working draft

# EEA Core Set of Indicators - CSI 033

# Aquaculture production

## May 2005 assessment



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European Environment Agency

## Key policy question: Is the current level of aquaculture sustainable?

***European aquaculture production has continued to increase rapidly during the last 10 years due to expansion in the marine sector in the EU + EFTA Countries. This represents a rise in pressure on adjacent water bodies and associated ecosystems. The precise level of local impact will vary according to production scale and techniques as well as the hydrodynamics and chemical characteristics of the region.***

### Annual aquaculture production by major area

A significant increase in total European aquaculture production has been observed in the last 10 years. In general, the significant improvements in the efficiency of feed and nutrient utilisation as well as environmental management have served to partially mitigate the associated increase in environmental pressure. The increase in both production and pressure on the environment has not been uniform across countries or across production systems. Only the mariculture sector has experienced a significant production increase, whilst brackish water production has increased at a much slower rate, and the levels of freshwater production have declined. On a regional level, EU + EFTA countries dominate production by far.

Europe's fish farms fall into two distinct groups: in western Europe the fish farms grow high-value species such as salmon and rainbow trout, frequently for export, whereas in central and eastern Europe the fish farms cultivate lower-value species such as carp that are mainly consumed locally.

Chemicals, particularly formalin and malachite green, are used in freshwater farms to control fungal and bacterial diseases. In marine farms antibiotics are used for disease control but the amounts used have been drastically reduced in the past years following the introduction of vaccines.

The observed growth in production has not come without problems. According to DG Fisheries "the European Aquaculture industry is facing a number of challenges in terms of market and of the environment. Its future will depend on its ability to become economically self-sufficient and its capacity to respond to environmental constraints".

### Production by country

The biggest European aquaculture producers are found in EU + EFTA region. Norway has the highest production with over 500 thousand tonnes in 2001, followed by Spain, France, Italy and the UK. These 5 countries account for 75.5 % of all aquaculture production from all 34 European countries. Even the smallest of these, the UK, produced 170 thousand tonnes in 2001, which is significantly higher than production in any European country outside of this region. Turkey's production of 67 thousand tonnes represents substantially the highest production in the AC 13 + Balkan region. The country ranking in 2001 in terms of production is very similar to that in 2000.

Norway is the dominant aquaculture producer with about 90 % of its production being the Atlantic salmon. It is noteworthy that in 2001, farming of this single species in Norway exceeded the combined total of all production species from all AC 13 + Balkan countries. Spain, the next biggest producer, is dominated by production of blue mussel, followed by France whose production is dominated by the Pacific cupped oyster (Crassostrea gigas). Turkish production consists mainly of trout, sea bream and sea bass.

### Production by major commercial species groups

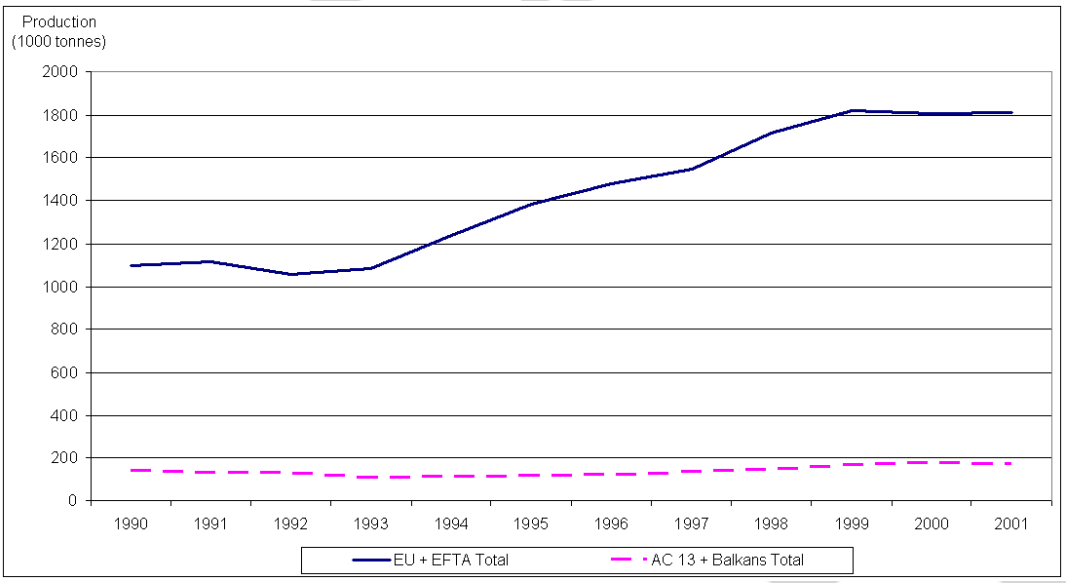
Different types of aquaculture generate very different pressures on the environment. Intensive finfish

production in marine and freshwater generates the greatest environmental pressure, and it is this kind of production which has increased most rapidly in recent years.

The major part of the increase in aquaculture production has been in marine salmon culture in Northwest Europe, and to a lesser extent in trout culture (throughout Western Europe and Turkey), seabass and seabream cage culture (mainly Greece and Turkey), and mussel and clam cultivation (throughout Western Europe); although the latter exhibits a downward trend since 1999. By contrast, inland aquaculture of carps (mainly common and silver carp) has declined significantly throughout Eastern and Central Europe (AC 13 and Balkan countries), in part due to political and economic changes in Eastern Europe.

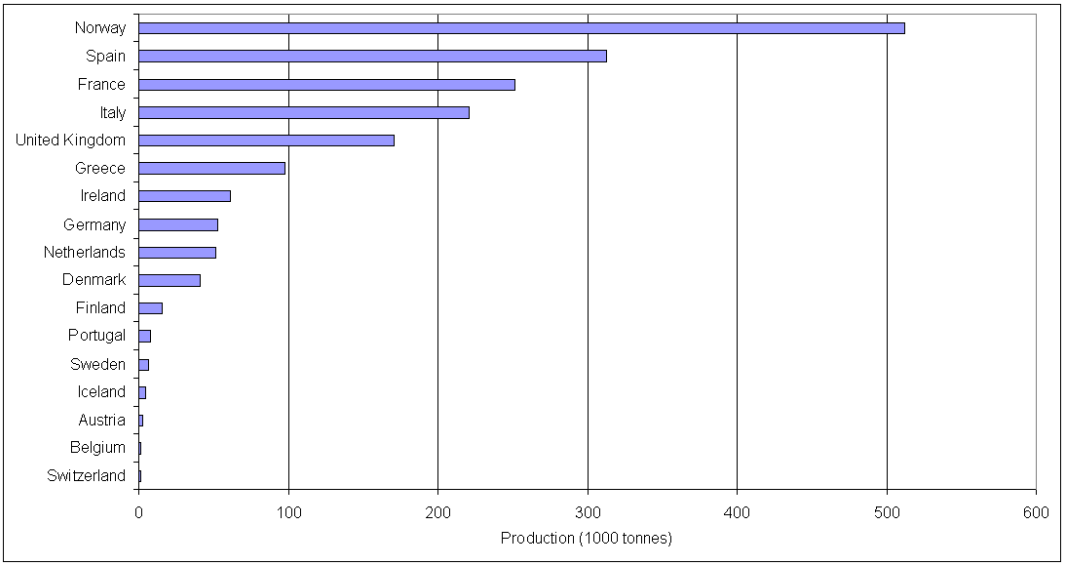
The main environmental pressures from aquaculture are associated with intensive finfish production, mainly salmonids in marine, brackish and freshwaters, and seabass and seabream in the marine environment.
It is precisely these sub-sectors that have experienced the highest growth rate in recent years. Although the cultivation of bivalve molluscs has also increased substantially, the environmental pressures associated with this type of aquaculture, which include removal of plankton and local concentration and accumulation of organic matter and metabolites, are generally considered to be less severe than those from intensive fin-fish cultivation. Pond aquaculture of carps in inland waters usually requires less intensive feeding, and in most cases a greater proportion of nutrients discharged are assimilated locally. Environmental pressure per unit production is likely to be less than for the more intensive salmonid production. Furthermore, this type of aquaculture has decreased in recent years.
As in the case of production per country, no significant changes have been observed in production by major species since the last assessment (2000).

Fig. 1: Annual aquaculture production by major area (EU+EFTA & AC13 + Balkans), 1990-2001



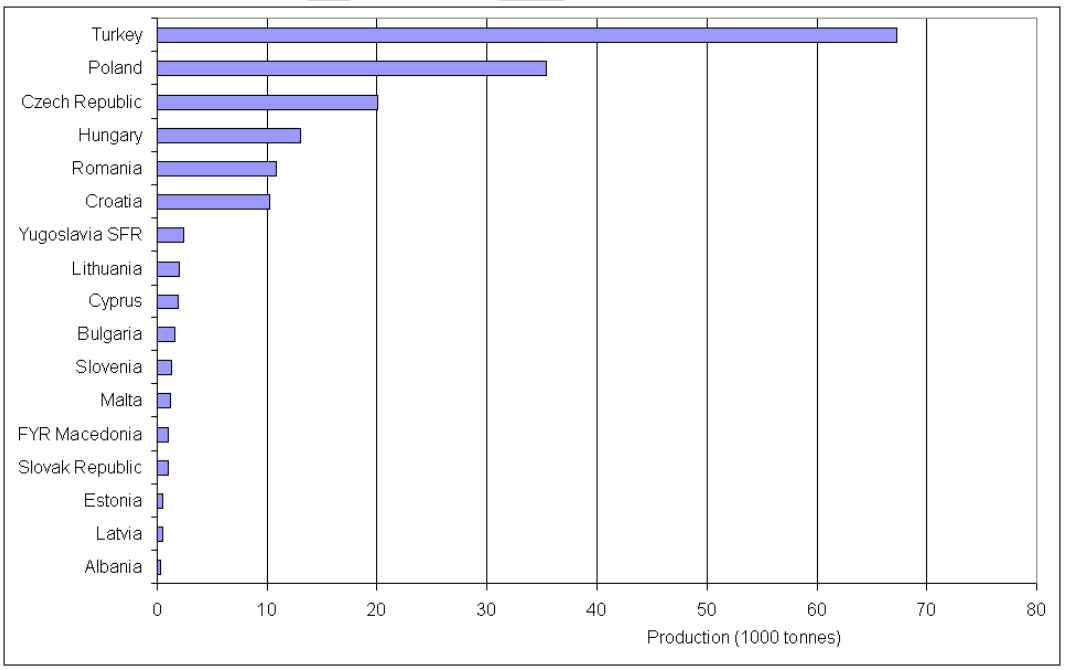

**Data source**: FAO FISHSTAT Plus
**Note:** Aquaculture production includes all environments i.e. marine, brackish and freshwater.
EU + EFTA: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK, Iceland, Norway and Switzerland.
AC 13 + Balkans: Albania, Bulgaria, Czech Republic, Croatia, Estonia, FYR Macedonia, Hungary, Latvia, Lithuania, Poland, Romania, Yugoslavia, Slovak Republic, Slovenia,
Cyprus, Malta and Turkey.
Luxembourg, Liechtenstein and Bosnia-Herzegovina, are not included due to either no aquaculture production or lack of data.

Fig. 2: Annual aquaculture production by country in (EU + EFTA), 2001



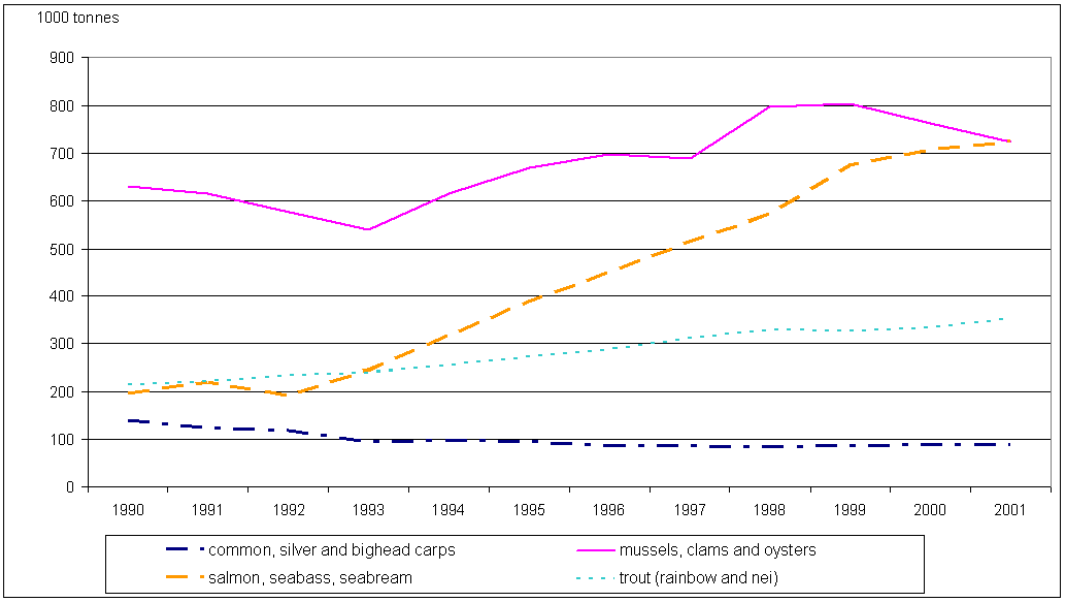

**Data source**: FAO FISHSTAT Plus
**Note:** Production includes all environments i.e. marine, brackish and freshwater.

Fig. 3: Annual aquaculture production by country in (AC13 + Balkans), 2001




**Data source**: FAO FISHSTAT Plus
**Note:** Production includes all environments i.e. marine, brackish and freshwater.

Fig. 4: Annual production of major commercial aquaculture species groups, 1990 - 2001




**Data source**: FAO FISHSTAT Plus

**Note:** Includes all countries and production environments for which data are available.
nei = not elsewhere indicated.
Trout (rainbow and nei) includes all species of trout.

## Specific policy question: What is the environmental performance of aquaculture?

### Production relative to coastline length

Environmental pressures exerted from aquaculture are not uniform. Of the EU countries, Spain, France and the Netherlands, and in terms of Accession countries, Turkey, have the greatest marine aquaculture production in relation to coastline length.

Aquaculture production intensity as measured per unit coastline length has reached an average of around 8 tonnes per km of coastline in EU + EFTA countries compared to 2 tonnes per km in AC 13 + Balkans region.
The increasing trend observed during the past years appears to be stabilising. However, pressure is likely to continue to increase as production of new species such as cod, halibut and turbot becomes more reliable.

By presenting production relative to coastline length, it is possible to determine a more comparable value of production density. This is potentially a better indicator of pressure than a single production value, but there are difficulties with this indicator. It is inappropriate for landlocked countries; it does not apply to freshwater production; it does not consider the area of coastline that is potentially suitable for production; and the determination of coastline length is problematic and relies upon uniform scale being used for each country's determination.

An alternative indicator could be based on the percentage coverage of key coastal habitat types by different types of aquaculture.

### Contribution of nutrients from aquaculture to total coastal nutrients loads

Marine finfish culture (mainly Atlantic salmon) is now making a significant contribution to nutrient loads in coastal waters. In the case of Norway (Norwegian and North Sea coasts), phosphorus discharges from mariculture appear to exceed the total from other sources.

Pressure from nutrients from intensive cultivation of marine and brackish water is becoming significant in the context of total nutrient loadings to coastal environment. The published data on total nutrient loadings to coastal waters remains poor in quality and inconsistent in coverage. The figures presented here should be treated with caution.

References:

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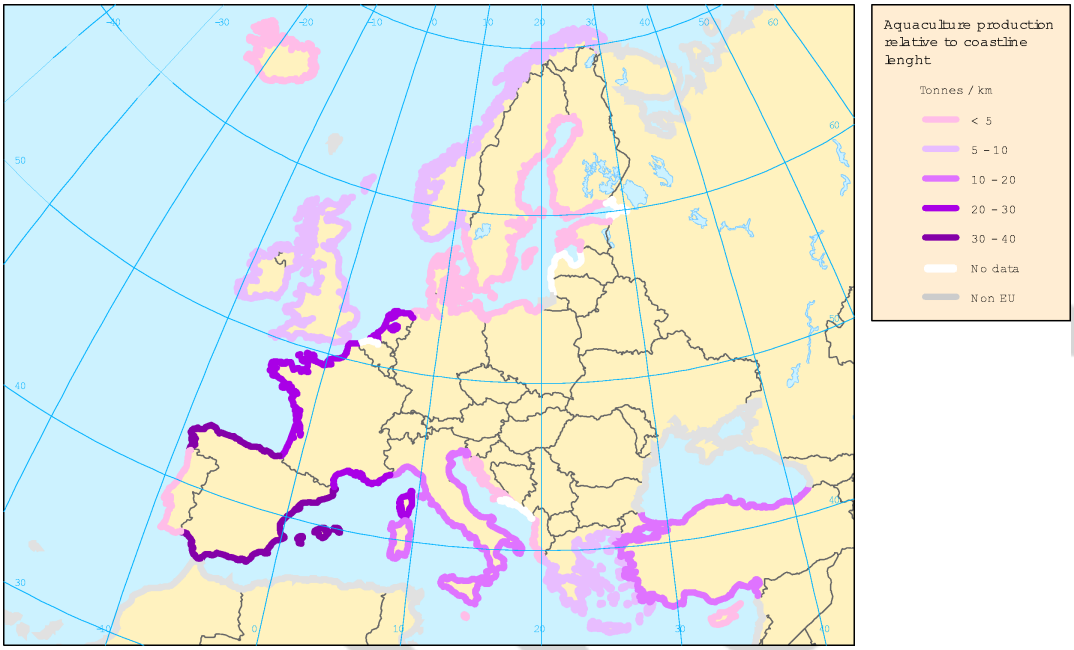
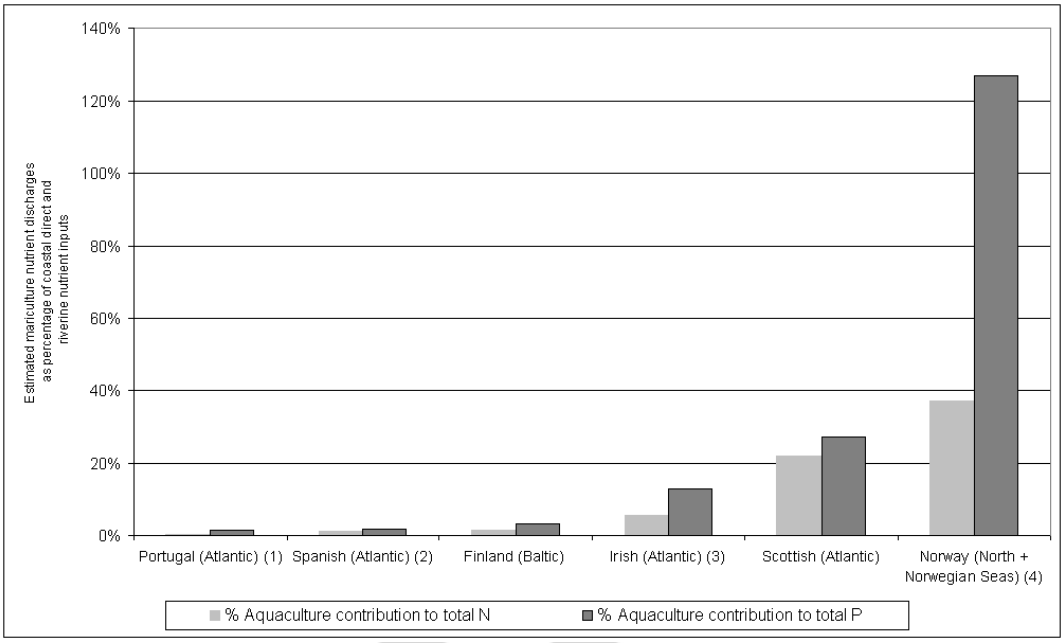
Fig. 5: Marine aquaculture production relative to coastline length




**Data source**: FAO FISHSTAT Plus and World Resources Institute
**Note:** Only marine and brackish waters production.
Average production density values for countries with a coastline and with coastline data available.
Based on latest year for which there are data: 2001 for all countries except Bulgaria (2000), Estonia (1995) and Poland (1993).

Fig. 6: Relative contribution of nutrients from marine and brackish water finfish culture in selected countries, 1999




**Data source**: FAO Fishstat Plus, Jonsson and Alanara, Ospar Commission, Haugen and Englestad, Beveridge, Helsinki Commission

**Note:** 1. Nitrogen load figure limited to riverine discharge only (no data on direct inputs).

2. Phosphorus load: average of lower and upper estimates.

3. Total N for riverine discharge estimated as NH3-N+NO3-N. This will overestimate the relative N loads from aquaculture.

4. Nutrient loads applicable to sea areas in which the bulk of marine and / or brackishwater finfish aquaculture takes place have been used. These figures do not include N and P discharges from inland aquaculture production.

The proportion of aquaculture production which results in nutrient waste is based upon the mid-range of values stated in the OSPAR 2000 report (55g N /production Kg ( 5.5%) and 7.5g P /production Kg (0.75%)).

The figures for Finland are based upon the HELCOM 1998. This gives both the total loads and the aquaculture load, therefore the OSPAR 2000 water ratio figure is not required to calculate aquaculture percentage of total.

Production figures relate to marine species only, except Finland, which refers to brackish water production.