

METRICS OVERVIEW – PIKE-PERCH

Purpose

The purpose of this document is to present the acquired data to determine relevant metrics for the indicator 5.2.1 and 5.2.2, respectively on Fishmeal Forage Fish Dependency Ratio (FFDR_m) and Fish Oil Forage Fish Dependency Ratio (FFDR_o) for the [ASC Pike-perch Module V.1.0](#). This document was used for the decision-making process within the revision of the feed-related metrics after the Stakeholder Consultation that took place in March-April 2023.

Background

ASC has eleven standards covering seventeen species groups. Despite this species coverage, interest in certifying additional species is increasing due to the successful uptake of the ASC Programme globally. As the impacts of the main culture systems are already covered by the existing standards, the addition of new species to the programme can be largely based on current standard requirements. This approach enables the organisation to deliver an efficient response to market demand or producer interest, whilst adhering to the ASC Standard Setting Procedure. In 2021 the ASC Board approved a number of species¹ for addition to the scope. Of these, pike-perch (*Sander lucioperca*) was chosen as the pilot.

A draft set of requirements was developed and was then proposed for Stakeholder Consultation in March and April 2023. The metrics selected for the FFDR indicators have been revised after the collection of additional data points and input during the consultation. The new metrics are presented in this document and were proposed as the final requirements for the ASC Pike-perch Module V.1.0.

Producer Countries and Volumes

In 2009, the total pike-perch production from aquaculture was 653 tonnes, which corresponded to < 5% of the level caught in open waters. In 2016 the aquaculture output was 1658 tons, 6.42% of the total output. The global production of pike-perch through aquaculture reached more than 3000 tonnes of live weight in 2020 and this trend is exponentially growing, as shown in **Figure 1**. Pike-perch aquaculture is starting to raise commercial interest on a global level and farming of this species transitioned from extensive freshwater pond farming to intensive closed recirculation aquaculture systems (RAS).

¹ *Clarridae spp., Ictalurus spp., Scortum barcoo, Percoidea., Sander spp., and Silurus glanis*

The main producing continents are Africa, Asia and Europe (**Figure 1**) and a list of the main producer countries can be found in **Table 1** below. Production volumes (in Tonnes - live weight) in 2020 reached values of 288.88t in Africa, 1798.8t in Asia and 986.11t in the EU. Historically, Europe was leading the aquaculture sector, followed by Africa and Asia, however, in more recent years the production of pike-perch in Asia, particularly in Kazakhstan, has increased exponentially, placing this continent as the main pike-perch producer since 2019.

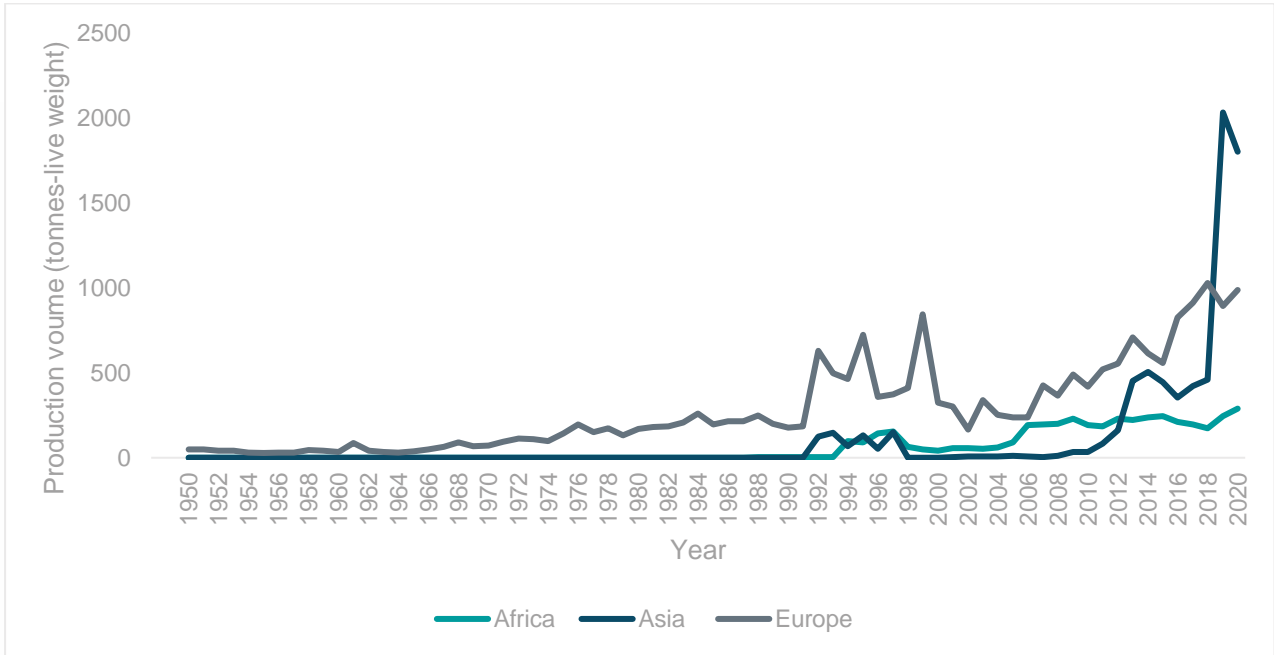


Figure 1 - Production by continent in tonnes - live weight²

² FAO. (2022a). *FishStatJ*. <https://www.fao.org/fishery/en/topic/166235>

Table 1 – Main producers in the pike-perch aquaculture industry; countries with 0 Tonnes – live weight values are still included as they produced higher volumes in years prior to 2020³

Continent	Country	Volume in 2020 (Tonnes - live weight)
Africa	Algeria	77.88
	Tunisia	216
Asia	Azerbaijan	0
	Kazakhstan	1241.8
	Tajikistan	37
	Uzbekistan	520
Europe	Austria	16.6
	Belarus	0
	Bosnia and Herzegovina	0.8
	Bulgaria	61.73
	Croatia	5.9
	Czechia	54
	Czechoslovakia	0
	Denmark	292
	Estonia	0
	France	55
	Germany	56
	Hungary	37.78
	Latvia	0
	Lithuania	0.3
	Netherlands	100
	Romania	70
	Russian Federation	174
	Slovakia	2.8
	Slovenia	0
Switzerland	59.2	
Ukraine	0	

³ FAO. (2022a). *FishStatJ*. <https://www.fao.org/fishery/en/topic/166235>

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Corresponding metrics

The ASC Pike-perch Module V.1.0. consists of seven different principles regarding legal regulations, habitat conservation, water quality and use, disease management, resources management, social responsibility, and fingerlings and egg supply management. Principles are then divided into different criteria and indicators. Regarding the ASC Pike-perch Module, the species-specific metrics are limited to indicators 5.2.1 and 5.2.2 regarding fishmeal and fish oil dependency ratios. The FFDRm and FFDRo for grow out were set at the **final values** highlighted in **Table 2** below after collecting data from literature research, stakeholder inputs and the consultation in March-April 2023. The procedure for the determination of the indicator metrics is explained in the section below.

Table 2 – Final metrics for the FFDR indicators for the ASC Pike-perch Module V.1.0.

Indicator number	Indicator text	Indicator metrics
5.2.1	Fishmeal Forage Fish Dependency Ratio (FFDRm) for grow-out	<2.3
5.2.2	Compliance with one of the two following requirements: a) Fish Oil Forage Fish Dependency Ratio (FFDRo) for grow-out	≤2.95

Data Collection - Sample size and boundaries

Based on the [Metrics Methodology](#), the main producer countries have to be represented in the dataset for metrics setting. This is valid only for countries with > 10% of the world production for this species. By using the latest data from FAO ⁴(**Figure 1**), an overview of the countries with more than 10% of world production of pike-perch has been developed and can be found in **Table 2** below. Based on the results, the initial target countries were Kazakhstan, Uzbekistan and Denmark. However, it was unfeasible to collect data from the aforementioned Asian countries due to the lack of scientific studies from these regions and scarcity of stakeholder involvement in data sharing. Eventually, based on the availability of research papers, the literature review included studies from Germany, Czech Republic, France, Hungary, The Netherlands and Romania (in order of numerosity).

⁴ FAO. (2022a). *FishStatJ*. <https://www.fao.org/fishery/en/topic/166235>

Therefore, the dataset came from countries in which the global production of pike-perch is currently at $\leq 10\%$. Stakeholder data was collected predominantly from Denmark. Other countries from which data was retrieved are Poland and Belgium. This is due to research centres on pike-perch located in these geographical regions. All data collected was limited to the species *Sander lucioperca*.

Table 3 - Producing countries in 2020; in tonnes - live weight and as a percentage of the total global production

	Tonnes - live weight	Percentage of the total global production
Total	3000	100%
Algeria	77.8	3%
Tunisia	216	7%
Azerbaijan	0	0%
Kazakhstan	1241.8	41%
Tajikistan	37	1%
Uzbekistan	520	17%
Austria	16.6	1%
Belarus	0	0%
Bosnia and Herzegovina	0.8	0%
Bulgaria	61.73	2%
Croatia	5.9	0%
Czechia	54	2%
Czechoslovakia	0	0%
Denmark	292	10%
Estonia	0	0%

France	55	2%
Germany	56	2%
Hungary	37.78	1%
Latvia	0	0%
Lithuania	0.3	0%
Netherlands	100	3%
Romania	70	2%
Russian Federation	174	6%
Slovakia	2.8	0%
Slovenia	0	0%
Switzerland	59.2	2%
Ukraine	0	0

Field verification in each of the main producer countries to verify data submission was not feasible for this project. Only one independent field visit was planned with Kaiserzander GbH & Co.KG, a RAS pike-perch producer in Niederlangen and Porta Westfalica (Germany). The visit served as a pilot for testing the feasibility of the requirements proposed in the ASC Pike-perch Module V.0.1.

Only data from non-certified farms, from the stakeholder discussions in March-April 2023 as well as literature data was used for the calculations. The provenience of the data is limited to Europe and mostly to RAS producers. Some literature data points cover ponds systems as well, whereas producer data covers also aquaponic systems. Information from literature used to determine the average fish meal and oil is no older than 2 years, whereas data used for the calculations was retrieved up to 2008 due to the limited availability of relevant studies in pike-perch nutrition. Additionally, the European Percid Fish Culture Group was consulted as part of the process. The data collected from all the different sources was then analysed and used to set the new metric requirements within the revised ASC Pike-perch Module V.1.0. The sample size was n = 70 due to literature and farm data availability.

All data points were deemed relevant and therefore used for the final metrics. **Table 4** below summarises the targets and sources of the data collection exercise.

Table 4 - Sample size overview

Target	Sample size	Sources	Comments
Certified farms	N.A.	N.A.	The current ASC scope does not cover pike-perch aquaculture
Non-certified farms	9	Initial contact with stakeholders, e-mails, 1:1 meetings, webinars, workshops	The data received was limited to European stakeholders. The stakeholders involved in data collection are kept anonymous. However, more information on the feedback can be found in the ASC Pike-perch Module Stakeholder Consultation Summary Report March – April 2023
Literature	61	Scopus, Science Direct, Google Scholar, SpringerLink	Only literature from studies on <i>Sander lucioperca</i> was selected. The results focused exclusively on European aquaculture.

Average fish meal content in diets (%)

The fishmeal (FM) content in diets must be calculated without trimmings, as by the indicator requirement. Trimmings vary exponentially throughout the years. As an example, in 2023 the trimming content was set at >50%, while in 2022 and 2021 the values were much lower (pers. Comm Stakeholders). This variation had to be considered when calculating the fishmeal content. Fishmeal from control diets were assumed to not include trimmings due to the lower values in comparison to the average pike-perch commercial diet and due to the high quality of the ingredients used in these studies. The average FM content in the diets without trimmings used for further calculations was set at **43.03%** (see **Table 5**).

Table 5 - Estimation of the average fishmeal content in pike-perch diets

Requirement	Value	Sample Size (n)	Remark	Source
Trimmings	24.67%	15	The value ranges between 12-50% depending on the year of reference	Feed producers
Fish meal inclusion in diets (with trimmings)	67%	5		Feed producers
Krill meal (%)	1%	1		Feed producers
Average fish meal content in diets (without trimmings)	41.58%	5	Control diets	Literature
	43.38%	21	Data available from contact with stakeholders and after the Stakeholder Consultation round in March-April 2023	Academia Non-certified producers Feed producers
	43.03%	26	The average value used for FFDRm metrics setting	All data

Average fish oil content in diets (%)

In case of the fish oil (FO), the values were more homogeneous, therefore the average fish oil content in the diets used for further calculations was set at **6.78%** (see **Table 6**).

Table 6 - Estimation of the average fish oil content in pike-perch diets

Value	Sample Size	Remark	Source
9.02%	4	Control diets	Literature
5.78%	9	Data available from contact with stakeholders and after the Stakeholder Consultation round in March-April 2023	Academia Non-certified producers Feed producers
6.78%	13	The average value used for FFDRo metrics setting	All data

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Overview of all data points

The determined average FM and FO inclusion in the diet (**Table 5** and **Table 6**) was then applied to 61 studies and 9 data points from stakeholders to calculate the average FFDRm and FFDRo. The e-FCR from literature was higher than the e-FCR collected from stakeholders. The FFDRm /o in literature were also slightly higher than producers' performances. All data points were used for calculating the central tendency from **Table 7** below. Due to similarities between the median of the FFDRm from literature and the 25% quartile from stakeholder data, the final requirement of the FFDRm is set at <2.3. With the same approach, the FFDRo value would be set at <1.6. However, it remains with a FFDRo value of ≤2.95, as presented during the Stakeholder Consultation.

Table 7 – Summary of the data set on pike-perch FFDR values from literature and non-certified farms

	Literature	Stakeholders' data
Average FM% in diets (w/o trimmings)	43.03±14.71 (n=26)	
Average FO% in diets (w/o trimmings)	6.77±3.46 (n=13)	
Average e-FCR	1.72±1.33 (n=61)	1.32±0.24 (n=9)
Average FFDRM	3.34±2.58 (n=61)	2.55±0.47 (n=9)
MAX FFDRm	14.15	3.30
MIN FFDRm	0.97	1.55
Median FFDRM	2.29	2.52
25% quartile FFDRM	1.80	2.33
Average FFDRo	2.34±1.80	1.78±3.33
MAX FFDRo	9.89	2.30
MIN FFDRo	0.68	1.08
Median FFDRo	1.60	1.76
25% quartile FFDRo	1.26	1.63

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The following papers have been consulted in order to obtain data. Some studies provided several data points.

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