

Legislation of Aquaculture

Status and Perspectives in the Baltic Sea and Nordic countries

Position Paper

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Introduction

Since the beginning of the 2010s, the European Commission has stressed the need to boost growth in the European aquaculture sector. The Blue Growth strategy (2012)¹, Common Fisheries Policy², the related 'strategic guidelines for the sustainable development of EU aquaculture' (2013)³ and the more recent 'Farm to Fork strategy for Sustainable food' (2020)⁴ indicate an ambition to increase productivity, create more jobs and improve competitiveness.

After several years of implementing these policies, we assess in this paper the current status and remaining issues regarding the legislative framework for aquaculture with a main focus on recommended actions for the Baltic Sea.

How ready is the regulatory framework in the Baltic Sea and Nordic countries to accept this challenge of growing the aquaculture sector?

Increasing the environmental sustainability of aquaculture, together with a wish to grow the sector, has been on the agenda of Baltic and Nordic countries for many years. Until now, however, no major growth has taken place in the aquaculture sector, in recent years mostly due to limiting environmental regulations⁵. Issued licenses are not corresponding to novel aquaculture production methods, and consequently do not encourage investors or industrial producers to invest in growing the sector.

¹ European Union: European Commission (2017). Commission Staff Working Document: Report on the Blue Growth Strategy: Towards more sustainable growth and jobs in the Blue Economy. 31 March 2017, SWD(2017) 128 final, available at: https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/swd-2017-128_en.pdf

² Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R1380>

³ COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Strategic Guidelines for the sustainable development of EU aquaculture /* COM/2013/0229 final */ Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52013DC0229>

⁴ European Commission Farm to Fork strategy for sustainable food (2020) https://ec.europa.eu/food/farm2fork_en

⁵ Young, N., Brattland, C., Digiovanni, C., Hersoug, B., Johnsen, J. P., Karlsen, K. M., Kvalvik, I. et al. 2019. Limitations to growth: social-ecological challenges to aquaculture development in five wealthy nations. Marine Policy, 104: 216–224.

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The further development of the aquaculture sector in a sustainable way has been one of the topics that the SUBMARINER Network for Blue Growth has committed itself to right from the beginning of its operations. Ever since the publication of the SUBMARINER Compendium (2012)⁶, which presented an assessment of the potential of the sector throughout the Baltic Sea Region, and the resulting SUBMARINER Roadmap (2013)⁷, which defined the actions necessary to make this happen, the network has actively pursued projects in that direction.

Most notably, the SUBMARINER network has fostered innovative technology development and transfer - i.e. innovative combinations of RAS (Recirculating Aquaculture Systems) with geothermics; for shrimp; and microalgae/plants– to promote the sustainability of RAS farms within the Southern Baltic countries (through the project ‘InnoAquaTech’⁸ and its follow-up project ‘AquaVIP’⁹); advancing the creation of commercial mussel as well as algae farms within the Baltic Proper (through the projects ‘BalticBlueGrowth’¹⁰ and ‘GRASS’¹¹), including also combinations of such systems with fish farms. The EMFF funded project AquaLIT¹² is focusing on measures how to reduce marine litter derived from the aquaculture sector. In addition, the ‘Blue Platform’ project (2018-2021)¹³ allows for the analysis of these and other projects in order to promote the uptake of their results, products and outputs by other actors and develop the next generation of actions required to promote a sustainable Blue Bioeconomy throughout the region.

To this end, the status, barriers and possible solutions for the challenges in aquaculture legislation have been recently discussed in two workshops for Nordic and Baltic Sea countries:

- Workshop ‘Alignment of Aquaculture Legislation’ organised by the Blue Platform project in Helsinki, Finland on 6-7 February 2020. Presentations available online: <https://www.submariner-network.eu/news/39-aquaculture-news/659-first-blue-platform-workshop-on-aquaculture-legislation-thank-you>

⁶ SUBMARINER Network (2012). SUBMARINER Network Compendium - An Assessment of Innovative and sustainable Uses of Baltic Marine Resources. Maritime Institute Gdansk: Poland. Available at: https://www.submariner-network.eu/images/roadmap/submariner_compendium_web.pdf

⁷ Przedzimirski J et al. (eds) (2015). SUBMARINER Roadmap. Towards a blue-green economy in the Baltic Sea Region. Gdańsk. 2nd edition. Available at: <https://www.submariner-network.eu/images/roadmap/sub-roadmap-2015-web.pdf>

⁸ Interreg Baltic Sea Region InnoAquaTech project ‘Cross-border development and transfer of innovative and sustainable aquaculture technologies in the South Baltic area’. More information: <https://www.submariner-network.eu/innoaquatech>

⁹ Interreg South Baltic AquaVip project ‘Aquaculture Virtual career development Platform for the South Baltic region’. More information: <http://aquavip.edu.pl>

¹⁰ Interreg Baltic Sea Region BalticBlueGrowth project ‘Initiating full-scale mussel farming in the Baltic Sea’. More information: <https://www.submariner-network.eu/balticbluegrowth>

¹¹ Interreg Baltic Sea Region GRASS project ‘Growing algae sustainably in the Baltic Sea’. More information: <https://www.submariner-network.eu/grass>

¹² European Maritime and Fisheries Fund AquaLit project ‘Averting the Discarding of Litter in the Marine Environment from the Aquaculture Industry’. More information: <https://aqua-lit.eu/about>

¹³ Interreg Baltic Sea Region Blue Platform project ‘Advancing Blue Bioeconomy Capacities in the Baltic Sea Region’. More information: <https://www.submariner-network.eu/blue-platform>

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- Workshop ‘Environmental licenses for Aquaculture’ organised by the Swedish Board of Agriculture in Stockholm/Arlanda, Sweden on 12-13 November 2019. Presentations available online: <http://www.svenskvattenbruk.se/46/nyheter-och-reportage/aktuellt-inom-vattenbruket/aktuellt/2020-05-11-presentationer-fran-workshop-om-miljotillstand-finns-nu-publicerade..html>

This position paper presents the proposed changes and alignments as a set of recommendations, supplemented with examples from Baltic and Nordic countries. In addition, it presents recommendations derived from the AquaLIT project, which organised two Learning Labs in the Baltic Sea Region.

The term ‘aquaculture’ in this paper refers mainly to saltwater fish aquaculture as well as mussel and algae cultivation as a compensatory measure. Where relevant, it also refers to RAS. The two workshops, on which this paper is based, showed that there are also issues with legislation for fresh water aquaculture. However, this is not the focus of this paper as such, although the authors stress that additional research on legislative improvements for this form of fish aquaculture would also be highly valuable.

Recommendations

1. *Aquaculture legislation should be reconciled on the EU level with environmental objectives.*

Although certain issues in the regulatory framework for aquaculture can and should be solved nationally¹⁴, the overarching European directives and regulations should be more aligned, so that they may cross-fertilize, meaning:

- The Common Agricultural Policy (CAP)¹⁵ should be more in line with the Water Framework Directive (WFD)¹⁶, as the good ecological status of waterbodies depends heavily on agricultural practices. The cumulative impacts on waterbodies should then be managed by both policies.
- Understanding the WFD not only as a set of obligations, but rather as a framework for operation, would provide opportunities for aquaculture production to increase, without negatively impacting the marine environment.
- Taking into account the foreseen role of aquaculture in increased protein production, a new HELCOM recommendation on food production would be desirable to form a

¹⁴ Froehlich, H. E., Couture, J., Falconer, L., Krause, G., Morris, J. A., Perez, M., Stentiford, G. D., Vehvilainen, H., and Halpern, B. S. 2020, Mind the gap between ICES nations’ future seafood consumption and aquaculture production. – ICES Journal of Marine Science, doi:10.1093/

¹⁵ European Sources Online (2013). Information Guide. Common Agricultural Policy. Cardiff: EDC. Available at: <http://aei.pitt.edu/75450/3/Common-Agricultural-Policy.pdf>

¹⁶ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32000L0060>

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common approach to nutrient loads and with an integrated view for nutrient loads from agriculture and aquaculture.

- An increasing amount of imported fresh fish is transported by air; frozen fish arrives in most cases by ship. The countries with the largest export of fresh fish are Tanzania, South Africa, Sri Lanka and Iceland. Consequentially, economic evaluations show that the CO₂ emission for the transport of 1 kg fish is:

Air	700-1000g CO ₂ /1000km
Road	100-200g CO ₂ /1000km
Rail	50g CO ₂ /1000km
Sea	18g CO ₂ /1000km

Therefore, regionally produced fish can help regions or countries to reduce their CO₂ footprint in accordance with possibly existing strategies to combat climate change and the international climate policy; appropriate national legislation can support this aim.

On the national level, legislation should then enable and support new technologies for aquaculture to mitigate environmental impacts and foresee compensation measures in the water basin management plans. In addition, legislation incentives on nutrient recycling in general could help to reconcile aquaculture growth and environmental objectives.

2. To minimize environmental impacts, optimal siting for marine aquaculture should be promoted through maritime spatial plans.

To minimize possible negative impacts on the marine environment, national regulations could foresee the inclusion of fish farm locations in their maritime spatial plans. These plans should include an estimation of the overall carrying capacity of the marine space.

In **Finland**, a spatial plan for aquaculture has been approved in 2014 after 6 years of development. Its principles include the allowance of aquaculture farms in areas with good or satisfactory water quality; to place them at least at 500 m distance from summer cottages, as well as allowing larger fish farms further offshore in order to improve profitability. The idea is to put the offshore farms out in summer and to take them back or to submerge them during the winter period. The spatial plan was well received with many people applying for new licenses and farms; resulting in already some new aquaculture farms with almost 2.000 t higher production. The plan also allows certain nutrient levels in the target areas.

In **Iceland** and **Norway**, the carrying capacity of marine space allocated for fish farms is estimated before any activity.

3. Compensation measures should be included in aquaculture policies.

Compensation measures should be a part of an aquaculture policy, included either in the water basin management plans and/or in the permit requirements. The inclusion of compensation measures could be secured either by adjusting the legislation of licensing or if the country's environmental law does not forbid compensation measures, then licenses can include permit orders on these measures to secure water quality. Legislation could also include the options of financing for compensation (own finances, water improvement fund, compensation company) following the "polluter pays" principle. The compensation should be proportional to the positive environmental impact achieved and not too costly. Compensations in aquatic systems should be considered specifically, apart from terrestrial areas.

The attitude of Baltic and Nordic countries towards compensation measures in aquaculture legislation is currently heterogenous:

- In **Denmark**, the former government made a reservation for 800 t N for new fish farm in Kattegat at offshore location in Their Food- og Agriculture Packet from 22.15.2015¹⁷. A law proposal (L111, 2016¹⁸) including the possibility to use compensatory measures for establishing new sea cage farms and for expanding existing farms was submitted to Danish parliament and the Environmental law was changed in 2017/2018. Further a now historical order for in-phasing "N" to aquaculture was approved 28.11.18¹⁹ with a deadline for application in March 2019. This led to the submission of almost 40 applications for new sea cage farms not only from existing aquaculture companies, but also from new investors. In August 2019 the current government announced in its press release that the development of new sea cage farms was to be stopped. In addition, almost all the existing sea cage farms are in process renewing their location permits and environmental license. Most decisions are appealed by either the Nature Conservation Board or The sports anglers. At the same time, **it is likely that mussel farming will be included as a tool for compensation in the next generation of WFD basin plans, but not as a compensatory measure for specific fish farms.** The Danish MSP (Havplan/Sea Plan) is currently under development.
- In **Finland**, various administrative acts and policy planning documents (including the Programme of Measures for the implementation of the Marine Strategy Framework Directive (MMSFD)) have formed the goal to have fish farming in the Baltic Sea use the fish feed produced from the Baltic Sea fish, i.e. *Baltic Sea Fish Feed* (BSFF). **The new Finnish government programme foresees to provide incentives to aquaculture farms, which reduce nutrient loading and apply circular economy principles, like RAS and BSFF.** The implementation of the governmental programme has led to the drafting of the

¹⁷ https://mfvm.dk/fileadmin/user_upload/FVM.dk/Dokumenter/Landbrug/Indsatser/Foedevare-og-landbrugspakke/Aftale_om_foedevare-og-landbrugspakken.pdf

¹⁸ <https://www.ft.dk/samling/20161/lovforslag/l111/index.htm> 15.12.2016

¹⁹ <https://www.retsinformation.dk/eli/lta/2018/1327>

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Finnish Green Deal by the Ministry of Agriculture and Forestry, including the use of Baltic Feed (i.e., BSFF) to achieve sustainable growth. It must be noted that this is planned as a voluntary system, however.

- Additional compensatory measures to improve water quality in Finland in the framework of existing legislation have been explored. In the framework of the "Local fishing" and the 'Baltic Fish' project²⁰, **the fishing of cyprinids (mainly bream) has been endorsed and local production chains developed.** Local production chains have been created in the region of Turku and the Kesko supermarket chain has launched a consumer product. However, fishing of cyprinids is a measure to improve water quality, but **not a compensatory measure** in Finland.
- At the same time on Åland, the revised **Water Act**²¹ **contains incentives for measures to reduce impacts, thus becoming the first regulatory framework of Nordic countries including compensation measures.** In the new Act, compensation is related to permitting and the Government Bill defines actions and criteria for compensation measures. The measures should be: 'ecosystem based and environmentally sustainable'; 'based on scientific knowledge'; and 'clearly show improvement of the water quality through the compensation measure'.
- In **Sweden**, the national law is in line with the Weser judgement since 1 January 2019. The Environmental Code states that a permit may be combined with the obligation to carry out or pay for special measures to compensate. So, the **compensation is seen as an option, not as an incentive** – it can be included in the list of conditions to be reviewed by authorities issuing a permit. A Swedish study on ecological compensation from 2017²² suggests the codification of the mitigation hierarchy and assessment of permits and a requirement to assess the need for compensation measures. However, the study does not tackle compensations for the aquatic environment to a full extent and therefore seems more relevant for Natura 2000 areas and land-based environments.
- In **Estonia**, the new regulation²³ emphasizes site selection for aquaculture so that achieving WFD objectives are not impeded. Also it sets sludge managing restrictions, outflow limit concentrations for pollutants and monitoring requirements. Additionally it contains formulas for calculating pollutant quantities from aquaculture and presents the opportunity to use compensation methods (such as farming mussels, seaweed, collecting seaweed from the beach or additional fishing from the influenced area) to reduce nutrient load to the environment.

²⁰ John Nurminen Foundation project "Baltic Fish". More information at <https://johnnurmisenfaat.fi/en/projects/baltic-fish/>

²¹ Water Act (1996:61)

²²Koh, N. S., Hahn, T., Ituarte-Lima, C. 2017. Safeguards for enhancing ecological compensation in Sweden.

Land Use Policy, Volume 64, May 2017, Pages 186–199. Available at:

<https://www.stockholmresilience.org/publications/artiklar/2017-03-24-safeguards-for-enhancing-ecological-compensation-in-sweden.html>

²³ Water Act. Available at <https://www.riigiteataja.ee/akt/103042020021>

4. *The basis of permit issuance should be more adjusted to farming practices.*

Permits for controlled environmental impact could be based on nutrient output calculations and not on the nutrient input (feed quota), where appropriate modelling is possible. Economical aspects should be considered during granting of the permit to expand and the license should be continued if the impact of the farm does not change.

In **Denmark**, the effect from nutrient output from a sea cage farms is based on three dimensional emission-based model calculations by DHI. In **Poland**, the fish farming permits are for 20 years instead of only 10 years, as is the case in most countries. This makes it easier for fish farmers to invest in new technologies supporting environmental sustainability. The following recommendations are partly derived from the AquaLIT Learning Lab meetings with stakeholders.

4.a. *Improve waste policy of aquaculture farms*

To support a preventive waste policy, farmers could make an inventory of all aquaculture equipment that have been installed to easily track what gear might be lost. The inventory of all companies could be integrated and made public by local authorities.

In addition, the waste policy (collection and depositing) on concessions should be improved, clarified and specified, and a better follow-up should be granted. Lost or abandoned items should be reported to the appropriate authorities.

4.b. *Improve waste management systems and waste recycling*

It would be beneficial to have a framework and certification for waste management in companies, e.g. including key performance indicators. For a proper *Plastic Management Policy*, the integrated management of plastic waste in the company's policy on reduction of plastic waste seems to be essential (incl. key performance indicators for implementation). Examples for measures are e.g. banning of single use plastics, use of recycled plastics, recycling of used plastics.

Many European countries only have a decommissioning plan but no waste management plan in aquaculture. The loss of gear and other material at sea often is by accident in the aquaculture sector but also due to a lack of management of procedures with precise step-by-step instructions and control.

To facilitate a coordinated management approach, the aquaculture sector should not be singled out as an industry that needs special regulations when it comes to waste material (non-biological, construction, equipment, etc.). There are many other small-scale industries with similar materials appearing from time to time or regularly as waste, so disposal and recycling should be linked up, not to be costly only for the aquaculture (i.e. economies of scale). This would make the logistics for handling wastes more attractive for specialized companies.

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The introduction of *incentives to use recycled plastics* as much as possible (but: of sufficient quality), e.g. by up-cycling of used nets to polyamide yarns to be used for swimwear, socks, etc. seem to be a promising way to raise the willingness of companies to recycle this specific waste. In addition, technologies should be improved to recycle mixed materials. These approaches need supportive national or cross-border regulations.

4.c. Preventive use of antibiotics should be avoided

For sustainability of aquaculture the permit criteria should include the reduction or avoidance of preventive antibiotics²⁴ due to negative side effects on farmed animals and wild populations.

5. Definitions of and applications of legal procedures for aquaculture should be clarified.

Definitions of aquaculture terms and methods should be harmonized throughout the legislative system in Europe, to outline the precise scope of each regulation. Legal procedures should be updated to shorten and simplify the process of applying and obtaining licences and permits for aquaculture. Guidelines for involved authorities should be in place to enhance the efficiency of the process.

- In **Norway** and **Iceland**, where specific Acts on aquaculture exist, the procedures are clearer and less controversial compared to countries without specific regulations. Norway operates a ‘one-stop-shop’ approach for licenses and permits; with the applicant needing to deal only with one institution.
- Several regulatory obstacles have been identified in **Swedish and Danish law** concerning aquaculture. Aquaculture is regulated by several different parallel regulations, thus involving a number of authorities and having different subject areas. Depending on the type of aquaculture production and local conditions, the permits or approvals can be required by environmental legislation, fishing legislation, animal welfare legislation, food legislation, disease legislation, EU animal by-products regulation, as well as the Planning and Building Act.
- In **Germany**, a legislative framework exists to guide applicants through the process. On the other hand, it is quite complicated for the aquaculture sector to find the way through these different administrative responsibilities. Each Federal State foresees the same steps, starting with the permission for building an aquaculture plant by the relevant agency for building, followed by the evaluation of impacts assessed by the responsible water agency and followed by the agencies for nature conservation concerned with impact assessments, FFH compatibility check and the nature conservation law related to species and biotope protection. Finally, the fish health is assessed and controlled by the veterinary agencies and the product, the fish or the

²⁴ Note that this does not apply to RAS, as antibiotics cannot be used in these systems anyhow.

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mussel, registered and permitted for market use by food control agencies. The system of agencies is different from Federal State to Federal State: some are following a two-step-system, some a three-step system with agencies on county-level (Landkreis) as well (apart from agencies on Länder-level and municipal level).

- In **Poland** aquaculture undergoes a list of legislation procedures, which pose many restrictions on the business. The legislative portfolio includes: Water Law, Environmental law, Building law, Inland fisheries law, Animal protection law, Veterinary Law, and Veterinary and rural law. Acts of the above mentioned legislation regulate the separate issues which need to be addressed by the aquaculture sector. This complexity of legislation is one of the drawbacks which hinders aquaculture development and popularity among entrepreneurs. Recirculating aquaculture systems are defined in the Polish strategic plans for aquaculture as the most promising and a plan for RAS investments and production is set. Financial aid for recirculating aquaculture systems business projects is available from European Maritime and Fisheries Fund, Measure 2.3 Production investments in aquaculture.

Conclusion and next steps

For further steps in the alignment of legislation on aquaculture, a view encompassing all related aspects in the diverse aquaculture sector is needed.

For the sake of sustainability, the main sources of protein production in the region should be defined together with an assessment of the nutrient loads generated by each production type and the impacts of climate change.

The exemptions in the WFD should be further discussed, as marine aquaculture structures do not destroy the water body as such.

The legal framework should be predictable also at the level of permitting authorities and not influenced by the political situation.

A more holistic assessment of nutrient loads both from agriculture as well as aquaculture should be encouraged across the EU.

More discussion between countries about good practices and how these may be implemented should be encouraged.

The update of the HELCOM Baltic Sea Action Plan should take into account the recommendations of this position paper.

Background information - Aquaculture in the Baltic Sea and Nordic countries

Both the current state of production and level of development differ considerably between the countries due to natural reasons and historical backgrounds. In addition, during the 1980s, aquaculture technologies have evolved to become partly detrimental for the marine environment and therefore the growth of the sector was stopped/reduced due to environmental protection activities. In order to give a complete picture, RAS and freshwater farming are also included in the section below.

Mostly salmonids are produced in aquaculture production of the Nordic countries, with Norway having a substantially larger production of fish (Atlantic salmon) than any other Nordic country. The main reasons for this difference are the deep fjords, protection from the harshest weather, and suitable water temperatures, that characterises the Norwegian west coast and make the opportunities for production of cold-water species very advantageous (HELCOM FISH CG Aquaculture, 2017).²⁵

Fish aquaculture in the Baltic Sea area mainly produces trout, rainbow trout and carp as well as a few other species, culminating in a limited number of species. Slow development of aquaculture in the Baltic Sea Region is neither due to a poor market situation nor to unfavourable natural conditions. The main obstacle has been environmental concerns. An increase in eutrophication is not acceptable for the Baltic Sea as it already heavily impacted by a long-lasting nutrient overload. Therefore, in some countries, marine aquaculture is missing completely. Aquaculture production in Nordic and Baltic countries is summarized in the table below, according to production type. The year 2010 is chosen as the baseline value so as to enable a comparison with the latest data available.

Country	Type of aquaculture and production, in t			Main species
	Marine	Freshwater	RAS	
Norway				Atlantic salmon, rainbow trout, cod, halibut, turbot, blue mussels, Arctic char, lobsters, spotted wolfish, macroalgae
2010	1 019 713 (FAO)	88 (FAO)	No data	
2017	1 308 387 (FAO)	97 (FAO)	No data	
Russia				Rainbow trout, carp, whitefish, salmon, pike, sturgeon
2010	N/A	No data	No data	
2018	N/A	38 100 ²⁶	No data	

²⁵ Nordic Council of Ministers report on Aquaculture in the Nordic countries and the BAT concept. Available at <https://portal.helcom.fi/meetings/CG%20Aquaculture%201-2017-471/MeetingDocuments/4-2%20NCM%20report%20on%20Aquaculture%20in%20the%20Nordic%20countries%20and%20the%20BAT%20concept.pdf>.

²⁶ http://fishcom.ru/files/documents/otraslevaya_devatelnost/akvakultura/proizvodstvo_akvakultury/statistika/dinamika_proizvodstva_produkcii.pdf

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Denmark				
2010	11 780 (FAO)	23 218 (FAO)	No data	Rainbow trout, brown trout, pikeperch, eel, Sturgeon (caviar) Atlantic salmon, Yellow-tailed tuna, mussels, seaweed
2017	15 765 (FAO)	21 723 (FAO)	No data	
Poland				
2010	N/A	36 400 (IAFE ²⁷ based on IFI data)	No data	Carp, trout, sturgeon, Atlantic salmon, African catfish
2019	N/A	37588 (IFI)	2806 ²⁸ (IFI)	
Germany				
2010	4985 (FAO)	35 979 (2017, FAO)	No data	Trout, carp, mussels, catfish
2017	16 936 (FAO)	19 043 (FAO)	No data	
Iceland				
2010	5050 (Statistics Iceland)	N/A	No data	Atlantic salmon, rainbow trout, Arctic char
2017	19 077 (Statistics Iceland)	N/A	No data	
Finland				
2010	9800 (Statistics Finland)	14 300(2018, Statistics Finland)	No data	Rainbow trout, Arctic char, perch, sturgeon, crayfish
2018	11 900 (Statistics Finland)	1900 (Statistics Finland) 2400 (Statistics Finland)	No data	
Sweden				
2010	Freshwater, marine, RAS	11 110 (2018, SCB & Jordbruksverket)	No data	Rainbow trout, Arctic char, perch, eel, blue mussels crayfish
2017	3665 (FAO) 4870 (FAO)	6979 (FAO) 9923 (FAO)	No data	
Lithuania				
2010	N/A	3190 (FAO)	No data	Carp, African catfish, bighead carp, sturgeon
2018	N/A	3355 (Eurofish)	No data	
Estonia				
2010	0	573 (FAO) 944 (Statistics Estonia)	70	Trout, carp, eel, Arctic char, European whitefish, sturgeon, crayfish
2018	80		280	

²⁷ Institute of Agricultural and Food Economics

²⁸ Total data for trout, Atlantic salmon and African catfish in full recirculation

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Latvia				Carp, trout, pike, sturgeon, catfish ²⁹
2010	N/A	549 (CSB Latvia)	No data	
2018	N/A	830 (CSB Latvia)	No data	

²⁹ Data retrieved from following sources:

<http://www.fao.org/fishery/countryprofiles/search/en>

http://www.stat.fi/til/vvilj/index_en.html

<https://www.statice.is/statistics/business-sectors/fisheries/aquaculture/>

<https://mir.gdynia.pl/dzialalnosc-naukowa/projekty/?lang=en>

<http://www.jordbruksverket.se>

<https://www.eurofish.dk/lithuania>

<https://www.stat.ee/news-release-2019-062>

[https://www.csb.gov.lv/lv/statistika/statistikas-](https://www.csb.gov.lv/lv/statistika/statistikas-temas/lauksaimnieciba/zivsaimnieciba/tabulas/zvg030/pardotas-zivis-un-vezveidigie-akvakultura)

[temas/lauksaimnieciba/zivsaimnieciba/tabulas/zvg030/pardotas-zivis-un-vezveidigie-akvakultura](https://www.csb.gov.lv/lv/statistika/statistikas-temas/lauksaimnieciba/zivsaimnieciba/tabulas/zvg030/pardotas-zivis-un-vezveidigie-akvakultura)