, marketing, sampling and analysis methods.

Traceability is also an integral part of Law No. 5996. Provisions 21-24 of this regulation cover traceability aspects in food and feed. Turkish companies use the EAN-UCC traceability system, which is also widely used in the EU (Yaralı, 2019). At the sectoral level the Aquaculture Register System, developed by MAF for monitoring aquaculture operations and production, is an important tool for traceability of cultured products back to broodstock and eggs. It keeps records of all life stages of cultured fish, movements and transfer of fish at all life stages, all fish treated according to national legislations, and traceability of harvested fish until processing. Aquaculture companies are obliged to enrol in the Aquaculture Registry System for insurance, credit support, best agriculture production certificate and other legal procedures. Certification schemes in the Turkish aquaculture sector – e.g. International Organization for Standardization (ISO), British Retail Consortium (BRC), International Featured Standards (IFS), GLOBALG.A.P., Hazard Analysis and Critical Control Point (HACCP) – have also facilitated traceability (Tolon, 2017a).

In line with EU directives (96/23/EC and 96/22/EC and 98/179/EC) Turkey has developed a national 'Regulation on measures to be taken to monitor certain substances and their residues in live animals and animal products' (2011) to implement the Regulation on Food Hygiene (2011). This programme includes wild or farmed aquatic products. Residue control is also a part of certification for seafood exports, and is carried out by accredited laboratories.

Furthermore, the General Directorate of Fisheries and Aquaculture has a specific Guideline for issuing export licences, health certificates and inspections of companies engaged in exports of seafood from Turkey (2012).

There are many regulations adapted for the implementation of Law No. 5996 which indirectly or directly covers production, harvest, transportation, processing and control of aquaculture products in terms of food safety and traceability.

7.3 ANIMAL WELFARE

The welfare of farm animals including fish is governed by the Regulation on General Provisions Regarding Welfare of Farm Animals (2014). This regulation establishes welfare standards

for farms and livestock breeding premises that consider animals' health, growth, copulation, and physiological and ethological needs. It also includes provisions regarding minimum standards for the protection of animals used in farming. This regulation has been drafted in accordance with the Council Directive 98/58/EC concerning the protection of animals kept for farming purposes. Specific welfare issues for aquatic animals are established by Aquaculture Regulation No. 25507, provision no. 21 (2004).

Derived from these regulations, the General Directorate of Fisheries and Aquaculture has developed a Circular (2018/3) covering general principles for fish welfare, control of fish and water quality, production facilities and equipment, farm management, harvest, transfers, record keeping, genotype changes and control of companies.

7.4 LABOUR AND OCCUPATIONAL HEALTH AND SAFETY

Working conditions and work-related rights and obligations of employers and employees, including aquaculture, seafood processing and feed manufacturing industries, are regulated by Labour Law No. 4857 (2003). It applies to all the establishments and to their employers, employers' representatives and employees, irrespective of the area of their activities. It also includes provisions on employment contracts, conditions and termination, wages, organisation of work, occupational health and safety, employment service, supervision and inspection of working conditions, and administrative penal provisions.

According to Labour Law No. 4857 (2003), overtime in Turkey is normally work that exceeds 45 hours a week. An employee is not to work more than 11 hours in a day, and total overtime must not exceed 270 hours in a year. An employee is entitled to payment of one-and-a-half times their normal hourly rate or can choose to receive an hour-and-a-half of free time for each hour of overtime worked. For those who are contracted for less than 45 hours a week, any excess time worked is considered extra hours. Within the aquaculture sector, overtime is subject to the written consent of the employee.

Furthermore, Social Insurance and Universal Health Insurance Law No. 5510 (2006) aims to ensure that individuals have social insurance and universal health insurance. Occupational Health and Safety Law No. 6331 (2012) regulates the duties, responsibilities, rights and obligations of employers and workers in order to ensure occupational health and safety and to improve existing health and safety conditions. According to national Occupational Health and Safety Law No. 6331, aquaculture is regarded as a 'hazardous profession' and every three years all employees must undergo medical check-ups. Companies in this category with more than 50 employees must have a physician and an occupational health and safety specialist on site.

7.5 AQUACULTURE FEED

Animal feed production, including fish feed in Turkey, is governed by Law No. 5996 and Feed and Biosafety Act No. 5977 (2010). Accordingly, there are regulations, instructions and Circulars in place to regulate feed production. The 'Regulation on placing feeds on market and their usage' (2011) sets out the principles and procedures for supplying to the market and for the use of feed to ensure human and animal health, as well as to raise consumer awareness. The regulation includes provisions on packaging, labelling, supply and use of animal feed. This regulation is drafted in accordance with the Regulation (EC) No. 767/2009 of the European Parliament and of the Council on the placing on the market and use of feed.

The 'Regulation on genetically modified organisms and products' (2010) aims to protect human, animal and plant health, and preserve biodiversity by preventing the risks that genetically modified organisms (GMOs) might cause. It also sets out principles and procedures concerning the import, export, processing, labelling, marketing and control of GMO and GMO products used in food and feed. The 'Regulation on the processing, controlling, audit, import and export of the genetically modified organisms and the products of genetically modified organisms for food and feed' (2009) further aims to protect human life and health, animal health and wellbeing, the environment, and consumer rights. Regulations on feed hygiene, feed additives and medicated feed are also addressed by relevant legislation (Anonymous, 2019).

7.6 THIRD-PARTY CERTIFICATION SCHEMES

The United Nations Food and Agriculture Organization (UN FAO or FAO) defines certification as the "procedure by which certification body or entity gives written or equivalent assurance that a product, process or service conforms to specified requirements. Certification may be, as appropriate, based on a range of audit activities that may include continuous audit in the production chain" (FAO, 2011). Certification schemes are becoming an important element of international seafood trade and marketing around the world. They are becoming more common in efforts to ensure food safety and quality, along with social and environmental aspects of sustainable food production in the growing aquaculture industry (Washington and Ababouch, 2011).

Indeed, markets and marketing of seafood, either wild or farmed, are becoming increasingly global, complex and competitive. Today's markets for aquatic products are heavily influenced by globalisation of the seafood trade, tough competition, restructuring in distribution channels,

increasing consolidation and market power in the retail sector, as well as tighter standards for handling and food safety by retailers, and increasing consumer demand for quality, convenience and traceability. Developing societal awareness along with increasing consumer concerns about the sustainability of seafood production systems and responsible practices with regards to environment, food safety, social aspects and animal welfare are among the crucial issues that need to be addressed by aquaculture producers in order to access international seafood markets. In this regard, certification is a market-based tool which enables producers to address and document their commitments to these issues.

Turkish SBSB production is an export-oriented sector fully integrated with international seafood markets including the EU. Today, a third-party certification scheme is seen as a prerequisite for access to international markets. Third-party certification schemes (and initiatives) for the aquaculture supply chain in Turkey are summarised in Annex 3. Key certification schemes include Aquaculture Stewardship Council (ASC), Best Aquaculture Practices (BAP) and Global Good Agricultural Practice (GLOBALG.A.P.).

7.7 CLIMATE CHANGE POLICIES

Turkey's National Climate Change Adaptation Strategy and Action Plan (2011-2023) was adopted in 2011 (Ministry of Environment and Urbanisation, 2011) along with a set of Climate Change Action Plans (2011-2023). The strategy of the Action Plans focuses on water resources management, the agricultural sector and food security, ecosystem services, biodiversity and forestry, natural disaster risk management and public health. Aquaculture is addressed under the agricultural sector and food security, ecosystem services, biodiversity and forestry. Aquaculture-specific actions are included under the objective 'UT4.2.4. Carrying out R&D studies to determine and monitor the effects of climate change on aqua-farming'.

7.8 INSPECTIONS

Feed manufacturers, hatcheries, grow-out, and packaging/processing companies are inspected for their food safety, traceability, environmental and labour practices by national authorities including the Ministry of Agriculture and Forestry, the Ministry of Environment and Urbanisation and the Ministry of Labour and Social Security. Companies with third-party certifications are audited by certifying bodies or certification conformity bodies within their own schemes. Global certification schemes require both annual scheduled audits and unannounced audits. Inspections by national authorities are similar in the sense that both unannounced and scheduled inspections are carried out.

SECTION 8

SUMMARISED RESULTS OF THE TURKISH SBSB SUPPLY CHAIN SURVEYS AND EU AND UK RETAILER REQUIREMENTS

This section summarises the findings of surveys of all stages of the Turkish SBSB supply chain, and of UK and Austrian retailer requirements with respect to the food safety, traceability, social and environmental aspects of sustainable seafood production. Annex 1 includes the survey questions and Annex 2 includes all of the survey results.

Table 3. Results of the surveys of the Turkish SBSB aquaculture companies and the Austrian and UK retailer requirements summarised. 'No requirements specified' = no requirements further to those of certification schemes. All retailers require suppliers to adhere to certification requirements.

MAIN SURVEY TOPICS	EUROPEAN RETAILER AND PROCESSOR REQUIREMENTS	QUESTION TOPICS	TURKISH SUPPLY CHAIN STAGES				
			AQUACULTURE FEED MANUFACTURERS	HATCHERIES	GROW-OUT FARMS	PACKAGING AND PROCESSING	TRANSPORTATION
	3 retailers (2 UK, 1 Austria) and 3 UK processors responded	Number of companies	All (5) respondents were vertically integrated	All (6) respondents were vertically integrated	90% (9/10) of respondents were vertically integrated	All (7) respondents were vertically integrated	None (2) vertically integrated reported
Production management	All require third-party certification for all supply chain stages (except transportation) either directly or indirectly through vertical integration. Some have prerequisites for certain certification schemes	Certification	A number of certifications including GLOBAL G.A.P., ISO (9001 22000, 50001 45001) and Halal were acquired by respondents	Two certifications – GLOBAL G.A.P. and BAP – were acquired by respondents	A number of certifications including GLOBAL G.A.P., ASC, BRC, ISO, BAP, IFS and other scheme(s) were acquired by respondents	A number of certifications including GLOBAL G.A.P., ASC, BRC, ISO (9001 and 22000), BAP, IFS, Sedex, Halal and other scheme(s) were acquired by respondents	N/A
	All require functioning traceability system(s) that show that inputs are traceable from their origin to their end	Traceability	<ul style="list-style-type: none"> All production processes traceable from start to finish (i.e. feed ingredients traceable to origin and fish traceable from input to output for each supply chain stage) All traceability system(s) subject to independent audits and certification processes 				N/A

MAIN SURVEY TOPICS	EUROPEAN RETAILER AND PROCESSOR REQUIREMENTS	QUESTION TOPICS	TURKISH SUPPLY CHAIN STAGES				
			AQUACULTURE FEED MANUFACTURERS	HATCHERIES	GROW-OUT FARMS	PACKAGING AND PROCESSING	TRANSPORTATION
Production management	Hatcheries: No requirements specified Grow-out: All require a fish health management plan (HMP) and access to veterinarian as minimum (similar to ASC, GLOBAL.G.A.P.)	Fish health	N/A	<ul style="list-style-type: none"> All (6): health management system All (6): vaccinations and anti-parasitics None reported use of antibiotics 17% (1): fish health laboratory All (6): on-site veterinarian 	<ul style="list-style-type: none"> All (10): animal welfare procedures and inspections All (10): vaccinations and anti-parasitics None reported use of antibiotics 10% (1): fish health laboratory All (10): on-site veterinarian 	N/A	N/A
	Grow-out: All require a mortality policy that aims to reduce mortalities as low as is reasonably practical (similar to ASC, GLOBAL.G.A.P.)	Mortality	N/A	Average of 7.5% mortality rate of fry up to 1-3g	Not specified	N/A	N/A
	Desire to move to electrical stunning but none currently have 100% coverage	Slaughter methods	N/A	N/A	<ul style="list-style-type: none"> 70% (7): ice stunning (thermal shock) 20% (2): electrical stunning 10% (1): no stunning method because sell live fish 	N/A	N/A
Production inputs	All require a functioning traceability system allowing for tracing of ingredients from a sustainable source to specific farm supplies	Aquaculture feed	<ul style="list-style-type: none"> All (5) buy fish meal and oil from suppliers with food safety certification All (5): no GMO ingredients 80% (4): testing for GMOs Average of five fish species used in feed (mainly anchovies, sardines and by-products of trout and tuna processing) 	<ul style="list-style-type: none"> All (6) buy certified dry feed (e.g. GLOBALG.A.P. CFM) under quality control monitoring scheme(s) 	<ul style="list-style-type: none"> All (10) buy certified dry feed (e.g. GLOBALG.A.P., ISO 9001, ISO 22000) under quality control monitoring scheme(s) All (10): no GMO ingredients 	N/A	N/A

MAIN SURVEY TOPICS	EUROPEAN RETAILER AND PROCESSOR REQUIREMENTS	QUESTION TOPICS	TURKISH SUPPLY CHAIN STAGES				
			AQUACULTURE FEED MANUFACTURERS	HATCHERIES	GROW-OUT FARMS	PACKAGING AND PROCESSING	TRANSPORTATION
Production inputs	All require companies to be able to demonstrate that inputs are traceable from start to finish (e.g. hatchery to plate)	Broodstock and eggs	N/A	<ul style="list-style-type: none"> 50% (3) produce own eggs 50% (3) buy eggs from supplier with health certificate from supplier 17% (1) have quarantine procedure 	N/A	N/A	N/A
		Fry	N/A	N/A	<ul style="list-style-type: none"> 50% (5) own certified hatcheries (GLOBAL G.A.P.) 40% (4) supplied by certified hatcheries (GLOBAL G.A.P. or BAP) 10% (1) buy fry from supplier with health certificate 	N/A	N/A
		Fish for processing and packaging	N/A	N/A	N/A	<ul style="list-style-type: none"> 57% (4) use fish from own certified farms (GLOBAL G.A.P., ASC) 43% (3) buy fish from other certified suppliers (BAP, IFS, ISO9001, ISO 22000) 	N/A
Climate change adaptation	No requirements specified	Perceived negative impacts	All (5) reported that availability and price of fish meal and fish oil are negatively impacted	All (6) reported that fish stress, immunity, growth, sex maturation, water quality, surrounding environment are negatively impacted	All (10) reported that production, immunity, disease risk, water quality, fish biology and ecosystem are negatively impacted	All (7) reported that stability of fish prices is negatively impacted	Respondents were not asked questions on climate change
		Adaptation and/or mitigation policy	40% (2) reported that they have climate change adaptation or mitigation but no specific action recorded	83% (5) reported that they have climate change adaptation or mitigation but no specific action recorded	No respondents reported that they have climate change adaptation	43% (3) reported that they have climate change adaptation or mitigation but no specific action recorded	

MAIN SURVEY TOPICS	EUROPEAN RETAILER AND PROCESSOR REQUIREMENTS	QUESTION TOPICS	TURKISH SUPPLY CHAIN STAGES				
			AQUACULTURE FEED MANUFACTURERS	HATCHERIES	GROW-OUT FARMS	PACKAGING AND PROCESSING	TRANSPORTATION
Environment	<p>Aquaculture feed manufacturers and hatcheries:</p> <p>No requirements specified but could adhere to the same requirements as a vertically integrated company</p> <p>Grow-out and packaging and processing:</p> <p>Most have requirements around recycling of plastics and use of fossil fuels (i.e. 'energy audit') to show reduction in global footprint</p>	Practices to reduce use of plastics	All (5) respondents have practices to reduce plastics including the use of big-bag, sack, low-density packaging materials and recycling of used materials	No specified practices applied by respondents	No specified practices applied by respondents	71% (5) reported they have practices to reduce plastics but no specific action recorded	Respondents were not asked questions on the environment
		Practices to reduce energy use and greenhouse gas (GHG) emissions	60% (3) reported having practices but did not provide specific actions	67% (4) reported having practices but did not provide specific actions	80% (8) reported having practices but did not provide specific actions	71% (5) reported having practices but did not provide specific actions	
		Waste management policy and action plan	80% (4) reported having contracts with waste disposal companies	All (6) reported having contracts with waste disposal companies	80% (8) reported using the Blue Card System developed by the Marine Services Directorate	86% (6) reported having contracts with waste disposal companies	
		Water quality	N/A	All (6) use Recirculated Aquaculture Systems (RAS) and monitor discharge quality following national legislations	All (10) reported having national authorities inspect for environmental contaminants (e.g. litter, pharmaceutical chemicals)	N/A	
Social	All have some level of requirements relating to social compliance (most common relates to Sedex-based audits at processing facility level)	Minimum age for employment	All (28) reported that the minimum age of employment is 18 years				All (2) reported that the minimum age of employment is 20 years
		Average minimum wage	All (11) reported that the minimum wage is TL2,000 per month. (Note: the minimum wage in 2020 was increased to TL2,943)		TL2,160	TL2,043	TL2,270
		Average number of employees	77	35	94	248	55
		Workers' rights	<ul style="list-style-type: none"> None of the employees is a member of a syndicate but they are free to form organisations All respondents have formal mechanisms to report grievances which are communicated to workers (no transportation companies reported having these mechanisms in place) All employees have contracts and are literate to understand the contracts (one of the transportation companies reported not having contracts with employees, which is a legal violation) All employees are informed of their labour rights 				
	No requirements specified regarding gender	Average percentage of positions held by women	6%	21%	7%	48%	9%
	Average percentage of high-level/low-level positions held by women	40% of high-level positions held by women, 17% low-level	15% high-level, 32% low-level	8% high-level, 5% low-level	24% high-level, 45% low-level	Not specified	

MAIN SURVEY TOPICS	EUROPEAN RETAILER AND PROCESSOR REQUIREMENTS	QUESTION TOPICS	TURKISH SUPPLY CHAIN STAGES				
			AQUACULTURE FEED MANUFACTURERS	HATCHERIES	GROW-OUT FARMS	PACKAGING AND PROCESSING	TRANSPORTATION
	No requirements specified regarding gender	Common positions held by women	Office-based, production engineer, quality control, procurement, accounting	Feeding, production, adaptation, quality control	Kitchen, office, vaccination	Filleting, packaging, fish sizing, fish scaling, cleaning	Office-based, accounting, vehicle position tracking
		Women's wages	All reported there are no differences between wages of employed women and men				
		Grow-out: All require farms to consult and work with neighbours All other stages: No requirements specified	Social responsibility project or policy	60% (3) reported having projects or policies but no examples provided	67% (4) reported having projects or policies but no examples provided	70% (7) reported to arranging festivals, clean-up events, regular meetings with local authorities and community	71% (5) reported having social welfare activities, regular meetings with local authorities and local community
Farms	No requirements specified other than adhering to national legislations	Location	N/A	N/A	• Average distance to nearest farm is 1,040m (greater than legal limit of 1,000m) • 10% (1): located in vicinity of a marine protected area (MPA)	N/A	N/A
		Escapes	N/A	N/A	Average of 1% ratio of fish escapes	N/A	N/A
		Predator control	N/A	N/A	All (10) reported to mainly use nets for birds, protective nets, acoustic deterrents for dolphins	N/A	N/A
Transportation	No requirements specified	Main export destinations	N/A	N/A	N/A	The EU plus the UK, US, Russian Federation and Arabic countries are the main export destinations	The EU plus the UK and Russian Federation are the main export destinations
		Types and routes	N/A	N/A	N/A	<ul style="list-style-type: none"> 70% products exported All transport via land routes 71% (5) transport via sea routes for US market 	<ul style="list-style-type: none"> EU: land routes (truck and/or ferry) with temperature-controlled vehicles US: Air route for chilled/fresh and sea route for frozen

SECTION 9

CHALLENGES AND RECOMMENDATIONS

Participation in global certification schemes such as ASC and GLOBALG.A.P. as well as the adoption of various national regulatory frameworks by the government, have helped the Turkish SBSB industry to become a major global exporter of farmed SBSB, particularly to European markets. This is reflected in the increased imports of Turkish SBSB by the EU and also particularly the UK in the past decade.

The Turkish SBSB industry has successfully gained its global market position with certification schemes which focus on meeting key international environmental, traceability and social standards of responsible seafood production. Its position has also been strengthened by the adoption of a national legislative framework to meet international (in particular EU) requirements concerning food, health and safety, social welfare and the environment. Nevertheless, this study focuses on the actions of key players in the SBSB supply chain in response to the environmental and social requirements for supplying these two species to the European market.

With the advance of new aquaculture technologies and an increase in consumer awareness of its environmental and social impacts, seafood production is a dynamic path where new requirements and standards could be viewed as challenges or barriers to continuous access to the EU and UK seafood markets.

Through the survey conducted for this study, some key existing and future challenges are identified, and recommendations are made for addressing them.

9.1 PRODUCTION MANAGEMENT

9.1.1 THIRD-PARTY SUSTAINABILITY CERTIFICATION

Challenges

The relatively recent onset of third-party certification schemes has completely changed the way that retailers approach their corporate responsibility and sourcing policies. Previously, retailers had developed their own requirements and then set out to audit (through in-house staff or third-party companies) suppliers against these. The advent of agreed certification schemes removed this onus from the retailers and provided a relatively unified and easy way to approach the process. As a result, virtually all EU and UK retailers buying SBSB from Turkey will require a third-party certification scheme to be in place.

Until recently this requirement has been almost exclusively covered by the GLOBALG.A.P. aquaculture standards (and to a lesser degree BAP). In the

last few years, the launching of the ASC sea bass and sea bream standard has provided a separate certification scheme. The general consensus of retailers suggests that the move will be towards the ASC standard becoming the preferred one over the next decade, as it is considered more robust. Meeting a more robust certification scheme will require further changes in practices of the supply chain actors in Turkey.

Another challenging area is the issue of partial certification. It is common practice in Turkey for companies to only certify the components (e.g. a certain percentage of farm sites) which will cover the demand required for specific markets like the EU and the UK. As Turkish producers also supply other international markets (Russia, Middle East, etc) where certification demands are relatively low, they do not see the need to cover the whole production of the company with the more onerous requirements of GLOBALG.A.P. and ASC. One company reported having only three of its 14 sites certified by the ASC as it believes this is enough to meet demand from European retailers.

Partial certification has been a controversial issue as it allows companies to earn green credentials while some parts of their production could possibly not be following

certification requirements for sustainability. Some quality managers in Turkey pointed out that the existence of certified and non-certified products in the same premises could be very challenging. For example, occasionally the sales department may require more certified products than they have available, and the temptation to mix small quantities of non-certified products is clear. Theoretically, this occurrence should be avoided by the CoC requirements which are in place in the GLOBALG.A.P. and ASC standards (and mass balance assessments which are completed), but it appears to still remain a challenge.

UK and Austrian retailers generally expressed the view that the Turkish SBSB sector is more advanced in terms of meeting third-party certification requirements than its existing competitors in Europe. The findings presented in this study support this and indicate that the requirement of UK and Austrian retailers for third-party certification is currently being met for all surveyed Turkish aquaculture companies. This point was often made, with the majority stating they had found it easier to receive third-party certification requirements from Turkish suppliers than some other competitors. The reason for this appears to be that the Turkish companies are more experienced in dealing with more advanced European markets than companies that mainly sell to traditional markets (e.g. Italy, Spain and France). The Turkish entry into the EU market had been specifically aimed at the western European retail markets that tend to require third-party certification, so this resulted in the early uptake of GLOBALG.A.P. requirements in Turkey – and, recently, a quicker uptake of ASC. To this effect, the requirement for third-party certification in Turkey is currently not perceived as a challenge, and may instead be an advantage as its competitors are not yet as advanced in this regard.



Recommendations

Turkish companies being only partially certified against international sustainability standards can create concerns. **It is recommended that Turkish producers increase the amount of certified product** they are able to supply to include a 'buffer' in times of high demand. This would help avoid any concerns that additional non-certified product might be included in certified audits at times when supply is limited.

To address the issue of partial certification, standard owners and stakeholders are **recommended to strictly implement mass balance of certified farms or companies** to avoid non-certified product being claimed as certified. Turkish aquaculture companies should be aware of and prepared to adapt to any changing market requirements in regard to third-party certification (e.g. ASC) or other emerging certification schemes to meet western European markets' requirements.

9.1.2 PRODUCTION TRACEABILITY



Challenges

Surveyed UK and Austrian retailers stated they require functioning traceability systems that can demonstrate that inputs are traceable from their origin to their end; and all surveyed Turkish companies stated they employ traceability systems subject to certification requirements, and their production processes are traceable from start to finish (i.e. input to output).

To meet the standard requirements for HACCP and ASC CoC certifications, companies operating processing facilities in Turkey will have a traceability system which allows batches entering the factory to be tracked to batches sold. At the farm level, a system of stock management will also be employed by the farm manager. However, anecdotic reports indicated that while all fish stockings, harvests, feeding and stock movements are recorded as required, there are challenges in maintaining these data beyond local sites, farms and aquaculture facilities. For instance, data are inputted in spreadsheets that are very complicated and hard to maintain properly, or there is a lack of transparency on inputs of data.

As a result, it can be a challenge to properly record fish movements from cage to cage. This is also the case in relation to fish coming through the hatchery system and then being transported on to the grow-out sites. This creates a very real risk where partial certification of fish farms is prevalent, as is the case for Turkish SBSB. Fish that are being produced in non-third-party certified hatcheries or cages could be incorrectly recorded as certified (or being mixed with certified batches) at the processing facilities.



Recommendations

To reduce the risks identified, **it is recommended that Turkish SBSB supply chain players including hatcheries, farms and processing facilities adopt digitised technologies for real-time and networked management and monitoring systems** such as purpose-built software systems. These avoid the need for farmers to enter data on multiple spreadsheets and do appear to present a better system for production management.

It is observed that some major Turkish companies have invested significant money in developing their own production management system to try to address proper fish recording and production management challenges in recent years. This is a difficult task, but if successful it would most likely resolve the issues currently seen in Turkey.

9.1.3 SLAUGHTER METHODS



Challenges

All retailers surveyed have indicated a desire to move to electrical stunning, although none currently has 100% coverage. Certified farms will need to comply with certification requirements. GLOBALG.A.P. states that "stunning prior to killing is mandatory", while the issue of humane slaughter is not covered by the ASC. In addition, the World Organisation for Animal Health (OIE), of which all EU member states and the UK are member countries, urges the use of electrical or mechanical stunning for fish slaughter. There is also the possibility that further requirements protecting fish at the time of slaughter will be put in place in the EU (European Commission, 2018).

However, Turkish farms still tend to complete the harvesting with a direct use of slurry ice, owing to its lower cost and its convenience. Humane slaughter technology is only used when it is specifically required by the client.

Electrical stunning prior to slaughtering has the potential to be humane if properly applied. All surveyed farms confirmed they use stunning prior to killing for the EU markets, which indicates that Turkish farms are relatively advanced with regards to stunning in comparison with international competitors.

The stunning units are regularly located on the harvest vessel, and each fish has to pass through the machine as it leaves the cage. It is then returned directly to the ice slurry systems which would normally be used. The machines in use have a limited capacity, which slows down the harvest process quite considerably. This is obviously not optimal for farmers, so there must be some doubt as to how often this stunning machine is being used. Indeed, farm visits revealed anecdotal reports that during fish harvesting for clients who have requested stunning or cages which are certified, this stunning process has in fact not happened.

The real challenge for Turkish SBSB producers is the method by which the fish is harvested and stunned, as other aquaculture producers (e.g. Norwegian salmon) have adopted a preferred but more costly approach (Annex 5). While the issue of humane slaughter is not currently creating a barrier for Turkish SBSB producers to sell product to EU and UK markets, there is a clear trend towards a 100% stunning preference. It is unclear how this will be achieved in Turkey with the systems currently employed.



Recommendations

The operational methods with which stunning machines are used in Turkey present some concerns. Although all surveyed farms reported using stunning prior to slaughter, a requirement of GLOBALG.A.P. certification, they will need to be prepared to move to 100% electrical stunning. UK and Austrian retailers interviewed said that this was their preferred method, and some are already close to achieving it. **It is recommended that Turkish farms and producers develop an approach to ensure procedures and methods are improved**, in order for Turkish product to meet this growing requirement from retailers.

In addition, there is concern over whether electrical stunning machines already in place are being used. One of the issues here is that machine use is very difficult to validate, since an auditor or retailer would need to be present to witness it. **It is recommended that retailers request verifiable evidence that stunning machines are being used.** This will help address the concerns of retailers as they move towards a 100% preference for electrical stunning.

9.2 PRODUCTION INPUTS

9.2.1 AQUACULTURE FEED SOURCING



Challenges

From the perspective of UK and Austrian retailers, feed has become an increasingly important area of concern. This is not surprising considering the sustainability questions which are often raised around the sourcing of fish meal and fish oil. Although all hatcheries and grow-out farms surveyed stated they only use certified feed, retailers are still concerned with ensuring the sustainable origin of these sources: they consider this to be the single most important factor when considering the feed supply to farms. The recent trend towards reducing the use of fish oil and fish meal has broadened the debate over sustainable feed sourcing to encompass the use of low trophic species in aquaculture.

In particular, it is reported that aquaculture feed manufacturers have been using European anchovies fished within the Exclusive Economic Zone (EEZ) of Turkey as a main ingredient in feed (and also imported from Mauritania or Peru when domestic supply is not sufficient), which may raise questions over sustainability. Most anchovy landings in Turkey are used as ingredients in fish meal and oil rather than for human consumption (Goulding *et al.* 2014), and this trend can be expected to increase with the rapid expansion

of the Turkish aquaculture sector. European anchovies, like many other small pelagic fishes, are particularly susceptible to fishing pressure (Gücü *et al.* 2017), yet fishing rates in the Black Sea exceed precautionary limits and the stock is considered as overexploited (GFCM-SGSABS, 2018). Projections show that the future anchovy stock biomass in the Black Sea is expected to decrease (Salihoglu *et al.* 2017), and continued high harvesting rates coupled with environmental stressors could lead to another stock collapse such as was seen in the late 1980s (Oguz, 2017).

Apart from domestic fisheries, Turkish aquaculture companies also source feed from other countries. One of Turkey's clear competitive advantages is its ability to source relatively cheap fish meal ingredients from countries like Mauritania, owing to close relationships between suppliers. Such market access to fish meal is simply not achievable for most European aquaculture companies. However, with this price advantage come additional concerns over the sustainability of fish meal sources that the Turkish SBSB farms are using.

Furthermore, it is unclear how these current sources meet the ASC requirement (i.e. to have a FishSource assessment score of 6 or higher for stock health). While some fish farms may have alternative fish meal sources which do meet ASC requirements, the FishSource website shows that most of the small pelagic species in Mauritania currently do not do so. Moreover, the 'current stock health' score of Black Sea anchovies according to 2017 data is below 6, and therefore does not meet the ASC requirement. Given that the new ASC feed standard will be released soon, it is anticipated that this will pose a greater challenge for Turkish SBSB producers.



Recommendations

The sourcing of fish meal and oil in the Turkish SBSB industry has raised some concerns among EU retailers. Aquaculture feed manufacturers will need to demonstrate that the ingredients they use originate from sustainable sources. For instance, anchovies from the Black Sea, which are considered to be overexploited, may not meet retailer or certification sustainability requirements in the near future.

It is recommended that further investigation into the sustainability of fish feed ingredients used by the Turkish SBSB aquaculture sector should be conducted to determine if more stringent requirements will be met. In particular, there should be a focus on evaluating the sustainability of anchovies from the Black Sea as they serve as an important feed ingredient (Goulding *et al.* 2014, Gücü *et al.* 2017) and do not fully meet ASC requirements.

Although 90% of the grow-out farms surveyed were found to favour feeds with a lower content of marine

ingredients (where quality is not impaired), only 50% have a plan or intention to use feed from sustainable sources. It is clear that this area needs further consideration by all parties, and the country's producers will need to adopt a plan on how to respond to the new requirements when the ASC aquaculture feed standard is released.

It is recommended that aquaculture feed manufacturers and fish farm producers should be transparent on their fish feed sourcing. Retailers are recommended to work with their Turkish suppliers and farms to develop a strategy for alternative feed ingredients to avoid the use of potential untraceable or unsustainable feed ingredients.

9.3 CLIMATE CHANGE

9.3.1 ADAPTATION AND MITIGATION



Challenges

Aquaculture – and particularly the farming of SBSB – is a rapidly developing sector in Turkey. New aquaculture production sites are allocated to the Mediterranean coast (e.g. Mersin, Adana), but this region is highly vulnerable to climate change. Many surveyed companies, although aware of the potential negative impacts of climate change on mariculture, have yet to develop tangible climate adaptation and mitigation policies.

The major producers have begun to employ some mitigation and adaptation measures including solar panels and wind turbines to generate renewable energy for farm sites. Climate change adaptation and mitigation issues are a growing concern for retailers in Europe, and are likely to become areas of focus in future. At aquaculture certification level, ASC requires farms to assess and record their annual GHG emissions, and to create a documented mitigation strategy to reduce them within two years. GLOBALG.A.P. requires farms to monitor energy use and develop a plan to improve energy efficiency.

To increase awareness of climate change impacts, a workshop was organised under the EU-funded CERES⁷ project (Mersin University and Kılıç Seafood) and Fish Forward project (WWF) in Bodrum, Turkey in February 2020. A wide range of stakeholders including farmed seafood producers, scientists, producer associations and government officials were invited to initiate a platform to address issues raised for aquaculture by climate change and to discuss possible adaptation policies.



Recommendations

To tackle the challenge of climate change, **it is recommended that the Turkish government develops bold national climate change adaptation and mitigation policies which will cover the SBSB sector.** The current National Climate Change Adaptation Strategy and Action Plan (2011-2023) does not include concrete strategies and action plans specific to the aquaculture sector, which is continuing to develop rapidly. Investment in scientific research, innovative technologies and capacity-building to support the sector will be needed to overcome the associated challenges.

Furthermore, a collaborative and bottom-up approach with the engagement of all sectoral stakeholders including producers, scientists and civil society organisations will be needed. **It is recommended that the SBSB supply chain develop strategic approaches to reduce its carbon footprint by using energy-conserving technology, improving the efficiency of feed management and feed conversion, and improving fish health** (Chang *et al.*, 2017; Robb, 2017). Support from wider stakeholders such as academics and civil society organisations – to increase awareness and recommend policies – can help Turkish producers to understand this area better and present plans on how to adapt to climate change, reduce GHG emissions, and improve their performance.

9.4 SOCIAL

9.4.1 SCALE DIVERSITY IN THE SECTOR



Challenges

To maintain competition, Turkish SBSB production tends to favour large-scale vertically integrated companies (>5,000 tonnes). This report found that most surveyed companies are partially or fully integrated along the different stages of SBSB production. Only one out of 10 grow-out farms surveyed is a small-scale family run business and not part of a vertically integrated company. Owing to the potential high investment requirement of offshore farms, these small-scale companies are mainly land-based farms, using earthen ponds and underground saline water, and are not able to compete with large-scale farms in terms of unit production costs. Some of these farms have stopped production and have been taken over by large-scale companies. While large-scale integrated farms have management and cost-saving advantages, the displacement of small-scale farms can lead to social issues such as job losses, as large-scale farms are usually less labour-intensive.



Recommendations

In many food-producing nations, preserving scale diversity in any sector is crucial to create employment and ensure socio-economic welfare for rural populations. **It is recommended that the Turkish government should develop policies such as an alternative niche market (e.g. organic SBSB) to enable a level playing field and ensure a healthy balance of scale diversity between large- and small-scale SBSB producers.**

Small-scale SBSB producers are recommended to develop alternative business models such as 'organic fish' that can differentiate their products from mass production and thus obtain a price premium in a growing EU niche market.

Such alternative business models would require cooperation and collective action among policymakers, producers, retailers and civil society organisations; as well as training for technical aspects, collective certification and marketing initiatives.

9.4.2 SOCIAL REQUIREMENTS



Challenges

Recently, instead of completing their own social compliance requirements, most retailers have relied on the social requirements of the ASC and GLOBALG.A.P. – and these have become prerequisites for entering the EU market. Both the ASC and GLOBALG.A.P. have quite detailed social requirements (Annex 4).

Overall the social requirements do not present a challenge to Turkish aquaculture companies, as the majority of them have already been GLOBALG.A.P. certified and all responding components of the SBSB supply chain reported that they comply with national law. Some farms, packaging and processing facilities have reported that they are ASC certified. However, issues identified in this study which require further improvement include:

- **Health and safety:** Although procedures may be in place, the implementation of appropriate health and safety regulations is sometimes lacking. All retailers interviewed require that certain health and safety conditions are met by the farms which supply them, and these are assessed through the ASC and GLOBALG.A.P. programmes. Both require some form of risk assessment to be undertaken and appropriate measures to be put in place for high-risk activities. For instance, both standards provide specific requirements for diving operations

(which are common in cage aquaculture), and Turkish farms are already likely to be meeting them. However, during farm visits (by retailers and/or suppliers), it has often been found that health and safety requirements are not being fully implemented. For example, despite procedures being in place, witnesses have reported that protective equipment was not being used during site visits (e.g. helmets, lifejackets, etc). This raises the possibility that some requirements are in place only during auditor visits, but are not set as standard procedure as required. Nevertheless, this problem is by no means exclusive to Turkish SBSB production, as it has been commonly observed in farms across many other seafood-producing nations.

■ **Increasing the inclusion of women in aquaculture operations:** The average ratio of women employed in the aquaculture industry in Turkey as a whole is 19%, which is above the average for Europe (FAO, 2018). However, this report found that as few as 6% and 7% of positions are held by women in aquaculture feed manufacturing plants and farms respectively. In addition, an average of only 22% of high-level positions are held by women, and 25% of low-level positions. This may reflect the already low proportion of women in a traditional labour-intensive industry like the aquaculture sector, but nevertheless, their underrepresentation is widespread.

■ **Freedom of association:** None of the employees at any supply chain stage is reported to be a member of a worker association or union. The reasons behind this are unclear, as all companies also reported that employees are free to form organisations.

Recommendations

All surveyed companies are GLOBALG.A.P. certified and some are ASC certified, and this indicates that they are meeting the current requirements of UK and Austrian retailers. **It is recommended that Turkish aquaculture companies should be prepared to uptake ASC certification with stricter requirements** if they have not already, as this may soon be the preferred certification scheme of EU retailers. Aside from certification requirements, there are still persistent challenges that need to be addressed by Turkish aquaculture companies. The following are recommendations for the identified challenges:

■ **Health and safety: Operators need to reinforce health and safety practices so they become part of standard operating practices** (and not something that only happens when auditors are present). This is especially important as it is required by both GLOBALG.A.P. and ASC certification schemes, and therefore by retailers. Inspections and site visits can be unannounced, so companies need to implement improved health and safety practices without delay.

■ **Increasing the inclusion of women in aquaculture operations:** Although the underrepresentation of women working at senior levels in the seafood industry is a global challenge, there needs to be a shift in cultural, social and political norms to support women to attain high-level positions. **Turkish aquaculture companies could help lead the way by actively recruiting qualified women and undertaking projects that serve to support women in the workplace.**

■ **Freedom of association:** The reasons behind the lack of worker associations and organisations along the SBSB supply chain will require further assessment. This assessment should explore if this is the preference of the employees, is imposed by the employers, or is due to other factors. **It is recommended that relevant management authorities in Turkey promote awareness of workers' rights and work with stakeholders in the SBSB supply chain to address this issue.**

9.4.3 SOCIAL RESPONSIBILITY PROJECTS AND POLICIES

Challenges

Social responsibility projects and policies are set up by operators in the supply chain to communicate with those who could be directly or indirectly impacted by aquaculture activities (e.g. villages near fish farms or other users of shared resources like water and fishing grounds). The aims of these projects are to avoid, mitigate or compensate these potential impacts and to build positive relationships with these stakeholders.

UK and Austrian retailers stated that they require grow-out farms to consult and work constructively with neighbours, and activities are checked on an annual basis. Additionally, the ASC standard has specific requirements on social responsibility policies, including interactions and dialogue with the local community and coastal users through regular meetings and other events.

Overall, 68% of the surveyed companies (excluding transportation) stated that they have a social responsibility project or policy in place, but only grow-out farms and packaging and processing companies provided tangible examples. This indicates that some Turkish SBSB supply chain actors may have fallen short of adopting tangible social responsibility projects.

It is clear that more Turkish farms will need to engage in these activities in order to meet both retailers' and ASC requirements, especially considering the anticipated uptake of ASC as a preferred certification requirement by retailers.

Recommendations

Given that at least 30% of the surveyed grow-out farms did not have a social responsibility project or policy, **it is recommended that awareness of corporate social responsibility should be increased within the SBSB supply chain sectors (feed manufacturers, farms, processors, etc.) so that they can understand the rationale and expectations for these projects and policies.**

While a standard such as ISO 26000 provides a set of voluntary principles for corporate social responsibility and is intended to assist organisations in contributing to sustainable development, **it is recommended that civil society organisations (e.g. WWF) work with SBSB producer organisations and the Corporate Social Responsibility Association of Turkey** to raise awareness on the need for corporate social responsibility.

Recommendations

Addressing an unexpected crisis like a global pandemic requires support from national management authorities. **It is recommended that the Turkish government provide support to the Turkish SBSB supply chain** to adopt changes needed. Useful tools such as 'Indicators for Sustainable Development of Aquaculture and Guidelines for their use in the Mediterranean (InDAM)' under the GFCM Scientific Advisory Committee on Aquaculture (CAQ) could be used to support the decision-making process (GFCM, 2011). Indicators developed in InDAM could also help the Turkish SBSB supply chain at sectoral or company level in assessing crisis management capabilities.

Successful crisis management in the Turkish farmed SBSB sector requires not only support from the government and supply chain actors, but also wider involvement and collaboration with other non-industry stakeholders like academia (e.g. on research) and civil society organisations (e.g. on awareness). **It is recommended that capacity-building workshops and pilot projects be conducted to support the Turkish SBSB sector in assessing sectoral crisis management capabilities and to develop response strategies.**

9.5 POLICY

9.5.1 CRISIS MANAGEMENT CAPABILITIES

Challenges

The impact of the Covid-19 crisis on world trade, including seafood, is a good example of the aquaculture sector getting caught unprepared. According to industry sources, the demand for Turkish fresh and chilled SBSB had fallen when the quarantine measures were imposed in major European markets as traditional outlets like markets and fish stalls were closed. Although the demand for frozen SBSB fillets has increased due to a longer shelf life, the export volume of frozen SBSB remains small.

The Turkish SBSB sector is also exposed to other risks including natural disasters; pollution and contaminants in food and water; plant and animal pathogens; plant and animal pests; invasive species; invasive genetic material; and social, market and financial risks (Bondad-Reantaso *et al.* 2008).

All these risks will have negative impacts on companies along the Turkish farmed SBSB supply chain, which may threaten the survival of the industry.

9.6 CONCLUSION

In conclusion, the Turkish SBSB aquaculture sector is on par with its European counterparts in terms of technical organisation and supply chain proficiency, industrial scale, compliance with European legislation and knowledge of EU and UK market requirements. However, there are challenges that the Turkish farmed SBSB industry and stakeholders need to address in order to meet changing retailer requirements and ensure continuous access to the EU and UK seafood markets. Implementation of the recommendations in this report will assist them to do so.

As this report only provides an overview of the Turkish SBSB supply chain and includes the use of qualitative surveys, it is recommended that additional research and more in-depth studies should be undertaken. Topics including feed sustainability, labour and human rights, pollution from farms, and retailer sustainability requirements should be investigated more closely in order to support further improvements in the Turkish farmed SBSB and wider aquaculture industries.

ANNEXES

ANNEX 1. TURKISH SBSB SUPPLY CHAIN SURVEY QUESTIONS

Below are the survey questions that were presented to all Turkish SBSB companies interviewed for this report. Section A1.1 includes questions posed to all companies and sections A1.2-1.6 include those specific to the supply chain stage. The main question topics include food safety and traceability, the environment, working conditions and gender, social responsibility, and climate change.

A1.1 ALL COMPANIES

GENERAL

1. Is your company part of a vertically integrated seafood enterprise?

All except transportation/exporters:

2. Is your enterprise certified? If yes, which third-party certifications do you have (e.g. environment, traceability)?
3. What standards and norms either international or national are you obliged to comply with?
4. What are the fundamental principles of these standards or certification schemes, what advantages do they provide for your enterprises?

Aquaculture feed manufacturers, hatcheries, grow-out farms:

5. Is your enterprise inspected by national authorities for food safety, traceability, environmental and labour aspects? Are the dates of inspections announced beforehand?

Hatcheries, grow-out farms:

6. Do you have animal welfare procedures in place?

Grow-out farms, packaging and processing:

7. Do you have or plan to apply for ASC (Chain-of-Custody) certification?
8. What is the ratio of your sales to domestic and export markets?
9. What are the main expectations of retailers in export markets in terms of seafood quality, traceability, feed used, sustainable food and other relevant aspects?
10. What are the constraints for exports of sea bass/sea bream?

Grow-out farms, packaging and processing, transportation/exporters:

11. What are the main export destinations/markets for Turkish sea bass/sea bream?
12. What are the routes and transportation means/types for export markets?

FOOD SAFETY AND TRACEABILITY

1. Is your production process...
 - a. Aquaculture feed manufacturers: traceable?
 - b. Hatcheries: traceable starting from broodstock phase until delivery of fry?
 - c. Grow-out farms: traceable starting from fry stocking phase until/including harvest?
 - d. Packaging and processing: traceable starting from fish harvest to end-product?
2. Is the traceability system subject to an independent auditing and certification process (Chain of Custody audit for packaging and processing)?

Hatcheries, grow-out farms:

3. Is the dry feed you use certified (e.g. IFFO, RSPO, RTRS) and under quality control monitoring schemes?
4. Do you have a health management system in place, e.g. vaccinations, use of anti-parasitics and antibiotics for prophylaxis?
5. Do you have a veterinarian for fish health management in your enterprise?

Grow-out farms, packaging and processing:

6. What are the national and international standards, norms and legislation that you must comply with in terms of hygiene (for packaging and processing), food safety, quality and traceability?

Hatcheries, grow-out farms, packaging and processing:

7. What are the procedures for procurement of...
 - a. Hatcheries: broodstock or eggs?
 - b. Grow-out farms: fry for stocking, e.g. certified hatcheries, health certificate from supplier?
 - c. Packaging and processing: fish material, e.g. analysis/tests, certified farms and suppliers?

 **ENVIRONMENT**

1. Does your enterprise have any practices to reduce the energy use (energy efficiency), greenhouse gases and carbon footprint of:
 - a. Aquaculture feed manufacturers: feed production?
 - b. Hatcheries: fry production?
 - c. Grow-out farms: fish production?
 - d. Packaging and processing: fish processing?
2. Do you have a waste management policy and action in place?
3. What are the international or national norms, standards or legislations that you must comply with for disposal of wastes (e.g. plastic bags for grow-out farms)? Which procedures do you follow?

Aquaculture feed manufacturers, grow-out farms, packaging and processing:

4. Does your enterprise have any specific practices to reduce the use of plastics in the production process and packaging?

Hatcheries, grow-out farms, packaging and processing:

5. What are your disposal procedures for dead broodstock, fry and eggs (hatcheries), dead fish (grow-out farms) or by-products (packaging and processing), and what is the national legislation for this?

Grow-out farms, packaging and processing:

6. Is your enterprise regularly inspected by national authorities for environmental aspects, i.e. water quality and benthic fauna and flora (for grow-out farms) or discharge water quality (for packaging and processing)?

 **WORKING CONDITIONS AND GENDER**

1. What is the minimum age for employment in your enterprise?
2. What is the minimum wage in your enterprise?
3. What is the number of your employees and gender ratio among employees?
4. What is the ratio of employed women in upper positions and low-profile/skill positions in your enterprise?
5. What is the most common position for women employed in your industry and why?
6. Is there a difference between the wages of women and men for the same position and if so why?
7. Are your employees a member of a syndicate?
8. Are workers free to form organisations, including unions, to protect their rights and bargain collectively for wages or working conditions?
9. Do all employees have a contract? Are all employees literate to guarantee they understand the contract?
10. By which means are your employees informed about their labour rights?
11. Does your company have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination?
12. Are these mechanisms communicated to workers?
13. How do you manage overtime (i.e. is it voluntary?)
14. Do you periodically measure the level of satisfaction among your employees?

All except transportation/exporters:

15. Are the health conditions of your employees considered for allocation of tasks?

16. How are the physical and psychological wellness of your employees protected by national legislation? What are your obligations?
17. Do you cooperate with recruitment agencies to look for future employees? Do they charge recruitment fees to the workers?

 **SOCIAL RESPONSIBILITY**

1. Do you have any social responsibility projects or policies for sake of social sustainability?

Grow-out, packaging and processing:

2. How do you manage positive interactions and dialogue with the local community and other coastal users?

 **CLIMATE CHANGE**

1. What would be the impact of climate change on...
 - a. Aquaculture feed manufacturers: the availability and price of fish meal and oil?
 - b. Hatcheries: marine hatcheries?
 - c. Grow-out farms: the production of sea bass/sea bream cage farming?
 - d. Packaging and processing: the availability and price of raw material (fish) for your sector?
2. Do you have any adaptation or mitigation policies in this regard?

 **ANY OTHER GENERAL COMMENTS**

1. Existing constraints?
2. Outlook?

A1.2 AQUACULTURE FEED MANUFACTURERS **FOOD SAFETY AND TRACEABILITY**

1. Are fish meal and fish oil used in sea bass/sea bream feeds traceable to their origin and is the information verifiable?
2. Are your feed ingredient suppliers certified?
3. Which quality control schemes are used? Do you carry out any analysis for GMOs?

4. How many fish species are used as fish meal in your feeds? Is the fish meal or oil of the same species used for producing fish feed?

A1.3 HATCHERIES **FOOD SAFETY AND TRACEABILITY**

1. What is the overall mortality rate for fry up to 1-3g?

 **ENVIRONMENT**

1. Do you use a recirculated aquaculture system (RAS)?
2. Do you monitor inlet/outlet (discharge) water quality and is there a national standard and legislation for discharge water that you must comply with?

A1.4 GROW-OUT FARMS **GENERAL**

1. Which slaughter method do you use for killing fish at harvest?

 **FOOD SAFETY AND TRACEABILITY**

1. Does the feed contain GMO-agro-feedstuffs?
2. Are chemicals used during grow-out certified products?

 **ENVIRONMENT**

1. What is the distance between your farm and the nearest farm?
2. What is the ratio of escapes from your farms? Do you have a precaution to reduce escapees?
3. How do you manage to protect your cages from marine wildlife, e.g. dolphins, and birds?
4. Is the farm situated in the vicinity of a marine protected area?
5. Does your enterprise consider the percentage of marine ingredients used within the sea bass/sea bream feed?
6. If so, do you have any plans to use feed with a lower marine ingredient content or that contains sustainable alternative proteins (e.g. insects)?

WORKING CONDITIONS AND GENDER

1. Do you have a risk management scheme for divers?

SOCIAL RESPONSIBILITY

1. Do you have any policies and strategies to promote the social acceptability of cage farming of sea bass/sea bream?

A1.5 PACKAGING AND PROCESSING

GENERAL

1. Is your unit licensed for exports to the EU?
2. What are your distribution channels?
3. What is your product range, processed and unprocessed?

FOOD SAFETY AND TRACEABILITY

1. Do you have a quality control and management system in place?
2. Is your enterprise regularly inspected by national authorities for sanitary conditions, food safety and traceability? Are the dates of inspections announced beforehand?

A1.6 TRANSPORTATION/EXPORTERS

FOOD SAFETY AND TRACEABILITY

1. What is the traceability system during transportation?
2. Are there any national/international standards or legislation regarding food safety and quality that you must comply with?
3. How do you control the cold chain during transportation?

NOTE: No questions were asked on environment, social responsibility or climate change for transportation/exporter companies.

A1.7 CERTIFICATION COMPANIES

1. Please provide a general picture of the sea bass/sea bream industry.
2. Is certification a must for access to domestic, EU or other markets?
3. What is the percentage of certified farms/hatcheries/packaging and processing facilities?
4. What is the average cost of being certified?
5. How do you see the future of the industry in terms of sustainable seafood production?

ANNEX 2. RESULTS OF THE TURKISH SBSB SUPPLY CHAIN SURVEYS AND EU RETAILER REQUIREMENTS

This section presents all the results of the Turkish SBSB supply chain surveys with respect to the seafood safety, traceability, social and environmental aspects of sustainable seafood production. Results reflect the responses from surveyed farms and are presented in the same structure as was used in the survey questionnaires. Feedback from UK and Austrian retailers is included at the end of each respective topic. Chapter 8 of this report presents a summary table of results.

A2.1 AQUACULTURE FEED MANUFACTURERS

GENERAL

All surveyed aquaculture feed manufacturers (5) are certified and part of a vertically integrated aquaculture company. All have GLOBALG.A.P. CFM (Compound Feed Manufacturing) certification. Other third-party certifications include ISO standards and halal food certification (Table 4). ASC does not yet have a certification scheme for feed-mills. Nevertheless, ASC requires suppliers (aquaculture feed manufacturers) that supply fishmeal/fish oil to ASC certified SBSB farms to comply with ASC requirements.

Table 4. Common third-party certification schemes in feed manufacturing

CERTIFICATION SCHEME	% OF SURVEYED FEED MANUFACTURERS (AND NUMBER)
GLOBALG.A.P. CFM	100 (5)
ISO 9001	40 (2)
ISO 22000	40 (2)
ISO 50001	20 (1)
OHSAS 18001 (replaced by ISO 45001)	20 (1)
Halal	20 (1)

Three manufacturers producing SBSB for local brands (60%) reported compliance only with national legislations. These included legislations set by the Ministry of Agriculture and Forestry and the Ministry of Environment (e.g. Law No. 5996 on veterinary services, plant health, food and feed 2010, Biosafety Act No. 5977 2010 and Directive 2002/32/EC on undesirable substances in animal feed). One of the surveyed firms, a multinational company producing an international brand, reported that it complies with EU regulations. Another manufacturer follows both national and EU legislations.

Fundamental governance principles adopted by surveyed firms are production quality, hygiene, food and feed safety, occupational health and safety, environmental health and safety, fish welfare, and sustainability. According to surveyed companies, benefits of certification and compliance with relevant regulations included customer satisfaction, environmental health, and sustainability.

Interviews with UK and Austrian retailers found that some required feed-mills to be ISO 22000 or Universal Feed Assurance Scheme (UFAS) certified, while others did not mention this specifically. All companies require all feed producers to comply with national and EU legislations.

FOOD SAFETY AND TRACEABILITY

Surveyed manufacturers indicated that fish meal and fish oil used in SBSB feeds are traceable to their origin and the information is verifiable, and production processes are traceable and traceability systems are subject to an independent audit and certification process for all surveyed firms (mainly by GLOBALG.A.P.).

All UK and Austrian retailers stated that they require feed producers to have a functioning traceability system allowing for the tracking of ingredients back to a 'sustainable source' and forward to specific farm supplies. How this is achieved is varied, with most relying on the GLOBALG.A.P. or ASC standards.

ENVIRONMENT

All surveyed manufacturers reported specific practices to reduce the use of plastics in production and packaging. The most common practices are the use of feedbags, big-bag, sack, low-density packaging materials and recycling of used materials. Three (60%) have practices to reduce energy use (increase energy efficiency), greenhouse gases and their carbon footprint in feed production. Four (80%) have a waste management policy and action plan in place. Surveyed manufacturers must comply with national requirements for disposal of wastes and use contractor firms for waste disposal.

The UK and Austrian retailers made no mention of specific environmental requirements on plastics, energy use or waste management for feed manufacturers.

All manufacturers reported that no GMOs are used in feeds. Four (80%) also carry out testing for GMOs (analysis is carried out either by the supplier or sent to independent laboratories). On average, five different fish species are used for production of SBSB feed (mainly anchovy, sardines and by-products of trout and tuna processing). When local anchovy meal and oil (caught in Turkish waters) is not available, fishmeal and oil are imported from Mauritania and Peru. Fishmeal and fish oil suppliers must have a food safety certification. According to feed manufacturers, fishmeal or oil used in fish feed are not of the same species for which feed is produced.

ASC currently requires farms to show that all fishmeal and fish oil is from sources which score more than six on the FishSource website. The ASC requirements state a five-year movement to third-party certified sources. However, this was amended in 2016 by an ASC Addendum which removed this requirement for the time being (as it was not achievable), and a 'feed standard' is currently being developed to overcome this in future. The ASC also places requirements on minimum FFDRm and FFDRo requirements (i.e. the amount of forage fish that is used in the feed). Finally, the ASC does not allow the use of same-species fishmeal. This is interesting as a lot of large producers send processing waste to the feed mill.

As a prerequisite, manufacturers will need to be able to show the source and ingredients of the feed they are using, and demonstrate that they are 'sustainable'.

SOCIAL REQUIREMENTS

All surveyed manufacturers consider the health conditions of their employees when allocating tasks. Occupational Health and Safety Law No. 6331 protects the physical and

psychological wellbeing of employees. Main health and safety obligations reported include the use of protective clothes and equipment, regular health checks for employees, and occupational health and safety training.

The minimum age for employment is 18 years for all surveyed manufacturers. The minimum wage per month is 2,000 Turkish lira (TL) on average.

Surveyed manufacturers have an average of 77 employees, of which an average of 6% are women and 94% are men. On average 40% of high-level positions and 17% of low-level positions are held by women. The most common positions for employed women are office-based positions, production engineer, quality control, procurement, and accounting. All surveyed manufacturers reported that there is no difference between the wages of women and men employed for the same position.

In addition, all surveyed manufacturers work with recruitment agencies (mainly the Public Employment Office – İŞKUR) to look for potential employees. Since İŞKUR is a public agency it does not incur any fees from employers or employees.

All surveyed manufacturers indicated that none of their employees is a member of a syndicate. However, they all reported that the workers are free to form organisations, including unions to protect their rights and bargain collectively for wages or working conditions. Furthermore, all employees have a contract and are literate to guarantee that they understand the contract. They are informed of their labour rights mainly through regular training held by the human resources department, the occupational health and safety office, or workers' representatives. All surveyed manufacturers have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination. All these mechanisms are communicated to workers.

All manufacturers are required to comply with Turkish overtime legislation. Overtime is voluntary for two (40%) of the surveyed manufacturers. One manages overtime according to the workload of the company and on a voluntary basis. One of the companies did not specify how it manages overtime beyond what is required by law. One company has a shift work plan in place. All periodically measure the level of satisfaction among employees.

Again, no specific mention of working conditions at feed mills was made by the UK or Austrian retailers.

SOCIAL RESPONSIBILITY

Out of all surveyed manufacturers, three (60%) have a social responsibility project or policy in place to address social sustainability issues. However, no tangible examples of social responsibility projects or policies were provided.

Social responsibility requirements for feed producers were not mentioned by the UK or Austrian retailers.

CLIMATE CHANGE

All surveyed manufacturers believe that climate change will have a negative effect (instability) on the availability and price of fishmeal and fish oil – namely that availability will decrease while prices will increase. Although two (40%) of the firms stated that they have an adaptation or mitigation policy for climate change, no specific examples were given.

EXISTING CONSTRAINTS AND OUTLOOK

Complexity and inconsistency in and among legislations that regulate the aquaculture feed sector was judged as the main constraint for feed manufacturers.

Instability in supply and thus price of aquaculture feed ingredients, specifically in fishmeal and fish oil, are seen as potential risks to the viability of the sector in coming years.

A2.2 HATCHERIES

GENERAL

All six surveyed hatcheries are certified and part of a vertically integrated seafood company. All have GLOBALG.A.P. certification. Two others are additionally BAP certified (Table 5). Interestingly, two of the surveyed hatcheries declared having ASC certification although ASC does not yet have a certification scheme for hatcheries. Nevertheless, ASC requires suppliers (hatcheries) that supply juveniles to ASC certified SBSB farms to comply with ASC requirements (ASC, 2019a). Moreover, one of the surveyed hatcheries that declared having Friend of the Sea certification was actually owned by a vertically-integrated company which was certified by Friend of the Sea.

Table 5. Common third-party certification schemes in hatcheries.

CERTIFICATION SCHEME	% OF SURVEYED HATCHERIES (AND/OR NUMBER)
GLOBALG.A.P.	100 (6)
BAP	33 (2)

All surveyed firms comply with national legislation and international standards (mainly GLOBALG.A.P., BAP and ASC).

UK and Austrian retailers count the hatchery sector as falling under 'farming,' so in principle they are subjected to the same buying requirements as the grow-out sector.

In most cases, the farms supplying these retailers are vertically integrated (and so the hatchery is owned by the producer directly). As a result, a farm's certification will cover the hatchery process. Retailers in both countries confirmed that the hatchery operations need to be third-party certified or meeting the necessary requirements indirectly (for ASC, the hatchery does not specifically need to be certified but the grow-out farm must show that its hatchery supplies meet the ASC requirements).

FOOD SAFETY AND TRACEABILITY

According to the responses of surveyed hatcheries, production processes are traceable starting from the broodstock phase until the delivery of fry. Traceability systems are subject to independent audits and certification processes.

In terms of broodstock or eggs, three (50%) of the companies are self-sufficient and do not purchase eggs from other hatcheries. When hatcheries are in need of fertilised eggs (e.g. in case of failure to reach sufficient induced spawning of broodstock or high demand for hatchery-reared fry exceeding their own egg stock) some hatcheries (3) buy eggs with a health certificate from other suppliers. One of these hatcheries also has a quarantine procedure along with a health certificate. Specialised software (e.g. Aquamanger) is commonly used to trace the production process among aquaculture companies including hatcheries.

All surveyed hatcheries use dry feed that is certified (e.g. GLOBALG.A.P. CFM) and under quality control monitoring schemes. The mortality rate of 1-3g fry is 7.5% on average and all surveyed hatcheries have a health management system in place. All use vaccinations and anti-parasitics but none reported any use of antibiotics. One reported that it has a fish health laboratory. All surveyed hatcheries have an on-site veterinarian.

The UK and Austrian retailers require that all hatchery inputs to the farm must be traceable back to a specific batch. No further requirements, other than those required by the third-party certifications, were specified.

ENVIRONMENT

Four of the surveyed hatcheries have practices to reduce energy use (increase energy efficiency), greenhouse gases and their carbon footprint in line with their certification schemes.

All surveyed hatcheries have a waste management policy and action plan in place. They mainly must comply with both national (e.g. Turkish Waste Management Legislation) and international (e.g. ASC, GLOBALG.A.P., ISO 14001, Friend of the Sea) standards for disposal of wastes. Surveyed hatcheries contract waste disposal companies for this purpose.

All surveyed hatcheries use a recirculated aquaculture system (RAS) and monitor inlet/outlet (discharge) water quality. There is a national legislation issued by the Turkish Ministry of Agriculture and Forestry that includes discharge water quality requirements.

The UK and Austrian retailers made no mention of specific environmental requirements for hatcheries. In many cases though, these are owned by the grow-out farm (vertically integrated) and so environmental requirements will naturally include the hatchery by default.

SOCIAL REQUIREMENTS

All surveyed hatcheries consider the health conditions of their employees when allocating tasks. Occupational Health and Safety Law No. 3661 protects the physical and psychological wellbeing of employees. Main health and safety obligations reported by the surveyed hatcheries include regular health checks for employees and occupational health and safety training.

The minimum age for employment is 18 years for all surveyed hatcheries. The minimum monthly wage is TL2,000 on average.

Surveyed hatcheries have an average of 35 employees, of which an average of 21% are women and 79% are men. On average 15% of high-level positions and 32% of low-level positions are held by women. The most common positions for women employed in the surveyed hatcheries are feeding, production, adaptation and quality control. All surveyed hatcheries reported that there is no difference between the wages of women and men employed for the same position.

In addition, all surveyed hatcheries work with recruitment agencies (mainly the Public Employment Office – İŞKUR) to look for potential employees. Since İŞKUR is a public agency it does not incur any recruitment fees from employers or employees.

All surveyed hatcheries indicated that none of the employees is a member of a syndicate, however, they all reported that workers are free to form organisations, including unions, to protect their rights and bargain collectively for wages or working conditions. Furthermore, all employees have a contract and are literate to guarantee that they understand the contract. They are informed of their labour rights (mainly through regular training held by the human resources department, the occupational health and safety office, or workers' representatives). All surveyed firms have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination. All these mechanisms are communicated to workers.

All hatcheries are required to comply with overtime legislation. Overtime is voluntary in three (50%) of the surveyed firms, while the remaining surveyed hatcheries manage overtime when it is needed (harvest season, bad

weather, etc). All surveyed hatcheries periodically measure the level of satisfaction among employees.

Again, no specific mention of working conditions at hatcheries was raised by the UK or Austrian retailers. For vertically-integrated farms the hatchery would be covered under the requirements set out for grow-out farms below.

SOCIAL RESPONSIBILITY

Four of the surveyed hatcheries (67%) reported that they have a social responsibility project or policy in place to address social sustainability issues. No tangible examples of social responsibility projects or policies were provided.

Social responsibility requirements for hatcheries were not specifically mentioned by the UK or Austrian retailers.

CLIMATE CHANGE

According to surveyed hatcheries, climate change would have an impact on fish stress, immunity, growth, sex maturation, water quality and surroundings. Although five (83%) hatcheries stated that they have an adaptation or mitigation policy for climate change, no specific examples were given.

EXISTING CONSTRAINTS AND OUTLOOK

Complexity and inconsistency of legislations, lack of qualified personnel, lack of production sites, lack of planning and low fish prices are the main existing constraints reported by the hatcheries. Constraints in supply of inputs (feed and brine shrimp), unemployment and economic problems are the outlooks reported by the surveyed firms.

In summary, the UK and Austrian retailers showed little specific focus on the hatchery sector. However, the fact that most companies are vertically integrated means that they are likely to be covered by the same requirements as are set out for grow-out farms below. From the farm surveys, no major differences were discovered between what retailers are expecting in Europe and what is occurring at the hatcheries in Turkey.

A2.3 GROW-OUT FARMS

GENERAL

Ten grow-out farms were surveyed. All nine surveyed cage farms are part of a vertically integrated aquaculture company (fully or partially integrated), while the one land-based (earthen ponds) farm is a small-scale family-run business.

All nine of the cage farms have third-party certification. The land-based farm is not certified. All the cage farms have GLOBALG.A.P. certification, while four (40%) of the surveyed farms have combinations of BRC, ISO, IFS or BAP certifications (Table 6). Of these certifications, BRC and IFC are related to processing, ISO to quality management, and GLOBALG.A.P., ASC and BAP to sustainability. Four of the surveyed farms (40%) have ASC certification, while the remaining surveyed cage farms are planning to apply. The total number of ASC certified SBSB aquaculture companies in Turkey is seven (2019).

It should also be noted that there are six aquaculture companies in Turkey certified by Friend of the Sea, although they were not interviewed for this survey (2019).

Table 6. Common third-party certification schemes in grow-out farms

CERTIFICATION SCHEME	% OF SURVEYED GROW-OUT FARMS (AND NUMBER)
GLOBALG.A.P.	90 (9)
COMBINATION OF BRC, ISO, BAP OR IFS	40 (4)
ASC	40 (4)

All farms must comply with national legislation governing grow-out operations. Certified farms must additionally comply with certification scheme standards.

The UK and Austrian retailers all confirmed that a third-party certification was an essential requirement for any farm to supply them. No company interviewed would consider buying from an aquaculture company that does not have this. The most common standard requirement currently is for GLOBALG.A.P., but BAP and ASC are also accepted. A move towards the ASC standard is currently taking place within the UK retail market (the ASC SBSB standard only recently got published), and this is expected to continue over the next five years. The ASC standard requirements are considered 'more specific' than GLOBALG.A.P., and are actually measurable (see Annex 4 for a comparison).

FOOD SAFETY AND TRACEABILITY

According to grow-out farm responses, production processes are traceable from the fry stocking phase until/including harvest. Traceability systems are subject to independent audits and certification processes.

In terms of procurement of fry for stocking, five (50%) surveyed farms have their own certified (GLOBALG.A.P.) hatcheries and four (40%) are supplied by certified (GLOBALG.A.P. or BAP) hatcheries. Only one (10%) farm reported buying fry from a supplier with a health certificate. All surveyed farms use dry feed that is certified

(GLOBALG.A.P., ISO 9001 and 22000) and under quality control monitoring schemes. Grow-out farms do not report using any feed that contains GMO ingredients.

UK and Austrian retailers all confirmed that they require a functioning traceability system, as much for product recall as for sustainability reasons. All third-party standards also have this requirement. All retailers stated they test these regularly, and that the system should allow product tracing from start to finish (hatchery to plate). Although this is often advertised as being the case in Turkey, some concerns around its traceability systems were raised.

GENETIC MODIFICATION

According to survey responses, grow-out farms do not use any feed that contains GMO ingredients.

In addition, UK and Austrian retailers indicated that they would not buy from a company that is involved in the production of genetically modified fish (although, in contrast to salmon, this has not yet occurred in SBSB). This is also in line with the ASC and GLOBAL G.A.P. requirements.

Although no evidence exists to suggest this may happen, Turkey's position outside the EU may make it more likely to experiment with genetic modification opportunities in future. However, this is still considered highly unlikely, as the result would most likely be a ban on imports of SBSB to the EU.

SLAUGHTER METHODS

All surveyed farms stated that they use stunning methods for killing fish at harvest. Seven of the nine cage farms reported using ice stunning, and two use electrical stunning. Ice stunning (thermal shock) is the more traditional method, however electrical stunning has recently become more popular specifically for sea bream.

In discussions with UK and Austrian retailers, a desire to move to electrical stunning was clear, although no retailer currently claims to have 100% coverage. This has nevertheless moved forward considerably in recent years, and some retailers claim they are very close to 100%. New suppliers would almost certainly be required to demonstrate the capacity, and existing suppliers will need to have moved to electrical stunning within the next year or so.

FISH HEALTH MANAGEMENT

All surveyed grow-out farms have animal welfare procedures in place (e.g. stocking density, monitoring of water quality and growth rates, prophylactic measures, feed quality and animal nutrition) and are inspected by national authorities and certification bodies (if accredited).

All surveyed farms use vaccination and anti-parasitics, but none reported any use of antibiotics. One farm reported that it has a fish health laboratory. All surveyed farms have a veterinarian. Surveyed farms reported that they must comply with national food safety standards in addition to GLOBALG.A.P., ASC, Russian and USA-FDA standards for food safety, quality and traceability.

All UK and Austrian retailers require the supplier to have some form of fish health management plan (HMP) and access to a veterinarian as a minimum. The ASC also requires an HMP to be in place and to be approved by a qualified veterinarian. GLOBALG.A.P. refers to this as a veterinary health plan (VHP), but it essentially covers the same things.

UK and EU retailers also require farms to have a specific mortality policy in place with the aim of reducing mortalities to as low a level as is reasonably practical. The ASC and GLOBALG.A.P. require the same as above. However, they specify that fish must be removed as soon as is reasonably practical and that all mortality must be classified (the reason for the death is determined as far as possible). If mortality is unexplained and greater than 0.5% of the total number per day, the farmer must send a sample off to a vet for examination.

FARM LOCATION

Based on figures provided by surveyed grow-out companies, the average distance to the nearest farm is 1,040m, which is above the allowable minimum of 1,000m set by Aquaculture Regulation No: 25507 (2004). Farms confirmed that they are sited in line with Turkish legal requirements.

The locations of Turkish farms are governed by Turkish law. In recent years this has undergone quite a major change, with the government deciding that farming activities should be moved offshore (when previously they were located very close in). The main reason for this was a clash between the tourism industry and the aquaculture sector. The residents of holiday resorts and summer houses do not want to have any farm located close to shore, claiming that farms smell bad and cause pollution. Since 2006 all fish farms have moved offshore, and newly licensed sites (e.g. Mersin) are also all offshore. Some farms report costs have gone up, but others say the new sites offer better production rates, which cancels out the cost increase.

UK and Austrian retailers did not report any specific requirements regarding farm locations (e.g. offshore or onshore, distance from neighbouring farms). All stated that if legislation was followed along with the third-party certification requirements then they were happy. The Turkish government has taken a strong stance on this issue, and as a result its farm locations can be considered to be more carefully planned than those of competitor countries.

ENVIRONMENT

With regards to the environmental impacts of the surveyed farms themselves, eight (80%) implement practices to reduce energy use (increase energy efficiency) and greenhouse gas emissions, and hence their carbon footprint. In addition, eight (80%) have a waste management policy and action plan in place. Farms must comply both with national legislations (e.g. Turkish waste management legislation, Turkish aquaculture law) and, if certified, with the requirements of the certification scheme for the disposal of wastes. Surveyed farms generally use the Blue Card Scheme (a waste disposal system developed by the Marine Services Directorate) for waste disposal. Along with aquaculture farms' environmental monitoring schemes, national authorities regularly inspect all surveyed farms for environmental contaminants (e.g. pharmaceutical chemicals, litter).

UK and Austrian retailers displayed widely varying attitudes towards the reduction of their carbon footprint, but this is clearly an area that is growing in importance. Currently most retailers have some requirements around the recycling of plastics and the use of fossil fuels. For example, they may be required to complete an 'energy audit' and show a decline in energy usage over time. Often though these policies are not clearly defined (for example, what does a 'decline over time' mean?). They appear in many cases to be works in progress.

Nine (90%) of the farms also stated that they are in favour of feeds with a lower proportion of marine ingredients to reduce fishing pressure on pelagic fish species (commonly used in fish meal and oil), as long as this does not impair the quality of the feed. Nevertheless, only five (50%) of the surveyed farms have any plan or intention to use feeds made from more sustainable sources (e.g. insect protein).

Certified farms need to comply with the feed requirements of the certification schemes (see Annex 3).

FISH ESCAPES AND PREDATOR CONTROL

According to data collected, the average ratio of fish escapes is 1% for surveyed farms. Cage farms mainly use Dyneema nets, double nets and sieve systems, and divers frequently check the nets as a precaution to reduce escapees. To protect the cages from marine wildlife farms mainly use durable nets for birds, and protective nets and acoustic deterrents for dolphins (*Delphinus delphis*, *Tursiops truncatus* and *Phocoena phocoena*). Only one of the surveyed farms is situated in the vicinity of a marine protected area.

Most UK and Austrian retailers require farms to report escapes to them on a case-by-case basis. The ASC also sets a maximum 'escape level' of no more than two escape events of 30% or more over a two-year period.

Not all companies have policies in relation to escapes, and limits are not specifically set by the GLOBALG.A.P. standard either.

For predator control, UK and Austrian retailers in this study had a zero-tolerance policy on lethal control, except in various specific examples (which are not that relevant to SBSB and are more in play for the salmon industry). This is also a requirement for GLOBALG.A.P. and ASC. Many retailers stated that they expect suppliers to report all 'interaction with wildlife' as it occurs (e.g. birds trapped in nets). No evidence is available to suggest that any specific issues exist with regards to escapes or predator control in Turkey.

SOCIAL REQUIREMENTS

All surveyed farms consider the health conditions of their employees when allocating tasks. The main labour and working condition obligations reported by the surveyed farms are required by national legislation such as Labour Law No. 4857 (2003) and Occupational Health and Safety Law No. 6331 (2012). Those that are certified must comply with certification scheme standards that are mainly structured in accordance with ILO principles.

The minimum age for employment is 18 years for all surveyed farms. The minimum monthly wage is TL2,160 on average.

Surveyed farms have an average of 94 employees, of which an average of 7% are women and 93% are men. On average 8% of high-level positions and 5% of low-level positions are held by women. The most common positions for employed women are kitchen, office, vaccination and diving. All farms reported that women and men employed for the same position receive the same wages.

All surveyed farms work with recruitment agencies (mainly the Public Employment Office, İŞKUR) to look for potential employees. Since İŞKUR is a public agency it does not charge any fees to employers or employees.

None of the farms surveyed indicated that any of their employees is a member of a syndicate. However, they all reported that workers are free to form organisations, including unions, to protect their rights and bargain collectively for wages or working conditions. Furthermore, all employees have a contract and are literate to guarantee they understand the contract. They are informed of their labour rights mainly through regular training held by the human resources department, occupational health and safety office, or workers' representatives. All surveyed farms have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination. All these mechanisms are communicated to workers.

All farms comply with the overtime conditions of Labour Law No. 4857 (2003), which states that overtime is voluntary. Five (56%) of the nine surveyed cage farms use overtime regularly. Two (22%) manage overtime when needed depending on emerging circumstances, and two (22%) of the farms do not use overtime at all. All surveyed farms periodically measure the level of satisfaction among employees. All surveyed cage farms have a risk management scheme for divers.

All retailers in the UK and Austria have some level of requirements relating to social compliance across aquaculture suppliers. The most common by far relates to Sedex-based audits at the processing facility level, which are required by all consulted companies.

Below this and at the farm level, the social requirements are quite varied. All companies stated that they have requirements on meeting national laws (specifically relating to wage levels, employment law, etc). It is important to understand that virtually all social standards require certain levels to be met, *unless* the national law has a different requirement. This means that the national law is the overriding factor when it comes to social compliance, and may lead to quite low requirements in some cases.

Exceptions to the above do exist, with some companies specifying that suppliers must go beyond national legislation (for example around working hours). However, this is not that common across retailers.

SOCIAL RESPONSIBILITY

Seven (70%) of the surveyed farms reported that they have a social responsibility project or policy in place to address social sustainability issues. Projects and initiatives reported included arranging festivals, clean-up events, and regular meetings with local authorities and with the local community.

The need for farms to consult and work constructively with neighbours was mentioned by all UK and Austrian retailers. This is something that they check for on a yearly basis, although generally only by confirming whether suppliers have had any complaints. It is also a specific requirement for the ASC standard.

In previous years, the relationship between the Turkish farming sector and its neighbours could not have been called healthy. Recent changes in legislation, though, have clearly improved the situation, and now most farms have open and regular dialogue with other local stakeholders.

In Turkey, the move offshore has helped, although some issues relating to smell and marine rubbish do still exist – these have created some recent tensions, especially with local hotel groups.

However, in summary, Turkish farms appear to perform better in this area than other European producers – although this is mainly through the force of legislation.

CLIMATE CHANGE

All surveyed farms expect climate change to have a negative impact on production, immunity, disease risk, water quality, fish biology and the ecosystem. Yet none of the farms stated that they had an adaptation or mitigation policy in place to address the challenges associated with climate change. The closest example provided was the lowering of stocking densities to reduce the risk of disease transmission.

As was previously mentioned, UK and Austrian retailers do not have any specific requirements for farms with regards to climate change adaptation (i.e. how to adapt production under climate change). Instead the requirements are around climate change mitigation to improve environmental performance (e.g. reducing carbon footprint).

EXISTING CONSTRAINTS AND OUTLOOK

Complex legislation, bureaucracy, high input costs, low fish prices and marketing problems (especially for small-scaled land-based farms) are the main existing constraints reported. Neither domestic nor international markets look promising in terms of fish prices in coming months. A weak Turkish foreign exchange rate has a positive impact on exports but a negative impact on imported raw material (mainly fishmeal and fish oil) which would lead to increasing production costs.

From the UK and Austrian retailers' perspective grow-out activities appear well developed, with few issues identified or differences between retail and supplier requirements.

A2.4 PACKAGING AND PROCESSING

GENERAL

All seven surveyed facilities are part of a vertically integrated seafood company and licensed for exports to the EU.

All of them have GLOBALG.A.P. certification. All packaging and processing facilities must comply with national legislation and with the standards of the corresponding certification scheme(s).

Since the domestic market prefers fresh fish rather than processed value added (e.g. fresh or frozen fillets), processing facilities tend to be export-oriented. On average, surveyed companies reported that 30% of total products are shipped to domestic markets, while 70% are exported. The main export destinations reported by the surveyed facilities are the EU, UK, US, Russian Federation and Arabic countries. All surveyed facilities use land routes for transportation of their products, while five firms (71%) additionally use air and sea routes for transporting to the US market.

All UK and Austrian retailers expect processing facilities to be certified by a third-party standard. BRC (UK companies mainly) or IFS are generally accepted. The processor will also need to be certified against the relevant standard for

Table 7. Common third-party certification schemes in packaging and processing facilities.

CERTIFICATION SCHEME	% OF SURVEYED FACILITIES (AND/OR NUMBER)
GLOBALG.A.P. COC	100 (7)
ASC/MSC COC	57 (4)
IFS	71 (5)
BRC	57 (4)
ISO (9001 AND 22000)	43 (3)
SEDEX	14 (1)
BAP	14 (1)
HALAL	14 (1)

chain of custody procedures. The Sedex system is also usually required to show social compliance.

There are no problems in this area for Turkish suppliers, with many adopting a variety of certification standards at once.

FOOD SAFETY AND TRACEABILITY

According to the responses of surveyed farms, production processes in packaging and processing facilities are traceable from fish harvest to end product. Traceability systems are subject to independent audits and certification processes (GLOBALG.A.P. CoC, ASC-MSC/CoC, BAP, IFS and ISO 9001).

In terms of procurement of fish material, four of the surveyed facilities process fish only from their own certified farms (GLOBALG.A.P., ASC), while other facilities accept fish from other certified suppliers (BAP, IFS, ISO 9001, ISO 22000). All surveyed facilities have a quality control and management system in place in accordance with their certification schemes. Surveyed packaging and processing facilities must comply with both national food safety legislation and certification scheme standards regarding food safety and quality (GLOBALG.A.P., IFS, BRC, ISO 9001, ISO 22000).

All surveyed facilities are inspected by national authorities and certification bodies for food safety and traceability. As is the case at other stages of the supply chain, certification bodies conduct both routine annual scheduled audits and unannounced audits. National authorities also make both scheduled and unannounced inspections.

UK and Austrian retailers require all facilities to meet national and EU legislation for food safety. They must be approved to export to the EU and the UK and on top of this will need to meet the requirements of the third-party standards as previously mentioned.

ENVIRONMENT

Five of the surveyed facilities have practices in place to reduce the use of plastics, energy and their carbon footprint. Six have a waste management policy and action plan in place to minimise negative impacts on the environment. Facilities must comply with both national legislation (e.g. Turkish waste management legislation, Turkish aquaculture law) and, if certified (e.g. BAP, IFS), with the requirements of the certification standards. The surveyed facilities all use external contractors for the collection and disposal of wastes.

Most UK and Austrian retailers will be dealing with vertically integrated companies, so the environmental requirements mentioned under grow-out farms will be included here (i.e. the processing units will need to show how they are reducing their global footprint as part of the overall company performance).

SOCIAL REQUIREMENTS

All surveyed facilities consider the health conditions of their employees when allocating tasks. Occupational Health and Safety Law No. 6331 protects the physical and psychological well-being of employees. The main health and safety obligations reported include regular health checks for employees and occupational health and safety training.

The minimum age for employment is 18 years for all surveyed facilities. The minimum monthly wage is TL2,043 on average.

Surveyed facilities have an average of 248 employees, of which an average of 48% are women and 52% are men. On average 24% of high-level positions and 45% of low-level positions are held by women. The most common positions for employed women are filleting, packaging, fish sizing, fish scaling and cleaning. All facilities reported that women and men employed for the same position receive the same wages.

Five (71%) of the surveyed facilities work with public recruitment agencies (İŞKUR) to look for potential employees. Since İŞKUR is a public agency it does not charge any fees to employers or employees.

None of the facilities surveyed indicated that any of their employees is a member of a syndicate. However, they all reported that workers are free to form organisations, including unions, to protect their rights and bargain collectively for wages or working conditions. Furthermore, all employees have a contract and are literate to guarantee they understand the contract. In addition, they are informed about their labour rights mainly through regular training, workers' representatives, workers' councils, orientation training, and employee contracts. All surveyed facilities have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination. All these mechanisms are communicated to workers.

All packaging and processing facilities are required to comply with overtime legislation. Overtime is voluntary in four of the surveyed facilities, while two manage overtime according to workload. Working overtime is not permitted in one of the facilities. All surveyed facilities periodically measure the level of satisfaction among employees.

All UK and Austrian retailers have certain social requirements which must be met at the processing facility. Again, since most suppliers are vertically integrated the requirements and issues identified under grow-out apply equally here. Indeed, it is in the processing sector that some of the main concerns around wage levels are likely to be found. Retailers are also heavily reliant on the Sedex system in the processing sector for confirming social compliance.

SOCIAL RESPONSIBILITY

Five (71%) of the surveyed facilities have a social responsibility project or policy in place to address social sustainability issues. They engage in positive interactions and dialogue with the local community by arranging social welfare activities and regular meetings with local authorities and the local community.

No specific social responsibility requirements were identified for the processing sector by UK and Austrian retailers.

CLIMATE CHANGE

Processors believe that climate change will have a negative impact on the stability of fish prices. Only three of the surveyed facilities declared they had an adaptation or mitigation policy for climate change, and none provided any details or examples.

No specific climate change requirements were identified for the processing sector by UK and Austrian retailers.

EXISTING CONSTRAINTS AND OUTLOOK

Complex and inconsistent legislation and low fish prices are the main existing constraints reported. As far as exports are concerned, the length and inconvenience of customs clearance hours, freight costs, price instability and low prices due to competition, and a lack of cold-storage facilities at airports for exports to North American markets are the main issues facing companies.

Raw material availability and the economic sustainability of SBSB production in the Aegean Sea are the main future concerns reported by the surveyed facilities.



Image 5. Packaging and processing facility in Turkey (Rad, 2019)



A2.5 TRANSPORTATION

GENERAL

Neither of the two surveyed transportation companies are part of a vertically integrated seafood company. They report that the Netherlands, France, UK, Belgium, Italy, Spain, Germany, Poland, Russian Federation and Romania are their main export destinations.

Transportation type (truck and/or ferry) and routes vary according to export destinations for EU member countries. Exports to the US are sent by air for chilled fresh products and by sea for frozen products.

It takes trucks around four days to reach Italy and six days to reach the UK. According to the surveyed companies, veterinary inspections at customs, speed violations, customs waiting times and a lack of necessary documents are the main constraints and logistical problems. Exporters are responsible for the safekeeping of the product, checking the labels, preparing the necessary documents and safely delivering the product to the transporter; while transporters are responsible for protecting the cold chain and safely delivering the product to the customer on time.

Neither UK nor Austrian retailers mentioned any specific supply requirements with regards to product transportation.

FOOD SAFETY AND TRACEABILITY

Food safety and quality are the responsibilities of the exporter. Transporters use satellite tracking systems (GPS) during transportation. Refrigerated vehicles with temperature control systems are used for controlling and assuring the maintenance of the cold chain.

WORKING CONDITIONS AND GENDER

The minimum age for employment is 20 years for both surveyed companies. The minimum monthly wage is TL2,270 on average.

Surveyed transportation firms have an average of 55 employees, of which only 9% are women. Due to long travelling times and the physical demands of the job, the most common positions for employed women are office-based positions, accounting and vehicle position tracking. Both firms reported that women and men employed for the same position receive the same wages.

One of the firms works with the İŞKUR recruitment agency to look for potential employees, and does not pay any recruitment fee.

Neither firm indicated that any of their employees is a member of a syndicate. However, they all reported that workers are free to form organisations, including unions, to protect their rights and bargain collectively for wages or working conditions. One of the companies reported that employees have a contract and are literate to guarantee they understand the contract, while the other did not report having contracts with its employees – despite this being a legal responsibility for the employer under national law. Employees are informed of their labour rights through the Human Resources Manager. Some employees ask co-workers for more information about their rights. Neither of the surveyed companies have formal mechanisms in place to report grievances with regard to labour conditions or to report complaints of discrimination.

ANNEX 3. SUMMARY OF THIRD-PARTY CERTIFICATION SCHEMES

The common third-party certification schemes used in the Turkish SBSB supply chain are summarised below.

A breakdown of third-party certification schemes according to different components of the SBSB supply chain in Turkey is provided in Table 8.

Table 8. Existing third-party certification schemes for the SBSB supply chain in Turkey (communication with industry certification experts).

LINK OF THE CHAIN	CERTIFICATION SCHEME
AQUACULTURE FEED	GLOBALG.A.P.-CFM, BAP
HATCHERY	GLOBALG.A.P., ASC, BAP
GROW-OUT	GLOBALG.A.P., ASC, Friend of the Sea, BAP
PACKAGING/ PROCESSING	GLOBALG.A.P.-CoC, ASC/MSC-CoC, BRC(BRCGS), IFS, Sedex, BCSI, ISO22000, ISO9001, BAP
EXPORTER	GLOBALG.A.P.-CoC, ASC/MSC-CoC
RETAILER	ASC/MSC-CoC

Aquaculture Stewardship Council (ASC):⁸ The ASC certification scheme focuses on environmental and social sustainability. It addresses environmental impacts of farming, workers' rights and communities surrounding certified farms. ASC has a specific standard for certifying SBSB farms. Through the MSC CoC, ASC labelled farmed products can be traced back along every section of the supply chain.

Best Aquaculture Practices (BAP):⁹ BAP is a seafood-specific certification programme that is capable of certifying every section of the production chain. The process starts with hatcheries, fish feed and grow-out, then ends with processing plants. BAP complies with the Global Food Safety Initiative (GFSI), Global Social Compliance Programme (GSCP) and Global Sustainable Seafood Initiative (GSSI). BAP covers community, environment, animal welfare, food safety and traceability aspects.

British Retail Consortium (BRC, rebranded as BRC Global Standard (BRCGS) in 2019):¹⁰ BRCGS has various certification schemes including food safety standards. Food safety certification standards primarily include senior management commitments, food safety (HACCP), food quality

management, site standards, product control, process control, personnel, and potential pathogen contamination risk.

GLOBALG.A.P.:¹¹ The GLOBALG.A.P. aquaculture standards cover legal compliance, food safety, workers' occupational health and safety, GLOBALG.A.P. Risk Assessment on Social Practice (GRASP), animal welfare, and environmental and ecological care. Aquaculture products produced by GLOBALG.A.P. certified production processes can be labelled with the GGN label. The GLOBALG.A.P. Chain of Custody Standard assures a high level of transparency and integrity by identifying the status of a product throughout the entire supply chain, from farm to retailer.

International Featured Standards (IFS):¹² The IFS Food Standard is a GFSI (Global Food Safety Initiative) recognised standard for auditing food manufacturers. It has a focus on food safety and the quality of processes and products.

Business Social Compliance Initiative (BSCI):¹³ BSCI is not a certification scheme. BSCI provides a system that helps companies to gradually improve working conditions in their supply chain to drive social compliance and improvements within factories and farms. BSCI implements the principal international labour standards protecting workers' rights, including International Labour Organization (ILO) conventions.

Friend of the Sea:¹⁴ The Friend of the Sea certification scheme covers sustainability criteria and indicators in aquaculture projects. The certification, granted by an accredited independent certification body, ensures that a product complies with sustainability requirements.

Sedex:¹⁵ Sedex enables companies to work together to better manage their social and environmental performance, and to protect workers in the supply chain. Each Sedex member is committed to being a responsible and sustainable business.

International Organization for Standardization (ISO):¹⁶ Commonly used ISO standards include the ISO 9001 Standards for Food Quality Management, the ISO 22000 Standards for Food Safety Management, the ISO 50001 Standard for Energy Management Systems, and the ISO 45001-2018 Standard for Occupational Health and Safety.

Halal:¹⁷ Halal certification assures that the product is made with ingredients (and produced in an environment) that comply with Islamic beliefs. It applies to end products or any ingredient used in production of the end product (e.g. aquaculture feed).

ANNEX 4. COMPARISON OF THE ASC AND GLOBALG.A.P. STANDARDS

The ASC and GLOBALG.A.P. standards are the two most readily accepted third-party certification schemes by UK and Austrian retailers for farmed SBSB. Below is a summary comparison of the two standards.

Table 9. Comparison of the ASC SBSB standard and GLOBALG.A.P. Aquaculture standard

COVERAGE AREA	ASC SEA BASS, SEA BREAM AND MEAGRE STANDARD	GLOBALG.A.P. AQUACULTURE STANDARD
Scope of standard	The standard covers the production of sea bass, sea bream and meagre (<i>Dicentrarchus</i> , <i>Sparus</i> and <i>Argyrosomus Sp.</i>) in all regions using sea cage grow-out systems.	The GLOBALG.A.P. Aquaculture Standard is a single set of regulations which cover all aquaculture production methods and species. It covers the process from hatchery through to processing. Specific separate requirements for sea bass and sea bream are not provided.
Hatchery/fingerling production	This is covered by Section 8 of the standard. Farms need to show documentation proving compliance of all fingerling and egg suppliers with Indicators 8.1 to 8.9. These requirements cover several of the key principles of production. Interestingly, auditors are not required to visit the supply hatcheries. Fingerlings are covered under 3.4 as well and should be from hatchery sources only. Both the supplier and receiver should have a biosecurity plan in place. The supplier should also have a suitable fish health protocol.	AQ 2 provides specific requirements relating to 'Reproduction'. These requirements are quite specific and cover the broodstock management, hatchery management, fish stripping and fingerling transportation. Requirements here are similar to those provided in the ASC standard but not as generic. It is also clear that the auditor is expected to visit the hatchery facilities (unlike for ASC). All hatcheries are required to be GLOBALG.A.P. certified (which is not specifically the case for ASC).
National laws and regulations	This is covered by Principle 1 and requires farms to demonstrate that they are correctly licensed and located under the correct leases and permits. The standard does not provide minimum guidance here but simply requires all national laws to be met.	This is covered under AQ1 and is very similar to the ASC. Farms must demonstrate legal compliance in terms of licensing and permits.

COVERAGE AREA	ASC SEA BASS, SEA BREAM AND MEAGRE STANDARD	GLOBALG.A.P. AQUACULTURE STANDARD
Conservation of habitat	This is covered by Principle 2 and in many cases requires the specific collection of environmental data (although not necessarily by an auditor, it can be the farms' own data). The farms are required to demonstrate specific redox potential or sulphide levels in the farm, specific benthic faunal scores, and evidence that copper levels are less than 34mg Cu/kg in sediment outside the farm area. A full methodology is provided for how this should be done.	AQ 9.1.5 talks about the implementation of a benthic monitoring programme as set out in an original and suitable EIA. Here though GLOBALG.A.P. is much less prescriptive than the ASC over what is required: no specific indicators are provided.
Water quality	Covered by Criterion 2.2. Farms must show that average DO levels are greater than 70%, that TAN, NO3 and TP levels are tested at the farm every quarter, and that any biocides used are approved under EU, US, Australian or Japanese legislation. Again, a full methodology is provided for how sampling should be completed.	As above, GLOBALG.A.P. is much less prescriptive than the ASC over what is required. A monitoring programme is required but no specific indicator levels are set by the standard.
Interaction with sensitive habitats and species	In Criterion 2.3 the farm must demonstrate it has a biodiversity impact assessment in place. Farms are not allowed to be located in high conservation value areas (unless certain conditions are met) or within 500m of seagrass meadows (>10m ²).	AQ 9.4 covers 'High Conservation Habitat Areas' (although it is unclear exactly what these are). Farms located here must have the express permission of the HCHA management. Also, if established since 1999, they need to show they are being retired or are actively rehabilitating the area over a period of three years.
Predator interaction	Criterion 2.4 states farms may not use submerged acoustic deterrents and that no endangered or red-listed animals can suffer mortality as a result of farm operations. Intentional lethal actions are also banned for all species at the farm (unless human safety is threatened).	Covered under AQ 9.2. Lethal control of endangered predators is not allowed, and a policy for predator control should be in place. GLOBALG.A.P. does not ban the use of intentional lethal action against all species, just those that are endangered.
Genetic integrity	Principle 3 deals with genetic integrity and the interaction of the farm with wild stocks. Farms are not allowed to culture non-native species unless the species is considered to be 'ecologically established'. All transgenic fish use is banned under the standard. Finally, escapes must be minimised and the stocking management system capable of identifying them. A maximum of 4% of the stock (at the end of the production cycle) are allowed to escape (unless extenuating circumstances exist).	AQ 2.1.4 specifically does not allow genetic modification in fish.

COVERAGE AREA	ASC SEA BASS, SEA BREAM AND MEAGRE STANDARD	GLOBALG.A.P. AQUACULTURE STANDARD
Feed use (fishmeal and fish oil)	This is covered in detail in Principle 4. All fishmeal and fish oil used must be traceable back to its source. Farms must be operating at a fishmeal forage dependency ratio (FFDRm) of ≤ 1.85 (for sea bass and sea bream) and a fish forage dependency ratio (FFDRo) of ≤ 2.95 . Farms may not use fishmeal or fish oil coming from species categorised as threatened on the IUCN red list or that come from the same genus (i.e. sea bream or sea bass cannot be used in the fish feed). The initial requirement for 90% of fishmeal or fish oil to be from an ISEAL accredited fishery (e.g. MSC) is not currently in place, and was replaced by an interim solution in 2016. This requires the sources to meet the minimum score of 5 or higher on the FishSource website. This interim solution will stay in place until the ASC Feed Standard is released.	Feed is covered under AQ7. Requirements are in place to determine that the feed is suitable for use and from a recognised supplier (i.e. a GLOBALG.A.P. Compound Feed Manufacturing Standard). Procedures are provided for storage of the feed, traceability and its management. GLOBALG.A.P. requires that feed ingredients do not come from endangered species. No other specific requirements are in place, however.
Feed use (non-marine-based)	Covered under Criterion 4.4, non-marine-based ingredients must be covered by a responsible sourcing policy and be fully traceable. Transgenic plant materials used must be fully documented. 80% of all soy and palm oil used must be certified under an ISEAL member programme.	As above.
Waste management	Covered by Criterion 4.5, evidence of recycling policy is required, and that biological and chemical waste is appropriately stored or disposed of. Farms must have a spill prevention and response plan; and for land-based net cleaning operations, a method of treating the effluent produced.	Waste management is covered under AQ 9.1.1., which asks for a policy to be in place. Land-based net cleaning is not specifically mentioned (but that is because the standard is not species/production specific).
Energy consumption and GHG emissions	In Criterion 4.6 farms are required to complete an energy use assessment for the production cycle (and within two years of initial audit). This should be measured in kilojoule/ tonne of fish/ production cycle. An annual GHG assessment (including the GHG emissions from feed used during previous production cycles) must be completed, and a strategy for reducing them must be in place.	No specific requirements on energy consumption or GHG emissions are provided in the GLOBALG.A.P. standard. Fossil fuel usage is briefly mentioned under AQ 9.1.3, but under a requirement for the EIA.

COVERAGE AREA	ASC SEA BASS, SEA BREAM AND MEAGRE STANDARD	GLOBALG.A.P. AQUACULTURE STANDARD
Disease and health management	This is covered by Principle 5 of the standard. Farms must have a fish health management plan (FHMP) and record-keeping system. The farm may not use therapeutic treatments which are listed as critically important to human medicine by the WHO. The prophylactic use of antimicrobial treatments is also not permitted. One anti-parasitic treatment and no more than three antibiotic treatments are permitted in any one production cycle.	Covered under AQ 5.2, the requirements are very similar to ASC. No specific limit is set on antibiotic treatment, it just has to be demonstrated that the fish have had a bacterial outbreak. However, more stringent requirements then exist for testing fish for antibiotic residues in an approved lab.
Mortality	The farm must record and recover all mortalities. Any unexplained mortalities which exceed 0.5% of the total per day must be reported to the designated fish health expert or veterinarian. A plan should be in place to try to reduce mortalities over time.	Covered under AQ 5.5. GLOBALG.A.P. does require that all mortality is recorded and collected. A plan is also required for how to deal with unexplained or mass mortality events, although no level indicators are provided here.
Slaughter	There are no requirements concerning slaughter methods.	GLOBALG.A.P. states that stunning prior to slaughter is a mandatory requirement (AQ 5.2.21).
Social requirements	Principle 6 covers the social requirements in detail. Staff must have access to trade unions (if they exist). They must be free to form organisations and to bargain collectively if they desire. Staff must have a minimum age of 15, or higher if local law requires. Young workers (15-18) must be protected (non-hazardous tasks, hours allow them to attend school, etc). There must be no evidence of forced, bonded or compulsory labour, and anti-discrimination policies must be in place. Wages must be above the national minimum wage, and there should be evidence that the employer is working towards a basic needs wage – although how this is calculated is not specified. In principle, therefore, paying above minimum wage is likely to qualify. All staff should have a contract or worker's agreement in place. Evidence of how suppliers and contractors are monitored is also required. Conflict resolution and disciplinary processes should be set out in procedures.	The social components of GLOBALG.A.P. are covered under AQ 16. In reality, though, this requires the auditor to confirm that a separate GRASP assessment has been completed (this is the specific standard which covers the social components). The GRASP requirements as a first step are usually completed by the farming company itself (self-assessment). This is then followed by an on-site audit to review the outcomes. The GRASP requirements are much simpler than and lack the detail of the ASC requirements, with notable omissions. Although the majority of major areas are covered by GRASP, differences do exist. The two most important are as follows: 1. Additional young workers protection is not provided (staff need only be of legal working age). 2. The basic needs wage is not covered (staff are simply required to be paid the national minimum wage).

COVERAGE AREA	ASC SEA BASS, SEA BREAM AND MEAGRE STANDARD	GLOBALG.A.P. AQUACULTURE STANDARD
	Working hours should be in line with national laws, unless these exceed international best practice (48 regular hours and 12 hours of overtime a week). All overtime should be voluntary and paid at a premium rate. If staff accommodation is provided it should be clean, sanitary, safe and suitable. Separate sanitary and toilet facilities should be provide	
Health and safety	Under Criterion 6.5, a health and safety risk assessment should be present. All staff should be trained in health and safety and have access to required personal protective equipment. Incidents must be recorded and followed up. Specific evidence that all diving operations are conducted in a manner that protects health and safety is required.	Covered under AF 4.1. Farms are required to have a written risk assessment and procedures. Signage must be provided for hazardous areas, and first aid kits must be visible. All workers and visitors should receive suitable personal protective equipment. The requirements are very similar to the ASC, although in general they are more prescriptive.
Conscientious neighbour	Covered by Principle 7 of the standard. Farms are required to consult regularly with communities and stakeholders and have a policy and mechanism for the resolution of disputes. New farms are specifically required to consult on any potential social impacts the farm may have.	No specific requirements on stakeholder engagement are included in the standard.

ANNEX 5. FISH SLAUGHTERING IN NORWAY

In Norway, the use of stunning technology has developed widely, with around half of all farms currently using a stunning system (Compassion In World Farming, 2018).

Fish may be harvested alive on well boats and taken to a central processing facility for slaughter. The fish are then pumped into the facility and passed straight through a stunning machine. Alternatively, barge systems are floated out to the cages and fish are pumped directly into a series of electric stunners before being pumped into a waiting well boat containing slush ice.¹⁸

This has clear advantages over the current process in Turkey, in that fish are harvested and transported alive to a suitable site for humane slaughter. However, its introduction would require significant investment in new harvesting and processing technology. It also has some specific issues which would require further consideration before it could be considered feasible:

1. The temperature difference between Norway and Turkey is high, so it is not clear how easily fish could be harvested by well-boat and kept alive back to shore.
2. Turkish companies tend not to have processing facilities located at the shore logistics location, but often some distance inland. This is not the case in Norway, where processing is usually located on the dockside. Clearly this presents an even bigger investment consideration.

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For further information on relevant Turkish legislation please visit www.mevzuat.gov.tr/

END NOTES

1. European market observatory for fisheries and aquaculture products: Species profile: European sea bass www.eumofa.eu/documents/20178/137160/European+seabass_31-1.pdf
2. European market observatory for fisheries and aquaculture products: Species profile: gilthead sea bream www.eumofa.eu/documents/20178/137160/Gilthead+seabream_31-1.pdf
3. In many cases it is the suppliers who dominate the purchasing process and control the sustainability requirements on behalf of the retailers.
4. The volumes as indicated here by the Aegean Union of Exporters differ slightly from the volumes indicated by Anadolu news agency in Table 2.
5. Other sources of sea bass and sea bream do exist but they are negligible and are not considered in more detail here.
6. Sea bass is more recognisable in the UK as it is caught in UK waters and already consumed. Sea bream is really a Mediterranean fish, and so used only to be eaten commonly by families on holiday.
7. <https://ceresproject.eu/>
8. www.asc-aqua.org/
9. www.bapcertification.org/
10. www.brcgs.com/brcgs/food-safety/
11. www.globalgap.org/uk_en/for-producers/globalg.a.p./integrated-farm-assurance-ifa/aquaculture/index.html
12. www.ifs-certification.com/index.php/en/standards/251-ifs-food-en
13. www.amfori.org/content/bsci-certificate-label-or-standard
14. friendofthesea.org/
15. www.sedex.com/
16. www.iso.org/standards.html
17. www.hafsahalal.com/
18. An example of a stunning machine produced by Baader can be found at www.baader.com/images/cm/videos/products/fish/Manual_Feeding.mp4





Sea bass © Yesh10511 / Shutterstock / WWF



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