Whole Foods Market Quality Standards for Farmed Seafood: Finfish and Shrimp

Including Guidance for Producers and Auditors

February 1, 2023

This document covers the following:

Introduction

These standards specify our minimum requirements and expectations for all producers supplying or seeking to supply farmed seafood to Whole Foods Market. These standards apply to individual producers or producer groups operating worldwide and cover all methods of production. Requirements related to particular species or production methods are specified in the standard. These standards are intended to be farm level. Please see Section 1, Standard 1.5, for a description of how farming areas are classified and where the third-party audit process begins.

While third-party audits are focused on farms, we still expect that producers will minimize stress to fish during harvesting, transport, and slaughter. For example, during transport, oxygen levels should be monitored and maintained at an adequate level and transport time should be limited. Fish should also be slaughtered in the most humane way possible. Mechanical or electrical stunning systems are preferred and should be monitored to ensure effectiveness. Furthermore, producers must maintain the highest standards for quality and food safety of seafood products. However, this will not be verified through the Quality Standards audit process. Suppliers should continue to obtain any relevant certifications such as HAACP and BRC to verify health and safety conditions at processing plants. We also expect that no preservatives will be applied to seafood products and that all local, state, and federal requirements for packing dates/shelf life, transport, and temperature controls will be followed.

Please note that these standards are designed for individual farms that sell fish and shrimp to Whole Foods Market and therefore are feasible for an individual producer to meet. Group certification may be an option for some suppliers. Producers interested in becoming certified as a group should inquire directly with Whole Foods Market to receive a more detailed guide and determine if they meet the necessary criteria for group certification.

While these standards are formal and require mandatory compliance from producers, this is a living document. As new information, farming techniques, and technology become available, we will update our standards to reflect opportunities for improvement. We fully recognize that not all producers will be able to meet these standards. Our expectation is that only the most innovative companies committed to maintaining healthy ecosystems and mitigating the potential environmental impacts will likely qualify.

While these standards require that producers take important environmental steps forward, we also acknowledge that further improvement in the industry’s environmental performance is necessary if we are to more fully protect our ecosystems. To promote such progress, Whole Foods Market is establishing a purchasing preference to source from suppliers that develop innovative technologies and practices such as Recirculating Aquaculture systems (RAS) that substantially reduce their environmental impacts, while at the same time meeting Whole Foods Market’s quality and cost criteria and other standards.

A. Requirements Related to Processing, Labeling, and Claims

A1. Whole Foods Market "Responsibly Farmed" Logo

The Whole Foods Market® “Responsibly Farmed” logo helps customers recognize our commitment to offering farmed seafood that has been third-party verified to meet our Quality Standards for Farmed Seafood. Suppliers interested in using this logo must receive permission from Whole Foods Market and follow our style guidelines. These logo guidelines are for both product packaging and for in-store use. Only products that meet the Quality Standards for Farmed Seafood and have been third-party verified by our approved Certification Body (CB) can display the logo. For information about the logo, including logo guidelines, please contact: CENAquaculturePackagingReview@wholefoods.com

A2. Preservatives

Use of certain preservatives and moisture retention agents on seafood are prohibited. Prohibited preservatives include, but are not limited to, sodium bisulfite, sodium tri- polyphosphate (STP), and sodium metabisulfite.
Use of carbon monoxide to enhance color, or for any other purpose, is prohibited.
Use of filtered wood smoke (also called Tasteless smoke) to retain color, or for any other purpose, is prohibited.

A3. Product Labeling

The standards contain a list of Latin and common names approved for use in labeling.

For hybrids, the following must be followed: “Common name” plus the word “hybrid” (female species code x male species code), e.g., Beluga hybrid (Huso huso x Acipenser ruthenus) [HUSxRUT].

Seafood must be labeled according to The Seafood List, the U.S. Food and Drug Administration’s (FDA) list of acceptable market or common names https://www.cfsanappsexternal.fda.gov/scripts/fdcc/?set=SeafoodList.

If Whole Foods Market or the CB suspects that imprecise labels are used or mislabeling has occurred, a final product sample may be collected and submitted for testing (e.g., DNA analysis) to verify species identification and origin. Sampling will be done at the producer’s expense. Product mislabeling will result in loss of certification.

A4. Non-GMO Verification

Non-GMO label claims on products in our stores must be substantiated to an approved third-party program. For suppliers selling to North America, Non-GMO verification can be achieved through the Non-GMO Project, NSF Non-GMO*, or USDA Organic certification, including international equivalent Organic certifications in Canada, the European Union, Japan, Republic of Korea and Switzerland.

For new products, producers choosing to make a Non-GMO claim must ensure that products are third-party verified to a Whole Foods Market-approved program before they are on shelf. For existing products that make a non-GMO claim, verification must be obtained by January 1, 2022.

Producers will be required to provide the Whole Foods Market CB with a valid non-GMO certificate from one of the acceptable organizations listed above.

Producer Guidance:
- *Genetically engineered (GE) crops, also known as bioengineered (BE), or genetically modified organisms (GMOs), are organisms whose genetic makeup (DNA) has been altered in a way that does not occur naturally.*
- *The Non-GMO Project and NSF Non-GMO standards may vary slightly. Producers should consult these organizations directly for details on program standards and requirements.*
- **Please note that starting September 15, 2020, NSF began winding down the NSF Non-GMO Certified program with a program retirement plan that concludes December 31, 2022. Whole Foods Market will continue to accept NSF Non-GMO certification until December 31, 2022, after which products bearing the NSF Non-GMO logo can no longer be sold to Whole Foods Market. Any products already sold into stream of commerce by December 31, 2022 may continue to bear the NSF Non-GMO label.*
- *This policy does not apply to our stores in the United Kingdom, as the EU already requires mandatory labeling of GMO ingredients in food products.*
- *While the USDA Organic Standards do not yet include aquaculture, acceptability of other international standards is dependent upon an equivalency arrangement with the USDA's National Organic Program.*

B. Terminology

Black caviar	Processed unfertilized eggs (roe) of Acipenseriformes. Roe from other species such as trout, salmon, flying fish, lake whitefish, and bowfin can be referred to as caviar or roe, with the acceptable FDA common name of that species preceding the word "caviar" (*e.g.*, rainbow trout caviar). *Producer Guidance: For the acceptable FDA common name, see https://www.cfsanappsexternal.fda.gov/scripts/fdcc/?set=SeafoodList.*
CB	Certification Body
Farm	Facility, including ponds, raceways, tanks or net cages, used for the production of grow-out fish. Normally, this facility covers the major grow-out phase of fish prior to harvest.
Fish	All species of finfish and shrimp and products thereof (*e.g.*, roe, caviar).
Production fish	All fish intended for human consumption, including post-larvae, fry, smolts and fingerlings.
Hatchery	Facility for hatching eggs and producing larval-stage animals under controlled conditions. In this document, the term hatchery includes facilities for holding broodstock used for egg production, egg hatching, and larval production. Larvae are defined as newly hatched animals that are transitioning to look like the adult version of itself. Yolk-sac stage in fish and metamorphosing newborn shrimp are examples of larvae.
Must	Required action on part of producer

Nursery	Facility for supporting post-larvae or fry development. Nurseries often are where animals are transitioned from starter feeds to grow-out feeds. They may also be used to produce advanced size fingerlings. Animals may spend a relatively minor amount of their time in nurseries and are eventually moved to grow-out facilities.
Producer	Operator of hatchery, nursery, or farm
Producer guidance	Defines a term in the standards, provides further clarification, or offers suggestions on methods that could be used to meet the standards.
Production Unit	Hatchery, nursery, farm, or processing plant
RAS	Recirculating Aquaculture Systems (RAS) refer to technology-based fish farming facilities that provide a highly controlled and optimized rearing environment. RAS utilize technologies such as mechanical and biological filters to remove waste products in order to maintain healthy water quality and to reduce water consumption through reuse of recirculating water. Such facilities are land-based and indoors, allowing any discharge to be treated and disposed of separately. RAS also greatly reduce the risk of escapes.
Should	A practice that is highly recommended

C. Definition of Aquaculture

For the purposes of the current standards, we define aquaculture as follows: The farming of aquatic organisms whereby growers enhance production by maintaining and managing cultured stocks in a defined area. To qualify as a farmed product (*i.e.*, not wild-caught), ALL of the following conditions must be met:

- Producers regularly add seed/eggs/post-larvae/fry/smolts to the farm. For finfish and shrimp, they must originate from a hatchery. AND;
- Producers have control of—either through ownership or leases—the area where they are farming. Harvesting animals in areas open to the public does not qualify as aquaculture and will be considered a wild-capture fishery. AND;
- Animals do not have to receive any added feed to be considered "farmed."

D. Scope of Standards

These standards apply to the following species, but may also cover other finfish and shrimp species as well. To find out if another species can be covered under these standards, please contact Whole Foods Market. Quality Standards for Farmed Bivalve Molluscs are covered in a separate document.

- Arctic char (*Salvelinus alpinus*)
- Atlantic salmon (*Salmo salar*)
- Barramundi (*Lates calcarifer*)
- Beluga Sturgeon (*Huso huso*) [HUS]
- Black tiger shrimp (*Penaeus monodon*)
- Catfish hybrid (*Ictalurus punctatus* × *I. furcatus*)
- Channel catfish (*Ictalurus punctatus*)

- Cobia (*Rachycentron canadum)*
- Pacific white shrimp (*Litopenaeus vannamei*)
- Persian Sturgeon *(Acipenser persicus)* [PER]
- Pirarucu / Paiche (*Arapaima gigas*)
- Pompano (*Trachinotus blochii*)
- Rainbow trout/Steelhead (*Oncorhynchus mykiss*)
- Redfish/red drum (*Sciaenops ocellatus*)
- Russian Sturgeon, Ossetra (*Acipenser gueldenstaedtii*) [GUE]
- Sea bass (*Dicentrarchus labrax*)
- Sea bream (*Sparus auratus*)
- Siberian Sturgeon (*Acipenser baerii*) [BAE]
- Stellate Sturgeon or Sevruga *(Acipenser stellatus)* [STE]
- Sterlet (*Acipenser ruthenus*) [RUT]
- Striped Bass (*Morone saxatilis)*
- Tambaqui (*Colossoma macropomum*)
- Tilapia (including *Oreochromis mossambicus* and hybrid species)
- White Sturgeon (*Acipenser transmontanus*) [TRA]
- Yellowtail (*Seriola rivoliana*)

E. Quality Standards for Farmed Seafood: Finfish and Shrimp

Section 1: General Requirements

1.1: Compliance with Governmental Requirements

Producers must comply with all local, state, and national laws, codes, and regulations governing operations, including, but not limited to those categories listed below.

a) Human health and safety
b) Labor and employment
c) Production siting and land use zoning
d) License requirements
e) Environmental assessments/reviews
f) Water quality
g) Movement and quarantine of animals to prevent introduction of exotic species or disease
h) Effluent discharges and monitoring requirements
i) Mangrove and wetland protection and restoration
j) Escapes
k) Predator control
l) Disease treatment
m) Local community involvement
n) Payment of fees and taxes

The following documents must be available during onsite audits, as applicable:

- Official licenses, leases, titles, and other forms of government approvals and registrations
- Tax receipts
- Recent inspection reports from government authorities, public records

- Posted placards about labor rights; any government information regarding labor laws are disseminated to staff; evidence of any reports from inspections on labor laws, information on government contracts regarding worker's health and safety
- Posted placards about safety, evidence of a safety training program, evidence of any reports from inspections on health and safety

1.2: Emergency Procedures

Each producer must have written emergency procedures to follow in case of an emergency. Anyone working at the farm or involved in farm management must be aware of the procedures in place and actions to take in the event of an emergency. Procedures must be posted in a prominent location so they are readily available in an emergency.

Producer Guidance:
Emergency procedures could include plans for responding to storms or natural disasters, fire, disease outbreak, emergency water shut off, or power failure.

1.3: Biosecurity Procedures

Each producer must implement and maintain a written biosecurity program. The program must include measures taken to avoid the introduction of pathogens from outside sources such as incoming stock, visitors, and trucks or equipment.

The following documents must be available during onsite audits, as applicable:

- Methods/protocols taken to prevent spread of disease
- Dates of health checks conducted on grow-out stock
- Data on incidences of disease or parasite outbreaks

1.4: Employee Training

Initial and ongoing training on the present standards must be provided by the producers to all farm employees. It is the responsibility of the producers to ensure that the requirements of these standards are understood by all individuals handling products sold to Whole Foods Market.

Producer Guidance:
- *Training can be experience-based or through a formal program.*
- *Written confirmation of attendance at training or achieving expectations of training should be available.*
- *Training should provide information on the specific requirements of the Whole Foods Market standards for all responsible staff.*

1.5: Audits

These standards are intended to be farm level. Because we recognize that producers have varying definitions for the different stages of production (*e.g.*, hatcheries, nurseries, and grow-out), we define the location where on-site third-party audits begin as indicated below. Using the approach described below, ~75% or more of the animals' life will be audited.

Third-party audits begin at the facilities indicated below.

- Shrimp: Facilities where shrimp are raised when they reach 30 days old (1 month) post-hatching.

- Finfish, except salmon and char: Facilities where fish are raised when they reach 90 days old (3 months) post-hatching.
- Salmon and char: Facilities where fish are raised when they reach 180 days old (6 months old) post-hatching.
- Acipenseriform species: Facilities where Acipenseriform species are raised after time of sexing, which is typically age 2-3years.

Premises, documentation, records, and production units are subject to annual inspection by an independent CB, selected by Whole Foods Market. In addition to, or instead of the annual on-site farm audits, the CB may carry out unannounced audits, remote audits, as well as audits at facilities outside of the normal scope for third-party audits. Auditors must have access to all facilities that are used for the production of fish for Whole Foods Market. This can include, but is not limited to, hatcheries, nurseries, grow-out farms, management offices and storage areas. These third-party audits must be paid for by suppliers.

Producer Guidance:
Producers are reminded that it's their responsibility to learn and understand the standards and comply with all components of the program. Producers should proactively reach out to Whole Foods Market with any questions about the standards and work continuously to implement the standards on their farms, including any necessary corrective actions. The role of the CB is to verify compliance and issue certifications to qualified producers, rather than to serve as a trainer of the standards.

1.6: Records

Producers must maintain, and provide, the CB full access to records sufficient to document compliance with all applicable Whole Foods Market Quality Standards for Farmed Seafood.

- Inaccurate reporting could lead to suspension of business.
- Records must be kept for three years after harvest.
- Records may be held in a range of formats, including computer programs, and hard copy files, but must be accessible during audits.

Producer Guidance:
• Farm documentation typically includes information on all inputs such as feed, nets, stock, treatments.
• In addition, farm documentation shall include information on the following, as applicable: All vaccinations applied, including product and date of administration. Include records confirming approval for use from veterinarian or animal health professional. All treatments used, including antibiotics and parasiticides. Specify frequency of use.
• In addition, independent inspections, environmental surveys and impact assessments may also be audited in order to verify compliance with a particular requirement in the standards.

Section 2: Transparency and Reporting Requirements

2.1: Notice of Violations or Critical Issues

Producers must inform the CB within 48 hours, in the form of a written letter that is also included in the Operator Profile (OP), about any of the following:

- Any major violations or open court cases related to government laws and regulations.
- Deaths of protected or endangered species
- Escapes involving over 50 fish

2.2: Whole Foods Market Operator Profile

Each producer must complete an Operator Profile (OP), which identifies practices implemented to ensure compliance with all applicable sections of Whole Foods Market Quality standards for Farmed Finfish and Shrimp. The OP must reflect actual practices for all production fish and be current at all times. If there are any changes in production practices, producers must update the document and re-submit to the CB within one month.

Producers that have written Standard Operating Procedures (SOPs) or a Quality Manual can provide a copy with their OP and refer to the relevant section within the OP.

An updated version must be submitted annually by March 15 to the CB.

2.3: Verification Statement for Early Life Stages

Producers must fill out, sign, and submit a Whole Foods Market Verification Statement for all Finfish and Shrimp during Early Stages of Production (*e.g.*, a hatchery or nursery) indicating that prohibited substances are not used. The statement must be sent to the CB.

An updated version must be submitted annually by March 15 to the CB.

2.4: Feed Manufacturer Compliance Statement

Whole Foods Market requires that producers report on ingredients used in feed. A Feed Manufacturer Compliance Statement for each feed type used for all stages of production fish, must be filled out by feed manfacturers and submitted to the CB. Feed labels for each feed type must be included.

The supplier must inform the CB of any planned changes to feed by re-submitting the updated Feed Manufacturer Compliance Statement and labels. The supplier must receive approval for the new feed by the CB prior to use.

Non-manufactured live feeds, such as Artemia, do not require a Compliance Statement.

Producer Guidance:

- *Any feed for which ingredients, or amounts of certain ingredients, vary are considered different feed types. If only pellet size varies, this does not need to be considered as different feed type.*
- *Feeds used for life stages outside the scope of the on-site audit must still comply with the standards.*
- *If feed is delivered in bulk (e.g. directly filled in silos) and no bags with physical feed labels are used, the producer can submit the feed product data sheet from the feed manufacturer together with the feed compliance form.*

An updated version must be submitted annually by March 15 to the CB.

2.5: Calculations Spreadsheet

Fish In: Fish Out ratios as well as nitrogen and phosphorus inputs must be calculated using the spreadsheet "Calculations for Whole Foods Market." Contact the CB for the spreadsheet "Calculations for Whole Foods Market".

An updated version must be submitted annually by March 15 to the CB.

2.6: Contamination Testing

Whole Foods Market requires that producers report on test results for Polychlorinated Biphenyls (PCBs), TEQs (dioxins, furans, and dioxin-like PCBs), and mercury:

- Tests for environmental contaminants are required annually.
- The sampling plan for environmental contaminants must be submitted to the CB, and approved by the CB, prior to sampling. Sampling plans must be submitted at the latest by December 1 for sampling in the following calendar year.
- Fish are sampled for environmental contaminants testing during the first harvest of the year.
- For initial certification, fish are sampled at the next harvest of the year and results are submitted to the CB prior to certification. Submission includes summarizing the relevant values in an email to the CB as well as sending the original analysis reports from the lab.
- Test results of harvest-size fish are submitted to the CB as soon as they are available. Submission includes summarizing the relevant values in an email to the CB as well as sending the original analysis reports from the lab.
- The sampling plan and testing for environmental contaminants is not applicable for caviar at this time.

2.7: EPA and DHA Testing, additional for salmon

Whole Foods Market requires that producers report on test results for combined EPA and DHA:

- Tests for EPA and DHA are required annually.
- Fish are sampled for EPA and DHA testing during the first harvest of the calendar year.
- For initial certification, fish are sampled at the next harvest of the year and results are submitted to the CB prior to certification. Submission includes summarizing the relevant values in an email to the CB as well as sending the original analysis reports from the lab.
- Test results of harvest-size fish are submitted to the CB as soon as they are available. Submission includes summarizing the relevant values in an email to the CB as well as sending the original analysis reports from the lab.

Section 3: Source of Grow-Out Stock

3.1: Use of Genetically Modified or Cloned Animals

Use of genetically modified or cloned animals is prohibited.

Producer Guidance:
- *Selective breeding is not considered genetic modification.*
- *Genetically engineered (GE) crops or animals are also known as genetically modified organisms, or GMOs.*
- *Inducing triploidy is not considered genetic modification. Non-chemical methods such as temperature and pressure shock to induce triploidy are permitted.*
- *Inducing triploidy is the process of retaining a third set of chromosmes, compared to the more normal diploid state. Triploidy may also occur in nature. The use of triploids can mitigate production problems associated with early sexual maturation. In addition, since triploids are functionally sterile, their use can minimize environmental concerns relating to genetic introgression from escaped farmed fish.*

3.2: Preventing Pathogens, additional for shrimp (Pacific white shrimp *Litopenaeus vannamei* and black tiger shrimp *Penaeus monodon*):

To avoid introducing and spreading pathogens to shrimp farms, producers should stock post-larvae from Specific Pathogen Free (SPF) and/or Specific Pathogen Resistant (SPR) shrimp broodstock. If certified SPF or SPR shrimp are not suitable to local conditions, producers must use shrimp bred for pathogen resistance. The Whole Foods Market Verification Statement for Early Stages of Production for Finfish and Shrimp must indicate which method of pathogen prevention is used.

Producer Guidance:
- *Domesticated SPF broodstock are defined as those animals that originate from stocks which have a documented history of being free of specific pathogens for at least two years. The status of Specific Pathogen Free should signify that the shrimp have passed through a rigorous disease screening process that determined them to be free from specified pathogens of concern*
- *Domesticated SPR broodstock are defined as those animals that are resistant to a specific pathogen. SPR describes a genetic trait of a shrimp that confers some resistance against specific pathogens. SPR shrimp usually result from a specific breeding programme designed to increase resistance to a particular virus. SPF and SPR are independent characteristics*
- *Use the World Organization for Animal Health's (OIE)'s current list of shrimp pathogens for monitoring broodstock in SPF surveillance programs. Targeted SPF surveillance programs should keep current on possible changes to the OIE list. The current list https://www.woah.org/en/what-we-do/animal-health-and-welfare/animal-diseases/?_tax_animal=aquatics%2Ccrustaceans includes the following pathogens: Taura syndrome virus (TSV), White spot syndrome virus (WSSV), Yellow head virus (YHV), Infectious hypodermal and haematopoietic necrosis virus (IHHNV), Infectious myonecrosis virus (IMNV), Hepatobacter penaei (necrotising hepatopancreatitis), and Acute hepatopancreatic necrosis disease (AHPND), and Decapod iridescent virus 1 (DIV1)*
- *Broodstock producers may also breed shrimp for specific pathogen resistance (SPR), yielding SPF/SPR shrimp.*
- *Requirements for SPF, SPR, or breeding for pathogen resistance, do not apply to small-holders using locally-caught wild broodstock.*

3.3: Species Selection

Raising native species is preferred. Exotic species can only be cultured if a substantial commercial industry for farming that species already exists or if scientific risk assessments demonstrate negligible risk to the surrounding ecosystem. To raise exotic species producers must demonstrate they have followed ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2004. Farms in the United States must also meet all state requirements for the introduction of new species.

Producer Guidance:
Negligible risks might include species that cannot survive and establish if they escape (e.g., there are no water bodies connected to the farm, or water temperatures are too cold in surrounding water bodies), or if the production system has no risk of escape (e.g., re-circulating tank systems with sand filters).

3.4: Grow-Out Stock

Grow-out stock must be raised in a hatchery. Wild-caught grow-out stock is prohibited.

Producer Guidance:
• Grow-out stock includes shrimp larvae and fish fingerlings/fry/smolts.
• Wild-caught grow-out stock includes both targeted catch and bycatch, both of which are prohibited.

3.5: Use of Hormones

The use of hormones on production fish is prohibited. This prohibition includes, but is not limited to use of growth hormones, and hormones for sex reversal.

3.6: CITES, additional for Acipenseriformes/black caviar:

Broodstock must be hatchery-raised according to CITES guidelines.

Section 4: Drug and Synthetic Chemical Use

4.1: The Following Drugs and Synthetic Chemicals are prohibited:

Prohibited Drugs and Chemicals for ALL <u>Production Fish</u>, Including Larvae, Post-larvae, Fry, Smolts, Fingerlings and Grow-out Stock:	*Producer Guidance:*
Preservatives	*Prohibited preservatives include, but are not limited to, sodium bisulfite, sodium tri-polyphosphate (STP), and sodium metabisulfite.*
Antibiotics	*Fish exhibiting symptoms associated with disease must receive veterinary attention, and if diagnosed with disease, must be treated as appropriate. However, the pen/tank/pond/raceway must be marked for identification and fish from that system cannot be sold to Whole Foods Market.*
Hormones	
Use of malachite green, crystal violet, and Tributyltin compounds (TBT)	
In-feed veterinary medicines, including parasiticide treatments such as emamectin benzoate	
Organophosphates	*Organophosphates are highly toxic chemicals used in some pesticides*
Synthetic parasiticides for sea lice treatments or other purposes. Limited amounts of hydrogen peroxide are permitted.	*• In 2007 (for farmed salmon) and 2008 (other finfish and shrimp), Whole Foods Market implemented a five-year phase out period for use of synthetic parasiticides on fish destined for Whole Foods Market stores. The phase out period has ended.* *• Alternatives to synthetic chemical treatments could include using vaccines, cleaner fish, mechanical solutions, sea lice traps, or other innovative solutions.* *• Wrasse/lumpsucker (cleaner fish) may be used to prevent infestations of sea lice. Cleaner fish should be hatchery raised. If wild-caught wrasse are used, catch levels must not cause wrasse populations to become overfished. If wrasse are non-native to the region where the farms are located, producers must demonstrate they have followed ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2004. Farms in the United States must also meet all state requirements for the introduction of new species.*

	• Beyond the phase-out period, if preventative methods fail and fish must be treated with synthetic parasiticides, those fish cannot be sold to Whole Foods Market.
Synthetic fungicides for finfish/shrimp after 30 days post-hatch for shrimp, 90 days post-hatch for finfish, or 180 days post-hatch for salmon and char.	*Synthetic fungicides include Formalin*

Section 5: Feed

NOTE: Some producers may raise species in systems where cultured fish feed on organisms living in the ecosystem (e.g., shrimp in extensive pond systems) and therefore do not require formulated feeds. The following standards apply only to those producers using added feeds. Feed requirements apply to all feeds for all life-stages, unless indicated otherwise.

5.1: Regulatory Compliance

All feed must comply with regulations of the U.S. Food and Drug Administration (FDA), the EU, or equivalent.

5.2: Nutrition

Whole Foods Market's aim is to maintain animal health throughout the life-cycle. Feed systems must deliver diets that are nutritionally complete for the species cultured. The use of probiotics to support animal health is permitted.

5.3: Non-Adulteration

Feed must not be adulterated.

5.4: Slaughterhouse Products

Slaughterhouse products from avian or mammalian species are prohibited in feed.

If the CB suspects that feed contains slaughterhouse products, they will collect a feed sample from the farm and submit it for laboratory testing. Suppliers are required to permit the CB to collect the sample. Sampling will be done at the producer's expense.

The threshold for the level of slaughterhouse products in feed is 3% (30,000 ppm). Producers whose feed tests at or above 3%will be suspended or denied approved status as suppliers. This value represents a reasonable limit for distinguishing intentional use from accidental cross-contamination.

Feed manufacturing equipment must be cleaned or purged prior to running feed batches for Whole Foods Market compliant feed. Flush batches cannot be sold to Whole Foods Market's suppliers. Below3% , but above the detection limit of 0.01% (100 ppm), indicates likely cross contamination of equipment from previous conventional batches. While results in this range would not lead to immediate suspension, results within this range will require suppliers to provide SOPs from feed companies indicating how equipment is cleaned/purged. Guidance for Standard Operating Procedures (SOPs) for clean-out/purge are included in the Producer Guidance section below.

Producer Guidance:
- *Testing is conducted using Qualitative PCR Analysis for Animal DNA,at a detection limit of (0.01%).*
- *The laboratory conducting the testing must be ISO 17025 accredited.*
- *Whole Foods Market recommends that testing is conducted by FoodChain ID Testing (formerly Genetic ID). Results must indicate the percentage of animal DNA detected.*

Testing is conducted in stages, as outlined below:

First Stage: Animal DNA Qualitative PCR Analysis:
- *Test results are Qualitative: "Not detected" or "Detected".*
- *If one or more of the test results is "Detected", check with your FoodChain ID Testing account manager to see if the sample contains sufficient DNA for Second Stage testing.*

Second Stage: Animal DNA Qualitative PCR Analysis (3% Threshold):
- *After the laboratory confirms that the sample contains sufficient DNA for Second Stage testing, DNA is re-extracted, and the sample is tested again.*
- *Test results are Qualitative: "Not detected" or "Detected, at a level less than 3%" or "Detected, at a level greater than 3%".*

- *The estimated cost of testing is $275.00 per sample.*
- *Whole Foods Market recommends that producers conduct their own periodic testing of feed to verify that feed received on the farm is compliant and present results of testing to the CB during third-party audits.*

Please note the following for submitting samples:
- *For consistency, feed should be tested using Qualitative PCR Analysis with the detection limit of 0.01% (100 ppm).*
- *Sample size is 200 grams.*
- *Samples need to be sealed and double bagged to avoid cross-contamination.*
- *Prior to sending samples, contact FoodChain ID to set up an account and receive further instructions on how to send a sample. Contact information:testing@foodchainid.com*
- *If another laboratory is selected, it is the supplier's responsibility to ensure that the same method and detection levels are used.*

The Cleanout/Purge SOPs should identify the following. Note that FDA provisions on cleaning and sanitation SOPs are outlined in 7 CFR 120.6
- *Purpose: To prevent or minimize contamination of compliant feed from avian or mammalian slaughterhouse products/ingredients*
- *Scope: Identify the areas or facilities to which this procedure applies*
- *Responsible Parties: Identify the individuals or departments responsible for execution of the cleanout/purge.*
- *Frequency: Identify how often the cleanout/purge procedure is executed.*
- *Recordkeeping: Identify how the execution of this procedure is documented or logged.*
- *Procedure: Clearly outline the steps used to execute the cleanout/purge. Clearly identify equipment affected and materials used.*
- *Address contamination prevention measures for applicable critical control points on shared equipment.*

If a purge is used as an intervening event, the SOP should identify the amount of product purged and why this is a sufficient amount.

5.5: Feed Processing

Feed must be fully processed to kill microorganisms, reduce the risk of disease transmission, and maintain its integrity in the water for optimal efficiency.

Producer Guidance:
Cooking ingredients is required to avoid disease and the deterioration of water quality from the high oxygen demand of raw food or organisms.

5.6: Feed Conversion Ratio

The Feed Conversion Ratio (FCR) must be calculated annually.

Producer Guidance:
- *The feed conversion ratio (FCR) indicates the amount of feed used to grow one kilogram of fish: FCR = kg feed / kg fish.*
- *FCR values shall be calculated for each generation or batch, rather than averaging for the entire facility. Exceptions include sturgeon (see 5.9) and production systems in which juvenile fish are stocked continuously and there are no distinguishable age batches. These systems can be calculated over the entire facility.*
- *If preferred, Early Stages can be left out of the FCR calculation due to insignificant biomass increase.*
- *For Acipenseriformes, the FCR can be calculated for the entire grow-out facility as a whole rather than as feed consumed by fish over their entire lifecycle. The total annual feed used ("in") is calculated against the total annual fish harvested ("out").*

5.7: Fish In, Fish Out Ratio

Whole Foods Market's goal is to reduce pressure on populations of wild fish and to decrease reliance on reduction fisheries for feed by moving toward the target Fish In, Fish Out Ratio, as indicated below. To evaluate progress towards meeting this goal, producers must report their ratios yearly. Ratios must be calculated using the spreadsheet "Calculations for Whole Foods Market." Whole Foods Market will review these reports to evaluate progress.

To calculate the ratio, use data from the farm diary, not from theoretical production and FCR values.

Target Level for Fish In, Fish Out Ratio:

- Shrimp (Litopenaeus vannamei): 1:1
- Black tiger shrimp (Penaeus monodon): 1.5:1
- Cod: 1:1
- Salmon 1:1
- Steelhead/Rainbow Trout 1:1
- Tilapia: 0.25: 1
- Channel Catfish: 0.35:1
- Other finfish and crustaceans: 1:1

Producer Guidance:
- *Whole Foods Market's aim is to reduce pressure on populations of wild fish and to decrease reliance on reduction fisheries.*
- *The Fish In, Fish Out Ratio (Feed Fish Equivalence Ratio or FFER) is the ratio of wild-caught fish consumed as fishmeal and/or oil to fish produced.*
- *Innovative technologies in support of this aim such as the use of algae and insect protein in feed is permitted. The use of insect meal must follow the COMMISSION REGULATION (EU) 2017/893 on processed animal protein, which limits the insect species currently approved as well as limits the type of substrate with which the insects can be fed.*
- *Contact the CB for the spreadsheet, "Calculations for Whole Foods Market," to use in calculating this ratio.*
- *FFER values shall be calculated per generation or batch, rather than averaging for the entire facility. Exceptions include sturgeon (see 5.9) and production systems in which juvenile fish are stocked continuously and there are no distinguishable age batches. These systems can be calculated over the entire facility.*
- *If preferred, Early Stages can be left out of the FFER calculation due to insignificant biomass increase.*
- *Explore the feasibility of using by-products from fish processing (i.e. trimmings from processing wild or farmed fish and crustaceans). By-products of fish processing do not need to be counted in the Fish In portion of the ratio.*
- *Explore other innovative methods for lowering the overall amount of fishmeal and fish oil in feed ingredients. For example, consider using marine worms or algae-based products as a source of essential fatty acids to reduce the amount of fish oil used.*

5.8: FFER, additional for Acipenseriformes:

For Acipenseriformes, the FFER shall be calculated for meat and reported annually. FFER calculation for caviar is not a requirement. For Acipenseriformes, the FFER will be calculated for the entire grow-out facility as a whole rather than as feed consumed by fish over their entire lifecycle. The total annual feed used ("in") is calculated against the total annual fish harvested ("out").

Producer Guidance:
- *This approach to calculating FFER is different for sturgeon than for other species of finfish. However, a different approach is needed for sturgeon due to the practice of continuously selecting and moving individual fish based on sex, state of maturation, stage of egg development, etc. As a result, fish are continuously re-selected and one batch of fish cannot be kept separate and traced for the entire grow-out.*
- *The production of caviar requires that fish are grown and fed for many years prior to harvest. Some of these fish may never produce caviar. In addition, for caviar production energy is going into sexual maturation and egg development, rather than into growth, as is the typical approach with other species of farmed finfish. The current FFER calculation does not credit the more protein rich egg development and only uses the parameter of overall fish weight at harvest ("out") versus feed used ("in"). For these reasons, Whole Foods Market acknowledges that FFER targets will be difficult to reach for sturgeon. However, Acipenceriformes are included in the goal of 1:1 for all finfish as a target for producers to work toward.*

5.9: Marine Ingredients

Whole Foods Market's ultimate goal is for all marine ingredients in feed to be sustainably sourced. To monitor progress toward meeting this goal, feed suppliers must report on the current status of each source fishery in the feed manufacturer compliance statement by indicating if the source fishery is certified or rated and if so, under which certification or rating program. To reduce pressure on populations of wild fish and to achieve a low Fish in, Fish out ratio, fish products used for feed should be sourced from by-products of fish processing to the greatest extent possible. Whenever possible, source fisheries of fishmeal and fish oil in feed should be Marine Stewardship Council (MSC)-certified.

5.10: Trash Fish

Producers must not use "trash fish" in feed.

Producer Guidance:

- *Trash fish is a term used to define fish that have low commercial value and may or may not be used for human consumption. These are typically small fish that are processed into fish meal and oil for animal feeds, including for aquaculture.*
- *Removing exotic species (e.g., carp from freshwater systems) for the purpose of restoring native fish and utilizing these fish for feed ingredients is permitted. These fish are not considered "trash fish" for the purposes of these standards.*

5.11: Krill

If krill is used as a component of feed, it must be sourced from a Marine Stewardship Council (MSC) certified fishery.

The feed manufacturer must demonstrate that krill in feed comes from an MSC certified fishery and MSC Chain of Custody (CoC) certified supplier.

Producer Guidance:
Krill is a valuable food source for marine life. While our standards for farmed fish (aquaculture) allow krill from fisheries certified by the MSC to be used as a rich nutrient-rich component of feed, it should be used in limited amounts.

5.12: Comingling

Under certain circumstances producers may decide to grow fish for Whole Foods Market as well as fish for other customers within a given farming site. It is permitted for producers to raise fish for customers other than Whole Foods Market, whereby a portion of the site is fed on compliant feed and another portion is fed on feed which does not meet Whole Foods Market's standards, provided that the following requirements are met:

- Feed used within a given farming site and shared water body must not contain any drugs or chemicals listed in standard 4.1.
- Physical separation of enclosures ensures low risk of fish for Whole Foods Market feeding on non-compliant feed.
- Physical and visual separation of enclosures clearly identifies compliant and non-compliant fish stocks.
- Mechanisms are in place to prevent co-mingling of products, including feed.

5.13: Non-GMO Verification

Non-GMO label claims on products in our stores must be third party verified or certified to a Whole Foods Market approved program. This applies to all products we sell in our U.S. and Canada stores, regardless of where they were made.For suppliers selling to North America, approved non-GMO verification can be achieved through the Non-GMO Project Verfication, USDA Organic certification, or international equivalent Organic certifications in Canada, the European Union, Japan, Republic of Korea Switzerland, Taiwan, the United Kingdom.

Producers will be required to provide the Whole Foods Market CB with a valid non-GMO or organic certificate from one of the acceptable programs listed.

Producer Guidance:

- *Genetically engineered (GE) crops, also known as bioengineered (BE), or genetically modified organisms (GMOs), are organisms whose genetic makeup (DNA) has been altered in a way that does not occur naturally.*
- *While the USDA Organic Standards do not yet include aquaculture, acceptability of other international standards is dependent upon an equivalency arrangement with the USDA's National Organic Program.*

5.14: Astaxanthin/canthaxanthin

The intention of this standard is to use non-synthetic sources of astaxanthin/canthaxanthin whenever possible, but to allow for small amounts of synthetic astaxanthin/canthaxanthin where other options are not available. The use of synthetic astaxanthin/canthaxanthin in feed to support fish health, including growth and survival, is limited to 10 ppm (10 mg astaxanthin/kg feed) for any feed size, at any life stage, and for all species.

Non-synthetic sources of astaxanthin/canthaxanthin, such as Astaxanthin-rich *Phaffia rhodozyma* (Phaffia), red carotenoid-rich *Paracoccus carotinifaciens* (Panaferd), or shrimp shells as a by-product from processing, that are used for pigmentation and fish health are permitted and inclusion levels of these non-synthetic sources in feed are not limited. Producers must obtain approval from Whole Foods Market to use other types of colorants.

Furthermore, the intention of this standard is that producers move from using synthetic astaxanthin/canthaxanthin to non-synthetic sources during the development of the fish. Therefore, when feed is switched to contain non-synthetic astaxanthin/canthaxanthin at higher inclusion levels, usually for the purpose of pigmentation, feed shall not be boosted with another 10 ppm of synthetic astaxanthin/canthaxanthin.

Producer Guidance:

- *Synthetic is defined as follows based upon the National Organic Program Guidance on the Classification of Materials: a substance that is formulated or manufactured by a chemical process or by a process that chemically changes a substance extracted from naturally occurring plant, animal or mineral sources, except that such term shall not apply to substances created by naturally occurring biological processes (e.g. fermentation).*
- *Further information on synthetic vs. non-synthetic can be found here: https://www.ams.usda.gov/sites/default/files/media/NOP-5033.pdf and here https://www.ams.usda.gov/sites/default/files/media/NOP-Synthetic-NonSynthetic-DecisionTree.pdf*

- *Whole Foods Market permits a limited amount of synthetic astaxanthin/canthaxanthin due to the difficulty of obtaining customized starter feeds. Astaxanthin/canthaxanthin can be an important antioxidant or source of provitamin A, which is linked to survival during development phases, growth, as well as disease and stress resistance.*
- *By limiting permissible amounts of synthetic astaxanthin/canthaxanthin, Whole Foods Market is assured that astaxanthin/canthaxanthin is added for the purpose of fish health, rather than for pigmentation. Higher inclusion levels of astaxanthin/canthaxanthin in feed, starting at approximately 40 ppm, are typically associated with pigmentation of fish, which must be achieved by using non-synthetic sources.*
- *The 10 ppm limit is based on consultation with feed manufacturers as well as published scientific studies showing the importance of astaxanthin/canthaxanthin supplementation to fish diets: Christiansen R, Lie O, Torrissen OJ (1995) Growth and survival of Atlantic salmon, Salmo salar L., fed different dietary levels of astaxanthin. First-feeding fry. Aquaculture Nutrition 1: 189-1 98 and Torrissen OJ and Christiansen R (1995), Requirements for carotenoids in fish diets. J. Appl. Ichthyol. 11: 225—230.*
- *There is no limit on inclusion levels of astaxanthin from non-synthetic origin. Feedback received from feed manufacturers as well as several scientific studies recommend the inclusion of at least 100ppm astaxanthin in diets for postlarval shrimp: Niu et al (2009) Effect of Dietary Astaxanthin on Growth, Survival, and Stress Tolerance of Postlarval Shrimp, Litopenaeus vannamei. Journal of the world aquaculture society: Vol. 40, No. 6 and Salarzadeh A and Rajabi B (2015) The effects of dietary supplementation synthetic Astaxanthin on body astaxanthin, survival, growth of white leg shrimp (Litopenaeus vannamei). International Journal of Advanced Research: Volume 3, Issue 3, 797-803.*

5.15: EPA and DHA, additional for salmon:

Component	Minimum level EPA & DHA	Cut/portion	Method
Total EPA & DHA	1000 mg / 114 g salmon	Any salmon cut or portion, such as steaks, fillets, sides, tail portions	See Appendix B

As producers and their feed manufacturers replace marine ingredients for reasons related to sustainability, cost, or availability, this standard aims to ensure that farmed salmon continues to provide enough beneficial omega-3 fatty acids.

Tests for EPA and DHA must be completed and results must be submitted to the CB prior to first certification. Samples must be submitted by either farm or processing facilities, not by both.

The sampling and testing method must be consistent among all producers and must follow the procedures outlined in Appendix B.

Producer Guidance:
- *This standard also aims to ensure that any portions of farmed salmon contribute to meeting the USDA's recommendation for omega-3s: 8 oz of seafood/week to provide an average consumption of 250 mg per day of EPA and DHA (1,750 mg/week or 875 mg/4 oz portion). Reference: https://health.gov/dietaryguidelines/2015/guidelines/chapter-1/a-closer-look-inside-healthy-eating-patterns/#callout-seafood .*
- *The distribution of EPA & DHA, and lipid levels in general, are known to vary throughout the flesh fillet, both anteriorly-posteriorly and dorsally-ventrally, with higher contents found around*

the dorsal fin region and lower contents at the tail end. Fish body size can also affect lipid status. Reference: M. Sprague et al. (2020), Variation in the nutritional composition of farmed Atlantic salmon (Salmo salar L.) fillets with emphasis on EPA and DHA contents. Journal of Food Composition and Analysis 94 (2020) 103618.

- *The method selected for this standard ensures a complete extraction of all fatty acids and therefore indicates the most accurate amount of EPA&DHA available to the consumer. Other methods can overestimate EPA&DHA results.*
- *Portion Size: The portion size of Whole Foods Market Whole Catch frozen farmed salmon fillets is 4 oz. In addition, the FDA references a portion size of 4 ounces. Other agencies and medical organizations reference portion sizes ranging from 3-4 ounces. Reference: https://www.fda.gov/food/consumers/advice-about-eating-fish*

5.16: Cleaner fish feed, additional for producers using cleaner fish:

If feed for cleaner fish is used and is of similar pellet size as the feed for the fish under production (e.g., salmon), the cleaner fish feed shall not contain any prohibited ingredients such as avian or mammalian products, or medication. This feed requirement is only applicable to cleaner fish feed where cleaner fish are stocked together with fish produced for Whole Foods Market.

Producer Guidance:
No feed manufacturer compliance statement is needed for cleaner fish feed; ingredients should be documented on feed labels or equivalent documentation from feed manufacturers.

Section 6: Environmental Contaminants

6.1: Maximum Levels of Contaminants

Contaminant group	Maximum Level		Method
PCBs	0.011 ppm (11 ppb)	11µg/kg	EPA 1668A or 1668C*
WHO-TEQs (dioxins, furans, dioxin-like PCBs)	2.16 ppt (parts per trillion)	2.16 pg/g or ng/kg	EPA 1668 A EPA 1613B
Mercury	0.22 ppm	0.22 mg/kg	EPA 1631**

Whole Foods Market's goal is to reduce concentrations of PCBs, TEQs (dioxins, furans, and dioxin-like PCBs), and mercury in fish to the levels listed above. To evaluate progress towards meeting this goal, producers must test fish for contaminants according to the protocols listed below and keep records of their results. Whole Foods Market will review records to evaluate progress.

Tests for environmental contaminants must be completed and results must be made available to the CB prior to first certification. Samples must be submitted by either farm or processing facilities, not by both.

Companies that have used the correct testing methods and have tested under the maximum levels of the standard for two years in a row may begin testing fish every other year. Permission to reduce testing frequency must be received by the CB. The sampling plan and testing for environmental contaminants is not applicable for caviar at this time.

Producer Guidance:

- *Maximum allowable contaminant levels are based on the values used by the U.S.EPA: 227 g meal size (8 ounces) and 70 kg body weight.*
- *Maximum allowable levels of PCBs and mercury are based on the U.S. Environmental Protection Agency's (EPA) National Guidance for Assessing Chemical Contaminant Data. Whole Foods Market has chosen to use the EPA's standards for seafood because they are the most protective standards available for human health. Until the EPA completes their dioxin reassessment, TEQs must meet the standards of the World Health Organization (WHO).*
- **/** See Appendix A for Required Sampling and Testing Methods, as well as for more information on method EPA 1668A or 1668C for PCBs, and on method EPA 1631 for mercury.*

Section 7: Water Quality and Pollution Prevention

7.1: Inputs

7.1.1: Disinfectants

Disinfectants for cleaning must be safe and used in concentrations that are non-toxic to fish and aquatic systems. Any disinfectants used must be approved for use by the U.S. Food and Drug Administration (FDA), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), or the World Organization for Animal Health (OIE). Producers operating in countries outside the United States may alternatively refer to national guidelines for safe disinfectant use. Proper recommended procedures for disposal must be followed.

7.1.2: Manure

Producers must not use raw (untreated) manure as fertilizer for promoting phytoplankton blooms in ponds. Use of human waste—either treated or untreated—as fertilizer is not permitted.

7.1.3: Liming Materials, additional for ponds:

Liming materials used for neutralizing acidity in pond water or pond soils are permitted.

7.1.4 Net Treatment, additional for net pens/cages:

Treating net pens/cages or net structures with copper-based antifouling agents (*e.g.*, paints), products containing zinc pyrithione and tralopyril, or other toxic antifoulant products is prohibited. Producers must not use nets that were previously treated with copper-based or other toxic antifoulants. This requirement applies to the entire farming site. Parallel production within a given farming site, whereby a portion of the site contains treated nets and another portion contains untreated nets, is prohibited.

Producer Guidance:

- *Whole Foods Market's original standard included a phase out period for treated and previously treated nets. The phase out period has ended.*
- *To control net-fouling organisms, producers could use methods such as air-drying, mechanical cleaning, or other non-toxic methods. Non-copper-based and non-toxic net treatments could also be acceptable alternatives.*

7.1.5: Power Washing

Underwater power washing is allowed if producers can demonstrate that bio-fouling organisms are not building up underneath pens and causing organic enrichment of benthic sediments. Sediment sampling, as specified in Standard 7.2.4, is sufficient for monitoring for organic enrichment.

7.1.6: Net pens/cages, additional for Acipenseriformes:

Production in net pens/cages in fresh water is prohibited.

7.2: Nutrient Management/Effluent

7.2.1: For ALL Producers using feed OR fertilizer:

Producers must work to minimize the negative impacts of effluent on receiving waters by reducing inputs of nitrogen and phosphorus. Producers must calculate total annual inputs of these nutrients per metric ton of fish produced in one year; Calculate these values using the Excel Spreadsheet, Calculations for Whole Foods Market, provided by the CB.

This information, as well as the information in Standard 7.2.2, will be used to evaluate producers' progress in reducing nutrient outputs and preventing environmental impacts, such as eutrophication. Calculations of total inputs assume a consistent level of production. Therefore, reducing inputs would reduce outputs of nutrients.

Producer Guidance:

For calculating inputs of nitrogen and phosphorus:

- *Calculate total nitrogen inputs in the form of feed and fertilizer (kg nitrogen/mt of fish produced in 1 year)*
- *Calculate total phosphorus inputs in the form of feed and fertilizer (kg phosphorus/mt of fish produced in 1 year)*
- *Work with feed companies to get values of Total Nitrogen and Total Phosphorus if information is not printed on feed bags.*

For reducing nutrient inputs:

- *Improve efficiency of feeding practices*
- *Reduce fertilizer use, if applicable*

7.2.2: For ALL Producers using feed OR fertilizer:

An effluent monitoring system must be in place to measure discharges of effluent into receiving waters. Producers must measure at least one of the following variables, but are encouraged to monitor all variables: total phosphorus, total nitrogen, total suspended solids, or 5-day biochemical oxygen demand. Producers must not increase the amount of water discharged to dilute effluent. Monitoring must occur monthly.

Requirements for effluent monitoring:

- Monitor concentrations of total phosphorus, total nitrogen, total suspended solids, or 5-day biochemical oxygen demand in effluent (mg/L or g/m3) at the end of the discharge pipe to ensure that samples are not contaminated by surrounding waters.
- Record total annual farm discharge, m3/year (amount of water discharged from farm annually)
- Record total annual farm inflow, m3/year (amount of water coming into the farm annually)
- Calculate load of variable using the Excel Spreadsheet, Calculations for Whole Foods Market, provided by the CB
    - Net pens/cages: Use Calculation Version 1
    - Watershed ponds and reuse systems: Use Calculation Version 2
    - Raceways or ponds with water exchange: Use Calculation Version 3

Producer Guidance:

<u>For reducing environmental impacts:</u>
For pond systems, producers can improve efficiency of water use and minimize impacts of effluent by:
- *Reducing amount of water discharged*
- *Preventing overflow after heavy rains by providing extra space in ponds.*
- *Reusing water where possible. For example, use closed pond systems or re-circulating tank systems.*

<u>Possible methods for treating effluent could include:</u>
- *Holding effluent in settling ponds*
- *Using constructed wetlands.*
- *Using integrated multi-trophic aquaculture systems (polyculture)*
- *Methods for minimizing the impacts of effluent may be outlined in a National Pollutant Discharge Elimination System (NPDES) permit for producers operating farms in the United States.*

7.2.3: Unconsumed Feed

Unconsumed feed must not accumulate on the seafloor beneath or adjacent to net pens or cages. Producers must have a system for monitoring the feeding process with a mechanism in place to control excess feeding. Producers must be able to confirm with data that unconsumed feed is not accumulating under cages.

Producer Guidance:
Video surveys of seafloor may be used to evaluate presence or absence of unconsumed feed.

7.2.4: Benthic Impacts, additional for net pens/net cages in marine systems:

Under or within 30 meters of net pens, sediment samples from soft bottom benthic environments (mud, sand, or shell) must have Redox potential levels greater than -100 mV nhe, or sulfide levels below 1300 micromoles prior to stocking fish.

Producer Guidance:
- *Take sediment samples and measurements in a manner that prevents contamination of samples from oxygen in water or air.*
- *Results of seafloor monitoring (e.g., video surveys) must confirm that unconsumed feed is not* accumulating *beneath or adjacent to net pens or cages.*

7.2.5: Mortalities

Dead fish must promptly be removed from enclosures. Inspections for dead fish must occur daily (weather permitting) to maintain good water quality in culture systems, prevent transmission of disease, and to avoid attracting predators. Dead fish must be disposed of appropriately to avoid negative impacts on quality of surface or groundwater.

Producer Guidance:
Follow local regulations governing appropriate disposal of dead fish, which could include methods such as burial or composting.

The following information must be included in farm documentation, as applicable:
- Number of mortalities
- Cause of mortalities

7.2.6: Soil Salinization, additional for shrimp and other species raised in saline ponds:
Producers must not damage nearby lands with salt-laden soils or saline water intrusion.

Producer Guidance:
- *If signs of a problem are evident, solutions could include constructing drainage canals or planting high growing, salt-resistant grasses around the farm.*
- *One possible way of demonstrating that no salinization is occurring are soil and water testing results from environmental impact statements or surveys.*

7.3: Water Use

7.3.1: Freshwater Salinization, additional for pond production in marine/brackish waters:
Salinization of fresh groundwater or soils must be prevented. Chloride concentrations must be maintained at the natural average salinity of local groundwater.

Producer Guidance:

Producers can prevent degradation of freshwater and soils from salinization or other contamination by:
- *Clearly defining mechanisms for preventing salinization, if farming marine species at inland farms.*
- *Having methods for verifying that salinization is not occurring, if farming marine species at inland farms.*
- *Evaluate leakages of pond water, effluents, and pond sediments as possible sources of salinization.*
- *Not siting farms on sandy soils or in places where there is a high likelihood that salt water from ponds will enter agricultural land or freshwater supplies.*
- *Using seepage reduction measures. For example, shrimp farms located inland may line ponds to prevent seawater from seeping into fresh groundwater supplies.*
- *Using low salinity water for preventing salinization, provided that farms don't rely on fresh groundwater for salinity control.*
- *Monitoring freshwater wells located on or near farms annually for Chloride concentrations.*

7.3.2: Discharge
Saline water must not be discharged into bodies of freshwater.

7.3.3: Use of Freshwater, additional for shrimp:
Freshwater resources, such as from aquifers, must not be depleted. Use of fresh ground water for salinity control is not permitted.

7.4: Stocking Density, additional for salmon:
To avoid causing stress, injury, or illness to confined animals and to reduce the overall environmental impacts of production, stocking densities (calculated as total biomass/total volume of pen) in open net pens must not exceed 20 kg per cubic meter. Recirculating Aquaculture Systems (RAS) may operate at higher densities if evidence of low stress to fish can be provided.

7.5: Injured Fish
Injured fish or seriously ill fish that appear unlikely to recover must be promptly and humanely euthanized. Internal policies shall specify how injured or ill fish are handled.

Section 8: Siting

8.1: Legal Approval

Producers must demonstrate that they have legal approval for aquaculture production where their farm is sited.

Producer Guidance:
- *Present the CB with permits, leases, or concessions required by government.*
- *Present the CB with up-to-date maps showing the location of all farms. Maps must indicate public and private land and water zones, any points of potential contamination, water flow direction, effluent discharge points, and show that producers do not exclude local communities from access to public fishing grounds, mangrove areas, or other resources used for hunting and gathering or fishing.*

8.2: Risk Avoidance

Farms must be sited appropriately to minimize the risks of disease or parasite transfer to wild aquatic life and ecosystems. For salmon raised in net pens, the farms must be sited at adequate distances from areas known to be important for wild salmon populations such as the mouths of salmon rivers.

Producer Guidance:

- *Disease and parasite transfer can occur from escapes. See Section 9 for escape prevention requirements.*
- *Maintaining adequate distance from the mouths of salmon rivers helps to protect wild salmon populations by minimizing interaction between farm stock and wild smolts, including the spread of sea lice.*
- *Producers should work with local experts to determine the appropriate distance for their region.*

<u>Methods of preventing disease and parasite transfer could include:</u>
- *Using RAS.*
- *Not siting farms in areas that contain seasonal aggregations or dense populations of wild fish or other wildlife that are known to be susceptible to diseases or parasites found at the farm.*
- *Using ecological buffers to separate farms from habitat for threatened or endangered species that are vulnerable to disease or parasites.*
- *Using barriers to physically separate farm stock from natural water bodies.*
- *Controlling effluent and minimizing the discharge of effluent.*

8.3: Ecosystem Protection

Ecosystem damage and habitat loss must be prevented. Producers must not convert areas of high ecological sensitivity into new sites or new farms, or for expanding current farms. All new sites or new farms must be sited above the average high tide line.

Producer Guidance:
- *Areas of high ecological sensitivity include coastal wetlands (including mangrove ecosystems), coral reefs, and freshwater bodies with little water exchange.*
- *Land-based farms should be sited in areas previously developed or formerly used for agriculture, rather than converting sensitive natural areas to farms.*
- *Farms should not be sited in special areas such as marine protected areas unless an Environmental Impact Assessment is conducted and can demonstrate low risk of impact and the producer can demonstrate a history of no significant interactions with wildlife.*

8.4: Mangrove and Wetland Protection, additional for shrimp/species on coastal farms: Whole Foods Market will only source seafood from producers who demonstrate a commitment to "no mangrove or wetland loss." Whole Foods Market will not source from farms that were converted from wetlands or mangrove forests to aquaculture operations after 1980 (either by their own company or a previous owner), unless the producer completed the requirements for mangrove or wetland restoration by July 1, 2013, as specified in the producer guidance.

Producer Guidance:
- *In 2008, when the Whole Foods Market Quality Standards for Finfish and Shrimp were released, we provided a five-year time period for restoration of mangroves for producers that were farming on land that had been converted to shrimp farms or other type of aquaculture. This allowance ended July 1, 2013. By that date, suppliers must have completed restoration in order to sell fish to Whole Foods Market from such farms. Restoration requirements stated that at least a hectare of new habitat must be restored for each hectare of wetland or mangrove forest converted to ponds (i.e. a 1:1 ratio).*
- *Restore the diversity of natural mangrove species rather than use mono-culture planting.*
- *Consider local hydrology (e.g., depth, duration, and frequency of tidal flooding).*
- *Consider possibility of fallowing farm sites to allow recovery of natural vegetation and biodiversity when appropriate.*

8.5: Local Hydrology
Land-based farms must be sited and constructed in such a way that local hydrology—surface and groundwater bodies—is not disturbed.

8.6: Site Suitability, additional for net pens/cages:
Farms must be sited in areas with suitable environmental characteristics, including current speed, water depth, and flushing action.

8.7: Distance from Neighboring Farms, additional for salmon raised in net pens/cages: Farms must be sited at adequate distances from other salmon farms to avoid parasite and disease transfer. Farms with a history of recurring disease or parasite problems due the proximity of neighboring farms may not be approved to sell fish to Whole Foods Market.

Section 9: Escape Prevention

9.1: Containment Management System, additional for net pens/net cages:
Whole Foods Market will source farmed fish from producers that can demonstrate exceptional effort in preventing escapes, with the goal of working to as close to zero escapes as possible. Producers must have a site-specific Containment Management System (CMS) for preventing escapes (including "leakage") of farmed fish into open water. Routines and protocols specified in the CMS are subject to announced and unannounced audits by the CB.

Producer Guidance:

<u>The Containment Management System should include, but is not limited to:</u>
- *Protocols for safely removing dead, sick, or wounded fish*
- *Exact counting of all dead fish*
- *Methods for preparing for and responding to storms and other emergencies*
- *Protocols and schedules for regular inspection of containment systems*
- *Protocols for preventing and responding to predator attacks if predators are present in the area (see Section 10 for acceptable predator control methods)*
- *Procedures for responding to escapes should they occur*
- *List of Critical Control Points (CCP)—the points at which fish are most likely to escape—and proactive measures to prevent escapes from occurring at the CCPs Protocols for security and surveillance to prevent vandalism*
- *Methods for controlling nets before transferring fish to pens*
- *Size and grading specifications for fish prior to transferring to pens*
- *Mesh size requirements relative to fish size*
- *Protocols for maintenance of all equipment and containment systems, such as net integrity and cleanliness, and structural integrity of mooring and cage supports.*
- *Farm records showing net/mesh inspection, etc.*
- *Protocols for operating boats safely around pens/cages*

<u>Note:</u> Escape Prevention Methods can include using closed, re-circulating production systems.

<u>Additional resources:</u> Norway's NYTEK Regulations, the U.S. State of Maine's requirements for CMS's and the North Atlantic Salmon Conservation Organization's (NASCO) Guidelines on Containment of Farmed Salmon CNL (01)53.

9.2: Reporting on Escapes/Leakage
In addition to meeting the requirements for reporting escapes or leakages to local, regional, or federal agencies, producers must inform the CB in writing within 48 hours of any escapes involving over 50 fish. Producers must also keep records of any escapes and the cause of the incidents, and make records available during audits.

9.3: Physical Barriers, additional for pond/tank/raceway systems:
Producers must use physical barriers, such as screens, filters, or size-appropriate grids in areas where effluent leaves the farm to prevent fish from escaping into local water bodies. In cases where fish reproduce in ponds, multiple screens or barriers may be necessary to prevent escapes.

Section 10: Predator Control

10.1: Predator Prevention

Exclusion of wildlife predators or other non-lethal methods must be the first level of defense. Lethal means of predator control can only be employed if non-lethal means have been ineffective. Producers must report the non-lethal methods that were attempted and the reasons they failed.

Producer Guidance:
- *Non-lethal methods may include: Top nets to prevent bird predators from reaching fish, with special attention to preventing entanglement or trapping of birds and bird scaring techniques such as e.g., bangers, screamers and propane cannons.*
- *Examples of lethal methods include shooting predators on the farm and oiling or destroying bird nests to prevent hatching.*
- *An example of a situation where lethal means are necessary is where a predator is entangled or injured and cannot be removed safely. Wildlife includes birds, aquatic and terrestrial mammals, reptiles, and amphibians.*
- *When establishing new ponds, or re-building ponds, consider reconfigurations such as smaller ponds to facilitate the use of exclusion methods.*

10.2: Lead Shot

Producers must not use lead shot for scaring or killing predators.

Producer Guidance:
This standard is intended to prevent toxic lead from entering the environment and harming birds and other wildlife.

10.3: Protected Species

Producers must not intentionally kill predators listed nationally or globally as vulnerable, endangered, or critically endangered (*e.g.,* by IUCN).

10.4: Avoidance of Suffering

Predator control methods must not cause wildlife to suffer. Lethal means of predator control must result in immediate death.

10.5: Interactions with Predators

Producers must document incidental takes of avian, terrestrial, or mammalian predators (*e.g.,* drownings or entanglements in predator nets). Details on the number of deaths, injuries, and the species affected must be documented in both the OP as well as the producer's records, which are subject to audit:

a) Descriptions of any predator interactions that have occurred, with details on injuries, and the species affected
b) Records of any intentional or incidental lethal take of predators. For take of bird predators on farms in the United States, a copy of the annual report to the U.S. Fish and Wildlife Service is sufficient.
c) Records of any lethal control methods used

Deaths of protected or endangered species must be immediately reported to the CB within 48 hours in writing.

10.6: Predator Nets, additional for net pens/cages:

If predators are present in the area, either as residents or as a migratory population, predator nets (*e.g.*, secondary nets for marine mammals and/or top nets for birds) are required. Predator nets must be maintained to ensure that no holes or tears are present.

10.7: Acoustic Harassment Devices

Acoustic Harassment Devices (AHDs) are prohibited.

Producer Guidance:
Acoustic Harassment devices are also referred to as Acoustic Deterrent Devices, (ADDs), "pingers," or seal scarers.

Section 11: Traceability

11.1: Electronic Traceability System

Whole Foods Market will only source from approved supply chains:

- Suppliers must utilize Whole Foods Market's selected electronic traceability software to allow Whole Foods Market to verify sourcing of all farmed products and to track products throughout the supply chain.
- Suppliers must enter data into their respective accounts in the electronic traceability software for each production lot.

11.2: Internal Traceability

Producers must have a tracking system to ensure the identity and history of all fish from point of arrival on the farm to point of sale to the processor. This must include:

- Purchase/sales records with relevant batch number
- Receiving records
- Farm records (use of feed, movement of stock, biomass)
- Mortality records
- Transport records
- Harvest records
- Processing records

11.3: CITES Labelling Requirements, additional for Acipenseriformes:

Domestically packed caviar for retail sale must include the common species name and country of origin. All information required by CITES, at present Resolution 50 CFR 23.71, for products sourced internationally must be available to the CB.

Producer Guidance:

- *Note that there are a number of sturgeon species listed under the U.S. Endangered Species Act, including beluga sturgeon (Huso huso) for which the permitting and labelling requirements, both for import and for movement within the United States, may differ.*
- *CITES guidance is available at the CITES Secretariat's website, Resolution Conf. 12.7 (Rev. CoP17–4, Annex 1 (or any updated version thereof): https://cites.org/sites/default/files/document/E-Res-12-07-R17.pdf*

Section 12: Additional Requirements for Farmed Sturgeon and Other Species Producing Caviar

12.1: Electronic Traceability System

Whole Foods Market will only source from approved supply chains:

12.1 Eligibility for new sturgeon and caviar suppliers entering Whole Foods Market program (Acipenseriformes):
New sturgeon and caviar suppliers are eligible for certification if fish destined for Whole Foods Market meet the following requirements:

- Feed: Harvest-size fish have been raised on compliant feed for at least 3 years prior to initial certification. All other fish are being fed compliant feed from the time of the first audit and onwards through the duration of their lifespan.

- Treatments: Harvest-size fish being sold for meat have not been treated with prohibited substances for at least 3 years prior to initial certification. (See standard 4.1 for list of prohibited substances.) All other fish must comply with standard 4.1 from the time of the first audit and onwards through the duration of their lifespan.

- The implementation of 12.2 and 12.3 (below) is established, including methods installed, trialed and personnel trained, by the time of the first audit.

Producer guidance:
Due to their unusually long lifespan and time to maturity, sturgeon may be raised for up to 12 years on farms before harvest, depending on the species. This duration makes it impractical for new farms to enter the Whole Foods Market program if compliance is required for the entire duration of production fish. This standard aims to provide an allowance for new farms to enter the program while ensuring that fish have spent a significant duration of their lifespan under compliant conditions.

12.2: Biopsy – Additional for Acipenceriformes

- Biopsy may only be performed by a veterinarian, or a member of staff specifically trained and approved by a veterinarian.

- When biopsy is used, producers must demonstrate the ability to keep stress levels to a minimum.

- Biopsy is prohibited for sex determination.

Producer Guidance:
- *Biopsy is a surgical technique to extract a small sample of eggs from the ovary. Biopsy is used when external verification (e.g., by ultrasound) does not provide sufficiently conclusive information.*
- *Biopsy should be replaced with non-invasive techniques such as ultrasound to the greatest extent possible.*
- *A preferred and alternate method to using anaesthetics during biopsy: fish are calmed and restrained without removing the fish from the tank in order to reduce stress. An incision is made by the vet or trained staff with a sharp blade to avoid/reduce pain.*

• The focus should be on keeping stress to a minimum. This may be by using anaesthetics or by the preferred alternate method described above with reduced handling of the fish.
• Examples of acceptable types of anaesthetics: Eugenol

12.3: Stunning/Killing – Additional for Acipenceriformes
The approved stunning/killing method is the use of a captive bolt stunner prior to bleeding.

Producer Guidance:
• A captive bolt stunner gives a forceful strike to the head in order to render the fish instantly and irrecoverably unconscious.
• If the captive bolt stunner does not prove effective, Whole Foods Market will evaluate alternative methods on-site on a case-by-case basis.

12.4: Egg Removal – Additional for Trout
If eggs are removed for caviar production by applying a slight pressure to the belly and without killing the parent fish, the fish must be anaesthetized first.

Producer Guidance:
• An example of an acceptable anaesthetic is Eugenol.

12.5: Space/Stocking densities
Due to the large size of Acipenceriformes, special attention is needed during the stocking and transport of live fish prior to slaughtering. Fish must not be crowded into small bins for chilling purposes prior to slaughter due to the risk of suffocation and stress. Facility structure and transport methods must be sufficient to keep stress to a minimum.

Producer Guidance:
• The facility itself should be suitable for the size of the fish.

Appendix A.

Sampling and Testing Methods for Environmental Contaminants

Contaminant group	Maximum Level		Method
PCBs	0.011 ppm (11 ppb)	11µg/kg	EPA 1668A or 1668C*
WHO-TEQs (dioxins, furans, dioxin-like PCBs)	2.16 ppt (parts per trillion)	2.16 pg/g or ng/kg	EPA 1668 A EPA 1613B
Mercury	0.22 ppm	0.22 mg/kg	EPA 1631**

I. Sampling Method

1. Submit a sampling plan to the CB prior to sampling and at the latest by December 1 for sampling in the following calendar year. The sampling plan for environmental contaminants must be approved by the CB prior to sampling. The plan must include the following information:
    - Sampling date
    - Expected date of receipt of results
    - Lab to be used
    - Number of farms from which samples will be taken
    - Number of ponds/tanks/raceways/pens from which samples will be taken
    - Reason for reduced sampling program, if applicable (see #3 below), with details demonstrating that the criteria for the reduced sampling are being met

2. During the first harvest of the year, collect fish for environmental contaminants testing.

3. For initial certification, sample fish at the next harvest of the year and share the results with the CB prior to certification.

4. Select harvest-size fish which are of average size compared to others in the tanks/pens.

5. Producers must collect samples from *each* farm/site unless they qualify for a reduced sampling program. Companies with several farms may be eligible to implement a reduced sampling program, whereby samples are collected from only one farm. Any company that wishes to carry out a reduced sampling program must submit their request to the CB for approval in their annual sampling plan (see #2 above). The sampling plan must include details of the farms to be tested. The criteria for reduced sampling are that all farms:
    - Are under the same management
    - Use the same feed
    - Source water from the same water body

Producer Guidance:
A "farm" or a "site" refers to a cluster of ponds, tanks, raceways and pens that are relatively close together, managed by the same staff, and typically tended to at the same time, or within a very short period of time.

6. Collect one fish from each of several ponds/tanks/raceways/pens. Several are defined as 10% of the total number of ponds/tanks/raceways/pens at the farm site. ***The minimum number of animals to be collected is three.***

Producer Guidance:
- *Example 1: If a farm has 25 ponds, then the number of ponds from which fish should be sampled is 3 (10% of 25 = 2.5, round number up to 3). Collect one fish from each of the three ponds, for a total of 3 fish and combine into a single sample to submit for analysis*

- *Example 2: If a farm has 56 ponds, then the number of ponds from which fish should be sampled is 6 (10% of 56 = 5.6, round number up to 6). Collect one fish from each of the six ponds, for a total of 6 fish and combine into a single sample to submit for analysis.*

- Example 3: If a farm has 18 ponds, then the number of ponds from which fish should be sampled is 3 (10% of 18 = 1.8, round number up to 2, and then chose 3 because it is the required minimum). Collect one fish from each of the three ponds, for a total of 3 fish and combine into a single sample to submit for analysis. If you only have two ponds with harvest size fish, sample two fish from one pond and one fish from the other.

7. The total weight of the sample must be a minimum of 250 grams. If the total sample does not weigh at least 250 grams, add additional animals to reach this minimum amount. This requirement applies to all farms, both those participating in a normal sampling program and those participating in a reduced sampling program.

Producer Guidance:
If the total weight of the sample is less than 250 grams, add additional animals from the same ponds that are being sampled. For example, if three ponds are being sampled, take two animals from each pond instead of one to reach the minimum of 250 grams.

8. Wrapping:
    - Finfish: Wrap each fish of a sample individually, whole and gutted, and pack with the other fish of that sample to send to the laboratory.
    - Shrimp: Wrap all animals in the sample together. If frozen, put shrimp in a jar so that when they are defrosted in the laboratory, the liquid can be used for analysis.

9. Filleting:
    - Sending one fillet per fish (in contrast to whole fish) is allowed, but the entire fillet must be sent to the lab, including the belly flap and skin. The fillet size must not be cut down. Prior to preparing fillets, and in between fish, wash and scrub filleting tools with soapy water, and then rinse well to get rid of all soap. In addition, clean and rinse the work surface before use and between fish. Put a fresh piece of heavy-duty foil on the surface where fillets are being prepared.

- Next individually wrap each complete fillet per fish in two layers of foil and seal in a zipper bag for freezing and shipping to the laboratory. Fillets thaw more easily than whole fish (and can lose fluid) so they must be well frozen before being sent and kept cold on more ice, or on dry ice during shipment. Warm samples may not be possible to analyze.

10. Require laboratories to use the testing methods specified below and to follow the quality assurance rules associated with each method.

II. Testing Methods

1. Prior to conducting chemical analysis, laboratories should do the following:
   - Finfish: Fillet each whole fish and then homogenize whole fillets from each fish. Fillets must include both the belly flap and the skin unless the fillets are sold to Whole Foods Market skinless (*e.g.*, catfish). A sub-sample of the homogenate can then be taken for analysis.
   - Shrimp: De-head, peel, and homogenize each shrimp. Vein should be left in. A sub-sample of the homogenate can then be taken for analysis.

2. Test results must be based on wet weight, rather than lipid weight.

3. All testing for environmental contaminants must be conducted by third party, independent laboratories. Laboratories should be accredited for the tests they are performing to ISO 17025 or the U.S. National Environmental Laboratory Accreditation Program (NELAP) standards. Actual laboratory results should be submitted to the Control Body (CB) as soon as they're available. Whole Foods Market and the CB have the right to request additional testing.

4. **PCBs:** Whole Foods Market requires that producers have fish tested for Polychlorinated Biphenyls (PCBs). Laboratories shall analyze samples for all 209 congeners. Report both the concentration of the 209 individual congeners and total PCBs as represented by the sum of the congeners. Laboratories should use the High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) method for analysis (*EPA Method 1668A, 1668C, or an equivalent method that provides detection limits of no more than 0.02 µg/kg per congener). Results shall be reported in µg/kg or parts per million (ppm).

5. **WHO-TEQs**: Producers must have fish tested for polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzo–*p*furans (PCDFs)(List #1 below), which includes the twelve dioxin-like PCBs (List #2 below). Laboratories shall also analyze dioxin, furan, and PCB congeners that have WHO Toxic Equivalency Factors (TEFs) (List 1 below) and report results in WHO-TEQs. If any compound is not detected, WHO-TEQs shall be reported as 0.5 of the Detection Limit (ND=0.5DL). Laboratories shall use EPA Method 1613b for dioxins & furans and EPA Method 1668A or 1668C, or an equivalent method that provides detection limits of no more than 0.02 µg/kg per congener for dioxin-like PCB's. Results shall be reported in pg/g, ng/kg, or parts per trillion (ppt).

1. Dioxins (PCDDs) and Furans (PCDFs) Required for Testing	2. Dioxin-like PCBs Required for Testing
Dioxins:	77
2,3,7,8-TCDD	81
1,2,3,7,8 -PeCDD	105
1,2,3,4,7,8-HxCDD	114
1,2,3,6,7,8-HxCDD	118
1,2,3,7,8,9-HxCDD	123
1,2,3,4,6,7,8-HpCDD	126
OCDD	156
Furans:	157
2,3,7,8-TCDF	167
1,2,3,7,8-PeCDF	169
2,3,4,7,8-PeCDF	189
1,2,3,4,7,8-HxCDF	
1,2,3,6,7,8-HxCDF	
1,2,3,7,8,9-HxCDF	
2,3,4,6,7,8-HxCDF	
1,2,3,4,6,7,8-HpCDF	
1,2,3,4,7,8,9-HpCDF	
OCDF	

6. **Mercury**: Producers must have fish tested for total mercury (Hg). **Laboratories may use the following methods:
    - EPA Method 1631, Appendix, Analysis by Cold Vapor Atomic Fluorescence Spectrometry, with Digestion I (section A11.1)
    - EPA Method 6020, Analysis by ICP-MS, with Digestion Methods 3050B, 3051, 3052
    - EPA Method 245.6, Analysis by Cold Vapor Atomic Absorption (section 11.1 - 11.2) (method specifies digestion method)
    - EPA Method 7471A, Analysis by Cold Vapor Atomic Absorption, with Alternate. Follow Digestion Method in Section 7.2.
      (Note: there is evidence that a low bias to the total Hg results may be seen if other digestion methods are used.)
    - EPA Method 7471B, Analysis by Cold Vapor Atomic Absorption, with Alternate. Follow Digestion Method in Section 11.2.
      (Note: there is evidence that a low bias to the total Hg results may be seen if other digestion methods are used.)

Results shall be reported in mg/kg or parts per million (ppm).

III. Results

The following must be submitted to the CB:

- Original reports from the laboratory, following reporting requirements indicated in section II for PCBs, WHO-TEQ and Mercury.
- The results summary provided by the lab should include, but is not limited to, the following:
  - sampling date
  - species tested
  - name of the sampled farm
  - date of analysis
  - method used; EPA method as outlined in “Section II Testing Methods,” or confirmation of equivalence to approved EPA method
  - results for PCBs, WHO-TEQs and mercury given in the required units, as indicated in the standard
  - detection limit used for each compound.

Appendix B.

Sampling and Testing Methods for EPA and DHA

Component	Minimum level EPA & DHA	Cut/portion	Method
Total EPA & DHA	1000 mg / 114 g salmon	Any salmon cut or portion, such as steaks, fillets, sides, tail portions	See Appendix B

I. Sampling Method

1. Collect fish during the first harvest of the calendar year.
2. For initial certification, fish are sampled at the next harvest of the year and results are shared with the CB prior to certification.
3. Collect a total of three fish from different tanks/pens.
4. Select harvest-size fish which are of average size compared to others in the tanks/pens.

II. Product cut for sample submission

1. Due to the variability of fatty acid content across different parts of a fillet, all producers must submit one full side (salmon side) per fish sampled.
2. Carefully review the steps required by laboratories, from sample preparation right up until test results reporting, so that producers can take responsibility of ensuring the required methods are followed by laboratories.
3. Place the sample in a labelled, sealable bag or wrap in foil and place in a bag and freeze at -20^{o}C. Place on dry ice for shipping to the laboratory. This will help maintain freezing and prevent fatty acid breakdown during shipping in the event of a shipping delay.
4. Ship samples in an insulated box to ensure that fish remains frozen.
5. Prior to shipping samples, reach out to the lab to ensure your company order is set up to avoid any delays.
6. Send your samples to one of the following two laboratories:

   Exact Scientific Services, Inc, www.exactscientific.com
   1355 Pacific Place Ste 101, Ferndale, WA 98248, USA
   +1 360 393 1114, K.oostra@exactscientific.com, lab@exactscientific.com

   Nutrition Analytical Service (NAS)
   Institute of Aquaculture, University of Stirling, Stirling FK9 4LA, Scotland, UK
   +44 1786 467873, fm11@stir.ac.uk

7. When sending samples, use the WFM Analysis Request Form, which will be provided by the Certification Body.

III. Product Preparation

When sending samples, specify that laboratories must use the following method:

1. From each of the three salmon sides, labs will prepare two composites for analysis in total; One composite is comprised of three Norwegian Quality Cut (NQC) standardized muscle samples blended into a single composite for analysis. The second composite is comprised of three tail samples blended into a single composite for analysis.
    a. The NQC relates to a region posterior to the dorsal fin to anterior of the anal fin.
    b. The best way to sample the quality cut is to remove a steak by cutting through the whole fish and by using one side of the steak for the sample.

Fig. 1 Whole fish (top left); Section posterior to the dorsal fin to anterior of the anal fin (top right); One side of the steak for the NQC (bottom left). Photo credit: Exact Scientific Services.

    c. Remove any visceral and inter-connective tissue still attached to the flesh. However, do not trim or remove any of the belly flap. Reference: Johnsen CA, Hagen O, Bendiksen EA (2011) Long-term effects of high-energy, low-fishmeal feeds on growth and flesh characteristics of Atlantic salmon (Salmo salar L.). Aquaculture 312: 109-116.
2. Remove the skin from samples. After removing the bulk of the flesh from the skin, laboratories shall run the blade of a knife along the skin to remove as much red muscle as possible to include in the sample for analysis.
3. Fish samples should be prepared prior to extraction. The sample preparation is needed to fully extract the lipid from the meat. Some fatty acids are bound and require additional steps to extract. Ether extraction is inadequate because it can incompletely extract lipids and extracts non-nutritive ether soluble material. The following two preparations allow for a complete extraction of all fatty acids when using an acid hydrolysis extraction:

    a. Freeze drying – increases the surface area of lipid exposed to solvent. Preferred method to remove potential lipid oxidation issues.
    b. Vacuum oven drying – at low temperatures. High temperatures can cause lipid oxidation.

IV. Product Extraction

1. Folch Extraction – chloroform and methanol used as extraction solvent.
2. Acid hydrolysis extraction (one step) – Use freeze dried sample to convert fatty acids to FAMEs

V. Purification

1. Extraction solvent should be evaporated using a rotary evaporator.

VI. Derivatization

1. Fatty acids are converted to fatty acid methyl esters (FAMES).

VII. FAME analysis

1. Analysis is run by GC-FID or GC-MS.
2. Retention times are compared to reference standards
3. Results for EPA and DHA are reported as mg/100g
4. The mg/100g is determined by using the mass of an internal standard to measure recovery. For consistency between labs a C17:0 heptadecanoic acid is used as an internal standard.
5. The FAMEs calculation is based on 100% of measured peaks.

VIII. Calculation of mg/100g

1. For the calculation of mg/100g of fatty acids in samples we use a known concentration of internal standard within the sample (17:0 heptadecanoic acid) which we are then able to apply to calculate the ug of fatty acids per mg of lipid (equivalent to mg/g lipid). We then apply the lipid content of the sample, based on the total lipid extract used for the FAME analysis, to arrive at our final absolute result (mg/100 g salmon flesh).

IX. Reporting Test Results:

1. Specify that laboratories must report test results based on wet weight rather than lipid weight.
2. The results must be expressed in milligrams of combined EPA and DHA per four-ounce piece of raw salmon (114 g).
3. The test report must indicate the type of sample analyzed *e.g.*, pooled sample of 3 NQC sections and pooled sample of 3 tail portions.
4. The test report must include the testing method used.
5. Submit the results to the CB. Submission includes summarizing the relevant values in an email to the CB as well as sending the original analysis request forms and the original analysis reports from the lab.