

Dicentrarchus labrax

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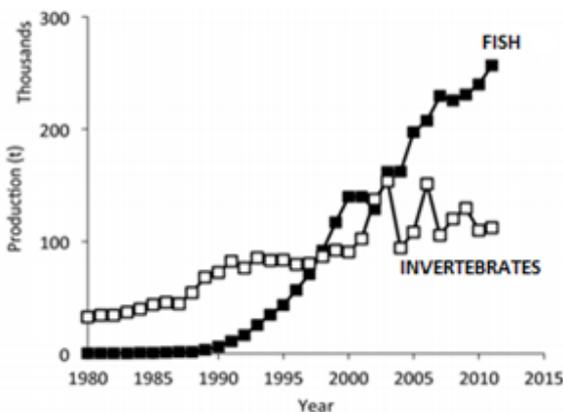
The European sea bass (aka seabass or bass) (1) is an important marine species both to commercial fisheries (where it

provides a valued seasonal catch for many inshore fishermen) and to aquaculture, where it is reared in lagoons (small scale production) and in industrial, offshore and inland systems.

The purpose of this guide is to give buyers background information on the responsible sourcing of farmed sea bass

Living close to shores and estuaries the European sea bass has traditionally been reared in enclosed lagoons or fitted tanks where they fed naturally until they were harvested - for instance Italian valliculture and ofesteros in southern Spain (which are still operational today) (2). In the 1960s however the growing scarcity of young fish and the example of salmon farming in northern Europe led to research and breeding programmes. It was this work that enabled the start of sea bass (and sea bream, the two species are often quoted together) farming in the Mediterranean in the 1980s. Sea bass is now predominantly farmed in coastal locations in the Mediterranean.

Figure 1. Shifting Mediterranean aquaculture production - from invertebrates to fish (3)



In the late 1980s, the growth of Mediterranean mariculture (farming in marine waters) witnessed a shift from the culturing of invertebrates (mainly mussels) and detritivorous fish (e.g. grey mullet) to the farming of more carnivorous species, i.e. sea bass and sea bream (Figure 1) (3). Sea bass (along with sea bream) are the most important cultured species in the Mediterranean today (4). World production of farmed sea bass has increased from around 60,000 metric tonnes (mt) in 2003 (5) to an estimated 162,000 mt in 2014. Turkey and Greece are the biggest producers representing 67% of world production, but Egypt is important (6).

The commercial viability of RAS (Re-circulating Aquaculture Systems) in the UK has had a 'stop and start' history (7). The UK currently has one sea bass RAS producer in Wales (8), producing its first fish in 2009. It is the only marine RAS currently producing table-fish for the UK market. Past production has been 300–500 mt per year. It targets 1,000 mt per year by 2015 (7).

BUYERS' TOP TIPS

Know your source of supply and only purchase farmed sea bass which is traceable throughout its entire production chain.

Ensure product complies with the appropriate farming, processing and production standards.

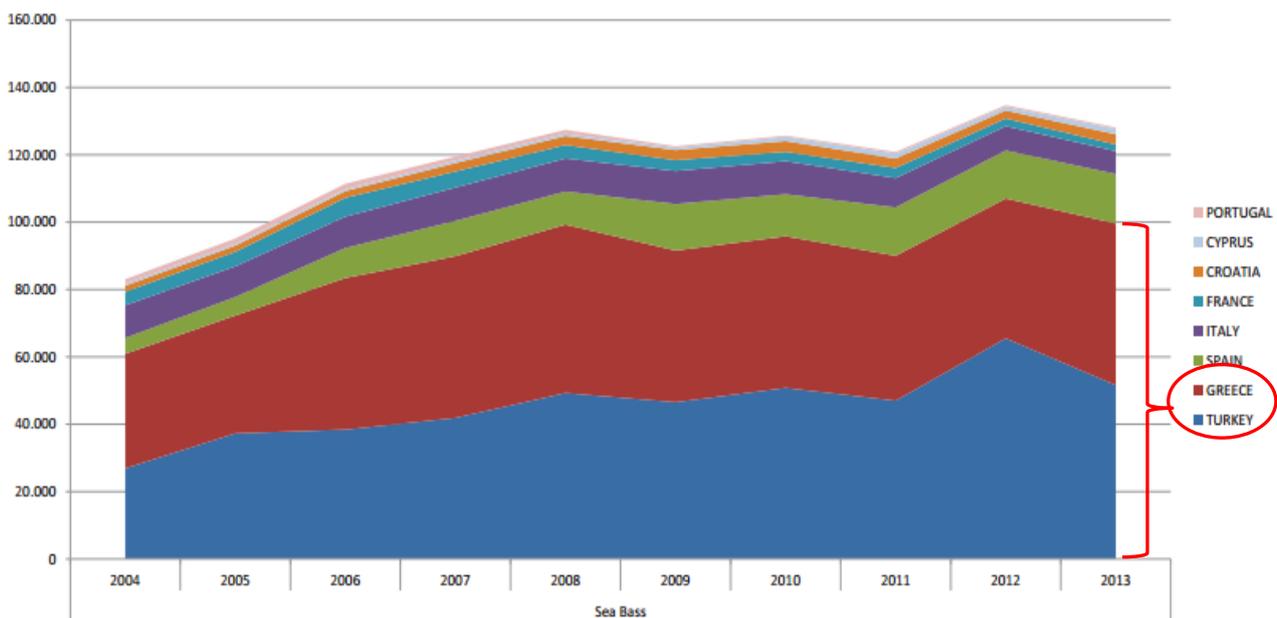
Understand the legal system for importing seabass, and the testing requirements to ensure all product is free from drug and chemical residues.

Be aware of the social and environmental impacts.

Sources and quantities

The Mediterranean is the centre of sea bass (and sea bream) aquaculture and these combined sectors have seen a percentage growth rate of 140% between 2002 and 2012 (9). Current production is dominated by Turkey and Greece (Figure 2), with an estimated 64,000 and 44,000 mt produced respectively in 2014 (6).

Figure 2. Sea bass growth and production (excluding North Africa) 2004 - 2013 (10)



In recent years Turkey has surpassed Greece as the leading sea bass producing nation, and a number of factors have contributed to Turkish success. The Greek industry has been struggling to maintain profitability for some years, while the economic crisis has restricted access to credit. Meanwhile, the Turkish sector has received investment and government support, on top of its existing advantage in terms of production costs. It now appears that growth in Turkish expansion is winding down and the focus is on turning production in to profit (6).

Reportedly 90% of sea bass (and sea bream) are sold in domestic or local markets (as opposed to 20% for Norwegian salmon for instance, which is now present in 160 markets worldwide); whilst whole fish represents >90% for the sea bass (and sea bream) market (only 5-10% of the Norwegian salmon market) (9). The smaller product size renders adding value (e.g. through filleting) more difficult than with larger fish such as salmon (11).

Farmed seabass is generally sold fresh and cleaned, mainly through supermarkets and restaurants (2). Sea bass ranked 11th in the top 35 UK retail species by value in the 52 weeks running up to August 2014, with 2,674 mt of retail sales (12). The UK imported 1,400 mt and 900 mt of fresh seabass from Greece and Turkey respectively in 2014 (6).

Biology

European sea bass are tolerant of a wide range of temperatures (5-28 °C) and salinities (3‰ to full strength sea water) making them able to frequent coastal inshore waters, estuaries and brackish water lagoons.

Adult sea bass usually occupy well defined feeding areas, often inshore, from which they migrate in autumn to offshore spawning areas (13). There is one breeding season per year, which takes place in winter in the Mediterranean population (December to

March), and can occur up to January till June (peaking in April) in Atlantic populations.

Sea bass larvae drift from spawning grounds towards the shore (14). Juvenile sea bass remain in or near these nursery areas for up to five years, depending on growth, and often dispersing well outside the 'home' range of the parent spawning stock (15). After 4 - 8 years sea bass attain maturity and adopt the migratory movements of the adult fish (16). Sea bass can reach 1 m in length and weigh 12 kg (2).

Cultivation methods and systems (2)

- **Hatchery and Weaning**

In aquaculture production the reproduction of sea bass is controlled in hatcheries, using broodstock.

To prolong the sea bass spawning cycle, the technique of photo-manipulation is used. This consists of inducing the species' seasonal sexual behaviour by controlling the period of artificial 'sunshine'. The eggs, fertilized by the male, are collected on the surface of spawning tanks and placed in incubator tanks where they hatch after 48 hours.

Larvae lose their yolk sac six days after hatching. At this point they are given a very specific diet, based first on seaweed and rotifera (a microscopic zooplankton), then, when their size permits, on artemia (a small crustacean living in lagoons, deltas and estuaries). This live food is always produced in the hatchery.

After 40 - 50 days, the larvae are transferred to the weaning unit where they are fed a formulated high-protein 'micro-diet' (nutrients are wrapped in a membrane or 'encapsulated' to form of small pellets, small enough to be ingested by larvae). After three to four weeks the fry are transferred to juvenile breeding units. Two months later, at

a weight of 2 - 5 g they are transferred to on-growing facilities.

Hatchery operations are technical and require highly trained, specialised staff. European hatcheries are generally independent and sell juvenile fish to on-growing facilities.

On-growing or fattening / feed

The purchase of young fish from hatcheries represents one of the biggest recurring investments made by fish farms. The fish are fattened in floating cages either smaller cages in sheltered sites, or larger cages in more exposed locations. Other farms raise sea bass in land-based tanks, generally using a recirculation system that controls the water temperature. This also makes it possible to raise sea bass at more northerly latitudes.

Sea bass are fed pellets high in fishmeal (FM) and fish oil (FO), but also vegetable extracts. The International Fishmeal and Fish Oil Organisation (IFFO) (now the Marine Ingredients Organisation), estimates that on average producing 1 mt of farmed fish (excluding filter feeding species) takes 0.5 mt of whole wild fish (17). For sea bass the FI:FO (Fish In: Fish Out) ratio is higher at around 2:1. FM and FO in sea bass diets constituted 26% and 6% in 2010, however these are set to reduce to 18% and 4% respectively by 2020 (9).

The use of FM and FO in all farmed fish feed is a contentious issue, and the feed industry is active in finding materials and methods whereby it can replace FM and FO with alternative ingredients without having

detrimental effects to fish health, growth rate and ultimately the quality of the final product.

Farmed sea bass are generally harvested and slaughtered when they weigh either 300 - 500g (18), but producers rear a range of sizes for market, which takes from under a year to two years depending on the desired size and factors such as water temperature.

Extensive cultivation

Extensive cultivation utilises larvae and juvenile sea bass that move naturally into tidal lagoons and inlets from which their escape is prevented by screens or traps at sluice gates. The sea bass are fed on both wild and artificial food during the two to three year period before being harvested. This method has been practiced locally in France, Spain, Italy and other countries for many years. A few semi-intensive farms, offshoots of traditional extensive aquaculture, still exist. In these facilities, lagoons and coastal ponds are stocked with fry from hatcheries, which are fattened with a commercial feed.

Sea-cage culture

From 5 g plus, the young sea bass are transferred to sea cages where, at water temperatures of 12 - 25°C, they will take 16 - 24 months to reach the standard marketing size of 400 g. In 2012 European warm water marine fish aquaculture (sea bass and sea bream) 55% of production came from large cages, 45% from small cages (19).

Land-based culture

Sea bass have also been cultivated intensively in heated water, initially in power

station cooling water, but more recently in temperature controlled recirculation (RAS) systems.

Modern seawater RAS enable sea bass to be cultivated with minimal environmental impact on the marine ecosystem as discharges can be re-cycled and escapes minimised. These land-based systems produce 400 g fish in 9 - 12 months from the juvenile, and can be

located in areas close to markets where sea temperature may make cultivation otherwise uneconomic. All these systems are subject to regulation in Europe under relevant environmental and fish health legislation. In 2012 European warm water marine fish aquaculture (sea bass and sea bream) 5% can from land based systems (19).

Environmental considerations

The growth of sea bass aquaculture industry has raised a number of environmental and social concerns (9,11,20):

- Reliance on high FM and FO levels in aquafeeds
- Habitat impacts, especially in more sheltered farming sites, and there is a lack of scope for rotational use of sites to enable fallowing
- Nutrient and chemical discharge impacts, especially in more sheltered farming sites with less water exchange
- Disease spread risk; transmission between farms and to wild fish populations
- Escapees may compete with wild fish and harbour diseases
- Carbon footprint from RAS power requirements, especially in climates where water has to be heated
- Stress and other factors which can make intensively farmed sea bass susceptible to viruses and diseases. Vaccine technology needs bolstering
- Conflicts among users of shared resources such as land and water

Management standards and certification

Both environmental and economic pressures support the need for management standards and certification of aquaculture production. Certification is a process that allows a supplier to demonstrate 'responsibility' by:

minimising impact on the environment; making the best use of locally available resources; making informed choices as far as labour rights; complying with national legislation and ensuring the best use of feed and therapeutic products.

Independent consultants, representatives from feed companies, national bodies, and international NGOs work with farmers in order to achieve the standards set out.

In January 2011 the first global guidelines for aquaculture certification were approved by the UNFAO Committee on Fisheries. The guidelines, which are non-binding, cover animal health, food safety, the environment, and worker issues (16).

International, independently certified sea bass is available on the market through schemes such as Friend of the Sea (with ~15 entries on their website) (21), Global GAP (with at least 38 producers certified around the Mediterranean) (22), and organic standards such as Nutrland (23) .

The Global Aquaculture Alliance recently held seminars on responsible aquaculture in Greece and Turkey (24), focusing on the implementation of the BAP (Best Aquaculture Practices) Finfish and Crustacean Farm Standards (25). Sea bass (and sea bream) are among the species covered by the BAP standards. Certification under this standard may enable sea bass producers to look at new market opportunities in Europe and North America.

The **Global Sustainable Seafood Initiative (GSSI)** (26). As seafood certification and labelling programs have become the primary tool to address sustainability issues for many companies, buyers, and consumers, the number of such programs has led to confusion and inefficiencies. In 2013 the GSSI was created to develop a common, consistent and global benchmarking tool for these programs, in order to measure and compare their performance. It is envisaged

that the final version of the GSSI Global benchmark Tool will be available in QIII 2015.

Supply chain standards

Responsible practice in the chilled and frozen supply chain depends on correct catching, gutting, washing, chilling or freezing, processing and handling practices throughout the chain. The British Retail Consortium (BRC) Global Standard & Safe & Local Supplier Approval (SALSA) certification standards are designed to raise standards in the seafood processing and wholesaling sectors.

Product characteristics and availability

Sea bass supplies from Mediterranean farms are available year round. Sea bass has a firm white flesh and mild, delicate flavour; a low-fat source of protein and a good source of selenium (27). Whole fish from 300 - 600 g are ideal for simply gutting, scaling, stuffing with herbs and baking or grilling. Skin-on fillets (two per person from a 400 - 600g fish, or one from a 800g+ fish) are great for grilling or pan-frying. The only significant difference from wild sea bass is that farmed bass have a slightly higher fat content. Sea bass has a flavour which stands on its own, but also works well with stronger flavours, and is particularly popular in Thai cuisine.

Within the EU (e.g. sea bass from Greece), food which has been placed on the market is regarded as being in free circulation, which

means that for fishery products (and bivalvemolluscs) they must be derived from an approved establishment and comply with the relevant hygiene rules.

Consignments of fishery products must display an identification mark of the State and the establishment approval number. Health certification for these products is not required, however, under food law, any product being placed on the market must be fit for consumption and it is therefore the responsibility of food business operators in the UK to ensure that products from other Member States do not pose a health risk to the general public (28). Turkey, the largest sea bass farming nation, is an approved non-EU country authorised to export fishery products to the UK. The Food Standard Agency (FSA) has produced a step-by-step importing guide (29).

At the end of 2014 new EU 'Labelling of Fishery and Aquaculture products' (FAPs) came into force. Now all wild fishery and farmed aquaculture products marketed within EU (both the EU and non-EU products) will display mandatory and voluntary information about the product for final consumers and mass caterers (30, 31).

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This is one of a series of responsible sourcing guides for aquaculture

See: <http://www.seafish.org/industry-support/aquaculture>

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